株式会社 ITS MORE
2020年4月設立

Digitally signed by 佐藤 豊
Date: 2020.08.31 18:19:01 +09'00'

2020年8月31日 投稿者: SATOXITS

GShell 0.2.7 – しじみ72個分のちから

開発：なんで72個分なんですかね？

社長：36の2倍だからでしょうか？

基盤：永谷園で見る…　いえ、70個分のようです。

開発：あそう。

基盤：商品情報には「1杯でしじみ70個分のちから」とありますね。

社長：なんにしても素晴らしいネーミングですね。

基盤：特許庁のほうで商標検索してみましょう。

No.	出願番号/登録番号/国際登録番号	商標見本	商標(検索用)	称呼基準	称呼(参考情報)	区分	出願人/権利者/名義人	出願日/国際登録日(事後指定日)	登録日
1	登録5313166 (商願2009-032176)		しじみ７０個分のちから	-	シジミナナジュッコブンノチカラ	29	株式会社永谷園ホールディングス	2009/04/28	2010/04/02
2	登録5313167 (商願2009-032179)		一杯でしじみ７０個分のパワー	-	イッパイデシジミナナジュッコブンノパワー	29	株式会社永谷園ホールディングス	2009/04/28	2010/04/02
3	登録5313172 (商願2009-032185)		しじみ７０個分のちから	-	シジミナナジュッコブンノチカラ	30	株式会社永谷園ホールディングス	2009/04/28	2010/04/02

全員：面白すぎるｗ

開発：正書法というものが無いのかな。

基盤：No.1 と No.3 の違いがわからないです。

社長：つまり「1杯でしじみ70個分のちから」というのは登録商標では無いということですね。

基盤：これ、商標は英数字も日本語というか全角でしかできないということですかね。

開発：内部的に Shift_JIS だったりするのかな。

開発：（検索用）ってありますから、「商標見本」の画像が本式なんでしょうね。

基盤：でも、商標見本のほうも全角になってますね。

社長：「十個」を「ジュッコ」て読むのは正式なんでしょうかね？わたしはずっとそう読んできたんですが、結構歳を食ってから、「ジッコ」が正式だと聞いてショックを受けたものです。

開発：そもそも正式には「ナナジュウ」じゃなくて「シチジュウ」じゃなかったでしたっけ？

社長：わたしはそもそも「シチ」じゃなくて「ヒチ」かと思ってました。シチとか江戸っ子ですか？みたいな。

基盤：訓令式ってやつですかね。

広報：商品名を「パワー」にするか「ちから」にするか、登録時点でももめてた感じが伝わります。

社長：きっと議論が紛糾して収拾できなかったんでしょう。

基盤：インパクト的にはちから派の圧勝ですけどね。

社長：チカラじゃないところに共感しますね。ひらがな派としては。

開発：パワー派は太宰府送りされちゃたのかな。

広報：力派は居なかったんでしょうか？

開発：カと区別しにくいですからねえ。

基盤：長州カとか。しじみのカとかいうパチモンも出そうです。

社長：IMEは昨日で一旦収束と思ったんですが、これは面白いお題ですね。

開発：HTML電子署名の話もやりたいですが。

社長：いやこれは、ヒトの琴線にふれるというか、人間工学的にも、shellにとってより根源的な課題だと思うんですよ。

開発：根源的重要性を基準にして仕事をスケジュールするといつまでも現実的な成果物が出ない気はしますｗ

基盤：そういえば、最近ところてんにおとなのふりかけをトッピングして食べるとなかなか良いと思っています。ただミニでもちょっと多すぎってとこはあるんですけど。

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開発：辞書はまだ試作中ですが、入力に成功しました。

```
iMac% gsh
gsh/0.2.7 (2020-08-31) SatoxITS(^-^)/
!1! dic im sijimi
--Id-- sijimi scan... 34 added, 1 dup. / 34 total (gshdic-sijimi.html)
[あr]!2! しじみ72個分のちから
--E-- command not found (sijiminanajuunixkobunnnotikaraq)
```

社長：これは x が来ると、それ以前にあった文字列を数を表す日本語文字列として解釈して算数字に置換するということですね？

基盤：AIみたいです。

開発：そういう実装もありえますが、ここでは辞書のちからを利用して「nanajuunix > 72」というマッチングをしています。

基盤：ふつうに72って打ったほうが速くないですか？

開発：まず数字キーが表示されないスマホのキーボードでは有用です。リアルタイム翻訳も兼ねます。nanajuuni / 72 / ななじゅうに / 七十二 / seventy two を互いにイケイケにするのです。

社長：わたしは数字キーのブラインド入力に自信が無いし、ホームポジションから極力動きたくないので、数字キーじゃなくてIMEの変換で入れることもあります。

基盤：x は小さいかなを出すのにも使われてますよね。

開発：xa, xi, xu, xe, xo, xy だけですね。このケースは xk だから被らない。それに、混同するようなら x を打つタイミングというか、前後との時間間隔で峻別すれば良いと思います。誤解されたら BS で取り消せば良いだけです。

社長：xx でもいいんじゃないでしょうか。というか、x の次は沢山空いてますね。

基盤：xx だと16進、xd なら10進に変換するとか。

開発：さすがにそこまで辞書化するのはどうかと思いますので、x が来たらアルゴリズム的にマッチすることになるでしょうね。

社長：うーむ。日本語読みで入力して計算すると。よくわからないけどすごいな。

開発：あとは、力 / ちからの切り替えを q でやっています。[chikara > ちから > 力] という2段の変換ではなく、あくまでも [chikara > 力] と [chikaraq > ちから] という対等な力関係です。

社長：複数読みがあるときは q qq qqq … とすると。

開発：q q2 q3 … でも良いかもしれません。

基盤：で、使用頻度に応じて辞書の中で q の数の割当てを変えると。

開発：なんにしても、 q はアルファベットのキーボードで唯一日本語入力に使用されていない聖地なわけです。

基盤：qu く、qi くぃ、…　だったりしますけどね。IME依存ですけど。

開発：それは踏襲してもしなくても良いと思います。宝の無駄遣い。

社長：というか、qu、qi、というのを辞書に入れとけば良いだけのような。

開発：なんにしても q は、文節の明示的な区切りと、候補選択機能を実現する、GShellにとって重要なキーだと思います。

社長：まさに重要な鍵ですね。

基盤：候補選択を q 連続打ちでやるのはちょっとつらいかもですね。qj、qjj、qjjj、… なんてのはどうでしょうか？で、qjjk とかやると、qj と同じになる。

社長：それは押しやすい。

開発：インタラクティブな候補選択モードになるなら、矢印キーでもよいかも。前進は普通のIMEと同じスペースでも。

社長：あからじめ変換モードを設定するとか、変換モードの有効期間とか、後追い変換の対象範囲とか、実用にこぎつけるには色々考えるべきことが多そうです。

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社長：ところで私はミスタッチが多いので、何か自動的にフォローしてくれる機能があると良いですね。

開発：近い文字列も別の表記として全部辞書に登録しておけばよいのではないかと。アルファベット26文字で、綴が10文字程度の単語が主だとすれば、26の10乗単語…

```
iMac% bc
bc 1.06
Copyright 1991-1994, 1997, 1998, 2000 Free Software Foundation, Inc.
This is free software with ABSOLUTELY NO WARRANTY.
For details type `warranty'.
26^10
141167095653376
141,167,095,653,376
```

基盤：所要 K x 141TB程度ですかね。

開発：まあ、1GB程度に収めたいところです。

社長：冗長な辞書で1億エントリくらいあっても、100メガエントリだから、イケるんじゃないでしょうかね？

開発：あとは辞書をどう生成するかですね。

社長：わたしはこれまで書いたブログの文章から生成したいです。全文検索機能もセットで作る。

開発：常用漢字が 2136字、読みが音訓で4388みたいですね。これを使ってローマ字表記にして、辞書に突っ込む。

基盤：ああ、2010年の改訂で「十 – 備考欄に〈「ジュッ」とも。〉と注記。」とありますね。

社長：で、データは？

基盤：文化庁からは常用漢字表がPDFで公開されてますね。あと、読みからの検索ページもあります。へー、「ふじ」って読みの漢字は「藤」だけなんですね。まあそういわれればそうか。

