```
/*<html>
<span id="gsh" data-title="GShell" data-author="sato@its-more.jp">
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<link rel="icon" id="GshFaviconURL" href=""><!-- place holder -->
<span id="GshVersion" hidden="">gsh--0.6.1--2020-10-05--SatoxITS</span>
<title>GShell-0.6.1 by SatoxITS</title>
<header id="GshBanner" height="100px" onclick="shiftBG();">
<div align="right"><note><a href="http://archive.gshell.org">GShell</a> version 0.6.1 // 2020-10-05 // SatoxITS</note></div>
</header>
<h2>GShell // a General purpose Shell built on the top of Golang</h2>
<p>
<note>
It is a shell for myself, by myself, of myself. --SatoxITS(^-^)
</note>
</p>
<div id="GJFactory_x"></div>

<div>
<span id="GshMenu">
<span class="GshMenu1" id="GshMenuEdit" onclick="html_edit();">Edit</span>
<span class="GshMenu1" id="GshMenuSave" onclick="html_save();">Save</span>
<span class="GshMenu1" id="GshMenuLoad" onclick="html_load();">Load</span>
<span class="GshMenu1" id="GshMenuVers" onclick="html_ver0();">Vers</span>
<span id="gsh-WinId" onclick="win_jump('0.1');">0</span>
<span class="GshMenu1" id="gsh-menu-exit" onclick="html_close();"></span>
<span class="GshMenu1" id="gsh-menu-fork" onclick="html_fork();">Fork</span>
<span class="GshMenu1" id="GshMenuStop" onclick="html_stop(this,true);">Stop</span>
<span class="GshMenu1" id="GshMenuFold" onclick="html_fold(this);">Unfold</span>
<span class="GshMenu1" id="gsh-menu-cksum" onclick="html_digest();">Digest</span>
<span class="GshMenu1" id="GshMenuSign" onclick="html_sign(this);" style="">Source</span>
<!-- | <span id="gsh-menu-pure" onclick="html_pure(this);">Pure</span> -->
</span>
</div>
*/
/*
<details id="GshStatement" class="gsh-document"><summary>Statement</summary>
<h3>Fun to create a shell</h3>
<p>For a programmer, it must be far easy and fun to create his own simple shell
rightly fitting to his favor and necessities, than learning existing shells with
complex full features that he never use.
I, as one of programmers, am writing this tiny shell for my own real needs,
totally from scratch, with fun.
</p><p>
For a programmer, it is fun to learn new computer languages.  For long years before
writing this software, I had been specialized to C and early HTML2 :-).
Now writing this software,  I'm learning Go language, HTML5, JavaScript and CSS
on demand as a novice of these, with fun.
</p><p>
This single file "gsh.go", that is executable by Go, contains all of the code written
in Go. Also it can be displayed as "gsh.go.html" by browsers. It is a standalone
HTML file that works as the viewer of the code of itself, and as the "home page" of
this software.
</p><p>
Because this HTML file is a Go program, you may run it as a real shell program
on your computer.
But you must be aware that this program is written under situation like above.
Needless to say, there is no warranty for this program in any means.
</p>
<address>Aug 2020, SatoxITS (sato@its-more.jp)</address>
</details>
*/
/*
<details id="GshFeatures" class="gsh-document"><summary>Features</summary><p>
</p>
<h3>Cross-browser communication</h3>
<p>
... to be written ...
</p>
<h3>Vi compatible command line editor</h3>
<p>
The command line of GShell can be edited with commands compatible with
<a href="https://www.washington.edu/computing/unix/vi.html"><b>vi</b></a>.
As in vi, you can enter <i><b>command mode</b></i> by <b>ESC</b> key,
then move around in the history by <b><code>j k / ? n N</code></b>,
or within the current line by <b><code>l h f w b 0 $ %</code></b> or so.
</p>
</details>
*/
/*
<details id="gsh-gindex">
<summary>Index</summary><div class="gsh-src">
Documents
    <span class="gsh-link" onclick="jumpto_JavaScriptView();">Command summary</span>
Go lang part<span class="gsh-src" onclick="document.getElementById('gsh-gocode').open=true;">
    Package structures
        <a href="#import">import</a>
        <a href="#struct">struct</a>
    Main functions
        <a href="#comexpansion">str-expansion</a>   // macro processor
        <a href="#finder">finder</a>        // builtin find + du
        <a href="#grep">grep</a>        // builtin grep + wc + cksum + ...
        <a href="#plugin">plugin</a>        // plugin commands
        <a href="#ex-commands">system</a>       // external commands
        <a href="#builtin">builtin</a>      // builtin commands
        <a href="#network">network</a>      // socket handler
        <a href="#remote-sh">remote-sh</a>  // remote shell
        <a href="#redirect">redirect</a>    // StdIn/Out redireciton
        <a href="#history">history</a>      // command history
        <a href="#rusage">rusage</a>        // resouce usage
        <a href="#encode">encode</a>        // encode / decode
        <a href="#IME">IME</a>      // command line IME
        <a href="#getline">getline</a>      // line editor
        <a href="#scanf">scanf</a>      // string decomposer
        <a href="#interpreter">interpreter</a>  // command interpreter
        <a href="#main">main</a>
</span>
JavaScript part
    <a href="#script-src-view" class="gsh-link" onclick="jumpto_JavaScriptView();">Source</a>
    <a href="#gsh-data-frame" class="gsh-link" onclick="jumpto_DataView();">Builtin data</a>
CSS part
    <a href="#style-src-view" class="gsh-link" onclick="jumpto_StyleView();">Source</a>
References
    <a href="#" class="gsh-link" onclick="jumpto_WholeView();">Internal</a>
    <a href="#gsh-reference" class="gsh-link" onclick="jumpto_ReferenceView();">External</a>
Whole parts
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Source</a>
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Download</a>
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Dump</a>

</div>
</details>
*/
//<details id="gsh-gocode">
```

```
//<summary>Go Source</summary><div class="gsh-src" onclick="document.getElementById('gsh-gocode').open=false;">
// gsh - Go lang based Shell
// (c) 2020 ITS more Co., Ltd.
// 2020-0807 created by SatoxITS (sato@its-more.jp)

package main // gsh main

// <a name="import">Imported packages</a> // <a href="https://golang.org/pkg/">Packages</a>
import (
    "fmt"       // <a href="https://golang.org/pkg/fmt/">fmt</a>
    "strings"   // <a href="https://golang.org/pkg/strings/">strings</a>
    "strconv"   // <a href="https://golang.org/pkg/strconv/">strconv</a>
    "sort"      // <a href="https://golang.org/pkg/sort/">sort</a>
    "time"      // <a href="https://golang.org/pkg/time/">time</a>
    "bufio"     // <a href="https://golang.org/pkg/bufio/">bufio</a>
    "io/ioutil" // <a href="https://golang.org/pkg/io/ioutil/">ioutil</a>
    "os"        // <a href="https://golang.org/pkg/os/">os</a>
    "syscall"   // <a href="https://golang.org/pkg/syscall/">syscall</a>
    "plugin"    // <a href="https://golang.org/pkg/plugin/">plugin</a>
    "net"       // <a href="https://golang.org/pkg/net/">net</a>
    "net/http"  // <a href="https://golang.org/pkg/net/http/">http</a>
    //"html"    // <a href="https://golang.org/pkg/html/">html</a>
    "path/filepath" // <a href="https://golang.org/pkg/path/filepath/">filepath</a>
    "go/types"  // <a href="https://golang.org/pkg/go/types/">types</a>
    "go/token"  // <a href="https://golang.org/pkg/go/token/">token</a>
    "encoding/base64"   // <a href="https://golang.org/pkg/encoding/base64/">base64</a>
    "unicode/utf8"  // <a href="https://golang.org/pkg/unicode/utf8/">utf8</a>
    //"gshdata" // gshell's logo and source code
    "hash/crc32"    // <a href="https://golang.org/pkg/unicode/hash/crc32/">crc32</a>
    "golang.org/x/net/websocket"
)

// // 2020-0906 added,
// // <a href="https://golang.org/cmd/cgo/">CGo</a>
// #include "poll.h" // <poll.h> // </poll.h> to be closed as HTML tag :-p
// typedef struct { struct pollfd fdv[8]; } pollFdv;
// int pollx(pollFdv *fdv, int nfds, int timeout){
//  return poll(fdv->fdv,nfds,timeout);
// }
import "C"

// // 2020-0906 added,
func CFpollIn1(fp*os.File, timeoutUs int)(ready uintptr){
    var fdv = C.pollFdv{}
    var nfds = 1
    var timeout = timeoutUs/1000

    fdv.fdv[0].fd = C.int(fp.Fd())
    fdv.fdv[0].events = C.POLLIN
    if( 0 < EventRecvFd ){
        fdv.fdv[1].fd = C.int(EventRecvFd)
        fdv.fdv[1].events = C.POLLIN
        nfds += 1
    }
    r := C.pollx(&fdv,C.int(nfds),C.int(timeout))
    if( r <= 0 ){
        return 0
    }
    if (int(fdv.fdv[1].revents) & int(C.POLLIN)) != 0 {
        //fprintf(stderr,"--De-- got Event\n");
        return uintptr(EventFdOffset + fdv.fdv[1].fd)
    }
    if (int(fdv.fdv[0].revents) & int(C.POLLIN)) != 0 {
        return uintptr(NormalFdOffset + fdv.fdv[0].fd)
    }
    return 0
}

const (
    NAME = "gsh"
    VERSION = "0.6.1"
    DATE = "2020-10-05"
    AUTHOR = "SatoxITS(^-^)//"
)
var (
    GSH_HOME = ".gsh"   // under home directory
    GSH_PORT = 9999
    MaxStreamSize = int64(128*1024*1024*1024) // 128GiB is too large?
    PROMPT = "> "
    LINESIZE = (8*1024)
    PATHSEP = ":"   // should be ";" in Windows
    DIRSEP = "/"    // canbe \ in Windows
)

// -xX logging control
// --A-- all
// --I-- info.
// --D-- debug
// --T-- time and resource usage
// --W-- warning
// --E-- error
// --F-- fatal error
// --Xn- network

// <a name="struct">Structures</a>
type GCommandHistory struct {
    StartAt     time.Time // command line execution started at
    EndAt       time.Time // command line execution ended at
    ResCode     int       // exit code of (external command)
    CmdError    error     // error string
    OutData     *os.File  // output of the command
    FoundFile   []string  // output - result of ufind
    Rusagev     [2]syscall.Rusage // Resource consumption, CPU time or so
    CmdId       int       // maybe with identified with arguments or impact
                          // redireciton commands should not be the CmdId
    WorkDir     string    // working directory at start
    WorkDirX    int       // index in ChdirHistory
    CmdLine     string    // command line
}
type GChdirHistory struct {
    Dir     string
    MovedAt     time.Time
    CmdIndex    int
}
type CmdMode struct {
    BackGround  bool
}
type Event struct {
    when        time.Time
    event       int
    evarg       int64
    CmdIndex    int
}
var CmdIndex int
```

```
var Events []Event
type PluginInfo struct {
    Spec        *plugin.Plugin
    Addr        plugin.Symbol
    Name        string // maybe relative
    Path        string // this is in Plugin but hidden
}
type GServer struct {
    host        string
    port        string
}

// <a href="https://tools.ietf.org/html/rfc3230">Digest</a>
const ( // SumType
    SUM_ITEMS   = 0x000001 // items count
    SUM_SIZE    = 0x000002 // data length (simplly added)
    SUM_SIZEHASH    = 0x000004 // data length (hashed sequence)
    SUM_DATEHASH    = 0x000008 // date of data (hashed sequence)
    // also envelope attributes like time stamp can be a part of digest
    // hashed value of sizes or mod-date of files will be useful to detect changes

    SUM_WORDS   = 0x000010 // word count is a kind of digest
    SUM_LINES   = 0x000020 // line count is a kind of digest
    SUM_SUM64   = 0x000040 // simple add of bytes, useful for human too

    SUM_SUM32_BITS  = 0x000100 // the number of true bits
    SUM_SUM32_2BYTE = 0x000200 // 16bits words
    SUM_SUM32_4BYTE = 0x000400 // 32bits words
    SUM_SUM32_8BYTE = 0x000800 // 64bits words

    SUM_SUM16_BSD   = 0x001000 // UNIXsum -sum -bsd
    SUM_SUM16_SYSV  = 0x002000 // UNIXsum -sum -sysv
    SUM_UNIXFILE    = 0x004000
    SUM_CRCIEEE = 0x008000
)
type CheckSum struct {
    Files       int64   // the number of files (or data)
    Size        int64   // content size
    Words       int64   // word count
    Lines       int64   // line count
    SumType     int
    Sum64       uint64
    Crc32Table  crc32.Table
    Crc32Val    uint32
    Sum16       int
    Ctime       time.Time
    Atime       time.Time
    Mtime       time.Time
    Start       time.Time
    Done        time.Time
    RusgAtStart [2]syscall.Rusage
    RusgAtEnd   [2]syscall.Rusage
}
type ValueStack [][]string
type GshContext struct {
    StartDir    string  // the current directory at the start
    GetLine     string  // gsh-getline command as a input line editor
    ChdirHistory    []GChdirHistory // the 1st entry is wd at the start
    gshPA       syscall.ProcAttr
    CommandHistory  []GCommandHistory
    CmdCurrent  GCommandHistory
    BackGround  bool
    BackGroundJobs  []int
    LastRusage  syscall.Rusage
    GshHomeDir  string
    TerminalId  int
    CmdTrace    bool // should be [map]
    CmdTime     bool // should be [map]
    PluginFuncs []PluginInfo
    iValues     []string
    iDelimiter  string // field sepearater of print out
    iFormat     string // default print format (of integer)
    iValStack   ValueStack
    LastServer  GServer
    RSERV       string // [gsh://]host[:port]
    RWD     string // remote (target, there) working directory
    lastCheckSum    CheckSum
}

func nsleep(ns time.Duration){
    time.Sleep(ns)
}
func usleep(ns time.Duration){
    nsleep(ns*1000)
}
func msleep(ns time.Duration){
    nsleep(ns*1000000)
}
func sleep(ns time.Duration){
    nsleep(ns*1000000000)
}

func strBegins(str, pat string)(bool){
    if len(pat) <= len(str){
        yes := str[0:len(pat)] == pat
        //fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,yes)
        return yes
    }
    //fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,false)
    return false
}
func isin(what string, list []string) bool {
    for _, v := range list  {
        if v == what {
            return true
        }
    }
    return false
}
func isinX(what string,list[]string)(int){
    for i,v := range list {
        if v == what {
            return i
        }
    }
    return -1
}

func env(opts []string) {
    env := os.Environ()
    if isin("-s", opts){
        sort.Slice(env, func(i,j int) bool {
            return env[i] < env[j]
        })
```

```
373     }
374     for _, v := range env {
375         fmt.Printf("%v\n",v)
376     }
377 }
378
379 // - rewriting should be context dependent
380 // - should postpone until the real point of evaluation
381 // - should rewrite only known notation of symobl
382 func scanInt(str string)(val int,leng int){
383     leng = -1
384     for i,ch := range str {
385         if '0' <= ch && ch <= '9' {
386             leng = i+1
387         }else{
388             break
389         }
390     }
391     if 0 < leng {
392         ival,_ := strconv.Atoi(str[0:leng])
393         return ival,leng
394     }else{
395         return 0,0
396     }
397 }
398 func substHistory(gshCtx *GshContext,str string,i int,rstr string)(leng int,rst string){
399     if len(str[i+1:]) == 0 {
400         return 0,rstr
401     }
402     hi := 0
403     histlen := len(gshCtx.CommandHistory)
404     if str[i+1] == '!' {
405         hi = histlen - 1
406         leng = 1
407     }else{
408         hi,leng = scanInt(str[i+1:])
409         if leng == 0 {
410             return 0,rstr
411         }
412         if hi < 0 {
413             hi = histlen + hi
414         }
415     }
416     if 0 <= hi && hi < histlen {
417         var ext byte
418         if 1 < len(str[i+leng:]) {
419             ext = str[i+leng:][1]
420         }
421         //fmt.Printf("--D-- %v(%c)\n",str[i+leng:],str[i+leng])
422         if ext == 'f' {
423             leng += 1
424             xlist := []string{}
425             list := gshCtx.CommandHistory[hi].FoundFile
426             for _,v := range list {
427                 //list[i] = escapeWhiteSP(v)
428                 xlist = append(xlist,escapeWhiteSP(v))
429             }
430             //rstr += strings.Join(list," ")
431             rstr += strings.Join(xlist," ")
432         }else
433         if ext == '@' || ext == 'd' {
434             // !N@ .. workdir at the start of the command
435             leng += 1
436             rstr += gshCtx.CommandHistory[hi].WorkDir
437         }else{
438             rstr += gshCtx.CommandHistory[hi].CmdLine
439         }
440     }else{
441         leng = 0
442     }
443     return leng,rstr
444 }
445 func escapeWhiteSP(str string)(string){
446     if len(str) == 0 {
447         return "\\z" // empty, to be ignored
448     }
449     rstr := ""
450     for _,ch := range str {
451         switch ch {
452             case '\\': rstr += "\\\\"
453             case ' ': rstr += "\\s"
454             case '\t': rstr += "\\t"
455             case '\r': rstr += "\\r"
456             case '\n': rstr += "\\n"
457             default: rstr += string(ch)
458         }
459     }
460     return rstr
461 }
462 func unescapeWhiteSP(str string)(string){ // strip original escapes
463     rstr := ""
464     for i := 0; i < len(str); i++ {
465         ch := str[i]
466         if ch == '\\' {
467             if i+1 < len(str) {
468                 switch str[i+1] {
469                     case 'z':
470                         continue;
471                 }
472             }
473         }
474         rstr += string(ch)
475     }
476     return rstr
477 }
478 func unescapeWhiteSPV(strv []string)([]string){ // strip original escapes
479     ustrv := []string{}
480     for _,v := range strv {
481         ustrv = append(ustrv,unescapeWhiteSP(v))
482     }
483     return ustrv
484 }
485
486 // <a name="comexpansion">str-expansion</a>
487 // - this should be a macro processor
488 func strsubst(gshCtx *GshContext,str string,histonly bool) string {
489     rbuff := []byte{}
490     if false {
491         //@@U Unicode should be cared as a character
492         return str
493     }
494     //rstr := ""
495     inEsc := 0 // escape characer mode
496     for i := 0; i < len(str); i++ {
```

```
        //fmt.Printf("--D--Subst %v:%v\n",i,str[i:])
        ch := str[i]
        if inEsc == 0 {
            if ch == '!' {
                //leng,xrstr := substHistory(gshCtx,str,i,rstr)
                leng,rs := substHistory(gshCtx,str,i,"")
                if 0 < leng {
    //_,rs := substHistory(gshCtx,str,i,"")
    rbuff = append(rbuff,[]byte(rs)...)
                    i += leng
                    //rstr = xrstr
                    continue
                }
            }
            switch ch {
                case '\\': inEsc = '\\'; continue
                //case '%':  inEsc = '%';  continue
                case '$':
            }
        }
        switch inEsc {
        case '\\':
            switch ch {
                case '\\': ch = '\\'
                case 's': ch = ' '
                case 't': ch = '\t'
                case 'r': ch = '\r'
                case 'n': ch = '\n'
                case 'z': inEsc = 0; continue // empty, to be ignored
            }
            inEsc = 0
        case '%':
            switch {
                case ch == '%': ch = '%'
                case ch == 'T':
                    //rstr = rstr + time.Now().Format(time.Stamp)
    rs := time.Now().Format(time.Stamp)
    rbuff = append(rbuff,[]byte(rs)...)
                    inEsc = 0
                    continue;
                default:
                    // postpone the interpretation
                    //rstr = rstr + "%" + string(ch)
    rbuff = append(rbuff,ch)
                    inEsc = 0
                    continue;
            }
            inEsc = 0
        }
        //rstr = rstr + string(ch)
        rbuff = append(rbuff,ch)
    }
    //fmt.Printf("--D--subst(%s)(%s)\n",str,string(rbuff))
    return string(rbuff)
    //return rstr
}
func showFileInfo(path string, opts []string) {
    if isin("-l",opts) || isin("-ls",opts) {
        fi, err := os.Stat(path)
        if err != nil {
            fmt.Printf("---------- ((%v))",err)
        }else{
            mod := fi.ModTime()
            date := mod.Format(time.Stamp)
            fmt.Printf("%v %8v %s ",fi.Mode(),fi.Size(),date)
        }
    }
    fmt.Printf("%s",path)
    if isin("-sp",opts) {
        fmt.Printf(" ")
    }else
    if ! isin("-n",opts) {
        fmt.Printf("\n")
    }
}
func userHomeDir()(string,bool){
    /*
    homedir,_ = os.UserHomeDir() // not implemented in older Golang
    */
    homedir,found := os.LookupEnv("HOME")
    //fmt.Printf("--I-- HOME=%v(%v)\n",homedir,found)
    if !found {
        return "/tmp",found
    }
    return homedir,found
}

func toFullpath(path string) (fullpath string) {
    if path[0] == '/' {
        return path
    }
    pathv := strings.Split(path,DIRSEP)
    switch {
    case pathv[0] == ".":
        pathv[0], _ = os.Getwd()
    case pathv[0] == "..": // all ones should be interpreted
        cwd, _ := os.Getwd()
        ppathv := strings.Split(cwd,DIRSEP)
        pathv[0] = strings.Join(ppathv,DIRSEP)
    case pathv[0] == "~":
        pathv[0],_ = userHomeDir()
    default:
        cwd, _ := os.Getwd()
        pathv[0] = cwd + DIRSEP + pathv[0]
    }
    return strings.Join(pathv,DIRSEP)
}

func IsRegFile(path string)(bool){
    fi, err := os.Stat(path)
    if err == nil {
        fm := fi.Mode()
        return fm.IsRegular();
    }
    return false
}

// <a name="encode">Encode / Decode</a>
// <a href="https://golang.org/pkg/encoding/base64/#example_NewEncoder">Encoder</a>
func (gshCtx *GshContext)Enc(argv[]string){
    file := os.Stdin
    buff := make([]byte,LINESIZE)
    li := 0
    encoder := base64.NewEncoder(base64.StdEncoding,os.Stdout)
```

```
    for li = 0; ; li++ {
        count, err := file.Read(buff)
        if count <= 0 {
            break
        }
        if err != nil {
            break
        }
        encoder.Write(buff[0:count])
    }
    encoder.Close()
}
func (gshCtx *GshContext)Dec(argv[]string){
    decoder := base64.NewDecoder(base64.StdEncoding,os.Stdin)
    li := 0
    buff := make([]byte,LINESIZE)
    for li = 0; ; li++ {
        count, err := decoder.Read(buff)
        if count <= 0 {
            break
        }
        if err != nil {
            break
        }
        os.Stdout.Write(buff[0:count])
    }
}
// lnsp [N] [-crlf][-C \\]
func (gshCtx *GshContext)SplitLine(argv[]string){
    strRep := isin("-str",argv) // "..."+
    reader := bufio.NewReaderSize(os.Stdin,64*1024)
    ni := 0
    toi := 0
    for ni = 0; ; ni++ {
        line, err := reader.ReadString('\n')
        if len(line) <= 0 {
            if err != nil {
            fmt.Fprintf(os.Stderr,"--I-- lnsp %d to %d (%v)\n",ni,toi,err)
            break
            }
        }
        off := 0
        ilen := len(line)
        remlen := len(line)
        if strRep { os.Stdout.Write([]byte("\"")) }
        for oi := 0; 0 < remlen; oi++ {
            olen := remlen
            addnl := false
            if 72 < olen {
                olen = 72
                addnl = true
            }
            fmt.Fprintf(os.Stderr,"--D-- write %d [%d.%d] %d %d/%d/%d\n",
                toi,ni,oi,off,olen,remlen,ilen)
            toi += 1
            os.Stdout.Write([]byte(line[0:olen]))
            if addnl {
                if strRep {
                    os.Stdout.Write([]byte("\"+\n\""))
                }else{
                    //os.Stdout.Write([]byte("\r\n"))
                    os.Stdout.Write([]byte("\\"))
                    os.Stdout.Write([]byte("\n"))
                }
            }
            line = line[olen:]
            off += olen
            remlen -= olen
        }
        if strRep { os.Stdout.Write([]byte("\"\n")) }
    }
    fmt.Fprintf(os.Stderr,"--I-- lnsp %d to %d\n",ni,toi)
}

// CRC32 <a href="http://golang.jp/pkg/hash-crc32">crc32</a>
// 1 0000 0100 1100 0001 0001 1101 1011 0111
var CRC32UNIX uint32 = uint32(0x04C11DB7) // Unix cksum
var CRC32IEEE uint32 = uint32(0xEDB88320)
func byteCRC32add(crc uint32,str[]byte,len uint64)(uint32){
    var oi uint64
    for oi = 0; oi < len; oi++ {
        var oct = str[oi]
        for bi := 0; bi < 8; bi++ {
            //fprintf(stderr,"--CRC32 %d %X (%d.%d)\n",crc,oct,oi,bi)
            ovf1 := (crc & 0x80000000) != 0
            ovf2 := (oct & 0x80) != 0
            ovf := (ovf1 && !ovf2) || (!ovf1 && ovf2)
            oct <<= 1
            crc <<= 1
            if ovf { crc ^= CRC32UNIX }
        }
    }
    //fprintf(stderr,"--CRC32 return %d %d\n",crc,len)
    return crc;
}
func byteCRC32end(crc uint32, len uint64)(uint32){
    var slen = make([]byte,4)
    var li = 0
        for li = 0; li < 4; {
                slen[li] = byte(len)
        li += 1
                len >>= 8
                if( len == 0 ){
                        break
        }
        }
        crc = byteCRC32add(crc,slen,uint64(li))
        crc ^= 0xFFFFFFFF
        return crc
}
func strCRC32(str string,len uint64)(crc uint32){
    crc = byteCRC32add(0,[]byte(str),len)
    crc = byteCRC32end(crc,len)
    //fprintf(stderr,"--CRC32 %d %d\n",crc,len)
    return crc
}
func CRC32Finish(crc uint32, table *crc32.Table, len uint64)(uint32){
    var slen = make([]byte,4)
    var li = 0
        for li = 0; li < 4; {
                slen[li] = byte(len & 0xFF)
        li += 1
                len >>= 8
                if( len == 0 ){
```

```
                        break
        }
        }
    crc = crc32.Update(crc,table,slen)
        crc ^= 0xFFFFFFFF
        return crc
}

func (gsh*GshContext)xCksum(path string,argv[]string, sum*CheckSum)(int64){
    if isin("-type/f",argv) && !IsRegFile(path){
        return 0
    }
    if isin("-type/d",argv) && IsRegFile(path){
        return 0
    }
    file, err := os.OpenFile(path,os.O_RDONLY,0)
    if err != nil {
        fmt.Printf("--E-- cksum %v (%v)\n",path,err)
        return -1
    }
    defer file.Close()
    if gsh.CmdTrace { fmt.Printf("--I-- cksum %v %v\n",path,argv) }

    bi := 0
    var buff = make([]byte,32*1024)
    var total int64 = 0
    var initTime = time.Time{}
    if sum.Start == initTime {
        sum.Start = time.Now()
    }
    for bi = 0; ; bi++ {
        count,err := file.Read(buff)
        if count <= 0 || err != nil {
            break
        }
        if (sum.SumType & SUM_SUM64) != 0 {
            s := sum.Sum64
            for _,c := range buff[0:count] {
                s += uint64(c)
            }
            sum.Sum64 = s
        }
        if (sum.SumType & SUM_UNIXFILE) != 0 {
            sum.Crc32Val = byteCRC32add(sum.Crc32Val,buff,uint64(count))
        }
        if (sum.SumType & SUM_CRCIEEE) != 0 {
            sum.Crc32Val = crc32.Update(sum.Crc32Val,&sum.Crc32Table,buff[0:count])
        }
        // <a href="https://en.wikipedia.org/wiki/BSD_checksum">BSD checksum</a>
        if (sum.SumType & SUM_SUM16_BSD) != 0 {
            s := sum.Sum16
            for _,c := range buff[0:count] {
                s = (s >> 1) + ((s & 1) << 15)
                s += int(c)
                s &= 0xFFFF
                //fmt.Printf("BSDsum: %d[%d] %d\n",sum.Size+int64(i),i,s)
            }
            sum.Sum16 = s
        }
        if (sum.SumType & SUM_SUM16_SYSV) != 0 {
            for bj := 0; bj < count; bj++ {
                sum.Sum16 += int(buff[bj])
            }
        }
        total += int64(count)
    }
    sum.Done = time.Now()
    sum.Files += 1
    sum.Size += total
    if !isin("-s",argv) {
        fmt.Printf("%v ",total)
    }
    return 0
}

// <a name="grep">grep</a>
// "lines", "lin" or "lnp" for "(text) line processor" or "scanner"
// a*,!ab,c, ... sequentioal combination of patterns
// what "LINE" is should be definable
// generic line-by-line processing
// grep [-v]
// cat -n -v
// uniq [-c]
// tail -f
// sed s/x/y/ or awk
// grep with line count like wc
// rewrite contents if specified
func (gsh*GshContext)xGrep(path string,rexpv[]string)(int){
    file, err := os.OpenFile(path,os.O_RDONLY,0)
    if err != nil {
        fmt.Printf("--E-- grep %v (%v)\n",path,err)
        return -1
    }
    defer file.Close()
    if gsh.CmdTrace { fmt.Printf("--I-- grep %v %v\n",path,rexpv) }
    //reader := bufio.NewReaderSize(file,LINESIZE)
    reader := bufio.NewReaderSize(file,80)
    li := 0
    found := 0
    for li = 0; ; li++ {
        line, err := reader.ReadString('\n')
        if len(line) <= 0 {
            break
        }
        if 150 < len(line) {
            // maybe binary
            break;
        }
        if err != nil {
            break
        }
        if 0 <= strings.Index(string(line),rexpv[0]) {
            found += 1
            fmt.Printf("%s:%d: %s",path,li,line)
        }
    }
        //fmt.Printf("total %d lines %s\n",li,path)
    //if( 0 < found ){ fmt.Printf("((found %d lines %s))\n",found,path); }
    return found
}

// <a name="finder">Finder</a>
// finding files with it name and contents
// file names are ORed
```

```
869 // show the content with %x fmt list
870 // ls -R
871 // tar command by adding output
872 type fileSum struct {
873     Err int64   // access error or so
874     Size    int64   // content size
875     DupSize int64   // content size from hard links
876     Blocks  int64   // number of blocks (of 512 bytes)
877     DupBlocks int64 // Blocks pointed from hard links
878     HLinks  int64   // hard links
879     Words   int64
880     Lines   int64
881     Files   int64
882     Dirs    int64   // the num. of directories
883     SymLink int64
884     Flats   int64   // the num. of flat files
885     MaxDepth    int64
886     MaxNamlen   int64   // max. name length
887     nextRepo    time.Time
888 }
889 func showFusage(dir string,fusage *fileSum){
890     bsume := float64(((fusage.Blocks-fusage.DupBlocks)/2)*1024)/1000000.0
891     //bsumdup := float64((fusage.Blocks/2)*1024)/1000000.0
892
893     fmt.Printf("%v: %v files (%vd %vs %vh) %.6f MB (%.2f MBK)\n",
894         dir,
895         fusage.Files,
896         fusage.Dirs,
897         fusage.SymLink,
898         fusage.HLinks,
899         float64(fusage.Size)/1000000.0,bsume);
900 }
901 const (
902     S_IFMT    = 0170000
903     S_IFCHR   = 0020000
904     S_IFDIR   = 0040000
905     S_IFREG   = 0100000
906     S_IFLNK   = 0120000
907     S_IFSOCK  = 0140000
908 )
909 func cumFinfo(fsum *fileSum, path string, staterr error, fstat syscall.Stat_t, argv[]string,verb bool)(*fileSum){
910     now := time.Now()
911     if time.Second <= now.Sub(fsum.nextRepo) {
912         if !fsum.nextRepo.IsZero(){
913             tstmp := now.Format(time.Stamp)
914             showFusage(tstmp,fsum)
915         }
916         fsum.nextRepo = now.Add(time.Second)
917     }
918     if staterr != nil {
919         fsum.Err += 1
920         return fsum
921     }
922     fsum.Files += 1
923     if 1 < fstat.Nlink {
924         // must count only once...
925         // at least ignore ones in the same directory
926         //if finfo.Mode().IsRegular() {
927         if (fstat.Mode & S_IFMT) == S_IFREG {
928             fsum.HLinks += 1
929             fsum.DupBlocks += int64(fstat.Blocks)
930             //fmt.Printf("---Dup HardLink %v %s\n",fstat.Nlink,path)
931         }
932     }
933     //fsum.Size += finfo.Size()
934     fsum.Size += fstat.Size
935     fsum.Blocks += int64(fstat.Blocks)
936     //if verb { fmt.Printf("(%8dBlk) %s",fstat.Blocks/2,path) }
937     if isin("-ls",argv){
938         //if verb { fmt.Printf("%4d %8d ",fstat.Blksize,fstat.Blocks) }
939 //      fmt.Printf("%d\t",fstat.Blocks/2)
940     }
941     //if finfo.IsDir()
942     if (fstat.Mode & S_IFMT) == S_IFDIR {
943         fsum.Dirs += 1
944     }
945     //if (finfo.Mode() & os.ModeSymlink) != 0
946     if (fstat.Mode & S_IFMT) == S_IFLNK {
947         //if verb { fmt.Printf("symlink(%v,%s)\n",fstat.Mode,finfo.Name()) }
948         //{ fmt.Printf("symlink(%o,%s)\n",fstat.Mode,finfo.Name()) }
949         fsum.SymLink += 1
950     }
951     return fsum
952 }
953 func (gsh*GshContext)xxFindEntv(depth int,total *fileSum,dir string, dstat syscall.Stat_t, ei int, entv []string,npatv[]string,argv[]string)(*fileSum){
954     nols := isin("-grep",argv)
955     // sort entv
956     /*
957     if isin("-t",argv){
958         sort.Slice(filev, func(i,j int) bool {
959             return 0 < filev[i].ModTime().Sub(filev[j].ModTime())
960         })
961     }
962     */
963         /*
964         if isin("-u",argv){
965             sort.Slice(filev, func(i,j int) bool {
966                 return 0 < filev[i].AccTime().Sub(filev[j].AccTime())
967             })
968         }
969         if isin("-U",argv){
970             sort.Slice(filev, func(i,j int) bool {
971                 return 0 < filev[i].CreatTime().Sub(filev[j].CreatTime())
972             })
973         }
974         */
975     /*
976     if isin("-S",argv){
977         sort.Slice(filev, func(i,j int) bool {
978             return filev[j].Size() < filev[i].Size()
979         })
980     }
981     */
982     for _,filename := range entv {
983         for _,npat := range npatv {
984             match := true
985             if npat == "*" {
986                 match = true
987             }else{
988                 match, _ = filepath.Match(npat,filename)
989             }
990             path := dir + DIRSEP + filename
991             if !match {
992                 continue
```

```
            }
            var fstat syscall.Stat_t
            staterr := syscall.Lstat(path,&fstat)
            if staterr != nil {
                if !isin("-w",argv){fmt.Printf("ufind: %v\n",staterr) }
                continue;
            }
            if isin("-du",argv) && (fstat.Mode & S_IFMT) == S_IFDIR {
                // should not show size of directory in "-du" mode ...
            }else
            if !nols && !isin("-s",argv) && (!isin("-du",argv) || isin("-a",argv)) {
                if isin("-du",argv) {
                    fmt.Printf("%d\t",fstat.Blocks/2)
                }
                showFileInfo(path,argv)
            }
            if true { // && isin("-du",argv)
                total = cumFinfo(total,path,staterr,fstat,argv,false)
            }
            /*
            if isin("-wc",argv) {
            }
            */
            if gsh.lastCheckSum.SumType != 0 {
                gsh.xCksum(path,argv,&gsh.lastCheckSum);
            }
            x := isinX("-grep",argv); // -grep will be convenient like -ls
            if 0 <= x && x+1 <= len(argv) { // -grep will be convenient like -ls
                if IsRegFile(path){
                    found := gsh.xGrep(path,argv[x+1:])
                    if 0 < found {
                        foundv := gsh.CmdCurrent.FoundFile
                        if len(foundv) < 10 {
                            gsh.CmdCurrent.FoundFile =
                            append(gsh.CmdCurrent.FoundFile,path)
                        }
                    }
                }
            }
            if !isin("-r0",argv) { // -d 0 in du, -depth n in find
                //total.Depth += 1
                if (fstat.Mode & S_IFMT) == S_IFLNK {
                    continue
                }
                if dstat.Rdev != fstat.Rdev {
                    fmt.Printf("--I-- don't follow differnet device %v(%v) %v(%v)\n",
                        dir,dstat.Rdev,path,fstat.Rdev)
                }
                if (fstat.Mode & S_IFMT) == S_IFDIR {
                    total = gsh.xxFind(depth+1,total,path,npatv,argv)
                }
            }
        }
    }
    return total
}
func (gsh*GshContext)xxFind(depth int,total *fileSum,dir string,npatv[]string,argv[]string)(*fileSum){
    nols := isin("-grep",argv)
    dirfile,oerr := os.OpenFile(dir,os.O_RDONLY,0)
    if oerr == nil {
        //fmt.Printf("--I-- %v(%v)[%d]\n",dir,dirfile,dirfile.Fd())
        defer dirfile.Close()
    }else{
    }

    prev := *total
    var dstat syscall.Stat_t
    staterr := syscall.Lstat(dir,&dstat) // should be flstat

    if staterr != nil {
        if !isin("-w",argv){ fmt.Printf("ufind: %v\n",staterr) }
        return total
    }
        //filev,err := ioutil.ReadDir(dir)
        //_,err := ioutil.ReadDir(dir) // ReadDir() heavy and bad for huge directory
        /*
        if err != nil {
            if !isin("-w",argv){ fmt.Printf("ufind: %v\n",err) }
            return total
        }
        */
    if depth == 0 {
        total = cumFinfo(total,dir,staterr,dstat,argv,true)
        if !nols && !isin("-s",argv) && (!isin("-du",argv) || isin("-a",argv)) {
            showFileInfo(dir,argv)
        }
    }
    // it it is not a directory, just scan it and finish

    for ei := 0; ; ei++ {
        entv,rderr := dirfile.Readdirnames(8*1024)
        if len(entv) == 0 || rderr != nil {
            //if rderr != nil { fmt.Printf("[%d] len=%d (%v)\n",ei,len(entv),rderr) }
            break
        }
        if 0 < ei {
            fmt.Printf("--I-- xxFind[%d] %d large-dir: %s\n",ei,len(entv),dir)
        }
        total = gsh.xxFindEntv(depth,total,dir,dstat,ei,entv,npatv,argv)
    }
    if isin("-du",argv) {
        // if in "du" mode
        fmt.Printf("%d\t%s\n",(total.Blocks-prev.Blocks)/2,dir)
    }
    return total
}

// {ufind|fu|ls} [Files] [// Names] [-- Expressions]
//  Files is "." by default
//  Names is "*" by default
//  Expressions is "-print" by default for "ufind", or -du for "fu" command
func (gsh*GshContext)xFind(argv[]string){
    if 0 < len(argv) && strBegins(argv[0],"?"){
        showFound(gsh,argv)
        return
    }
    if isin("-cksum",argv) || isin("-sum",argv) {
        gsh.lastCheckSum = CheckSum{}
        if isin("-sum",argv) && isin("-add",argv) {
            gsh.lastCheckSum.SumType |= SUM_SUM64
        }else
        if isin("-sum",argv) && isin("-size",argv) {
            gsh.lastCheckSum.SumType |= SUM_SIZE
        }else
```

```
        if isin("-sum",argv) && isin("-bsd",argv) {
            gsh.lastCheckSum.SumType |= SUM_SUM16_BSD
        }else
        if isin("-sum",argv) && isin("-sysv",argv) {
            gsh.lastCheckSum.SumType |= SUM_SUM16_SYSV
        }else
        if isin("-sum",argv) {
            gsh.lastCheckSum.SumType |= SUM_SUM64
        }
        if isin("-unix",argv) {
            gsh.lastCheckSum.SumType |= SUM_UNIXFILE
            gsh.lastCheckSum.Crc32Table = *crc32.MakeTable(CRC32UNIX)
        }
        if isin("-ieee",argv){
            gsh.lastCheckSum.SumType |= SUM_CRCIEEE
            gsh.lastCheckSum.Crc32Table = *crc32.MakeTable(CRC32IEEE)
        }
        gsh.lastCheckSum.RusgAtStart = Getrusagev()
    }
    var total = fileSum{}
    npats := []string{}
    for _,v := range argv {
        if 0 < len(v) && v[0] != '-' {
            npats = append(npats,v)
        }
        if v == "//" { break }
        if v == "--" { break }
        if v == "-grep" { break }
        if v == "-ls" { break }
    }
    if len(npats) == 0 {
        npats = []string{"*"}
    }
    cwd := "."
    // if to be fullpath ::: cwd, _ := os.Getwd()
    if len(npats) == 0 { npats = []string{"*"} }
    fusage := gsh.xxFind(0,&total,cwd,npats,argv)
    if gsh.lastCheckSum.SumType != 0 {
        var sumi uint64 = 0
        sum := &gsh.lastCheckSum
        if (sum.SumType & SUM_SIZE) != 0 {
            sumi = uint64(sum.Size)
        }
        if (sum.SumType & SUM_SUM64) != 0 {
            sumi = sum.Sum64
        }
        if (sum.SumType & SUM_SUM16_SYSV) != 0 {
            s := uint32(sum.Sum16)
            r := (s & 0xFFFF) + ((s & 0xFFFFFFFF) >> 16)
            s = (r & 0xFFFF) + (r >> 16)
            sum.Crc32Val = uint32(s)
            sumi = uint64(s)
        }
        if (sum.SumType & SUM_SUM16_BSD) != 0 {
            sum.Crc32Val = uint32(sum.Sum16)
            sumi = uint64(sum.Sum16)
        }
        if (sum.SumType & SUM_UNIXFILE) != 0 {
            sum.Crc32Val = byteCRC32end(sum.Crc32Val,uint64(sum.Size))
            sumi = uint64(byteCRC32end(sum.Crc32Val,uint64(sum.Size)))
        }
        if 1 < sum.Files {
            fmt.Printf("%v %v // %v / %v files, %v/file\r\n",
                sumi,sum.Size,
                abssize(sum.Size),sum.Files,
                abssize(sum.Size/sum.Files))
        }else{
            fmt.Printf("%v %v %v\n",
                sumi,sum.Size,npats[0])
        }
    }
    if !isin("-grep",argv) {
        showFusage("total",fusage)
    }
    if !isin("-s",argv){
        hits := len(gsh.CmdCurrent.FoundFile)
        if 0 < hits {
            fmt.Printf("--I-- %d files hits // can be refered with !%df\n",
                hits,len(gsh.CommandHistory))
        }
    }
    if gsh.lastCheckSum.SumType != 0 {
        if isin("-ru",argv) {
            sum := &gsh.lastCheckSum
            sum.Done = time.Now()
            gsh.lastCheckSum.RusgAtEnd = Getrusagev()
            elps := sum.Done.Sub(sum.Start)
            fmt.Printf("--cksum-size: %v (%v) / %v files, %v/file\r\n",
                sum.Size,abssize(sum.Size),sum.Files,abssize(sum.Size/sum.Files))
            nanos := int64(elps)
            fmt.Printf("--cksum-time: %v/total, %v/file, %.1f files/s, %v\r\n",
                abbtime(nanos),
                abbtime(nanos/sum.Files),
                (float64(sum.Files)*1000000000.0)/float64(nanos),
                abbspeed(sum.Size,nanos))
            diff := RusageSubv(sum.RusgAtEnd,sum.RusgAtStart)
            fmt.Printf("--cksum-rusg: %v\n",sRusagef("",argv,diff))
        }
    }
    return
}

func showFiles(files[]string){
    sp := ""
    for i,file := range files {
        if 0 < i { sp = " " } else { sp = "" }
        fmt.Printf(sp+"%s",escapeWhiteSP(file))
    }
}
func showFound(gshCtx *GshContext, argv[]string){
    for i,v := range gshCtx.CommandHistory {
        if 0 < len(v.FoundFile) {
            fmt.Printf("!%d (%d) ",i,len(v.FoundFile))
            if isin("-ls",argv){
                fmt.Printf("\n")
                for _,file := range v.FoundFile {
                    fmt.Printf("") //sub number?
                    showFileInfo(file,argv)
                }
            }else{
                showFiles(v.FoundFile)
                fmt.Printf("\n")
            }
        }
```

```
    }
}

func showMatchFile(filev []os.FileInfo, npat,dir string, argv[]string)(string,bool){
    fname := ""
    found := false
    for _,v := range filev {
        match, _ := filepath.Match(npat,(v.Name()))
        if match {
            fname = v.Name()
            found = true
            //fmt.Printf("[%d] %s\n",i,v.Name())
            showIfExecutable(fname,dir,argv)
        }
    }
    return fname,found
}
func showIfExecutable(name,dir string,argv[]string)(ffullpath string,ffound bool){
    var fullpath string
    if strBegins(name,DIRSEP){
        fullpath = name
    }else{
        fullpath = dir + DIRSEP + name
    }
    fi, err := os.Stat(fullpath)
    if err != nil {
        fullpath = dir + DIRSEP + name + ".go"
        fi, err = os.Stat(fullpath)
    }
    if err == nil {
        fm := fi.Mode()
        if fm.IsRegular() {
          // R_OK=4, W_OK=2, X_OK=1, F_OK=0
          if syscall.Access(fullpath,5) == nil {
            ffullpath = fullpath
            ffound = true
            if ! isin("-s", argv) {
                showFileInfo(fullpath,argv)
            }
          }
        }
    }
    return ffullpath, ffound
}
func which(list string, argv []string) (fullpathv []string, itis bool){
    if len(argv) <= 1 {
        fmt.Printf("Usage: which comand [-s] [-a] [-ls]\n")
        return []string{""}, false
    }
    path := argv[1]
    if strBegins(path,"/") {
        // should check if excecutable?
