```
/*<html>
<span id="gsh">
<span id="gsh_digest_" class="_digest_" style="display:none;"></span>
<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" style="display:none;">gsh--0.3.6--2020-09-09--SatoxITS</span>
<title>GShell-0.3.6 by SatoxITS</title>
<header id="GshBanner" height="100px" onclick="shiftBG();" style="">
<div align="right"><note><a href="http://gshell.org">GShell</a> version 0.3.6 // 2020-09-09 // 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>
<span id="gsh-WinId" onclick="win_jump('0.1');">0</span>
<span id="GshMenu">
| <span id="gsh-menu-exit" onclick="html_close();"></span>
| <span id="gsh-menu-fork" onclick="html_fork();">Fork</span>
| <span id="GshMenuStop" onclick="html_stop(this,true);">Stop</span>
| <span id="GshMenuFold" onclick="html_fold(this);">Unfold</span>
| <span id="gsh-menu-cksum" onclick="html_digest();">Digest</span>
| <span id="GshMenuSign" onclick="html_sign(this);">Source</span>
<!-- | <span id="gsh-menu-pure" onclick="html_pure(this);">Pure</span> -->
|</span>
*/
/*
<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>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>
)

// // 2020-0906 added,
// // <a href="https://golang.org/cmd/cgo/">CGo</a>
// #include <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 = "0.3.6"
    DATE = "2020-09-09"
    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>
```

```
250 const ( // SumType
251     SUM_ITEMS   = 0x000001 // items count
252     SUM_SIZE    = 0x000002 // data length (simplly added)
253     SUM_SIZEHASH    = 0x000004 // data length (hashed sequence)
254     SUM_DATEHASH    = 0x000008 // date of data (hashed sequence)
255     // also envelope attributes like time stamp can be a part of digest
256     // hashed value of sizes or mod-date of files will be useful to detect changes
257
258     SUM_WORDS   = 0x000010 // word count is a kind of digest
259     SUM_LINES   = 0x000020 // line count is a kind of digest
260     SUM_SUM64   = 0x000040 // simple add of bytes, useful for human too
261
262     SUM_SUM32_BITS  = 0x000100 // the number of true bits
263     SUM_SUM32_2BYTE = 0x000200 // 16bits words
264     SUM_SUM32_4BYTE = 0x000400 // 32bits words
265     SUM_SUM32_8BYTE = 0x000800 // 64bits words
266
267     SUM_SUM16_BSD   = 0x001000 // UNIXsum -sum -bsd
268     SUM_SUM16_SYSV  = 0x002000 // UNIXsum -sum -sysv
269     SUM_UNIXFILE    = 0x004000
270     SUM_CRCIEEE = 0x008000
271 )
272 type CheckSum struct {
273     Files       int64   // the number of files (or data)
274     Size        int64   // content size
275     Words       int64   // word count
276     Lines       int64   // line count
277     SumType     int
278     Sum64       uint64
279     Crc32Table  crc32.Table
280     Crc32Val    uint32
281     Sum16       int
282     Ctime       time.Time
283     Atime       time.Time
284     Mtime       time.Time
285     Start       time.Time
286     Done        time.Time
287     RusgAtStart [2]syscall.Rusage
288     RusgAtEnd   [2]syscall.Rusage
289 }
290 type ValueStack [][]string
291 type GshContext struct {
292     StartDir    string  // the current directory at the start
293     GetLine     string  // gsh-getline command as a input line editor
294     ChdirHistory    []GChdirHistory // the 1st entry is wd at the start
295     gshPA       syscall.ProcAttr
296     CommandHistory  []GCommandHistory
297     CmdCurrent  GCommandHistory
298     BackGround  bool
299     BackGroundJobs  []int
300     LastRusage  syscall.Rusage
301     GshHomeDir  string
302     TerminalId  int
303     CmdTrace    bool // should be [map]
304     CmdTime     bool // should be [map]
305     PluginFuncs []PluginInfo
306     iValues     []string
307     iDelimiter  string // field sepearater of print out
308     iFormat     string // default print format (of integer)
309     iValStack   ValueStack
310     LastServer  GServer
311     RSERV       string // [gsh://]host[:port]
312     RWD     string // remote (target, there) working directory
313     lastCheckSum    CheckSum
314 }
315
316 func nsleep(ns time.Duration){
317     time.Sleep(ns)
318 }
319 func usleep(ns time.Duration){
320     nsleep(ns*1000)
321 }
322 func msleep(ns time.Duration){
323     nsleep(ns*1000000)
324 }
325 func sleep(ns time.Duration){
326     nsleep(ns*1000000000)
327 }
328
329 func strBegins(str, pat string)(bool){
330     if len(pat) <= len(str){
331         yes := str[0:len(pat)] == pat
332         //fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,yes)
333         return yes
334     }
335     //fmt.Printf("--D-- strBegins(%v,%v)=%v\n",str,pat,false)
336     return false
337 }
338 func isin(what string, list []string) bool {
339     for _, v := range list  {
340         if v == what {
341             return true
342         }
343     }
344     return false
345 }
346 func isinX(what string,list[]string)(int){
347     for i,v := range list {
348         if v == what {
349             return i
350         }
351     }
352     return -1
353 }
354
355 func env(opts []string) {
356     env := os.Environ()
357     if isin("-s", opts){
358         sort.Slice(env, func(i,j int) bool {
359             return env[i] < env[j]
360         })
361     }
362     for _, v := range env {
363         fmt.Printf("%v\n",v)
364     }
365 }
366
367 // - rewriting should be context dependent
368 // - should postpone until the real point of evaluation
369 // - should rewrite only known notation of symobl
370 func scanInt(str string)(val int,leng int){
371     leng = -1
372     for i,ch := range str {
373         if '0' <= ch && ch <= '9' {
374             leng = i+1
```

```
        }else{
            break
        }
    }
    if 0 < leng {
        ival,_ := strconv.Atoi(str[0:leng])
        return ival,leng
    }else{
        return 0,0
    }
}
func substHistory(gshCtx *GshContext,str string,i int,rstr string)(leng int,rst string){
    if len(str[i+1:]) == 0 {
        return 0,rstr
    }
    hi := 0
    histlen := len(gshCtx.CommandHistory)
    if str[i+1] == '!' {
        hi = histlen - 1
        leng = 1
    }else{
        hi,leng = scanInt(str[i+1:])
        if leng == 0 {
            return 0,rstr
        }
        if hi < 0 {
            hi = histlen + hi
        }
    }
    if 0 <= hi && hi < histlen {
        var ext byte
        if 1 < len(str[i+leng:]) {
            ext = str[i+leng:][1]
        }
        //fmt.Printf("--D-- %v(%c)\n",str[i+leng:],str[i+leng])
        if ext == 'f' {
            leng += 1
            xlist := []string{}
            list := gshCtx.CommandHistory[hi].FoundFile
            for _,v := range list {
                //list[i] = escapeWhiteSP(v)
                xlist = append(xlist,escapeWhiteSP(v))
            }
            //rstr += strings.Join(list," ")
            rstr += strings.Join(xlist," ")
        }else
        if ext == '@' || ext == 'd' {
            // !N@ .. workdir at the start of the command
            leng += 1
            rstr += gshCtx.CommandHistory[hi].WorkDir
        }else{
            rstr += gshCtx.CommandHistory[hi].CmdLine
        }
    }else{
        leng = 0
    }
    return leng,rstr
}
func escapeWhiteSP(str string)(string){
    if len(str) == 0 {
        return "\\z" // empty, to be ignored
    }
    rstr := ""
    for _,ch := range str {
        switch ch {
            case '\\': rstr += "\\\\"
            case ' ': rstr += "\\s"
            case '\t': rstr += "\\t"
            case '\r': rstr += "\\r"
            case '\n': rstr += "\\n"
            default: rstr += string(ch)
        }
    }
    return rstr
}
func unescapeWhiteSP(str string)(string){ // strip original escapes
    rstr := ""
    for i := 0; i < len(str); i++ {
        ch := str[i]
        if ch == '\\' {
            if i+1 < len(str) {
                switch str[i+1] {
                    case 'z':
                        continue;
                }
            }
        }
        rstr += string(ch)
    }
    return rstr
}
func unescapeWhiteSPV(strv []string)([]string){ // strip original escapes
    ustrv := []string{}
    for _,v := range strv {
        ustrv = append(ustrv,unescapeWhiteSP(v))
    }
    return ustrv
}

// <a name="comexpansion">str-expansion</a>
// - this should be a macro processor
func strsubst(gshCtx *GshContext,str string,histonly bool) string {
    rbuff := []byte{}
    if false {
        //@@U Unicode should be cared as a character
        return str
    }
    //rstr := ""
    inEsc := 0 // escape characer mode
    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
// show the content with %x fmt list
// ls -R
// tar command by adding output
type fileSum struct {
    Err int64   // access error or so
    Size    int64   // content size
    DupSize int64   // content size from hard links
    Blocks  int64   // number of blocks (of 512 bytes)
    DupBlocks int64 // Blocks pointed from hard links
    HLinks  int64   // hard links
    Words   int64
    Lines   int64
    Files   int64
    Dirs    int64   // the num. of directories
    SymLink int64
    Flats   int64   // the num. of flat files
    MaxDepth    int64
    MaxNamlen   int64   // max. name length
```

```
875     nextRepo    time.Time
876 }
877 func showFusage(dir string,fusage *fileSum){
878     bsume := float64(((fusage.Blocks-fusage.DupBlocks)/2)*1024)/1000000.0
879     //bsumdup := float64((fusage.Blocks/2)*1024)/1000000.0
880 
881     fmt.Printf("%v: %v files (%vd %vs %vh) %.6f MB (%.2f MBK)\n",
882         dir,
883         fusage.Files,
884         fusage.Dirs,
885         fusage.SymLink,
886         fusage.HLinks,
887         float64(fusage.Size)/1000000.0,bsume);
888 }
889 const (
890     S_IFMT    = 0170000
891     S_IFCHR   = 0020000
892     S_IFDIR   = 0040000
893     S_IFREG   = 0100000
894     S_IFLNK   = 0120000
895     S_IFSOCK  = 0140000
896 )
897 func cumFinfo(fsum *fileSum, path string, staterr error, fstat syscall.Stat_t, argv[]string,verb bool)(*fileSum){
898     now := time.Now()
899     if time.Second <= now.Sub(fsum.nextRepo) {
900         if !fsum.nextRepo.IsZero(){
901             tstmp := now.Format(time.Stamp)
902             showFusage(tstmp,fsum)
903         }
904         fsum.nextRepo = now.Add(time.Second)
905     }
906     if staterr != nil {
907         fsum.Err += 1
908         return fsum
909     }
910     fsum.Files += 1
911     if 1 < fstat.Nlink {
912         // must count only once...
913         // at least ignore ones in the same directory
914         //if finfo.Mode().IsRegular() {
915         if (fstat.Mode & S_IFMT) == S_IFREG {
916             fsum.HLinks += 1
917             fsum.DupBlocks += int64(fstat.Blocks)
918             //fmt.Printf("---Dup HardLink %v %s\n",fstat.Nlink,path)
919         }
920     }
921     //fsum.Size += finfo.Size()
922     fsum.Size += fstat.Size
923     fsum.Blocks += int64(fstat.Blocks)
924     //if verb { fmt.Printf("(%8dBlk) %s",fstat.Blocks/2,path) }
925     if isin("-ls",argv){
926         //if verb { fmt.Printf("%4d %8d ",fstat.Blksize,fstat.Blocks) }
927 //      fmt.Printf("%d\t",fstat.Blocks/2)
928     }
929     //if finfo.IsDir()
930     if (fstat.Mode & S_IFMT) == S_IFDIR {
931         fsum.Dirs += 1
932     }
933     //if (finfo.Mode() & os.ModeSymlink) != 0
934     if (fstat.Mode & S_IFMT) == S_IFLNK {
935         //if verb { fmt.Printf("symlink(%v,%s)\n",fstat.Mode,finfo.Name()) }
936         //{ fmt.Printf("symlink(%o,%s)\n",fstat.Mode,finfo.Name()) }
937         fsum.SymLink += 1
938     }
939     return fsum
940 }
941 func (gsh*GshContext)xxFindEntv(depth int,total *fileSum,dir string, dstat syscall.Stat_t, ei int, entv []string,npatv[]string,argv[]string)(*fileSum){
942     nols := isin("-grep",argv)
943     // sort entv
944     /*
945     if isin("-t",argv){
946         sort.Slice(filev, func(i,j int) bool {
947             return 0 < filev[i].ModTime().Sub(filev[j].ModTime())
948         })
949     }
950     */
951         /*
952         if isin("-u",argv){
953             sort.Slice(filev, func(i,j int) bool {
954                 return 0 < filev[i].AccTime().Sub(filev[j].AccTime())
955             })
956         }
957         if isin("-U",argv){
958             sort.Slice(filev, func(i,j int) bool {
959                 return 0 < filev[i].CreatTime().Sub(filev[j].CreatTime())
960             })
961         }
962         */
963     /*
964     if isin("-S",argv){
965         sort.Slice(filev, func(i,j int) bool {
966             return filev[j].Size() < filev[i].Size()
967         })
968     }
969     */
970     for _,filename := range entv {
971         for _,npat := range npatv {
972             match := true
973             if npat == "*" {
974                 match = true
975             }else{
976                 match, _ = filepath.Match(npat,filename)
977             }
978             path := dir + DIRSEP + filename
979             if !match {
980                 continue
981             }
982             var fstat syscall.Stat_t
983             staterr := syscall.Lstat(path,&fstat)
984             if staterr != nil {
985                 if !isin("-w",argv){fmt.Printf("ufind: %v\n",staterr) }
986                 continue;
987             }
988             if isin("-du",argv) && (fstat.Mode & S_IFMT) == S_IFDIR {
989                 // should not show size of directory in "-du" mode ...