開発：うーん、でもやっぱり字単位じゃなくて語単位の辞書が欲しいですよね。

社長：Google IME から本体の辞書をもらえませんかね？

基盤：辞書ならいろいろフリーなのもありますね。

社長：いや、必要なら有償でも。まあ1万円くらいまでなら。

基盤：広辞苑が1万円くらいですね。

開発：でも、その広辞苑用のブラウザからしか読めないように辞書データは保護されてるんじゃないですかね。技術的にか、あるいは、ライセンス上。

社長：まあ辞書データは知財の核心ですからね。でも、説明とかはとりあえずいらなくて、単語と読みだけでいいわけです。それくらいナマで渡してくれないですかね？

基盤：単語単位で検索できるAPIとかはあるんじゃないですかね？

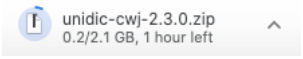
開発：うちのIMEは1文字毎にインクリメンタルに検索できないといけないので、それではダメですね。

社長：昔のCannaのとかどうですかね。あるいはICOTの形態素解析辞書とか。

開発：それか！ああ、UniDicというものがありますね。

基盤：「主として近代の論説文（明治普通文）を対象としています。」？

開発：とりあえず「現代書き言葉UniDic」ダウンロードしてみます。GPL / LGPL / BSD License …



全員：(^-^;

社長：まあ、気長に待ちましょうw

基盤：10Mbps未満ですね。

開発：うちのライトセールでミラーしてあげたいですね。

社長：展開したら20GBくらいですかね。

基盤：むーぎわらのー♪

社長：マリゴールドってクッサイですよね。以前ガーデニングにハマった時。母もそう言ってました。

開発：しかしIMEは面白いですけど、日本語入力についてはどこまでやるかですね。GShellにとっては本題では無いし。

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社長：そういえば、vi では ~ で大文字小文字変換ができるわけで、これは GShell IME でもやりたいですね。

開発：vi の場合、入力モードと閲覧モードがわかれてるので、そのあたりのキー割り当てに余裕がありますよね。GShell の入力にも閲覧モードというのを入れたいという話でしたが。

基盤：閲覧モードに入ったら hjkl で移動できるとか楽ちんでいいんじゃないですかね。

社長：IMEで閲覧モードは面白いと思います。/ とか : コマンドとかも使える。てかそれ、既に gsh.go の TODO に書いてありますが。

開発：vi 互換にしますかね。ESC で閲覧モードへ…

開発：こんな感じでどうでしょうね？閲覧モードではhl を下上左右と解釈します。

社長：おー。これこれ、これが欲しかったです。素晴らしい！

開発：x で一文字削除。

社長：素晴らしい！

開発：i と a で入力モードに移行する。

社長：素晴らしい！

開発：そして、~ で大文字小文字反転。

社長：猛烈に感動した！

基盤：その感動、ブログでは全く伝えられないですねw

社長：vi 使いには伝わるでしょう (^-^)/ GShell史上最大の快挙です。

開発：この幸せはたったこれだけのコードで実現したわけです。所要15分。

```
                if ch == 033 {
                        MODE_ShowMode = true
                        MODE_EditMode = !MODE_EditMode
                        iin.Redraw();
                        continue
                }
                if MODE_EditMode {
                        switch ch {
                                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_EditMode = !MODE_EditMode
                                        ch = GO_RIGHT
                                case 'i': MODE_EditMode = !MODE_EditMode
                                        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
                        }
                }
"gsh.go" line 4434 of 5645 --78%-- col 2-16
```

基盤：ケースの反転とか関数化しましょうよｗ

開発：一貫してやっつけです。

社長：明るい未来が見えた気がした。

開発：あとは / と ？ でヒストリ検索とかですかね。: で色々コマンドとか。

基盤：Emacs的にコマンドのコンプリーションとかできると良いですね。

社長：うーん、GShell にとって、これはまさに one giant leap だったと思います。飲みに行きたい… けれど今日はボウリングの試合があるんだな。

開発：まだ時間があるので、試合前に軽く祝杯も良いですね。

社長：そうしましょう。

— 2020-0831 SatoxITS (^-^)/

http-im3-gsh-gsh-0.2.7.go ダウンロード

```
/*
                                                GShell version 0.2.7 // 2020-08-31 // SatoxITS
```

GShell // a General purpose Shell built on the top of Golang

```
It is a shell for myself, by myself, of myself. -SatoxITS(^-^)
```

0 | | Fork | Stop | Unfold | */ /*

▼ Statement

Fun to create a shell

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.

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.

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.

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.

Aug 2020, SatoxITS (sato@its-more.jp)