        _,exOK := showIfExecutable(path,"/",argv)
        fmt.Printf("--D-- %v exOK=%v\n",path,exOK)
        return []string{path},exOK
    }
    pathenv, efound := os.LookupEnv(list)
    if ! efound {
        fmt.Printf("--E-- which: no \"%s\" environment\n",list)
        return []string{""}, false
    }
    showall := isin("-a",argv) || 0 <= strings.Index(path,"*")
    dirv := strings.Split(pathenv,PATHSEP)
    ffound := false
    ffullpath := path
    for _, dir := range dirv {
        if 0 <= strings.Index(path,"*") { // by wild-card
            list,_ := ioutil.ReadDir(dir)
            ffullpath, ffound = showMatchFile(list,path,dir,argv)
        }else{
            ffullpath, ffound = showIfExecutable(path,dir,argv)
        }
        //if ffound && !isin("-a", argv) {
        if ffound && !showall {
            break;
        }
    }
    return []string{ffullpath}, ffound
}

func stripLeadingWSParg(argv[]string)([]string){
    for ; 0 < len(argv); {
        if len(argv[0]) == 0 {
            argv = argv[1:]
        }else{
            break
        }
    }
    return argv
}
func xEval(argv []string, nlend bool){
    argv = stripLeadingWSParg(argv)
    if len(argv) == 0 {
        fmt.Printf("eval [%%format] [Go-expression]\n")
        return
    }
    pfmt := "%v"
    if argv[0][0] == '%' {
        pfmt = argv[0]
        argv = argv[1:]
    }
    if len(argv) == 0 {
        return
    }
    gocode := strings.Join(argv," ");
    //fmt.Printf("eval [%v] [%v]\n",pfmt,gocode)
    fset := token.NewFileSet()
    rval, _ := types.Eval(fset,nil,token.NoPos,gocode)
    fmt.Printf(pfmt,rval.Value)
    if nlend { fmt.Printf("\n") }
}

func getval(name string) (found bool, val int) {
    /* should expand the name here */
    if name == "gsh.pid" {
        return true, os.Getpid()
    }else
    if name == "gsh.ppid" {
        return true, os.Getppid()
    }
    return false, 0
}

func echo(argv []string, nlend bool){
```

```
    for ai := 1; ai < len(argv); ai++ {
        if 1 < ai {
            fmt.Printf(" ");
        }
        arg := argv[ai]
        found, val := getval(arg)
        if found {
            fmt.Printf("%d",val)
        }else{
            fmt.Printf("%s",arg)
        }
    }
    if nlend {
        fmt.Printf("\n");
    }
}

func resfile() string {
    return "gsh.tmp"
}
//var resF *File
func resmap() {
    //_ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, os.ModeAppend)
    // https://developpaper.com/solution-to-golang-bad-file-descriptor-problem/
    _ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, 0600)
    if err != nil {
        fmt.Printf("refF could not open: %s\n",err)
    }else{
        fmt.Printf("refF opened\n")
    }
}

// @@2020-0821
func gshScanArg(str string,strip int)(argv []string){
    var si = 0
    var sb = 0
    var inBracket = 0
    var arg1 = make([]byte,LINESIZE)
    var ax = 0
    debug := false

    for ; si < len(str); si++ {
        if str[si] != ' ' {
            break
        }
    }
    sb = si
    for ; si < len(str); si++ {
        if sb <= si {
            if debug {
                fmt.Printf("--Da- +%d %2d-%2d %s ... %s\n",
                    inBracket,sb,si,arg1[0:ax],str[si:])
            }
        }
        ch := str[si]
        if ch  == '{' {
            inBracket += 1
            if 0 < strip && inBracket <= strip {
                //fmt.Printf("stripLEV %d <= %d?\n",inBracket,strip)
                continue
            }
        }
        if 0 < inBracket {
            if ch == '}' {
                inBracket -= 1
                if 0 < strip && inBracket < strip {
                    //fmt.Printf("stripLEV %d <  %d?\n",inBracket,strip)
                    continue
                }
            }
            arg1[ax] = ch
            ax += 1
            continue
        }
        if str[si] == ' ' {
            argv = append(argv,string(arg1[0:ax]))
            if debug {
                fmt.Printf("--Da- [%v][%v-%v] %s ... %s\n",
                    -1+len(argv),sb,si,str[sb:si],string(str[si:]))
            }
            sb = si+1
            ax = 0
            continue
        }
        arg1[ax] = ch
        ax += 1
    }
    if sb < si {
        argv = append(argv,string(arg1[0:ax]))
        if debug {
            fmt.Printf("--Da- [%v][%v-%v] %s ... %s\n",
                -1+len(argv),sb,si,string(arg1[0:ax]),string(str[si:]))
        }
    }
    if debug {
        fmt.Printf("--Da- %d [%s] => [%d]%v\n",strip,str,len(argv),argv)
    }
    return argv
}

// should get stderr (into tmpfile ?) and return
func (gsh*GshContext)Popen(name,mode string)(pin*os.File,pout*os.File,err bool){
    var pv = []int{-1,-1}
    syscall.Pipe(pv)

    xarg := gshScanArg(name,1)
    name = strings.Join(xarg," ")

    pin = os.NewFile(uintptr(pv[0]),"StdoutOf-{"+name+"}")
    pout = os.NewFile(uintptr(pv[1]),"StdinOf-{"+name+"}")
    fdix := 0
    dir := "?"
    if mode == "r" {
        dir = "<"
        fdix = 1 // read from the stdout of the process
    }else{
        dir = ">"
        fdix = 0 // write to the stdin of the process
    }
    gshPA := gsh.gshPA
    savfd := gshPA.Files[fdix]

    var fd uintptr = 0
    if mode == "r" {
```

```
        fd = pout.Fd()
        gshPA.Files[fdix] = pout.Fd()
    }else{
        fd = pin.Fd()
        gshPA.Files[fdix] = pin.Fd()
    }
        // should do this by Goroutine?
        if false {
            fmt.Printf("--Ip- Opened fd[%v] %s %v\n",fd,dir,name)
            fmt.Printf("--RED1 [%d,%d,%d]->[%d,%d,%d]\n",
                os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd(),
                pin.Fd(),pout.Fd(),pout.Fd())
        }
            savi := os.Stdin
            savo := os.Stdout
            save := os.Stderr
            os.Stdin  = pin
            os.Stdout = pout
            os.Stderr = pout
        gsh.BackGround = true
        gsh.gshelllh(name)
        gsh.BackGround = false
            os.Stdin  = savi
            os.Stdout = savo
            os.Stderr = save

    gshPA.Files[fdix] = savfd
    return pin,pout,false
}

// <a name="ex-commands">External commands</a>
func (gsh*GshContext)excommand(exec bool, argv []string) (notf bool,exit bool) {
    if gsh.CmdTrace { fmt.Printf("--I-- excommand[%v](%v)\n",exec,argv) }

    gshPA := gsh.gshPA
    fullpathv, itis := which("PATH",[]string{"which",argv[0],"-s"})
    if itis == false {
        return true,false
    }
    fullpath := fullpathv[0]
    argv = unescapeWhiteSPV(argv)
    if 0 < strings.Index(fullpath,".go") {
        nargv := argv // []string{}
        gofullpathv, itis := which("PATH",[]string{"which","go","-s"})
        if itis == false {
            fmt.Printf("--F-- Go not found\n")
            return false,true
        }
        gofullpath := gofullpathv[0]
        nargv = []string{ gofullpath, "run", fullpath }
        fmt.Printf("--I-- %s {%s %s %s}\n",gofullpath,
            nargv[0],nargv[1],nargv[2])
        if exec {
            syscall.Exec(gofullpath,nargv,os.Environ())
        }else{
            pid, _ := syscall.ForkExec(gofullpath,nargv,&gshPA)
            if gsh.BackGround {
                fmt.Fprintf(stderr,"--Ip- in Background pid[%d]%d(%v)\n",pid,len(argv),nargv)
                gsh.BackGroundJobs = append(gsh.BackGroundJobs,pid)
            }else{
                rusage := syscall.Rusage {}
                syscall.Wait4(pid,nil,0,&rusage)
                gsh.LastRusage = rusage
                gsh.CmdCurrent.Rusagev[1] = rusage
            }
        }
    }else{
        if exec {
            syscall.Exec(fullpath,argv,os.Environ())
        }else{
            pid, _ := syscall.ForkExec(fullpath,argv,&gshPA)
            //fmt.Printf("[%d]\n",pid); // '&' to be background
            if gsh.BackGround {
                fmt.Fprintf(stderr,"--Ip- in Background pid[%d]%d(%v)\n",pid,len(argv),argv)
                gsh.BackGroundJobs = append(gsh.BackGroundJobs,pid)
            }else{
                rusage := syscall.Rusage {}
                syscall.Wait4(pid,nil,0,&rusage);
                gsh.LastRusage = rusage
                gsh.CmdCurrent.Rusagev[1] = rusage
            }
        }
    }
    return false,false
}

// <a name="builtin">Builtin Commands</a>
func (gshCtx *GshContext) sleep(argv []string) {
    if len(argv) < 2 {
        fmt.Printf("Sleep 100ms, 100us, 100ns, ...\n")
        return
    }
    duration := argv[1];
    d, err := time.ParseDuration(duration)
    if err != nil {
        d, err = time.ParseDuration(duration+"s")
        if err != nil {
            fmt.Printf("duration ? %s (%s)\n",duration,err)
            return
        }
    }
    //fmt.Printf("Sleep %v\n",duration)
    time.Sleep(d)
    if 0 < len(argv[2:]) {
        gshCtx.gshellv(argv[2:])
    }
}
func (gshCtx *GshContext)repeat(argv []string) {
    if len(argv) < 2 {
        return
    }
    start0 := time.Now()
    for ri,_ := strconv.Atoi(argv[1]); 0 < ri; ri-- {
        if 0 < len(argv[2:]) {
            //start := time.Now()
            gshCtx.gshellv(argv[2:])
            end := time.Now()
            elps := end.Sub(start0);
            if( 1000000000 < elps ){
                fmt.Printf("(repeat#%d %v)\n",ri,elps);
            }
        }
    }
}
```

```
1613
1614 func (gshCtx *GshContext)gen(argv []string) {
1615     gshPA := gshCtx.gshPA
1616     if len(argv) < 2 {
1617         fmt.Printf("Usage: %s N\n",argv[0])
1618         return
1619     }
1620     // should br repeated by "repeat" command
1621     count, _ := strconv.Atoi(argv[1])
1622     fd := gshPA.Files[1] // Stdout
1623     file := os.NewFile(fd,"internalStdOut")
1624     fmt.Printf("--I-- Gen. Count=%d to [%d]\n",count,file.Fd())
1625     //buf := []byte{}
1626     outdata := "0123 5678 0123 5678 0123 5678 0123 5678\r"
1627     for gi := 0; gi < count; gi++ {
1628         file.WriteString(outdata)
1629     }
1630     //file.WriteString("\n")
1631     fmt.Printf("\n(%d B)\n",count*len(outdata));
1632     //file.Close()
1633 }
1634
1635 // <a name="rexec">Remote Execution</a> // 2020-0820
1636 func Elapsed(from time.Time)(string){
1637     elps := time.Now().Sub(from)
1638     if 1000000000 < elps {
1639         return fmt.Sprintf("[%5d.%02ds]",elps/1000000000,(elps%1000000000)/10000000)
1640     }else
1641     if 1000000 < elps {
1642         return fmt.Sprintf("[%3d.%03dms]",elps/1000000,(elps%1000000)/1000)
1643     }else{
1644         return fmt.Sprintf("[%3d.%03dus]",elps/1000,(elps%1000))
1645     }
1646 }
1647 func abbtime(nanos int64)(string){
1648     if 1000000000 < nanos {
1649         return fmt.Sprintf("%d.%02ds",nanos/1000000000,(nanos%1000000000)/10000000)
1650     }else
1651     if 1000000 < nanos {
1652         return fmt.Sprintf("%d.%03dms",nanos/1000000,(nanos%1000000)/1000)
1653     }else{
1654         return fmt.Sprintf("%d.%03dus",nanos/1000,(nanos%1000))
1655     }
1656 }
1657 func abssize(size int64)(string){
1658     fsize := float64(size)
1659     if 1024*1024*1024 < size {
1660         return fmt.Sprintf("%.2fGiB",fsize/(1024*1024*1024))
1661     }else
1662     if 1024*1024 < size {
1663         return fmt.Sprintf("%.3fMiB",fsize/(1024*1024))
1664     }else{
1665         return fmt.Sprintf("%.3fKiB",fsize/1024)
1666     }
1667 }
1668 func absize(size int64)(string){
1669     fsize := float64(size)
1670     if 1024*1024*1024 < size {
1671         return fmt.Sprintf("%8.2fGiB",fsize/(1024*1024*1024))
1672     }else
1673     if 1024*1024 < size {
1674         return fmt.Sprintf("%8.3fMiB",fsize/(1024*1024))
1675     }else{
1676         return fmt.Sprintf("%8.3fKiB",fsize/1024)
1677     }
1678 }
1679 func abbspeed(totalB int64,ns int64)(string){
1680     MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
1681     if 1000 <= MBs {
1682         return fmt.Sprintf("%6.3fGB/s",MBs/1000)
1683     }
1684     if 1 <= MBs {
1685         return fmt.Sprintf("%6.3fMB/s",MBs)
1686     }else{
1687         return fmt.Sprintf("%6.3fKB/s",MBs*1000)
1688     }
1689 }
1690 func abspeed(totalB int64,ns time.Duration)(string){
1691     MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
1692     if 1000 <= MBs {
1693         return fmt.Sprintf("%6.3fGBps",MBs/1000)
1694     }
1695     if 1 <= MBs {
1696         return fmt.Sprintf("%6.3fMBps",MBs)
1697     }else{
1698         return fmt.Sprintf("%6.3fKBps",MBs*1000)
1699     }
1700 }
1701 func fileRelay(what string,in*os.File,out*os.File,size int64,bsiz int)(wcount int64){
1702     Start := time.Now()
1703     buff := make([]byte,bsiz)
1704     var total int64 = 0
1705     var rem int64 = size
1706     nio := 0
1707     Prev := time.Now()
1708     var PrevSize int64 = 0
1709
1710     fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) START\n",
1711         what,absize(total),size,nio)
1712
1713     for i:= 0; ; i++ {
1714         var len = bsiz
1715         if int(rem) < len {
1716             len = int(rem)
1717         }
1718         Now := time.Now()
1719         Elps := Now.Sub(Prev);
1720         if 1000000000 < Now.Sub(Prev) {
1721             fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) %s\n",
1722                 what,absize(total),size,nio,
1723                 abspeed((total-PrevSize),Elps))
1724             Prev = Now;
1725             PrevSize = total
1726         }
1727         rlen := len
1728         if in != nil {
1729             // should watch the disconnection of out
1730             rcc,err := in.Read(buff[0:rlen])
1731             if err != nil {
1732                 fmt.Printf(Elapsed(Start)+"--En- X: %s read(%v,%v)<%v\n",
1733                     what,rcc,err,in.Name())
1734                 break
1735             }
1736             rlen = rcc
```

```
            if string(buff[0:10]) == "((SoftEOF " {
                var ecc int64 = 0
                fmt.Sscanf(string(buff),"((SoftEOF %v",&ecc)
                fmt.Printf(Elapsed(Start)+"--En- X: %s Recv ((SoftEOF %v))/%v\n",
                    what,ecc,total)
                if ecc == total {
                    break
                }
            }
        }

        wlen := rlen
        if out != nil {
            wcc,err := out.Write(buff[0:rlen])
            if err != nil {
                fmt.Printf(Elapsed(Start)+"-En-- X: %s write(%v,%v)>%v\n",
                    what,wcc,err,out.Name())
                break
            }
            wlen = wcc
        }
        if wlen < rlen {
            fmt.Printf(Elapsed(Start)+"--En- X: %s incomplete write (%v/%v)\n",
                what,wlen,rlen)
            break;
        }

        nio += 1
        total += int64(rlen)
        rem -= int64(rlen)
        if rem <= 0 {
            break
        }
    }
    Done := time.Now()
    Elps := float64(Done.Sub(Start))/1000000000 //Seconds
    TotalMB := float64(total)/1000000 //MB
    MBps := TotalMB / Elps
    fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) %v %.3fMB/s\n",
        what,total,size,nio,absize(total),MBps)
    return total
}
func tcpPush(clnt *os.File){
    // shrink socket buffer and recover
    usleep(100);
}
func (gsh*GshContext)RexecServer(argv[]string){
    debug := true
    Start0 := time.Now()
    Start := Start0
//  if local == ":" { local = "0.0.0.0:9999" }
    local := "0.0.0.0:9999"

    if 0 < len(argv) {
        if argv[0] == "-s" {
            debug = false
            argv = argv[1:]
        }
    }
    if 0 < len(argv) {
        argv = argv[1:]
    }
    port, err := net.ResolveTCPAddr("tcp",local);
    if err != nil {
        fmt.Printf("--En- S: Address error: %s (%s)\n",local,err)
        return
    }
    fmt.Printf(Elapsed(Start)+"--In- S: Listening at %s...\n",local);
    sconn, err := net.ListenTCP("tcp", port)
    if err != nil {
        fmt.Printf(Elapsed(Start)+"--En- S: Listen error: %s (%s)\n",local,err)
        return
    }

    reqbuf := make([]byte,LINESIZE)
    res := ""
    for {
        fmt.Printf(Elapsed(Start0)+"--In- S: Listening at %s...\n",local);
        aconn, err := sconn.AcceptTCP()
        Start = time.Now()
        if err != nil {
            fmt.Printf(Elapsed(Start)+"--En- S: Accept error: %s (%s)\n",local,err)
            return
        }
        clnt, _ := aconn.File()
        fd := clnt.Fd()
        ar := aconn.RemoteAddr()
        if debug { fmt.Printf(Elapsed(Start0)+"--In- S: Accepted TCP at %s [%d] <- %v\n",
            local,fd,ar) }
        res = fmt.Sprintf("220 GShell/%s Server\r\n",VERSION)
        fmt.Fprintf(clnt,"%s",res)
        if debug { fmt.Printf(Elapsed(Start)+"--In- S: %s",res) }
        count, err := clnt.Read(reqbuf)
        if err != nil {
            fmt.Printf(Elapsed(Start)+"--En- C: (%v %v) %v",
                count,err,string(reqbuf))
        }
        req := string(reqbuf[:count])
        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",string(req)) }
        reqv := strings.Split(string(req),"\r")
        cmdv := gshScanArg(reqv[0],0)
        //cmdv := strings.Split(reqv[0]," ")
        switch cmdv[0] {
            case "HELO":
                res = fmt.Sprintf("250 %v",req)
            case "GET":
                // download {remotefile|-zN} [localfile]
                var dsize int64 = 32*1024*1024
                var bsize int = 64*1024
                var fname string = ""
                var in *os.File = nil
                var pseudoEOF = false
                if 1 < len(cmdv) {
                    fname = cmdv[1]
                    if strBegins(fname,"-z") {
                        fmt.Sscanf(fname[2:],"%d",&dsize)
                    }else
                    if strBegins(fname,"{") {
                        xin,xout,err := gsh.Popen(fname,"r")
                        if err {
                        }else{
                            xout.Close()
                            defer xin.Close()
                            in = xin
```

```
                            dsize = MaxStreamSize
                            pseudoEOF = true
                        }
                    }else{
                        xin,err := os.Open(fname)
                        if err != nil {
                            fmt.Printf("--En- GET (%v)\n",err)
                        }else{
                            defer xin.Close()
                            in = xin
                            fi,_ := xin.Stat()
                            dsize = fi.Size()
                        }
                    }
                }
                //fmt.Printf(Elapsed(Start)+"--In- GET %v:%v\n",dsize,bsize)
                res = fmt.Sprintf("200 %v\r\n",dsize)
                fmt.Fprintf(clnt,"%v",res)
                tcpPush(clnt); // should be separated as line in receiver
                fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
                wcount := fileRelay("SendGET",in,clnt,dsize,bsize)
                if pseudoEOF {
                    in.Close() // pipe from the command
                    // show end of stream data (its size) by OOB?
                    SoftEOF := fmt.Sprintf("((SoftEOF %v))",wcount)
                    fmt.Printf(Elapsed(Start)+"--In- S: Send %v\n",SoftEOF)

                    tcpPush(clnt); // to let SoftEOF data apper at the top of recevied data
                    fmt.Fprintf(clnt,"%v\r\n",SoftEOF)
                    tcpPush(clnt); // to let SoftEOF alone in a packet (separate with 200 OK)
                        // with client generated random?
                    //fmt.Printf("--In- L: close %v (%v)\n",in.Fd(),in.Name())
                }
                res = fmt.Sprintf("200 GET done\r\n")
            case "PUT":
                // upload {srcfile|-zN} [dstfile]
                var dsize int64 = 32*1024*1024
                var bsize int = 64*1024
                var fname string = ""
                var out *os.File = nil
                if 1 < len(cmdv) { // localfile
                    fmt.Sscanf(cmdv[1],"%d",&dsize)
                }
                if 2 < len(cmdv) {
                    fname = cmdv[2]
                    if fname == "-" {
                        // nul dev
                    }else
                    if strBegins(fname,"{") {
                        xin,xout,err := gsh.Popen(fname,"w")
                        if err {
                        }else{
                            xin.Close()
                            defer xout.Close()
                            out = xout
                        }
                    }else{
                    // should write to temporary file
                    // should suppress ^C on tty
            xout,err := os.OpenFile(fname,os.O_CREATE|os.O_RDWR|os.O_TRUNC,0600)
            //fmt.Printf("--In- S: open(%v) out(%v) err(%v)\n",fname,xout,err)
                        if err != nil {
                            fmt.Printf("--En- PUT (%v)\n",err)
                        }else{
                            out = xout
                        }
                    }
                fmt.Printf(Elapsed(Start)+"--In- L: open(%v,w) %v (%v)\n",
                    fname,local,err)
                }
                fmt.Printf(Elapsed(Start)+"--In- PUT %v (/%v)\n",dsize,bsize)
                fmt.Printf(Elapsed(Start)+"--In- S: 200 %v OK\r\n",dsize)
                fmt.Fprintf(clnt,"200 %v OK\r\n",dsize)
                fileRelay("RecvPUT",clnt,out,dsize,bsize)
                res = fmt.Sprintf("200 PUT done\r\n")
            default:
                res = fmt.Sprintf("400 What? %v",req)
        }
        swcc,serr := clnt.Write([]byte(res))
        if serr != nil {
            fmt.Printf(Elapsed(Start)+"--In- S: (wc=%v er=%v) %v",swcc,serr,res)
        }else{
            fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
        }
        aconn.Close();
        clnt.Close();
    }
    sconn.Close();
}
func (gsh*GshContext)RexecClient(argv[]string)(int,string){
    debug := true
    Start := time.Now()
    if len(argv) == 1 {
        return -1,"EmptyARG"
    }
    argv = argv[1:]
    if argv[0] == "-serv" {
        gsh.RexecServer(argv[1:])
        return 0,"Server"
    }
    remote := "0.0.0.0:9999"
    if argv[0][0] == '@' {
        remote = argv[0][1:]
        argv = argv[1:]
    }
    if argv[0] == "-s" {
        debug = false
        argv = argv[1:]
    }
    dport, err := net.ResolveTCPAddr("tcp",remote);
    if err != nil {
        fmt.Printf(Elapsed(Start)+"Address error: %s (%s)\n",remote,err)
        return -1,"AddressError"
    }
    fmt.Printf(Elapsed(Start)+"--In- C: Connecting to %s\n",remote)
    serv, err := net.DialTCP("tcp",nil,dport)
    if err != nil {
        fmt.Printf(Elapsed(Start)+"Connection error: %s (%s)\n",remote,err)
        return -1,"CannotConnect"
    }
    if debug {
        al := serv.LocalAddr()
        fmt.Printf(Elapsed(Start)+"--In- C: Connected to %v <- %v\n",remote,al)
    }
```

```
1985
1986    req := ""
1987    res := make([]byte,LINESIZE)
1988    count,err := serv.Read(res)
1989    if err != nil {
1990        fmt.Printf("--En- S: (%3d,%v) %v",count,err,string(res))
1991    }
1992    if debug { fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res)) }
1993
1994    if argv[0] == "GET" {
1995        savPA := gsh.gshPA
1996        var bsize int = 64*1024
1997        req = fmt.Sprintf("%v\r\n",strings.Join(argv," "))
1998        fmt.Printf(Elapsed(Start)+"--In- C: %v",req)
1999        fmt.Fprintf(serv,req)
2000        count,err = serv.Read(res)
2001        if err != nil {
2002        }else{
2003            var dsize int64 = 0
2004            var out *os.File = nil
2005            var out_tobeclosed *os.File = nil
2006            var fname string = ""
2007            var rcode int = 0
2008            var pid int = -1
2009            fmt.Sscanf(string(res),"%d %d",&rcode,&dsize)
2010            fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res[0:count]))
2011            if 3 <= len(argv) {
2012                fname = argv[2]
2013                if strBegins(fname,"{") {
2014                    xin,xout,err := gsh.Popen(fname,"w")
2015                    if err {
2016                    }else{
2017                        xin.Close()
2018                        defer xout.Close()
2019                        out = xout
2020                        out_tobeclosed = xout
2021                        pid = 0 // should be its pid
2022                    }
2023                }else{
2024                    // should write to temporary file
2025                    // should suppress ^C on tty
2026                    xout,err := os.OpenFile(fname,os.O_CREATE|os.O_RDWR|os.O_TRUNC,0600)
2027                    if err != nil {
2028                        fmt.Print("--En- %v\n",err)
2029                    }
2030                    out = xout
2031                    //fmt.Printf("--In-- %d > %s\n",out.Fd(),fname)
2032                }
2033            }
2034            in,_ := serv.File()
2035            fileRelay("RecvGET",in,out,dsize,bsize)
2036            if 0 <= pid {
2037                gsh.gshPA = savPA // recovery of Fd(), and more?
2038                fmt.Printf(Elapsed(Start)+"--In- L: close Pipe > %v\n",fname)
2039                out_tobeclosed.Close()
2040                //syscall.Wait4(pid,nil,0,nil) //@@
2041            }
2042        }
2043    }else
2044    if argv[0] == "PUT" {
2045        remote, _ := serv.File()
2046        var local *os.File = nil
2047        var dsize int64 = 32*1024*1024
2048        var bsize int = 64*1024
2049        var ofile string = "-"
2050        //fmt.Printf("--I-- Rex %v\n",argv)
2051        if 1 < len(argv) {
2052            fname := argv[1]
2053            if strBegins(fname,"-z") {
2054                fmt.Sscanf(fname[2:],"%d",&dsize)
2055            }else
2056            if strBegins(fname,"{") {
2057                xin,xout,err := gsh.Popen(fname,"r")
2058                if err {
2059                }else{
2060                    xout.Close()
2061                    defer xin.Close()
2062                    //in = xin
2063                    local = xin
2064                    fmt.Printf("--In- [%d] < Upload output of %v\n",
2065                        local.Fd(),fname)
2066                    ofile = "-from."+fname
2067                    dsize = MaxStreamSize
2068                }
2069            }else{
2070                xlocal,err := os.Open(fname)
2071                if err != nil {
2072                    fmt.Printf("--En- (%s)\n",err)
2073                    local = nil
2074                }else{
2075                    local = xlocal
2076                    fi,_ := local.Stat()
2077                    dsize = fi.Size()
2078                    defer local.Close()
2079                    //fmt.Printf("--I-- Rex in(%v / %v)\n",ofile,dsize)
2080                }
2081                ofile = fname
2082                fmt.Printf(Elapsed(Start)+"--In- L: open(%v,r)=%v %v (%v)\n",
2083                    fname,dsize,local,err)
2084            }
2085        }
2086        if 2 < len(argv) && argv[2] != "" {
2087            ofile = argv[2]
2088            //fmt.Printf("(%d)%v B.ofile=%v\n",len(argv),argv,ofile)
2089        }
2090        //fmt.Printf(Elapsed(Start)+"--I-- Rex out(%v)\n",ofile)
2091        fmt.Printf(Elapsed(Start)+"--In- PUT %v (/%v)\n",dsize,bsize)
2092        req = fmt.Sprintf("PUT %v %v \r\n",dsize,ofile)
2093        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",req) }
2094        fmt.Fprintf(serv,"%v",req)
2095        count,err = serv.Read(res)
2096        if debug { fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res[0:count])) }
2097        fileRelay("SendPUT",local,remote,dsize,bsize)
2098    }else{
2099        req = fmt.Sprintf("%v\r\n",strings.Join(argv," "))
2100        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",req) }
2101        fmt.Fprintf(serv,"%v",req)
2102        //fmt.Printf("--In- sending RexRequest(%v)\n",len(req))
2103    }
2104    //fmt.Printf(Elapsed(Start)+"--In- waiting RexResponse...\n")
2105    count,err = serv.Read(res)
2106    ress := ""
2107    if count == 0 {
2108        ress = "(nil)\r\n"
```

```
    }else{
        ress = string(res[:count])
    }
    if err != nil {
        fmt.Printf(Elapsed(Start)+"--En- S: (%d,%v) %v",count,err,ress)
    }else{
        fmt.Printf(Elapsed(Start)+"--In- S: %v",ress)
    }
    serv.Close()
    //conn.Close()

    var stat string
    var rcode int
    fmt.Sscanf(ress,"%d %s",&rcode,&stat)
    //fmt.Printf("--D-- Client: %v (%v)",rcode,stat)
    return rcode,ress
}

// <a name="remote-sh">Remote Shell</a>
// gcp file [...] { [host]:[port:][dir] | dir } // -p | -no-p
func (gsh*GshContext)FileCopy(argv[]string){
    var host = ""
    var port = ""
    var upload = false
    var download = false
    var xargv = []string{"rex-gcp"}
    var srcv = []string{}
    var dstv = []string{}
    argv = argv[1:]

    for _,v := range argv {
        /*
        if v[0] == '-' { // might be a pseudo file (generated date)
            continue
        }
        */
        obj := strings.Split(v,":")
        //fmt.Printf("%d %v %v\n",len(obj),v,obj)
        if 1 < len(obj) {
            host = obj[0]
            file := ""
            if 0 < len(host) {
                gsh.LastServer.host = host
            }else{
                host = gsh.LastServer.host
                port = gsh.LastServer.port
            }
            if 2 < len(obj) {
                port = obj[1]
                if 0 < len(port) {
                    gsh.LastServer.port = port
                }else{
                    port = gsh.LastServer.port
                }
                file = obj[2]
            }else{
                file = obj[1]
            }
            if len(srcv) == 0 {
                download = true
                srcv = append(srcv,file)
                continue
            }
            upload = true
            dstv = append(dstv,file)
            continue
        }
        /*
        idx := strings.Index(v,":")
        if 0 <= idx {
            remote = v[0:idx]
            if len(srcv) == 0 {
                download = true
                srcv = append(srcv,v[idx+1:])
                continue
            }
            upload = true
            dstv = append(dstv,v[idx+1:])
            continue
        }
        */
        if download {
            dstv = append(dstv,v)
        }else{
            srcv = append(srcv,v)
        }
    }
    hostport := "@" + host + ":" + port
    if upload {
        if host != "" { xargv = append(xargv,hostport) }
        xargv = append(xargv,"PUT")
        xargv = append(xargv,srcv[0:]...)
        xargv = append(xargv,dstv[0:]...)
    //fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v // %v\n",hostport,dstv,srcv,xargv)
    fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v\n",hostport,dstv,srcv)
        gsh.RexecClient(xargv)
    }else
    if download {
        if host != "" { xargv = append(xargv,hostport) }
        xargv = append(xargv,"GET")
        xargv = append(xargv,srcv[0:]...)
        xargv = append(xargv,dstv[0:]...)
    //fmt.Printf("--I-- FileCopy GET gsh://%v/%v > %v // %v\n",hostport,srcv,dstv,xargv)
    fmt.Printf("--I-- FileCopy GET gsh://%v/%v > %v\n",hostport,srcv,dstv)
        gsh.RexecClient(xargv)
    }else{
    }
}

// target
func (gsh*GshContext)Trelpath(rloc string)(string){
    cwd, _ := os.Getwd()
    os.Chdir(gsh.RWD)
    os.Chdir(rloc)
    twd, _ := os.Getwd()
    os.Chdir(cwd)

    tpath := twd + "/" + rloc
    return tpath
}
// join to rmote GShell - [user@]host[:port] or cd host:[port]:path
func (gsh*GshContext)Rjoin(argv[]string){
    if len(argv) <= 1 {
        fmt.Printf("--I-- current server = %v\n",gsh.RSERV)
```

```
        return
    }
    serv := argv[1]
    servv := strings.Split(serv,":")
    if 1 <= len(servv) {
        if servv[0] == "lo" {
            servv[0] = "localhost"
        }
    }
    switch len(servv) {
        case 1:
            //if strings.Index(serv,":") < 0 {
            serv = servv[0] + ":" + fmt.Sprintf("%d",GSH_PORT)
            //}
        case 2: // host:port
            serv = strings.Join(servv,":")
    }
    xargv := []string{"rex-join","@"+serv,"HELO"}
    rcode,stat := gsh.RexecClient(xargv)
    if (rcode / 100) == 2 {
        fmt.Printf("--I-- OK Joined (%v) %v\n",rcode,stat)
        gsh.RSERV = serv
    }else{
        fmt.Printf("--I-- NG, could not joined (%v) %v\n",rcode,stat)
    }
}
func (gsh*GshContext)Rexec(argv[]string){
    if len(argv) <= 1 {
        fmt.Printf("--I-- rexec command [ | {file || {command} ]\n",gsh.RSERV)
        return
    }

    /*
    nargv := gshScanArg(strings.Join(argv," "),0)
    fmt.Printf("--D-- nargc=%d [%v]\n",len(nargv),nargv)
    if nargv[1][0] != '{' {
        nargv[1] = "{" + nargv[1] + "}"
        fmt.Printf("--D-- nargc=%d [%v]\n",len(nargv),nargv)
    }
    argv = nargv
    */
    nargv := []string{}
    nargv = append(nargv,"{"+strings.Join(argv[1:]," ")+"}")
    fmt.Printf("--D-- nargc=%d %v\n",len(nargv),nargv)
    argv = nargv

    xargv := []string{"rex-exec","@"+gsh.RSERV,"GET"}
    xargv = append(xargv,argv...)
    xargv = append(xargv,"/dev/tty")
    rcode,stat := gsh.RexecClient(xargv)
    if (rcode / 100) == 2 {
        fmt.Printf("--I-- OK Rexec (%v) %v\n",rcode,stat)
    }else{
        fmt.Printf("--I-- NG Rexec (%v) %v\n",rcode,stat)
    }
}
func (gsh*GshContext)Rchdir(argv[]string){
    if len(argv) <= 1 {
        return
    }
    cwd, _ := os.Getwd()
    os.Chdir(gsh.RWD)
    os.Chdir(argv[1])
    twd, _ := os.Getwd()
    gsh.RWD = twd
    fmt.Printf("--I-- JWD=%v\n",twd)
    os.Chdir(cwd)
}
func (gsh*GshContext)Rpwd(argv[]string){
    fmt.Printf("%v\n",gsh.RWD)
}
func (gsh*GshContext)Rls(argv[]string){
    cwd, _ := os.Getwd()
    os.Chdir(gsh.RWD)
    argv[0] = "-ls"
    gsh.xFind(argv)
    os.Chdir(cwd)
}
func (gsh*GshContext)Rput(argv[]string){
    var local string = ""
    var remote string = ""
    if 1 < len(argv) {
        local = argv[1]
        remote = local // base name
    }
    if 2 < len(argv) {
        remote = argv[2]
    }
    fmt.Printf("--I-- jput from=%v to=%v\n",local,gsh.Trelpath(remote))
}
func (gsh*GshContext)Rget(argv[]string){
    var remote string = ""
    var local string = ""
    if 1 < len(argv) {
        remote = argv[1]
        local = remote // base name
    }
    if 2 < len(argv) {
        local = argv[2]
    }
    fmt.Printf("--I-- jget from=%v to=%v\n",gsh.Trelpath(remote),local)
}

// <a name="network">network</a>
// -s, -si, -so // bi-directional, source, sync (maybe socket)
func (gshCtx*GshContext)sconnect(inTCP bool, argv []string) {
    gshPA := gshCtx.gshPA
    if len(argv) < 2 {
        fmt.Printf("Usage: -s [host]:[port[.udp]]\n")
        return
    }
    remote := argv[1]
    if remote == ":" { remote = "0.0.0.0:9999" }

    if inTCP { // TCP
        dport, err := net.ResolveTCPAddr("tcp",remote);
        if err != nil {
            fmt.Printf("Address error: %s (%s)\n",remote,err)
            return
        }
        conn, err := net.DialTCP("tcp",nil,dport)
        if err != nil {
            fmt.Printf("Connection error: %s (%s)\n",remote,err)
            return
```

```
        }
        file, _ := conn.File();
        fd := file.Fd()
        fmt.Printf("Socket: connected to %s, socket[%d]\n",remote,fd)

        savfd := gshPA.Files[1]
        gshPA.Files[1] = fd;
        gshCtx.gshellv(argv[2:])
        gshPA.Files[1] = savfd
        file.Close()
        conn.Close()
    }else{
        //dport, err := net.ResolveUDPAddr("udp4",remote);
        dport, err := net.ResolveUDPAddr("udp",remote);
        if err != nil {
            fmt.Printf("Address error: %s (%s)\n",remote,err)
            return
        }
        //conn, err := net.DialUDP("udp4",nil,dport)
        conn, err := net.DialUDP("udp",nil,dport)
        if err != nil {
            fmt.Printf("Connection error: %s (%s)\n",remote,err)
            return
        }
        file, _ := conn.File();
        fd := file.Fd()

        ar := conn.RemoteAddr()
        //al := conn.LocalAddr()
        fmt.Printf("Socket: connected to %s [%s], socket[%d]\n",
            remote,ar.String(),fd)

        savfd := gshPA.Files[1]
        gshPA.Files[1] = fd;
        gshCtx.gshellv(argv[2:])
        gshPA.Files[1] = savfd
        file.Close()
        conn.Close()
    }
}
func (gshCtx*GshContext)saccept(inTCP bool, argv []string) {
    gshPA := gshCtx.gshPA
    if len(argv) < 2 {
        fmt.Printf("Usage: -ac [host]:[port[.udp]]\n")
        return
    }
    local := argv[1]
    if local == ":" { local = "0.0.0.0:9999" }
    if inTCP { // TCP
        port, err := net.ResolveTCPAddr("tcp",local);
        if err != nil {
            fmt.Printf("Address error: %s (%s)\n",local,err)
            return
        }
        //fmt.Printf("Listen at %s...\n",local);
        sconn, err := net.ListenTCP("tcp", port)
        if err != nil {
            fmt.Printf("Listen error: %s (%s)\n",local,err)
            return
        }
        //fmt.Printf("Accepting at %s...\n",local);
        aconn, err := sconn.AcceptTCP()
        if err != nil {
            fmt.Printf("Accept error: %s (%s)\n",local,err)
            return
        }
        file, _ := aconn.File()
        fd := file.Fd()
        fmt.Printf("Accepted TCP at %s [%d]\n",local,fd)

        savfd := gshPA.Files[0]
        gshPA.Files[0] = fd;
        gshCtx.gshellv(argv[2:])
        gshPA.Files[0] = savfd

        sconn.Close();
        aconn.Close();
        file.Close();
    }else{
        //port, err := net.ResolveUDPAddr("udp4",local);
        port, err := net.ResolveUDPAddr("udp",local);
        if err != nil {
            fmt.Printf("Address error: %s (%s)\n",local,err)
            return
        }
        fmt.Printf("Listen UDP at %s...\n",local);
        //uconn, err := net.ListenUDP("udp4", port)
        uconn, err := net.ListenUDP("udp", port)
        if err != nil {
            fmt.Printf("Listen error: %s (%s)\n",local,err)
            return
        }
        file, _ := uconn.File()
        fd := file.Fd()
        ar := uconn.RemoteAddr()
        remote := ""
        if ar != nil { remote = ar.String() }
        if remote == "" { remote = "?" }

        // not yet received
        //fmt.Printf("Accepted at %s [%d] <- %s\n",local,fd,"")

        savfd := gshPA.Files[0]
        gshPA.Files[0] = fd;
        savenv := gshPA.Env
        gshPA.Env = append(savenv, "REMOTE_HOST="+remote)
        gshCtx.gshellv(argv[2:])
        gshPA.Env = savenv
        gshPA.Files[0] = savfd

        uconn.Close();
        file.Close();
    }
}

// empty line command
func (gshCtx*GshContext)xPwd(argv[]string){
    // execute context command, pwd + date
    // context notation, representation scheme, to be resumed at re-login
    cwd, _ := os.Getwd()
    switch {
    case isin("-a",argv):
        gshCtx.ShowChdirHistory(argv)
    case isin("-ls",argv):
```

```
        showFileInfo(cwd,argv)
    default:
        fmt.Printf("%s\n",cwd)
    case isin("-v",argv): // obsolete emtpy command
        t := time.Now()
        date := t.Format(time.UnixDate)
        exe, _ := os.Executable()
        host, _ := os.Hostname()
        fmt.Printf("{PWD=\"%s\"",cwd)
        fmt.Printf(" HOST=\"%s\"",host)
        fmt.Printf(" DATE=\"%s\"",date)
        fmt.Printf(" TIME=\"%s\"",t.String())
        fmt.Printf(" PID=\"%d\"",os.Getpid())
        fmt.Printf(" EXE=\"%s\"",exe)
        fmt.Printf("}\n")
    }
}

// <a name="history">History</a>
// these should be browsed and edited by HTTP browser
// show the time of command with -t and direcotry with -ls
// openfile-history, sort by -a -m -c
// sort by elapsed time by -t -s
// search by "more" like interface
// edit history
// sort history, and wc or uniq
// CPU and other resource consumptions
// limit showing range (by time or so)
// export / import history
func (gshCtx *GshContext)xHistory(argv []string){
    atWorkDirX := -1
    if 1 < len(argv) && strBegins(argv[1],"@") {
        atWorkDirX,_ = strconv.Atoi(argv[1][1:])
    }
    //fmt.Printf("--D-- showHistory(%v)\n",argv)
    for i, v := range gshCtx.CommandHistory {
        // exclude commands not to be listed by default
        // internal commands may be suppressed by default
        if v.CmdLine == "" && !isin("-a",argv) {
            continue;
        }
        if 0 <= atWorkDirX {
            if v.WorkDirX != atWorkDirX {
                continue
            }
        }
        if !isin("-n",argv){ // like "fc"
            fmt.Printf("!%-2d ",i)
        }
        if isin("-v",argv){
            fmt.Println(v) // should be with it date
        }else{
            if isin("-l",argv) || isin("-l0",argv) {
                elps := v.EndAt.Sub(v.StartAt);
                start := v.StartAt.Format(time.Stamp)
                fmt.Printf("@%d ",v.WorkDirX)
                fmt.Printf("[%v] %11v/t ",start,elps)
            }
            if isin("-l",argv) && !isin("-l0",argv){
                fmt.Printf("%v",Rusagef("%t %u\t// %s",argv,v.Rusagev))
            }
            if isin("-at",argv) { // isin("-ls",argv){
                dhi := v.WorkDirX // workdir history index
                fmt.Printf("@%d %s\t",dhi,v.WorkDir)
                // show the FileInfo of the output command??