990             }else
991             if !nols && !isin("-s",argv) && (!isin("-du",argv) || isin("-a",argv)) {
992                 if isin("-du",argv) {
993                     fmt.Printf("%d\t",fstat.Blocks/2)
994                 }
995                 showFileInfo(path,argv)
996             }
997             if true { // && isin("-du",argv)
998                 total = cumFinfo(total,path,staterr,fstat,argv,false)
999             }
```

```
            /*
            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() {
```

```
1375     //_ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, os.ModeAppend)
1376     // https://developpaper.com/solution-to-golang-bad-file-descriptor-problem/
1377     _ , err := os.OpenFile(resfile(), os.O_RDWR|os.O_CREATE, 0600)
1378     if err != nil {
1379         fmt.Printf("refF could not open: %s\n",err)
1380     }else{
1381         fmt.Printf("refF opened\n")
1382     }
1383 }
1384
1385 // @@2020-0821
1386 func gshScanArg(str string,strip int)(argv []string){
1387     var si = 0
1388     var sb = 0
1389     var inBracket = 0
1390     var arg1 = make([]byte,LINESIZE)
1391     var ax = 0
1392     debug := false
1393
1394     for ; si < len(str); si++ {
1395         if str[si] != ' ' {
1396             break
1397         }
1398     }
1399     sb = si
1400     for ; si < len(str); si++ {
1401         if sb <= si {
1402             if debug {
1403                 fmt.Printf("--Da- +%d %2d-%2d %s ... %s\n",
1404                     inBracket,sb,si,arg1[0:ax],str[si:])
1405             }
1406         }
1407         ch := str[si]
1408         if ch  == '{' {
1409             inBracket += 1
1410             if 0 < strip && inBracket <= strip {
1411                 //fmt.Printf("stripLEV %d <= %d?\n",inBracket,strip)
1412                 continue
1413             }
1414         }
1415         if 0 < inBracket {
1416             if ch == '}' {
1417                 inBracket -= 1
1418                 if 0 < strip && inBracket < strip {
1419                     //fmt.Printf("stripLEV %d <  %d?\n",inBracket,strip)
1420                     continue
1421                 }
1422             }
1423             arg1[ax] = ch
1424             ax += 1
1425             continue
1426         }
1427         if str[si] == ' ' {
1428             argv = append(argv,string(arg1[0:ax]))
1429             if debug {
1430                 fmt.Printf("--Da- [%v][%v-%v] %s ... %s\n",
1431                     -1+len(argv),sb,si,str[sb:si],string(str[si:]))
1432             }
1433             sb = si+1
1434             ax = 0
1435             continue
1436         }
1437         arg1[ax] = ch
1438         ax += 1
1439     }
1440     if sb < si {
1441         argv = append(argv,string(arg1[0:ax]))
1442         if debug {
1443             fmt.Printf("--Da- [%v][%v-%v] %s ... %s\n",
1444                 -1+len(argv),sb,si,string(arg1[0:ax]),string(str[si:]))
1445         }
1446     }
1447     if debug {
1448         fmt.Printf("--Da- %d [%s] => [%d]%v\n",strip,str,len(argv),argv)
1449     }
1450     return argv
1451 }
1452
1453 // should get stderr (into tmpfile ?) and return
1454 func (gsh*GshContext)Popen(name,mode string)(pin*os.File,pout*os.File,err bool){
1455     var pv = []int{-1,-1}
1456     syscall.Pipe(pv)
1457
1458     xarg := gshScanArg(name,1)
1459     name = strings.Join(xarg," ")
1460
1461     pin = os.NewFile(uintptr(pv[0]),"StdoutOf-{"+name+"}")
1462     pout = os.NewFile(uintptr(pv[1]),"StdinOf-{"+name+"}")
1463     fdix := 0
1464     dir := "?"
1465     if mode == "r" {
1466         dir = "<"
1467         fdix = 1 // read from the stdout of the process
1468     }else{
1469         dir = ">"
1470         fdix = 0 // write to the stdin of the process
1471     }
1472     gshPA := gsh.gshPA
1473     savfd := gshPA.Files[fdix]
1474
1475     var fd uintptr = 0
1476     if mode == "r" {
1477         fd = pout.Fd()
1478         gshPA.Files[fdix] = pout.Fd()
1479     }else{
1480         fd = pin.Fd()
1481         gshPA.Files[fdix] = pin.Fd()
1482     }
1483         // should do this by Goroutine?
1484         if false {
1485             fmt.Printf("--Ip- Opened fd[%v] %s %v\n",fd,dir,name)
1486             fmt.Printf("--RED1 [%d,%d,%d]->[%d,%d,%d]\n",
1487                 os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd(),
1488                 pin.Fd(),pout.Fd(),pout.Fd())
1489         }
1490             savi := os.Stdin
1491             savo := os.Stdout
1492             save := os.Stderr
1493             os.Stdin  = pin
1494             os.Stdout = pout
1495             os.Stderr = pout
1496         gsh.BackGround = true
1497         gsh.gshelllh(name)
1498         gsh.BackGround = false
1499             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);
            }
        }
    }
}

func (gshCtx *GshContext)gen(argv []string) {
    gshPA := gshCtx.gshPA
    if len(argv) < 2 {
        fmt.Printf("Usage: %s N\n",argv[0])
        return
    }
    // should br repeated by "repeat" command
    count, _ := strconv.Atoi(argv[1])
    fd := gshPA.Files[1] // Stdout
    file := os.NewFile(fd,"internalStdOut")
    fmt.Printf("--I-- Gen. Count=%d to [%d]\n",count,file.Fd())
    //buf := []byte{}
    outdata := "0123 5678 0123 5678 0123 5678 0123 5678\r"
    for gi := 0; gi < count; gi++ {
        file.WriteString(outdata)
    }
    //file.WriteString("\n")
    fmt.Printf("\n(%d B)\n",count*len(outdata));
    //file.Close()
}

// <a name="rexec">Remote Execution</a> // 2020-0820
func Elapsed(from time.Time)(string){
```

```
1625     elps := time.Now().Sub(from)
1626     if 1000000000 < elps {
1627         return fmt.Sprintf("[%5d.%02ds]",elps/1000000000,(elps%1000000000)/10000000)
1628     }else
1629     if 1000000 < elps {
1630         return fmt.Sprintf("[%3d.%03dms]",elps/1000000,(elps%1000000)/1000)
1631     }else{
1632         return fmt.Sprintf("[%3d.%03dus]",elps/1000,(elps%1000))
1633     }
1634 }
1635 func abbtime(nanos int64)(string){
1636     if 1000000000 < nanos {
1637         return fmt.Sprintf("%d.%02ds",nanos/1000000000,(nanos%1000000000)/10000000)
1638     }else
1639     if 1000000 < nanos {
1640         return fmt.Sprintf("%d.%03dms",nanos/1000000,(nanos%1000000)/1000)
1641     }else{
1642         return fmt.Sprintf("%d.%03dus",nanos/1000,(nanos%1000))
1643     }
1644 }
1645 func abssize(size int64)(string){
1646     fsize := float64(size)
1647     if 1024*1024*1024 < size {
1648         return fmt.Sprintf("%.2fGiB",fsize/(1024*1024*1024))
1649     }else
1650     if 1024*1024 < size {
1651         return fmt.Sprintf("%.3fMiB",fsize/(1024*1024))
1652     }else{
1653         return fmt.Sprintf("%.3fKiB",fsize/1024)
1654     }
1655 }
1656 func absize(size int64)(string){
1657     fsize := float64(size)
1658     if 1024*1024*1024 < size {
1659         return fmt.Sprintf("%8.2fGiB",fsize/(1024*1024*1024))
1660     }else
1661     if 1024*1024 < size {
1662         return fmt.Sprintf("%8.3fMiB",fsize/(1024*1024))
1663     }else{
1664         return fmt.Sprintf("%8.3fKiB",fsize/1024)
1665     }
1666 }
1667 func abbspeed(totalB int64,ns int64)(string){
1668     MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
1669     if 1000 <= MBs {
1670         return fmt.Sprintf("%6.3fGB/s",MBs/1000)
1671     }
1672     if 1 <= MBs {
1673         return fmt.Sprintf("%6.3fMB/s",MBs)
1674     }else{
1675         return fmt.Sprintf("%6.3fKB/s",MBs*1000)
1676     }
1677 }
1678 func abspeed(totalB int64,ns time.Duration)(string){
1679     MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
1680     if 1000 <= MBs {
1681         return fmt.Sprintf("%6.3fGBps",MBs/1000)
1682     }
1683     if 1 <= MBs {
1684         return fmt.Sprintf("%6.3fMBps",MBs)
1685     }else{
1686         return fmt.Sprintf("%6.3fKBps",MBs*1000)
1687     }
1688 }
1689 func fileRelay(what string,in*os.File,out*os.File,size int64,bsiz int)(wcount int64){
1690     Start := time.Now()
1691     buff := make([]byte,bsiz)
1692     var total int64 = 0
1693     var rem int64 = size
1694     nio := 0
1695     Prev := time.Now()
1696     var PrevSize int64 = 0
1697
1698     fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) START\n",
1699         what,absize(total),size,nio)
1700
1701     for i:= 0; ; i++ {
1702         var len = bsiz
1703         if int(rem) < len {
1704             len = int(rem)
1705         }
1706         Now := time.Now()
1707         Elps := Now.Sub(Prev);
1708         if 1000000000 < Now.Sub(Prev) {
1709             fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) %s\n",
1710                 what,absize(total),size,nio,
1711                 abspeed((total-PrevSize),Elps))
1712             Prev = Now;
1713             PrevSize = total
1714         }
1715         rlen := len
1716         if in != nil {
1717             // should watch the disconnection of out
1718             rcc,err := in.Read(buff[0:rlen])
1719             if err != nil {
1720                 fmt.Printf(Elapsed(Start)+"--En- X: %s read(%v,%v)<%v\n",
1721                     what,rcc,err,in.Name())
1722                 break
1723             }
1724             rlen = rcc
1725             if string(buff[0:10]) == "((SoftEOF " {
1726                 var ecc int64 = 0
1727                 fmt.Sscanf(string(buff),"((SoftEOF %v",&ecc)
1728                 fmt.Printf(Elapsed(Start)+"--En- X: %s Recv ((SoftEOF %v))/%v\n",
1729                     what,ecc,total)
1730                 if ecc == total {
1731                     break
1732                 }
1733             }
1734         }
1735
1736         wlen := rlen
1737         if out != nil {
1738             wcc,err := out.Write(buff[0:rlen])
1739             if err != nil {
1740                 fmt.Printf(Elapsed(Start)+"-En-- X: %s write(%v,%v)>%v\n",
1741                     what,wcc,err,out.Name())
1742                 break
1743             }
1744             wlen = wcc
1745         }
1746         if wlen < rlen {
1747             fmt.Printf(Elapsed(Start)+"--En- X: %s incomplete write (%v/%v)\n",
1748                 what,wlen,rlen)
1749             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)
```

```
1875
1876                    tcpPush(clnt); // to let SoftEOF data apper at the top of recevied data
1877                    fmt.Fprintf(clnt,"%v\r\n",SoftEOF)
1878                    tcpPush(clnt); // to let SoftEOF alone in a packet (separate with 200 OK)
1879                        // with client generated random?