/ /

▶ Index

*/ //

▼ Go Source

//

```
// gsh – Go lang based Shell
// (c) 2020 ITS more Co., Ltd.
// 2020-0807 created by SatoxITS (sato@its-more.jp)

package main // gsh main
// Imported packages // Packages
import (
        "fmt"           // fmt
        "strings"       // strconv
        "strconv"       // strconv
        "sort"          // sort
        "time"          // time
        "bufio"         // bufio
        "io/ioutil"     // ioutil
        "os"            // os
        "syscall"       // syscall
        "plugin"        // plugin
        "net"           // net
        "net/http"      // http
        //"html"        // html
        "path/filepath" // filepath
        "go/types"      // types
        "go/token"      // token
        "encoding/base64"       // base64
        "unicode/utf8"  // utf8
        //"gshdata"     // gshell's logo and source code
        "hash/crc32"    // crc32
)
const (
        NAME = "gsh"
        VERSION = "0.2.7"
```

```
        DATE = "2020-08-31"
        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

// Structures
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
}

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

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

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

        SUM_SUM16_BSD   = 0x001000 // UNIXsum -sum -bsd
        SUM_SUM16_SYSV  = 0x002000 // UNIXsum -sum -sysv
        SUM_UNIXFILE    = 0x004000
        SUM_CRCIEEE     = 0x008000
)
type CheckSum struct {
        Files           int64   // the number of files (or data)
        Size            int64   // content size
        Words           int64   // word count
        Lines           int64   // line count
        SumType         int
        Sum64           uint64
        Crc32Table      crc32.Table
        Crc32Val        uint32
        Sum16           int
        Ctime           time.Time
        Atime           time.Time
        Mtime           time.Time
        Start           time.Time
        Done            time.Time
        RusgAtStart     [2]syscall.Rusage
        RusgAtEnd       [2]syscall.Rusage
}
type ValueStack [][]string
type GshContext struct {
        StartDir        string  // the current directory at the start
        GetLine         string  // gsh-getline command as a input line editor
        ChdirHistory    []GChdirHistory // the 1st entry is wd at the start
        gshPA           syscall.ProcAttr
        CommandHistory  []GCommandHistory
        CmdCurrent      GCommandHistory
        BackGround      bool
        BackGroundJobs  []int
        LastRusage      syscall.Rusage
        GshHomeDir      string
        TerminalId      int
        CmdTrace        bool // should be [map]
        CmdTime         bool // should be [map]
```

```
        PluginFuncs     []PluginInfo
        iValues         []string
        iDelimiter      string // field sepearater of print out
        iFormat         string // default print format (of integer)
        iValStack       ValueStack
        LastServer      GServer
        RSERV           string // [gsh://]host[:port]
        RWD             string // remote (target, there) working directory
        lastCheckSum    CheckSum
}

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

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

func env(opts []string) {
        env := os.Environ()
        if isin("-s", opts){
                sort.Slice(env, func(i,j int) bool {
                        return env[i] < env[j]
                })
        }
        for _, v := range env {
                fmt.Printf("%v\n",v)
        }
}
```

```
// - rewriting should be context dependent
// - should postpone until the real point of evaluation
// - should rewrite only known notation of symobl
func scanInt(str string)(val int,leng int){
        leng = -1
        for i,ch := range str {
                if '0' <= ch && ch <= '9' {
                        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
}

// str-expansion
// - 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
}

// Encode / Decode
// Encoder
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){
        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)
                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 {
                                //os.Stdout.Write([]byte("\r\n"))
                                os.Stdout.Write([]byte("\\"))
                                os.Stdout.Write([]byte("\n"))
                        }
                        line = line[olen:]
```

```
                        off += olen
                        remlen -= olen
                }
        }
        fmt.Fprintf(os.Stderr,"--I-- lnsp %d to %d\n",ni,toi)
}

// CRC32 crc32
// 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 i uint64
        for i = 0; i < len; i++ {
                var oct = str[i]
                for bi := 0; bi < 8; bi++ {
                        ovf1 := (crc & 0x80000000) != 0
                        ovf2 := (oct & 0x80) != 0
                        ovf := (ovf1 && !ovf2) || (!ovf1 && ovf2)
                        oct <<= 1
                        crc <<= 1
                        if ovf { crc ^= CRC32UNIX }
                }
        }
        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 byteCRC32(str[]byte,len uint64)(crc uint32){
        crc = byteCRC32add(0,str,len)
        crc = byteCRC32end(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])
		}
		// BSD checksum
		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
}

// grep
// “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
}

// Finder
// 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
        nextRepo        time.Time
}
func showFusage(dir string,fusage *fileSum){
        bsume := float64(((fusage.Blocks-fusage.DupBlocks)/2)*1024)/1000000.0
        //bsumdup := float64((fusage.Blocks/2)*1024)/1000000.0

        fmt.Printf("%v: %v files (%vd %vs %vh) %.6f MB (%.2f MBK)\n",
                dir,
                fusage.Files,
                fusage.Dirs,
                fusage.SymLink,
                fusage.HLinks,
                float64(fusage.Size)/1000000.0,bsume);
}
const (
        S_IFMT    = 0170000
        S_IFCHR   = 0020000
        S_IFDIR   = 0040000
        S_IFREG   = 0100000
        S_IFLNK   = 0120000
        S_IFSOCK  = 0140000
)
func cumFinfo(fsum *fileSum, path string, staterr error, fstat syscall.Stat_t, argv[]string,verb bool)(*fileSum
){
        now := time.Now()
        if time.Second <= now.Sub(fsum.nextRepo) {
                if !fsum.nextRepo.IsZero(){
                        tstmp := now.Format(time.Stamp)
                        showFusage(tstmp,fsum)
                }
                fsum.nextRepo = now.Add(time.Second)
        }
        if staterr != nil {
                fsum.Err += 1
                return fsum
        }
        fsum.Files += 1
        if 1 < fstat.Nlink {
                // must count only once...
                // at least ignore ones in the same directory
                //if finfo.Mode().IsRegular() {
                if (fstat.Mode & S_IFMT) == S_IFREG {
                        fsum.HLinks += 1
                        fsum.DupBlocks += int64(fstat.Blocks)
                        //fmt.Printf("---Dup HardLink %v %s\n",fstat.Nlink,path)
                }
        }
```

```
        //fsum.Size += finfo.Size()
        fsum.Size += fstat.Size
        fsum.Blocks += int64(fstat.Blocks)
        //if verb { fmt.Printf("(%8dBlk) %s",fstat.Blocks/2,path) }
        if isin("-ls",argv){
                //if verb { fmt.Printf("%4d %8d ",fstat.Blksize,fstat.Blocks) }
//              fmt.Printf("%d\t",fstat.Blocks/2)
        }
        //if finfo.IsDir()
        if (fstat.Mode & S_IFMT) == S_IFDIR {
                fsum.Dirs += 1
        }
        //if (finfo.Mode() & os.ModeSymlink) != 0
        if (fstat.Mode & S_IFMT) == S_IFLNK {
                //if verb { fmt.Printf("symlink(%v,%s)\n",fstat.Mode,finfo.Name()) }
                //{ fmt.Printf("symlink(%o,%s)\n",fstat.Mode,finfo.Name()) }
                fsum.SymLink += 1
        }
        return fsum
}
func (gsh*GshContext)xxFindEntv(depth int,total *fileSum,dir string, dstat syscall.Stat_t, ei int, entv []strin
g,npatv[]string,argv[]string)(*fileSum){
        nols := isin("-grep",argv)
        // sort entv
        /*
        if isin("-t",argv){
                sort.Slice(filev, func(i,j int) bool {
                        return 0 < filev[i].ModTime().Sub(filev[j].ModTime())
                })
        }
        */
                /*
                if isin("-u",argv){
                        sort.Slice(filev, func(i,j int) bool {
                                return 0 < filev[i].AccTime().Sub(filev[j].AccTime())
                        })
                }
                if isin("-U",argv){
                        sort.Slice(filev, func(i,j int) bool {
                                return 0 < filev[i].CreatTime().Sub(filev[j].CreatTime())
                        })
                }
                */
        /*
        if isin("-S",argv){
                sort.Slice(filev, func(i,j int) bool {
                        return filev[j].Size() < filev[i].Size()
                })
        }
        */
        for _,filename := range entv {
                for _,npat := range npatv {
                        match := true
                        if npat == "*" {
                                match = true
                        }else{
                                match, _ = filepath.Match(npat,filename)
                        }
                        path := dir + DIRSEP + filename
                        if !match {
                                continue
```

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

```
                defer dirfile.Close()
        }else{
        }

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

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

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

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

```
                gsh.lastCheckSum.SumType |= SUM_SIZE
        }else
        if isin("-sum",argv) && isin("-bsd",argv) {
                gsh.lastCheckSum.SumType |= SUM_SUM16_BSD
        }else
        if isin("-sum",argv) && isin("-sysv",argv) {
                gsh.lastCheckSum.SumType |= SUM_SUM16_SYSV
        }else
        if isin("-sum",argv) {
                gsh.lastCheckSum.SumType |= SUM_SUM64
        }
        if isin("-unix",argv) {
                gsh.lastCheckSum.SumType |= SUM_UNIXFILE
                gsh.lastCheckSum.Crc32Table = *crc32.MakeTable(CRC32UNIX)
        }
        if isin("-ieee",argv){
                gsh.lastCheckSum.SumType |= SUM_CRCIEEE
                gsh.lastCheckSum.Crc32Table = *crc32.MakeTable(CRC32IEEE)
        }
        gsh.lastCheckSum.RusgAtStart = Getrusagev()
}
var total = fileSum{}
npats := []string{}
for _,v := range argv {
        if 0 < len(v) && v[0] != '-' {
                npats = append(npats,v)
        }
        if v == "//" { break }
        if v == "--" { break }
        if v == "-grep" { break }
        if v == "-ls" { break }
}
if len(npats) == 0 {
        npats = []string{"*"}
}
cwd := "."
// if to be fullpath ::: cwd, _ := os.Getwd()
if len(npats) == 0 { npats = []string{"*"} }
fusage := gsh.xxFind(0,&total,cwd,npats,argv)
if gsh.lastCheckSum.SumType != 0 {
        var sumi uint64 = 0
        sum := &gsh.lastCheckSum
        if (sum.SumType & SUM_SIZE) != 0 {
                sumi = uint64(sum.Size)
        }
        if (sum.SumType & SUM_SUM64) != 0 {
                sumi = sum.Sum64
        }
        if (sum.SumType & SUM_SUM16_SYSV) != 0 {
                s := uint32(sum.Sum16)
                r := (s & 0xFFFF) + ((s & 0xFFFFFFFF) >> 16)
                s = (r & 0xFFFF) + (r >> 16)
                sum.Crc32Val = uint32(s)
                sumi = uint64(s)
        }
        if (sum.SumType & SUM_SUM16_BSD) != 0 {
                sum.Crc32Val = uint32(sum.Sum16)
                sumi = uint64(sum.Sum16)
        }
        if (sum.SumType & SUM_UNIXFILE) != 0 {
                sum.Crc32Val = byteCRC32end(sum.Crc32Val,uint64(sum.Size))
```