            }
            fmt.Printf("%s",v.CmdLine)
            fmt.Printf("\n")
        }
    }
}
// !n - history index
func searchHistory(gshCtx GshContext, gline string) (string, bool, bool){
    if gline[0] == '!' {
        hix, err := strconv.Atoi(gline[1:])
        if err != nil {
            fmt.Printf("--E-- (%s : range)\n",hix)
            return "", false, true
        }
        if hix < 0 || len(gshCtx.CommandHistory) <= hix {
            fmt.Printf("--E-- (%d : out of range)\n",hix)
            return "", false, true
        }
        return gshCtx.CommandHistory[hix].CmdLine, false, false
    }
    // search
    //for i, v := range gshCtx.CommandHistory {
    //}
    return gline, false, false
}
func (gsh*GshContext)cmdStringInHistory(hix int)(cmd string, ok bool){
    if 0 <= hix && hix < len(gsh.CommandHistory) {
        return gsh.CommandHistory[hix].CmdLine,true
    }
    return "",false
}

// temporary adding to PATH environment
// cd name -lib for LD_LIBRARY_PATH
// chdir with directory history (date + full-path)
// -s for sort option (by visit date or so)
func (gsh*GshContext)ShowChdirHistory1(i int,v GChdirHistory, argv []string){
    fmt.Printf("!%-2d ",v.CmdIndex) // the first command at this WorkDir
    fmt.Printf("@%d ",i)
    fmt.Printf("[%v] ",v.MovedAt.Format(time.Stamp))
    showFileInfo(v.Dir,argv)
}
func (gsh*GshContext)ShowChdirHistory(argv []string){
    for i, v := range gsh.ChdirHistory {
        gsh.ShowChdirHistory1(i,v,argv)
    }
}
func skipOpts(argv[]string)(int){
    for i,v := range argv {
        if strBegins(v,"-") {
        }else{
            return i
        }
    }
    return -1
}
func (gshCtx*GshContext)xChdir(argv []string){
    cdhist := gshCtx.ChdirHistory
    if isin("?",argv ) || isin("-t",argv) || isin("-a",argv) {
```

```
        gshCtx.ShowChdirHistory(argv)
        return
    }
    pwd, _ := os.Getwd()
    dir := ""
    if len(argv) <= 1 {
        dir = toFullpath("~")
    }else{
        i := skipOpts(argv[1:])
        if i < 0 {
            dir = toFullpath("~")
        }else{
            dir = argv[1+i]
        }
    }
    if strBegins(dir,"@") {
        if dir == "@0" { // obsolete
            dir = gshCtx.StartDir
        }else
        if dir == "@!" {
            index := len(cdhist) - 1
            if 0 < index { index -= 1 }
            dir = cdhist[index].Dir
        }else{
            index, err := strconv.Atoi(dir[1:])
            if err != nil {
                fmt.Printf("--E-- xChdir(%v)\n",err)
                dir = "?"
            }else
            if len(gshCtx.ChdirHistory) <= index {
                fmt.Printf("--E-- xChdir(history range error)\n")
                dir = "?"
            }else{
                dir = cdhist[index].Dir
            }
        }
    }
    if dir != "?" {
        err := os.Chdir(dir)
        if err != nil {
            fmt.Printf("--E-- xChdir(%s)(%v)\n",argv[1],err)
        }else{
            cwd, _ := os.Getwd()
            if cwd != pwd {
                hist1 := GChdirHistory { }
                hist1.Dir = cwd
                hist1.MovedAt = time.Now()
                hist1.CmdIndex = len(gshCtx.CommandHistory)+1
                gshCtx.ChdirHistory = append(cdhist,hist1)
                if !isin("-s",argv){
                    //cwd, _ := os.Getwd()
                    //fmt.Printf("%s\n",cwd)
                    ix := len(gshCtx.ChdirHistory)-1
                    gshCtx.ShowChdirHistory1(ix,hist1,argv)
                }
            }
        }
    }
    if isin("-ls",argv){
        cwd, _ := os.Getwd()
        showFileInfo(cwd,argv);
    }
}
func TimeValSub(tv1 *syscall.Timeval, tv2 *syscall.Timeval){
    *tv1 = syscall.NsecToTimeval(tv1.Nano() - tv2.Nano())
}
func RusageSubv(ru1, ru2 [2]syscall.Rusage)([2]syscall.Rusage){
    TimeValSub(&ru1[0].Utime,&ru2[0].Utime)
    TimeValSub(&ru1[0].Stime,&ru2[0].Stime)
    TimeValSub(&ru1[1].Utime,&ru2[1].Utime)
    TimeValSub(&ru1[1].Stime,&ru2[1].Stime)
    return ru1
}
func TimeValAdd(tv1 syscall.Timeval, tv2 syscall.Timeval)(syscall.Timeval){
    tvs := syscall.NsecToTimeval(tv1.Nano() + tv2.Nano())
    return tvs
}
/*
func RusageAddv(ru1, ru2 [2]syscall.Rusage)([2]syscall.Rusage){
    TimeValAdd(ru1[0].Utime,ru2[0].Utime)
    TimeValAdd(ru1[0].Stime,ru2[0].Stime)
    TimeValAdd(ru1[1].Utime,ru2[1].Utime)
    TimeValAdd(ru1[1].Stime,ru2[1].Stime)
    return ru1
}
*/

// <a name="rusage">Resource Usage</a>
func sRusagef(fmtspec string, argv []string, ru [2]syscall.Rusage)(string){
    // ru[0] self , ru[1] children
    ut := TimeValAdd(ru[0].Utime,ru[1].Utime)
    st := TimeValAdd(ru[0].Stime,ru[1].Stime)
    uu := (ut.Sec*1000000 + int64(ut.Usec)) * 1000
    su := (st.Sec*1000000 + int64(st.Usec)) * 1000
    tu := uu + su
    ret := fmt.Sprintf("%v/sum",abbtime(tu))
    ret += fmt.Sprintf(", %v/usr",abbtime(uu))
    ret += fmt.Sprintf(", %v/sys",abbtime(su))
    return ret
}
func Rusagef(fmtspec string, argv []string, ru [2]syscall.Rusage)(string){
    ut := TimeValAdd(ru[0].Utime,ru[1].Utime)
    st := TimeValAdd(ru[0].Stime,ru[1].Stime)
    fmt.Printf("%d.%06ds/u ",ut.Sec,ut.Usec) //ru[1].Utime.Sec,ru[1].Utime.Usec)
    fmt.Printf("%d.%06ds/s ",st.Sec,st.Usec) //ru[1].Stime.Sec,ru[1].Stime.Usec)
    return ""
}
func Getrusagev()([2]syscall.Rusage){
    var ruv = [2]syscall.Rusage{}
    syscall.Getrusage(syscall.RUSAGE_SELF,&ruv[0])
    syscall.Getrusage(syscall.RUSAGE_CHILDREN,&ruv[1])
    return ruv
}
func showRusage(what string,argv []string, ru *syscall.Rusage){
    fmt.Printf("%s: ",what);
    fmt.Printf("Usr=%d.%06ds",ru.Utime.Sec,ru.Utime.Usec)
    fmt.Printf(" Sys=%d.%06ds",ru.Stime.Sec,ru.Stime.Usec)
    fmt.Printf(" Rss=%vB",ru.Maxrss)
    if isin("-l",argv) {
        fmt.Printf(" MinFlt=%v",ru.Minflt)
        fmt.Printf(" MajFlt=%v",ru.Majflt)
        fmt.Printf(" IxRSS=%vB",ru.Ixrss)
        fmt.Printf(" IdRSS=%vB",ru.Idrss)
        fmt.Printf(" Nswap=%vB",ru.Nswap)
```

```
    fmt.Printf(" Read=%v",ru.Inblock)
    fmt.Printf(" Write=%v",ru.Oublock)
    }
    fmt.Printf(" Snd=%v",ru.Msgsnd)
    fmt.Printf(" Rcv=%v",ru.Msgrcv)
    //if isin("-l",argv) {
        fmt.Printf(" Sig=%v",ru.Nsignals)
    //}
    fmt.Printf("\n");
}
func (gshCtx *GshContext)xTime(argv[]string)(bool){
    if 2 <= len(argv){
        gshCtx.LastRusage = syscall.Rusage{}
        rusagev1 := Getrusagev()
        fin := gshCtx.gshellv(argv[1:])
        rusagev2 := Getrusagev()
        showRusage(argv[1],argv,&gshCtx.LastRusage)
        rusagev := RusageSubv(rusagev2,rusagev1)
        showRusage("self",argv,&rusagev[0])
        showRusage("chld",argv,&rusagev[1])
        return fin
    }else{
        rusage:= syscall.Rusage {}
        syscall.Getrusage(syscall.RUSAGE_SELF,&rusage)
        showRusage("self",argv, &rusage)
        syscall.Getrusage(syscall.RUSAGE_CHILDREN,&rusage)
        showRusage("chld",argv, &rusage)
        return false
    }
}
func (gshCtx *GshContext)xJobs(argv[]string){
    fmt.Printf("%d Jobs\n",len(gshCtx.BackGroundJobs))
    for ji, pid := range gshCtx.BackGroundJobs {
        //wstat := syscall.WaitStatus {0}
        rusage := syscall.Rusage {}
        //wpid, err := syscall.Wait4(pid,&wstat,syscall.WNOHANG,&rusage);
        wpid, err := syscall.Wait4(pid,nil,syscall.WNOHANG,&rusage);
        if err != nil {
            fmt.Printf("--E-- %%%d [%d] (%v)\n",ji,pid,err)
        }else{
            fmt.Printf("%%%d[%d](%d)\n",ji,pid,wpid)
            showRusage("chld",argv,&rusage)
        }
    }
}
func (gsh*GshContext)inBackground(argv[]string)(bool){
    if gsh.CmdTrace { fmt.Printf("--I-- inBackground(%v)\n",argv) }
    gsh.BackGround = true // set background option
    xfin := false
    xfin = gsh.gshellv(argv)
    gsh.BackGround = false
    return xfin
}
// -o file without command means just opening it and refer by #N
// should be listed by "files" comnmand
func (gshCtx*GshContext)xOpen(argv[]string){
    var pv = []int{-1,-1}
    err := syscall.Pipe(pv)
    fmt.Printf("--I-- pipe()=[#%d,#%d](%v)\n",pv[0],pv[1],err)
}
func (gshCtx*GshContext)fromPipe(argv[]string){
}
func (gshCtx*GshContext)xClose(argv[]string){
}

// <a name="redirect">redirect</a>
func (gshCtx*GshContext)redirect(argv[]string)(bool){
    if len(argv) < 2 {
        return false
    }

    cmd := argv[0]
    fname := argv[1]
    var file *os.File = nil

    fdix := 0
    mode := os.O_RDONLY

    switch {
    case cmd == "-i" || cmd == "<":
        fdix = 0
        mode = os.O_RDONLY
    case cmd == "-o" || cmd == ">":
        fdix = 1
        mode = os.O_RDWR | os.O_CREATE
    case cmd == "-a" || cmd == ">>":
        fdix = 1
        mode = os.O_RDWR | os.O_CREATE | os.O_APPEND
    }
    if fname[0] == '#' {
        fd, err := strconv.Atoi(fname[1:])
        if err != nil {
            fmt.Printf("--E-- (%v)\n",err)
            return false
        }
        file = os.NewFile(uintptr(fd),"MaybePipe")
    }else{
        xfile, err := os.OpenFile(argv[1], mode, 0600)
        if err != nil {
            fmt.Printf("--E-- (%s)\n",err)
            return false
        }
        file = xfile
    }
    gshPA := gshCtx.gshPA
    savfd := gshPA.Files[fdix]
    gshPA.Files[fdix] = file.Fd()
    fmt.Printf("--I-- Opened [%d] %s\n",file.Fd(),argv[1])
    gshCtx.gshellv(argv[2:])
    gshPA.Files[fdix] = savfd

    return false
}

//fmt.Fprintf(res, "GShell Status: %q", html.EscapeString(req.URL.Path))
func httpHandler(res http.ResponseWriter, req *http.Request){
    path := req.URL.Path
    fmt.Printf("--I-- Got HTTP Request(%s)\n",path)
    {
        gshCtxBuf, _ :=  setupGshContext()
        gshCtx := &gshCtxBuf
        fmt.Printf("--I-- %s\n",path[1:])
        gshCtx.tgshelll(path[1:])
    }
```

```
    fmt.Fprintf(res, "Hello(^-^)//\n%s\n",path)
}
func (gshCtx *GshContext) httpServer(argv []string){
    http.HandleFunc("/", httpHandler)
    accport := "localhost:9999"
    fmt.Printf("--I-- HTTP Server Start at [%s]\n",accport)
    http.ListenAndServe(accport,nil)
}
func (gshCtx *GshContext)xGo(argv[]string){
    go gshCtx.gshellv(argv[1:]);
}
func (gshCtx *GshContext) xPs(argv[]string)(){
}

// <a name="plugin">Plugin</a>
// plugin [-ls [names]] to list plugins
// Reference: <a href="https://golang.org/src/plugin/">plugin</a> source code
func (gshCtx *GshContext) whichPlugin(name string,argv[]string)(pi *PluginInfo){
    pi = nil
    for _,p := range gshCtx.PluginFuncs {
        if p.Name == name && pi == nil {
            pi = &p
        }
        if !isin("-s",argv){
            //fmt.Printf("%v %v ",i,p)
            if isin("-ls",argv){
                showFileInfo(p.Path,argv)
            }else{
                fmt.Printf("%s\n",p.Name)
            }
        }
    }
    return pi
}
func (gshCtx *GshContext) xPlugin(argv[]string) (error) {
    if len(argv) == 0 || argv[0] == "-ls" {
        gshCtx.whichPlugin("",argv)
        return  nil
    }
    name := argv[0]
    Pin := gshCtx.whichPlugin(name,[]string{"-s"})
    if Pin != nil {
        os.Args = argv // should be recovered?
        Pin.Addr.(func())()
        return nil
    }
    sofile := toFullpath(argv[0] + ".so") // or find it by which($PATH)

    p, err := plugin.Open(sofile)
    if err != nil {
        fmt.Printf("--E-- plugin.Open(%s)(%v)\n",sofile,err)
        return err
    }
    fname := "Main"
    f, err := p.Lookup(fname)
    if( err != nil ){
        fmt.Printf("--E-- plugin.Lookup(%s)(%v)\n",fname,err)
        return err
    }
    pin := PluginInfo {p,f,name,sofile}
    gshCtx.PluginFuncs = append(gshCtx.PluginFuncs,pin)
    fmt.Printf("--I-- added (%d)\n",len(gshCtx.PluginFuncs))

    //fmt.Printf("--I-- first call(%s:%s)%v\n",sofile,fname,argv)
    os.Args = argv
    f.(func())()
    return err
}
func (gshCtx*GshContext)Args(argv[]string){
    for i,v := range os.Args {
        fmt.Printf("[%v] %v\n",i,v)
    }
}
func (gshCtx *GshContext) showVersion(argv[]string){
    if isin("-l",argv) {
        fmt.Printf("%v/%v (%v)",NAME,VERSION,DATE);
    }else{
        fmt.Printf("%v",VERSION);
    }
    if isin("-a",argv) {
        fmt.Printf(" %s",AUTHOR)
    }
    if !isin("-n",argv) {
        fmt.Printf("\n")
    }
}

// <a name="scanf">Scanf</a> // string decomposer
// scanf [format] [input]
func scanv(sstr string)(strv[]string){
    strv = strings.Split(sstr," ")
    return strv
}
func scanUntil(src,end string)(rstr string,leng int){
    idx := strings.Index(src,end)
    if 0 <= idx {
        rstr = src[0:idx]
        return rstr,idx+len(end)
    }
    return src,0
}

// -bn -- display base-name part only // can be in some %fmt, for sed rewriting
func (gsh*GshContext)printVal(fmts string, vstr string, optv[]string){
    //vint,err := strconv.Atoi(vstr)
    var ival int64 = 0
    n := 0
    err := error(nil)
    if strBegins(vstr,"_") {
        vx,_ := strconv.Atoi(vstr[1:])
        if vx < len(gsh.iValues) {
            vstr = gsh.iValues[vx]
        }else{
        }
    }
    // should use Eval()
    if strBegins(vstr,"0x") {
        n,err = fmt.Sscanf(vstr[2:],"%x",&ival)
    }else{
        n,err = fmt.Sscanf(vstr,"%d",&ival)
//fmt.Printf("--D-- n=%d err=(%v) {%s}=%v\n",n,err,vstr, ival)
    }
    if n == 1 && err == nil {
        //fmt.Printf("--D-- formatn(%v) ival(%v)\n",fmts,ival)
```

```
        fmt.Printf("%"+fmts,ival)
    }else{
        if isin("-bn",optv){
            fmt.Printf("%"+fmts,filepath.Base(vstr))
        }else{
            fmt.Printf("%"+fmts,vstr)
        }
    }
}
func (gsh*GshContext)printfv(fmts,div string,argv[]string,optv[]string,list[]string){
    //fmt.Printf("{%d}",len(list))
    //curfmt := "v"
    outlen := 0
    curfmt := gsh.iFormat

    if 0 < len(fmts) {
        for xi := 0; xi < len(fmts); xi++ {
            fch := fmts[xi]
            if fch == '%' {
                if xi+1 < len(fmts) {
                    curfmt = string(fmts[xi+1])
 gsh.iFormat = curfmt
                    xi += 1
    if xi+1 < len(fmts) && fmts[xi+1] == '(' {
        vals,leng := scanUntil(fmts[xi+2:],")")
        //fmt.Printf("--D-- show fmt(%v) val(%v) next(%v)\n",curfmt,vals,leng)
        gsh.printVal(curfmt,vals,optv)
        xi += 2+leng-1
        outlen += 1
    }
                    continue
                }
            }
            if fch == '_' {
                hi,leng := scanInt(fmts[xi+1:])
                if 0 < leng {
                    if hi < len(gsh.iValues) {
                        gsh.printVal(curfmt,gsh.iValues[hi],optv)
                        outlen += 1 // should be the real length
                    }else{
                        fmt.Printf("((out-range))")
                    }
                    xi += leng
                    continue;
                }
            }
            fmt.Printf("%c",fch)
            outlen += 1
        }
    }else{
        //fmt.Printf("--D-- print {%s}\n")
        for i,v := range list {
            if 0 < i {
                fmt.Printf(div)
            }
            gsh.printVal(curfmt,v,optv)
            outlen += 1
        }
    }
    if 0 < outlen {
        fmt.Printf("\n")
    }
}
func (gsh*GshContext)Scanv(argv[]string){
    //fmt.Printf("--D-- Scanv(%v)\n",argv)
    if len(argv) == 1 {
        return
    }
    argv = argv[1:]
    fmts := ""
    if strBegins(argv[0],"-F") {
        fmts = argv[0]
        gsh.iDelimiter = fmts
        argv = argv[1:]
    }
    input := strings.Join(argv," ")
    if fmts == "" { // simple decomposition
        v := scanv(input)
        gsh.iValues = v
        //fmt.Printf("%v\n",strings.Join(v,","))
    }else{
        v := make([]string,8)
        n,err := fmt.Sscanf(input,fmts,&v[0],&v[1],&v[2],&v[3])
        fmt.Printf("--D-- Scanf ->(%v) n=%d err=(%v)\n",v,n,err)
        gsh.iValues = v
    }
}
func (gsh*GshContext)Printv(argv[]string){
    if false { //@@U
        fmt.Printf("%v\n",strings.Join(argv[1:]," "))
        return
    }
    //fmt.Printf("--D-- Printv(%v)\n",argv)
    //fmt.Printf("%v\n",strings.Join(gsh.iValues,","))
    div := gsh.iDelimiter
    fmts := ""
    argv = argv[1:]
    if 0 < len(argv) {
        if strBegins(argv[0],"-F") {
            div = argv[0][2:]
            argv = argv[1:]
        }
    }

    optv := []string{}
    for _,v := range argv {
        if strBegins(v,"-"){
            optv = append(optv,v)
            argv = argv[1:]
        }else{
            break;
        }
    }
    if 0 < len(argv) {
        fmts = strings.Join(argv," ")
    }
    gsh.printfv(fmts,div,argv,optv,gsh.iValues)
}
func (gsh*GshContext)Basename(argv[]string){
    for i,v := range gsh.iValues {
        gsh.iValues[i] = filepath.Base(v)
    }
}
func (gsh*GshContext)Sortv(argv[]string){
```

```
    sv := gsh.iValues
    sort.Slice(sv , func(i,j int) bool {
        return sv[i] < sv[j]
    })
}
func (gsh*GshContext)Shiftv(argv[]string){
    vi := len(gsh.iValues)
    if 0 < vi {
        if isin("-r",argv) {
            top := gsh.iValues[0]
            gsh.iValues = append(gsh.iValues[1:],top)
        }else{
            gsh.iValues = gsh.iValues[1:]
        }
    }
}

func (gsh*GshContext)Enq(argv[]string){
}
func (gsh*GshContext)Deq(argv[]string){
}
func (gsh*GshContext)Push(argv[]string){
    gsh.iValStack = append(gsh.iValStack,argv[1:])
    fmt.Printf("depth=%d\n",len(gsh.iValStack))
}
func (gsh*GshContext)Dump(argv[]string){
    for i,v := range gsh.iValStack {
        fmt.Printf("%d %v\n",i,v)
    }
}
func (gsh*GshContext)Pop(argv[]string){
    depth := len(gsh.iValStack)
    if 0 < depth {
        v := gsh.iValStack[depth-1]
        if isin("-cat",argv){
            gsh.iValues = append(gsh.iValues,v...)
        }else{
            gsh.iValues = v
        }
        gsh.iValStack = gsh.iValStack[0:depth-1]
        fmt.Printf("depth=%d %s\n",len(gsh.iValStack),gsh.iValues)
    }else{
        fmt.Printf("depth=%d\n",depth)
    }
}

// <a name="interpreter">Command Interpreter</a>
func (gshCtx*GshContext)gshellv(argv []string) (fin bool) {
    fin = false

    if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv((%d))\n",len(argv)) }
    if len(argv) <= 0 {
        return false
    }
    xargv := []string{}
    for ai := 0; ai < len(argv); ai++ {
        xargv = append(xargv,strsubst(gshCtx,argv[ai],false))
    }
    argv = xargv
    if false {
        for ai := 0; ai < len(argv); ai++ {
            fmt.Printf("[%d] %s [%d]%T\n",
                ai,argv[ai],len(argv[ai]),argv[ai])
        }
    }
    cmd := argv[0]
    if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv(%d)%v\n",len(argv),argv) }
    switch { // https://tour.golang.org/flowcontrol/11
    case cmd == "":
        gshCtx.xPwd([]string{}); // emtpy command
    case cmd == "-x":
        gshCtx.CmdTrace = ! gshCtx.CmdTrace
    case cmd == "-xt":
        gshCtx.CmdTime = ! gshCtx.CmdTime
    case cmd == "-ot":
        gshCtx.sconnect(true, argv)
    case cmd == "-ou":
        gshCtx.sconnect(false, argv)
    case cmd == "-it":
        gshCtx.saccept(true , argv)
    case cmd == "-iu":
        gshCtx.saccept(false, argv)
    case cmd == "-i" || cmd == "<" || cmd == "-o" || cmd == ">" || cmd == "-a" || cmd == ">>" || cmd == "-s" || cmd == "><":
        gshCtx.redirect(argv)
    case cmd == "|":
        gshCtx.fromPipe(argv)
    case cmd == "args":
        gshCtx.Args(argv)
    case cmd == "bg" || cmd == "-bg":
        rfin := gshCtx.inBackground(argv[1:])
        return rfin
    case cmd == "-bn":
        gshCtx.Basename(argv)
    case cmd == "call":
        _,_ = gshCtx.excommand(false,argv[1:])
    case cmd == "cd" || cmd == "chdir":
        gshCtx.xChdir(argv);
    case cmd == "-cksum":
        gshCtx.xFind(argv)
    case cmd == "-sum":
        gshCtx.xFind(argv)
    case cmd == "-sumtest":
        str := ""
        if 1 < len(argv) { str = argv[1] }
        crc := strCRC32(str,uint64(len(str)))
        fprintf(stderr,"%v %v\n",crc,len(str))
    case cmd == "close":
        gshCtx.xClose(argv)
    case cmd == "gcp":
        gshCtx.FileCopy(argv)
    case cmd == "dec" || cmd == "decode":
        gshCtx.Dec(argv)
    case cmd == "#define":
    case cmd == "dic" || cmd == "d":
        xDic(argv)
    case cmd == "dump":
        gshCtx.Dump(argv)
    case cmd == "echo" || cmd == "e":
        echo(argv,true)
    case cmd == "enc" || cmd == "encode":
        gshCtx.Enc(argv)
    case cmd == "env":
        env(argv)
    case cmd == "eval":
```

```
        xEval(argv[1:],true)
    case cmd == "ev" || cmd == "events":
        dumpEvents(argv)
    case cmd == "exec":
        _,_ = gshCtx.excommand(true,argv[1:])
        // should not return here
    case cmd == "exit" || cmd == "quit":
        // write Result code EXIT to 3>
        return true
    case cmd == "fdls":
        // dump the attributes of fds (of other process)
    case cmd == "-find" || cmd == "fin" || cmd == "ufind" || cmd == "uf":
        gshCtx.xFind(argv[1:])
    case cmd == "fu":
        gshCtx.xFind(argv[1:])
    case cmd == "fork":
        // mainly for a server
    case cmd == "-gen":
        gshCtx.gen(argv)
    case cmd == "-go":
        gshCtx.xGo(argv)
    case cmd == "-grep":
        gshCtx.xFind(argv)
    case cmd == "gdeq":
        gshCtx.Deq(argv)
    case cmd == "genq":
        gshCtx.Enq(argv)
    case cmd == "gpop":
        gshCtx.Pop(argv)
    case cmd == "gpush":
        gshCtx.Push(argv)
    case cmd == "history" || cmd == "hi": // hi should be alias
        gshCtx.xHistory(argv)
    case cmd == "jobs":
        gshCtx.xJobs(argv)
    case cmd == "lnsp" || cmd == "nlsp":
        gshCtx.SplitLine(argv)
    case cmd == "-ls":
        gshCtx.xFind(argv)
    case cmd == "nop":
        // do nothing
    case cmd == "pipe":
        gshCtx.xOpen(argv)
    case cmd == "plug" || cmd == "plugin" || cmd == "pin":
        gshCtx.xPlugin(argv[1:])
    case cmd == "print" || cmd == "-pr":
        // output internal slice // also sprintf should be
        gshCtx.Printv(argv)
    case cmd == "ps":
        gshCtx.xPs(argv)
    case cmd == "pstitle":
        // to be gsh.title
    case cmd == "rexecd" || cmd == "rexd":
        gshCtx.RexecServer(argv)
    case cmd == "rexec" || cmd == "rex":
        gshCtx.RexecClient(argv)
    case cmd == "repeat" || cmd == "rep": // repeat cond command
        gshCtx.repeat(argv)
    case cmd == "replay":
        gshCtx.xReplay(argv)
    case cmd == "scan":
        // scan input (or so in fscanf) to internal slice (like Files or map)
        gshCtx.Scanv(argv)
    case cmd == "set":
        // set name ...
    case cmd == "serv":
        gshCtx.httpServer(argv)
    case cmd == "shift":
        gshCtx.Shiftv(argv)
    case cmd == "sleep":
        gshCtx.sleep(argv)
    case cmd == "-sort":
        gshCtx.Sortv(argv)

    case cmd == "j" || cmd == "join":
        gshCtx.Rjoin(argv)
    case cmd == "a" || cmd == "alpa":
        gshCtx.Rexec(argv)
    case cmd == "jcd" || cmd == "jchdir":
        gshCtx.Rchdir(argv)
    case cmd == "jget":
        gshCtx.Rget(argv)
    case cmd == "jls":
        gshCtx.Rls(argv)
    case cmd == "jput":
        gshCtx.Rput(argv)
    case cmd == "jpwd":
        gshCtx.Rpwd(argv)

    case cmd == "time":
        fin = gshCtx.xTime(argv)
    case cmd == "ungets":
        if 1 < len(argv) {
            ungets(argv[1]+"\n")
        }else{
        }
    case cmd == "pwd":
        gshCtx.xPwd(argv);
    case cmd == "ver" || cmd == "-ver" || cmd == "version":
        gshCtx.showVersion(argv)
    case cmd == "where":
        // data file or so?
    case cmd == "which":
        which("PATH",argv);
    case cmd == "gj" && 1 < len(argv) && argv[1] == "listen":
        go gj_server(argv[1:]);
    case cmd == "gj" && 1 < len(argv) && argv[1] == "serve":
        go gj_server(argv[1:]);
    case cmd == "gj" && 1 < len(argv) && argv[1] == "join":
        go gj_client(argv[1:]);
    case cmd == "gj":
        jsend(argv);
    case cmd == "jsend":
        jsend(argv);
    default:
        if gshCtx.whichPlugin(cmd,[]string{"-s"}) != nil {
            gshCtx.xPlugin(argv)
        }else{
            notfound,_ := gshCtx.excommand(false,argv)
            if notfound {
                fmt.Printf("--E-- command not found (%v)\n",cmd)
            }
        }
    }
```

```
    return fin
}

func (gsh*GshContext)gshelll(gline string) (rfin bool) {
    argv := strings.Split(string(gline)," ")
    fin := gsh.gshellv(argv)
    return fin
}
func (gsh*GshContext)tgshelll(gline string)(xfin bool){
    start := time.Now()
    fin := gsh.gshelll(gline)
    end := time.Now()
    elps := end.Sub(start);
    if gsh.CmdTime {
        fmt.Printf("--T-- " + time.Now().Format(time.Stamp) + "(%d.%09ds)\n",
            elps/1000000000,elps%1000000000)
    }
    return fin
}
func Ttyid() (int) {
    fi, err := os.Stdin.Stat()
    if err != nil {
        return 0;
    }
    //fmt.Printf("Stdin: %v Dev=%d\n",
    //  fi.Mode(),fi.Mode()&os.ModeDevice)
    if (fi.Mode() & os.ModeDevice) != 0 {
        stat := syscall.Stat_t{};
        err := syscall.Fstat(0,&stat)
        if err != nil {
            //fmt.Printf("--I-- Stdin: (%v)\n",err)
        }else{
            //fmt.Printf("--I-- Stdin: rdev=%d %d\n",
            //  stat.Rdev&0xFF,stat.Rdev);
            //fmt.Printf("--I-- Stdin: tty%d\n",stat.Rdev&0xFF);
            return int(stat.Rdev & 0xFF)
        }
    }
    return 0
}
func (gshCtx *GshContext) ttyfile() string {
    //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
    ttyfile := gshCtx.GshHomeDir + "/" + "gsh-tty" +
         fmt.Sprintf("%02d",gshCtx.TerminalId)
         //strconv.Itoa(gshCtx.TerminalId)
    //fmt.Printf("--I-- ttyfile=%s\n",ttyfile)
    return ttyfile
}
func (gshCtx *GshContext) ttyline()(*os.File){
    file, err := os.OpenFile(gshCtx.ttyfile(),os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
    if err != nil {
        fmt.Printf("--F-- cannot open %s (%s)\n",gshCtx.ttyfile(),err)
        return file;
    }
    return file
}
func (gshCtx *GshContext)getline(hix int, skipping bool, prevline string) (string) {
    if( skipping ){
        reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
        line, _, _ := reader.ReadLine()
        return string(line)
    }else
    if true {
        return xgetline(hix,prevline,gshCtx)
    }
    /*
    else
    if( with_exgetline && gshCtx.GetLine != "" ){
        //var xhix int64 = int64(hix); // cast
        newenv := os.Environ()
        newenv = append(newenv, "GSH_LINENO="+strconv.FormatInt(int64(hix),10) )

        tty := gshCtx.ttyline()
        tty.WriteString(prevline)
        Pa := os.ProcAttr {
            "", // start dir
            newenv, //os.Environ(),
            []*os.File{os.Stdin,os.Stdout,os.Stderr,tty},
            nil,
        }
//fmt.Printf("--I-- getline=%s // %s\n",gsh_getlinev[0],gshCtx.GetLine)
proc, err := os.StartProcess(gsh_getlinev[0],[]string{"getline","getline"},&Pa)
        if err != nil {
            fmt.Printf("--F-- getline process error (%v)\n",err)
            // for ; ; { }
            return "exit (getline program failed)"
        }
        //stat, err := proc.Wait()
        proc.Wait()
        buff := make([]byte,LINESIZE)
        count, err := tty.Read(buff)
        //_, err = tty.Read(buff)
        //fmt.Printf("--D-- getline (%d)\n",count)
        if err != nil {
            if ! (count == 0) { // && err.String() == "EOF" ) {
                fmt.Printf("--E-- getline error (%s)\n",err)
            }
        }else{
            //fmt.Printf("--I-- getline OK \"%s\"\n",buff)
        }
        tty.Close()
        gline := string(buff[0:count])
        return gline
    }else
    */
    {
        // if isatty {
            fmt.Printf("!%d",hix)
            fmt.Print(PROMPT)
        // }
        reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
        line, _, _ := reader.ReadLine()
        return string(line)
    }
}

//== begin ================================================== getline
/*
 * getline.c
 * 2020-0819 extracted from dog.c
 * getline.go
 * 2020-0822 ported to Go
 */
/*
```

```
package main // getline main
import (
    "fmt"       // <a href="https://golang.org/pkg/fmt/">fmt</a>
    "strings"   // <a href="https://golang.org/pkg/strings/">strings</a>
    "os"        // <a href="https://golang.org/pkg/os/">os</a>
    "syscall"   // <a href="https://golang.org/pkg/syscall/">syscall</a>
    //"bytes"      // <a href="https://golang.org/pkg/os/">os</a>
    //"os/exec" // <a href="https://golang.org/pkg/os/">os</a>
)
*/

// C language compatibility functions
var errno = 0
var stdin  *os.File = os.Stdin
var stdout *os.File = os.Stdout
var stderr *os.File = os.Stderr
var EOF = -1
var NULL = 0
type FILE os.File
type StrBuff []byte
var NULL_FP *os.File = nil
var NULLSP = 0
//var LINESIZE = 1024

func system(cmdstr string)(int){
    PA := syscall.ProcAttr {
        "", // the starting directory
        os.Environ(),
        []uintptr{os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd()},
        nil,
    }
    argv := strings.Split(cmdstr," ")
    pid,err := syscall.ForkExec(argv[0],argv,&PA)
    if( err != nil ){
        fmt.Printf("--E-- syscall(%v) err(%v)\n",cmdstr,err)
    }
    syscall.Wait4(pid,nil,0,nil)

    /*
    argv := strings.Split(cmdstr," ")
    fmt.Fprintf(os.Stderr,"--I-- system(%v)\n",argv)
    //cmd := exec.Command(argv[0:]...)
    cmd := exec.Command(argv[0],argv[1],argv[2])
    cmd.Stdin = strings.NewReader("output of system")
    var out bytes.Buffer
    cmd.Stdout = &out
    var serr bytes.Buffer
    cmd.Stderr = &serr
    err := cmd.Run()
    if err != nil {
        fmt.Fprintf(os.Stderr,"--E-- system(%v)err(%v)\n",argv,err)
        fmt.Printf("ERR:%s\n",serr.String())
    }else{
        fmt.Printf("%s",out.String())
    }
    */
    return 0
}
func atoi(str string)(ret int){
    ret,err := fmt.Sscanf(str,"%d",ret)
    if err == nil {
        return ret
    }else{
        // should set errno
        return 0
    }
}
func getenv(name string)(string){
    val,got := os.LookupEnv(name)
    if got {
        return val
    }else{
        return "?"
    }
}
func strcpy(dst StrBuff, src string){
    var i int
    srcb := []byte(src)
    for i = 0; i < len(src) && srcb[i] != 0; i++ {
        dst[i] = srcb[i]
    }
    dst[i] = 0
}
func xstrcpy(dst StrBuff, src StrBuff){
    dst = src
}
func strcat(dst StrBuff, src StrBuff){
    dst = append(dst,src...)
}
func strdup(str StrBuff)(string){
    return string(str[0:strlen(str)])
}
func sstrlen(str string)(int){
    return len(str)
}
func strlen(str StrBuff)(int){
    var i int
    for i = 0; i < len(str) && str[i] != 0; i++ {
    }
    return i
}
func sizeof(data StrBuff)(int){
    return len(data)
}
func isatty(fd int)(ret int){
    return 1
}

func fopen(file string,mode string)(fp*os.File){
    if mode == "r" {
        fp,err := os.Open(file)
        if( err != nil ){
            fmt.Printf("--E-- fopen(%s,%s)=(%v)\n",file,mode,err)
            return NULL_FP;
        }
        return fp;
    }else{
        fp,err := os.OpenFile(file,os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
        if( err != nil ){
            return NULL_FP;
        }
        return fp;
    }
}
```

```
func fclose(fp*os.File){
    fp.Close()
}
func fflush(fp *os.File)(int){
    return 0
}
func fgetc(fp*os.File)(int){
    var buf [1]byte
    _,err := fp.Read(buf[0:1])
    if( err != nil ){
        return EOF;
    }else{
        return int(buf[0])
    }
}
func sfgets(str*string, size int, fp*os.File)(int){
    buf := make(StrBuff,size)
    var ch int
    var i int
    for i = 0; i < len(buf)-1; i++ {
        ch = fgetc(fp)
        //fprintf(stderr,"--fgets %d/%d %X\n",i,len(buf),ch)
        if( ch == EOF ){
            break;
        }
        buf[i] = byte(ch);
        if( ch == '\n' ){
            break;
        }
    }
    buf[i] = 0
    //fprintf(stderr,"--fgets %d/%d (%s)\n",i,len(buf),buf[0:i])
    return i
}
func fgets(buf StrBuff, size int, fp*os.File)(int){
    var ch int
    var i int
    for i = 0; i < len(buf)-1; i++ {
        ch = fgetc(fp)
        //fprintf(stderr,"--fgets %d/%d %X\n",i,len(buf),ch)
        if( ch == EOF ){
            break;
        }
        buf[i] = byte(ch);
        if( ch == '\n' ){
            break;
        }
    }
    buf[i] = 0
    //fprintf(stderr,"--fgets %d/%d (%s)\n",i,len(buf),buf[0:i])
    return i
}
func fputc(ch int , fp*os.File)(int){
    var buf [1]byte
    buf[0] = byte(ch)
    fp.Write(buf[0:1])
    return 0
}
func fputs(buf StrBuff, fp*os.File)(int){
    fp.Write(buf)
    return 0
}
func xfputss(str string, fp*os.File)(int){
    return fputs([]byte(str),fp)
}
func sscanf(str StrBuff,fmts string, params ...interface{})(int){
    fmt.Sscanf(string(str[0:strlen(str)]),fmts,params...)
    return 0
}
func fprintf(fp*os.File,fmts string, params ...interface{})(int){
    fmt.Fprintf(fp,fmts,params...)
    return 0
}

// <a name="IME">Command Line IME</a>
//---------------------------------------------------------------------------- MyIME
var MyIMEVER = "MyIME/0.0.2";
type RomKana struct {
    dic string  // dictionaly ID
    pat string  // input pattern
    out string  // output pattern
    hit int64   // count of hit and used
}
var dicents = 0
var romkana [1024]RomKana
var Romkan []RomKana

func isinDic(str string)(int){
    for i,v := range Romkan {
        if v.pat == str {
            return i
        }
    }
    return -1
}
const (
    DIC_COM_LOAD = "im"
    DIC_COM_DUMP = "s"
    DIC_COM_LIST = "ls"
    DIC_COM_ENA  = "en"
    DIC_COM_DIS  = "di"
)
func helpDic(argv []string){
    out := stderr
    cmd := ""
    if 0 < len(argv) { cmd = argv[0] }
    fprintf(out,"--- %v Usage\n",cmd)
    fprintf(out,"... Commands\n")
    fprintf(out,"...   %v %-3v [dicName] [dicURL ] -- Import dictionary\n",cmd,DIC_COM_LOAD)
    fprintf(out,"...   %v %-3v [pattern] -- Search in dictionary\n",cmd,DIC_COM_DUMP)
    fprintf(out,"...   %v %-3v [dicName] -- List dictionaries\n",cmd,DIC_COM_LIST)
    fprintf(out,"...   %v %-3v [dicName] -- Disable dictionaries\n",cmd,DIC_COM_DIS)
    fprintf(out,"...   %v %-3v [dicName] -- Enable dictionaries\n",cmd,DIC_COM_ENA)
    fprintf(out,"... Keys ... %v\n","ESC can be used for '\\'")
    fprintf(out,"...   \\c -- Reverse the case of the last character\n",)
    fprintf(out,"...   \\i -- Replace input with translated text\n",)
    fprintf(out,"...   \\j -- On/Off translation mode\n",)
    fprintf(out,"...   \\l -- Force Lower Case\n",)
    fprintf(out,"...   \\u -- Force Upper Case (software CapsLock)\n",)
    fprintf(out,"...   \\v -- Show translation actions\n",)
    fprintf(out,"...   \\x -- Replace the last input character with it Hexa-Decimal\n",)
}
func xDic(argv[]string){
    if len(argv) <= 1 {
```

```
        helpDic(argv)
        return
    }
    argv = argv[1:]
    var debug = false
    var info = false
    var silent = false
    var dump = false
    var builtin = false
    cmd := argv[0]
    argv = argv[1:]
    opt := ""
    arg := ""

    if 0 < len(argv) {
        arg1 := argv[0]
        if arg1[0] == '-' {
            switch arg1 {
                default: fmt.Printf("--Ed-- Unknown option(%v)\n",arg1)
                    return
                case "-b": builtin = true
                case "-d": debug = true
                case "-s": silent = true
                case "-v": info = true
            }
            opt = arg1
            argv = argv[1:]
        }
    }

    dicName := ""
    dicURL := ""
    if 0 < len(argv) {
        arg = argv[0]
        dicName = arg
        argv = argv[1:]
    }
    if 0 < len(argv) {
        dicURL = argv[0]
        argv = argv[1:]
    }
    if false {
        fprintf(stderr,"--Dd-- com(%v) opt(%v) arg(%v)\n",cmd,opt,arg)
    }
    if cmd == DIC_COM_LOAD {
        //dicType := ""
        dicBody := ""
        if !builtin && dicName != "" && dicURL == "" {
            f,err := os.Open(dicName)
            if err == nil {
                dicURL = dicName
            }else{
                f,err = os.Open(dicName+".html")
                if err == nil {
                    dicURL = dicName+".html"
                }else{
                    f,err = os.Open("gshdic-"+dicName+".html")
                    if err == nil {
                        dicURL = "gshdic-"+dicName+".html"
                    }
                }
            }
            if err == nil {
                var buf = make([]byte,128*1024)
                count,err := f.Read(buf)
                f.Close()
                if info {
                    fprintf(stderr,"--Id-- ReadDic(%v,%v)\n",count,err)
                }
                dicBody = string(buf[0:count])
            }
        }
        if dicBody == "" {
            switch arg {
                default:
                    dicName = "WorldDic"
                    dicURL = WorldDic
                    if info {
                    fprintf(stderr,"--Id-- default dictionary \"%v\"\n",
                        dicName);
                    }
                case "wnn":
                    dicName = "WnnDic"
                    dicURL = WnnDic
                case "sumomo":
                    dicName = "SumomoDic"
                    dicURL = SumomoDic
                case "sijimi":
                    dicName = "SijimiDic"
                    dicURL = SijimiDic
                case "jkl":
                    dicName = "JKLJaDic"
                    dicURL = JA_JKLDic
            }
            if debug {
                fprintf(stderr,"--Id-- %v URL=%v\n\n",dicName,dicURL);
            }
            dicv := strings.Split(dicURL,",")
            if debug {
                fprintf(stderr,"--Id-- %v encoded data...\n",dicName)
                fprintf(stderr,"Type: %v\n",dicv[0])
                fprintf(stderr,"Body: %v\n",dicv[1])
                fprintf(stderr,"\n")
            }
            body,_ := base64.StdEncoding.DecodeString(dicv[1])
            dicBody = string(body)
        }
        if info {
            fmt.Printf("--Id-- %v %v\n",dicName,dicURL)
            fmt.Printf("%s\n",dicBody)
        }
        if debug {
            fprintf(stderr,"--Id-- dicName %v text...\n",dicName)
            fprintf(stderr,"%v\n",string(dicBody))
        }
        entv := strings.Split(dicBody,"\n");
        if info {
            fprintf(stderr,"--Id-- %v scan...\n",dicName);
        }
        var added int = 0
        var dup int = 0
        for i,v := range entv {
            var pat string
            var out string
```

```
            fmt.Sscanf(v,"%s %s",&pat,&out)
            if len(pat) <= 0 {
            }else{
                if 0 <= isinDic(pat) {
                    dup += 1
                    continue
                }
                romkana[dicents] = RomKana{dicName,pat,out,0}
                dicents += 1
                added += 1
                Romkan = append(Romkan,RomKana{dicName,pat,out,0})
                if debug {
                    fmt.Printf("[%3v]:[%2v]%-8v [%2v]%v\n",
                        i,len(pat),pat,len(out),out)
                }
            }
        }
        if !silent {
            url := dicURL
            if strBegins(url,"data:") {
                url = "builtin"
            }
            fprintf(stderr,"--Id-- %v scan... %v added, %v dup. / %v total (%v)\n",
                dicName,added,dup,len(Romkan),url);
        }
        // should sort by pattern length for conclete match, for performance
        if debug {
            arg = "" // search pattern
            dump = true
        }
    }
    if cmd == DIC_COM_DUMP || dump {
        fprintf(stderr,"--Id-- %v dump... %v entries:\n",dicName,len(Romkan));
        var match = 0
        for i := 0; i < len(Romkan); i++ {
            dic := Romkan[i].dic
            pat := Romkan[i].pat
            out := Romkan[i].out
            if arg == "" || 0 <= strings.Index(pat,arg)||0 <= strings.Index(out,arg) {
                fmt.Printf("\\\\%v\t%v [%2v]%-8v [%2v]%v\n",
                    i,dic,len(pat),pat,len(out),out)
                match += 1
            }
        }
        fprintf(stderr,"--Id-- %v matched %v / %v entries:\n",arg,match,len(Romkan));
    }
}
func loadDefaultDic(dic int){
    if( 0 < len(Romkan) ){
        return
    }
    //fprintf(stderr,"\r\n")
    xDic([]string{"dic",DIC_COM_LOAD});

    var info = false
    if info {
        fprintf(stderr,"--Id-- Conguraturations!! WorldDic is now activated.\r\n")
        fprintf(stderr,"--Id-- enter \"dic\" command for help.\r\n")
    }
}
func readDic()(int){
    /*
    var rk *os.File;
    var dic = "MyIME-dic.txt";
    //rk = fopen("romkana.txt","r");
    //rk = fopen("JK-JA-morse-dic.txt","r");
    rk = fopen(dic,"r");
    if( rk == NULL_FP ){
        if( true ){
            fprintf(stderr,"--%s-- Could not load %s\n",MyIMEVER,dic);
        }
        return -1;
    }
    if( true ){
        var di int;
        var line = make(StrBuff,1024);
        var pat string
        var out string
        for di = 0; di < 1024; di++ {
            if( fgets(line,sizeof(line),rk) == NULLSP ){
                break;
            }
            fmt.Sscanf(string(line[0:strlen(line)]),"%s %s",&pat,&out);
            //sscanf(line,"%s %[^\r\n]",&pat,&out);
            romkana[di].pat = pat;
            romkana[di].out = out;
            //fprintf(stderr,"--Dd- %-10s %s\n",pat,out)
        }
        dicents += di
        if( false ){
            fprintf(stderr,"--%s-- loaded romkana.txt [%d]\n",MyIMEVER,di);
            for di = 0; di < dicents; di++ {
                fprintf(stderr,
                    "%s %s\n",romkana[di].pat,romkana[di].out);
            }
        }
    }
    fclose(rk);

    //romkana[dicents].pat = "//ddump"
    //romkana[dicents].pat = "//ddump" // dump the dic. and clean the command input
    */
    return 0;
}
func matchlen(stri string, pati string)(int){
    if strBegins(stri,pati) {
        return len(pati)
    }else{
        return 0
    }
}
func convs(src string)(string){
    var si int;
    var sx = len(src);
    var di int;
    var mi int;
    var dstb []byte

    for si = 0; si < sx; { // search max. match from the position
        if strBegins(src[si:],"%x/") {
            // %x/integer/ // s/a/b/
            ix := strings.Index(src[si+3:],"/")
            if 0 < ix {
                var iv int = 0
```

```
                //fmt.Sscanf(src[si+3:si+3+ix],"%d",&iv)
                fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
                sval := fmt.Sprintf("%x",iv)
                bval := []byte(sval)
                dstb = append(dstb,bval...)
                si = si+3+ix+1
                continue
            }
        }
        if strBegins(src[si:],"%d/") {
            // %d/integer/ // s/a/b/
            ix := strings.Index(src[si+3:],"/")
            if 0 < ix {
                var iv int = 0
                fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
                sval := fmt.Sprintf("%d",iv)
                bval := []byte(sval)
                dstb = append(dstb,bval...)
                si = si+3+ix+1
                continue
            }
        }
        if strBegins(src[si:],"%t") {
            now := time.Now()
            if true {
                date := now.Format(time.Stamp)
                dstb = append(dstb,[]byte(date)...)
                si = si+3
            }
            continue
        }
        var maxlen int = 0;
        var len int;
        mi = -1;
        for di = 0; di < dicents; di++ {
            len = matchlen(src[si:],romkana[di].pat);
            if( maxlen < len ){
                maxlen = len;
                mi = di;
            }
        }
        if( 0 < maxlen ){
            out := romkana[mi].out;
            dstb = append(dstb,[]byte(out)...);
            si += maxlen;
        }else{
            dstb = append(dstb,src[si])
            si += 1;
        }
    }
    return string(dstb)
}
func trans(src string)(int){
    dst := convs(src);
    xfputss(dst,stderr);
    return 0;
}

//------------------------------------------------------------- LINEEDIT
// "?" at the top of the line means searching history

// should be compatilbe with Telnet
const (
    EV_MODE     = 255
    EV_IDLE     = 254
    EV_TIMEOUT  = 253

    GO_UP       = 252   // k
    GO_DOWN     = 251   // j
    GO_RIGHT    = 250   // l
    GO_LEFT     = 249   // h
    DEL_RIGHT   = 248   // x
    GO_TOPL     = 'A'-0x40  // 0
    GO_ENDL     = 'E'-0x40  // $

    GO_TOPW     = 239   // b
    GO_ENDW     = 238   // e
    GO_NEXTW    = 237   // w

    GO_FORWCH   = 229   // f
    GO_PAIRCH   = 228   // %

    GO_DEL      = 219   // d

    HI_SRCH_FW  = 209   // /
    HI_SRCH_BK  = 208   // ?