1880                    //fmt.Printf("--In- L: close %v (%v)\n",in.Fd(),in.Name())
1881                }
1882                res = fmt.Sprintf("200 GET done\r\n")
1883            case "PUT":
1884                // upload {srcfile|-zN} [dstfile]
1885                var dsize int64 = 32*1024*1024
1886                var bsize int = 64*1024
1887                var fname string = ""
1888                var out *os.File = nil
1889                if 1 < len(cmdv) { // localfile
1890                    fmt.Sscanf(cmdv[1],"%d",&dsize)
1891                }
1892                if 2 < len(cmdv) {
1893                    fname = cmdv[2]
1894                    if fname == "-" {
1895                        // nul dev
1896                    }else
1897                    if strBegins(fname,"{") {
1898                        xin,xout,err := gsh.Popen(fname,"w")
1899                        if err {
1900                        }else{
1901                            xin.Close()
1902                            defer xout.Close()
1903                            out = xout
1904                        }
1905                    }else{
1906                    // should write to temporary file
1907                    // should suppress ^C on tty
1908            xout,err := os.OpenFile(fname,os.O_CREATE|os.O_RDWR|os.O_TRUNC,0600)
1909            //fmt.Printf("--In- S: open(%v) out(%v) err(%v)\n",fname,xout,err)
1910                        if err != nil {
1911                            fmt.Printf("--En- PUT (%v)\n",err)
1912                        }else{
1913                            out = xout
1914                        }
1915                    }
1916                fmt.Printf(Elapsed(Start)+"--In- L: open(%v,w) %v (%v)\n",
1917                    fname,local,err)
1918                }
1919                fmt.Printf(Elapsed(Start)+"--In- PUT %v (/%v)\n",dsize,bsize)
1920                fmt.Printf(Elapsed(Start)+"--In- S: 200 %v OK\r\n",dsize)
1921                fmt.Fprintf(clnt,"200 %v OK\r\n",dsize)
1922                fileRelay("RecvPUT",clnt,out,dsize,bsize)
1923                res = fmt.Sprintf("200 PUT done\r\n")
1924            default:
1925                res = fmt.Sprintf("400 What? %v",req)
1926        }
1927        swcc,serr := clnt.Write([]byte(res))
1928        if serr != nil {
1929            fmt.Printf(Elapsed(Start)+"--In- S: (wc=%v er=%v) %v",swcc,serr,res)
1930        }else{
1931            fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
1932        }
1933        aconn.Close();
1934        clnt.Close();
1935    }
1936    sconn.Close();
1937 }
1938 func (gsh*GshContext)RexecClient(argv[]string)(int,string){
1939    debug := true
1940    Start := time.Now()
1941    if len(argv) == 1 {
1942        return -1,"EmptyARG"
1943    }
1944    argv = argv[1:]
1945    if argv[0] == "-serv" {
1946        gsh.RexecServer(argv[1:])
1947        return 0,"Server"
1948    }
1949    remote := "0.0.0.0:9999"
1950    if argv[0][0] == '@' {
1951        remote = argv[0][1:]
1952        argv = argv[1:]
1953    }
1954    if argv[0] == "-s" {
1955        debug = false
1956        argv = argv[1:]
1957    }
1958    dport, err := net.ResolveTCPAddr("tcp",remote);
1959    if err != nil {
1960        fmt.Printf(Elapsed(Start)+"Address error: %s (%s)\n",remote,err)
1961        return -1,"AddressError"
1962    }
1963    fmt.Printf(Elapsed(Start)+"--In- C: Connecting to %s\n",remote)
1964    serv, err := net.DialTCP("tcp",nil,dport)
1965    if err != nil {
1966        fmt.Printf(Elapsed(Start)+"Connection error: %s (%s)\n",remote,err)
1967        return -1,"CannotConnect"
1968    }
1969    if debug {
1970        al := serv.LocalAddr()
1971        fmt.Printf(Elapsed(Start)+"--In- C: Connected to %v <- %v\n",remote,al)
1972    }
1973
1974    req := ""
1975    res := make([]byte,LINESIZE)
1976    count,err := serv.Read(res)
1977    if err != nil {
1978        fmt.Printf("--En- S: (%3d,%v) %v",count,err,string(res))
1979    }
1980    if debug { fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res)) }
1981
1982    if argv[0] == "GET" {
1983        savPA := gsh.gshPA
1984        var bsize int = 64*1024
1985        req = fmt.Sprintf("%v\r\n",strings.Join(argv," "))
1986        fmt.Printf(Elapsed(Start)+"--In- C: %v",req)
1987        fmt.Fprintf(serv,req)
1988        count,err = serv.Read(res)
1989        if err != nil {
1990        }else{
1991            var dsize int64 = 0
1992            var out *os.File = nil
1993            var out_tobeclosed *os.File = nil
1994            var fname string = ""
1995            var rcode int = 0
1996            var pid int = -1
1997            fmt.Sscanf(string(res),"%d %d",&rcode,&dsize)
1998            fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res[0:count]))
1999            if 3 <= len(argv) {
```

```
                fname = argv[2]
                if strBegins(fname,"{") {
                    xin,xout,err := gsh.Popen(fname,"w")
                    if err {
                    }else{
                        xin.Close()
                        defer xout.Close()
                        out = xout
                        out_tobeclosed = xout
                        pid = 0 // should be its pid
                    }
                }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)
                    if err != nil {
                        fmt.Print("--En- %v\n",err)
                    }
                    out = xout
                    //fmt.Printf("--In-- %d > %s\n",out.Fd(),fname)
                }
            }
            in,_ := serv.File()
            fileRelay("RecvGET",in,out,dsize,bsize)
            if 0 <= pid {
                gsh.gshPA = savPA // recovery of Fd(), and more?
                fmt.Printf(Elapsed(Start)+"--In- L: close Pipe > %v\n",fname)
                out_tobeclosed.Close()
                //syscall.Wait4(pid,nil,0,nil) //@@
            }
        }
    }else
    if argv[0] == "PUT" {
        remote, _ := serv.File()
        var local *os.File = nil
        var dsize int64 = 32*1024*1024
        var bsize int = 64*1024
        var ofile string = "-"
        //fmt.Printf("--I-- Rex %v\n",argv)
        if 1 < len(argv) {
            fname := argv[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
                    local = xin
                    fmt.Printf("--In- [%d] < Upload output of %v\n",
                        local.Fd(),fname)
                    ofile = "-from."+fname
                    dsize = MaxStreamSize
                }
            }else{
                xlocal,err := os.Open(fname)
                if err != nil {
                    fmt.Printf("--En- (%s)\n",err)
                    local = nil
                }else{
                    local = xlocal
                    fi,_ := local.Stat()
                    dsize = fi.Size()
                    defer local.Close()
                    //fmt.Printf("--I-- Rex in(%v / %v)\n",ofile,dsize)
                }
                ofile = fname
                fmt.Printf(Elapsed(Start)+"--In- L: open(%v,r)=%v %v (%v)\n",
                    fname,dsize,local,err)
            }
        }
        if 2 < len(argv) && argv[2] != "" {
            ofile = argv[2]
            //fmt.Printf("(%d)%v B.ofile=%v\n",len(argv),argv,ofile)
        }
        //fmt.Printf(Elapsed(Start)+"--I-- Rex out(%v)\n",ofile)
        fmt.Printf(Elapsed(Start)+"--In- PUT %v (/%v)\n",dsize,bsize)
        req = fmt.Sprintf("PUT %v %v \r\n",dsize,ofile)
        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",req) }
        fmt.Fprintf(serv,"%v",req)
        count,err = serv.Read(res)
        if debug { fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res[0:count])) }
        fileRelay("SendPUT",local,remote,dsize,bsize)
    }else{
        req = fmt.Sprintf("%v\r\n",strings.Join(argv," "))
        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",req) }
        fmt.Fprintf(serv,"%v",req)
        //fmt.Printf("--In- sending RexRequest(%v)\n",len(req))
    }
    //fmt.Printf(Elapsed(Start)+"--In- waiting RexResponse...\n")
    count,err = serv.Read(res)
    ress := ""
    if count == 0 {
        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{}
```

```
2125     argv = argv[1:]
2126
2127     for _,v := range argv {
2128         /*
2129         if v[0] == '-' { // might be a pseudo file (generated date)
2130             continue
2131         }
2132         */
2133         obj := strings.Split(v,":")
2134         //fmt.Printf("%d %v %v\n",len(obj),v,obj)
2135         if 1 < len(obj) {
2136             host = obj[0]
2137             file := ""
2138             if 0 < len(host) {
2139                 gsh.LastServer.host = host
2140             }else{
2141                 host = gsh.LastServer.host
2142                 port = gsh.LastServer.port
2143             }
2144             if 2 < len(obj) {
2145                 port = obj[1]
2146                 if 0 < len(port) {
2147                     gsh.LastServer.port = port
2148                 }else{
2149                     port = gsh.LastServer.port
2150                 }
2151                 file = obj[2]
2152             }else{
2153                 file = obj[1]
2154             }
2155             if len(srcv) == 0 {
2156                 download = true
2157                 srcv = append(srcv,file)
2158                 continue
2159             }
2160             upload = true
2161             dstv = append(dstv,file)
2162             continue
2163         }
2164         /*
2165         idx := strings.Index(v,":")
2166         if 0 <= idx {
2167             remote = v[0:idx]
2168             if len(srcv) == 0 {
2169                 download = true
2170                 srcv = append(srcv,v[idx+1:])
2171                 continue
2172             }
2173             upload = true
2174             dstv = append(dstv,v[idx+1:])
2175             continue
2176         }
2177         */
2178         if download {
2179             dstv = append(dstv,v)
2180         }else{
2181             srcv = append(srcv,v)
2182         }
2183     }
2184     hostport := "@" + host + ":" + port
2185     if upload {
2186         if host != "" { xargv = append(xargv,hostport) }
2187         xargv = append(xargv,"PUT")
2188         xargv = append(xargv,srcv[0:]...)
2189         xargv = append(xargv,dstv[0:]...)
2190     //fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v // %v\n",hostport,dstv,srcv,xargv)
2191     fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v\n",hostport,dstv,srcv)
2192         gsh.RexecClient(xargv)
2193     }else
2194     if download {
2195         if host != "" { xargv = append(xargv,hostport) }
2196         xargv = append(xargv,"GET")
2197         xargv = append(xargv,srcv[0:]...)
2198         xargv = append(xargv,dstv[0:]...)
2199     //fmt.Printf("--I-- FileCopy GET gsh://%v/%v > %v // %v\n",hostport,srcv,dstv,xargv)
2200     fmt.Printf("--I-- FileCopy GET gsh://%v/%v > %v\n",hostport,srcv,dstv)
2201         gsh.RexecClient(xargv)
2202     }else{
2203     }
2204 }
2205
2206 // target
2207 func (gsh*GshContext)Trelpath(rloc string)(string){
2208     cwd, _ := os.Getwd()
2209     os.Chdir(gsh.RWD)
2210     os.Chdir(rloc)
2211     twd, _ := os.Getwd()
2212     os.Chdir(cwd)
2213
2214     tpath := twd + "/" + rloc
2215     return tpath
2216 }
2217 // join to rmote GShell - [user@]host[:port] or cd host:[port]:path
2218 func (gsh*GshContext)Rjoin(argv[]string){
2219     if len(argv) <= 1 {
2220         fmt.Printf("--I-- current server = %v\n",gsh.RSERV)
2221         return
2222     }
2223     serv := argv[1]
2224     servv := strings.Split(serv,":")
2225     if 1 <= len(servv) {
2226         if servv[0] == "lo" {
2227             servv[0] = "localhost"
2228         }
2229     }
2230     switch len(servv) {
2231         case 1:
2232             //if strings.Index(serv,":") < 0 {
2233             serv = servv[0] + ":" + fmt.Sprintf("%d",GSH_PORT)
2234             //}
2235         case 2: // host:port
2236             serv = strings.Join(servv,":")
2237     }
2238     xargv := []string{"rex-join","@"+serv,"HELO"}
2239     rcode,stat := gsh.RexecClient(xargv)
2240     if (rcode / 100) == 2 {
2241         fmt.Printf("--I-- OK Joined (%v) %v\n",rcode,stat)
2242         gsh.RSERV = serv
2243     }else{
2244         fmt.Printf("--I-- NG, could not joined (%v) %v\n",rcode,stat)
2245     }
2246 }
2247 func (gsh*GshContext)Rexec(argv[]string){
2248     if len(argv) <= 1 {
2249         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)
```

```
3250     case cmd == "-ls":
3251         gshCtx.xFind(argv)
3252     case cmd == "nop":
3253         // do nothing
3254     case cmd == "pipe":
3255         gshCtx.xOpen(argv)
3256     case cmd == "plug" || cmd == "plugin" || cmd == "pin":
3257         gshCtx.xPlugin(argv[1:])
3258     case cmd == "print" || cmd == "-pr":
3259         // output internal slice // also sprintf should be
3260         gshCtx.Printv(argv)
3261     case cmd == "ps":
3262         gshCtx.xPs(argv)
3263     case cmd == "pstitle":
3264         // to be gsh.title
3265     case cmd == "rexecd" || cmd == "rexd":
3266         gshCtx.RexecServer(argv)
3267     case cmd == "rexec" || cmd == "rex":
3268         gshCtx.RexecClient(argv)
3269     case cmd == "repeat" || cmd == "rep": // repeat cond command
3270         gshCtx.repeat(argv)
3271     case cmd == "replay":
3272         gshCtx.xReplay(argv)
3273     case cmd == "scan":
3274         // scan input (or so in fscanf) to internal slice (like Files or map)
3275         gshCtx.Scanv(argv)
3276     case cmd == "set":
3277         // set name ...