```
                        sumi = uint64(byteCRC32end(sum.Crc32Val,uint64(sum.Size)))
                }
                if 1 < sum.Files {
                        fmt.Printf("%v %v // %v / %v files, %v/file\r\n",
                                sumi,sum.Size,
                                abssize(sum.Size),sum.Files,
                                abssize(sum.Size/sum.Files))
                }else{
                        fmt.Printf("%v %v %v\n",
                                sumi,sum.Size,npats[0])
                }
        }
        if !isin("-grep",argv) {
                showFusage("total",fusage)
        }
        if !isin("-s",argv){
                hits := len(gsh.CmdCurrent.FoundFile)
                if 0 < hits {
                        fmt.Printf("--I-- %d files hits // can be refered with !%df\n",
                                hits,len(gsh.CommandHistory))
                }
        }
        if gsh.lastCheckSum.SumType != 0 {
                if isin("-ru",argv) {
                        sum := &gsh.lastCheckSum
                        sum.Done = time.Now()
                        gsh.lastCheckSum.RusgAtEnd = Getrusagev()
                        elps := sum.Done.Sub(sum.Start)
                        fmt.Printf("--cksum-size: %v (%v) / %v files, %v/file\r\n",
                                sum.Size,abssize(sum.Size),sum.Files,abssize(sum.Size/sum.Files))
                        nanos := int64(elps)
                        fmt.Printf("--cksum-time: %v/total, %v/file, %.1f files/s, %v\r\n",
                                abbtime(nanos),
                                abbtime(nanos/sum.Files),
                                (float64(sum.Files)*1000000000.0)/float64(nanos),
                                abbspeed(sum.Size,nanos))
                        diff := RusageSubv(sum.RusgAtEnd,sum.RusgAtStart)
                        fmt.Printf("--cksum-rusg: %v\n",sRusagef("",argv,diff))
                }
        }
        return
}

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

```
                                showFiles(v.FoundFile)
                                fmt.Printf("\n")
                        }
                }
        }
}

func showMatchFile(filev []os.FileInfo, npat,dir string, argv[]string)(string,bool){
        fname := ""
        found := false
        for _,v := range filev {
                match, _ := filepath.Match(npat,(v.Name()))
                if match {
                        fname = v.Name()
                        found = true
                        //fmt.Printf("[%d] %s\n",i,v.Name())
                        showIfExecutable(fname,dir,argv)
                }
        }
        return fname,found
}
func showIfExecutable(name,dir string,argv[]string)(ffullpath string,ffound bool){
        var fullpath string
        if strBegins(name,DIRSEP){
                fullpath = name
        }else{
                fullpath = dir + DIRSEP + name
        }
        fi, err := os.Stat(fullpath)
        if err != nil {
                fullpath = dir + DIRSEP + name + ".go"
                fi, err = os.Stat(fullpath)
        }
        if err == nil {
                fm := fi.Mode()
                if fm.IsRegular() {
                  // R_OK=4, W_OK=2, X_OK=1, F_OK=0
                  if syscall.Access(fullpath,5) == nil {
                        ffullpath = fullpath
                        ffound = true
                        if ! isin("-s", argv) {
                                showFileInfo(fullpath,argv)
                        }
                  }
                }
        }
        return ffullpath, ffound
}
func which(list string, argv []string) (fullpathv []string, itis bool){
        if len(argv) <= 1 {
                fmt.Printf("Usage: which comand [-s] [-a] [-ls]\n")
                return []string{""}, false
        }
        path := argv[1]
        if strBegins(path,"/") {
                // should check if excecutable?
                _,exOK := showIfExecutable(path,"/",argv)
                fmt.Printf("--D-- %v exOK=%v\n",path,exOK)
                return []string{path},exOK
        }
        pathenv, efound := os.LookupEnv(list)
```

```
        if ! efound {
                fmt.Printf("--E-- which: no \"%s\" environment\n",list)
                return []string{""}, false
        }
        showall := isin("-a",argv) || 0 <= strings.Index(path,"*")
        dirv := strings.Split(pathenv,PATHSEP)
        ffound := false
        ffullpath := path
        for _, dir := range dirv {
                if 0 <= strings.Index(path,"*") { // by wild-card
                        list,_ := ioutil.ReadDir(dir)
                        ffullpath, ffound = showMatchFile(list,path,dir,argv)
                }else{
                        ffullpath, ffound = showIfExecutable(path,dir,argv)
                }
                //if ffound && !isin("-a", argv) {
                if ffound && !showall {
                        break;
                }
        }
        return []string{ffullpath}, ffound
}

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

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

```
                return true, os.Getppid()
        }
        return false, 0
}

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

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

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

        for ; si < len(str); si++ {
                if str[si] != ' ' {
                        break
                }
        }
        sb = si
        for ; si < len(str); si++ {
                if sb <= si {
                        if debug {
                                fmt.Printf("--Da- +%d %2d-%2d %s ... %s\n",
                                        inBracket,sb,si,arg1[0:ax],str[si:])
                        }
                }
                ch := str[si]
```

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

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

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

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

```
                dir = ">"
                fdix = 0 // write to the stdin of the process
        }
        gshPA := gsh.gshPA
        savfd := gshPA.Files[fdix]

        var fd uintptr = 0
        if mode == "r" {
                fd = pout.Fd()
                gshPA.Files[fdix] = pout.Fd()
        }else{
                fd = pin.Fd()
                gshPA.Files[fdix] = pin.Fd()
        }
                // should do this by Goroutine?
                if false {
                        fmt.Printf("-Ip- Opened fd[%v] %s %v\n",fd,dir,name)
                        fmt.Printf("-RED1 [%d,%d,%d]->[%d,%d,%d]\n",
                                os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd(),
                                pin.Fd(),pout.Fd(),pout.Fd())
                }
                        savi := os.Stdin
                        savo := os.Stdout
                        save := os.Stderr
                        os.Stdin  = pin
                        os.Stdout = pout
                        os.Stderr = pout
                gsh.BackGround = true
                gsh.gshelllh(name)
                gsh.BackGround = false
                        os.Stdin  = savi
                        os.Stdout = savo
                        os.Stderr = save

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

// External commands
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
}

// Builtin Commands
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()
}

// Remote Execution // 2020-0820
func Elapsed(from time.Time)(string){
        elps := time.Now().Sub(from)
        if 1000000000 < elps {
                return fmt.Sprintf("[%5d.%02ds]",elps/1000000000,(elps%1000000000)/10000000)
        }else
        if 1000000 < elps {
                return fmt.Sprintf("[%3d.%03dms]",elps/1000000,(elps%1000000)/1000)
        }else{
                return fmt.Sprintf("[%3d.%03dus]",elps/1000,(elps%1000))
        }
}
func abbtime(nanos int64)(string){
        if 1000000000 < nanos {
                return fmt.Sprintf("%d.%02ds",nanos/1000000000,(nanos%1000000000)/10000000)
        }else
        if 1000000 < nanos {
                return fmt.Sprintf("%d.%03dms",nanos/1000000,(nanos%1000000)/1000)
        }else{
                return fmt.Sprintf("%d.%03dus",nanos/1000,(nanos%1000))
        }
}
func abssize(size int64)(string){
        fsize := float64(size)
        if 1024*1024*1024 < size {
                return fmt.Sprintf("%.2fGiB",fsize/(1024*1024*1024))
```