    HI_SRCH_RFW = 207   // n
    HI_SRCH_RBK = 206   // N
)

// should return number of octets ready to be read immediately
//fprintf(stderr,"\n--Select(%v %v)\n",err,r.Bits[0])


var EventRecvFd = -1 // file descriptor
var EventSendFd = -1
const EventFdOffset = 1000000
const NormalFdOffset = 100

func putEvent(event int, evarg int){
    if true {
        if EventRecvFd < 0 {
            var pv = []int{-1,-1}
            syscall.Pipe(pv)
            EventRecvFd = pv[0]
            EventSendFd = pv[1]
            //fmt.Printf("--De-- EventPipe created[%v,%v]\n",EventRecvFd,EventSendFd)
        }
    }else{
        if EventRecvFd < 0 {
            // the document differs from this spec
            // https://golang.org/src/syscall/syscall_unix.go?s=8096:8158#L340
            sv,err := syscall.Socketpair(syscall.AF_UNIX,syscall.SOCK_STREAM,0)
            EventRecvFd = sv[0]
            EventSendFd = sv[1]
            if err != nil {
                fmt.Printf("--De-- EventSock created[%v,%v](%v)\n",
                    EventRecvFd,EventSendFd,err)
            }
        }
    }
    var buf = []byte{ byte(event)}
    n,err := syscall.Write(EventSendFd,buf)
    if err != nil {
```

```
        fmt.Printf("--De-- putEvent[%v](%3v)(%v %v)\n",EventSendFd,event,n,err)
    }
}
func ungets(str string){
    for _,ch := range str {
        putEvent(int(ch),0)
    }
}
func (gsh*GshContext)xReplay(argv[]string){
    hix := 0
    tempo := 1.0
    xtempo := 1.0
    repeat := 1

    for _,a := range argv { // tempo
        if strBegins(a,"x") {
            fmt.Sscanf(a[1:],"%f",&xtempo)
            tempo = 1 / xtempo
            //fprintf(stderr,"--Dr-- tempo=[%v]%v\n",a[2:],tempo);
        }else
        if strBegins(a,"r") { // repeat
            fmt.Sscanf(a[1:],"%v",&repeat)
        }else
        if strBegins(a,"!") {
            fmt.Sscanf(a[1:],"%d",&hix)
        }else{
            fmt.Sscanf(a,"%d",&hix)
        }
    }
    if hix == 0 || len(argv) <= 1 {
        hix = len(gsh.CommandHistory)-1
    }
    fmt.Printf("--Ir-- Replay(!%v x%v r%v)\n",hix,xtempo,repeat)
        //dumpEvents(hix)
    //gsh.xScanReplay(hix,false,repeat,tempo,argv)
    go gsh.xScanReplay(hix,true,repeat,tempo,argv)
}

// <a href="https://golang.org/pkg/syscall/#FdSet">syscall.Select</a>
// 2020-0827 GShell-0.2.3
/*
func FpollIn1(fp *os.File,usec int)(uintptr){
    nfd := 1

    rdv := syscall.FdSet {}
    fd1 := fp.Fd()
    bank1 := fd1/32
    mask1 := int32(1 << fd1)
    rdv.Bits[bank1] = mask1

    fd2 := -1
    bank2 := -1
    var mask2 int32 = 0

    if 0 <= EventRecvFd {
        fd2 = EventRecvFd
        nfd = fd2 + 1
        bank2 = fd2/32
        mask2 = int32(1 << fd2)
        rdv.Bits[bank2] |= mask2
        //fmt.Printf("--De-- EventPoll mask added [%d][%v][%v]\n",fd2,bank2,mask2)
    }

    tout := syscall.NsecToTimeval(int64(usec*1000))
    //n,err := syscall.Select(nfd,&rdv,nil,nil,&tout) // spec. mismatch
    err := syscall.Select(nfd,&rdv,nil,nil,&tout)
    if err != nil {
        //fmt.Printf("--De-- select() err(%v)\n",err)
    }
    if err == nil {
        if 0 <= fd2 && (rdv.Bits[bank2] & mask2) != 0 {
            if false {
                fmt.Printf("--De-- got Event\n")
            }
            return uintptr(EventFdOffset + fd2)
        }else
        if (rdv.Bits[bank1] & mask1) != 0 {
            return uintptr(NormalFdOffset + fd1)
        }else{
            return 1
        }
    }else{
        return 0
    }
}
*/
func fgetcTimeout1(fp *os.File,usec int)(int){
  READ1:
    //readyFd := FpollIn1(fp,usec)
    readyFd := CFpollIn1(fp,usec)
    if readyFd < 100 {
        return EV_TIMEOUT
    }

    var buf [1]byte

    if EventFdOffset <= readyFd {
        fd := int(readyFd-EventFdOffset)
        _,err := syscall.Read(fd,buf[0:1])
        if( err != nil ){
            return EOF;
        }else{
            if buf[0] == EV_MODE {
                recvEvent(fd)
                goto READ1
            }
            return int(buf[0])
        }
    }

    _,err := fp.Read(buf[0:1])
    if( err != nil ){
        return EOF;
    }else{
        return int(buf[0])
    }
}

func visibleChar(ch int)(string){
    switch {
        case '!' <= ch && ch <= '~':
            return string(ch)
    }
    switch ch {
```

```
        case ' ': return "\\s"
        case '\n': return "\\n"
        case '\r': return "\\r"
        case '\t': return "\\t"
    }
    switch ch {
        case 0x00: return "NUL"
        case 0x07: return "BEL"
        case 0x08: return "BS"
        case 0x0E: return "SO"
        case 0x0F: return "SI"
        case 0x1B: return "ESC"
        case 0x7F: return "DEL"
    }
    switch ch {
        case EV_IDLE: return fmt.Sprintf("IDLE")
        case EV_MODE: return fmt.Sprintf("MODE")
    }
    return fmt.Sprintf("%X",ch)
}
func recvEvent(fd int){
    var buf = make([]byte,1)
    _,_ = syscall.Read(fd,buf[0:1])
    if( buf[0] != 0 ){
        romkanmode = true
    }else{
        romkanmode = false
    }
}
func (gsh*GshContext)xScanReplay(hix int,replay bool,repeat int,tempo float64,argv[]string){
    var Start time.Time
    var events = []Event{}
    for _,e := range Events {
        if hix == 0 || e.CmdIndex == hix {
            events = append(events,e)
        }
    }
    elen := len(events)
    if 0 < elen {
        if events[elen-1].event == EV_IDLE {
            events = events[0:elen-1]
        }
    }
    for r := 0; r < repeat; r++ {
        for i,e := range events {
            nano := e.when.Nanosecond()
            micro := nano / 1000
            if Start.Second() == 0 {
                Start = time.Now()
            }
            diff := time.Now().Sub(Start)
            if replay {
                if e.event != EV_IDLE {
                    putEvent(e.event,0)
                    if e.event == EV_MODE { // event with arg
                        putEvent(int(e.evarg),0)
                    }
                }
            }else{
            fmt.Printf("%7.3fms #%-3v !%-3v [%v.%06d] %3v %02X %-4v %10.3fms\n",
                    float64(diff)/1000000.0,
                    i,
                    e.CmdIndex,
                    e.when.Format(time.Stamp),micro,
                    e.event,e.event,visibleChar(e.event),
                    float64(e.evarg)/1000000.0)
            }
            if e.event == EV_IDLE {
                d := time.Duration(float64(time.Duration(e.evarg)) * tempo)
                //nsleep(time.Duration(e.evarg))
                nsleep(d)
            }
        }
    }
}
func dumpEvents(arg[]string){
    hix := 0
    if 1 < len(arg) {
        fmt.Sscanf(arg[1],"%d",&hix)
    }
    for i,e := range Events {
        nano := e.when.Nanosecond()
        micro := nano / 1000
        //if e.event != EV_TIMEOUT {
        if hix == 0 || e.CmdIndex == hix {
            fmt.Printf("#%-3v !%-3v [%v.%06d] %3v %02X %-4v %10.3fms\n",i,
                e.CmdIndex,
                e.when.Format(time.Stamp),micro,
                e.event,e.event,visibleChar(e.event),float64(e.evarg)/1000000.0)
        }
        //}
    }
}
func fgetcTimeout(fp *os.File,usec int)(int){
    ch := fgetcTimeout1(fp,usec)
    if ch != EV_TIMEOUT {
        now := time.Now()
        if 0 < len(Events) {
            last := Events[len(Events)-1]
            dura := int64(now.Sub(last.when))
            Events = append(Events,Event{last.when,EV_IDLE,dura,last.CmdIndex})
        }
        Events = append(Events,Event{time.Now(),ch,0,CmdIndex})
    }
    return ch
}

var AtConsoleLineTop = true
var TtyMaxCol = 72 // to be obtained by ioctl?
var EscTimeout = (100*1000)
var (
    MODE_VicMode    bool    // vi compatible command mode
    MODE_ShowMode   bool
    romkanmode  bool    // shown translation mode, the mode to be retained
    MODE_Recursive  bool    // recursive translation
    MODE_CapsLock   bool    // software CapsLock
    MODE_LowerLock  bool    // force lower-case character lock
    MODE_ViInsert   int // visible insert mode, should be like "I" icon in X Window
    MODE_ViTrace    bool    // output newline before translation
)
type IInput struct {
    lno     int
    lastlno     int
    pch     []int   // input queue
```

```
    prompt      string
    line        string
    right       string
    inJmode     bool
    pinJmode    bool
    waitingMeta string  // waiting meta character
    LastCmd     string
}
func (iin*IInput)Getc(timeoutUs int)(int){
    ch1 := EOF
    ch2 := EOF
    ch3 := EOF
    if( 0 < len(iin.pch) ){ // deQ
        ch1 = iin.pch[0]
        iin.pch = iin.pch[1:]
    }else{
        ch1 = fgetcTimeout(stdin,timeoutUs);
    }
    if( ch1 == 033 ){ /// escape sequence
        ch2 = fgetcTimeout(stdin,EscTimeout);
        if( ch2 == EV_TIMEOUT ){
        }else{
            ch3 = fgetcTimeout(stdin,EscTimeout);
            if( ch3 == EV_TIMEOUT ){
                iin.pch = append(iin.pch,ch2) // enQ
            }else{
                switch( ch2 ){
                    default:
                        iin.pch = append(iin.pch,ch2) // enQ
                        iin.pch = append(iin.pch,ch3) // enQ
                    case '[':
                        switch( ch3 ){
                            case 'A': ch1 = GO_UP; // ^
                            case 'B': ch1 = GO_DOWN; // v
                            case 'C': ch1 = GO_RIGHT; // >
                            case 'D': ch1 = GO_LEFT; // <
                            case '3':
                ch4 := fgetcTimeout(stdin,EscTimeout);
                                if( ch4 == '~' ){
                //fprintf(stderr,"x[%02X %02X %02X %02X]\n",ch1,ch2,ch3,ch4);
                                    ch1 = DEL_RIGHT
                                }
                        }
                    case '\\':
                //ch4 := fgetcTimeout(stdin,EscTimeout);
                //fprintf(stderr,"y[%02X %02X %02X %02X]\n",ch1,ch2,ch3,ch4);
                        switch( ch3 ){
                            case '~': ch1 = DEL_RIGHT
                        }
                }
            }
        }
    }
    return ch1
}
func (inn*IInput)clearline(){
    var i int
    fprintf(stderr,"\r");
    // should be ANSI ESC sequence
    for i = 0; i < TtyMaxCol; i++ { // to the max. position in this input action
        fputc(' ',os.Stderr);
    }
    fprintf(stderr,"\r");
}
func (iin*IInput)Redraw(){
    redraw(iin,iin.lno,iin.line,iin.right)
}
func redraw(iin *IInput,lno int,line string,right string){
    inMeta := false
    showMode := ""
    showMeta := "" // visible Meta mode on the cursor position
    showLino := fmt.Sprintf("!%d! ",lno)
    InsertMark := "" // in visible insert mode

    if MODE_VicMode {
    }else
    if 0 < len(iin.right) {
        InsertMark = " "
    }

    if( 0 < len(iin.waitingMeta) ){
        inMeta = true
        if iin.waitingMeta[0] != 033 {
            showMeta = iin.waitingMeta
        }
    }
    if( romkanmode ){
        //romkanmark = " *";
    }else{
        //romkanmark = "";
    }
    if MODE_ShowMode {
        romkan := "--"
        inmeta := "-"
        inveri := ""
        if MODE_CapsLock {
            inmeta = "A"
        }
        if MODE_LowerLock {
            inmeta = "a"
        }
        if MODE_ViTrace {
            inveri = "v"
        }
        if MODE_VicMode {
            inveri = ":"
        }
        if romkanmode {
            romkan = "\343\201\202"
            if MODE_CapsLock {
                inmeta = "R"
            }else{
                inmeta = "r"
            }
        }
        if inMeta {
            inmeta = "\\"
        }
        showMode = "["+romkan+inmeta+inveri+"]";
    }
    Pre := "\r" + showMode + showLino
    Output := ""
    Left := ""
    Right := ""
```

```
    if romkanmode {
        Left = convs(line)
        Right = InsertMark+convs(right)
    }else{
        Left = line
        Right = InsertMark+right
    }
    Output = Pre+Left
    if MODE_ViTrace {
        Output += iin.LastCmd
    }
    Output += showMeta+Right
    for len(Output) < TtyMaxCol { // to the max. position that may be dirty
        Output += " "
        // should be ANSI ESC sequence
        // not necessary just after newline
    }
    Output += Pre+Left+showMeta // to set the cursor to the current input position
    fprintf(stderr,"%s",Output)

    if MODE_ViTrace {
        if 0 < len(iin.LastCmd) {
            iin.LastCmd = ""
            fprintf(stderr,"\r\n")
        }
    }
    AtConsoleLineTop  = false
}
// <a href="https://golang.org/pkg/unicode/utf8/">utf8</a>
func delHeadChar(str string)(rline string,head string){
    _,clen := utf8.DecodeRune([]byte(str))
    head = string(str[0:clen])
    return str[clen:],head
}
func delTailChar(str string)(rline string, last string){
    var i = 0
    var clen = 0
    for {
        _,siz := utf8.DecodeRune([]byte(str)[i:])
        if siz <= 0 { break }
        clen = siz
        i += siz
    }
    last = str[len(str)-clen:]
    return str[0:len(str)-clen],last
}

// 3> for output and history
// 4> for keylog?
// <a name="getline">Command Line Editor</a>
func xgetline(lno int, prevline string, gsh*GshContext)(string){
    var iin IInput
    iin.lastlno = lno
    iin.lno = lno

    CmdIndex = len(gsh.CommandHistory)
    if( isatty(0) == 0 ){
        if( sfgets(&iin.line,LINESIZE,stdin) == NULL ){
            iin.line = "exit\n";
        }else{
        }
        return iin.line
    }
    if( true ){
        //var pts string;
        //pts = ptsname(0);
        //pts = ttyname(0);
        //fprintf(stderr,"--pts[0] = %s\n",pts?pts:"?");
    }
    if( false ){
        fprintf(stderr,"! ");
        fflush(stderr);
        sfgets(&iin.line,LINESIZE,stdin);
        return iin.line
    }
    system("/bin/stty -echo -icanon");
    xline := iin.xgetlinel(prevline,gsh)
    system("/bin/stty echo sane");
    return xline
}
func (iin*IInput)Translate(cmdch int){
    romkanmode = !romkanmode;
    if MODE_ViTrace {
        fprintf(stderr,"%v\r\n",string(cmdch));
    }else
    if( cmdch == 'J' ){
        fprintf(stderr,"J\r\n");
        iin.inJmode = true
    }
    iin.Redraw();
    loadDefaultDic(cmdch);
    iin.Redraw();
}
func (iin*IInput)Replace(cmdch int){
    iin.LastCmd = fmt.Sprintf("\\%v",string(cmdch))
    iin.Redraw();
    loadDefaultDic(cmdch);
    dst := convs(iin.line+iin.right);
    iin.line = dst
    iin.right = ""
    if( cmdch == 'I' ){
        fprintf(stderr,"I\r\n");
        iin.inJmode = true
    }
    iin.Redraw();
}
// aa 12 a1a1
func isAlpha(ch rune)(bool){
    if 'a' <= ch && ch <= 'z' || 'A' <= ch && ch <= 'Z' {
        return true
    }
    return false
}
func isAlnum(ch rune)(bool){
    if 'a' <= ch && ch <= 'z' || 'A' <= ch && ch <= 'Z' {
        return true
    }
    if '0' <= ch && ch <= '9' {
        return true
    }
    return false
}

// 0.2.8 2020-0901 created
```

```
// <a href="https://golang.org/pkg/unicode/utf8/#DecodeRuneInString">DecodeRuneInString</a>
func (iin*IInput)GotoTOPW(){
    str := iin.line
    i := len(str)
    if i <= 0 {
        return
    }
    //i0 := i
    i -= 1
    lastSize := 0
    var lastRune rune
    var found = -1
    for 0 < i { // skip preamble spaces
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if !isAlnum(lastRune) { // character, type, or string to be searched
            i -= lastSize
            continue
        }
        break
    }
    for 0 < i {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { continue } // not the character top
        if !isAlnum(lastRune) { // character, type, or string to be searched
            found = i
            break
        }
        i -= lastSize
    }
    if found < 0 && i == 0 {
        found = 0
    }
    if 0 <= found {
        if isAlnum(lastRune) { // or non-kana character
        }else{ // when positioning to the top o the word
            i += lastSize
        }
        iin.right = str[i:] + iin.right
        if 0 < i {
            iin.line = str[0:i]
        }else{
            iin.line = ""
        }
    }
    //fmt.Printf("\n(%d,%d,%d)[%s][%s]\n",i0,i,found,iin.line,iin.right)
    //fmt.Printf("") // set debug messae at the end of line
}
// 0.2.8 2020-0901 created
func (iin*IInput)GotoENDW(){
    str := iin.right
    if len(str) <= 0 {
        return
    }
    lastSize := 0
    var lastRune rune
    var lastW = 0
    i := 0
    inWord := false

    lastRune,lastSize = utf8.DecodeRuneInString(str[0:])
    if isAlnum(lastRune) {
        r,z := utf8.DecodeRuneInString(str[lastSize:])
        if 0 < z && isAlnum(r) {
            inWord = true
        }
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        lastW = i // the last alnum if in alnum word
        i += lastSize
    }
    if inWord {
        goto DISP
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        i += lastSize
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        lastW = i
        i += lastSize
    }
DISP:
    if 0 < lastW {
        iin.line = iin.line + str[0:lastW]
        iin.right = str[lastW:]
    }
    //fmt.Printf("\n(%d)[%s][%s]\n",i,iin.line,iin.right)
    //fmt.Printf("") // set debug messae at the end of line
}
// 0.2.8 2020-0901 created
func (iin*IInput)GotoNEXTW(){
    str := iin.right
    if len(str) <= 0 {
        return
    }
    lastSize := 0
    var lastRune rune
    var found = -1
    i := 1
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            found = i
            break
        }
        i += lastSize
    }
    if 0 < found {
        if isAlnum(lastRune) { // or non-kana character
```

```
        }else{ // when positioning to the top o the word
            found += lastSize
        }
        iin.line = iin.line + str[0:found]
        if 0 < found {
            iin.right = str[found:]
        }else{
            iin.right = ""
        }
    }
    //fmt.Printf("\n(%d)[%s][%s]\n",i,iin.line,iin.right)
    //fmt.Printf("") // set debug messae at the end of line
}
// 0.2.8 2020-0902 created
func (iin*IInput)GotoPAIRCH(){
    str := iin.right
    if len(str) <= 0 {
        return
    }
    lastRune,lastSize := utf8.DecodeRuneInString(str[0:])
    if lastSize <= 0 {
        return
    }
    forw := false
    back := false
    pair := ""
    switch string(lastRune){
        case "{": pair = "}"; forw = true
        case "}": pair = "{"; back = true
        case "(": pair = ")"; forw = true
        case ")": pair = "("; back = true
        case "[": pair = "]"; forw = true
        case "]": pair = "["; back = true
        case "<": pair = ">"; forw = true
        case ">": pair = "<"; back = true
        case "\"": pair = "\""; // context depednet, can be f" or back-double quote
        case "'": pair = "'"; // context depednet, can be f' or back-quote
        // case Japanese Kakkos
    }
    if forw {
        iin.SearchForward(pair)
    }
    if back {
        iin.SearchBackward(pair)
    }
}
// 0.2.8 2020-0902 created
func (iin*IInput)SearchForward(pat string)(bool){
    right := iin.right
    found := -1
    i := 0
    if strBegins(right,pat) {
        _,z := utf8.DecodeRuneInString(right[i:])
        if 0 < z {
            i += z
        }
    }
    for i < len(right) {
        if strBegins(right[i:],pat) {
            found = i
            break
        }
        _,z := utf8.DecodeRuneInString(right[i:])
        if z <= 0 { break }
        i += z
    }
    if 0 <= found {
        iin.line = iin.line + right[0:found]
        iin.right = iin.right[found:]
        return true
    }else{
        return false
    }
}
// 0.2.8 2020-0902 created
func (iin*IInput)SearchBackward(pat string)(bool){
    line := iin.line
    found := -1
    i := len(line)-1
    for i = i; 0 <= i; i-- {
        _,z := utf8.DecodeRuneInString(line[i:])
        if z <= 0 {
            continue
        }
        //fprintf(stderr,"-- %v %v\n",pat,line[i:])
        if strBegins(line[i:],pat) {
            found = i
            break
        }
    }
    //fprintf(stderr,"--%d\n",found)
    if 0 <= found {
        iin.right = line[found:] + iin.right
        iin.line = line[0:found]
        return true
    }else{
        return false
    }
}
// 0.2.8 2020-0902 created
// search from top, end, or current position
func (gsh*GshContext)SearchHistory(pat string, forw bool)(bool,string){
    if forw {
        for _,v := range gsh.CommandHistory {
            if 0 <= strings.Index(v.CmdLine,pat) {
                //fprintf(stderr,"\n--De-- found !%v [%v]%v\n",i,pat,v.CmdLine)
                return true,v.CmdLine
            }
        }
    }else{
        hlen := len(gsh.CommandHistory)
        for i := hlen-1; 0 < i ; i-- {
            v := gsh.CommandHistory[i]
            if 0 <= strings.Index(v.CmdLine,pat) {
                //fprintf(stderr,"\n--De-- found !%v [%v]%v\n",i,pat,v.CmdLine)
                return true,v.CmdLine
            }
        }
    }
    //fprintf(stderr,"\n--De-- not-found(%v)\n",pat)
    return false,"(Not Found in History)"
}
// 0.2.8 2020-0902 created
func (iin*IInput)GotoFORWSTR(pat string,gsh*GshContext){
```

```
    found := false
    if 0 < len(iin.right) {
        found = iin.SearchForward(pat)
    }
    if !found {
        found,line := gsh.SearchHistory(pat,true)
        if found {
            iin.line = line
            iin.right = ""
        }
    }
}
func (iin*IInput)GotoBACKSTR(pat string, gsh*GshContext){
    found := false
    if 0 < len(iin.line) {
        found = iin.SearchBackward(pat)
    }
    if !found {
        found,line := gsh.SearchHistory(pat,false)
        if found {
            iin.line = line
            iin.right = ""
        }
    }
}
func (iin*IInput)getstring1(prompt string)(string){ // should be editable
    iin.clearline();
    fprintf(stderr,"\r%v",prompt)
    str := ""
    for {
        ch := iin.Getc(10*1000*1000)
        if ch == '\n' || ch == '\r' {
            break
        }
        sch := string(ch)
        str += sch
        fprintf(stderr,"%s",sch)
    }
    return str
}

// search pattern must be an array and selectable with ^N/^P
var SearchPat = ""
var SearchForw = true

func (iin*IInput)xgetline1(prevline string, gsh*GshContext)(string){
    var ch int;

    MODE_ShowMode = false
    MODE_VicMode = false
    iin.Redraw();
    first := true

    for cix := 0; ; cix++ {
        iin.pinJmode = iin.inJmode
        iin.inJmode = false

        ch = iin.Getc(1000*1000)

        if ch != EV_TIMEOUT && first {
            first = false
            mode := 0
            if romkanmode {
                mode = 1
            }
            now := time.Now()
            Events = append(Events,Event{now,EV_MODE,int64(mode),CmdIndex})
        }
        if ch == 033 {
            MODE_ShowMode = true
            MODE_VicMode = !MODE_VicMode
            iin.Redraw();
            continue
        }
        if MODE_VicMode {
            switch ch {
                case '0': ch = GO_TOPL
                case '$': ch = GO_ENDL
                case 'b': ch = GO_TOPW
                case 'e': ch = GO_ENDW
                case 'w': ch = GO_NEXTW
                case '%': ch = GO_PAIRCH

                case 'j': ch = GO_DOWN
                case 'k': ch = GO_UP
                case 'h': ch = GO_LEFT
                case 'l': ch = GO_RIGHT
                case 'x': ch = DEL_RIGHT
                case 'a': MODE_VicMode = !MODE_VicMode
                    ch = GO_RIGHT
                case 'i': MODE_VicMode = !MODE_VicMode
                    iin.Redraw();
                    continue
                case '~':
                    right,head := delHeadChar(iin.right)
                    if len([]byte(head)) == 1 {
                        ch = int(head[0])
                        if( 'a' <= ch && ch <= 'z' ){
                            ch = ch + 'A'-'a'
                        }else
                        if( 'A' <= ch && ch <= 'Z' ){
                            ch = ch + 'a'-'A'
                        }
                        iin.right = string(ch) + right
                    }
                    iin.Redraw();
                    continue
                case 'f': // GO_FORWCH
                    iin.Redraw();
                    ch = iin.Getc(3*1000*1000)
                    if ch == EV_TIMEOUT {
                        iin.Redraw();
                        continue
                    }
                    SearchPat = string(ch)
                    SearchForw = true
                    iin.GotoFORWSTR(SearchPat,gsh)
                    iin.Redraw();
                    continue
                case '/':
                    SearchPat = iin.getstring1("/") // should be editable
                    SearchForw = true
                    iin.GotoFORWSTR(SearchPat,gsh)
                    iin.Redraw();
```

```
                    continue
                case '?':
                    SearchPat = iin.getstring1("?") // should be editable
                    SearchForw = false
                    iin.GotoBACKSTR(SearchPat,gsh)
                    iin.Redraw();
                    continue
                case 'n':
                    if SearchForw {
                        iin.GotoFORWSTR(SearchPat,gsh)
                    }else{
                        iin.GotoBACKSTR(SearchPat,gsh)
                    }
                    iin.Redraw();
                    continue
                case 'N':
                    if !SearchForw {
                        iin.GotoFORWSTR(SearchPat,gsh)
                    }else{
                        iin.GotoBACKSTR(SearchPat,gsh)
                    }
                    iin.Redraw();
                    continue
            }
        }
        switch ch {
            case GO_TOPW:
                iin.GotoTOPW()
                iin.Redraw();
                continue
            case GO_ENDW:
                iin.GotoENDW()
                iin.Redraw();
                continue
            case GO_NEXTW:
                // to next space then
                iin.GotoNEXTW()
                iin.Redraw();
                continue
            case GO_PAIRCH:
                iin.GotoPAIRCH()
                iin.Redraw();
                continue
        }

        //fprintf(stderr,"A[%02X]\n",ch);
        if( ch == '\\' || ch == 033 ){
            MODE_ShowMode = true
            metach := ch
            iin.waitingMeta = string(ch)
            iin.Redraw();
                // set cursor //fprintf(stderr,"???\b\b\b")
            ch = fgetcTimeout(stdin,2000*1000)
                // reset cursor
            iin.waitingMeta = ""

            cmdch := ch
            if( ch == EV_TIMEOUT ){
                if metach == 033 {
                    continue
                }
                ch = metach
            }else
            /*
            if( ch == 'm' || ch == 'M' ){
                mch := fgetcTimeout(stdin,1000*1000)
                if mch == 'r' {
                    romkanmode = true
                }else{
                    romkanmode = false
                }
                continue
            }else
            */
            if( ch == 'k' || ch == 'K' ){
                MODE_Recursive = !MODE_Recursive
                iin.Translate(cmdch);
                continue
            }else
            if( ch == 'j' || ch == 'J' ){
                iin.Translate(cmdch);
                continue
            }else
            if( ch == 'i' || ch == 'I' ){
                iin.Replace(cmdch);
                continue
            }else
            if( ch == 'l' || ch == 'L' ){
                MODE_LowerLock = !MODE_LowerLock
                MODE_CapsLock = false
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'u' || ch == 'U' ){
                MODE_CapsLock = !MODE_CapsLock
                MODE_LowerLock = false
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'v' || ch == 'V' ){
                MODE_ViTrace = !MODE_ViTrace
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'c' || ch == 'C' ){
                if 0 < len(iin.line) {
                    xline,tail := delTailChar(iin.line)
                    if len([]byte(tail)) == 1 {
                        ch = int(tail[0])
                        if( 'a' <= ch && ch <= 'z' ){
                            ch = ch + 'A'-'a'
                        }else
                        if( 'A' <= ch && ch <= 'Z' ){
                            ch = ch + 'a'-'A'
                        }
```

```
                    iin.line = xline + string(ch)
                }
            }
            if MODE_ViTrace {
                fprintf(stderr,"%v\r\n",string(cmdch));
            }
            iin.Redraw();
            continue
        }else{
            iin.pch = append(iin.pch,ch) // push
            ch = '\\'
        }
    }
    switch( ch ){
        case 'P'-0x40: ch = GO_UP
        case 'N'-0x40: ch = GO_DOWN
        case 'B'-0x40: ch = GO_LEFT
        case 'F'-0x40: ch = GO_RIGHT
    }
    //fprintf(stderr,"B[%02X]\n",ch);
    switch( ch ){
        case 0:
            continue;

        case '\t':
            iin.Replace('j');
            continue
        case 'X'-0x40:
            iin.Replace('j');
            continue

        case EV_TIMEOUT:
            iin.Redraw();
            if iin.pinJmode {
                fprintf(stderr,"\\J\r\n")
                iin.inJmode = true
            }
            continue
        case GO_UP:
            if iin.lno == 1 {
                continue
            }
            cmd,ok := gsh.cmdStringInHistory(iin.lno-1)
            if ok {
                iin.line = cmd
                iin.right = ""
                iin.lno = iin.lno - 1
            }
            iin.Redraw();
            continue
        case GO_DOWN:
            cmd,ok := gsh.cmdStringInHistory(iin.lno+1)
            if ok {
                iin.line = cmd
                iin.right = ""
                iin.lno = iin.lno + 1
            }else{
                iin.line = ""
                iin.right = ""
                if iin.lno == iin.lastlno-1 {
                    iin.lno = iin.lno + 1
                }
            }
            iin.Redraw();
            continue
        case GO_LEFT:
            if 0 < len(iin.line) {
                xline,tail := delTailChar(iin.line)
                iin.line = xline
                iin.right = tail + iin.right
            }
            iin.Redraw();
            continue;
        case GO_RIGHT:
            if( 0 < len(iin.right) && iin.right[0] != 0 ){
                xright,head := delHeadChar(iin.right)
                iin.right = xright
                iin.line += head
            }
            iin.Redraw();
            continue;
        case EOF:
            goto EXIT;
        case 'R'-0x40: // replace
            dst := convs(iin.line+iin.right);
            iin.line = dst
            iin.right = ""
            iin.Redraw();
            continue;
        case 'T'-0x40: // just show the result
            readDic();
            romkanmode = !romkanmode;
            iin.Redraw();
            continue;
        case 'L'-0x40:
            iin.Redraw();
            continue
        case 'K'-0x40:
            iin.right = ""
            iin.Redraw();
            continue
        case 'E'-0x40:
            iin.line += iin.right
            iin.right = ""
            iin.Redraw();
            continue
        case 'A'-0x40:
            iin.right = iin.line + iin.right
            iin.line = ""
            iin.Redraw();
            continue
        case 'U'-0x40:
            iin.line = ""
            iin.right = ""
            iin.clearline();
            iin.Redraw();
            continue;
        case DEL_RIGHT:
            if( 0 < len(iin.right) ){
                iin.right,_ = delHeadChar(iin.right)
                iin.Redraw();
            }
            continue;
        case 0x7F: // BS? not DEL
```

```
                if( 0 < len(iin.line) ){
                    iin.line,_ = delTailChar(iin.line)
                    iin.Redraw();
                }
                /*
                else
                if( 0 < len(iin.right) ){
                    iin.right,_ = delHeadChar(iin.right)
                    iin.Redraw();
                }
                */
                continue;
            case 'H'-0x40:
                if( 0 < len(iin.line) ){
                    iin.line,_ = delTailChar(iin.line)
                    iin.Redraw();
                }
                continue;
        }
        if( ch == '\n' || ch == '\r' ){
            iin.line += iin.right;
            iin.right = ""
            iin.Redraw();
            fputc(ch,stderr);
            AtConsoleLineTop  = true
            break;
        }
        if MODE_CapsLock {
            if 'a' <= ch && ch <= 'z' {
                ch = ch+'A'-'a'
            }
        }
        if MODE_LowerLock {
            if 'A' <= ch && ch <= 'Z' {
                ch = ch+'a'-'A'
            }
        }
        iin.line += string(ch);
        iin.Redraw();
    }
EXIT:
    return iin.line + iin.right;
}

func getline_main(){
    line := xgetline(0,"",nil)
    fprintf(stderr,"%s\n",line);
/*
    dp = strpbrk(line,"\r\n");
    if( dp != NULL ){
        *dp = 0;
    }

    if( 0 ){
        fprintf(stderr,"\n(%d)\n",int(strlen(line)));
    }
    if( lseek(3,0,0) == 0 ){
        if( romkanmode ){
            var buf [8*1024]byte;
            convs(line,buff);
            strcpy(line,buff);
        }
        write(3,line,strlen(line));
        ftruncate(3,lseek(3,0,SEEK_CUR));
        //fprintf(stderr,"outsize=%d\n",(int)lseek(3,0,SEEK_END));
        lseek(3,0,SEEK_SET);
        close(3);
    }else{
        fprintf(stderr,"\r\ngotline: ");
        trans(line);
        //printf("%s\n",line);
        printf("\n");
    }
*/
}
//== end ========================================================== getline

//
// $USERHOME/.gsh/
//      gsh-rc.txt, or gsh-configure.txt
//              gsh-history.txt
//              gsh-aliases.txt // should be conditional?
//
func (gshCtx *GshContext)gshSetupHomedir()(bool) {
    homedir,found := userHomeDir()
    if !found {
        fmt.Printf("--E-- You have no UserHomeDir\n")
        return true
    }
    gshhome := homedir + "/" + GSH_HOME
    _, err2 := os.Stat(gshhome)
    if err2 != nil {
        err3 := os.Mkdir(gshhome,0700)
        if err3 != nil {
            fmt.Printf("--E-- Could not Create %s (%s)\n",
                gshhome,err3)
            return true
        }
        fmt.Printf("--I-- Created %s\n",gshhome)
    }
    gshCtx.GshHomeDir = gshhome
    return false
}
func setupGshContext()(GshContext,bool){
    gshPA := syscall.ProcAttr {
        "", // the staring directory
        os.Environ(), // environ[]
        []uintptr{os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd()},
        nil, // OS specific
    }
    cwd, _ := os.Getwd()
    gshCtx := GshContext {
        cwd, // StartDir
        "", // GetLine
        []GChdirHistory { {cwd,time.Now(),0} }, // ChdirHistory
        gshPA,
        []GCommandHistory{}, //something for invokation?
        GCommandHistory{}, // CmdCurrent
        false,
        []int{},
        syscall.Rusage{},
        "", // GshHomeDir
        Ttyid(),
        false,
```

```
        false,
        []PluginInfo{},
        []string{},
        " ",
        "v",
        ValueStack{},
        GServer{"",""}, // LastServer
        "", // RSERV
        cwd, // RWD
        CheckSum{},
    }
    err := gshCtx.gshSetupHomedir()
    return gshCtx, err
}
func (gsh*GshContext)gshelllh(gline string)(bool){
    ghist := gsh.CmdCurrent
    ghist.WorkDir,_ = os.Getwd()
    ghist.WorkDirX = len(gsh.ChdirHistory)-1
    //fmt.Printf("--D--ChdirHistory(@%d)\n",len(gsh.ChdirHistory))
    ghist.StartAt = time.Now()
    rusagev1 := Getrusagev()
    gsh.CmdCurrent.FoundFile = []string{}
    fin := gsh.tgshelll(gline)
    rusagev2 := Getrusagev()
    ghist.Rusagev = RusageSubv(rusagev2,rusagev1)
    ghist.EndAt = time.Now()
    ghist.CmdLine = gline
    ghist.FoundFile = gsh.CmdCurrent.FoundFile

    /* record it but not show in list by default
    if len(gline) == 0 {
        continue
    }
    if gline == "hi" || gline == "history" { // don't record it
        continue
    }
    */
    gsh.CommandHistory = append(gsh.CommandHistory, ghist)
    return fin
}
// <a name="main">Main loop</a>
func script(gshCtxGiven *GshContext) (_ GshContext) {
    gshCtxBuf,err0 := setupGshContext()
    if err0 {
        return gshCtxBuf;
    }
    gshCtx := &gshCtxBuf

    //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
    //resmap()

    /*
    if false {
        gsh_getlinev, with_exgetline :=
            which("PATH",[]string{"which","gsh-getline","-s"})
        if with_exgetline {
            gsh_getlinev[0] = toFullpath(gsh_getlinev[0])
            gshCtx.GetLine = toFullpath(gsh_getlinev[0])
        }else{
        fmt.Printf("--W-- No gsh-getline found. Using internal getline.\n");
        }
    }
    */

    ghist0 := gshCtx.CmdCurrent // something special, or gshrc script, or permanent history
    gshCtx.CommandHistory = append(gshCtx.CommandHistory,ghist0)

    prevline := ""
    skipping := false
    for hix := len(gshCtx.CommandHistory); ; {
        gline := gshCtx.getline(hix,skipping,prevline)
        if skipping {
            if strings.Index(gline,"fi") == 0 {
                fmt.Printf("fi\n");
                skipping = false;
            }else{
                //fmt.Printf("%s\n",gline);
            }
            continue
        }
        if strings.Index(gline,"if") == 0 {
            //fmt.Printf("--D-- if start: %s\n",gline);
            skipping = true;
            continue
        }
        if false {
            os.Stdout.Write([]byte("gotline:"))
            os.Stdout.Write([]byte(gline))
            os.Stdout.Write([]byte("\n"))
        }
        gline = strsubst(gshCtx,gline,true)
        if false {
            fmt.Printf("fmt.Printf %%v - %v\n",gline)
            fmt.Printf("fmt.Printf %%s - %s\n",gline)
            fmt.Printf("fmt.Printf %%x - %s\n",gline)
            fmt.Printf("fmt.Printf %%U - %s\n",gline)
            fmt.Printf("Stouut.Write -")
            os.Stdout.Write([]byte(gline))
            fmt.Printf("\n")
        }
        /*
        // should be cared in substitution ?
        if 0 < len(gline) && gline[0] == '!' {
            xgline, set, err := searchHistory(gshCtx,gline)
            if err {
                continue
            }
            if set {
                // set the line in command line editor
            }
            gline = xgline
        }
        */
        fin := gshCtx.gshelllh(gline)
        if fin {
            break;
        }
        prevline = gline;
        hix++;
    }
    return *gshCtx
}
func main() {
    gshCtxBuf := GshContext{}
```

```
    gsh := &gshCtxBuf
    argv := os.Args

    if( isin("wss",argv) ){
        gj_server(argv[1:]);
        return;
    }
    if( isin("wsc",argv) ){
        gj_client(argv[1:]);
        return;
    }
    if 1 < len(argv) {
        if isin("version",argv){
            gsh.showVersion(argv)
            return
        }
        if argv[1] == "gj" {
            if argv[2] == "listen" { go gj_server(argv[2:]); }
            if argv[2] == "server" { go gj_server(argv[2:]); }
            if argv[2] == "serve"  { go gj_server(argv[2:]); }
            if argv[2] == "client" { go gj_client(argv[2:]); }
            if argv[2] == "join"   { go gj_client(argv[2:]); }
        }
        comx := isinX("-c",argv)
        if 0 < comx {
            gshCtxBuf,err := setupGshContext()
            gsh := &gshCtxBuf
            if !err {
                gsh.gshellv(argv[comx+1:])
            }
            return
        }
    }
    if 1 < len(argv) && isin("-s",argv) {
    }else{
        gsh.showVersion(append(argv,[]string{"-l","-a"}...))