3278     case cmd == "serv":
3279         gshCtx.httpServer(argv)
3280     case cmd == "shift":
3281         gshCtx.Shiftv(argv)
3282     case cmd == "sleep":
3283         gshCtx.sleep(argv)
3284     case cmd == "-sort":
3285         gshCtx.Sortv(argv)
3286
3287     case cmd == "j" || cmd == "join":
3288         gshCtx.Rjoin(argv)
3289     case cmd == "a" || cmd == "alpa":
3290         gshCtx.Rexec(argv)
3291     case cmd == "jcd" || cmd == "jchdir":
3292         gshCtx.Rchdir(argv)
3293     case cmd == "jget":
3294         gshCtx.Rget(argv)
3295     case cmd == "jls":
3296         gshCtx.Rls(argv)
3297     case cmd == "jput":
3298         gshCtx.Rput(argv)
3299     case cmd == "jpwd":
3300         gshCtx.Rpwd(argv)
3301
3302     case cmd == "time":
3303         fin = gshCtx.xTime(argv)
3304     case cmd == "ungets":
3305         if 1 < len(argv) {
3306             ungets(argv[1]+"\n")
3307         }else{
3308         }
3309     case cmd == "pwd":
3310         gshCtx.xPwd(argv);
3311     case cmd == "ver" || cmd == "-ver" || cmd == "version":
3312         gshCtx.showVersion(argv)
3313     case cmd == "where":
3314         // data file or so?
3315     case cmd == "which":
3316         which("PATH",argv);
3317     default:
3318         if gshCtx.whichPlugin(cmd,[]string{"-s"}) != nil {
3319             gshCtx.xPlugin(argv)
3320         }else{
3321             notfound,_ := gshCtx.excommand(false,argv)
3322             if notfound {
3323                 fmt.Printf("--E-- command not found (%v)\n",cmd)
3324             }
3325         }
3326     }
3327     return fin
3328 }
3329
3330 func (gsh*GshContext)gshelll(gline string) (rfin bool) {
3331     argv := strings.Split(string(gline)," ")
3332     fin := gsh.gshellv(argv)
3333     return fin
3334 }
3335 func (gsh*GshContext)tgshelll(gline string)(xfin bool){
3336     start := time.Now()
3337     fin := gsh.gshelll(gline)
3338     end := time.Now()
3339     elps := end.Sub(start);
3340     if gsh.CmdTime {
3341         fmt.Printf("--T-- " + time.Now().Format(time.Stamp) + "(%d.%09ds)\n",
3342             elps/1000000000,elps%1000000000)
3343     }
3344     return fin
3345 }
3346 func Ttyid() (int) {
3347     fi, err := os.Stdin.Stat()
3348     if err != nil {
3349         return 0;
3350     }
3351     //fmt.Printf("Stdin: %v Dev=%d\n",
3352     //  fi.Mode(),fi.Mode()&os.ModeDevice)
3353     if (fi.Mode() & os.ModeDevice) != 0 {
3354         stat := syscall.Stat_t{};
3355         err := syscall.Fstat(0,&stat)
3356         if err != nil {
3357             //fmt.Printf("--I-- Stdin: (%v)\n",err)
3358         }else{
3359             //fmt.Printf("--I-- Stdin: rdev=%d %d\n",
3360             //  stat.Rdev&0xFF,stat.Rdev);
3361             //fmt.Printf("--I-- Stdin: tty%d\n",stat.Rdev&0xFF);
3362             return int(stat.Rdev & 0xFF)
3363         }
3364     }
3365     return 0
3366 }
3367 func (gshCtx *GshContext) ttyfile() string {
3368     //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
3369     ttyfile := gshCtx.GshHomeDir + "/" + "gsh-tty" +
3370          fmt.Sprintf("%02d",gshCtx.TerminalId)
3371          //strconv.Itoa(gshCtx.TerminalId)
3372     //fmt.Printf("--I-- ttyfile=%s\n",ttyfile)
3373     return ttyfile
3374 }
```

```
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
```

```
3750            }else{
3751                f,err = os.Open(dicName+".html")
3752                if err == nil {
3753                    dicURL = dicName+".html"
3754                }else{
3755                    f,err = os.Open("gshdic-"+dicName+".html")
3756                    if err == nil {
3757                        dicURL = "gshdic-"+dicName+".html"
3758                    }
3759                }
3760            }
3761            if err == nil {
3762                var buf = make([]byte,128*1024)
3763                count,err := f.Read(buf)
3764                f.Close()
3765                if info {
3766                    fprintf(stderr,"--Id-- ReadDic(%v,%v)\n",count,err)
3767                }
3768                dicBody = string(buf[0:count])
3769            }
3770        }
3771        if dicBody == "" {
3772            switch arg {
3773                default:
3774                    dicName = "WorldDic"
3775                    dicURL = WorldDic
3776                    if info {
3777                    fprintf(stderr,"--Id-- default dictionary \"%v\"\n",
3778                        dicName);
3779                    }
3780                case "wnn":
3781                    dicName = "WnnDic"
3782                    dicURL = WnnDic
3783                case "sumomo":
3784                    dicName = "SumomoDic"
3785                    dicURL = SumomoDic
3786                case "sijimi":
3787                    dicName = "SijimiDic"
3788                    dicURL = SijimiDic
3789                case "jkl":
3790                    dicName = "JKLJaDic"
3791                    dicURL = JA_JKLDic
3792            }
3793            if debug {
3794                fprintf(stderr,"--Id-- %v URL=%v\n\n",dicName,dicURL);
3795            }
3796            dicv := strings.Split(dicURL,",")
3797            if debug {
3798                fprintf(stderr,"--Id-- %v encoded data...\n",dicName)
3799                fprintf(stderr,"Type: %v\n",dicv[0])
3800                fprintf(stderr,"Body: %v\n",dicv[1])
3801                fprintf(stderr,"\n")
3802            }
3803            body,_ := base64.StdEncoding.DecodeString(dicv[1])
3804            dicBody = string(body)
3805        }
3806        if info {
3807            fmt.Printf("--Id-- %v %v\n",dicName,dicURL)
3808            fmt.Printf("%s\n",dicBody)
3809        }
3810        if debug {
3811            fprintf(stderr,"--Id-- dicName %v text...\n",dicName)
3812            fprintf(stderr,"%v\n",string(dicBody))
3813        }
3814        entv := strings.Split(dicBody,"\n");
3815        if info {
3816            fprintf(stderr,"--Id-- %v scan...\n",dicName);
3817        }
3818        var added int = 0
3819        var dup int = 0
3820        for i,v := range entv {
3821            var pat string
3822            var out string
3823            fmt.Sscanf(v,"%s %s",&pat,&out)
3824            if len(pat) <= 0 {
3825            }else{
3826                if 0 <= isinDic(pat) {
3827                    dup += 1
3828                    continue
3829                }
3830                romkana[dicents] = RomKana{dicName,pat,out,0}
3831                dicents += 1
3832                added += 1
3833                Romkan = append(Romkan,RomKana{dicName,pat,out,0})
3834                if debug {
3835                    fmt.Printf("[%3v]:[%2v]%-8v [%2v]%v\n",
3836                        i,len(pat),pat,len(out),out)
3837                }
3838            }
3839        }
3840        if !silent {
3841            url := dicURL
3842            if strBegins(url,"data:") {
3843                url = "builtin"
3844            }
3845            fprintf(stderr,"--Id-- %v scan... %v added, %v dup. / %v total (%v)\n",
3846                dicName,added,dup,len(Romkan),url);
3847        }
3848        // should sort by pattern length for conclete match, for performance
3849        if debug {
3850            arg = "" // search pattern
3851            dump = true
3852        }
3853    }
3854    if cmd == DIC_COM_DUMP || dump {
3855        fprintf(stderr,"--Id-- %v dump... %v entries:\n",dicName,len(Romkan));
3856        var match = 0
3857        for i := 0; i < len(Romkan); i++ {
3858            dic := Romkan[i].dic
3859            pat := Romkan[i].pat
3860            out := Romkan[i].out
3861            if arg == "" || 0 <= strings.Index(pat,arg)||0 <= strings.Index(out,arg) {
3862                fmt.Printf("\\\\%v\t%v [%2v]%-8v [%2v]%v\n",
3863                    i,dic,len(pat),pat,len(out),out)
3864                match += 1
3865            }
3866        }
3867        fprintf(stderr,"--Id-- %v matched %v / %v entries:\n",arg,match,len(Romkan));
3868    }
3869 }
3870 func loadDefaultDic(dic int){
3871     if( 0 < len(Romkan) ){
3872         return
3873     }
3874     //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){
```

```
4000     dst := convs(src);
4001     xfputss(dst,stderr);
4002     return 0;