```
        }else
        if 1024*1024 < size {
                return fmt.Sprintf("%.3fMiB",fsize/(1024*1024))
        }else{
                return fmt.Sprintf("%.3fKiB",fsize/1024)
        }
}
func absize(size int64)(string){
        fsize := float64(size)
        if 1024*1024*1024 < size {
                return fmt.Sprintf("%8.2fGiB",fsize/(1024*1024*1024))
        }else
        if 1024*1024 < size {
                return fmt.Sprintf("%8.3fMiB",fsize/(1024*1024))
        }else{
                return fmt.Sprintf("%8.3fKiB",fsize/1024)
        }
}
func abbspeed(totalB int64,ns int64)(string){
        MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
        if 1000 <= MBs {
                return fmt.Sprintf("%6.3fGB/s",MBs/1000)
        }
        if 1 <= MBs {
                return fmt.Sprintf("%6.3fMB/s",MBs)
        }else{
                return fmt.Sprintf("%6.3fKB/s",MBs*1000)
        }
}
func abspeed(totalB int64,ns time.Duration)(string){
        MBs := (float64(totalB)/1000000) / (float64(ns)/1000000000)
        if 1000 <= MBs {
                return fmt.Sprintf("%6.3fGBps",MBs/1000)
        }
        if 1 <= MBs {
                return fmt.Sprintf("%6.3fMBps",MBs)
        }else{
                return fmt.Sprintf("%6.3fKBps",MBs*1000)
        }
}
func fileRelay(what string,in*os.File,out*os.File,size int64,bsiz int)(wcount int64){
        Start := time.Now()
        buff := make([]byte,bsiz)
        var total int64 = 0
        var rem int64 = size
        nio := 0
        Prev := time.Now()
        var PrevSize int64 = 0

        fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) START\n",
                what,absize(total),size,nio)

        for i:= 0; ; i++ {
                var len = bsiz
                if int(rem) < len {
                        len = int(rem)
                }
                Now := time.Now()
                Elps := Now.Sub(Prev);
                if 1000000000 < Now.Sub(Prev) {
                        fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) %s\n",
```

```
                                what,absize(total),size,nio,
                                abspeed((total-PrevSize),Elps))
                        Prev = Now;
                        PrevSize = total
                }
                rlen := len
                if in != nil {
                        // should watch the disconnection of out
                        rcc,err := in.Read(buff[0:rlen])
                        if err != nil {
                                fmt.Printf(Elapsed(Start)+"--En- X: %s read(%v,%v)<%v\n",
                                        what,rcc,err,in.Name())
                                break
                        }
                        rlen = rcc
                        if string(buff[0:10]) == "((SoftEOF " {
                                var ecc int64 = 0
                                fmt.Sscanf(string(buff),"((SoftEOF %v",&ecc)
                                fmt.Printf(Elapsed(Start)+"--En- X: %s Recv ((SoftEOF %v))/%v\n",
                                        what,ecc,total)
                                if ecc == total {
                                        break
                                }
                        }
                }

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

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

```
func (gsh*GshContext)RexecServer(argv[]string){
        debug := true
        Start0 := time.Now()
        Start := Start0
//      if local == ":" { local = "0.0.0.0:9999" }
        local := "0.0.0.0:9999"

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

        reqbuf := make([]byte,LINESIZE)
        res := ""
        for {
                fmt.Printf(Elapsed(Start0)+"--In- S: Listening at %s...\n",local);
                aconn, err := sconn.AcceptTCP()
                Start = time.Now()
                if err != nil {
                        fmt.Printf(Elapsed(Start)+"--En- S: Accept error: %s (%s)\n",local,err)
                        return
                }
                clnt, _ := aconn.File()
                fd := clnt.Fd()
                ar := aconn.RemoteAddr()
                if debug { fmt.Printf(Elapsed(Start0)+"--In- S: Accepted TCP at %s [%d] <- %v\n",
                        local,fd,ar) }
                res = fmt.Sprintf("220 GShell/%s Server\r\n",VERSION)
                fmt.Fprintf(clnt,"%s",res)
                if debug { fmt.Printf(Elapsed(Start)+"--In- S: %s",res) }
                count, err := clnt.Read(reqbuf)
                if err != nil {
                        fmt.Printf(Elapsed(Start)+"--En- C: (%v %v) %v",
                                count,err,string(reqbuf))
                }
                req := string(reqbuf[:count])
                if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",string(req)) }
                reqv := strings.Split(string(req),"\r")
                cmdv := gshScanArg(reqv[0],0)
                //cmdv := strings.Split(reqv[0]," ")
                switch cmdv[0] {
                        case "HELO":
                                res = fmt.Sprintf("250 %v",req)
                        case "GET":
                                // download {remotefile|-zN} [localfile]
```

```
                var dsize int64 = 32*1024*1024
                var bsize int = 64*1024
                var fname string = ""
                var in *os.File = nil
                var pseudoEOF = false
                if 1 < len(cmdv) {
                        fname = cmdv[1]
                        if strBegins(fname,"-z") {
                                fmt.Sscanf(fname[2:],"%d",&dsize)
                        }else
                        if strBegins(fname,"{") {
                                xin,xout,err := gsh.Popen(fname,"r")
                                if err {
                                }else{
                                        xout.Close()
                                        defer xin.Close()
                                        in = xin
                                        dsize = MaxStreamSize
                                        pseudoEOF = true
                                }
                        }else{
                                xin,err := os.Open(fname)
                                if err != nil {
                                        fmt.Printf("--En- GET (%v)\n",err)
                                }else{
                                        defer xin.Close()
                                        in = xin
                                        fi,_ := xin.Stat()
                                        dsize = fi.Size()
                                }
                        }
                }
                //fmt.Printf(Elapsed(Start)+"--In- GET %v:%v\n",dsize,bsize)
                res = fmt.Sprintf("200 %v\r\n",dsize)
                fmt.Fprintf(clnt,"%v",res)
                tcpPush(clnt); // should be separated as line in receiver
                fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
                wcount := fileRelay("SendGET",in,clnt,dsize,bsize)
                if pseudoEOF {
                        in.Close() // pipe from the command
                        // show end of stream data (its size) by OOB?
                        SoftEOF := fmt.Sprintf("((SoftEOF %v))",wcount)
                        fmt.Printf(Elapsed(Start)+"--In- S: Send %v\n",SoftEOF)

                        tcpPush(clnt); // to let SoftEOF data apper at the top of recevied data
                        fmt.Fprintf(clnt,"%v\r\n",SoftEOF)
                        tcpPush(clnt); // to let SoftEOF alone in a packet (separate with 200 OK)
                                // with client generated random?
                        //fmt.Printf("--In- L: close %v (%v)\n",in.Fd(),in.Name())
                }
                res = fmt.Sprintf("200 GET done\r\n")
        case "PUT":
                // upload {srcfile|-zN} [dstfile]
                var dsize int64 = 32*1024*1024
                var bsize int = 64*1024
                var fname string = ""
                var out *os.File = nil
                if 1 < len(cmdv) { // localfile
                        fmt.Sscanf(cmdv[1],"%d",&dsize)
                }
                if 2 < len(cmdv) {
```

```
                                        fname = cmdv[2]
                                        if fname == "-" {
                                                // nul dev
                                        }else
                                        if strBegins(fname,"{") {
                                                xin,xout,err := gsh.Popen(fname,"w")
                                                if err {
                                                }else{
                                                        xin.Close()
                                                        defer xout.Close()
                                                        out = xout
                                                }
                                        }else{
                                        // should write to temporary file
                                        // should suppress ^C on tty
                                xout,err := os.OpenFile(fname,os.O_CREATE|os.O_RDWR|os.O_TRUNC,0600)
                                //fmt.Printf("--In- S: open(%v) out(%v) err(%v)\n",fname,xout,err)
                                                if err != nil {
                                                        fmt.Printf("--En- PUT (%v)\n",err)
                                                }else{
                                                        out = xout
                                                }
                                        }
                                fmt.Printf(Elapsed(Start)+"--In- L: open(%v,w) %v (%v)\n",
                                        fname,local,err)
                                }
                                fmt.Printf(Elapsed(Start)+"--In- PUT %v (/%v)\n",dsize,bsize)
                                fmt.Printf(Elapsed(Start)+"--In- S: 200 %v OK\r\n",dsize)
                                fmt.Fprintf(clnt,"200 %v OK\r\n",dsize)
                                fileRelay("RecvPUT",clnt,out,dsize,bsize)
                                res = fmt.Sprintf("200 PUT done\r\n")
                        default:
                                res = fmt.Sprintf("400 What? %v",req)
                }
                swcc,serr := clnt.Write([]byte(res))
                if serr != nil {
                        fmt.Printf(Elapsed(Start)+"--In- S: (wc=%v er=%v) %v",swcc,serr,res)
                }else{
                        fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
                }
                aconn.Close();
                clnt.Close();
        }
        sconn.Close();
}
func (gsh*GshContext)RexecClient(argv[]string)(int,string){
        debug := true
        Start := time.Now()
        if len(argv) == 1 {
                return -1,"EmptyARG"
        }
        argv = argv[1:]
        if argv[0] == "-serv" {
                gsh.RexecServer(argv[1:])
                return 0,"Server"
        }
        remote := "0.0.0.0:9999"
        if argv[0][0] == '@' {
                remote = argv[0][1:]
                argv = argv[1:]
        }
```

```
	if argv[0] == "-s" {
		debug = false
		argv = argv[1:]
	}
	dport, err := net.ResolveTCPAddr("tcp",remote);
	if err != nil {
		fmt.Printf(Elapsed(Start)+"Address error: %s (%s)\n",remote,err)
		return -1,"AddressError"
	}
	fmt.Printf(Elapsed(Start)+"--In- C: Connecting to %s\n",remote)
	serv, err := net.DialTCP("tcp",nil,dport)
	if err != nil {
		fmt.Printf(Elapsed(Start)+"Connection error: %s (%s)\n",remote,err)
		return -1,"CannotConnect"
	}
	if debug {
		al := serv.LocalAddr()
		fmt.Printf(Elapsed(Start)+"--In- C: Connected to %v <- %v\n",remote,al)
	}

	req := ""
	res := make([]byte,LINESIZE)
	count,err := serv.Read(res)
	if err != nil {
		fmt.Printf("--En- S: (%3d,%v) %v",count,err,string(res))
	}
	if debug { fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res)) }

	if argv[0] == "GET" {
		savPA := gsh.gshPA
		var bsize int = 64*1024
		req = fmt.Sprintf("%v\r\n",strings.Join(argv," "))
		fmt.Printf(Elapsed(Start)+"--In- C: %v",req)
		fmt.Fprintf(serv,req)
		count,err = serv.Read(res)
		if err != nil {
		}else{
			var dsize int64 = 0
			var out *os.File = nil
			var out_tobeclosed *os.File = nil
			var fname string = ""
			var rcode int = 0
			var pid int = -1
			fmt.Sscanf(string(res),"%d %d",&rcode,&dsize)
			fmt.Printf(Elapsed(Start)+"--In- S: %v",string(res[0:count]))
			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
}

// Remote Shell
// gcp file […] { [host]:[port:][dir] | dir } // -p | -no-p
func (gsh*GshContext)FileCopy(argv[]string){
        var host = “”
        var port = “”
        var upload = false
        var download = false
        var xargv = []string{“rex-gcp”}
        var srcv = []string{}
        var dstv = []string{}
        argv = argv[1:]

        for _,v := range argv {
                /*
                if v[0] == ‘-‘ { // might be a pseudo file (generated date)
                        continue
                }
                */
                obj := strings.Split(v,”:”)
                //fmt.Printf(“%d %v %v\n”,len(obj),v,obj)
                if 1 < len(obj) {
```

```
                host = obj[0]
                file := ""
                if 0 < len(host) {
                        gsh.LastServer.host = host
                }else{
                        host = gsh.LastServer.host
                        port = gsh.LastServer.port
                }
                if 2 < len(obj) {
                        port = obj[1]
                        if 0 < len(port) {
                                gsh.LastServer.port = port
                        }else{
                                port = gsh.LastServer.port
                        }
                        file = obj[2]
                }else{
                        file = obj[1]
                }
                if len(srcv) == 0 {
                        download = true
                        srcv = append(srcv,file)
                        continue
                }
                upload = true
                dstv = append(dstv,file)
                continue
        }
        /*
        idx := strings.Index(v,":")
        if 0 <= idx {
                remote = v[0:idx]
                if len(srcv) == 0 {
                        download = true
                        srcv = append(srcv,v[idx+1:])
                        continue
                }
                upload = true
                dstv = append(dstv,v[idx+1:])
                continue
        }
        */
        if download {
                dstv = append(dstv,v)
        }else{
                srcv = append(srcv,v)
        }
}
hostport := "@" + host + ":" + port
if upload {
        if host != "" { xargv = append(xargv,hostport) }
        xargv = append(xargv,"PUT")
        xargv = append(xargv,srcv[0:]...)
        xargv = append(xargv,dstv[0:]...)
//fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v // %v\n",hostport,dstv,srcv,xargv)
fmt.Printf("--I-- FileCopy PUT gsh://%s/%v < %v\n",hostport,dstv,srcv)
        gsh.RexecClient(xargv)
}else
if download {
        if host != "" { xargv = append(xargv,hostport) }
        xargv = append(xargv,"GET")
```

```
                xargv = append(xargv,srcv[0:]...)
                xargv = append(xargv,dstv[0:]...)
        //fmt.Printf("--I-- FileCopy GET gsh://%v/%v > %v // %v\n",hostport,srcv,dstv,xargv)
        fmt.Printf("-I- FileCopy GET gsh://%v/%v > %v\n",hostport,srcv,dstv)
                gsh.RexecClient(xargv)
        }else{
        }
}

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

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

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

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

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