    }
    script(nil)
    //gshCtx := script(nil)
    //gshelll(gshCtx,"time")
}

//</div></details>
//<details id="gsh-todo"><summary>Considerations</summary><div class="gsh-src">
// - inter gsh communication, possibly running in remote hosts -- to be remote shell
// - merged histories of multiple parallel gsh sessions
// - alias as a function or macro
// - instant alias end environ export to the permanent > ~/.gsh/gsh-alias and gsh-environ
// - retrieval PATH of files by its type
// - gsh as an IME with completion using history and file names as dictionaies
// - gsh a scheduler in precise time of within a millisecond
// - all commands have its subucomand after "---" symbol
// - filename expansion by "-find" command
// - history of ext code and output of each commoand
// - "script" output for each command by pty-tee or telnet-tee
// - $BUILTIN command in PATH to show the priority
// - "?" symbol in the command (not as in arguments) shows help request
// - searching command with wild card like: which ssh-*
// - longformat prompt after long idle time (should dismiss by BS)
// - customizing by building plugin and dynamically linking it
// - generating syntactic element like "if" by macro expansion (like CPP) >> alias
// - "!" symbol should be used for negation, don't wast it just for job control
// - don't put too long output to tty, record it into GSH_HOME/session-id/comand-id.log
// - making canonical form of command at the start adding quatation or white spaces
// - name(a,b,c) ... use "(" and ")" to show both delimiter and realm
// - name? or name! might be useful
// - htar format - packing directory contents into a single html file using data scheme
// - filepath substitution shold be done by each command, expecially in case of builtins
// - @N substition for the history of working directory, and @spec for more generic ones
// - @dir prefix to do the command at there, that means like (chdir @dir; command)
// - GSH_PATH for plugins
// - standard command output: list of data with name, size, resouce usage, modified time
// - generic sort key option -nm name, -sz size, -ru rusage, -ts start-time, -tm mod-time
//   -wc word-count, grep match line count, ...
// - standard command execution result: a list of string, -tm, -ts, -ru, -sz, ...
// - -tailf-filename like tail -f filename, repeat close and open before read
// - max. size and max. duration and timeout of (generated) data transfer
// - auto. numbering, aliasing, IME completion of file name (especially rm of quieer name)
// - IME "?" at the top of the command line means searching history
// - IME %d/0x10000/ %x/ffff/
// - IME ESC to go the edit mode like in vi, and use :command as :s/x/y/g to edit history
// - gsh in WebAssembly
// - gsh as a HTTP server of online-manual
//---END--- (^-^)//ITS more</div></details>

//<span class="gsh-golang-data">

var WorldDic = //<span id="gsh-world-dic">
"data:text/dic;base64,"+
"Ly8gTXlJTUUvMC4wLjEg6L6e5pu4ICgyMDIwLTA4MTlhKQpzZWthaSDkuJbnlYwKa28g44GT"+
"Cm5uIOOCkwpuaSDjgasKY2hpIOOBoQp0aSDjgaEKaGEg44GvCnNlIOOBmwprYSDjgYsKaSDj"+
"gYQK";
//</span>

var WnnDic = //<span id="gsh-wnn-dic">
"data:text/dic;base64,"+
"PG1ldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL2Rp"+
"Y3ZlcglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNXbm5ccy8vXHMyMDIwLTA4MzAK"+
"R1NoZWxsCUdTaGVsbArjgo/jgZcJ56eBCndhdGFzaGkJ56eBCndhdGFzaQnnp4EK44Gq"+
"44G+44GICeWQjeWJjQpuYW1hZQnlkI3liY0K44Gq44GL44GuCeS4remHjgpuYWthbm8J5Lit"+
"6YeOCndhCeOCjwp0YQnjgZ8Kc2kJ44GXCnNoaQnjgZcKbm8J44GuCm5hCeOBqgptYQnjgb4K"+
"ZQnjgYgKaGEJ44GvCm5hCeOBqgprYQnjgYsKbm8J44GuCmRlCeOBpwpzdQnjgZkKZVxzCWVj"+
"aG8KZGljCWRpYwplY2hvCWVjaG8KcmVwbGF5CXJlcGxheQpyZXBlYXQJcmVwZWF0CmROCWRh"+
"dGVccysnJVklbSVkLSVIOiVNOiVTJwp0aW9uCXRpb24KJXQJJXQJLy8gdG8gYmUgYW4gYWN0"+
"aW9uCjwvdGV4dGFyZWE+Cg=="
//</span>

var SumomoDic = //<span id="gsh-sumomo-dic">
"data:text/dic;base64,"+
"PG1ldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
"cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTdWlvbW9ccy8vXHMyMDIwLTA4MzAK"+
"c3UJ44GZCm1vCeOCggpubwnjga4KdQnjgYYKY2hpCeOBoQp0aQnjgaEKdWNoaQnlhoUKdXRp"+
"CeWGhQpzdW1vbW8J44GZ44KC44KCCnN1bW9tb21vCeOBmeOCguOCguOCggptb21vCeahgwpt"+
"b21vbW8J5qGD44KCCiwsCeOAgQouLgnjgIIKPC9OZXh0YXJlYT4K"
//</span>

var SijimiDic = //<span id="gsh-sijimi-dic">
"data:text/dic;base64,"+
"PG1ldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
"cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTaGlqaW1pXHMvL1xzMjAyMC0wODMw"+
"CnNpCeOBlwpzaGkJ44GXCmppCeOBmAptaQnjgb8KbmEJ44GqCmplCeOBmOOChQp4eXUJ44KF"+
"CnU44GGCm5pCeOBqwprbwnjgZMKYnUJ44G2Cm5uCeOCkwpubwnjga4KY2hpCeOBoQp0aQnj"+
"gaEKa2EJ44GLCnJhCeOCiQosLAnjgIEKLi4J44CCCnhuYW5hCeS4gwp4anVlCeWNgQp4bmkJ"+
"5LqMCmtveAnlgIsKa29xCeWAiwprb3gJ5YCLCm5hbmFqdXVuaXgJNzIKbmFuYWp1dW5peHgJ"+
```

```
"77yX77ySCm5hbmFqdXVuaVgJ77yX77ySCuS4g+WNgeS6jHgJNzIKa29idW5uCeWAi+WIhgp0"+
"aWthcmFxCeOBoeOBi+OCiQp0aWthcmEJ5YqbCmNoaWthcmEJ5YqbCjwvdGV4dGFyZWE+Cg="
//</span>

var JA_JKLDic = //<span id="gsh-ja-jkl-dic">
"data:text/dic;base64,"+
"Ly92ZXJsCU15SU1FamRpY2ptb3JzZWpKQWpKS0woMjAyMGowODE5KSheLV4pL1NhdG94SVRT"+
"CmtqamprbGtqa2tsa2psIOS4lueVjApqamtqamwJ44GCCmtqbAnjgYQKa2tqbAnjgYYKamtq"+
"amwJ44GICmtqa2trbAnjgYoKa2pra2wJ44GLCmpramtrbAnjgY0Ka2tramwJ44GPCmpramps"+
"CeOBkQpqampqbAnjgZMKamtqa2psCeOBlQpqamtqa2wJ44GXCmpqamtqbAnjgZkKa2pqamts"+
"CeOBmwpqamprbAnjgZ0KamtsCeOBnwpra2prbAnjgaEKa2pqa2wJ44GkCmtqa2pqbAnjgaYK"+
"a2tqa2tsCeOBqApramtsCeOBqgpqa2prbAnjgasKa2tra2wJ44GsCmpqa2psCeOBrQpra2pq"+
"bAnjga4Kamtra2wJ44GvCmpqa2tqbAnjgbIKampra2wJ44G1CmtsCeOBuApqa2tsCeOBuwpq"+
"a2tqbAnjgb4Ka2tqa2psCeOBvwpqbAnjgoAKamtra2psCeOCgQpqa2tqa2wJ44KCCmtqamwJ"+
"44KECmpra2pqbAnjgoYKampsCeOCiApra2tsCeOCiQpqamtsCeOCigpqa2pqa2wJ44KLCmpq"+
"amwJ44KMCmtqa2psCeOCjQpqa2psCeOCjwpramtramwJ44KQCmtqamtrbAnjgpEKa2pqamwJ"+
"44KSCmtqa2prbAnjgpMKa2pqa2psCeODvApra2wJ44KbCmtramprbAnjgpwKa2pramtqbAnj"+
"gIEK";
//</span>

//</span>
/*
<style id="gsh-references-style">
#references details { font-family:Georgia; }
#references a { font-family:Georgia; }
.wrap { white-space:normal; }
</style>
<details id="references"><summary>References</summary><div class="gsh-src">
Web technology
  <a href="https://html.spec.whatwg.org">HTML: The Living Standard</a> (September 2020)
    <a href="https://html.spec.whatwg.org/dev/">Developer Version</a>

  <a href="https://drafts.csswg.org">CSS Working Group Editor Drafts</a> (September 2020)

  <a href="https://developer.mozilla.org/ja/docs/Web">MDN web docs</a>
    <a href="https://developer.mozilla.org/ja/docs/Web/HTML/Element">HTML</a>
    <a href="https://developer.mozilla.org/en-US/docs/Web/CSS">CSS</a> : <span class="wrap">
     <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Selectors">selectors</a>
     <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/background-repeat">repeat</a></span>
    <a href="https://developer.mozilla.org/en-US/docs/Web/JavaScript">JavaScript</a>
    <a href="https://developer.mozilla.org/en-US/docs/Web/HTTP">HTTP</a>
    <a href="https://mdn-web-dna.s3-us-west-2.amazonaws.com/MDN-Browser-Compatibility-Report-2020.pdf">MDN Browser Compatibility Report (2020)</a>

Go language (August 2020 / Go 1.15)
  <a href="https://golang.org">The Go Programming Language</a>
    <a href="https://golang.org/pkg/">Packages</a>
      <a href="https://godoc.org/golang.org/x/net/websocket">WebSocket</a>

<a href="https://stackoverflow.com/">Stackoverflow</a>
<!--
<iframe src="https://golang.org" width="100%" height="300"></iframe>
-->
</div></details>
*/
/*
<details id="html-src" onclick="frame_open();"><summary>Raw Source</summary><div>

<!-- h2>The full of this HTML including the Go code is here.</h2 -->
<details id="gsh-whole-view"><summary>Whole file</summary>
 <a name="whole-src-view"></a>
 <span id="src-frame"></span><!-- a window to show source code -->
</details>

<details id="gsh-style-frame" onclick="fill_CSSView()"><summary>CSS part</summary>
 <a name="style-src-view"></a>
 <span id="gsh-style-view"></span>
</details>

<details id="gsh-script-frame" onclick="fill_JavaScriptView()"><summary>JavaScript part</summary>
 <a name="script-src-view"></a>
 <span id="gsh-script-view"></span>
</details>

<details id="gsh-data-frame" onclick="fill_DataView()"><summary>Builtin data part</summary>
 <a name="gsh-data-frame"></a>
 <span id="gsh-data-view"></span>
</details>

</div></details>
*/

/*
<div id="GshFooter0"></div>
<!-- 2020-09-17 SatoxITS, visible script { -- >
<details><summary>GJScript</summary>
<style>.gjscript { font-family:Georgia; }</style>
<pre id="gjscript_1" class="gjscript"> function gjtest1(){ alert('Hello GJScript!'); }
  gjtest1()
</pre>
<script>
  gjs = document.getElementById('gjscript_1');
  //eval(gjs.innerHTML);
  //gjs.outerHTML = ""
</script>
</details><!-- ---------- END-OF-VISIBLE-PART ---------- } -->

<!--
// 2020-0906 added,
https://developer.mozilla.org/en-US/docs/Web/CSS/z-index
https://developer.mozilla.org/en-US/docs/Web/CSS/position
-->
<span id="GshGrid">(^_^)//<small>{Hit j k l h}</small></span>

<span id="GStat"><br>
</span>
<span id="GMenu" onclick="GShellMenu(this)"></span>
<span id="GTop"></span>
<div id="GShellPlane" onclick="showGShellPlane();"></div>
<div id="RawTextViewer"></div>
<div id="RawTextViewerClose" onclick="hideRawTextViewer()"> CLOSE </div>

<style id="GshStyleDef">
 #LineNumbered table,tr,td {
   margin:0;
   padding:4px;
   spacing:0;
   border:12px;
 }
 textarea.LineNumber {
   font-size:12px;
   font-family:monospace,Courier New;
   color:#282;
   padding:4px;
   text-align:right;
```

```
5705  }
5706  textarea.LineNumbered {
5707    font-size:12px;
5708    font-family:monospace,Courier New;
5709    padding:4px;
5710    wrap:off;
5711  }
5712  #RawTextViewer{
5713    z-index:0;
5714    position:fixed; top:0px; left:0px;
5715    width:100%; xxxheight:50px; xheight:0px;
5716    overflow:auto;
5717    color:#fff; background-color:rgba(128,128,256,0.2);
5718    font-size:12px;
5719    spellcheck:false;
5720  }
5721  #RawTextViewerClose{
5722    z-index:0;
5723    position:fixed; top:-100px; left:-100px;
5724    color:#fff; background-color:rgba(128,128,256,0.2);
5725    font-size:20px; font-family:Georgia;
5726    white-space:pre;
5727  }
5728  #xxxGShellPlane{
5729    z-index:0;
5730    position:fixed; top:0px; left:0px;
5731    width:100%; height:50px;
5732    overflow:auto;
5733    color:#fff; background-color:rgba(128,128,256,0.3);
5734    font-size:12px;
5735  }
5736  #xxxGTop{
5737    z-index:9;
5738    opacity:1.0;
5739    position:fixed; top:0px; left:0px;
5740    width:320px; height:20px;
5741    color:#fff; background-color:rgba(32,32,160,0.15);
5742    color:#fff; font-size:12px;
5743  }
5744  #xxxGPos{
5745    z-index:12;
5746    position:fixed; top:0px; left:0px;
5747    opacity:1.0;
5748    width:640px; height:30px;
5749    color:#fff; background-color:rgba(0,0,0,0.2);
5750    color:#fff; font-size:12px;
5751  }
5752  #GMenu{
5753    z-index:2000;
5754    position:fixed; top:250px; left:0px;
5755    opacity:1.0;
5756    width:100px; height:100px;
5757    color:#fff;
5758    color:#fff; background-color:rgba(0,0,0,0.0);
5759    color:#fff; font-size:16px; font-family:Georgia;
5760    background-repeat:no-repeat;
5761  }
5762  #xxxGStat{
5763    z-index:8;
5764    xopacity:0.0;
5765    position:fixed; top:20px; left:0px;
5766    xwidth:640px;
5767    width:100%; height:90px;
5768    color:#fff; background-color:rgba(0,0,128,0.04);
5769    font-size:20px; font-family:Georgia;
5770  }
5771  #GLog{
5772    z-index:10;
5773    position:fixed; top:50px; left:0px;
5774    opacity:1.0;
5775    width:640px; height:60px;
5776    color:#fff; background-color:rgba(0,0,128,0.10);
5777    font-size:12px;
5778  }
5779  #GshGrid {
5780    z-index:11;
5781    xopacity:0.0;
5782    position:fixed; top:0px; left:0px;
5783    width:320px; height:30px;
5784    color:#9f9; font-size:16px;
5785  }
5786  xbody {display:none;}
5787  .gsh-link{color:green;}
5788  #gsh {border-width:1;margin:0;padding:0;}
5789  #gsh {font-family:monospace,Courier New;color:#ddf;font-size:8px;}
5790  #gsh header{height:100px;}
5791  #xgsh header{height:100px;background-image:url(GShell-Logo00.png);}
5792  #GshMenu{font-size:14pt;color:#c44;}
5793  .GshMenu1{
5794     font-size:14pt;color:#2a2;padding:4px; text-align:right;
5795  }
5796  .GshMenu1:hover{
5797     font-size:14pt;color:#fff;font-wait:bold;background-color:#2a2;
5798  }
5799  #GshFooter{height:100px;background-size:80px;background-repeat:no-repeat;}
5800  #gsh note{color:#000;font-size:10pt;}
5801  #gsh h2{color:#24a;font-family:Georgia;font-size:18pt;}
5802  #gsh h3{color:#24a;font-family:Georgia;font-size:16pt;}
5803  #gsh details{color:#888;background-color:#fff;font-family:monospace;}
5804  #gsh summary{font-size:16pt;color:#fff;background-color:#8af;height:30px;}
5805  #gsh pre{font-size:11pt;color:#223;background-color:#fafff;}
5806  #gsh a{color:#24a;}
5807  #gsh a[name]{color:#24a;font-size:16pt;}
5808  #gsh .gsh-src{white-space:pre;font-family:monospace,Courier New;font-size:11pt;}
5809  #gsh .gsh-src{background-color:#fafff;color:#223;}
5810  #gsh-src-src{spellcheck:false}
5811  #SrcTextarea{white-space:pre;font-family:Courier New;font-size:10pt;}
5812  #SrcTextarea{background-color:#fafff;color:#223;}
5813  .gsh-code {white-space:pre;font-family:Courier New !important;}
5814  .gsh-code {color:#024;font-size:11pt; background-color:#fafaff;}
5815  .gsh-golang-data {display:none;}
5816  #gsh-WinId {color:#000;font-size:14pt;}
5817
5818  .gsh-document {font-size:11pt;background-color:#fff;font-family:Georgia;}
5819  .gsh-document {color:#000;background-color:#fff !important;}
5820  .gsh-document > h2{color:#000;background-color:#fff !important;}
5821  .gsh-document details{color:#000;background-color:#fff;font-family:Georgia;}
5822  .gsh-document p{max-width:550pt;color:#000;background-color:#fff;font-family:Georgia;}
5823  .gsh-document address{width:500pt;color:#000;background-color:#fff;font-family:Georgia;}
5824
5825  @media print {
5826   #gsh pre{font-size:11pt !important;}
5827  }
5828 </style>
```

```
<!--
// Logo image should be drawn by JavaScript from a meta-font.
// CSS seems not follow line-splitted URL
-->
<script id="gsh-data">
//GSellLogo="QR-ITS-more.jp.png"
GSellLogo="\
```


```
iVBORw0KGgoAAAANSUhEUgAAAQEAAAB/CAYAAADvs3f4AAAAAXNSR0IArs4c6QAAAHhlWElm\
TU0AKgAAAAgABAEaAAUAAAABAAAAPgEbAAUAAAABAAAARgEoAAMAAAABAAIAAIdpAAQAAAAB\
AAAATgAAAAAAAABIAAAAAQAAAEgAAAABAAOgAQADAAAAAQABAACgAgAEAAAAAQAAAQGgAwAE\
AAAAAQAAAH8AAAAAYx1BhgAAAAlwSFlzAAALEwAACxMBAJqcGAAAF3RJREFUeAHtnQuUFNWZ\
x++t7ukZ3iCggO/jY6Osb8WgMzAvn7uG4+bISTR7YnQXdQPCkGj2aNwlD2MSlRkeUaPnoCdu\
4iuJx7jriYZ50DOGmF2VqIBEiSggCoiMMA+mu+vu//ZMD9U1dau6a2aUbv91GKrq3vvdx6/q\
fnXvdx8tBA8SIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIIFDl4A8dLP2\
2eXs9H9+ftSkSdHxsic2qqdE7YusS+1qaalKfnY5YsokMHwEPtdK4MQFz5UeExlbLYSaYUl5\
npDiLKXEZClFiRM53JSUaq9ScqcU6i+2kK3StuONy5reEGKJ7Qw7mOvKec2ToqOiZwoljhFS\
jbOVHCstMRb3USXEJ8hFu7DsdmFb2+xU4vWWFVXbBpMeZUlAE/hcKoGab66eKGOlNykh56PC\
HxH2VVBKoRKqh3qUeKi1YdaOfONJ56OkdI6w5BwomnOQlyPzi0N9DLmXpFK/60p2P/Piyovf\
N8mfM+/nJWNGnjw9KqOToLVGSFt2p2Ril1gn3ij0Vk7YsoWVMzEuVPfPlRKYdfOak2LRSB0q\
zrWocCOG6qEhvgRaCj/dktj3g7dXXH4gKN6aRS0zpYzerqS6RXuAoZDQqfk79SKTRXHu\
L66as88pU/PN1pNlTLTQJKSc73dPXSr20ur7iiwPcC8Qhb\
+cNHjBj5gJRyDlJHy39o84D40H2Qtx8THaPeFuIOU+w1C\
+KnyhK5FGEv0WGgAExB83eXMoLY\
rikbd9gHEP52VgQl4h89FUA6kJyYFbbQbnzLJg4zFiesnDHCwvUoeiVQOb/5C9FY9DlUueOH\
+zGhUh9nSqOqrm0uWgurkI9RpjBD4Y6uQcQdD5TUOW63zD3MHesy14V49isbdKyxbGHlCpFR\
UJ6toACF7F9VF58NBfDHT0MBaE74Ent+eWrrWr+Lz/QTw60AdB7QJUjps/OA7cOoBNBCeMUZ\
ttCu/coG28fLpvKElTPFV8juRasEahbHvxaR1guoeBPyfUDo4+OfeBdyb8L4tz9XeSXFAMOc\
bgGgov0g1zgGGw4jF392xnHhdc+Mwf3JTjfntZ2yC1YJBXNUt5KIKyck1sxXRdld6BmcevN\
aJovy/VBacMevqEP46/ZlnJjt9jx17VL53Zl5Mtvap1QGlNHw5pQDqXyNTQlZ2b8nGcMG2ZV\
qOoFjSdYvV0AZzDfayidv6FJ35CS4jXZk9hir7e27zm6p3T8hLJpkYicJpV1HtK/DJFU4Jw1\
lImhxM5IR9fzzgRKx4w/C+HQSPE+krbIyrN3qEPTNahsHaLDs2xh5Q5NCoPPVdEpgcqbm\
7/zdOaHptag/mlKJ77Ku+cSoi5PVHr2/eDJbpVHr8Igw3HSaqD/tz+lmy8wDxWv\
pd/CfU42AK2IUPlvTK1L/sJjyE5PVHqr728NzvfUzvvDODGy9GoopuaU\
f/8hpXVu/43rQg9xtq6Ytcvl5XDC3fmWDQn9nbf2le7wKE1bOK65icBu0Eqhd3Iaw82dwKPUw\
hrauc6ZcWdkcjUZK8EUXMae71zZUqoGCjSrOLp2RjFEa2uzoXeKjBjQ3oPCDmaOuQlJ\
WNW4rPy9jJxuPeDL/HXzscicZN+xKUbaq8yYmLhHwZaq8YKoeMcji9Iy9Ly\
Pwk79U/55Bk75fSXMchwhj79Y35xY7qu8YspvTbqSG+55hdjjn6YS6ErfyqVOL2xoeLrbmWj\
YwkqG5S2p1IOK5djzgs+2LB1B4Z6/gG+uosa6yuWOA0kVrp4KdrflBBjN2LvlX6+rqDbJH7tlhbN\
NQT3iqMHz7ETHvuRxnv45r8FpfQWRnDiqVfV2qBlxEFl6+rqDLV82CTnVYBidBs2JfBpwMJP\
aW3rXYbqm9qXMLnmChjCnvUN5fKMRc2LbLzJBk8mU55cn4x/2rLdj0QvZQ2KyyuoA1J3DzpNjtKkyuuO1pdqccfMz\
gKGp/aHfXooVi+JTofmzuZJyn8F7QHmhAMxdaAeTX6c7F07\
0xuUl19F0bLaKGgQhafa5NVPhxjK7X0gLuOMRm+JAFefsnnaKzLRhZXLyBf5ediUwKc1/wD7\
fD+JL72vEtDPEIqgWkZj6zFP/d5duzt+CaSAFJfAxDaE2YYNeUnKhQbRHnmQLGjr\
dqV2Sx/S+nLN0dPelXVtD/SkUr+H0CAhLMNQ3CwTF84gThMJ7Tv3kh/40D/jSe0D8ef8Bg\
ePdtCYCR0RCKr3q6vL0pOf7XfXvDAaVzcGjQECZX56CyYcmxZ/7CyuWar2IP5nrT7FRv\
4yMTRk3XuwyfGJgmxt/xdbpt8uSRi7Fl1luoFJtQm3pwu7FRv\
hUL4693pwu1YyN+FX0C+Cy0VrIWXzylh/w3n7fiibrePtUeDPEIqgWkZjZmHDzFciM\
dMflf6+eWl0/651MmCDD2YFEl2dFycgj38aRAbQSPGX1sCGUcCaKrDOUyszauvgcZx6zAvTf\
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AjzxxVwCLD+BYJ07RA6IHTuc8jclEpNNZZ5qZ4PS8xK09H9p55d2S3TmJNgu8zUPTN+OL/PC\
dc2P4UFahmsfn47H6RP12VnwjzrZ5LufLwSLBs0YF72KosQJJyIzN2fL0OaGkG4U6b8+BxYQ\
TkKVwenYqeupTgZ2ftH6qhg26/jB8aPKnoBo59jZZLh9L+O84E59USUQhki65Vwg6P3njyDW\
85ziR500l+qAbRR6TsO+rzbMQxwv2xr0csSSmQI/fCFY7LPdZ2lJZr5KK+C5dELh6ixYITwL\
Vl/nm4/cmBCW+nXmNWee48EZnelWaOf+EKyUroI1DOGpL3PawpZRGFplnIhtCOXYQ5CLqPQW\
RGj4fb1+LEuY3VncC8bZF4KVlszeZfVNVs6qjsQv++Y0t29BUzqWrjqWZDI1oBJWxzE18vIx\
KEFL9fdsBxp/2Xs6sgXKM3dfCLatfd8adBNluOUNhlAfwg6Bw93sevqjlHMULPw/b14a6npg\
pkSWlwr06fYMn+v3Ml U6MwfbD3KwyWsTXwj2zUcuO4jSJ+6WUyjBTlLlpSvlokE327S/NJwX\
MqJ+21W6VtWlTi4TY/bUnDxmS7iu9baqa2OYX5DbUX1z9BRpGEvdrDHJ5lk3m3z394VgdSYp\
qZbnklkQbbVhBteHI61/0vu/ZgszaeFLR+tNOBCxY90Xa7q7BBtQ6tbuV/oYiPhu8xhzA4R7\
o1MaOu3Q4pYZWHWwCtlaI7Ndi3bXo2P7v2p70cmmEPycew8L4Q6770Ev+htZPnED+mNPy/W2\
9LRATHr5EJ/vQ5gfIlw7StTREMd4gAu5rQ3T6aRSqdmx7Z+/GB47ui290UWv9JX4AnJ71lIS\
16Y+xi8sfm6YcrRQxul4K1ysH6Be9llOYHs79i/4cxbvgnH2jWB1jlXXxecYQuZU0g5WDluq\
Y6xMFg2XRcb6wYrTJp5NO7zuP3v9irmdNn4F5eSbKoHOtab6aStQOt7/beUgSubPmhrC27B1\
0YQhSlOJvclkYo4fxKoZ+kqw+oajDVEsgVEr9PehP+SrXWnkMNLm6VpQnUiKxIzm+0PveQqf\
h4F8J1j9WwOrt+64Stf50OWEzd2G5tCd/PZS/VXH3nagrQUl+4B2j8m8SsS/FmI9D3McBjwo\
kRn3kXzuqzpszkZUlcbOCRjmPWhQlaBxM1gsduI3l5d3JlR9ywOVm9NplkTiE/CQYIdtWZV2\
8/KpqxnKkvc1bdveIDDt0Usc+RxmsDIpnxmIw78tYM6HZGdCt2fgZnJ+8xzuSRBvQ4zrhEw9\
H926s8VJSOHFzRdII7AAPQwzkI7LsplurBj0QPxYbyb/8dmn2//ll/qqnago2AwqF/38+WEl\
I4afr5Q5EXMARkAoI2CCP2xvJNV+lMZ78LkH3V27LWVt2n9w4/+6JqdkxJPLqd7b1TADkw1p\
nIhS+QSI+HiEw5RPuVengV20d6Nf7K0t1oF1dj/ikUsatCEBEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEhD/B9wOq7SGUV++AAAAAElFTkSuQmCC";

ITSmoreQR="\
iVBORw0KGgoAAAANSUhEUgAAAG8AAABvAQMAAADYCwwjAAAABlBMVEX///9BaeFHqDaJAAAB\
HklEQVQ4jdXTsa2EMAwGYCMX7sICkVgjXVaCBe7CArASXdaIlAWgS4HwM5zEVS+mvSgS+ZBQ\
8gcb4BdHyzwv8szMSaUBHNm+KAd4QC8LDpDn8ogT4UpPGci2jI8IGFx3eLwPWaHknVyWecev\
UEbDXaB0X2aNjueYDOzNklQassPCkjc4nW3E1SfwqYk6jU/vAkPhg0AlSFhve8Jt0dkwDMwr\
yMGSSuPyWHAr19k0tkV2sb3sdW2rUCqW88g4Rp1A9s1JPv9cTplNRD4XFkin8XaQCIwT6Lzq\
ZO8dHw/4+U2GzqlS8gbqVmkfr1N6YXK8OqlD0OmlGTMvzPERA8AL9vvbOifpSoL33fsVytrL\
S9wiqDzznhUI38v5n783/gBuUs2eLglc8gAAAABJRU5ErkJggg==";

</script>

<div id="GJFactory_1" class="xxxGJFactory" style=""></div>
<!--
https://developer.mozilla.org/en-US/docs/Web/CSS/line-height
-->
<style>
  .GJFactory{
    resize:both; overflow:scroll;
    position:static;
    border:1.2px dashed #282; xborder-radius:2px;
    margin:0px; padding:10px !important;
    width:340px; height:340px;
    flex-wrap: wrap;
    color:#fff; background-color:rgba(0,0,0,0.0);
    line-height:0.0;
    xxxcolor:#22a !important;
    text-shadow:2px 2px #ddf;
  }
  .GJFactory h1,h2,h3,h4 {
    xxxcolor:#22a !important;
  }
  xxxinput {
    border:1px dashed #0f0; border-radius:0px;
  }
  .GJWin:hover{
    color:#df8 !important;
    background-color:rgba(32,32,160,0.8) !important;
    line-height:0.0;
  }
  .GJWin:active{
    color:#df8 !important;
    background-color:rgba(224,32,32,0.8) !important;
    line-height:0.0;
  }
  .GJWin:focus{
    color:#df8 !important;
    background-color:rgba(32,32,32,1.0) !important;
    line-height:0.0;
  }
  .GJWin{
    z-index:10000;
    display:inline;
    position:relative;
    flex-wrap: wrap;
    top:0; left:0px;
    width:285px !important; height:205px !important;
    border:1px solid #eea; border-radius:2px;
    margin:0px; padding:0px;
    font-size:8pt;
    line-height:0.0;
    color:#fff; background-color:rgba(0,0,64,0.1) !important;
  }
  .GJTab{
    display:inline;
    position:relative;
    top:0px; left:0px;
    margin:0px; padding:2px;
    border:0px solid #000; border-radius:2px;
    width:90px; height:20px;
    font-family:Georgia;
    font-size:9pt;
    line-height:1.0;
    white-space:nowrap;
    color:#fff; background-color:rgba(0,0,64,0.7);
    text-align:center;
    vertical-align:middle;
  }
  .GJStat:focus{
    color:#df8 !important;
    background-color:rgba(32,32,32,1.0) !important;
    line-height:1.0;
  }
  .GJStat{
    display:inline;
    position:relative;
    top:0px; left:0px;
    margin:0px; padding:2px;
    border:0px solid #00f; border-radius:2px;
    width:166px; height:20px;
    font-family:monospace;
    font-size:9pt;
    line-height:1.0;
    color:#fff; background-color:rgba(0,0,64,0.2);
    text-align:center;
    vertical-align:middle;
  }
  .GJIcon{
```

```
    display:inline;
    position:relative;
    top:0px; left:1px;
    border:2px solid #44a;
    margin:0px; padding:1px;
    width:13.2; height:13.2px;
    border-radius:2px;
    font-family:Georgia;
    font-size:13.2px;
    line-height:1.0;
    white-space:nowrap;
    color:#fff; background-color:rgba(32,32,160,0.8);
    text-align:center;
    vertical-align:middle;
    text-shadow:0px 0px;
  }
  .GJText:focus{
    color:#fff !important;
    background-color:rgba(32,32,160,0.8) !important;
    line-height:1.0;
  }
  .GJText{
    display:inline;
    position:relative;
    top:0px; left:0px;
    border:0px solid #000; margin:0px; padding:0px;
    width:280px; height:160px;
    border:0px;
    font-family:Courier New,monospace !important;
    font-size:8pt;
    line-height:1.0;
    white-space:pre;
    color:#fff; xbackground-color:rgba(0,0,64,0.5);
    background-color:rgba(32,32,128,0.8) !important;
  }
  .GJMode{
    display:inline;
    position:relative;
    top:0px; left:0px;
    border:0px solid #000; border-radius:0px;
    margin:0px; padding:0px;
    width:280px; height:20px;
    font-size:9pt;
    line-height:1.0;
    white-space:nowrap;
    color:#fff; background-color:rgba(0,0,64,0.7);
    text-align:left;
    vertical-align:middle;
  }
</style>

<script id="gsh-script">
  // 2020-0909 added, permanet local storage
  // https://developer.mozilla.org/en-US/docs/Web/API/Window/localStorage
  var MyHistory = ""
  Permanent = localStorage;
  MyHistory = Permanent.getItem('MyHistory')
  if( MyHistory == null ){ MyHistory = "" }
  d = new Date()
  MyHistory = d.getTime()/1000+" "+document.URL+"\n" + MyHistory
  Permanent.setItem('MyHistory',MyHistory)
  //Permanent.setItem('MyWindow',window)

  var GJLog_Win = null
  var GJLog_Tab = null
  var GJLog_Stat = null
  var GJLog_Text = null
  var GJWin_Mode = null
  var FProductInterval = 0

  var GJ_FactoryID = -1
  var GJFactory = null
  if( e = document.getElementById('GJFactory_0') ){
    GJFactory_1.height = 0
    GJFactory = e
    e.setAttribute('class','GJFactory')
    var GJ_FactoryID = 0
  }else{
    GJFactory = GJFactory_1
    var GJ_FactoryID = 1
  }

  function GJFactory_Destroy(){
    gjf = GJFactory
    //gjf = document.getElementById('GJFactory')
    //alert('gfj='+gjf)
    if( gjf != null ){
        if( gjf.childNodes != null ){
            for( i = 0; i < gjf.childNodes.length; i++ ){
                gjf.removeChild(gjf.childNodes[i])
            }
        }
        gjf.innerHTML = ''
        gjf.style.width = 0
        gjf.style.height = 0
        gjf.removeAttribute('style')
        GJLog_Win = GJLog_Tab = GJLog_Stat = GJLog_Text = GJWin_Mode = null
        window.clearInterval(FProductInterval)
        return '-- Destroy: work product destroyed'
    }else{
        return '-- Destroy: work product not exist'
    }
  }

  var TransMode = false
  var onKeyControl = false
  var OnKeyShift = false
  var OnKeyAlt = false
  var OnKeyJ = false
  var OnKeyK = false
  var OnKeyL = false

  function GJWin_OnKeyUp(ev){
    keycode = ev.code;
    if( keycode == 'ShiftLeft' ){
        OnKeyShift = false
    }else
    if( keycode == 'ControlLeft' ){
        onKeyControl = false
    }else
    if( keycode == 'AltLeft' ){
        OnKeyAlt = false
    }else
    if( keycode == 'KeyJ' ){ OnKeyJ = false }else
```

```
    if( keycode == 'KeyK' ){ OnKeyK = false }else
    if( keycode == 'KeyL' ){ OnKeyL = false }else
    {
    }
    ev.preventDefault()
  }
  function and(a,b){ if(a){ if(b){ return true; } return false; } }
  function GJWin_OnKeyDown(ev){
    keycode = ev.code;
    mode = ''
    key = ''
    if( keycode == 'ControlLeft' ){
        onKeyControl = true
        ev.preventDefault()
        return;
    }else
    if( keycode == 'ShiftLeft' ){
        OnKeyShift = true
        ev.preventDefault()
        return;
    }else
    if( keycode == 'AltLeft' ){
        ev.preventDefault()
        OnKeyAlt = true
        return;
    }else
    if( keycode == 'Backquote' ){
        TransMode = !TransMode
        ev.preventDefault()
    }else
    if( and(keycode == 'Space', OnKeyShift) ){
        TransMode = !TransMode
        ev.preventDefault()
    }else
    if( keycode == 'ShiftRight' ){
        TransMode = !TransMode
    }else
    if( keycode == 'Escape' ){
        TransMode = true
        ev.preventDefault()
    }else
    if( keycode == 'Enter' ){
        TransMode = false
        //ev.preventDefault()
    }
    if( keycode == 'KeyJ' ){ OnKeyJ = true }else
    if( keycode == 'KeyK' ){ OnKeyK = true }else
    if( keycode == 'KeyL' ){ OnKeyL = true }else
    {
    }

    if( ev.altKey    ){ key += 'Alt+' }
    if( onKeyControl ){ key += 'Ctrl+' }
    if( OnKeyShift   ){ key += 'Shift+' }
    if( and(keycode != 'KeyJ', OnKeyJ) ){ key += 'J+' }
    if( and(keycode != 'KeyK', OnKeyK) ){ key += 'K+' }
    if( and(keycode != 'KeyL', OnKeyL) ){ key += 'L+' }
    key += keycode

    if( TransMode ){
        //mode = "[\343\201\202r]"
        mode = "[あr]"
    }else{
        mode = '[---]'
    }
    ////  /gjmode.innerHTML = "[---]"
    GJWin_Mode.innerHTML = mode + ' ' + key
    //alert('Key:'+keycode)
    ev.stopPropagation()
    //ev.preventDefault()
  }
  function GJWin_OnScroll(ev){
    x = DragStartX = gsh.getBoundingClientRect().left.toFixed(0)
    y = DragStatty = gsh.getBoundingClientRect().top.toFixed(0)
    GJLog_append('OnScroll: x='+x+',y='+y)
  }
  document.addEventListener('scroll',GJWin_OnScroll)
  function GJWin_OnResize(ev){
    w = window.innerWidth
    h = window.innerHeight
    GJLog_append('OnResize: w='+w+',h='+h)
  }
  window.addEventListener('resize',GJWin_OnResize)

  var DragStartX = 0
  var DragStartY = 0
  function GJWin_DragStart(ev){
    // maybe this is the grabbing position
    this.style.position = 'fixed'
    x = DragStartX = this.getBoundingClientRect().left.toFixed(0)
    y = DragStatty = this.getBoundingClientRect().top.toFixed(0)
    GJLog_Stat.value = 'DragStart: x='+x+',y='+y
  }
  function GJWin_Drag(ev){
    x = ev.clientX; y = ev.clientY // x = ev.pageX; y = ev.pageY
    this.style.left = x - DragStartX
    this.style.top = y - DragStartY
    this.style.zIndex = '30000'
    this.style.position = 'fixed'
    x = this.getBoundingClientRect().left.toFixed(0)
    y = this.getBoundingClientRect().top.toFixed(0)
    GJLog_Stat.value = 'x='+x+',y='+y
    ev.preventDefault()
    ev.stopPropagation()
  }
  function GJWin_DragEnd(ev){
    x = ev.clientX; y = ev.clientY
    //x = ev.pageX; y = ev.pageY
    this.style.left = x - DragStartX
    this.style.top = y - DragStartY
    this.style.zIndex = '30000'
    this.style.position = 'fixed'
    if( true ){
        console.log("Dropped: "+this.nodeName+'#'+this.id+' x='+x+' y='+y
            +' parent='+this.parentNode.id)
    }
    x = this.getBoundingClientRect().left.toFixed(0)
    y = this.getBoundingClientRect().top.toFixed(0)
    GJLog_Stat.value = 'x='+x+',y='+y
    ev.preventDefault()
    ev.stopPropagation()
  }
  function GJWin_DragIgnore(ev){
    ev.preventDefault()
```

```
  ev.stopPropagation()
}
// 2020-09-15 let every object have console view!
var GJ_ConsoleID = 0
var PrevReport = new Date()
function GJLog_StatUpdate(){
  txa = GJLog_Stat;
  if( txa == null ){
      return;
  }
  tmLap0 = new Date();
  p = txa.parentNode;
  pw = txa.getBoundingClientRect().width;
  ph = txa.getBoundingClientRect().height;
  //txa.value += '#'+p.id+' pw='+pw+', ph='+ph+'\n';
  tx1 = '#'+p.id+' pw='+pw+', ph='+ph+'\n';

  w = txa.getBoundingClientRect().width;
  h = txa.getBoundingClientRect().height;
  //txa.value += 'w='+w+', h='+h+'\n';
  tx1 += 'w='+w+', h='+h+'\n';

  //txa.value += '\n';
  //txa.value += DateShort() + '\n';
  tx1 += '\n';
  tx1 += DateShort() + '\n';
  tmLap1 = new Date();

  txa.value += tx1;
  tmLap2 = new Date();

  // vertical centering of the last line
  sHeight = txa.scrollHeight - 30; // depends on the font-size
  tmLap3 = new Date();

  txa.scrollTop = sHeight; // depends on the font-size
  tmLap4 = new Date();

  now = tmLap0.getTime();
  if( PrevReport == 0 || 10000 <= now-PrevReport ){
      PrevReport = now;
      console.log('StatBarUpdate:'
          + 'leng=' + txa.value.length + ' byte, '
          + 'time='  + (tmLap4 -tmLap0) + 'ms {'
          + 'tadd=' + (tmLap2 -tmLap1) + ', '
          + 'hcal=' + (tmLap3 -tmLap2) + ', '
          + 'scrl=' + (tmLap4 -tmLap3) + '}'
      );
  }
}
GJWin_StatUpdate = GJLog_StatUpdate;
function GJ_showTime1(wid){
  //e = document.getElementById(wid);
  //console.log(wid.id+'.value.length='+wid.value.length)
  if( e != null ){
      //e.value = DateShort();
  }else{
      // should remove the Listener
  }
}
function GJWin_OnResizeTextarea(ev){
  this.value += 'resized:' + '\n'
}
function GJ_NewConsole(wname){
  wid = wname + '_' + GJ_ConsoleID
  GJ_ConsoleID += 1

  GJFactory.style.setProperty('width',360+'px'); //GJFsize
  GJFactory.style.setProperty('height',320+'px')
  e = GJFactory;
  console.log('GJFa #'+e.id+' from w='+e.style.width+', h='+e.style.height)

  if( GJFactory.innerHTML == "" ){
      GJFactory.innerHTML = '<'+'H3>GJ Factory_'+ GJ_FactoryID +'<'+'/H3><'+'hr>\n'
  }else{
      GJFactory.innerHTML += '<'+'hr>\n'
  }

  gjwin = GJLog_Win = document.createElement('span')
  gjwin.id = wid
  gjwin.setAttribute('class','GJWin')
  gjwin.setAttribute('draggable','true')
  gjwin.addEventListener('dragstart',GJWin_DragStart)
  gjwin.addEventListener('drag',GJWin_Drag)
  gjwin.addEventListener('dragend',GJWin_Drag)
  gjwin.addEventListener('dragover',GJWin_DragIgnore)
  gjwin.addEventListener('dragenter',GJWin_DragIgnore)
  gjwin.addEventListener('dragleave',GJWin_DragIgnore)
  gjwin.addEventListener('dragexit',GJWin_DragIgnore)
  gjwin.addEventListener('drop',GJWin_DragIgnore)
  gjwin.addEventListener('keydown',GJWin_OnKeyDown)

  gjtab = GJLog_Tab = document.createElement('textarea')
  gjtab.addEventListener('keydown',GJWin_OnKeyDown)
  gjtab.style.readonly = true
  gjtab.contenteditable = false
  gjtab.value = wid
  gjtab.id = wid + '_Tab'
  gjtab.setAttribute('class','GJTab')
  gjtab.setAttribute('spellcheck','false')
  gjwin.appendChild(gjtab)

  gjstat = GJLog_Stat = document.createElement('textarea')
  gjstat.addEventListener('keydown',GJWin_OnKeyDown)
  gjstat.id = wid + '_Stat'
  gjstat.value = DateShort()
  gjstat.setAttribute('class','GJStat')
  gjstat.setAttribute('spellcheck','false')
  gjwin.appendChild(gjstat)

  gjicon = document.createElement('span')
  gjicon.addEventListener('keydown',GJWin_OnKeyDown)
  gjicon.id = wid + '_Icon'
  gjicon.innerHTML = 'G<font color="#f44">J</font>'
  gjicon.setAttribute('class','GJIcon')
  gjicon.setAttribute('spellcheck','false')
  gjwin.appendChild(gjicon)

  gjtext = GJLog_Text = document.createElement('textarea')
  gjtext.addEventListener('keydown',GJWin_OnKeyDown)
  gjtext.addEventListener('keyup',GJWin_OnKeyUp)
  gjtext.addEventListener('resize',GJWin_OnResizeTextarea)
  gjtext.id = wid + '_Text'
  gjtext.setAttribute('class','GJText')
```

```
    gjtext.setAttribute('spellcheck','false')
    gjwin.appendChild(gjtext)


    // user's mode as of IME
    gjmode = GJWin_Mode = document.createElement('textarea')
    gjmode.addEventListener('keydown',GJWin_OnKeyDown)
    gjmode.addEventListener('keydown',GJWin_OnKeyDown)
    gjmode.id = wid + '_Mode'
    gjmode.setAttribute('class','GJMode')
    gjmode.setAttribute('spellcheck','false')
    gjmode.innerHTML = '[---]'
    gjwin.appendChild(gjmode)

    gjwin.zIndex = 30000
    GJFactory.appendChild(gjwin)

    gjtab.scrollTop = 0
    gjstat.scrollTop = 0

    //x = gjwin.getBoundingClientRect().left.toFixed(0)
    //y = gjwin.getBoundingClientRect().top.toFixed(0)
    //gjwin.style.position = 'static'
    //gjwin.style.left = 0
    //gjwin.style.top = 0

    //update = '{'+wid+'.value=DateShort()}',
    update = '{GJ_showTime1('+wid+');}',
    // 2020-09-19 this causes memory leaks
    //FProductInterval = window.setInterval(update,200)
    //FProductInterval = window.setInterval(GJWin_StatUpdate,200)
    //FProductInterval = window.setInterval(GJ_showTime1,200,wid);
    FProductInterval = window.setInterval(GJ_showTime1,200,gjstat);
    return update
  }
  function xxxGJF_StripClass(){
    GJLog_Win.style.removeProperty('width')
    GJLog_Tab.style.removeProperty('width')
    GJLog_Stat.style.removeProperty('width')
    GJLog_Text.style.removeProperty('width')
    return "Stripped classes"
  }
  function isElem(id){
    return document.getElementById(id) != null
  }
  function GJLog_append(...args){
    txt = GJLog_Text;
    if( txt == null ){
        return; // maybe GJLog element is removed
    }
    logs = args.join(' ')
    txt.value += logs + '\n'
    txt.scrollTop = txt.scrollHeight
    //GJLog_Stat.value = DateShort()
  }
  //window.addEventListener('time',GJLog_StatUpdate)
  function test_GJ_Console(){
    window.setInterval(GJLog_StatUpdate,1000);
    GJ_NewConsole('GJ_Console')
    e = GJFactory;
    console.log('GJF0 #'+e.id+' from w='+e.style.width+', h='+e.style.height)
    e.style.width = 360; //GJFsize
    e.style.height = 320;
    console.log('GJF0 #'+e.id+' to w='+e.style.width+', h='+e.style.height)
  }
  /// test_GJ_Console();

  var StopConsoleLog = true
  // 2020-09-15 added,
  // log should be saved to permanet memory
  // const px = new Proxy(console.log,{ alert() })
  __console_log = console.log
  __console_info = console.info
  __console_warn = console.warn
  __console_error = console.error
  __console_exception = console.exception
  // should pop callstack info.