4003 }
4004
4005 //------------------------------------------------------------ LINEEDIT
4006 // "?" at the top of the line means searching history
4007
4008 // should be compatilbe with Telnet
4009 const (
4010     EV_MODE     = 255
4011     EV_IDLE     = 254
4012     EV_TIMEOUT  = 253
4013
4014     GO_UP       = 252   // k
4015     GO_DOWN     = 251   // j
4016     GO_RIGHT    = 250   // l
4017     GO_LEFT     = 249   // h
4018     DEL_RIGHT   = 248   // x
4019     GO_TOPL     = 'A'-0x40  // 0
4020     GO_ENDL     = 'E'-0x40  // $
4021
4022     GO_TOPW     = 239   // b
4023     GO_ENDW     = 238   // e
4024     GO_NEXTW    = 237   // w
4025
4026     GO_FORWCH   = 229   // f
4027     GO_PAIRCH   = 228   // %
4028
4029     GO_DEL      = 219   // d
4030
4031     HI_SRCH_FW  = 209   // /
4032     HI_SRCH_BK  = 208   // ?
4033     HI_SRCH_RFW = 207   // n
4034     HI_SRCH_RBK = 206   // N
4035 )
4036
4037 // should return number of octets ready to be read immediately
4038 //fprintf(stderr,"\n--Select(%v %v)\n",err,r.Bits[0])
4039
4040
4041 var EventRecvFd = -1 // file descriptor
4042 var EventSendFd = -1
4043 const EventFdOffset = 1000000
4044 const NormalFdOffset = 100
4045
4046 func putEvent(event int, evarg int){
4047     if true {
4048         if EventRecvFd < 0 {
4049             var pv = []int{-1,-1}
4050             syscall.Pipe(pv)
4051             EventRecvFd = pv[0]
4052             EventSendFd = pv[1]
4053             //fmt.Printf("--De-- EventPipe created[%v,%v]\n",EventRecvFd,EventSendFd)
4054         }
4055     }else{
4056         if EventRecvFd < 0 {
4057             // the document differs from this spec
4058             // https://golang.org/src/syscall/syscall_unix.go?s=8096:8158#L340
4059             sv,err := syscall.Socketpair(syscall.AF_UNIX,syscall.SOCK_STREAM,0)
4060             EventRecvFd = sv[0]
4061             EventSendFd = sv[1]
4062             if err != nil {
4063                 fmt.Printf("--De-- EventSock created[%v,%v](%v)\n",
4064                     EventRecvFd,EventSendFd,err)
4065             }
4066         }
4067     }
4068     var buf = []byte{ byte(event)}
4069     n,err := syscall.Write(EventSendFd,buf)
4070     if err != nil {
4071         fmt.Printf("--De-- putEvent[%v](%3v)(%v %v)\n",EventSendFd,event,n,err)
4072     }
4073 }
4074 func ungets(str string){
4075     for _,ch := range str {
4076         putEvent(int(ch),0)
4077     }
4078 }
4079 func (gsh*GshContext)xReplay(argv[]string){
4080     hix := 0
4081     tempo := 1.0
4082     xtempo := 1.0
4083     repeat := 1
4084
4085     for _,a := range argv { // tempo
4086         if strBegins(a,"x") {
4087             fmt.Sscanf(a[1:],"%f",&xtempo)
4088             tempo = 1 / xtempo
4089             //fprintf(stderr,"--Dr-- tempo=[%v]%v\n",a[2:],tempo);
4090         }else
4091         if strBegins(a,"r") { // repeat
4092             fmt.Sscanf(a[1:],"%v",&repeat)
4093         }else
4094         if strBegins(a,"!") {
4095             fmt.Sscanf(a[1:],"%d",&hix)
4096         }else{
4097             fmt.Sscanf(a,"%d",&hix)
4098         }
4099     }
4100     if hix == 0 || len(argv) <= 1 {
4101         hix = len(gsh.CommandHistory)-1
4102     }
4103     fmt.Printf("--Ir-- Replay(!%v x%v r%v)\n",hix,xtempo,repeat)
4104         //dumpEvents(hix)
4105     //gsh.xScanReplay(hix,false,repeat,tempo,argv)
4106     go gsh.xScanReplay(hix,true,repeat,tempo,argv)
4107 }
4108
4109 // <a href="https://golang.org/pkg/syscall/#FdSet">syscall.Select</a>
4110 // 2020-0827 GShell-0.2.3
4111 /*
4112 func FpollIn1(fp *os.File,usec int)(uintptr){
4113     nfd := 1
4114
4115     rdv := syscall.FdSet {}
4116     fd1 := fp.Fd()
4117     bank1 := fd1/32
4118     mask1 := int32(1 << fd1)
4119     rdv.Bits[bank1] = mask1
4120
4121     fd2 := -1
4122     bank2 := -1
4123     var mask2 int32 = 0
4124
```

```
    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 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")
        }
    }
}
// <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.xgetline1(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);
            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 1 < len(argv) {
        if isin("version",argv){
            gsh.showVersion(argv)
            return
        }
        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>
```

```
5500
5501 //<span class="gsh-golang-data">
5502
5503 var WorldDic = //<span id="gsh-world-dic">
5504 "data:text/dic;base64,"+
5505 "Ly8gTXlJTUUvMC4wLjEg6L6e5pu4ICgyMDIwLTA4MTlhKQpzZWthaSDkuJbnlYwKa28g44GT"+
5506 "Cm5uIOOCkwpuaSDjgasKY2hpIOOBoQp0aSDjgaEKaGEg44GvCnNlIOOBmwprYSDjgYsKaSDj"+
5507 "gYQK";
5508 //</span>
5509
5510 var WnnDic = //<span id="gsh-wnn-dic">
5511 "data:text/dic;base64,"+
5512 "PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL2Rp"+
5513 "Y3Zlcg1HU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNXbm5ccy8vXHMyMDIwLTA4MzAK"+
5514 "R1NoZWxsCUdTaGVsbArjgo/jgZ/jgZcJ56eBCndhdGFzaGkJ56eBCndhdGFzaQnnp4EK44Gq"+
5515 "44G+44GICeWQjeWJjQpuYW1hZQnlkI3liY0K44Gq44GL44GuCeS4remHjgpuYWthbm8J5Lit"+
5516 "6YeOCndhCeOCjwp0YQnjgZ8Kc2kJ44GXCnNoaQnjgZcKbm8J44GuCm5hCeOBqgptYQnjgb4K"+
5517 "ZQnjgYgKaGEJ44GvCm5hCeOBqgprYQnjgYsKbm8J44GuCmRlCeOBpwpzdQnjgZkKZVxzCWVj"+
5518 "aG8KZGljCWRpYwplY2hvCWVjaG8KcmVwbGF5CXJlcGxheQpyZXBlYXQJcmVwZWF0CmR0CWRh"+
5519 "dGVccysnJVklbSVkLSVIOiVNOiVTJwp0aW9uCXRpb24KJXQJJXQJLy8gdG8gYmUgYW4gYWN0"+
5520 "aW9uCjwvdGV4dGFyZWE+Cg=="
5521 //</span>
5522
5523 var SumomoDic = //<span id="gsh-sumomo-dic">
5524 "data:text/dic;base64,"+
5525 "PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
5526 "cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTdW1vbW9ccy8vXHMyMDIwLTA4MzAK"+
5527 "c3UJ44GZCmlvCeOCggpubwnjga4KdQnjgYYKY2hpCeOBoQp0aQnjgaEKdWNoaQnlhoUKdXRp"+
5528 "CeWGhQpzdW1vbW8J44GZ44KC44KCCnNlbW9tb21vCeOBmeOCguOCguOCggptb21vCeahgwpt"+
5529 "b21vbW8J5qGD44KCCiwsCeOAgQouLgnjgIIKPC90ZXh0YXJlYT4K"
5530 //</span>
5531
5532 var SijimiDic = //<span id="gsh-sijimi-dic">
5533 "data:text/dic;base64,"+
5534 "PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
5535 "cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTaGlqaWlpXHMvL1xzMjAyMC0wODMw"+
5536 "CnNpCeOBlwpzaGkJ44GXCmppCeOBmAptaQnjgb8KbmEJ44GqCmplCeOBmOOChQp4eXUJ44KF"+
5537 "CnUJ44GGCm5pCeOBqwprbwnjgZMKYnUJ44G2Cm5uCeOCkwpubwnjga4KY2hpCeOBoQp0aQnj"+
5538 "gaEKa2EJ44GLCnJhCeOCiQosLAnjgIEKLi4J44CCCnhuYW5hCeS4gwp4anV1CeWNgQp4bmkJ"+
5539 "5LqMCmtveAnlgIsKa29xCeWAiwprb3gJ5YCLCm5hbmFqdXVuaXgJNzIKbmFuYWp1dW5peHgJ"+
5540 "77yX77ySCm5hbmFqdXVuaVgJ77yX77ySCuS4g+WNgeS6jHgJNzIKa29idW5uCeWAi+WIhgp0"+
5541 "aWthcmFxCeOBoeOBi+OCiQp0aWthcmEJ5YqbCmNoaWthcmEJ5YqbCjwvdGV4dGFyZWE+Cg="
5542 //</span>
5543
5544 var JA_JKLDic = //<span id="gsh-ja-jkl-dic">
5545 "data:text/dic;base64,"+
5546 "Ly92ZXJsCU15SU1FamRpY2ptb3JzZWpKQWpKS0woMjAyMGowODE5KSheLV4pLlNhdG94SVRT"+
5547 "CmtqamprbGtqa2tsa2psIOS4lueVjApqamtqamwJ44GCCmtqbAnjgYQKa2tqbAnjgYYKamtq"+
5548 "amwJ44GICmtqa2trbAnjgYoKa2pra2wJ44GLCmpramtrbAnjgY0Ka2tramwJ44GPCmpramps"+
5549 "CeOBkQpqampqbAnjgZMKamtqa2psCeOBlQpqamtqa2wJ44GXCmpqamtqbAnjgZkKa2pqamts"+
5550 "CeOBmwpqamprbAnjgZ0KamtsCeOBnwpra2prbAnjgaEKa2pqa2wJ44GkCmtqa2pqbAnjgaYK"+
5551 "a2tqa2tsCeOBqApramtsCeOBqgpqa2prbAnjgasKa2tra2wJ44GsCmpqa2psCeOBrQpra2pq"+
5552 "bAnjga4Kamtra2wJ44GvCmpqa2tqbAnjgbIKampra2wJ44G1CmtsCeOBuApqa2tsCeOBuwpq"+
5553 "a2tqbAnjgb4Ka2tqa2psCeOBvwpqbAnjgoAKamtra2psCeOCgQpqa2tqa2wJ44KCCmtqamwJ"+
5554 "44KECmpra2pqbAnjgoYKampsCeOCiApra2tsCeOCiQpqamtsCeOCigpqa2pqa2wJ44KLCmpq"+
5555 "amwJ44KMCmtqa2psCeOCjQpqa2psCeOCjwpramtramwJ44KQCmtqamtrbAnjgpEKa2pqamwJ"+
5556 "44KSCmtqa2prbAnjgpMKa2pqa2psCeODvApra2wJ44KbCmtramprbAnjgpwKa2pramtqbAnj"+
5557 "gIEK";
5558 //</span>
5559
5560 //</span>
5561 /*
5562 <details id="references"><summary>References</summary><div class="gsh-src">
5563 <p>
5564 <a href="https://golang.org">The Go Programming Language</a>
5565 <iframe src="https://golang.org" width="100%" height="300"></iframe>
5566
5567 <a href="https://developer.mozilla.org/ja/docs/Web">MDN web docs</a>
5568  <a href="https://developer.mozilla.org/ja/docs/Web/HTML/Element">HTML</a>
5569  CSS:
5570    <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Selectors">Selectors</a>
5571    <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/background-repeat">repeat</a>
5572  HTTP
5573  JavaScript:
5574  ...