```
                local = argv[2]
        }
        fmt.Printf("--I-- jget from=%v to=%v\n",gsh.Trelpath(remote),local)
}

// network
// -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")
        }
}

// History
// 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
}
*/

// Resource Usage
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){
}

// redirect
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)(){
}

// Plugin
// plugin [-ls [names]] to list plugins
// Reference: plugin 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")
        }
}

// Scanf // 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)
        }
}

// Command Interpreter
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” || cm
                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 == "close":
                gshCtx.xClose(argv)
        case cmd == "gcp":
                gshCtx.FileCopy(argv)
        case cmd == "dec" || cmd == "decode":
                gshCtx.Dec(argv)
        case cmd == "#define":
        case cmd == "dic" || cmd == "d":
                xDic(argv)
        case cmd == "dump":
                gshCtx.Dump(argv)
        case cmd == "echo" || cmd == "e":
                echo(argv,true)
        case cmd == "enc" || cmd == "encode":
                gshCtx.Enc(argv)
        case cmd == "env":
                env(argv)
        case cmd == "eval":
                xEval(argv[1:],true)
        case cmd == "ev" || cmd == "events":
                dumpEvents(argv)
        case cmd == "exec":
                _,_ = gshCtx.excommand(true,argv[1:])
                // should not return here
        case cmd == "exit" || cmd == "quit":
                // write Result code EXIT to 3>
                return true
        case cmd == “fdls”:
                // dump the attributes of fds (of other process)
        case cmd == “-find” || cmd == “fin” || cmd == “ufind” || cmd == “uf”:
                gshCtx.xFind(argv[1:])
        case cmd == “fu”:
                gshCtx.xFind(argv[1:])
        case cmd == “fork”:
                // mainly for a server
        case cmd == “-gen”:
                gshCtx.gen(argv)
```

```
	case cmd == "-go":
		gshCtx.xGo(argv)
	case cmd == "-grep":
		gshCtx.xFind(argv)
	case cmd == "gdeq":
		gshCtx.Deq(argv)
	case cmd == "genq":
		gshCtx.Enq(argv)
	case cmd == "gpop":
		gshCtx.Pop(argv)
	case cmd == "gpush":
		gshCtx.Push(argv)
	case cmd == "history" || cmd == "hi": // hi should be alias
		gshCtx.xHistory(argv)
	case cmd == "jobs":
		gshCtx.xJobs(argv)
	case cmd == "lnsp" || cmd == "nlsp":
		gshCtx.SplitLine(argv)
	case cmd == "-ls":
		gshCtx.xFind(argv)
	case cmd == "nop":
		// do nothing
	case cmd == "pipe":
		gshCtx.xOpen(argv)
	case cmd == "plug" || cmd == "plugin" || cmd == "pin":
		gshCtx.xPlugin(argv[1:])
	case cmd == "print" || cmd == "-pr":
		// output internal slice // also sprintf should be
		gshCtx.Printv(argv)
	case cmd == "ps":
		gshCtx.xPs(argv)
	case cmd == "pstitle":
		// to be gsh.title
	case cmd == "rexecd" || cmd == "rexd":
		gshCtx.RexecServer(argv)
	case cmd == "rexec" || cmd == "rex":
		gshCtx.RexecClient(argv)
	case cmd == "repeat" || cmd == "rep": // repeat cond command
		gshCtx.repeat(argv)
	case cmd == "replay":
		gshCtx.xReplay(argv)
	case cmd == "scan":
		// scan input (or so in fscanf) to internal slice (like Files or map)
		gshCtx.Scanv(argv)
	case cmd == "set":
		// set name …
	case cmd == "serv":
		gshCtx.httpServer(argv)
	case cmd == "shift":
		gshCtx.Shiftv(argv)
	case cmd == "sleep":
		gshCtx.sleep(argv)
	case cmd == "-sort":
		gshCtx.Sortv(argv)

	case cmd == "j" || cmd == "join":
		gshCtx.Rjoin(argv)
	case cmd == "a" || cmd == "alpa":
		gshCtx.Rexec(argv)
	case cmd == "jcd" || cmd == "jchdir":
		gshCtx.Rchdir(argv)
```