  console.exception = function(...args){
    __console_exception(...args)
    alert('-- got console.exception("'+args+'")')
  }
  console.error = function(...args){
    __console_error(...args)
    alert('-- got console.error("'+args+'")')
  }
  console.warn = function(...args){
    __console_warn(...args)
    alert('-- got console.warn("'+args+'")')
  }
  console.info = function(...args){
    alert('-- got console.info("'+args+'")')
    __console_info(...args)
  }
  console.log = function(...args){
    __console_log(...args)
    if( StopConsoleLog ){
        return;
    }
    if( 0 <= args[0].indexOf('!') ){
        //alert('-- got console.log("'+args+'")')
    }
    GJLog_append(...args)
  }

//document.getElementById('GshFaviconURL').href = GShellFavicon
document.getElementById('GshFaviconURL').href = GShellInsideIcon
//document.getElementById('GshFaviconURL').href = ITSmoreQR
//document.getElementById('GshFaviconURL').href = GSellLogo

// id of GShell HTML elemets
var E_BANNER = "GshBanner" // banner element in HTML
var E_FOOTER = "GshFooter" // footer element in HTML
var E_GINDEX = "gsh-gindex" // index of Golang code of GShell
var E_GOCODE = "gsh-gocode" // Golang code of GSHell
var E_TODO   = "gsh-todo"   // TODO of GSHell
var E_DICT   = "gsh-dict"   // Dictionaly of GSHell

function bannerElem(){ return document.getElementById(E_BANNER); }
function bannerStyleFunc(){ return bannerElem().style; }
var bannerStyle = bannerStyleFunc()
bannerStyle.backgroundImage = "url("+GSellLogo+")";
//bannerStyle.backgroundImage = "url("+GShellInsideIcon+")";
//bannerStyle.backgroundImage = "url("+GShellFavicon+")";
GMenu.style.backgroundImage = "url("+GShellInsideIcon+")";
```

```
6697
6698 function footerElem(){ return document.getElementById(E_FOOTER); }
6699 function footerStyle(){ return footerElem().sytle; }
6700 //footerElem().style.backgroundImage="url("+ITSmoreQR+")";
6701 //footerStyle().backgroundImage = "url("+ITSmoreQR+")";
6702
6703 function html_fold(e){
6704     if( e.innerHTML == "Fold" ){
6705         e.innerHTML = "Unfold"
6706         document.getElementById('gsh-menu-exit').innerHTML=""
6707         document.getElementById('GshStatement').open=false
6708         GshFeatures.open = false
6709         document.getElementById('html-src').open=false
6710         document.getElementById(E_GINDEX).open=false
6711         document.getElementById(E_GOCODE).open=false
6712         document.getElementById(E_TODO).open=false
6713         document.getElementById('references').open=false
6714     }else{
6715         e.innerHTML = "Fold"
6716         document.getElementById('GshStatement').open=true
6717         GshFeatures.open = true
6718         document.getElementById(E_GINDEX).open=true
6719         document.getElementById(E_GOCODE).open=true
6720         document.getElementById(E_TODO).open=true
6721         document.getElementById('references').open=true
6722     }
6723 }
6724 function html_pure(e){
6725     if( e.innerHTML == "Pure" ){
6726         document.getElementById('gsh').style.display=true
6727         //document.style.display = false
6728         e.innerHTML = "Unpure"
6729     }else{
6730         document.getElementById('gsh').style.display=false
6731         //document.style.display = true
6732         e.innerHTML = "Pure"
6733     }
6734 }
6735
6736 var bannerIsStopping = false
6737 //NOTE: .com/JSREF/prop_style_backgroundposition.asp
6738 function shiftBG(){
6739     bannerIsStopping = !bannerIsStopping
6740     bannerStyle.backgroundPosition = "0 0";
6741 }
6742 // status should be inherited on Window Fork(), so use the status in DOM
6743 function html_stop(e,toggle){
6744     if( toggle ){
6745         if( e.innerHTML == "Stop" ){
6746             bannerIsStopping = true
6747             e.innerHTML = "Start"
6748         }else{
6749             bannerIsStopping = false
6750             e.innerHTML = "Stop"
6751         }
6752     }else{
6753         // update JavaScript variable from DOM status
6754         if( e.innerHTML == "Stop" ){ // shown if it's running
6755             bannerIsStopping = false
6756         }else{
6757             bannerIsStopping = true
6758         }
6759     }
6760 }
6761 html_stop(document.getElementById('GshMenuStop'),false) // onInit.
6762 //html_stop(bannerElem(),false) // onInit.
6763
6764 //https://www.w3schools.com/jsref/met_win_setinterval.asp
6765 function shiftBanner(){
6766     var now = new Date().getTime();
6767     //"console.log("now="+(now%10))
6768     if( !bannerIsStopping ){
6769         bannerStyle.backgroundPosition = ((now/10)%100000)+" 0";
6770     }
6771 }
6772 window.setInterval(shiftBanner,10); // onInit.
6773
6774 //  <a href="https://developer.mozilla.org/ja/docs/Web/API/Window/open">window.open()</a>
6775 // from embedded html to standalone page
6776 var MyChildren = 0
6777 function html_fork(){
6778     GJFactory_Destroy()
6779     MyChildren += 1
6780     WinId = document.getElementById('gsh-WinId').innerHTML + "." + MyChildren;
6781     newwin = window.open("",WinId,"");
6782     src = document.getElementById("gsh");
6783     srchtml = src.outerHTML
6784     newwin.document.write("/*<"+"html>\n");
6785     newwin.document.write(srchtml);
6786     newwin.document.write("<"+"/html>\n");
6787     newwin.document.getElementById('gsh-menu-exit').innerHTML = "Close";
6788     newwin.document.getElementById('gsh-WinId').innerHTML = WinId;
6789     newwin.document.close();
6790     newwin.focus();
6791 }
6792 function html_close(){
6793     window.close()
6794 }
6795 function win_jump(win){
6796     //win = window.top;
6797     win = window.openner; // https://developer.mozilla.org/ja/docs/Web/API/window.opener
6798     if( win == null ){
6799         console.log("jump to window.opener("+win+")(Error)\n")
6800     }else{
6801         console.log("jump to window.opener("+win+")\n")
6802         win.focus();
6803     }
6804 }
6805
6806 // 0.2.9 2020-0902 created chekcsum of HTML
6807 CRC32UNIX = 0x04C11DB7 // Unix cksum
6808 function byteCRC32add(bigcrc,octstr,octlen){
6809     var crc = new Int32Array(1)
6810     crc[0] = bigcrc
6811
6812     let oi = 0
6813     for( ; oi < octlen; oi++ ){
6814         var oct = new Int8Array(1)
6815         oct[0] = octstr[oi]
6816         for( bi = 0; bi < 8; bi++ ){
6817             //console.log("--CRC32 "+crc[0]+" "+oct[0].toString(16)+" ["+oi+"."+bi+"]\n")
6818             ovf1 = crc[0] < 0 ? 1 : 0
6819             ovf2 = oct[0] < 0 ? 1 : 0
6820             ovf = ovf1 ^ ovf2
```

```
            oct[0] <<= 1
            crc[0] <<= 1
            if( ovf ){ crc[0] ^= CRC32UNIX }
        }
    }
    //console.log("--CRC32 byteAdd return crc="+crc[0]+","+oi+"/"+octlen+"\n")
    return crc[0];
}
function strCRC32add(bigcrc,stri,strlen){
    var crc = new Uint32Array(1)
    crc[0] = bigcrc
    var code = new Uint8Array(strlen);
    for( i = 0; i < strlen; i++){
        code[i] = stri.charCodeAt(i) // not charAt() !!!!
        //console.log("=== "+code[i].toString(16)+" <<== "+stri[i]+"\n")
    }
    crc[0] = byteCRC32add(crc,code,strlen)
    //console.log("--CRC32 strAdd return crc="+crc[0]+"\n")
    return crc[0]
}
function byteCRC32end(bigcrc,len){
    var crc = new Uint32Array(1)
    crc[0] = bigcrc
    var slen = new Uint8Array(4)
    let li = 0
        for( ; li < 4; ){
                slen[li] = len
        li += 1
                len >>= 8
                if( len == 0 ){
                        break
        }
        }
        crc[0] = byteCRC32add(crc[0],slen,li)
        crc[0] ^= 0xFFFFFFFF
        return crc[0]
}
function strCRC32(stri,len){
    var crc = new Uint32Array(1)
    crc[0] = 0
    crc[0] = strCRC32add(0,stri,len)
    crc[0] = byteCRC32end(crc[0],len)
    //console.log("--CRC32 "+crc[0]+" "+len+"\n")
    return crc[0]
}

DestroyGJLink = null; // to be replaced
DestroyFooter = null; // to be defined
DestroyEventSharingCodeview = function dummy(){}
Destroy_WirtualDesktop = function(){}

function getSourceText(){
    if( DestroyFooter != null ) DestroyFooter();
    version = document.getElementById('GshVersion').innerHTML
    sfavico = document.getElementById('GshFaviconURL').href;
    sbanner = document.getElementById('GshBanner').style.backgroundImage;
    spositi = document.getElementById('GshBanner').style.backgroundPosition;

    if( document.getElementById('GJC_1') != null ){ GJC_1.remove() }
    if( DestroyGJLink != null ) DestroyGJLink();
    DestroyEventSharingCodeview();
    Destroy_WirtualDesktop();

    // these should be removed by CSS selector or class, after sevaed to non-printed attribute
    GshBanner.removeAttribute('style');
    document.getElementById('GshMenuSign').removeAttribute("style");
    styleGMenu = GMenu.getAttribute("style")
    GMenu.removeAttribute("style");
    styleGStat = GStat.getAttribute("style")
    GStat.removeAttribute("style");
    styleGTop = GTop.getAttribute("style")
    GTop.removeAttribute("style");
    styleGshGrid = GshGrid.getAttribute("style")
    GshGrid.removeAttribute("style");
    //styleGPos = GPos.getAttribute("style");
    //GPos.removeAttribute("style");
    //GPos.innerHTML = "";
    //styleGLog = GLog.getAttribute("style");
    //GLog.removeAttribute("style");
    //GLog.innerHTML = "";
    styleGShellPlane = GShellPlane.getAttribute("style")
    GShellPlane.removeAttribute("style")
    styleRawTextViewer = RawTextViewer.getAttribute("style")
    RawTextViewer.removeAttribute("style")
    styleRawTextViewerClose = RawTextViewerClose.getAttribute("style")
    RawTextViewerClose.removeAttribute("style")

    GshFaviconURL.href = "";

    //it seems that interHTML and outerHTML generate style="" for these (??)
    //GshBanner.removeAttribute('style');
    //GshFooter.removeAttribute('style');
    //GshMenuSign.removeAttribute('style');
    GshBanner.style=""
    GshMenuSign.style=""

    textarea = document.createElement("textarea")
    srchtml = document.getElementById("gsh").outerHTML;
        //textarea = document.createElement("textarea")
        // 2020-0910 ?? ... this causes inserting style="" to Banner and Footer,
        // with Chromium?/ after reloading from file:///
        textarea.innerHTML = srchtml
    // <a href="https://stackoverflow.com/questions/5796718/html-entity-decode">Thanks</a>
        var rawtext = textarea.value
        //textarea.destroy()
        //rawtext = gsh.textContent // this removes #include <FILENAME> too
        var orgtext = ""
         + "/*<"+"html>\n"  // lost preamble text
         + rawtext
         + "<"+"/html>\n"   // lost trail text
        ;

    tlen = orgtext.length
    //console.log("getSourceText: length="+tlen+"\n")
    document.getElementById('GshFaviconURL').href                 = sfavico;

    document.getElementById('GshBanner').style.backgroundImage    = sbanner;
    document.getElementById('GshBanner').style.backgroundPosition = spositi;

    GStat.setAttribute("style",styleGStat)
    GMenu.setAttribute("style",styleGMenu)
    GTop.setAttribute("style",styleGTop)
    //GLog.setAttribute("style",styleGLog)
    //GPos.setAttribute("style",styleGPos)
```

```
    GshGrid.setAttribute("style",styleGshGrid)
    GShellPlane.setAttribute("style",styleGShellPlane)
    RawTextViewer.setAttribute("style",styleRawTextViewer)
    RawTextViewerClose.setAttribute("style",styleRawTextViewerClose)
    canontext = orgtext.replace(' style=""','')
    // open="" too
    return canontext
}
function getDigest(){
    var text = ""
    text = getSourceText()
    var digest = ""
    tlen = text.length
    digest = strCRC32(text,tlen) + " " + tlen
    return { text, digest }
}
function html_digest(){
    version = document.getElementById('GshVersion').innerHTML
    let {text, digest} = getDigest()
    alert("cksum: " + digest + " " + version)
}
function charsin(stri,char){
    ln = 0;
    for( i = 0; i < stri.length; i++ ){
        if( stri.charCodeAt(i) == char.charCodeAt(0) )
            ln++;
    }
    return ln;
}

//class digestElement extends HTMLElement { }
//< script>customElements.define('digest',digestElement)< /script>
function showDigest(e){
    result = 'version=' + GshVersion.innerHTML + '\n'
    result += 'lines='   + e.dataset.lines   + '\n'
        + 'length='  + e.dataset.length  + '\n'
        + 'crc32u='  + e.dataset.crc32u  + '\n'
        + 'time='    + e.dataset.time    + '\n';

    alert(result)
}

function html_sign(e){
    if( RawTextViewer.style.zIndex == 1000 ){
        hideRawTextViewer()
        return
    }
    DestroyEventSharingCodeview();
    Destroy_WirtualDesktop();
    GJFactory_Destroy()
    if( DestroyGJLink != null ) DestroyGJLink();
    //gsh_digest_.innerHTML = "";
    text = getSourceText() // the original text
    tlen = text.length
    digest = strCRC32(text,tlen)
    //gsh_digest_.innerHTML = digest + " " + tlen
    //text = getSourceText() // the text with its digest
    Lines = charsin(text,'\n')

    name = "gsh"
    sid = name + "-digest"
    d = new Date()
    signedAt = d.getTime()

    sign = '/'+'*<'+'span\n'
        + ' id="' + sid + '"\n'
        + ' class="_digest_"\n'
        + ' data-target-id="'+name+'"\n'
        + ' data-crc32u="'  + digest    + '"\n'
        + ' data-length="'  + tlen      + '"\n'
        + ' data-lines="'   + Lines     + '"\n'
        + ' data-time="'    + signedAt  + '"\n'
        + ' ><' + '/span>\n*'+'/\n'

    text = sign + text

    txthtml = '<' + 'table id="LineNumbered"><' + 'tr><' + 'td>'
        + '<' + 'textarea cols=5 rows=' + Lines + ' class="LineNumber">'
    for( i = 1; i <= Lines; i++ ){
        txthtml += i.toString() + '\n'
    }
    txthtml += ""
        + '<' + '/textarea>'
        + '<' + '/td><' + 'td>'
        + '<' + 'textarea cols=150 rows=' + Lines + 'spellcheck="false"'
        + ' class="LineNumbered">'
        + text + '<'+'/textarea>'
        + '<' + '/td><' + '/tr><' + '/table>'

    for( i = 1; i <= 30; i++ ){
        txthtml += '<br>\n'
    }
    RawTextViewer.innerHTML = txthtml
    RawTextViewer.spellcheck = false // (spelcheck above seems ineffective)

    btn = e
    e.style.color = "rgba(128,128,255,0.9)";
    y = e.getBoundingClientRect().top.toFixed(0)
    //h = e.getBoundingClientRect().height.toFixed(0)
    RawTextViewer.style.top = Number(y) + 30
    RawTextViewer.style.left = 100;
    RawTextViewer.style.height = window.innerHeight - 20;
    //RawTextViewer.style.Opacity = 1.0;
    //RawTextViewer.style.backgroundColor = "rgba(0,0,0,0.0)";
    RawTextViewer.style.backgroundColor = "rgba(255,255,255,0.8)";
    RawTextViewer.style.zIndex = 1000;
    RawTextViewer.style.display = true;

    if( RawTextViewerClose.style == null ){
        RawTextViewerClose.style = "";
    }
    RawTextViewerClose.style.top = Number(y) + 10
    RawTextViewerClose.style.left = 100;
    RawTextViewerClose.style.zIndex = 1001;

    ScrollToElement(CurElement,RawTextViewerClose)
}
function hideRawTextViewer(){
    RawTextViewer.style.left = 10000;
    RawTextViewer.style.zIndex = -100;
    RawTextViewer.style.Opacity = 0.0;
    RawTextViewer.style = null
    RawTextViewer.innerHTML = "";
```

```
    GshMenuSign.style.color = "rgba(255,128,128,1.0)";
    RawTextViewerClose.style.top = 0;
    RawTextViewerClose.style = null
}

// source code viewr
function frame_close(){
    srcframe = document.getElementById("src-frame");
    srcframe.innterHTML = "";
    //srcframe.style.cols = 1;
    srcframe.style.rows = 1;
    srcframe.style.height = 0;
    srcframe.style.display = false;
    src = document.getElementById("SrcTextarea");
    src.innerHML = ""
    //src.cols = 0
    src.rows = 0
    src.display = false
    //alert("--closed--")
}
//<!-- | <span onclick="html_view();">Source</span> -->
//<!-- | <span onclick="frame_close();">SourceClose</span> -->
//<!--| <span>Download</span> -->
function frame_open(){
    if( DestroyFooter != null ) DestroyFooter();
    document.getElementById('GshFaviconURL').href = "";
    oldsrc = document.getElementById("GENSRC");
    if( oldsrc != null ){
        //alert("--I--(erasing old text)")
        oldsrc.innterHTML = "";
        return
    }else{
        //alert("--I--(no old text)")
    }
    styleBanner = GshBanner.getAttribute("style")
    GshBanner.removeAttribute("style")
    if( document.getElementById('GJC_1') ){ GJC_1.remove() }

    GshFaviconURL.href = "";
    GStat.removeAttribute('style')
    GshGrid.removeAttribute('style')
    GshMenuSign.removeAttribute('style')
    //GPos.removeAttribute('style')
    //GPos.innerHTML = "";
    //GLog.removeAttribute('style')
    //GLog.innerHTML = "";
    GMenu.removeAttribute('style')
    GTop.removeAttribute('style')
    GShellPlane.removeAttribute('style')
    RawTextViewer.removeAttribute('style')
    RawTextViewerClose.removeAttribute('style')

    if( DestroyGJLink != null ) DestroyGJLink();
    GJFactory_Destroy()
    Destroy_WirtualDesktop();
    DestroyEventSharingCodeview();

    src = document.getElementById("gsh");
    srchtml = src.outerHTML
    srcframe = document.getElementById("src-frame");
    srcframe.innerHTML = ""
     + "<"+"cite id=\"GENSRC\">\n"
     + "<"+"style>\n"
     + "#GENSRC textarea{tab-size:4;}\n"
     + "#GENSRC textarea{-o-tab-size:4;}\n"
     + "#GENSRC textarea{-moz-tab-size:4;}\n"
     + "#GENSRC textarea{spellcheck:false;}\n"
     + "</"+"style>\n"
     + "<"+'textarea id="SrcTextarea" cols=100 rows=20 class="gsh-code" spellcheck="false">'
     + "/*<"+"html>\n"  // lost preamble text
     + srchtml
     + "<"+"/html>\n"   // lost trail text
     + "</"+"textarea>\n"
     + "</"+"cite><!-- GENSRC -->\n";

    //srcframe.style.cols = 80;
    //srcframe.style.rows = 80;

    GshBanner.setAttribute('style',styleBanner)
}
function fill_CSSView(){
    part = document.getElementById('GshStyleDef')
    view = document.getElementById('gsh-style-view')
    view.innerHTML = ""
     + "<"+'textarea cols=100 rows=20 class="gsh-code">'
     + part.innerHTML
     + "<"+"/textarea>"
}
function fill_JavaScriptView(){
    jspart = document.getElementById('gsh-script')
    view = document.getElementById('gsh-script-view')
    view.innerHTML = ""
     + "<"+'textarea cols=100 rows=20 class="gsh-code">'
     + jspart.innerHTML
     + "<"+"/textarea>"
}
function fill_DataView(){
    part = document.getElementById('gsh-data')
    view = document.getElementById('gsh-data-view')
    view.innerHTML = ""
     + "<"+'textarea cols=100 rows=20 class="gsh-code">'
     + part.innerHTML
     + "<"+"/textarea>"
}
function jumpto_StyleView(){
    jsview = document.getElementById('html-src')
    jsview.open = true
    jsview = document.getElementById('gsh-style-frame')
    jsview.open = true
    fill_CSSView()
}
function jumpto_JavaScriptView(){
    jsview = document.getElementById('html-src')
    jsview.open = true
    jsview = document.getElementById('gsh-script-frame')
    jsview.open = true
    fill_JavaScriptView()
}
function jumpto_DataView(){
    jsview = document.getElementById('html-src')
    jsview.open = true
    jsview = document.getElementById('gsh-data-frame')
    jsview.open = true
    fill_DataView()
```

```
}
function jumpto_WholeView(){
    jsview = document.getElementById('html-src')
    jsview.open = true
    jsview = document.getElementById('gsh-whole-view')
    jsview.open = true
    frame_open()
}
function html_view(){
    html_stop();

    banner = document.getElementById('GshBanner').style.backgroundImage;
    footer = document.getElementById('GshFooter').style.backgroundImage;
    document.getElementById('GshBanner').style.backgroundImage = "";
    document.getElementById('GshBanner').style.backgroundPosition = "";
    document.getElementById('GshFooter').style.backgroundImage = "";

    //srcwin = window.open("","CodeView2","");
    srcwin = window.open("","","");
    srcwin.document.write("<span id=\"gsh\">\n");

    src = document.getElementById("gsh");
    srcwin.document.write("<"+"style>\n");
    srcwin.document.write("textarea{tab-size:4;}\n");
    srcwin.document.write("textarea{-o-tab-size:4;}\n");
    srcwin.document.write("textarea{-moz-tab-size:4;}\n");
    srcwin.document.write("</style>\n");
    srcwin.document.write("<h2>\n");
    srcwin.document.write("<"+"span onclick=\"window.close();\">Close</span> | \n");
    //srcwin.document.write("<"+"span onclick=\"html_stop();\">Run</span>\n");
    srcwin.document.write("</h2>\n");
    srcwin.document.write("<"+"textarea id=\"gsh-src-src\" cols=100 rows=60>");
    srcwin.document.write("/*<"+"html>\n");
    srcwin.document.write("<"+"span id=\"gsh\">");
    srcwin.document.write(src.innerHTML);
    srcwin.document.write("<"+"/span><"+"/html>\n");
    srcwin.document.write("</"+"textarea>\n");

    document.getElementById('GshBanner').style.backgroundImage = banner;
    document.getElementById('GshFooter').style.backgroundImage = footer

    sty = document.getElementById("GshStyleDef");
    srcwin.document.write("<"+"style>\n");
    srcwin.document.write(sty.innerHTML);
    srcwin.document.write("<"+"/style>\n");

    run = document.getElementById("gsh-script");
    srcwin.document.write("<"+"script>\n");
    srcwin.document.write(run.innerHTML);
    srcwin.document.write("<"+"/script>\n");

    srcwin.document.write("<"+"/span><"+"/html>\n"); // gsh span
    srcwin.document.close();
    srcwin.focus();
}
GSH = document.getElementById("gsh")

//GSH.onclick = "alert('Ouch!')"
//GSH.css = "{background-color:#eef;}"
//GSH.style = "background-color:#eef;"
//GSH.style.display = false;
//alert('Ouch0!')
//GSH.style.display = true;

// 2020-0904 created, tentative
document.addEventListener('keydown',jgshCommand);
//CurElement = GshStatement
CurElement = GshMenu
MemElement = GshMenu

function nextSib(e){
    n = e.nextSibling;
    for( i = 0; i < 100; i++ ){
        if( n == null ){
            break;
        }
        if( n.nodeName == "DETAILS" ){
            return n;
        }
        n = n.nextSibling;
    }
    return null;
}
function prevSib(e){
    n = e.previousSibling;
    for( i = 0; i < 100; i++ ){
        if( n == null ){
            break;
        }
        if( n.nodeName == "DETAILS" ){
            return n;
        }
        n = n.previousSibling;
    }
    return null;
}
function setColor(e,eName,eColor){
    if( e.hasChildNodes() ){
        s = e.childNodes;
        if( s != null ){
            for( ci = 0; ci < s.length; ci++ ){
                if( s[ci].nodeName == eName ){
                    s[ci].style.color = eColor;
                    //s[ci].style.backgroundColor = eColor;
                    break;
                }
            }
        }
    }
}

// https://docs.microsoft.com/en-us/previous-versions//hh781509(v=vs.85)
function showCurElementPosition(ev){
//  if( document.getElementById("GPos") == null ){
//      return;
//  }
//  if( GPos == null ){
//      return;
//  }
    e = CurElement
    y = e.getBoundingClientRect().top.toFixed(0)
    x = e.getBoundingClientRect().left.toFixed(0)

    h = ev + " "
```

```
    h += 'y='+y+", "+ 'x='+x+" -- "
    h += "w=" + window.innerWidth + ", h=" + window.innerHeight + " -- "
    //GPos.test = h
    //GPos.innerHTML = h
//  GPos.innerHTML = h
}

function zero2(n){
    if( n < 10 ){
        return '0' + n;
    }else{
        return n;
    }
}
function DateHourMin(){
    d = new Date();
    //return '%02d:%02d'.sprintf(d.getHours(),d.getMinutes())
    return zero2(d.getHours()) + ":" + zero2(d.getMinutes());
}
function DateShort(){
    d = new Date()
    return  d.getFullYear()
        + "/" + zero2(d.getMonth())
        + "/" + zero2(d.getDate())
        + " " + zero2(d.getHours())
        + ":" + zero2(d.getMinutes())
        + ":" + zero2(d.getSeconds())
}
function DateLong0(ms){
    d = new Date();
    d.setTime(ms);
    return
        //d.getFullYear() + "/" + d.getMonth() + "/" + d.getDate() + " "
        //+ d.getHours() + ":" + d.getMinutes() + ":" + d.getSeconds()
        DateShort()
        + "." + d.getMilliseconds()
        + " " + d.getTimezoneOffset()/60
        + " "
        + d.getTime()  + "." + d.getMilliseconds()

}
function DateLong(){
    return DateLong0(new Date());
}
function GShellMenu(e){
    //GLog.innerHTML = "Hello, World! (" + DateLong() + ")"
    showGShellPlane()
}
// placements of planes
function GShellResizeX(ev){
    //if( document.getElementById("GMenu") != null ){
        GMenu.style.left = window.innerWidth - 100
        GMenu.style.top = window.innerHeight - 90 - 200
        //console.log("place GMENU "+GMenu.style.left+" "+GMenu.style.top)

    //}
    GStat.style.width = window.innerWidth
    //if( document.getElementById("GPos") != null ){
        //GPos.style.width = window.innerWidth
        //GPos.style.top = window.innerHeight - 30; //GPos.style.height
    //}
    //if( document.getElementById("GLog") != null ){
    //  GLog.style.width = window.innerWidth
        //GLog.innerHTML = ""
    //}
    //if( document.getElementById("GLog") != null ){
        //GLog.innerHTML = "Resize: w=" + window.innerWidth +
        //", h=" + window.innerHeight
    //}
    showCurElementPosition(ev)
}
function GShellResize(){
    GShellResizeX("[RESIZE]")
}
window.onresize = GShellResize
var prevNode = null
var LogMouseMoveOverElement = false;
function GJSH_OnMouseMove(ev){
    if( LogMouseMoveOverElement == false ){
        return;
    }
    x = ev.clientX
    y = ev.clientY
    d = new Date()
    t = d.getTime() / 1000
    if( document.elementFromPoint ){
        e = document.elementFromPoint(x,y)
        if( e != null ){
            if( e == prevNode ){
            }else{
                console.log('Mo~'+t+'('+x+','+y+') '
                    +e.nodeType+' '+e.tagName+'#'+e.id)
                prevNode = e
            }
        }else{
            console.log(t+'('+x+','+y+') no element')
        }
    }else{
        console.log(t+'('+x+','+y+') no elementFromPoint')
    }
}
window.addEventListener('mousemove',GJSH_OnMouseMove);

function GJSH_OnMouseMoveScreen(ev){
    x = ev.screenX
    y = ev.screenY
    d = new Date()
    t = d.getTime() / 1000
    console.log(t+'('+x+','+y+') no elementFromPoint')
}
//screen.addEventListener('mousemove',GJSH_OnMouseMoveScreen);

function ScrollToElement(oe,ne){
    ne.scrollIntoView()
    ny = ne.getBoundingClientRect().top.toFixed(0)
    nx = ne.getBoundingClientRect().left.toFixed(0)
    //GLog.innerHTML = "["+ny+","+nx+"]"
    //window.scrollTo(0,0)

    GTop.style.backgroundColor = "rgba(0,0,0,0.0)"
    GshGrid.style.left = '250px';
    GshGrid.style.zIndex = 0
    if( false ){
        oy = oe.getBoundingClientRect().top.toFixed(0)
```

```
        ox = oe.getBoundingClientRect().left.toFixed(0)
        y = e.getBoundingClientRect().top.toFixed(0)
        x = e.getBoundingClientRect().left.toFixed(0)
        window.scrollTo(x,y)
        ny = e.getBoundingClientRect().top.toFixed(0)
        nx = e.getBoundingClientRect().left.toFixed(0)
        //GLog.innerHTML = "["+oy+","+ox+"]->["+y+","+x+"]->["+ny+","+nx+"]"
    }
}
function showGShellPlane(){
    if( GShellPlane.style.zIndex == 0 ){
        GShellPlane.style.zIndex = 1000;
        GShellPlane.style.left = 30;
        GShellPlane.style.height = 320;
        GShellPlane.innerHTML = DateLong() + "<br>" +
            "-- History --<br>" + MyHistory;
    }else{
        GShellPlane.style.zIndex = 0;
        GShellPlane.style.left = 0;
        GShellPlane.style.height = 50;
        GShellPlane.innerHTML = "";
    }
}
var SuppressGJShell = false
function jgshCommand(kevent){
    if( SuppressGJShell ){
        return
    }
    key = kevent
    keycode = key.code
    //GStat.style.width = window.innerWidth
    GStat.style.backgroundColor = "rgba(0,0,0,0.4)"

    console.log("JSGsh-Key:"+keycode+"(^-^)//")
    if( keycode == "Slash" ){
        console.log('('+x+','+y+') ')
        e = document.elementFromPoint(x,y)
        console.log('('+x+','+y+') '+e.nodeType+' '+e.tagName+'#'+e.id)
    }else
    if( keycode == "Digit0" ){ // fold side-bar
        // "Zero page"
        showGShellPlane();
    }else
    if( keycode == "Digit1" ){ // fold side-bar
        primary.style.width = "94%"
        secondary.style.width = "0%"
        secondary.style.opacity = 0
        GStat.innerHTML = "[Single Column View]"
    }else
    if( keycode == "Digit2" ){ // unfold side-bar
        primary.style.width = "58%"
        secondary.style.width = "36%"
        secondary.style.opacity = 1
        GStat.innerHTML = "[Double Column View]"
    }else
    if( keycode == "KeyU" ){ // fold/unfold all
        html_fold(GshMenuFold);
        location.href = "#"+CurElement.id;
    }else
    if( keycode == "KeyO" || keycode == "ArrowRight" ){ // fold the element
        CurElement.open = !CurElement.open;
    }else
    if( keycode == "ArrowRight" ){ // unfold the element
        CurElement.open = true
    }else
    if( keycode == "ArrowLeft" ){ // unfold the element
        CurElement.open = false
    }else
    if( keycode == "KeyI" ){ // inspect the element
        e = CurElement
        //GLog.innerHTML =
        GJLog_append("Current Element: " + e + "<br>"
            + "name="+e.nodeName + ", "
            + "id="+e.id + ", "
            + "children="+e.childNodes.length + ", "
            + "parent="+e.parentNode.id + "<br>"
            + "text="+e.textContent)
        GStat.style.backgroundColor = "rgba(0,0,0,0.8)"
        return
    }else
    if( keycode == "KeyM" ){ // memory the position
        MemElement = CurElement
    }else
    if( keycode == "KeyN" || keycode == "ArrowDown" ){ // next element
        e = nextSib(CurElement)
        if( e != null ){
            setColor(CurElement,"SUMMARY","#fff")
            setColor(e,"SUMMARY","#8f8") // should be complement ?
            oe = CurElement
            CurElement = e
            //location.href = "#"+e.id;
            ScrollToElement(oe,e)
        }
    }else
    if( keycode == "KeyP" || keycode == "ArrowUp" ){ // previous element
        oe = CurElement
        e = prevSib(CurElement)
        if( e != null ){
            setColor(CurElement,"SUMMARY","#fff")
            setColor(e,"SUMMARY","#8f8") // should be complement ?
            CurElement = e
            //location.href = "#"+e.id;
            ScrollToElement(oe,e)
        }else{
            e = document.getElementById("GshBanner")
            if( e != null ){
                setColor(CurElement,"SUMMARY","#fff")
                CurElement = e
                ScrollToElement(oe,e)
            }else{
                e = document.getElementById("primary")
                if( e != null ){
                    setColor(CurElement,"SUMMARY","#fff")
                    CurElement = e
                    ScrollToElement(oe,e)
                }
            }
        }
    }else
    if( keycode == "KeyR" ){
        location.reload()
    }else
    if( keycode == "KeyJ" ){
        GshGrid.style.top = '120px';
```

```
        GshGrid.innerHTML = '(>_<){Down}';
    }else
    if( keycode == "KeyK" ){
        GshGrid.style.top = '0px';
        GshGrid.innerHTML = '(^-^){Up}';
    }else
    if( keycode == "KeyH" ){
        GshGrid.style.left = '0px';
        GshGrid.innerHTML = "('_'){Left}";
    }else
    if( keycode == "KeyL" ){
        //GLog.innerHTML +=
        GJLog_append(
            'screen='+screen.width+'px'+'<br>'+
            'window='+window.innerWidth+'px'+'<br>'
        )
        GshGrid.style.left = (document.documentElement.clientWidth-160).toString(10)+'px';
        GshGrid.innerHTML = '(@_@){Right}';
    }else
    if( keycode == "KeyS" ){
        html_stop(GshMenuStop,true)
    }else
    if( keycode == "KeyF" ){
        html_fork()
    }else
    if( keycode == "KeyC" ){
        window.close()
    }else
    if( keycode == "KeyD" ){
        html_digest()
    }else
    if( keycode == "KeyV" ){
        e = document.getElementById('gsh-digest')
        if( e != null ){
            showDigest(e)
        }
    }

    showCurElementPosition("["+key.code+"] --");
    //if( document.getElementById("GPos") != null ){
        //GPos.innerHTML += "["+key.code+"] --"
    //}
    //GShellResizeX("["+key.code+"] --");
}
GShellResizeX("[INIT]");

DisplaySize = '-- Display: '+ 'screen='+screen.width+'px, '+'window='+window.innerWidth+'px';

let {text, digest} = getDigest()
//GLog.innerHTML +=
GJLog_append(
    '-- GShell: ' + GshVersion.innerHTML + '\n' +
    '-- Digest: ' + digest + '\n' +
    DisplaySize
    //+ "<br>" + "-- LastVisit:<br>" + MyHistory
)
GShellResizeX(null);

// <a href="https://www.w3.org/TR/WebCryptoAPI/">Web Cryptography API</a>
//Convert a string into an ArrayBuffer
//from https://developers.google.com/web/updates/2012/06/How-to-convert-ArrayBuffer-to-and-from-String
function str2ab(str) {
    const buf = new ArrayBuffer(str.length);
    const bufView = new Uint8Array(buf);
    for (let i = 0, strLen = str.length; i < strLen; i++) {
        bufView[i] = str.charCodeAt(i);
    }
    return buf;
}
function importPrivateKey(pem) {
  const binaryDerString = window.atob(pemContents);
  const binaryDer = str2ab(binaryDerString);
  return window.crypto.subtle.importKey(
    "pkcs8",
    binaryDer,
    {
     name: "RSA-PSS",
     modulusLength: 2048,
     publicExponent: new Uint8Array([1, 0, 1]),
     hash: "SHA-256",
    },
    true,
    ["sign"]
  );
}
//importPrivateKey(ppem)

//key = {}
//buf = "abc"
//enc = "xyzxxxxxx"; //crypto.publicEncrypt(key,buf)
//b64 = btoa(enc)
//dec = atob(b64)
//GLog.innerHTML = "enc:" + b64 + ", dec:" + dec
</script>
*/

/*
<!-- ----- GJConsole BEGIN { ----- -->
<span id="gjc" data-title="GJConsole" data-author="sato@its-more.jp">
<details><summary>GJ Console</summary>
<p>
<span id="GJE_RootNode0"></span>
</p>
<style id="GJConsoleStyle">
  .GJConsole {
    z-index:1000;
    width:400; height:200px;
    margin:2px;
    color:#fff; background-color:#66a;
    font-size:12px; font-family:monospace,Courier New;
  }
</style>

<script id="GJConsoleScript" class="GJConsole">
  var PS1 = "% "
  function GJC_Keydown(keyevent){
    key = keyevent.code
    if( key == "Enter" ){
        GJC_Command(this)
        this.value += "\n" + PS1 // prompt
    }else
    if( key == "Escape"){
        SuppressGJShell = false
        GshMenu.focus() // should be previous focus
```

```
  }
}
var GJC_SessionId
function GJC_SetSessionId(){
  var xd = new Date()
  GJC_SessionId = xd.getTime() / 1000
}
GJC_SetSessionId()
function GJC_Memory(mem,args,text){
  argv = args.split(' ')
  cmd = argv[0]
  argv.shift()
  args = argv.join(' ')
  ret = ""

  if( cmd == 'clear' ){
      Permanent.setItem(mem,'')
  }else
  if( cmd == 'read' ){
      ret = Permanent.getItem(mem)
  }else
  if( cmd == 'save' ){
      val = Permanent.getItem(mem)
      if( val == null ){ val = "" }
      d = new Date()
      val += d.getTime()/1000+" "+GJC_SessionId+" "+document.URL+" "+args+"\n"
      val += text.value
      Permanent.setItem(mem,val)
  }else
  if( cmd == 'write' ){
      val = Permanent.getItem(mem)
      if( val == null ){ val = "" }
      d = new Date()
      val += d.getTime()/1000+" "+GJC_SessionId+" "+document.URL+" "+args+"\n"
      Permanent.setItem(mem,val)
  }else{
      ret = "Commands: write | read | save | clear"
  }
  return ret
}
// -- 2020-09-14 added TableEditor
var GJE_CurElement = null; //GJE_RootNode
GJE_NodeSaved = null
GJE_TableNo = 1
function GJE_StyleKeyCommand(kev){
  keycode = kev.code
  console.log('GJE-Key: '+keycode)
  if( keycode == 'Escape' ){
      GJE_SetStyle(this);
  }
  kev.stopPropagation()
  // https://developer.mozilla.org/en-US/docs/Web/API/Event/stopPropagation
}
var GJE_CommandMode = false
function GJE_TableKeyCommand(kev,tab){
  wasCmdMode = GJE_CommandMode
  key = kev.code
  if( key == 'Escape' ){
      console.log("To command mode: "+tab.nodeName+"#"+tab.id)
      //tab.setAttribute('contenteditable','false')
      tab.style.caretColor = "blue"
      GJE_CommandMode = true
  }else
  if( key == "KeyA" ){
      tab.style.caretColor = "red"
      GJE_CommandMode = false
  }else
  if( key == "KeyI" ){
      tab.style.caretColor = "red"
      GJE_CommandMode = false
  }else
  if( key == "KeyO" ){
      tab.style.caretColor = "red"
      GJE_CommandMode = false
  }else
  if( key == "KeyJ" ){
      console.log("ROW-DOWN")
  }else
  if( key == "KeyK" ){
      console.log("ROW-UP")
  }else
  if( key == "Keyw" ){
      console.log("COL-FORW")
  }else
  if( key == "Keyb" ){
      console.log("COL-BACK")
  }

  kev.stopPropagation()
  if( wasCmdMode ){
      kev.preventDefault()
  }
}
function GJE_DragEvent(ev,elem){
  x = ev.clientX
  y = ev.clientY
  console.log("Dragged: "+this.nodeName+'#'+this.id+' x='+x+' y='+y)
}
// https://developer.mozilla.org/en-US/docs/Web/API/DragEvent
// https://www.w3.org/TR/uievents/#events-mouseevents
function GJE_DropEvent(ev,elem){
  x = ev.clientX
  y = ev.clientY
  this.style.x = x
  this.style.y = y
  this.style.position = 'absolute' // 'fixed'
  this.parentNode = gsh // just for test
  console.log("Dropped: "+this.nodeName+'#'+this.id+' x='+x+' y='+y
      +' parent='+this.parentNode.id)
}
function GJE_SetTableStyle(ev){
  this.innerHTML = this.value; // sync. for external representation?
  if(false){
      stid = this.parentNode.id+this.id
          // and remove "_span" at the end
      e = document.getElementById(stid)
      //alert('SetTableStyle #'+e.id+'\n'+this.value)
      if( e != null ){
          e.innerHTML = this.value
      }else{
          console.log('Style Not found: '+stid)
      }
      //alert('event StopPropagetion: '+ev)
  }
```

```
  }
  function setCSSofClass(cclass,cstyle){
    const ss = document.styleSheets[3]; // 0, 1, 2, 3, ... ?
    rlen = ss.cssRules.length;
    let tabrule = null;
    rulex = -1

    // should skip white space at the top of cstyle
    sel = cstyle.charAt(0);
    selector = sel+cclass;
    console.log('-- search style rule for '+selector)

    for(let i = 0; i < rlen; i++){
        cr = ss.cssRules[i];
        console.log('CSS rule ['+i+'/'+rlen+'] '+cr.selectorText);
        if( cr.selectorText  === selector ){ // css class selector
            tabrule = ss.cssRules[i];
            console.log('CSS rule found for:['+i+'/'+rlen+'] '+selector);
            ss.deleteRule(i);
            //rlen = ss.cssRules.length;
            rulex = i
            // should search and replace the property here
        }
    }
    // https://developer.mozilla.org/en-US/docs/Web/API/CSSStyleSheet/insertRule
    if( tabrule == null ){
        console.log('CSS rule NOT found for:['+rlen+'] '+selector);
        ss.insertRule(cstyle,rlen);
        ss.insertRule(cstyle,0); // override by 0?
        console.log('CSS rule inserted:['+(rlen+1)+']\n'+cstyle);
    }else{
        ss.insertRule(cstyle,rlen);
        ss.insertRule(cstyle,0);
        console.log('CSS rule replaced:['+(rlen+1)+']\n'+cstyle);
    }
  }
  function GJE_SetStyle(te){
    console.log('Apply the style to:'+te.id+'\n');
    console.log('Apply the style to:'+te.parentNode.id+'\n');
    console.log('Apply the style to:'+te.parentNode.class+'\n');
    cclass = te.parentNode.class;
    setCSSofClass(cclass,te.value); // should get selecter part from
                    // selector { rules }

    if(false){
    //console.log('Apply the style:')
    //stid = this.parentNode.id+this.id+"
    //stid = this.id+".style"
    css = te.value
    stid = te.parentNode.id+".style"
    e = document.getElementById(stid)
    if( e != null ){
        //console.log('Apply the style:'+e.id+'\n'+te.value);
        console.log('Apply the style:'+e.id+'\n'+css);
//      e.innerHTML = css; //te.value;
        //ncss = e.sheet;
        //ncss.insertRule(te.value,ncss.cssRules.length);
    }else{
        console.log('No element to Apply the style: '+stid)
    }
    tblid = te.parentNode.id+".table";
    e = document.getElementById(tblid);
    if( e != null ){
        //e.setAttribute('style',css);
        e.setProperty('style',css,'!impotant');
    }
    }
  }
  function makeTable(argv){
    //tid = ''
    cwe = GJE_CurElement
    tid = 'table_' + GJE_TableNo

    nt = new Text('\n')
    cwe.appendChild(nt)

    ne = document.createElement('span'); // the container
    cwe.appendChild(ne)
    ne.id = tid + '-span'
    ne.setAttribute('contenteditable',true)

    htspan = document.createElement('span'); // html part
    //htspan.id = tid + '-html'
    //ne.innerHTML = '\n'
    nt = new Text('\n')
    ne.appendChild(nt)
    ne.appendChild(htspan)

    htspan.id = tid
    htspan.setAttribute('class',tid)

    ne.setAttribute('draggable','true')
    ne.addEventListener('drag',GJE_DragEvent);
    ne.addEventListener('dragend',GJE_DropEvent);

    var col = 3
    var row = 2
    if( argv[0] != null ){
        col = argv[0]
        argv.shift()
    }
    if( argv[0] != null ){
        row = argv[0]
        argv.shift()
    }

    //ne.setAttribute('class',tid)
    ht = "\n"
    //ht += '<'+'table ' + 'id="'+tid+'"' + ' class="'+tid+'"'
    ht += '<'+'table '
        + ' onkeydown="GJE_TableKeyCommand(event,this)"'
        //+ ' ondrag="GJE_DragEvent(event,this)"\n'
        //+ ' ondragend="GJE_DropEvent(event,this)"\n'
        //+ ' draggable="true"\n'
        //+ ' contenteditable="true"'
        + '>\n'
    ht += '<'+'tbody>\n';
    for( r = 0; r < row; r++ ){
        ht += "<"+"tr>\n"
        for( c = 0; c < col; c++ ){
            ht += "<"+"td>"
            ht +=  "ABCDEFGHIJKLMNOPQRSTUVWXYZ".charAt(c) + r
            ht += "<"+"/td>\n"
        }
```

```
        ht += "<"+"/tr>\n"
    }
    ht += '<'+'/tbody>\n';
    ht += '<'+'/table>\n';
    htspan.innerHTML = ht;
    nt = new Text('\n')
    ne.appendChild(nt)

    st = '#'+tid+' *{\n' // # for instanse specific
        +'  '+'border:1px solid #aaa;\n'
        +'  '+'background-color:#efe;\n'
        +'  '+'color:#222;\n'
        +'  '+'font-size:#14pt !important;\n'
        +'  '+'font-family:monospace,Courier New !important;\n'
        +'} /'+'* hit ESC to apply *'+'/\n'

    // wish script to be incldued
    //nj = document.createElement('script')
    //ne.appendChild(nj)
    //ne.innerHTML = 'function SetStyle(e){}'

    // selector seems lost in dynamic style appending
    if(false){
     ns = document.createElement('style')
     ne.appendChild(ns)
     ns.id = tid + '.style'
     ns.innerHTML = '\n'+st
     nt = new Text('\n')
     ne.appendChild(nt)
    }
    setCSSofClass(tid,st); // should be in JavaScript script?