5575 </p>
5576 </div></details>
5577 */
5578 /*
5579 <details id="html-src" onclick="frame_open();"><summary>Raw Source</summary><div>
5580
5581 <!-- h2>The full of this HTML including the Go code is here.</h2 -->
5582 <details id="gsh-whole-view"><summary>Whole file</summary>
5583  <a name="whole-src-view"></a>
5584  <span id="src-frame"></span><!-- a window to show source code -->
5585 </details>
5586
5587 <details id="gsh-style-frame" onclick="fill_CSSView()"><summary>CSS part</summary>
5588  <a name="style-src-view"></a>
5589  <span id="gsh-style-view"></span>
5590 </details>
5591
5592 <details id="gsh-script-frame" onclick="fill_JavaScriptView()"><summary>JavaScript part</summary>
5593  <a name="script-src-view"></a>
5594  <span id="gsh-script-view"></span>
5595 </details>
5596
5597 <details id="gsh-data-frame" onclick="fill_DataView()"><summary>Builtin data part</summary>
5598  <a name="gsh-data-frame"></a>
5599  <span id="gsh-data-view"></span>
5600 </details>
5601
5602 </div></details>
5603 */
5604 /*
5605 <div id="gsh-footer" style=""></div><!-- ----------- END-OF-VISIBLE-PART ----------- -->
5606
5607 <!--
5608 // 2020-0906 added,
5609 https://developer.mozilla.org/en-US/docs/Web/CSS/z-index
5610 https://developer.mozilla.org/en-US/docs/Web/CSS/position
5611 -->
5612 <span id="GshGrid">(^_^)/<small>{Hit j k l h}</small></span>
5613
5614 <span id="GStat">
5615  [ GShell Status Line ]<br>
5616 </span>
5617 <div id="GPos" align="right"></div>
5618 <div id="GLog"></div>
5619 <span id="GMenu" onclick="GShellMenu(this)"></span>
5620 <span id="GTop"></span>
5621 <div id="GShellPlane" onclick="showGShellPlane();"></div>
5622 <div id="RawTextViewer"></div>
5623 <div id="RawTextViewerClose" onclick="hideRawTextViewer()"> CLOSE </div>
5624
```

```
<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;
}
textarea.LineNumbered {
  font-size:12px;
  font-family:monospace,Courier New;
  padding:4px;
  wrap:off;
  spellcheck:false;
}
#RawTextViewer{
  z-index:0;
  position:fixed; top:0px; left:0px;
  width:100%; height:50px;
  overflow:auto;
  color:#fff; background-color:rgba(128,128,256,1.0);
  font-size:12px;
  spellcheck:false;
}
#RawTextViewerClose{
  z-index:0;
  position:fixed; top:-100px; left:-100px;
  color:#fff; background-color:rgba(128,128,256,1.0);
  font-size:20px; font-family:Georgia;
  white-space:pre;
}
#GShellPlane{
  z-index:0;
  position:fixed; top:0px; left:0px;
  width:100%; height:50px;
  overflow:auto;
  color:#fff; background-color:rgba(128,128,256,0.8);
  font-size:12px;
}
#GTop{
  z-index:9;
  opacity:1.0;
  position:fixed; top:0px; left:0px;
  width:320px; height:20px;
  color:#fff; background-color:rgba(0,0,0,0.5);
  color:#fff; font-size:12px;
}
#GPos{
  z-index:12;
  position:fixed; top:0px; left:0px;
  opacity:1.0;
  width:640px; height:30px;
  color:#fff; background-color:rgba(0,0,0,0.4);
  color:#fff; font-size:12px;
}
#GMenu{
  z-index:2000;
  position:fixed; top:250px; left:0px;
  opacity:1.0;
  width:100px; height:100px;
  color:#fff;
  color:#fff; background-color:rgba(0,0,0,0.0);
  color:#fff; font-size:16px; font-family:Georgia;
  background-repeat:no-repeat;
}
#GStat{
  z-index:9;
  xopacity:0.0;
  position:fixed; top:20px; left:0px;
  width:640px; height:90px;
  color:#fff; background-color:rgba(0,0,0,0.4);
  font-size:20px; font-family:Georgia;
}
#GLog{
  z-index:10;
  position:fixed; top:50px; left:0px;
  opacity:1.0;
  width:640px; height:60px;
  color:#fff; background-color:rgba(0,0,64,0.2);
  font-size:12px;
}
#GshGrid {
  z-index:11;
  xopacity:0.0;
  position:fixed; top:0px; left:0px;
  width:320px; height:30px;
  color:#9f9; font-size:16px;
}
xbody {display:none;}
.gsh-link{color:green;}
#gsh {border-width:1;margin:0;padding:0;}
#gsh {font-family:monospace,Courier New;color:#ddf;font-size:8px;}
#gsh header{height:100px;}
#xgsh header{height:100px;background-image:url(GShell-Logo00.png);}
#GshMenu{font-size:14pt;color:#f88;}
#gsh-footer{height:100px;background-size:80px;background-repeat:no-repeat;}
#gsh note{color:#000;font-size:10pt;}
#gsh h2{color:#24a;font-family:Georgia;font-size:18pt;}
#gsh h3{color:#24a;font-family:Georgia;font-size:16pt;}
#gsh details{color:#888;background-color:#fff;font-family:monospace;}
#gsh summary{font-size:16pt;color:#fff;background-color:#8af;height:30px;}
#gsh pre{font-size:11pt;color:#223;background-color:#fafff;}
#gsh a{color:#24a;}
#gsh a[name]{color:#24a;font-size:16pt;}
#gsh .gsh-src{white-space:pre;font-family:monospace,Courier New;font-size:11pt;}
#gsh .gsh-src{background-color:#fafff;color:#223;}
#gsh-src-src{spellcheck:false}
#src-frame-textarea{white-space:pre;font-family:monospace,Courier New;font-size:11pt;}
#src-frame-textarea{background-color:#fafff;color:#223;}
.gsh-code {white-space:pre;font-family:monospace !import;}
.gsh-code {color:#088;font-size:11pt; background-color:#eef;}
.gsh-golang-data {display:none;}
#gsh-WinId {color:#000;font-size:14pt;}

.gsh-document {font-size:11pt;background-color:#fff;font-family:Georgia;}
.gsh-document {color:#000;background-color:#fff !import;}
.gsh-document > h2{color:#000;background-color:#fff !import;}
.gsh-document details{color:#000;background-color:#fff;font-family:Georgia;}
.gsh-document p{max-width:550pt;color:#000;background-color:#fff;font-family:Georgia;}
```

```
 .gsh-document address{width:500pt;color:#000;background-color:#fff;font-family:Georgia;}

 @media print {
  #gsh pre{font-size:11pt !import;}
 }
</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\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIIFDl4A8dLP2\
2eXs9H9+ftSkSdHxsic2qqdE7YusS+lqaalKfnY5YsokMHwEPtdK4MQFz5UeExlbLYSaYUl5\
npDiLKXEZClFiRM53JSUaq9ScqcU6i+2kK3StuONy5reEGKJ7Qw7mOvKec2ToqOiZwoljhFS\
jbOVHCstMRb3USXEJ8hFu7DsdmFb2+xU4vWWFVXbBpMeZUlAE/hcKoGab66eKGOlNykh56PC\
HxH2VVBKoRKqh3qUeKilYdaOfONJ56OkdI6w5BwomnOQlyPzi0N9DLmXpFK/60p2P/Piyovf\
N8mfM+/nJWNGnjw9KqOToLVGSFt2p2Ril1gn3ij0Vk7YsoWVMzEuVPfPlRKYdfOak2LRSB0q\
zrWocCOG6qEhvgRaCj/dktj3g7dXXH4gKN6aRS0zpYzerqS6RAoZDQqfk79SKTRXHu/e+9FN\
L66as88pU/PN1pNlTLQJKSc73dPXSr20ur7iiwPcC8QhbNnCyhUIlryyOTQvYF5JfvqBL7jx\
+cNHjBj5gJRyDlJHy39o84D40H2Qtx8THaPeFuIOU+w1C+KnyhK5FGEv0WGgAExB83eXMoLY\
rikbd9gHEP52VgQl4h89FUA6kJyYFbbQbnzLJg4zFiesnDHCwvUoeiVQOb/5C9FY9DlUueOH\
+zGhUh9nSqOqrm0uWgurkI9RpjBD4Y6uQcQdD5TUOW63zD3MHesy14V49isbdKyxbGHlCpFR\
UJ6toACF7F9VF58NBfDHT0MBaE74Ent+eWrrWr+Lz/QTw60AdB7QJUjps/OA7cOoBNBCeMUZ\
ttCu/coG28fLpvKElTPFV8juRasEahbHvxaR1guoeBPyfUDo4+OfeBdyb8L4tz9XeSXFAMOc\
bgGgov0glzgGGw4jF392xnHhdc+Mwf3JTjfntZ2yClYJBJXNUt5KIKyck1sxXRdld6BmcevN\
aJovy/VBacMevqEP46/ZlnJjt9jx17VL53Zl5MtvaplQGlNHw5pQDqXyNTQlZ2b8nGcMG2ZV\
qOoFjSdYvV0AZzDfayidv6FJ35CS4jXZk9hir7e27zm6p3T8hLJpkYicJpV1HtK/DJFU4Jw1\
lImhxM5IR9fzzgRKx4w/C+HQSPE+krbIyrN3qEPTNahsHaLDs2xh5Q5NCoPPVdEpgcqbm/8e\
7/zdOaHptag/mlKJ77U0VG0xybTdX/Ex/PTfa/i7r7Ku+cSoiCxUwrohUxF16wEV9H+ccVgl\
pd/CfU42AK2IUPlvTK1L/sJjyE5PVHqr728NzvfUzvvDODGy9GoopuuhmNLNfcTx48YHL2qH\
f/8hpXVu/43rQg9xtq6YtcvlXDC3fmWDQn9nbf2le7wKElbOK65icBu0Eqhd3IaW82dwKPUw\
hrauc6ZcWdkcjUZK8EUXMae71zUqwCu2nbi6eVn1Ji9/P7eW+ioMAogF+NI3iJLSf8dn9ipA\
WNW4rPy9jJxuPeDL/HXzNzgTsveslD2vsWHWI9mu5rvVvZX9foS4v/LfmqdEIpHDGlfM2uCW\
gJIy2wOENPaZ3fEcivd+ZYNCNJYtrNyhyGAo8jRoJTAUmRiqOCJnRW5FpTN++frTwdh4SiUv\
bVlWvbfFLcRF04qazRD7176/rBjKylD5pBiZ5Wi4wQu7tikPBeCOpuW+Kj0sqP8GHNoAZuwL\
iOzuywDhQ9zBr2xoDRqVQFi5QxxH6OwVjRKAAW46pvT+RxAJVLjW7vY9/+CeUBMkl68/rPQn\
mCufKzaldFN/yI8gA5iwC3dkIKhsyvZuCYSVG/KHcwhFWDRKAMMcD8EKX+rHFl2A9bt2d172\
2qNzOvzCDYmfEtNy7QogXDXWIKAIQ7cOQZchyADWnerqN5xVXttcJsdGp2OtwqmWJU7A+Eh7\
yhYbUgm1IX7f7K1DwaRyUfN42FIuxNDdVEtamL6sYC9R26VtbZaW2px8Nfmehz3EM+mgsolk\
d3/ZnBGElXPGUWzXg1YCq5eW5/zBGy54aWOgwWKfnWbqptcevWT4FUBvov32gew8DLzDTMaj\
aupq7t/bMXX+yw/egJGKoTksy2d+gFBb9VoDvX5BlZTOR+Wfjyb0pP6U0XGOYNqR/quta3vB\
Fgeua6qv2d7vn8dFdV3rldBw34GSPg9iODG9h5XWknh9kAaAMmyJ6dklPzZmtD3cnu77vtw5C\
h/YrGlp7Wxp/VvuRDuc+wsq54ymm+8zzKOgyRSPRa4IKoGzli8b6ytagcEPmb9v/m09cUATz\
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"gtdU2s8VYsYei/pcBrfkFNTBgnP9RdRPXujqhNOVevcYoKpwOJ5vgiv8Khz9/k7RDkUorxMd"+
"Q/m58uAOuzxpLRPwbgOgyxB/q9iVbB59RLM+PQ7oZXM8A1rb6Ddxu/sMeb/ogrCO3nANks5b"+
"DXfHqLA0NOq0sa0pxn9K3VfGudOOxMS4OE2La+2j9WO6SIRvOxFnGsPgoT8Z1nAKVh3S038C"+
"xvKNOCGogpBKnNevLH4quTZcWdGk9TigsrL4l10xjiieLXbZ3ums8u1ecPmPPCE1ahdeeVws"+
"z73l+Zfa2UnvuHwbAeAOaN0OmHENLmd8DdpXuE2lQU/Qvyyft+99U6T36BP+kC7aRQr6NqdE"+