```
        case cmd == “jget”:
                gshCtx.Rget(argv)
        case cmd == “jls”:
                gshCtx.Rls(argv)
        case cmd == “jput”:
                gshCtx.Rput(argv)
        case cmd == “jpwd”:
                gshCtx.Rpwd(argv)

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

func (gsh*GshContext)gshelll(gline string) (rfin bool) {
        argv := strings.Split(string(gline)," ")
        fin := gsh.gshellv(argv)
        return fin
}
func (gsh*GshContext)tgshelll(gline string)(xfin bool){
        start := time.Now()
        fin := gsh.gshelll(gline)
        end := time.Now()
        elps := end.Sub(start);
        if gsh.CmdTime {
                fmt.Printf("--T-- " + time.Now().Format(time.Stamp) + "(%d.%09ds)\n",
                        elps/1000000000,elps%1000000000)
        }
        return fin
}
func Ttyid() (int) {
        fi, err := os.Stdin.Stat()
        if err != nil {
                return 0;
        }
        //fmt.Printf("Stdin: %v Dev=%d\n",
        //      fi.Mode(),fi.Mode()&os.ModeDevice)
        if (fi.Mode() & os.ModeDevice) != 0 {
```

```
                stat := syscall.Stat_t{};
                err := syscall.Fstat(0,&stat)
                if err != nil {
                        //fmt.Printf("--I-- Stdin: (%v)\n",err)
                }else{
                        //fmt.Printf("--I-- Stdin: rdev=%d %d\n",
                        //      stat.Rdev&0xFF,stat.Rdev);
                        //fmt.Printf("--I-- Stdin: tty%d\n",stat.Rdev&0xFF);
                        return int(stat.Rdev & 0xFF)
                }
        }
        return 0
}
func (gshCtx *GshContext) ttyfile() string {
        //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
        ttyfile := gshCtx.GshHomeDir + "/" + "gsh-tty" +
                 fmt.Sprintf("%02d",gshCtx.TerminalId)
                 //strconv.Itoa(gshCtx.TerminalId)
        //fmt.Printf("--I-- ttyfile=%s\n",ttyfile)
        return ttyfile
}
func (gshCtx *GshContext) ttyline()(*os.File){
        file, err := os.OpenFile(gshCtx.ttyfile(),os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
        if err != nil {
                fmt.Printf("--F-- cannot open %s (%s)\n",gshCtx.ttyfile(),err)
                return file;
        }
        return file
}
func (gshCtx *GshContext)getline(hix int, skipping bool, prevline string) (string) {
        if( skipping ){
                reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
                line, _, _ := reader.ReadLine()
                return string(line)
        }else
        if true {
                return xgetline(hix,prevline,gshCtx)
        }
        /*
        else
        if( with_exgetline && gshCtx.GetLine != "" ){
                //var xhix int64 = int64(hix); // cast
                newenv := os.Environ()
                newenv = append(newenv, "GSH_LINENO="+strconv.FormatInt(int64(hix),10) )

                tty := gshCtx.ttyline()
                tty.WriteString(prevline)
                Pa := os.ProcAttr {
                        "", // start dir
                        newenv, //os.Environ(),
                        []*os.File{os.Stdin,os.Stdout,os.Stderr,tty},
                        nil,
                }
//fmt.Printf("--I-- getline=%s // %s\n",gsh_getlinev[0],gshCtx.GetLine)
proc, err := os.StartProcess(gsh_getlinev[0],[]string{"getline","getline"},&Pa)
                if err != nil {
                        fmt.Printf("--F-- getline process error (%v)\n",err)
                        // for ; ; { }
                        return "exit (getline program failed)"
                }
                //stat, err := proc.Wait()
```

```
                proc.Wait()
                buff := make([]byte,LINESIZE)
                count, err := tty.Read(buff)
                //_, err = tty.Read(buff)
                //fmt.Printf("--D-- getline (%d)\n",count)
                if err != nil {
                        if ! (count == 0) { // && err.String() == "EOF" ) {
                                fmt.Printf("--E-- getline error (%s)\n",err)
                        }
                }else{
                        //fmt.Printf("--I-- getline OK \"%s\"\n",buff)
                }
                tty.Close()
                gline := string(buff[0:count])
                return gline
        }else
        */
        {
                // if isatty {
                        fmt.Printf("!%d",hix)
                        fmt.Print(PROMPT)
                // }
                reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
                line, _, _ := reader.ReadLine()
                return string(line)
        }
}

//== begin ================================================== getline
/*
 * getline.c
 * 2020-0819 extracted from dog.c
 * getline.go
 * 2020-0822 ported to Go
 */
/*
package main // getline main
import (
        "fmt"           // fmt
        “strings”       // strings
        “os”            // os
        “syscall”       // syscall
        //”bytes”               // os
        //”os/exec”     // os
)
*/

// 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
}
```

// Command Line IME

```
//————————————————————— MyIME
var MyIMEVER = “MyIME/0.0.2”;
type RomKana struct {
        dic string      // dictionaly ID
        pat string      // input pattern
        out string      // output pattern
        hit int64       // count of hit and used
}
```

```
var dicents = 0
var romkana [1024]RomKana
var Romkan []RomKana

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

        if 0 < len(argv) {
                arg1 := argv[0]
                if arg1[0] == '-' {
                        switch arg1 {
                                default: fmt.Printf("--Ed-- Unknown option(%v)\n",arg1)
                                        return
```

```
                        case "-b": builtin = true
                        case "-d": debug = true
                        case "-s": silent = true
                        case "-v": info = true
                }
                opt = arg1
                argv = argv[1:]
        }
}

dicName := ""
dicURL := ""
if 0 < len(argv) {
        arg = argv[0]
        dicName = arg
        argv = argv[1:]
}
if 0 < len(argv) {
        dicURL = argv[0]
        argv = argv[1:]
}
if false {
        fprintf(stderr,"--Dd-- com(%v) opt(%v) arg(%v)\n",cmd,opt,arg)
}
if cmd == DIC_COM_LOAD {
        //dicType := ""
        dicBody := ""
        if !builtin && dicName != "" && dicURL == "" {
                f,err := os.Open(dicName)
                if err == nil {
                        dicURL = dicName
                }else{
                        f,err = os.Open(dicName+".html")
                        if err == nil {
                                dicURL = dicName+".html"
                        }else{
                                f,err = os.Open("gshdic-"+dicName+".html")
                                if err == nil {
                                        dicURL = "gshdic-"+dicName+".html"
                                }
                        }
                }
                if err == nil {
                        var buf = make([]byte,128*1024)
                        count,err := f.Read(buf)
                        f.Close()
                        if info {
                                fprintf(stderr,"--Id-- ReadDic(%v,%v)\n",count,err)
                        }
                        dicBody = string(buf[0:count])
                }
        }
        if dicBody == "" {
                switch arg {
                        default:
                                dicName = "WorldDic"
                                dicURL = WorldDic
                                if info {
                                fprintf(stderr,"--Id-- default dictionary \"%v\"\n",
                                        dicName);
                                }
```