    nx = document.createElement('textarea')
    ne.appendChild(nx)
    nx.id = tid + '-style_def'
    nx.setAttribute('class','GJ_StyleEditor')
    nx.spellcheck = false
    nx.cols = 60
    nx.rows = 10
    nx.innerHTML = '\n'+st
    nx.addEventListener('change',GJE_SetTableStyle);
    nx.addEventListener('keydown',GJE_StyleKeyCommand);
    //nx.addEventListener('click',GJE_SetTableStyle);

    nt = new Text('\n')
    cwe.appendChild(nt)

    GJE_TableNo += 1
    return 'created TABLE id="'+tid+'"'
  }
  function GJE_NodeEdit(argv){
    cwe = GJE_CurElement
    cmd = argv[0]
    argv.shift()
    args = argv.join(' ')
    ret = ""

    if( cmd == '.u' || cmd == '.un' || cmd == 'undo' ){
        if( GJE_NodeSaved != null ){
            xn = GJE_RootNode
            GJE_RootNode = GJE_NodeSaved
            GJE_NodeSaved = xn
            ret = '-- did undo'
        }else{
            ret = '-- could not undo'
        }
        return ret
    }
    GJE_NodeSaved = GJE_RootNode.cloneNode()
    if( cmd == '.c' || cmd == '.cd' || cmd == 'cd' ){
        if( argv[0] == null ){
            ne = GJE_RootNode
        }else
        if( argv[0] == '..' ){
            ne = cwe.parentNode
        }else{
            ne = document.getElementById(argv[0])
        }
        if( ne != null ){
            GJE_CurElement = ne
            ret = "-- current node: " + ne.id
        }else{
            ret = "-- not found: " + argv[0]
        }
    }else
    if( cmd == '.mkt' || cmd == '.mktable' ){
        makeTable(argv)
    }else
    if( cmd == '.m' || cmd == '.mk' || cmd == 'mk' ){
        ne = document.createElement(argv[0])
        //ne.id = argv[0]
        ret = "-- created " + ne + " under " + cwe.tagName + "#" + cwe.id
        cwe.appendChild(ne)
        if( cmd == '.m' || cmd == '.mk' ){
            GJE_CurElement = ne
        }
    }else
    if( cmd == '.n' || cmd == '.nm' || cmd == 'nm' ){
        cwe.id = argv[0]
    }else
    if( cmd == '.r' || cmd == '.rm' || cmd == 'rm' ){
    }else
    if( cmd == '.h' || cmd == '.sh' || cmd == 'sh' ){
        s = argv.join(' ')
        cwe.innerHTML = s
    }else
    if( cmd == '.a' || cmd == '.sa' || cmd == 'sa' ){
        cwe.setAttribute(argv[0],argv[1])
    }else
    if( cmd == '.l' ){
    }else
    if( cmd == '.i' || cmd == '.ih' || cmd == 'ih' ){
        ret = cwe.innerHTML
    }else
    if( cmd == '.p' || cmd == '.pw' || cmd == 'pw' ){
        ret = cwe.nodeType + " " + cwe.tagName + " " + cwe.id
        for( we = cwe.parentNode; we != null; ){
            ret += "\n" + " " + we.nodeType + " " + we.tagName + " " + we.id
            we = we.parentNode
        }
    }else
    {
        ret = "Command: mk | rm \n"
        ret += "   pw -- print current node\n"
```

```
        ret += "   mk type -- make node with name and type\n"
        ret += "   nm name -- set the id #name of current node\n"
        ret += "   rm name -- remove named node\n"
        ret += "   cd name -- change current node\n"
    }
    //alert(ret)
    return ret
}
function GJC_Command(text){
    lines = text.value.split('\n')
    line = lines[lines.length-1]
    argv = line.split(' ')
    text.value += '\n'
    if( argv[0] == '%' ){ argv.shift() }
    args0 = argv.join(' ')
    cmd = argv[0]
    argv.shift()
    args = argv.join(' ')

    if( cmd == 'nolog' ){
        StopConsoleLog = true
    }else
    if( cmd == 'new' ){
        if( argv[0] == 'table' ){
            argv.shift()
            console.log('argv='+argv)
            text.value += makeTable(argv)
        }else
        if( argv[0] == 'console' ){
            text.value += GJ_NewConsole('GJ_Console')
        }else{
            text.value += '-- new { console | table }'
        }
    }else
    if( cmd == 'strip' ){
        //text.value += GJF_StripClass()
    }else
    if( cmd == 'css' ){
    sel = '#table_1'
    if(argv[0]=='0')
    rule1 = sel+'{color:#000 !important; background-color:#fff !important;}';
    else
    rule1 = sel+'{color:#f00 !important; background-color:#eef !important;}';
        document.styleSheets[3].deleteRule(0);
        document.styleSheets[3].insertRule(rule1,0);
        text.value += 'CSS rule added: '+rule1
    }else
    if( cmd == 'print' ){
        e = null;
        if( e == null ){
            e = document.getElementById('GJFactory_0')
        }
        if( e == null ){
            e = document.getElementById('GJFactory_1')
        }
        if( argv[0] != null ){
            id = argv[0]
            if( id  == 'f' ){
                //e = document.getElementById('GJE_RootNode');
            }else{
                e = document.getElementById(id)
            }
            if( e != null ){
                text.value += e.outerHTML
            }else{
                text.value += "Not found: " + id
            }
        }else{
            text.value += GJE_RootNode.outerHTML
            //text.value += e.innerHTML
        }
    }else
    if( cmd == 'destroy' ){
        text.value += GJFactory_Destroy()
    }else
    if( cmd == 'save' ){
        e = document.getElementById('GJFactory')
        Permanent.setItem('GJFactory-1',e.innerHTML)
        text.value += "-- Saved GJFactory"
    }else
    if( cmd == 'load' ){
        gjf = Permanent.getItem('GJFactory-1')
        e = document.getElementById('GJFactory')
        e.innerHTML = gjf
        // must restore EventListener
        text.value += "-- EventListener was not restored"
    }else
    if( cmd.charAt(0) == '.' ){
        argv0 = args0.split(' ')
        text.value += GJE_NodeEdit(argv0)
    }else
    if( cmd == 'cont' ){
        bannerIsStopping = false
        GshMenuStop.innerHTML = "Stop"
    }else
    if( cmd == 'date' ){
        text.value += DateLong()
    }else
    if( cmd == 'echo' ){
        text.value += args
    }else
    if( cmd == 'fork' ){
        html_fork()
    }else
    if( cmd == 'last' ){
        text.value += MyHistory
        //h = document.createElement("span")
        //h.innerHTML = MyHistory
        //text.value += h.innerHTML
        //tx = MyHistory.replace("\n","")
        //text.value += tx.replace("<"+"br>","\n") + "xxxx<"+"br>yyyy"
    }else
    if( cmd == 'ne' ){
        text.value += GJE_NodeEdit(argv)
    }else
    if( cmd == 'reload' ){
        location.reload()
    }else
    if( cmd == 'mem' ){
        text.value += GJC_Memory('GJC_Storage',args,text)
    }else
    if( cmd == 'stop' ){
        bannerIsStopping = true
        GshMenuStop.innerHTML = "Start"
```

```
    }else
    if( cmd == 'who' ){
        text.value += "SessionId="+GJC_SessionId+" "+document.URL
    }else
    if( cmd == 'wall' ){
        text.value += GJC_Memory('GJC_Wall','write',text)
    }else
    {
        text.value += "Commands: help | echo | date | last \n"
                + '          new  | save | load | mem  \n'
                + '          who  | wall | fork | nife'
    }
  }

  function GJC_Input(){
    if( this.value.endsWith("\n") ){ // remove NL added by textarea
        this.value = this.value.slice(0,this.value.length-1)
    }
  }

  var GCJ_Id = null
  function GJC_Resize(){
    GJC_Id.style.zIndex = 20000
    GJC_Id.style.width = window.innerWidth - 16
    GJC_Id.style.height = 300
    GJC_Id.style.backgroundColor = "rgba(0,64,16,1.0)" // blackboard color
    GJC_Id.style.color = "rgba(255,255,255,1.0)"
  }
  function GJC_FocusIn(){
    this.spellcheck = false
    SuppressGJShell = true
    this.onkeydown = GJC_Keydown
    GJC_Resize()
  }
  function GJC_FocusOut(){
    SuppressGJShell = false
    this.removeEventListener('keydown',GJC_Keydown);
  }
  window.addEventListener('resize',GJC_Resize);

  function GJC_OnStorage(e){
    //alert('Got Message')
    //GJC.value += "\n(((ReceivedMessage)))\n"
  }
  window.addEventListener('storage',GJC_OnStorage);
  //window.addEventListener('storage',()=>{alert('GotMessage')})

  function GJC_Setup(gjcId){
    gjcId.style.width = gsh.getBoundingClientRect().width
    gjcId.value = "GJShell Console // " + GshVersion.innerHTML + "\n"
    //gjcId.value += "Date: " + DateLong() + "\n"
    gjcId.value += PS1
    gjcId.onfocus = GJC_FocusIn
    gjcId.addEventListener('input',GJC_Input);
    gjcId.addEventListener('focusout',GJC_FocusOut);
    GJC_Id = gjcId
  }
  function GJC_Clear(id){
  }
  if( document.getElementById("GJC_0") != null ){
    GJC_Setup(GJC_0)
  }else{
    document.write('<'+'textarea id="GJC_1" class="GJConsole"><'+'/textarea>')
    GJC_Setup(GJC_1)
    factory = document.createElement('span');
    gsh.appendChild(factory)
    GJE_RootNode = factory;
    GJE_CurElement = GJE_RootNode;
  }

  // TODO: focus handling
</script>
<style>
.GJ_StyleEditor {
  font-size:9pt !important;
  font-family:Courier New, monospace !important;
}
</style>

</details>
</span>
<!-- ----- GJConsole END } ----- -->
*/

/*
<span id="BlinderText">
<style id="BlinderTextStyle">
 #GJLinkView {
    xxposition:absolute; z-index:5000;
    position:relative;
    display:block;
    left:8px;
    color:#fff;
    width:800px; height:300px; resize:both;
    margin:0px; padding:4px;
    background-color:rgba(200,200,200,0.5) !important;
 }
 .MssgText {
    width:578px !important;
    resize:both !important;
    color:#000 !important;
 }
 .GjNote {
    font-family:Georgia !important;
    font-size:13pt !important;
    color:#22a !important;
 }
 .textField  {
    display:inline;
    border:0.5px solid #444;
    border-radius:3px;
    color:#000; background-color:#fff;
    width:106pt; height:18pt;
    margin:2px;
    padding:2px;
    resize:none;
    vertical-align:middle;
    font-size:10pt; font-family:Courier New;
 }
 .textLabel {
    border:0px solid #000 !important;
    background-color:rgba(0,0,0,0);
 }
 .textURL {
```

```
    width:300pt !important;
    border:0px solid #000 !important;
    background-color:rgba(0,0,0,0);
}
 .VisibleText {
 }
 .BlinderText {
    color:#000; background-color:#eee;
 }
 .joinButton {
    font-family:Georgia !important;
    font-size:11pt;
    line-height:1.1;
    height:18pt;
    width:50pt;
    padding:3px !important;
    text-align:center !important;
    border-color:#aaa !important;
    border-radius:5px;
    color:#fff; background-color:#4a4 !important;
    vertical-align:middle !important;
 }
 .SendButton {
    vertical-align:top;
 }
 .ws0_log {
    font-size:10pt;
    color:#000 !important;
    line-height:1.0;
    background-color:rgba(255,255,255,0.7) !important;
    font-family:Courier New,monospace !important;
    width:99.3%;
    white-space:pre;
 }
</style>

<!-- Form autofill test
Location: <input id="xxserv" type="text" value="https://192.168.10.1/boafrm/formLogin" size="80">
<form method="POST" id="xxform" action="https://192.168.10.1/boafrm/formLogin">
dest?     <input id="XDS" name="dest" type="text" size="80" value="/index_contents.html">
-->
<details><summary>Form Auto. Filling</summary>
<style>
 .xxinput { width:260pt !important; line-height:1.1 !important; margin:1px;
    display:inline !important; font-size:10pt !important; padding:1px !important;
 }
</style>
<span style="font-family:Courier New;color:black;font-size:12pt;" onactive="">
 <form method="POST" id="xxform" action="https://192.168.10.1/" style="white-space:pre;">
 Location: <input id="xxserv" class="xxinput" type="text" value="https://192.168.10.1/" size="80">
 Username: <input id="xxuser" class="xxinput" name="user" type="text" autocomplete="on">
 Password: <input id="xxpass" class="xxinput" name="pass" type="password" autocomplete="on">
 SessionId:<input id="xxssid" class="xxinput" name="SESSION_ID" type="text" size="80">
           <input id="xxsubm" class="xxinput" type="submit" value="Submit"></form>
</span>
<script>
 function XXSetFormAction(){
    xxform.setAttribute('action',xxserv.value);
}
xxform.setAttribute('action',xxserv.value);
xxserv.addEventListener('change',XXSetFormAction);
//xxserv.value = location.href;
</script>
</details>
*/

/*
<details id="BlinderTextClass" class="gsh-src"><summary>BlinderText</summary>
<span id="BlinderTextScript">
// https://w3c.github.io/uievents/#event-type-keydown
//
// 2020-09-21 class BlinderText - textarea element not to be readable
//
// BlinderText attributes
//  bl_plainText - null
//  bl_hideChecksum - [false]
//  bl_showLength - [false]
//  bl_visible - [false]
//  data-bl_config - []
//    - min. length
//    - max. length
//    - acceptable charset in generete text
//
function BlinderChecksum(text){
    plain = text.bl_plainText;
    return strCRC32(plain,plain.length).toFixed(0);
}
function BlinderKeydown(ev){
    pass = ev.target
    if( ev.code == 'Enter' ){
        ev.preventDefault();
    }
    ev.stopPropagation()
}
function BlinderKeyup1(ev){
    blind = ev.target
    if( ev.code == 'Backspace'){
        blind.bl_plainText = blind.bl_plainText.slice(0,blind.bl_plainText.length-1)
    }else
    if( and(ev.code == 'KeyV', ev.ctrlKey) ){
        blind.bl_visible = !blind.bl_visible;
    }else
    if( and(ev.code == 'KeyL', ev.ctrlKey) ){
        blind.bl_showLength = !blind.bl_showLength;
    }else
    if( and(ev.code == 'KeyU', ev.ctrlKey) ){
        blind.bl_plainText = "";
    }else
    if( and(ev.code == 'KeyR', ev.ctrlKey) ){
        checksum = BlinderChecksum(blind);
        blind.bl_plainText = checksum; //.toString(32);
    }else
    if( ev.code == 'Enter' ){
        ev.stopPropagation();
        ev.preventDefault();
        return;
    }else
    if( ev.key.length != 1 ){
        console.log('KeyUp: '+ev.code+'/'+ev.key);
        return;
    }else{
        blind.bl_plainText += ev.key;
    }
```

```
    leng = blind.bl_plainText.length;
    //console.log('KeyUp: '+ev.code+'/'+blind.bl_plainText);
    checksum = BlinderChecksum(blind) % 10; // show last one digit only

    visual = '';
    if( !blind.bl_hideCheckSum || blind.bl_showLength ){
        visual += '[';
    }
    if( !blind.bl_hideCheckSum ){
        visual += '#'+checksum.toString(10);
    }
    if( blind.bl_showLength ){
        visual += '/' + leng;
    }
    if( !blind.bl_hideCheckSum || blind.bl_showLength ){
        visual += '] ';
    }
    if( blind.bl_visible ){
        visual += blind.bl_plainText;
    }else{
        visual += '*'.repeat(leng);
    }
    blind.value = visual;
}
function BlinderKeyup(ev){
    BlinderKeyup1(ev);
    ev.stopPropagation();
}
// https://w3c.github.io/uievents/#keyboardevent
// https://w3c.github.io/uievents/#uievent
// https://dom.spec.whatwg.org/#event
function BlinderTextEvent(){
    ev = event;
    blind = ev.target;
    console.log('Event '+ev.type+'@'+blind.nodeName+'#'+blind.id)
    if( ev.type == 'keyup' ){
        BlinderKeyup(ev);
    }else
    if( ev.type == 'keydown' ){
        BlinderKeydown(ev);
    }else{
        console.log('thru-event '+ev.type+'@'+blind.nodeName+'#'+blind.id)
    }
}
//< textarea hidden id="BlinderTextClassDef" class="textField""
// onkeydown="BlinderTextEvent()" onkeyup="BlinderTextEvent()"
// spellcheck="false">< /textarea>
//< textarea hidden id="gj_pass1"
//  class="textField BlinderText"
//  placeholder="PassWord1"
//  onkeydown="BlinderTextEvent()"
//  onkeyup="BlinderTextEvent()"
//  spellcheck="false"< /textarea>
function SetupBlinderText(parent,txa,phold){
    if( txa == null ){
        txa = document.createElement('textarea');
        //txa.id = id;
    }
    txa.setAttribute('class','textField BlinderText');
    txa.setAttribute('placeholder',phold);
    txa.setAttribute('onkeydown','BlinderTextEvent()');
    txa.setAttribute('onkeyup','BlinderTextEvent()');
    txa.setAttribute('spellcheck','false');
    //txa.setAttribute('bl_plainText','false');
    txa.bl_plainText = '';
    //parent.appendChild(txa);
}
function DestroyBlinderText(txa){
    txa.removeAttribute('class');
    txa.removeAttribute('placeholder');
    txa.removeAttribute('onkeydown');
    txa.removeAttribute('onkeyup');
    txa.removeAttribute('spellcheck');
    txa.bl_plainText = '';
}
//
// visible textarea like Username
//
function VisibleTextEvent(){
    if( event.code == 'Enter' ){
        if( event.target.NoEnter ){
            event.preventDefault();
        }
    }
    event.stopPropagation();
}
function SetupVisibleText(parent,txa,phold){
    if( false ){
        txa.setAttribute('class','textField VisibleText');
    }else{
        newclass = txa.getAttribute('class');
        if( and(newclass != null, newclass != '') ){
            newclass += ' ';
        }
        newclass += 'VisibleText';
        txa.setAttribute('class',newclass);
    }
    //console.log('SetupVisibleText class='+txa.class);
    txa.setAttribute('placeholder',phold);
    txa.setAttribute('onkeydown','VisibleTextEvent()');
    txa.setAttribute('onkeyup',  'VisibleTextEvent()');
    txa.setAttribute('spellcheck','false');
    cols = txa.getAttribute('cols');
    if( cols != null ){
        txa.style.width = '580px';
        //console.log('VisualText#'+txa.id+' cols='+cols)
    }else{
        //console.log('VisualText#'+txa.id+' NO cols')
    }
    rows = txa.getAttribute('rows');
    if( rows != null ){
        txa.style.height = '30px';
        txa.style.resize = 'both';
        txa.NoEnter = false;
    }else{
        txa.NoEnter = true;
    }
}
function DestroyVisibleText(txa){
    txa.removeAttribute('class');
    txa.removeAttribute('placeholder');
    txa.removeAttribute('onkeydown');
    txa.removeAttribute('onkeyup');
    txa.removeAttribute('spellcheck');
```

```
    cols = txa.removeAttribute('cols');
}
</span>
<script>
js = document.getElementById('BlinderTextScript');
eval(js.innerHTML);
//js.outerHTML = ""
</script>

</details>
</span>
*/

/*
<script id="GJLinkScript">
function gjkey_hash(text){
    return strCRC32(text,text.length) % 0x10000;
}
function gj_addlog(e,msg){
    now = (new Date().getTime() / 1000).toFixed(3);
    tstp = '['+now+'] '
    e.value += tstp + msg;
    e.scrollTop = e.scrollHeight;
}
function gj_addlog_cl(msg){
    ws0_log.value += '(console.log) ' + msg + '\n';
}
var GJ_Channel = null;
var GJ_Log = null;
var gjx; // the global variable
function GJ_Join(){
    target = gj_join;
    if( target.value == 'Leave' ){
        GJ_Channel.close();
        GJ_Channel = null;
        target.value = 'Join';
        return;
    }

    var ws0;
    var ws0_log;

    sav_console_log = console.error
    console.error = gj_addlog_cl
    ws0 = new WebSocket(gj_serv.innerHTML);
    console.error = sav_console_log

    GJ_Channel = ws0;
    ws0_log = document.getElementById('ws0_log');
    GJ_Log = ws0_log;

    now = (new Date().getTime() / 1000).toFixed(3);
    const wsstats = ["CONNECTING","OPEN","CLOSING","CLOSED"];
    cst = wsstats[ws0.readyState];
    gj_addlog(ws0_log,'stat '+ws0.readyState+'('+cst+') : GJ Linked\n');

    ws0.addEventListener('error', function(event){
        gj_addlog(ws0_log,'stat error : transport error?\n');
    });
    ws0.addEventListener('open', function(event){
        GJLinkView.style.zIndex = 10000;
        //console.log('#'+GJLinkView.id+'.zIndex='+GJLinkView.style.zIndex);
        date1 = new Date().getTime();
        date2 = (date1 / 1000).toFixed(3);
        seed = date1.toString(16);

        // user name and key
        user = document.getElementById('gj_user').value;
        if( user.length == 0 ){
            gj_user.value = 'nemo';
            user = 'nemo';
        }
        key1 = document.getElementById('gj_ukey').bl_plainText;
        ukey = gjkey_hash(seed+user+key1).toString(16);

        // session name and key
        chan = document.getElementById('gj_chan').value;
        if( chan.length == 0 ){
            gj_chan.value = 'main';
            chan = 'main';
        }
        key2 = document.getElementById('gj_ckey').bl_plainText;
        ckey = gjkey_hash(seed+chan+key2).toString(16);

        msg = date2 +' JOIN ' + user + '|' + chan + ' ' + ukey + ':' + ckey;
        gj_addlog(ws0_log,'send '+msg+'\n');
        ws0.send(msg);

        target.value = 'Leave';
        //console.log('['+date2+'] #'+target.id+' '+target.value+'\n');
        //gj_addlog(ws0_log,'label '+target.value+'\n');
    });
    ws0.addEventListener('message', function(event){
        now = (new Date().getTime() / 1000).toFixed(3);
        msg = event.data;
        gj_addlog(ws0_log,'recv '+msg+'\n');

        argv = msg.split(' ')
        tstamp = argv[0];
        argv.shift();
        if( argv[0] == 'reload' ){
            location.reload()
        }
        argv.shift(); // command
        argv.shift(); // from|to
        if( argv[0] == 'auth' ){
            // doing authorization required
        }
        if( argv[0] == 'echo' ){
            now = (new Date().getTime() / 1000).toFixed(3);
            msg = now+' '+'RESP '+argv.join(' ');
            gj_addlog(ws0_log,'send '+msg+'\n');
            ws0.send(msg);
        }
        if( argv[0] == 'eval' ){
            argv.shift();
            js = argv.join(' ');
            ret = eval(js); // <------------ eval()
            gj_addlog(ws0_log,'eval '+js+' = '+ret+'\n');
            now = (new Date().getTime() / 1000).toFixed(3);
            msg = now + ' ' + 'RESP ' + ret;
            ws0.send(msg);
            gj_addlog(ws0_log,'send '+msg+'\n')
        }
```

```
    });
    ws0.addEventListener('close', function(event){
        if( GJ_Channel == null ){
            gj_addlog(ws0_log,'stat OK : GJ UnLinked\n');
            return;
        }
        GJ_Channel.close();
        GJ_Channel = null;
        target.value = 'Join';
        gj_addlog(ws0_log,'stat error : close : GJ UnLinked unexpectedly\n');
    });
}
function GJ_SendMessageUserPass(user,chan,msgbody){
    now = (new Date().getTime() / 1000).toFixed(3);
    msg = now +' ISAY '+user+'|'+chan+' '+ msgbody;
    gj_addlog(GJ_Log,'send '+msg+'\n');
    GJ_Channel.send(msg);
}
function GJ_SendMessage(msgbody){
    if( GJ_Channel == null ){
        gj_addlog(ws0_log,'stat error : send : GJ not Linked\n');
        return;
    }
    //target = event.target;
    user = document.getElementById('gj_user').value;
    chan = document.getElementById('gj_chan').value;
    GJ_SendMessageUserPass(user,chan,msgbody);
}
function GJ_Send(){
    msgbody = gj_sendText.value;
    GJ_SendMessage(msgbody);
}
</script>

<!-- ------------------------- GJLINK ------------------ -->
<!--
    - User can subscribe to a channel
    - A channel will be broadcasted
    - A channel can be a pattern (regular expression)
    - User is like From:(me) and channel is like To: or Recipient:
    - like VIABUS
        - watch message with SENDME, WATCH, CATCH, HEAR, or so
        - routing with path expression or name pattern (with routing with DNS like system)
-->
*/

//<span id="GJLinkGolang">
// <details id="GshWebSocket" class="gsh-src"><summary>Golang / JavaScript Link</summary>
// 2020-0920 created
// <a href="https://pkg.go.dev/golang.org/x/net/websocket">WS</a>
// <a href="https://godoc.org/golang.org/x/net/websocket">WS</a>
// INSTALL: go get golang.org/x/net/websocket
// INSTALL: sudo {apt,yum} install git (if git is not instlled yet)
// import "golang.org/x/net/websocket"
const gshws_origin = "http://locahost:9999"
const gshws_server = "localhost:9999"
const gshws_port = 9999
const gshws_path = "gjlink1"
const gshws_url = "ws://"+gshws_server+"/"+gshws_path
const GSHWS_MSGSIZE = (8*1024)
func fmtstring(fmts string, params ...interface{})(string){
    return fmt.Sprintf(fmts,params...)
}
func GSHWS_MARK(what string)(string){
    now := time.Now()
    us := fmtstring("%06d",now.Nanosecond() / 1000)
    mark := ""
    if( !AtConsoleLineTop ){
        mark += "\n"
        AtConsoleLineTop = true
    }
    mark += "["+now.Format(time.Stamp)+"."+us+"] -GJ-" + what + ": "
    return mark
}
func gchk(what string,err error){
    if( err != nil ){
        panic(GSHWS_MARK(what)+err.Error())
    }
}
func glog(what string, fmts string, params ...interface{}){
    fmt.Print(GSHWS_MARK(what))
    fmt.Printf(fmts+"\n",params...)
}

var WSV = []*websocket.Conn{}
func jsend(argv []string){
    if len(argv) <= 1 {
        fmt.Printf("--Ij %v [-m] command arguments\n",argv[0])
        return
    }
    argv = argv[1:]
    if( len(WSV) == 0 ){
        fmt.Printf("--Ej-- No link now\n")
        return
    }
    if( 1 < len(WSV) ){
        fmt.Printf("--Ij-- multiple links (%v)\n",len(WSV))
    }

    multicast := false // should be filtered with regexp
    if( 0 < len(argv) && argv[0] == "-m" ){
        multicast = true
        argv = argv[1:]
    }
    args := strings.Join(argv," ")

        now := time.Now()
        msec := now.UnixNano() / 1000000;
        tstamp := fmtstring("%.3f",float64(msec)/1000.0)
        msg := fmtstring("%v SEND gshell|* %v",tstamp,args)

    if( multicast ){
        for i,ws := range WSV {
            wn,werr := ws.Write([]byte(msg))
            if( werr != nil ){
                fmt.Printf("[%v] wn=%v, werr=%v\n",i,wn,werr)
            }
            glog("SQ",fmtstring("(%v) %v",wn,msg))
        }
    }else{
        i := 0
            ws := WSV[i]
            wn,werr := ws.Write([]byte(msg))
            if( werr != nil ){
```

```
                fmt.Printf("[%v] wn=%v, werr=%v\n",i,wn,werr)
            }
            glog("SQ",fmtstring("(%v) %v",wn,msg))
    }
}
func serv1(ws *websocket.Conn) {
    WSV = append(WSV,ws)
    //fmt.Print("\n")
    glog("CO","accepted connections[%v]",len(WSV))
    //remoteAddr := ws.RemoteAddr
    //fmt.Printf("-- accepted %v\n",remoteAddr)
    //fmt.Printf("-- accepted %v\n",ws.Config())
    //fmt.Printf("-- accepted %v\n",ws.Config().Header)
    //fmt.Printf("-- accepted %v // %v\n",ws,serv1)

    var reqb = make([]byte,GSHWS_MSGSIZE)
    for {
        rn, rerr := ws.Read(reqb)
        if( rerr != nil || rn < 0 ){
            glog("SQ",fmtstring("(%v,%v)",rn,rerr))
            break
        }
        req := string(reqb[0:rn])
        glog("SQ",fmtstring("(%v) %v",rn,req))

        margv := strings.Split(req," ");
        margv = margv[1:]
        if( 0 < len(margv) ){
            if( margv[0] == "RESP" ){
                // should forward to the destination
                continue;
            }
        }
        now := time.Now()
        msec := now.UnixNano() / 1000000;
        tstamp := fmtstring("%.3f",float64(msec)/1000.0)
        res := fmtstring("%v "+"CAST"+" %v",tstamp,req)
        wn, werr := ws.Write([]byte(res))
        gchk("SE",werr)
        glog("SR",fmtstring("(%v) %v",wn,string(res)))
    }
    glog("SF","WS response finish")

    wsv := []*websocket.Conn{}
    wsx := 0
    for i,v := range WSV {
        if( v != ws ){
            wsx = i
            wsv = append(wsv,v)
        }
    }
    WSV = wsv
    //glog("CO","closed %v",ws)
    glog("CO","closed connection [%v/%v]",wsx+1,len(WSV)+1)
    ws.Close()
}
// url ::= [scheme://]host[:port][/path]
func decomp_URL(url string){
}
func full_wsURL(){
}
func gj_server(argv []string) {
    gjserv := gshws_url
    gjport := gshws_server
    gjpath := gshws_path
    gjscheme := "ws"

    //cmd := argv[0]
    argv = argv[1:]
    if( 1 <= len(argv) ){
        serv := argv[0]
        if( 0 < strings.Index(serv,"://") ){
            schemev := strings.Split(serv,"://")
            gjscheme = schemev[0]
            serv = schemev[1]
        }
        if( 0 < strings.Index(serv,"/") ){
            pathv := strings.Split(serv,"/")
            serv = pathv[0]
            gjpath = pathv[1]
        }
        servv := strings.Split(serv,":")
        host := "localhost"
        port := 9999
        if( servv[0] != "" ){
            host = servv[0]
        }
        if( len(servv) == 2 ){
            fmt.Sscanf(servv[1],"%d",&port)
        }
        //glog("LC","hostport=%v (%v : %v)",servv,host,port)
        gjport = fmt.Sprintf("%v:%v",host,port)
        gjserv = gjscheme + "://" + gjport + "/" + gjpath
    }
    glog("LS",fmtstring("listening at %v",gjserv))
    http.Handle("/"+gjpath,websocket.Handler(serv1))
    err := error(nil)
    if( gjscheme == "wss" ){
        // https://golang.org/pkg/net/http/#ListenAndServeTLS
        //err = http.ListenAndServeTLS(gjport,nil)
    }else{
        err = http.ListenAndServe(gjport,nil)
    }
    gchk("LE",err)
}

func gj_client(argv []string) {
    glog("CS",fmtstring("connecting to %v",gshws_url))
    ws, err := websocket.Dial(gshws_url,"",gshws_origin)
    gchk("C",err)

    var resb = make([]byte, GSHWS_MSGSIZE)
    for qi := 0; qi < 3; qi++ {
        req := fmtstring("Hello, GShell! (%v)",qi)
        wn, werr := ws.Write([]byte(req))
        glog("QM",fmtstring("(%v) %v",wn,req))
        gchk("QE",werr)
        rn, rerr := ws.Read(resb)
        gchk("RE",rerr)
        glog("RM",fmtstring("(%v) %v",rn,string(resb)))
    }
    glog("CF","WS request finish")
}
//</details></span>
```

```
8929
8930 /*
8931 <details><summary>GJ Link</summary>
8932 <span id="GJLinkView" class="GJLinkView">
8933  <p>
8934  <note class="GjNote">Execute command "gsh gj server" on the localhost and push the Join button:</note>
8935  </p>
8936  <p>
8937  <span id="GJLink_1">
8938  <script id="gj_xxx1_gen">
8939  if( document.getElementById('gj_serv') == null ){ // executed twice??
8940   document.write('<'+'span id="gj_serv_label" class="textField textLabel">Server: <'+'/span>');
8941   document.write('<'+'span id="gj_serv" class="textField textURL" contenteditable><'+'/span>');
8942  }
8943  </script>
8944  <br>
8945  <input id="gj_join" type="button" class="joinButton" onclick="GJ_Join()" value="Join">
8946  <script id="gj_xxx2_gen">
8947  if( true ){
8948   document.write('<'+'textarea id="gj_user" class="textField"><'+'/textarea>');
8949   document.write('<'+'textarea id="gj_ukey" class="textField"><'+'/textarea>');
8950   document.write('<'+'textarea id="gj_chan" class="textField"><'+'/textarea>');
8951   document.write('<'+'textarea id="gj_ckey" class="textField"><'+'/textarea>');
8952  }
8953  </script>
8954  <br>
8955  <input id="gj_sendButton" type="button" class="joinButton SendButton" onclick="GJ_Send()" value="Send" data-bodyid="gj_sendText">
8956  <script id="gj_sendText_gen">
8957  if( true ){
8958   document.write('<'+'textarea id="gj_sendText" class="textField MssgText" cols=60 rows=2><'+'/textarea>');
8959  }
8960  </script>
8961  </span></p>
8962  <p>
8963  <script id="ws0_log_gen">
8964  if( true ){
8965   document.write('<'+'textarea id="ws0_log" class="ws0_log"'
8966     +' cols=100 rows=10 spellcheck="false"><'+'/textarea>');
8967  }
8968  </script>
8969  </p>
8970 </span>
8971 <script>
8972 function SetupGJLink(){
8973     SetupVisibleText(GJLink_1,gj_serv,'GJLinkSv');
8974     SetupVisibleText(GJLink_1,gj_user,'UserName');
8975     SetupBlinderText(GJLink_1,gj_ukey,'UserKey');
8976     SetupVisibleText(GJLink_1,gj_chan,'ChannelName');
8977     SetupBlinderText(GJLink_1,gj_ckey,'ChannelKey');
8978     SetupVisibleText(GJLink_1,gj_sendText,'Message');
8979     gj_serv.innerHTML = 'ws://localhost:9999/gjlink1'
8980 }
8981 SetupGJLink();
8982 function iselem(eid){
8983     return document.getElementById(eid);
8984 }
8985 function DestroyGJLink1(){
8986     if( iselem('gj_serv_label') ) gj_user.parentNode.removeChild(gj_serv_label);
8987     if( iselem('gj_serv') ) gj_user.parentNode.removeChild(gj_serv);
8988     if( iselem('gj_user') ) gj_user.parentNode.removeChild(gj_user);
8989     if( iselem('gj_ukey') ) gj_ukey.parentNode.removeChild(gj_ukey);
8990     if( iselem('gj_chan') ) gj_chan.parentNode.removeChild(gj_chan);
8991     if( iselem('gj_ckey') ) gj_ckey.parentNode.removeChild(gj_ckey);
8992     if( iselem('gj_sendText') ) gj_sendText.parentNode.removeChild(gj_sendText);
8993     if( iselem('ws0_log') ) ws0_log.parentNode.removeChild(ws0_log);
8994 }
8995 DestroyGJLink = DestroyGJLink1;
8996 </script>
8997 </details>
8998 */
8999
9000 /*
9001 <script id="HtmlCodeview-script">
9002   function showHtmlCode(otxa,code){
9003     if( event.target.value == 'ShowCode' ){
9004         txa = document.createElement('textarea');
9005         txa.id = otxa.id;
9006         txa.setAttribute('class','HtmlCodeviewText');
9007         otxa.parentNode.replaceChild(txa,otxa);
9008         txa.setAttribute('spellcheck','false');
9009         txa.value = code.innerHTML;
9010         txa.style.display = "block";
9011         txa.style.width = "100%";
9012         txa.style.height = "300px";
9013         event.target.value = 'HideCode';
9014     }else{
9015         txa.style.display = "none";
9016         event.target.value = 'ShowCode';
9017     }
9018   }
9019 </script>
9020 <style id="HtmlCodeview-style">
9021   .HtmlCodeviewText {
9022     font-size:10pt;
9023     font-family:Courier New;
9024     white-space:pre;
9025   }
9026   .HtmlCodeviewButton {
9027     font-size:11pt;
9028     line-height:1.2;
9029     font-family:Georgia;
9030     border-radius:3px;
9031     color:#ddd; background-color:#333;
9032   }
9033 </style>
9034 */
9035
9036 /*
9037 <details><summary>Live HTML Snapshot</summary>
9038 <span id="LiveHTML">
9039 <!-- ---------- HTML SnapShot: Edit, save and load // 2020-0924 SatoxITS { -->
9040 <input class="HtmlCodeviewButton" type="button" value="ShowCode" onclick="showLiveHTMLcode()">
9041 <span id="LiveHTML_Codeview"></span>
9042 <script id="LiveHtmlScript">
9043 function showLiveHTMLcode(){
9044     showHtmlCode(LiveHTML_Codeview,LiveHTML);
9045 }
9046 var _editable = false;
9047 var savSuppressGJShell = false;
9048 function ToggleEditMode(){
9049     _editable = !_editable;
9050     if( _editable ){
9051         savSuppressGJShell = SuppressGJShell;
9052         SuppressGJShell = true;
```

```
        gsh.setAttribute('contenteditable','true');
        GshMenuEdit.innerHTML = 'Lock';
        GshMenuEdit.style.color = 'rgba(255,0,0,1)';
        GshMenuEdit.style.backgroundColor = 'rgba(255,255,255,1)';
    }else{
        SuppressGJShell = savSuppressGJShell;
        gsh.setAttribute('contenteditable','false');
        GshMenuEdit.innerHTML = 'Edit';
        GshMenuEdit.style.color = 'rgba(16,160,16,1)';
        GshMenuEdit.style.backgroundColor = 'rgba(255,255,255,1)';
    }
}
function html_edit(){
    ToggleEditMode();
}

// Live HTML (DOM) Snapshot onto browser's localStorage
// 2020-0923 SatoxITS
var htRoot = gsh // -- Element-ID, should be selectable
const snappedHTML = 'SnappedHTML'; // Item-ID of the HTML data in localStogate
                   // -- should be a [map] of URL
                   // -- should be with CSSOM as inline script
const htVersionTag = 'VersionTag'; // VesionTag Eelment-ID in the HTML (in DOM)
function showVersion(note,w,v,u,t){
    w.alert(note+': ' + v + '\n'
        + '-- URL:  ' + u + '\n'
        + '-- Time: ' + DateLong0(t*1000)
    );
}
function html_save(){
    u = document.URL;
    t = new Date().getTime() / 1000;
    v = '<'+'span id="'+htVersionTag+'" data-url="'+u+'" data-time="'+t+'">';
    v += '<'+'/span>\n';
    h += v + htRoot.outerHTML;
    localStorage.setItem(snappedHTML,h);
    showVersion("Saved",window,v,u,t);
}
function html_load(){
    h = localStorage.getItem(snappedHTML);
    if( h == null ){
        alert('No snapshot taken yet');
        return;
    }
    w = window.open('','','');
    d = w.document;
    d.write(h);
    w.focus();
    html_ver1("Loaded",w,d);
}
function html_ver1(note,w,d){
    if( (v = d.getElementById(htVersionTag)) != null ){
        h = v.outerHTML;
        u = v.getAttribute('data-url');
        t = v.getAttribute('data-time');
    }else{
        h = 'No version info. in the page';
        u = '';
        t = 0;
    }
    showVersion(note,w,v,u,t);
}
function html_ver0(){
    html_ver1("Version",window,document);
}
</script>
<!-- LiveHTML } -->
</span>
</details>
*/

/*
<details><summary>Event sharing</summary>
<span id="EventSharingCodeSpan">

<!-- ---------- Event sharing // 2020-0925 SatoxITS { -->

<div id="iftestTemplate" class="iftest" hidden="">
<style> .iftestbody{ color:#f22;font-family:Georgia;font-size:10pt;} </style>
<span id="frameBody" class="iftestbody" onclick="frameClick()"><script>
  function docadd(txt){
    document.body.append(txt);
    window.scrollTo(0,100000);
  }
  function frameClick(){
    xy = '(x='+event.x + ' y='+event.y+')';
    //docadd('Got Click on #'+event.target.id+' '+xy+ '\n');
    docadd('Got Click on #'+Fid.value+', '+xy+ '\n');
    window.scrollTo(0,100000);
    window.parent.postMessage('OnClick: '+xy,'*');
  }
  function frameMousemove(){
    if( false ){
    document.body.append('Mousemove on #'+event.target.id+' '
        + 'x='+event.x + ' y='+event.y + '\n');
    peerWin = window.frames.iframe1;
    document.body.append('Send to peer #'+peerWin+' ' + '\n');
    window.scrollTo(0,100000);
    peerWin.postMessage('Hi!','*');
    }
  }
  function frameKeydown(){
    msg = 'Got Keydown: #'+Fid.value+', ('+event.code+')';
    docadd(msg+'\n');
    window.parent.postMessage(msg,'*');
  }
  function frameOnMessage(){
    docadd('Message ' + event.data + '\n');
    window.scrollTo(0,100000);
  }
  if( document.getElementById('Fid') ){
    frameBody.id = Fid.value;
    h = '';
    h += '<'+'style>*{';
    h += 'font-size:10pt;white-space:pre-wrap;';
    h += 'font-family:Courier New;';
    h += '}<'+'/style>';
    h += 'I am '+Fid.value+'\n';
    document.write(h);
    window.addEventListener('click',frameClick);
    window.addEventListener('keydown',frameKeydown);
    window.addEventListener('message',frameOnMessage);
    window.addEventListener('mousemove',frameMousemove);
    window.parent.postMessage('Hi parent, I am '+Fid.value,'*');
```

```
  }
</script></span></div>

<style>.iframeTest{margin:3px;resize:both;width:370px;height:120px;}</style>
<h2>Inter-window communicaiton</h2>
<note>
frame0 >>> frame1 and frame2<br>
frame1 >>> frame0 and frame2<br>
frame2 >>> frame0 and frame1<br>
</note>
<div id="iframe-test">
<pre id="iframeHost" style="border:1px;font-family:Courier New;font-size:10pt;"></pre>
<iframe id="iframe0" title="iframe0" class="iframeTest" style=""></iframe>
<iframe id="iframe1" title="iframe1" class="iframeTest"></iframe>
<iframe id="iframe2" title="iframe2" class="iframeTest"></iframe>
</div>

<script id="if0-test-script">
  setupFrames0();
  setupFrames12();

  function setFrameSrcdoc(dst,src){
    if( true ){
        dst.contentWindow.document.write(src);
        // this makes browser waite close, and crash if accumulated !?