"mnxEQKUmt7WRPwtd3ITll2s3Zzf3hlVCKFSHBFCN6+/qjDOqz6rUtT9VEeOfa7vq7m5tI/dD"+
"295mGh25YkHSDyq9t4XKhHq03sYf/3Eha+AxrWnBBeHc6uq6XXUbAKSDcC0VK4G7ejOYsm2H"+
"REMNEKF9WDhLs18hly/wA+RiDRjHOJ22Ij+pl0A5DH4OyaQkcQocuVZiBl4JjRwHH8CD+7tA"+
"0FuxPWSASoCgmV4sZZZhW5rXGyecX1wny7+E/+IqFeUK/R89knneGSwJ7wAAAABJRU5ErkJg"+
"gg==";

GShellFavicon="\
iVBORw0KGgoAAAANSUhEUgAAAKwAAAB/CAYAAABymylZAAAAAXNSR0IArs4c6QAAAHhlWElm\
TU0AKgAAAAgABAEaAAUAAAABAAAAPgEbAAUAAAABAAAARgEoAAMAAAABAAIAAIdpAAQAAAAB\
AAAATgAAAAAAAABIAAAAAQAAAEgAAAABAAOgAQADAAAAAQABAACgAgAEAAAAAQAAAKygAwAE\
AAAAAQAAAH8AAAACt6tZwAAAAlwSFlzAAALEwAACxMBAJqcGAAADQRJREFUeAHtnQ9wFNUd\
x9/b21z+iYCKCiIK1amWlj/jH6BCkstFEFthlIGpRWdstQoqkEunttrW2nFqO1YTIlatinZ0\
amdAqY6jIyOXi7kgglarVv74b3BAQPkbVAjJ3e3r94WcJpe93csmcbjb784kd/ve7723+3nf\
ffv+nxA8SIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAE\
SIAESIAESIAESIAESIAESIAESIAESIAESIAESMCgLRx84/Tylk/EYasHcANHxRK\
XiEuf65tAHEwaD8ImP2wLTxTadyBmzrT+42pzRSrd3peQvpXsMtrhgNYCn8fewHXFUap+zyH\
ZUASIAESIAESOKII+LPR9dzsk5ELvxdKBTzlhpQpkbIeFle+8Jan8AzkmYA/67BKXiek+pmQ\
hsf7VweE6PyDZ+oM6JmAxwzznN6REVCqS4SQXwihLI8XtFFcuWqHx7AMRgIkQAIkQAJHIAH/\
Nbqem3098iHoOS8sa5O44oUmz+EZcEAE/FWHXfnjs0FLd/YP80ZNJkRALvAWlqEGg4C/BGsE\
rgK0AMb/d3uCJlWJsIyVnsIy0KAQ8FeVYNmsYWJYR5F3cqmUmLt6v/fwDDlQAv4S7EBpYYQ/\
65pV5ccdZ46QncHyziLlZeDtlK7m5lAyw2ywTmXNDa8cLcpLjlWWOiolU1/s3dO5692nZqBP\
2D8HBZtDXp+28KXicYGjq9Fve6Eh5QVCinOVEqOkFL1Ka7gpKVWbUnKnFOodS8i4tKyWaGPT\
e0Lc2e8+3+ra1plI62LEVYnPs6SQfapwSqmv0Kf8upDWGkzleSbaWPFuDreUtyYUrEPWhW9e\
fawMFi9QQt4CcZ7gYOroBVF9CrE/2qnEo/ElFa4DDqHalosCUt4rpJzsGLGNJ56Z10QqVRtt\
rHrDxjvvnShYmyysWPTq6UEzEEGJeS2EWmpj4skJ8SVQAt/zSeLLuz5aemlHZiRVkdhpAVH0\
F6R5ZaZff851OgmVOrtlSeXG/oTLB9s+r5h8uOihusYfzl91fGlp2cNSytlIA2//wU0J8aEK\
IX87zhymPtKTb3oc1bXxa/DKX3bYpoeHh686jqCSExCUgvXALy+CVN0SO8MMmi9BUOOH+oIh\
zFN7phGqbb3CkOoJlFO9zR7rGVn3dlQNRtg4570TSlhkYSjSUok6478h1pHfRo6i4D4mnU7N\
4tZxwlBPIu1BE6uOGw2+T9JpFNKn7wUbrmu5WgpjGTK138OlulcApeIWCLAdDauxqEoclYs4\
lBTb03bKUEtQ4panzx0+9yONN9ANsdFQmN4oxSnokzgTn+f0CaNUSnWm3unjXgAOvhZsuC6+\
CGJpzDUfdWMGrf0n8BezIJxDYscHa+vntqfDT10QHlkcVCej9jsVJebVqEtOSfv1/ERXV9fE\
74raV8+EyC/v6Wf7XamnO5KqNr60Ylem/+GqTOA6dKXNTz8weCCamh8Mobur8I5Bblbk D6Cq\
RbHvm2bRm7hi95JVllhSPpWyEn9sXhL6JNe7lK1+UwQWK2HcmG5M6VJZWuLU1Y1Tt9TUxe+E\
sB0ngishHovWT/2FW5q6wVhWVnYT4r/QkuK2WP20gixhfSnYqqgYaZ5btBav0/PdhIDX8FuW\
lfhprLH6fTfbbP7VC6PfkUXFvwHsOZYSjzc1TK3TtjWR1jecr0HtS1rJCXhIuO9BN1xfVgkC\
5wZudRZKNx2llqVU8pLmxuoBCaZpaVgvJdelZO+SUopx3Sll+3idYu2NxneCDUVaJ2Ko847e\
GPqe4dUaP7R/74/WPD77y76+A3c574a/FyENPbyb9YB/cVZPn3oYfrtv3PCjGPJ0FAKqAet3\
7T4wc6jEqpkHy0eaEKuDXFG7FWKKHh72Wx453a+vBKsbWtla7r0hpRYM9SyotQ1dvQtfd2/1\
Tr/7DA8W5jK8WHVTLKfuMts4CszRV4IlA+Y8t/zD1L0now1VcTe7wfDHK3+TazxSTjKLi2K6\
C8zV1gcGfhKsRNeUXnGQ9UBVoK390MFfZTUYZA8prA05RYnejKA0/huOtNw+cc5y9264nCLN\
TyPHOlR+3pL9VWMIdCpG6plLTstasnpJRcQ+BiH0q9kKGnrXmH4dRYnEzujfavZkBtINQKzX\
eQd16tyHZZX6MCWt2lh9JeY9+O/wj2AjrQ+hFTPfKYutZOqipvsrX7Oz6ZobW1yiJ0ePsfN3\
csNYwSFsi3RXtKHi7ky7cCT+GEaorst0dzvHgMI/O9rVwtaHpu1zsy0kf99UCZDBlzllHOqT\
```

```
2yDWtdlsVHHx9fDrt1h1fOgMKMF/29W2qY7k7zDUuzlbutncUdLMKykR60OL45Oy2RSiuy8E\
213vcxGbegYZDF3bH6gAT7f3yc0VArNdIoMx/886D1mVSBlTZPt5SDnaCMhXwpHmaf0Mmbfm\
vhDsqJNGjXHr80QJu84lF/WeBp4PPAlZG1gtD1Zu7VBWBRp9q/ubAB6EYVKYL/ulF8EXgsVc\
V9eGEnbQ/DSrWOYsRxRiQB34EOx/ssYPD73WK9owbTpEezP++jfTSoqyoAzc6xR/ofj5QrDY\
BnasW4Zhsv+2rDYr5qZQAvdp5We1t/GQSumZYW6HgmgfPJRo/y4aaU+7Gffyl+LS0KKWcC+3\
AjzxxVwCLD+BYJ07RA6IHTuc8jclEpNNZZ5qZ4PS8xK09H9p55d2S3TmJNgu8zUPTN+OL/PC\
dc2P4UFahmsfn47H6RP12VnwjzrZ5LufLwSLBs0YF72KosQJJyIzN2fL0OaGkG4U6b8+BxYQ\
TkKVwenYqeupTgZ2ftH6qhg26/jB8aPKnoBo59jZZLh9L+O84E59USUQhki65Vwg6P3njyDW\
85ziR500l+qAbRR6TsO+rzbMQxwv2xr0csSSmQI/fCFY7LPdZ2lJZr5KK+C5dELh6ixYITwL\
Vl/nm4/cmBCW+nXmNWee48EZnelWaOf+EKyUroI1DOGpL3PawpZRGFp1nIhtCOXYQ5CLqPQW\
RGj4fb1+LEuY3VncC8bZF4KVlszeZfVNVs6qjsQv++Y0t29BUzqWrjqWZDI1oBJWxzEl8vIx\
KEFL9fdsBxp/2Xs6sgXKM3dfCLatfd8adBN1uOUNhlAfwg6Bw93sevqj1HMULPw/b14a6npg\
pkSWlwr06fYMn+v3MlU6MwfbD3KwyWsTXwj2zUcuO4jSJ+6WUyjBTlLlpSv1okE327S/NJwX\
MqJ+21W6VtW1Ti4TY/bUnDxmS7iu9baqa2OYX5DbUX1z9BRpGEvdrDHJ5lk3m3z394VgdSYp\
qZbnklkQbbVhBteHI61/0vu/ZgszaeFLR+tNOBCxY90Xa7q7BBtQ6tbuV/oYiPhu8xhzA4R7\
o1MaOu3Q4pYZWHWwCt1aI7Ndi3bXo2P7v2p70cmmEPycew8L4Q6770Ev+htZPnED+mNPy/W2\
9LRATHr5EJ/vQ5gfIlw7StTREMd4gAu5rQ3T6aRSqdmx7Z+/GB47ui290UWv9JX4AnJ71lIS\
16Y+xi8sfm6YcrRQxul4K1ysH6Be9llOYHs79i/4cxbvgnH2jWB1jlXXxecYQuZU0g5WDluq\
Y6xMFg2XRcb6wYrTJp5NO7ZuP3v9irmdNn4F5eSbKoHOtab6aStQOt7/beUgSubPmhrC27B1\
0YQhS1OJvclkYo4fxKoZ+kqw+oajDVEsgVEr9PehP+SrXWnkMNLm6VpQnUiKxIzm+0PveQqf\
h4F8J1j9WwOrt+64Stf50OWEzd2G5tCd/FZS/VXH3nagrQUl+4B2j8m8SsS/FmI9D3McBjwo\
kRn3kXzuqzpsZkZU1cbOCRjmPWhQ1aBxM1gsduI3l5d3JlR9ywOVm9Np1kTiE/CQYIdtWZV2\
8/KpqxnKkvc1bdveIDDt0Usc+RxmsDIpnxmIw78tYM6HZGdCt2fgZnJ+8xzuSRBvQ4zrhEw9\
H926s8VJSOHFzRdII7AAPQwzkI7Lsp1urBj0QPxYbyb/8dmn2//ll/qqnago2AwqF/38+WEl\
I4afr5Q5EXMARkAoI2CCP2xvJNV+lMZ78LkH3V27LWVt2n9w4/+6JqdkxJPLqd7b1TADkw1p\
nIhS+QSI+HiEw5RPuVengV20d6Nf7K0t1oF1dj/ikUsatCEBEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEhD/B9wOq7SGUV++AAAAAElFTkSuQmCC";

ITSmoreQR="\
iVBORw0KGgoAAAANSUhEUgAAAG8AAABvAQMAAADYCwwjAAAABlBMVEX///9BaeFHqDaJAAAB\
HklEQVQ4jdXTsa2EMAwGYCMX7sICkVgjXVaCBe7CArASXdaIlAWgS4HwM5zEVS+mvSgS+ZBQ\
8gcb4BdHyzwv8szMSaUBHNm+KAd4QC8LDpDn8ogT4UpPGci2jI8IGFx3eLwPWaHknVyWecev\
UEbDXaB0X2aNjueYDOzNklQassPCkjc4nW3E1SfwqYk6jU/vAkPhg0AlSFhve8Jt0dkwDMwr\
yMGSSuPyWHAr19k0tkV2sb3sdW2rUCqW88g4Rp1A9s1JPv9cTp1NRD4XFkin8XaQCIwT6Lzq\
ZO8dHw/4+U2GzqlS8gbqVmkfr1N6YXK8OqlD0OmlGTMvzPERA8AL9vvbOifpSoL33fsVytrL\
S9wiqDzznhUI38v5n783/gBuUs2eLg1c8gAAAABJRU5ErkJggg==";

</script>

<script id="gsh-script">
//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 = "gsh-footer" // 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+")";

function footerElem(){ return document.getElementById(E_FOOTER); }
function footerStyle(){ return footerElem().sytle; }
footerElem().style.backgroundImage="url("+ITSmoreQR+")";
//footerStyle().backgroundImage = "url("+ITSmoreQR+")";

function html_fold(e){
    if( e.innerHTML == "Fold" ){
        e.innerHTML = "Unfold"
        document.getElementById('gsh-menu-exit').innerHTML=""
        document.getElementById('GshStatement').open=false
        GshFeatures.open = false
        document.getElementById('html-src').open=false
        document.getElementById(E_GINDEX).open=false
        document.getElementById(E_GOCODE).open=false
        document.getElementById(E_TODO).open=false
        document.getElementById('references').open=false
    }else{
        e.innerHTML = "Fold"
        document.getElementById('GshStatement').open=true
        GshFeatures.open = true
        document.getElementById(E_GINDEX).open=true
        document.getElementById(E_GOCODE).open=true
        document.getElementById(E_TODO).open=true
        document.getElementById('references').open=true
    }
}
function html_pure(e){
    if( e.innerHTML == "Pure" ){
        document.getElementById('gsh').style.display=true
        //document.style.display = false
        e.innerHTML = "Unpure"
    }else{
        document.getElementById('gsh').style.display=false
        //document.style.display = true
        e.innerHTML = "Pure"
    }
}

var bannerIsStopping = false
//NOTE: .com/JSREF/prop_style_backgroundposition.asp
function shiftBG(){
    bannerIsStopping = !bannerIsStopping
    bannerStyle.backgroundPosition = "0 0";
}
// status should be inherited on Window Fork(), so use the status in DOM
function html_stop(e,toggle){
    if( toggle ){
        if( e.innerHTML == "Stop" ){
            bannerIsStopping = true
            e.innerHTML = "Start"
        }else{
            bannerIsStopping = false
            e.innerHTML = "Stop"
        }
    }else{
        // update JavaScript variable from DOM status
        if( e.innerHTML == "Stop" ){ // shown if it's running
            bannerIsStopping = false
        }else{
            bannerIsStopping = true
        }
```

```
    }
}
html_stop(document.getElementById('GshMenuStop'),false) // onInit.
//html_stop(bannerElem(),false) // onInit.

//https://www.w3schools.com/jsref/met_win_setinterval.asp
function shiftBanner(){
    var now = new Date().getTime();
    //"console.log("now="+(now%10))
    if( !bannerIsStopping ){
        bannerStyle.backgroundPosition = ((now/10)%100000)+" 0";
    }
}
setInterval(shiftBanner,10); // onInit.

//  <a href="https://developer.mozilla.org/ja/docs/Web/API/Window/open">window.open()</a>
// from embedded html to standalone page
var MyChildren = 0
function html_fork(){
    MyChildren += 1
    WinId = document.getElementById('gsh-WinId').innerHTML + "." + MyChildren;
    newwin = window.open("",WinId,"");
    src = document.getElementById("gsh");
    newwin.document.write("/*<"+"html>\n");
    newwin.document.write("<"+"span id=\"gsh\">");
    newwin.document.write(src.innerHTML);
    newwin.document.write("<"+"/span><"+"/html>\n"); // gsh span
    newwin.document.getElementById('gsh-menu-exit').innerHTML = "Close";
    newwin.document.getElementById('gsh-WinId').innerHTML = WinId;
    newwin.document.close();
    newwin.focus();
}
function html_close(){
    window.close()
}
function win_jump(win){
    //win = window.top;
    win = window.openner; // https://developer.mozilla.org/ja/docs/Web/API/window.opener
    if( win == null ){
        console.log("jump to window.opener("+win+")(Error)\n")
    }else{
        console.log("jump to window.opener("+win+")\n")
        win.focus();
    }
}

// 0.2.9 2020-0902 created chekcsum of HTML
CRC32UNIX = 0x04C11DB7 // Unix cksum
function byteCRC32add(bigcrc,octstr,octlen){
    var crc = new Int32Array(1)
    crc[0] = bigcrc

    let oi = 0
    for( ; oi < octlen; oi++ ){
        var oct = new Int8Array(1)
        oct[0] = octstr[oi]
        for( bi = 0; bi < 8; bi++ ){
            //console.log("--CRC32 "+crc[0]+" "+oct[0].toString(16)+" ["+oi+"."+bi+"]\n")
            ovf1 = crc[0] < 0 ? 1 : 0
            ovf2 = oct[0] < 0 ? 1 : 0
            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]
}
function getSourceText(){
    //alert("cksum="+strCRC32("",0))
    //alert("cksum="+strCRC32("0",1))
    //return

    version = document.getElementById('GshVersion').innerHTML
    sfavico = document.getElementById('GshFaviconURL').href;
    sbanner = document.getElementById('GshBanner').style.backgroundImage;
    spositi = document.getElementById('GshBanner').style.backgroundPosition;
    sfooter = document.getElementById('gsh-footer').style.backgroundImage;

    // these should be removed by CSS selector or class
    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")

    document.getElementById('GshFaviconURL').href = "";
    document.getElementById('GshBanner').style.backgroundImage = "";
    document.getElementById('GshBanner').style.backgroundPosition = "";
    document.getElementById('gsh-footer').style.backgroundImage = ""

    //html = document.getElementById("gsh").outerHTML;
    html = document.getElementById("gsh").innerHTML;

        textarea = document.createElement("textarea")
        textarea.innerHTML = html
        // <a href="https://stackoverflow.com/questions/5796718/html-entity-decode">Thanks</a>
        var text = ""
        text = textarea.value
        //textarea.destroy()
        text = ""
         + "/*<"+"html>\n"      // lost preamble text
         + "<"+"span id=\"gsh\">"   // lost preamble text
         + text
         + "<"+"/span><"+"/html>\n" // lost trail text
        ;

    tlen = text.length
    //console.log("length="+tlen+"\n"+text)
    console.log("length="+tlen+"\n")
    //alert("cksum : " + strCRC32(text,tlen) + " " + tlen + " " + version)

    document.getElementById('GshFaviconURL').href                = sfavico;
    document.getElementById('GshBanner').style.backgroundImage    = sbanner;
    document.getElementById('GshBanner').style.backgroundPosition = spositi;
    document.getElementById('gsh-footer').style.backgroundImage    = sfooter;

    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)
    return text
}
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;
}
function html_sign(e){
    if( RawTextViewer.style.zIndex == 1000 ){
        hideRawTextViewer()
        return
    }
    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')
    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 + ' class="LineNumbered">'
        + text + '<'+'/textarea>'
        + '<' + '/td><' + '/tr><' + '/table>'

    for( i = 1; i <= 30; i++ ){
        txthtml += '<br>\n'
    }
    RawTextViewer.innerHTML = txthtml

    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 = "";
    gsh_digest_.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("src-frame-textarea");
    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(){
    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)")
    }
    banner = document.getElementById('GshBanner').style.backgroundImage;
    footer = document.getElementById('gsh-footer').style.backgroundImage;

    document.getElementById('GshFaviconURL').href = "";
    document.getElementById('GStat').style = "";
    document.getElementById('GPos').style = "";
    document.getElementById('GPos').innerHTML = "";
    document.getElementById('GLog').style = "";
    document.getElementById('GLog').innerHTML = "";
    document.getElementById('GMenu').style = "";
    //document.getElementById('GMenu').style.backgroundImage = "";
    //document.getElementById('GMenu').style.backgroundPosition = "";

    document.getElementById('GshBanner').style.backgroundImage = "";
    document.getElementById('GshBanner').style.backgroundPosition = "";
    document.getElementById('gsh-footer').style.backgroundImage = "";
    document.getElementById('rsa-oaep-message').style = "";

    src = document.getElementById("gsh");
    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="src-frame-textarea" cols=100 rows=20 class="gsh-code">'
     + "/*<"+"html>\n"           // lost preamble text
     + "<"+"span id=\"gsh\">"    // lost preamble text
     + src.innerHTML
     + "<"+"/span><"+"/html>\n"  // lost trail text
     + "</"+"textarea>\n"
     + "</"+"cite><!-- GENSRC -->\n";

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

    document.getElementById('GshBanner').style.backgroundImage = banner;
    document.getElementById('gsh-footer').style.backgroundImage = footer;
}
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('gsh-footer').style.backgroundImage;
    document.getElementById('GshBanner').style.backgroundImage = "";
    document.getElementById('GshBanner').style.backgroundPosition = "";
    document.getElementById('gsh-footer').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('gsh-footer').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 DateLong(e){
    d = new Date()
    return  d.getFullYear() + "/" + d.getMonth() + "/" + d.getDate() + " "
        + d.getHours() + ":" + d.getMinutes() + ":" + d.getSeconds()
        + "." + d.getMilliseconds()
        + " " + d.getTimezoneOffset()/60
        + " "
        + d.getTime()  + "." + d.getMilliseconds()

}
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
        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

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
    return
    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+"]"
}
var MyHistory = ""
function showGShellPlane(){
    if( GShellPlane.style.zIndex == 0 ){
        GShellPlane.style.zIndex = 1000;
        GShellPlane.style.left = 30;
        GShellPlane.style.height = 320;
        GShellPlane.innerHTML = DateLong(null) + "<br>" +
          "-- History --<br>" + MyHistory;
    }else{
        GShellPlane.style.zIndex = 0;
        GShellPlane.style.left = 0;
        GShellPlane.style.height = 50;
        GShellPlane.innerHTML = "";
    }
}
function jgshCommand(event){
    key = event
    keycode = key.code
    //GStat.style.width = window.innerWidth
    GStat.style.backgroundColor = "rgba(0,0,0,0.4)"

    console.log("JSGsh-Key:"+keycode+"(^-^)/")
    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 = "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 +=
            '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()
    }

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

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

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

//Permanent.setItem('MyWindow',window)
let {text, digest} = getDigest()
GLog.innerHTML +=
    "-- GShell: " + GshVersion.innerHTML
    + "<br>" + "-- Digest: " + digest
    //+ "<br>" + DisplaySize
    //+ "<br>" + "-- LastVisit:<br>" + MyHistory

GShellResizeX(null);
</script>


<!-- ###################### WebCrypto ######################### --><!--
<details id="WebCrypto"><summary>WebCrypto</summary>
 Reference: <a href="https://mdn.github.io/dom-examples/web-crypto/encrypt-decrypt/index.html">
                    https://mdn.github.io/dom-examples/web-crypto/encrypt-decrypt/index.html</a>
 <style id="web-crypto-demo-style.css">
```

```
#WebCrypto *{ color:#080; font-size:9pt; }
#rsa-oaep-message{ width:100% !important; height:24pt; color:#000 !important;
      border-width:2 !important; background-color:#f8f8f8 !important; font-size:13pt !impotant;
}
#WebCrypto input{ width:50pt; background-color:#4a4; color:#fff; border-width:0; }
</style>

<span id="web-crypto-demo.html">
  <section class="encrypt-decrypt rsa-oaep">
    <h3 class="encrypt-decrypt-heading">Web Crypto - RSA-OAEP</h3>
    <section class="encrypt-decrypt-controls">
     <p>
       <b>Plain text:</b><br>
       <input type="textarea" id="rsa-oaep-message" name="message" value="Hello, GShell!" style="">
     </p>
     <p>
       <input class="encrypt-button" type="button" value="Encrypt"><br>
       <span class="ciphertext"><b>Cipher text:</b><br>
   <span class="ciphertext-value"></span></span>
     </p>
     <p>
       <input class="decrypt-button" type="button" value="Decrypt"><br>
       <span class="decrypted"><b>Decrypted text:</b><br>
       <span class="decrypted-value"></span></span>
     </p>
     <p>
       <input type="button" value="ShowKey" onclick="ShowKey()"><br>
   <span id="PublicKey">PublicKey...</span>
     </p>
  </section>
 </section>
</span>

<script id="web-crypto-rsa-oaep.js">
var RSAKeyPair = null;
function ShowKey(){
 document.getElementById("PublicKey").innerHTML = RSAKeyPair.publicKey;
}
   (() => {
     //Store the calculated ciphertext here, so we can decrypt the message later.
     let ciphertext;

     //Fetch the contents of the "message" textbox, and encode it
     //in a form we can use for the encrypt operation.
     function getMessageEncoding() {
       const messageBox = document.querySelector("#rsa-oaep-message");
       let message = messageBox.value;
       let enc = new TextEncoder();
       return enc.encode(message);
     }

     //Get the encoded message, encrypt it and display a representation
     //of the ciphertext in the "Ciphertext" element.
     async function encryptMessage(key) {
       let encoded = getMessageEncoding();
       ciphertext = await window.crypto.subtle.encrypt(
         {
       name: "RSA-OAEP"
         },
         key,
         encoded
       );

       //let xbuffer = new Uint8Array(ciphertext, 0, 5);
       let xbuffer = new Uint8Array(ciphertext, 0, ciphertext.byteLength);
let b = new Uint8Array(ciphertext,0,ciphertext.byteLength);
//document.write("{"+b.length+"}")
//let b64 = btoa(b);
let b64 = btoa(new Uint8Array(ciphertext,0,ciphertext.byteLength));
     const ciphertextValue = document.querySelector(".rsa-oaep .ciphertext-value");
       ciphertextValue.classList.add('fade-in');
       ciphertextValue.addEventListener('animationend', () => {
         ciphertextValue.classList.remove('fade-in');
       });
       ciphertextValue.textContent =
ciphertext.byteLength
+ " bytes "
+ xbuffer
//+ " ... "
//+ b + "(" + b.length + ")"
//+ b64 + "(" + b64.length + ")"
;
     }

     //Fetch the ciphertext and decrypt it.
     //Write the decrypted message into the "Decrypted" box.
     async function decryptMessage(key) {
       let decrypted = await window.crypto.subtle.decrypt(
         {
       name: "RSA-OAEP"
         },
         key,
         ciphertext
       );

       let dec = new TextDecoder();
       const decryptedValue = document.querySelector(".rsa-oaep .decrypted-value");
       decryptedValue.classList.add('fade-in');
       decryptedValue.addEventListener('animationend', () => {
         decryptedValue.classList.remove('fade-in');
       });
       decryptedValue.textContent = dec.decode(decrypted);
     }

     //Generate an encryption key pair, then set up event listeners
     //on the "Encrypt" and "Decrypt" buttons.
     window.crypto.subtle.generateKey(
       {
       name: "RSA-OAEP",
       // Consider using a 4096-bit key for systems that require long-term security
       modulusLength: 2048,
       publicExponent: new Uint8Array([1, 0, 1]),
       hash: "SHA-256",
       },
       true,
       ["encrypt", "decrypt"]
     ).then((keyPair) => {
RSAKeyPair = keyPair
       const encryptButton = document.querySelector(".rsa-oaep .encrypt-button");
//document.getElementById('PublicKey').innerHTML = crypto.subtle.exportKey(pkcs8,keyPair.publicKey)
       encryptButton.addEventListener("click", () => {
         encryptMessage(keyPair.publicKey);
       });

       const decryptButton = document.querySelector(".rsa-oaep .decrypt-button");
```

```
        decryptButton.addEventListener("click", () => {
          decryptMessage(keyPair.privateKey);
        });
      });

    })();
  </script>
</details>
-->
*///<br></span></html>
```