        // so it should be closed after write
        dst.contentWindow.document.close();
    }else{
        // to be erased before source dump
        // but shold be set for live snapshot
        dst.srcdoc = src;
    }
  }
  function setupFrames0(){
    ibody = iframe0.contentWindow.document.body;
    iframe0.style.width = "755px"
    //iframeHost.innerHTML = "Message exchange at iframes' host:\n";
    window.addEventListener('message',messageFromChild);

    if0 = '';
    if0 += '<'+'pre style="font-family:Courier New;">';
    if0 += '<input id="Fid" value="iframe0">';
    if0 += iftestTemplate.innerHTML;
    setFrameSrcdoc(iframe0,if0);

    function clickOnChild(){
        console.log('clickOn #'+this.id);
    }
    function moveOnChild(){
        console.log('moveOn #'+this.id);
    }
    iframe0.contentWindow.document.body.style.setProperty('white-space','pre');
    iframe0.contentWindow.document.body.style.setProperty('font-size','9pt');
  }
  function setupFrames12(){
    if1 = '<input id="Fid" value="iframe1">';
    if1 += iftestTemplate.innerHTML;
    setFrameSrcdoc(iframe1,if1);
    //iframe1.name = 'iframe1'; // this seems break contentWindow

    if2 = '<input id="Fid" value="iframe2">';
    if2 += iftestTemplate.innerHTML;
    setFrameSrcdoc(iframe2,if2);

    iframe1.addEventListener('message',messageFromChild);
        //iframe1.addEventListener('mouseover',moveOnChild);
    iframe2.addEventListener('message',messageFromChild);
        //iframe2.addEventListener('mouseover',moveOnChild);
    iframe1.contentWindow.postMessage('[parent0] Hi iframe1 -- from parent.','*');
    //iframe1.contentWindow.postMessage('Your peer is '+iframe2.contentWindow,'*');
    iframe2.contentWindow.postMessage('[parent0] Hi iframe2 -- from parent.','*');
    //iframe2.contentWindow.postMessage('Your peer is '+iframe1.contentWindow,'*');
  }
  function messageFromChild(){
    from = null;
    forw = null;
    if( event.source == iframe0.contentWindow ){
        from = '[iframe0] '
        forw = 'iframe12';
    }else
    if( event.source == iframe1.contentWindow ){
        from = '[iframe1] '
        forw = 'iframe2';
    }else
    if( event.source == iframe2.contentWindow ){
        from = '[iframe2] '
        forw = 'iframe1';
    }else
    {
        iframeHost.innerHTML += 'Message [unknown] '
        + ' orig=' + event.origin
        + ' data=' + event.data
        //+ ' from=' + event.source
        ;
    }
    msglog1 = from + event.data + ' -- '
        + ' from=' + event.source
        + ' orig=' + event.origin
        + ' name=' + event.source.name
        //+ ' port=' + event.ports
        //+ ' evid=' + event.lastEventId
        + '\n'
        ;
    if( true ){
        if( forw == 'iframe1' || forw == 'iframe12' ){
        iframe1.contentWindow.postMessage(from+event.data);
        }
        if( forw == 'iframe2' || forw == 'iframe12' ){
        iframe2.contentWindow.postMessage(from+event.data);
        }
    }
    txtadd0(msglog1);

    function txtadd0(txt){
        iframe0.contentWindow.document.body.append(txt);
        iframe0.contentWindow.scrollTo(0,100000);
    }
  }
  function es_ShowSelf(){
    iframe1.setAttribute('src',document.URL);
    iframe2.setAttribute('src',document.URL);
  }
</script>
```

```
<input class="HtmlCodeviewButton" type="button" value="ShowSelf" onclick="es_ShowSelf()">
<input class="HtmlCodeviewButton" type="button" value="ShowCode" onclick="es_showHtmlCode()">
<span id="EventSharingCodeview"></span>
<script id="EventShareingScript">
function es_showHtmlCode(){
    showHtmlCode(EventSharingCodeview,EventSharingCodeSpan);
}
DestroyEventSharingCodeview = function(){
    //EventSharingCodeview.parentNode.removeChild(EventSharingCodeview);
    EventSharingCodeview.innerHTML = "";
    iframe0.style = "";
    //iframe0.srcdoc = "erased";
    //iframe1.srcdoc = "erased";
    //iframe2.srcdoc = "erased";
}
</script>
<!-- EventSharing } -->
</span>
</details>
*/

/*
<!-- ---------- "GShell Inside" Nofitifaction { -->
<script id="script-gshell-inside">
var notices = 0;
function noticeGShellInside(){
    ver = '';
    if( ver = document.getElementById('GshVersion') ){
        ver = ver.innerHTML;
    }
    console.log('GJShell Inside (^-^)//'+ver);
    notices += 1;
    if( 2 <= notices ){
        document.removeEventListener('mousemove',noticeGShellInside);
    }
}
document.addEventListener('mousemove',noticeGShellInside);
noticeGShellInside();

const FooterName = 'GshFooter'
function DestroyFooter(){
    if( (footer = document.getElementById(FooterName)) != null ){
        //footer.parentNode.removeChild(footer);
        empty = document.createElement('div');
        empty.id = 'GshFooter0';
        footer.parentNode.replaceChild(empty,footer);
    }
}

footer = document.createElement('div');
footer.id = FooterName;
footer.style.backgroundImage = "url("+ITSmoreQR+")";
//GshFooter0.parentNode.appendChild(footer);
GshFooter0.parentNode.replaceChild(footer,GshFooter0);
</script>
<!-- } -->

<!--
    border:20px inset #888;
-->

//<span id="WirtualDesktopCodeSpan">
/*
<details open="false"><summary>Wirtual Desktop</summary>
<!-- ---------- Web Wirtual Desktop // 2020-0927 SatoxITS { -->
<style>
.WirtualSpace {
    z-index:0;
    xwidth:1280px !important; xheight:720px !important;
    width:5120px; height:2880px;
    border-width:0px;
    xxbackground-color:rgba(32,32,160,0.8);
    xxbackground-image:url("WD-WallPaper03.png");
    xxbackground-size:100% 100%;
    color:#22a;xfont-family:Georgia;font-size:10pt;
    xxoverflow:scroll;
}
.WirtualGrid {
    z-index:0;
    position:absolute;
    width:800px; height:500px;
    border:1px inset #fff;
    color:rgba(192,255,192,0.8);
    font-family:Georgia, Courier New;
    text-align:right;
    vertical-align:middle;
    font-size:200px;
    text-shadow:4px 4px #ccf;
}
.WD_GridScroll {
    z-index:100000;
    background-color:rgba(200,200,200,0.1);
}
.WirtualDesktop {
    z-index:0;
    position:relative;
    resize:both !important;
    overflow:scroll;
    display:block;
    min-width:120px !important; min-height:60px !important;
    width:800px;
    height:500px;
    border:10px inset #228;
    border-width:30px; border-radius:20px;
    background-image:url("WD-WallPaper03.png");
    background-size:100% 100%;
    color:#22a;font-family:Georgia;font-size:10pt;
}
.comment {
    // overflow=scroll seems to bound childrens' view in the element span
    // specifying overflow seems fix the position of the element
}
.WirtualBrowserSpan {
    z-index:10;
    xxxborder:0.5px dashed #fff !important;
    border-color:rgba(255,255,255,0.5) !important;
    position:relative;
    left:100px;
    top:100px;
    display:block;
    resize:both !important;
    width:540px;
    height:320px;
    min-width:40px !important; min-height:20px !important;
```

```
    max-width:5120px !important; max-height:2880px !important;
    background-color:rgba(255,200,255,0.1);
    xoverflow:scroll;
}
.xWirtualBrowserLocationBar:focus {
    color:#f00;
    background-color:rgba(255,128,128,0.2);
}
.xWirtualBrowserLocationBar:active {
    color:#f00;
    background-color:rgba(128,255,128,0.2);
}
a.WirtualBrowserLocation {
    color:#ccc !important;
    text-decoration:none !important;
}
a.WirtualBrowserLocation:hover {
    color:#fff !important;
    text-decoration:underline;
}
.WirtualBrowserLocationBar {
    position:absolute;
    z-index:100000;
    display:block;
    width:400px;
    height:20px;
    padding-left:2px;
    line-height:1.1;
    vertical-align:middle;
    font-size:14px;
    color:#fff;
    background-color:rgba(128,128,128,0.2);
    font-family:Georgia;
}
.WirtualBrowserCommandBar {
    position:absolute;
    z-index:200000;
    xxxdisplay:inline;
    display:block;
    width:60px;
    height:20px;
    line-height:1.1;
    vertical-align:middle;
    font-size:14px;
    color:#fe4;
    background-color:rgba(128,128,128,0.1);
    font-family:Georgia;
    text-align:left;
    left:404px;
}
.WirtualBrowserFrame {
    xxposition:relative;
    position:absolute;
    xxdisplay:inline;
    display:block;
    z-index:10;
    resize:both !important;
    width:480px; height:240px;
    min-width:60px; min-height:30px;
    max-width:5120px; max-height:2880px;
    border-radius:6px;
    background-color:rgba(255,255,255,0.9);
    border-top:20px solid;
    border-right:4px solid;
    border-bottom:10px solid;
}
.WinFavicon {
    width:16px;
    height:16px;
    margin:1px;
    margin-right:3px;
    vertical-align:middle;
    background-color:rgba(255,255,255,1.0);
}
.WirtualDesktopMenuBar {
    xposition:absolute;
    color:#fff;
    font-size:7pt;
    text-align:right;
    padding-right:4px;
    background-color:rgba(128,128,128,0.7);
}
.WirtualDesktopCalender {
    color:#fff;
    font-size:22pt;
    text-align:right;
    padding-right:4px;
    xbackground-color:rgba(255,255,255,0.2);
}
.xxxxinput { width:260pt !important; line-height:1.1 !important; margin:1px;
    display:inline !important; font-size:10pt !important; padding:1px !important;
}
.WD_Config {
    display:inline !important;
    padding:2px !important;
    font-size:10pt !important;
    width:60pt !important;
    height:12pt !important;
    line-height:1.0pt !important;
    height:15pt !important;
}
.WD_Button {
    display:inline !important;
    padding:2px !important;
    color:#fff !important;
    background-color:#228 !important;
    font-size:10pt !important;
    width:60pt !important;
    height:12pt !important;
    line-height:1.0pt !important;
    height:16pt !important;
    border:2px inset #44a !important;
}
.WD_Href {
    display:inline !important;
    padding:2px !important;
    font-size:9pt !important;
    width:120pt !important;
    height:12pt !important;
    line-height:1.0pt !important;
    height:15pt !important;
}

.LiveHtmlCodeviewText {
```

```
    font-size:10pt;
    font-family:Courier New;
    xwhite-space:pre;
}

.WD_Panel {
    x-index:100 !important;
    color:#000 !important;
    margin-left:25px !important;
    width:800px !important;
    padding:4px !important;
    border:1px solid #888 !important;
    border-radius:6px !important;
    background-color:rgba(220,220,220,0.9) !important;
}
.WD_Help {
    font-size:10pt !important;
    line-height:1.2 !important;
    color:#000 !important;
    width:100% !important;
    background-color:rgba(240,240,255,0.8) !important;
}

.WB_Zoom {
}
</style>
<h2>CosmoScreen 0.0.8</h2>
<p>
<menu>
<span id="WD_Help_1" class="WD_Help"><b>ScopeControl command keys</b><br>
 g ... grid on/off<br>
 i ... zoom in<br>
 o ... zoom out<br>
 s ... save current scope<br>
 r ... restore saved scope<br>
</span>
</menu>
</p>
<div class="WD_Panel" draggable="true">
<p><!-- should be on the frame of the WD -->
Monitor <input id="WD_Resize_1" class="WD_Button" type="button" value="Resize">
 < <input id="WD_Width_1" class="WD_Config" type="text">
 x <input id="WD_Height_1" class="WD_Config" type="text">
 wall-paper: <a href="WD-WallPaper03.png" class="WD_Href" contenteditable="true">WD-WallPaler03.png</a>
</p>
<p>
Desktop <input id="WS_Resize_1" class="WD_Button" type="button" value="Resize">
 < <input id="WS_1_Width" class="WD_Config" type="text">
 x <input id="WS_1_Height" class="WD_Config" type="text">
</p>
<p>
Display <input id="WD_Zoom_1" class="WD_Button" type="button" value="Zoom">
 < <input id="WD_Zoom_1_XY" class="WD_Config" type="text" value="1.0">
 x <input id="WD_Zoom_1_MAG" class="WD_Config" type="text" value="1.41421356">
 < <input id="WD_Zoom_1_OUT" class="WD_Button" type="button" value="ZoomOut">
 < <input id="WD_Zoom_1_IN" class="WD_Button" type="button" value="ZoomIn">
</p>
<p>
Content <input id="WD_Scroll_1" class="WD_Button" type="button" value="Scroll">
 X <input id="WD_Left_1" class="WD_Config" type="text" value="0">
 Y <input id="WD_Top_1" class="WD_Config" type="text" value="0">
shift+wheel for horizontal scroll
</p>
<p>
Scopexx <input id="WD_Zoom_1_Restore" class="WD_Button" type="button" value="Restore">
 < <input id="WD_Zoom_1_RestoreScope" class="WD_Config" type="text" value="Scope0">
 | <input id="WD_Zoom_1_Save" class="WD_Button" type="button" value="Save">
 > <input id="WD_Zoom_1_SaveScope" class="WD_Config" type="text" value="Scope0">
</p>
<p>
Scopeyy <input id="WD_Zoom_1_Forw" class="WD_Button" type="button" value="Forw">
 < <input id="WD_Zoom_1_ForwScope" class="WD_Config" type="text" value="Scope0">
 | <input id="WD_Zoom_1_Back" class="WD_Button" type="button" value="Back">
 > <input id="WD_Zoom_1_BackScope" class="WD_Config" type="text" value="Scope0">
</p>
<p>
Scopezz <input id="WD_Zoom_1_Push" class="WD_Button" type="button" value="Push">
 < <input id="WD_Zoom_1_PushScope" class="WD_Config" type="text" value="Scope0">
 | <input id="WD_Zoom_1_Pop" class="WD_Button" type="button" value="Pop">
 > <input id="WD_Zoom_1_PopScope" class="WD_Config" type="text" value="Scope0">
</p>
<p>
Display <input id="WD_Grid_1" class="WD_Button" type="button" value="GridOn">
</p>
</div>

<div id="WirtualDesktop_1" class="WirtualDesktop" draggable="true" contenteditable="true" style="">
<div id="WirtualDesktop_1_MenuBar" class="WirtualDesktopMenuBar" spellcheck="false">
<i>CosmoScreen 0.0.8</i><span id="WirtualDesktop_1_Clock"></span>
</div>
<div id="WirtualDesktop_1_Calender" class="WirtualDesktopCalender ">00:00</div>
<div align=right><h1>WirtualSpace 1.</h1></div>
<div id="WirtualDesktop_1_Content" class="WirtualSpace">

<div id="WirtualBrowser_1" class="WirtualBrowserSpan" spellcheck="false" draggable="true">
<div id="WirtualBrowser_1_Location" class="WirtualBrowserLocationBar"></div>
<span id="WirtualBrowser_1_Command" class="WirtualBrowserCommandBar">Reload</span>
<iframe id="WirtualBrowser_1_Frame" class="WirtualBrowserFrame" style=""></iframe>
</div>

<div id="WirtualBrowser_2" class="WirtualBrowserSpan" spellcheck="false" draggable="true">
<div id="WirtualBrowser_2_Location" class="WirtualBrowserLocationBar"></div>
<span id="WirtualBrowser_2_Command" class="WirtualBrowserCommandBar">Reload</span>
<iframe id="WirtualBrowser_2_Frame" class="WirtualBrowserFrame" style=""></iframe>
</div>

<div id="WirtualBrowser_3" class="WirtualBrowserSpan" spellcheck="false" draggable="true">
<div id="WirtualBrowser_3_Location" class="WirtualBrowserLocationBar"></div>
<span id="WirtualBrowser_3_Command" class="WirtualBrowserCommandBar">Reload</span>
<iframe id="WirtualBrowser_3_Frame" class="WirtualBrowserFrame" style=""></iframe>
</div>

<div id="WirtualDesktop_1_GridPlane" class="WirtualSpace"></div>
</div>
</div>

<input class="HtmlCodeviewButton" type="button" value="ShowCode" onclick="vd_showHtmlCode()">
<span id="WirtualDesktopCodeview"></span>
<script id="WirutalDesktopScript">
function vd_showHtmlCode(){
    codespan = document.getElementById('WirtualDesktopCodeSpan');
    showHtmlCode(WirtualDesktopCodeview,codespan);
    WirtualDesktopCodeview.setAttribute('class','LiveHtmlCodeviewText');
}
```

```
DestroyEventSharingCodeview = function(){
    WirtualDesktopCodeview.innerHTML = "";
}

function wdlog(log){
    if( GJ_Channel != null ){
        GJ_SendMessage('WD '+log);
    }
    console.log(log);
}
var topMostWin = 10000;
function onEnterWin(e){
    t = e.target;
    oindex = t.style.zIndex;
    //if( oindex == '' ) oindex = 0;
    //t.saved_zIndex = oindex;
    //t.style.zIndex = 10000;
    topMostWin += 1;
    t.style.zIndex = topMostWin;
    nindex = t.style.zIndex;
    wdlog('Enter '+t+' #'+t.id+'('+oindex+'->'+nindex+')');
    e.stopPropagation();
    e.preventDefault();
}
function onClickWin(e){ // can detect click on the thick border?  t = e.target;
    oindex = t.style.zIndex;
    topMostWin += 1;
    t.style.zIndex = topMostWin;
    nindex = t.style.zIndex;
    wdlog('Click '+t+' #'+t.id+'('+oindex+'->'+nindex+')');
    //e.stopPropagation();
    //e.preventDefault();
}
function onLeaveWin(e){
    t = e.target;
    //oindex = t.style.zIndex;
    //nindex = t.saved_zIndex;
    //t.style.zIndex = nindex;
    //wdlog('Leave '+e.target+' #'+e.target.id+'('+oindex+'->'+nindex+')');
    e.stopPropagation();
    e.preventDefault();
}

var WinDragstartX; // event
var WinDragstartY;
var WinDragstartTX; // target
var WinDragstartTY;

function onWinDragstart(e){
    WinDragstartX = e.x;
    WinDragstartY = e.y;

    t = e.target;

    //WinDragstartTX = t.getBoundingClientRect().left.toFixed(0)
    //WinDragstartTY = t.getBoundingClientRect().top.toFixed(0)
    if( t.style.left == '' ){
        WinDragstartTX = x0 = 0;
        t.style.left = '0px';
    }else{
        //WinDragstartTX = x0 = Number(t.style.left);
        WinDragstartTX = x0 = parseInt(t.style.left);
    }
    if( t.style.top == '' ){
        WinDragstartTY = y0 = 0;
        t.style.top = '0px';
    }else{
        //WinDragstartTY = y0 = Number(t.style.top);
        WinDragstartTY = y0 = parseInt(t.style.top);
    }
    if( true ){ // to be undo
        t.wasAtX = WinDragstartTX;
        t.wasAtY = WinDragstartTY;
    }
    wdlog('DragSTA #'+t.id
        + ' event('+e.x+','+e.y+')'
        + ' position=' + t.style.position
        + ' style left,top('+t.style.left+','+t.style.top+')'
    );
    e.stopPropagation();
    //e.preventDefault();
    return true;
}
function onWinDragEvent(wh,e,set,dolog){
    t = e.target;
    dx = e.x - WinDragstartX;
    dy = e.y - WinDragstartY;
    nx = WinDragstartTX + dx;
    ny = WinDragstartTY + dy;
    log = 'Drag'+wh+' #'+t.id
        + ' event0('+WinDragstartX+','+WinDragstartY+')'
        + ' event('+e.x+','+e.y+')'
        + ' diff('+dx+','+dy+')'
        + ' (' + nx + ',' + ny + ')'
        + ' (' + t.style.left + ',' + t.style.top + ')'
        + ' wasAt(' + t.wasAtX + ',' + t.wasAtY + ')'
    ;
    if( e.x != 0 || e.y != 0 ){
        if( set == true ){
            //t.style.x = nx + 'px'; // not effective
            //t.style.y = ny + 'px'; // not effective
            t.style.left = nx + 'px';
            t.style.top  = ny + 'px';
            log += ' Set';
        }else{
            log += ' NotSet';
            if( !dolog ){
                log = '';
            }
        }
    }else{
        log += ' What?'; // the type is event start?
        if( !dolog ){
            log = '';
        }
    }
    if( and(dolog, log != '') ){
        wdlog(log);
    }
    if( true ){
        // should be propargeted to parent in FireFox ?
        e.stopPropagation();
    }
    e.preventDefault();
```

```
    return false;
}
function onWinDrag(e){
    return onWinDragEvent('Ing',e,true,false);
}
function onWinDragend(e){
    return onWinDragEvent('End',e,false,true);
}
function onWinDragexit(e){
    return onWinDragEvent('Exit',e,false,true);
}
function onWinDragover(e){
    return onWinDragEvent('Over',e,false,true);
}
function onWinDragenter(e){
    return onWinDragEvent('Enter',e,false,true);
}
function onWinDragleave(e){
    return onWinDragEvent('Leave',e,false,true);
}
function onWinDragdrop(e){
    return onWinDragEvent('Drop',e,false,true);
}
function onFaviconChange(e){
    wdlog('--Favicon #'+e.target.id+' href='+e.details.href);
}
var savedSuppressGJShell = false;
function stopGShell(e){
    //wdlog('enter Gsh STOP');
    savedSuppressGJShell = SuppressGJShell;
    SuppressGJShell = true;
    e.stopPropagation();
    e.preventDefault();
}
function contGShell(e){
    //wdlog('leave Gsh STOP');
    SuppressGJShell = savedSuppressGJShell;
    e.stopPropagation();
    e.preventDefault();
}

function WD_onKeydown(e){
    keycode = e.code;
    console.log('Keydown #'+e.target.id+' '+keycode);
    if( keycode == 'KeyG' ){
        WD_setGrid1(WD_Grid_1);
    }else
    if( keycode == 'KeyI' ){
        WD_doZoomIN();
    }else
    if( keycode == 'KeyO' ){
        WD_doZoomOUT();
    }else
    if( keycode == 'KeyR' ){
        WD_RestoreScope(null);
    }else
    if( keycode == 'KeyS' ){
        WD_SaveScope(null);
    }
    e.stopPropagation();
    e.preventDefault();
}
function WD_onKeyup(e){
    e.stopPropagation();
    e.preventDefault();
}
WirtualDesktop_1.addEventListener('keydown',    e => { WD_onKeydown(e); });
WirtualDesktop_1_Content.addEventListener('keydown',    e => { WD_onKeydown(e); });
WD_Help_1.addEventListener('keydown',   e => { WD_onKeydown(e); });
WD_Help_1.addEventListener('keyup', e => { WD_onKeyup(e); });

function settleWin(s,l,cmd,f,u,w,h,x,y,c,scale){
    function WirtualBrowserCommand(e,s,l,cmd,f){
        command = cmd.innerHTML
        if( command == "Reload" ){
            href_id = e.target.href_id;
            d = document.getElementById(href_id);
            wdlog('href_tag=#'+href_id+'\n elem=#'+href_id+'\n href='+d);
            url = d.innerHTML;
            wdlog('---- Load href_tag=#'+href_id+'\n elem=#'+href_id+'\n href='+d
                +'\n url='+url);
            wdlog('---- Load target #'+f.id)+' with url='+url;
            f.src = url;
        }else{
            alert('unknown command"'+command+'" '+e.target.id+','+l.id+','+f.id);
        }
    }
    function onKeyDown(e){
        if( e.code == 'Enter' ){
            e.stopPropagation();
            e.preventDefault();
        }
    }
    function onKeyUp(e){
        if( e.code == 'Enter' ){
            e.stopPropagation();
            e.preventDefault();
            // should reload immediately ?
        }
    }

    if( false ){
        wdlog('start settle WirtualBrowser url='+u +'\n'
            + 'id=' + s.id + '\n'
            + 'width=' + s.style.width + '\n'
            + 'height=' + s.style.height
        );
    }
    // very iportant for WordPress ??
    s.style.width = f.style.width = 501; // for WordPress ...??
    s.style.height = f.style.height = 271; // for WordPress ...??
    if( false ){
        wdlog('midway settle WirtualBrowser url='+u +'\n'
            + 'id=' + s.id + '\n'
            + 'width=' + s.style.width + '\n'
            + 'height=' + s.style.height
        );
    }
    s.width = 502; // for WordPress ...??
    s.height = 272; // for WordPress ...??
    if( false ){
        wdlog('midway-2 settle WirtualBrowser url='+u +'\n'
            + 'id=' + s.id + '\n'
            + 'span-width=' + s.width + '\n'
```

```
            + 'span-height=' + s.height
        );
    }

    s.style.width = w + 'px';
    s.style.height = h + 'px';
    f.style.width = w + 'px';
    f.style.height = h + 'px';
    //f.style.setProperty('-webkit-transform','scale('+scale+')');
    f.style.setProperty('transform','scale('+scale+')');

    //wdlog('--xl-- u='+u+' width s='+s.style.width+',f='+f.style.width);
    //wdlog('--x2-- u='+u+' width s='+s.style.width+',f='+f.style.width);
    s.setAttribute('draggable','true')
    f.setAttribute('draggable','false'); // why necessary?
    l.setAttribute('draggable','false'); // why necessary?
    cmd.setAttribute('draggable','false'); // why necessary?
    s.addEventListener('dragstart', e => { onWinDragstart(e); });
    s.addEventListener('drag',  e => { onWinDrag(e); });
    s.addEventListener('exit',  e => { onWinDragexit(e); });
    s.addEventListener('dragend',   e => { onWinDragend(e); });
    s.addEventListener('dragexit',  e => { onWinDragexit(e); });
    s.addEventListener('dragenter', e => { onWinDragenter(e); });
    s.addEventListener('dragover',  e => { onWinDragover(e); });
    s.addEventListener('dragleave', e => { onWinDragleave(e); });
    s.addEventListener('drop',  e => { onWinDragdrop(e); });

    s.addEventListener('mouseenter',e => { onEnterWin(e); });
    s.addEventListener('mouseleave',e => { onLeaveWin(e); });

    if( false ){
        s.style.position = "absolute";
        s.style.x = x+'px';
        s.style.left = x+'px';
        s.style.y = y+'px';
        s.style.top = y+'px';
    }else{
        s.style.setProperty('position','absolute','important');
        s.style.setProperty('x',x+'px','important');
        s.style.setProperty('left',x+'px','important');
        s.style.setProperty('y',y+'px','important');
        s.style.setProperty('top',y+'px','important');
    }

    favicon = './favicon.ico';
    uv1 = u.split('://');
    if( 2 <= uv1.length ){
        uv2 = uv1[1].split('/');
        if( 2 <= uv2.length ){
            if( uv1[0] == 'file' ){
                //favicon = 'file://' + uv2.slice(0,uv2.length-1).join('/')
                //  + '/favicon.ico';
                favcion = './favicon.ico';
            }else{
                favicon = uv1[0] + '://' + uv2[0] + '/favicon.ico';
            }
        }
    }
    //wdlog("----- favicon-url="+favicon);
    href_id = l.id + '_href';
    l.innerHTML = '<img class="WinFavicon" src="'+favicon+'">'
        + '<a id="'+href_id+'" class="WirtualBrowserLocation" href="'+u+'">'+u+'</a>';
    //l.addEventListener('click',   e => { onClickWin(e); });
    l.addEventListener('mouseenter',e => { stopGShell(e); });
    l.addEventListener('mouseleave',e => { contGShell(e); });
    l.addEventListener('keydown',   e => { onKeyDown(e); });
    l.addEventListener('keyup', e => { onKeyUp(e); });

    cmd.href_id = href_id;
    wdlog('(0)cmd=#'+cmd.id);
    wdlog('(1)href_id=#'+href_id);
    wdlog('(2)href_id=#'+cmd.href_id);
    cmd.addEventListener('click',   e => { WirtualBrowserCommand(e,s,l,cmd,f); });

    f.style.borderColor = c;
    f.src = u;
    //f.addEventListener('mouseenter',e => { onEnterWin(e); });
    //f.addEventListener('mouseleave',e => { onLeaveWin(e); });

    //s.addEventListener('click',   e => { onClickWin(e); });
    //f.addEventListener('click',   e => { wdlog('click wb1'); });
    f.addEventListener('mozbrowsericonchange',onFaviconChange);

    wdlog('done settle WirtualBrowser url='+u +'\n'
        + 'id=' + s.id + ' '
        + 'width=' + s.style.width + ' '
        + 'height=' + s.style.height + ' '
        + 'cmd=' + cmd.id
    );
}

dt = WirtualDesktop_1;
dt.style.width = "800px";
dt.style.height = "500px";
dt.addEventListener('dragstart',e => { onWinDragstart(e); });
dt.addEventListener('drag', e => { onWinDrag(e); });
dt.addEventListener('exit', e => { onWinDragexit(e); });

function GRonClick(){
    WD_SaveScope(null); // should be push
    t = event.target;
    x = t.getAttribute('data-leftx');
    y = t.getAttribute('data-topy');
    zoom = WD_Zoom_1_XY.value;
    x *= zoom;
    y *= zoom;
    WD_doScrollXY(event,x,y);
    //alert('scroll #'+t.id+' x='+x+', y='+y);
}
function WD_setGrid(e){
    t = e.target;
    WD_setGrid1(t);
}
function WD_setGrid1(t){
    //ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
    ds = WirtualDesktop_1_GridPlane;
    if( t.value == 'GridOn' ){
        for( col = 0; col < 16; col++ ){
            for( row = 0; row < 16; row++ ){
                g1 = document.createElement('span');
                g1.setAttribute('class','WirtualGrid');
                leftx = col * 800;
                topy = row * 500;
                gid = col + '.' + row
```

```
                label = '<'+'span '
                    + 'id="'+gid+'" '+'class="WD_GridScroll" '
                    + 'contenteditable="false" onclick="GRonClick()" '
                    + 'data-leftx=' + leftx + ' ' + 'data-topy=' + topy + ' '
                    + '>'
                    + gid + '<'+'/span>';
                console.log('grid '+label);
                g1.innerHTML = label;
                g1.position = 'relative';
                g1.leftx = leftx;
                g1.topy = topy;
                g1.style.left = g1.leftx + 'px';
                g1.style.top = g1.topy + 'px';
                if( col % 2 == row % 2 ){
                    g1.style.backgroundColor = 'rgba(255,255,255,0.3)';
                }
                ds.appendChild(g1);
            }
        }
        t.value = 'GridOff';
    }else{
        ds.innerHTML = '';
        t.value = 'GridOn';
    }
}
WD_Grid_1.addEventListener('click', e => { WD_setGrid(e); });

var sav_scrollLeft;
var sav_scrollTOp;
var sav_nscale;
function WD_SaveScope(e){
    sav_scrollLeft = WD_Left_1.value;
    sav_scrollTop = WD_Top_1.value;
    sav_nscale = WD_Zoom_1_XY.value;
    //console.log('saved zoom='+sav_oscale+','+sav_nscale);
}
function WD_RestoreScope(e){
    WD_Zoom_1_XY.value = sav_nscale;
    WD_doZoom();

    WD_Left_1.value = sav_scrollLeft;
    WD_Top_1.value = sav_scrollTop;
    WD_doScroll(null);
}
WD_Zoom_1_Save.addEventListener('click', e => { WD_SaveScope(e); });
WD_Zoom_1_Restore.addEventListener('click', e => { WD_RestoreScope(e); });

function ignoreEvent(e){
    e.stopPropagation();
    //e.preventDefault();
}
WD_Width_1.value = dt.style.width;
WD_Width_1.addEventListener('keydown',ignoreEvent);
WD_Width_1.addEventListener('keyup',ignoreEvent);
WD_Height_1.value = dt.style.height;
WD_Height_1.addEventListener('keydown',ignoreEvent);
WD_Height_1.addEventListener('keyup',ignoreEvent);

function zoomMag(){
    return WD_Zoom_1_MAG.value;
}
WD_Zoom_1_MAG.addEventListener('keydown',ignoreEvent);
WD_Zoom_1_MAG.addEventListener('keyup',ignoreEvent);

function escale1(e,oscale,nscale){
    e.style.setProperty('transform','scale('+nscale+')');
    rscale = oscale / nscale;
    w = parseInt(e.style.width);
    h = parseInt(e.style.height);
    w = w * rscale; //(oscale/nscale);
    h = h * rscale; //(oscale/nscale);
    e.style.width = w + 'px';
    e.style.height = h + 'px';
}
function scaleWD(ds,oscale,nscale){
    if( true ){
        escale1(WirtualBrowser_1,oscale,nscale);
        escale1(WirtualBrowser_1_Location,oscale,nscale);
        escale1(WirtualBrowser_1_Command,oscale,nscale);
        escale1(WirtualBrowser_1_Frame,oscale,nscale);

        escale1(WirtualBrowser_2,oscale,nscale);
        escale1(WirtualBrowser_2_Location,oscale,nscale);
        escale1(WirtualBrowser_2_Command,oscale,nscale);
        escale1(WirtualBrowser_2_Frame,oscale,nscale);

        escale1(WirtualBrowser_3,oscale,nscale);
        escale1(WirtualBrowser_3_Location,oscale,nscale);
        escale1(WirtualBrowser_3_Command,oscale,nscale);
        escale1(WirtualBrowser_3_Frame,oscale,nscale);
    }
}
function WD_doZoom(){
    ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
    oscale = WD_Zoom_1_XY.ovalue; // hidden value for current zoom
    nscale = WD_Zoom_1_XY.value;
    ds.style.zoom = nscale;
    WD_Zoom_1_XY.value = ds.style.zoom;
    WD_Zoom_1_XY.ovalue = ds.style.zoom;
    scaleWD(ds,oscale,nscale);
}
WD_Zoom_1.addEventListener('click',WD_doZoom);
WD_Zoom_1_XY.addEventListener('keydown',ignoreEvent);
WD_Zoom_1_XY.addEventListener('keyup',ignoreEvent);

function WD_doZoomOUT(){
    ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
    oscale = WD_Zoom_1_XY.value;
    if( oscale == 0 || oscale == '' ){
        oscale = 1;
    }
    nscale = oscale / zoomMag();
    ds.style.zoom = nscale;
    WD_Zoom_1_XY.value = ds.style.zoom;
    WD_Zoom_1_XY.ovalue = ds.style.zoom;
    scaleWD(ds,oscale,nscale);
}
function WD_doZoomIN(){
    ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
    oscale = WD_Zoom_1_XY.value;
    if( oscale == 0 || oscale == '' ){
        oscale = 1;
    }
    nscale = oscale * zoomMag();
```

```
    if( 4 < nscale ){
        alert('maybe too large, zoom='+nscale);
        return;
    }
    ds.style.zoom = nscale;
    WD_Zoom_1_XY.value = ds.style.zoom;
    WD_Zoom_1_XY.ovalue = ds.style.zoom;
    scaleWD(ds,oscale,nscale);
}
WD_Zoom_1_OUT.addEventListener('click',WD_doZoomOUT);
WD_Zoom_1_IN.addEventListener('click',WD_doZoomIN);

function WD_doResize(e){
    dt = WirtualDesktop_1;
    dt.style.width = WD_Width_1.value;
    dt.style.height = WD_Height_1.value;
    WD_Width_1.value = dt.style.width;
    WD_Height_1.value = dt.style.height;
}
WD_Resize_1.addEventListener('click',e => { WD_doResize(e); });


function WD_doRSResize(e){
    //alert('Resize Space');
    ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
    ds.style.width = WS_1_Width.value;
    ds.style.height = WS_1_Height.value;
    WS_1_Width.value = ds.style.width;
    WS_1_Height.value = ds.style.height;
}
ds = WirtualDesktop_1_Content; // should be WirtualSpace_1
ds.style.width = '5120px';
ds.style.height = '2880px';
WS_1_Width.value = ds.style.width;
WS_1_Height.value = ds.style.height;
WS_1_Width.addEventListener('keydown',ignoreEvent);
WS_1_Width.addEventListener('keyup',ignoreEvent);
WS_1_Height.addEventListener('keydown',ignoreEvent);
WS_1_Height.addEventListener('keyup',ignoreEvent);
WS_Resize_1.addEventListener('click',e => { WD_doRSResize(e); });

function WD_doScrollXY(e,sleft,stop){
    dt = WirtualDesktop_1;
    dt.scrollLeft = sleft;
    dt.scrollTop = stop;
    WD_Left_1.value = dt.scrollLeft;
    WD_Top_1.value = dt.scrollTop;
    console.log('--Scroll #'+dt.id+' ('+sleft+','+stop+')');
}
function WD_doScroll(e){
    //dt = WirtualDesktop_1_Content;
    dt = WirtualDesktop_1;
    sleft = parseInt(WD_Left_1.value);
    stop = parseInt(WD_Top_1.value);
    dt.scrollLeft = sleft;
    dt.scrollTop = stop;
    WD_Left_1.value = dt.scrollLeft;
    WD_Top_1.value = dt.scrollTop;
    console.log('--Scroll #'+dt.id+' ('+sleft+','+stop+')');
}
WD_Scroll_1.addEventListener('click',e => { WD_doScroll(e); });
WD_Left_1.addEventListener('keydown',ignoreEvent);
WD_Left_1.addEventListener('keyup',ignoreEvent);
WD_Top_1.addEventListener('keydown',ignoreEvent);
WD_Top_1.addEventListener('keyup',ignoreEvent);

function showScrollPosition(){
    if( false )
    console.log(
        'wstop=' + WirtualDesktop_1.style.top + ',' +
        'wsx=' + WirtualDesktop_1.style.y + ',' +
        'wss=' + WirtualDesktop_1.scrollTop + ',' +
        'wdtop=' + WirtualDesktop_1_Content.style.top +',' +
        'wdx=' + WirtualDesktop_1_Content.style.y +',' +
        'wds=' + WirtualDesktop_1_Content.scrollTop + ','
    );
    WD_Left_1.value = WirtualDesktop_1.scrollLeft;
    WD_Top_1.value = WirtualDesktop_1.scrollTop;
}
WirtualDesktop_1.addEventListener('scroll',showScrollPosition);
WirtualDesktop_1_Content.addEventListener('scroll',showScrollPosition);


if( false ){
w = 1000 + 'px';
dt.style.width = w;
dt.style.height = "300px";
dt.style.resize = 'both';
dt.style.borderWidth = 50 + 'px';
dt.style.borderRadius = 25 + 'px';
console.log('--2---------- #'+dt.id+' style=' +dt.style);
console.log('-------------- #'+dt.id+' width=' +dt.style.width);
console.log('-------------- #'+dt.id+' left='  +dt.style.left);
console.log('-------------- #'+dt.id+' border='+dt.style.border);
}

function onDTResize(e){
    dt = e.target;
    h = parseInt(dt.style.height);
    dt.style.borderWidth = (h * 0.075) + 'px';
    console.log('---------------- borderWidgh='+dt.style.borderWidth);
}
WirtualDesktop_1.addEventListener('resize', e => { onDTResize(e); });
//console.log('-------------- #'+dt.id+' borderWidth='+dt.style.getProperty('border-width'));

settleWin(
    WirtualBrowser_1,
    WirtualBrowser_1_Location,
    WirtualBrowser_1_Command,
    WirtualBrowser_1_Frame,
    document.URL,
    500,280,50,20,'#262',1.0);
settleWin(
    WirtualBrowser_2,
    WirtualBrowser_2_Location,
    WirtualBrowser_2_Command,
    WirtualBrowser_2_Frame,
    'https://its-more.jp/ja_jp/',
    500,280,150,100,'#448',1.0);

settleWin(
    WirtualBrowser_3,
    WirtualBrowser_3_Location,
    WirtualBrowser_3_Command,
```

```
    WirtualBrowser_3_Frame,
    //'../gshell/gsh.go.html',
        //'http://gshell.org/gshell/gsh.go.html',
    'https://golang.org',
    500,280,250,180,'#444',1.0);
    //1000,720,0,0,'#444',0.125);
    //1200,720,-100,-50,'#444',0.4);

function WD_ClockUpdate(e){
    WirtualDesktop_1_Clock.innerHTML = DateShort();
    WirtualDesktop_1_Calender.innerHTML = DateHourMin();
}
window.setInterval(WD_ClockUpdate,500);
//GJ_Join();

Destroy_WirtualDesktop = function(){
    WirtualDesktop_1.style = "";

    WirtualBrowser_1.removeAttribute('style');
    WirtualBrowser_1_Location.innerHTML = '';
    WirtualBrowser_1_Frame.removeAttribute('src');
    WirtualBrowser_1_Frame.removeAttribute('style');
    WirtualBrowser_1_Frame.style="";

    WirtualBrowser_2.removeAttribute('style');
    WirtualBrowser_2_Location.innerHTML = '';
    WirtualBrowser_2_Frame.removeAttribute('src');
    WirtualBrowser_2_Frame.style="";

    WirtualBrowser_3.removeAttribute('style');
    WirtualBrowser_3_Location.innerHTML = '';
    WirtualBrowser_3_Frame.removeAttribute('src');
    WirtualBrowser_3_Frame.style="";

    GJFactory_1.style = "";
    iframe0.style = "";
    WirtualDesktop_1.style = "";
}

</script>
<!-- WirtualDesktop } -->
</details>
*/ //</span>

//<!-- ---------- Work { ---------- -->
//<span id="Template_WorkCodeSpan">
/*
<details><summary>Work Template</summary>
<!-- ---------- Template of Work// 2020-0928 SatoxITS { -->
<h2>Template of Work</h2>
<input id="Template_WorkCodeViewOpen" class="HtmlCodeViewButton" type="button" value="Source">
<input id="Template_WorkOpenSnapshot" class="HtmlCodeViewButton" type="button" value="Snapshot">
<input id="Template_WorkCodeSignature" class="HtmlCodeViewButton" type="button" value="Signature">
<span id="Template_WorkCodeView"></span>
<script id="Template_WorkScript">
function Tmplate_openWorkCodeView(){
    function Template_showWorkCode(){
        showHtmlCode(Template_WorkCodeView,Template_WorkCodeSpan);
    }
    Template_WorkCodeViewOpen.addEventListener('click',Template_showWorkCode);
}
Tmplate_openWorkCodeView(); /// should be invoked by an event
</script>
</details>
<!-- Template_WorkCodeSpan } -->
*/ //</span>
//<!-- ---------- Work } ---------- -->

//<br></span></html>
```