```
                        case "wnn":
                                dicName = "WnnDic"
                                dicURL = WnnDic
                        case "sumomo":
                                dicName = "SumomoDic"
                                dicURL = SumomoDic
                        case "sijimi":
                                dicName = "SijimiDic"
                                dicURL = SijimiDic
                        case "jkl":
                                dicName = "JKLJaDic"
                                dicURL = JA_JKLDic
                }
                if debug {
                        fprintf(stderr,"--Id-- %v URL=%v\n\n",dicName,dicURL);
                }
                dicv := strings.Split(dicURL,",")
                if debug {
                        fprintf(stderr,"--Id-- %v encoded data...\n",dicName)
                        fprintf(stderr,"Type: %v\n",dicv[0])
                        fprintf(stderr,"Body: %v\n",dicv[1])
                        fprintf(stderr,"\n")
                }
                body,_ := base64.StdEncoding.DecodeString(dicv[1])
                dicBody = string(body)
        }
        if info {
                fmt.Printf("--Id-- %v %v\n",dicName,dicURL)
                fmt.Printf("%s\n",dicBody)
        }
        if debug {
                fprintf(stderr,"--Id-- dicName %v text...\n",dicName)
                fprintf(stderr,"%v\n",string(dicBody))
        }
        entv := strings.Split(dicBody,"\n");
        if info {
                fprintf(stderr,"--Id-- %v scan...\n",dicName);
        }
        var added int = 0
        var dup int = 0
        for i,v := range entv {
                var pat string
                var out string
                fmt.Sscanf(v,"%s %s",&pat,&out)
                if len(pat) <= 0 {
                }else{
                        if 0 <= isinDic(pat) {
                                dup += 1
                                continue
                        }
                        romkana[dicents] = RomKana{dicName,pat,out,0}
                        dicents += 1
                        added += 1
                        Romkan = append(Romkan,RomKana{dicName,pat,out,0})
                        if debug {
                                fmt.Printf("[%3v]:[%2v]%-8v [%2v]%v\n",
                                        i,len(pat),pat,len(out),out)
                        }
                }
        }
        if !silent {
```

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

        var info = false
        if info {
                fprintf(stderr,"--Id-- Conguraturations!! WorldDic is now activated.\r\n")
                fprintf(stderr,"--Id-- enter \"dic\" command for help.\r\n")
        }
}
func readDic()(int){
        /*
        var rk *os.File;
        var dic = "MyIME-dic.txt";
        //rk = fopen("romkana.txt","r");
        //rk = fopen("JK-JA-morse-dic.txt","r");
        rk = fopen(dic,"r");
        if( rk == NULL_FP ){
                if( true ){
                        fprintf(stderr,"--%s-- Could not load %s\n",MyIMEVER,dic);
                }
                return -1;
        }
        if( true ){
                var di int;
                var line = make(StrBuff,1024);
                var pat string
                var out string
                for di = 0; di < 1024; di++ {
```

```
                        if( fgets(line,sizeof(line),rk) == NULLSP ){
                                break;
                        }
                        fmt.Sscanf(string(line[0:strlen(line)]),"%s %s",&pat,&out);
                        //sscanf(line,"%s %[^\r\n]",&pat,&out);
                        romkana[di].pat = pat;
                        romkana[di].out = out;
                        //fprintf(stderr,"--Dd- %-10s %s\n",pat,out)
                }
                dicents += di
                if( false ){
                        fprintf(stderr,"--%s-- loaded romkana.txt [%d]\n",MyIMEVER,di);
                        for di = 0; di < dicents; di++ {
                                fprintf(stderr,
                                        "%s %s\n",romkana[di].pat,romkana[di].out);
                        }
                }
        }
        fclose(rk);

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

        for si = 0; si < sx; { // search max. match from the position
                if strBegins(src[si:],"%x/") {
                        // %x/integer/ // s/a/b/
                        ix := strings.Index(src[si+3:],"/")
                        if 0 < ix {
                                var iv int = 0
                                //fmt.Sscanf(src[si+3:si+3+ix],"%d",&iv)
                                fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
                                sval := fmt.Sprintf("%x",iv)
                                bval := []byte(sval)
                                dstb = append(dstb,bval...)
                                si = si+3+ix+1
                                continue
                        }
                }
                if strBegins(src[si:],"%d/") {
                        // %d/integer/ // s/a/b/
                        ix := strings.Index(src[si+3:],"/")
                        if 0 < ix {
                                var iv int = 0
                                fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
                                sval := fmt.Sprintf("%d",iv)
```

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

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

// should be compatilbe with Telnet
const (
        EV_MODE         = 255
        EV_IDLE         = 254
        EV_TIMEOUT      = 253
        GO_UP           = 252
        GO_DOWN         = 251
        GO_RIGHT        = 250
        GO_LEFT         = 249
        DEL_RIGHT       = 248
)

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

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

func putEvent(event int, evarg int){
        if true {
                if EventRecvFd < 0 {
                        var pv = []int{-1,-1}
                        syscall.Pipe(pv)
                        EventRecvFd = pv[0]
                        EventSendFd = pv[1]
                        //fmt.Printf("--De-- EventPipe created[%v,%v]\n",EventRecvFd,EventSendFd)
                }
        }else{
                if EventRecvFd < 0 {
                        // the document differs from this spec
                        // https://golang.org/src/syscall/syscall_unix.go?s=8096:8158#L340
                        sv,err := syscall.Socketpair(syscall.AF_UNIX,syscall.SOCK_STREAM,0)
                        EventRecvFd = sv[0]
                        EventSendFd = sv[1]
                        if err != nil {
                                fmt.Printf("--De-- EventSock created[%v,%v](%v)\n",
                                        EventRecvFd,EventSendFd,err)
                        }
                }
        }
        var buf = []byte{ byte(event)}
        n,err := syscall.Write(EventSendFd,buf)
        if err != nil {
                fmt.Printf("--De-- putEvent[%v](%3v)(%v %v)\n",EventSendFd,event,n,err)
        }
}
func ungets(str string){
        for _,ch := range str {
                putEvent(int(ch),0)
        }
}
func (gsh*GshContext)xReplay(argv[]string){
        hix := 0
        tempo := 1.0
        xtempo := 1.0
        repeat := 1

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

```
        }
        fmt.Printf("--Ir-- Replay(!%v x%v r%v)\n",hix,xtempo,repeat)
                //dumpEvents(hix)
        //gsh.xScanReplay(hix,false,repeat,tempo,argv)
        go gsh.xScanReplay(hix,true,repeat,tempo,argv)
}

// syscall.Select
// 2020-0827 GShell-0.2.3
func FpollIn1(fp *os.File,usec int)(uintptr){
        nfd := 1

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

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

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

        tout := syscall.NsecToTimeval(int64(usec*1000))
        //n,err := syscall.Select(nfd,&rdv,nil,nil,&tout) // spec. mismatch
        err := syscall.Select(nfd,&rdv,nil,nil,&tout)
        if err != nil {
                //fmt.Printf("--De-- select() err(%v)\n",err)
        }
        if err == nil {
                if 0 <= fd2 && (rdv.Bits[bank2] & mask2) != 0 {
                        if false {
                                fmt.Printf("--De-- got Event\n")
                        }
                        return uintptr(EventFdOffset + fd2)
                }else
                if (rdv.Bits[bank1] & mask1) != 0 {
                        return uintptr(NormalFdOffset + fd1)
                }else{
                        return 1
                }
        }else{
                return 0
        }
}
func fgetcTimeout1(fp *os.File,usec int)(int){
  READ1:
        readyFd := FpollIn1(fp,usec)
        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_EditMode   bool    // vi compatible mode
        MODE_ShowMode   bool
        romkanmode      bool
        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_EditMode {
        }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_EditMode {
                        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")
                }
        }
}
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?
// Command Line Editor
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();
}
func (iin*IInput)xgetline1(prevline string, gsh*GshContext)(string){
        var ch int;

        MODE_ShowMode = 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_EditMode = !MODE_EditMode
                        iin.Redraw();
                        continue
                }
                if MODE_EditMode {
                        switch ch {
                                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_EditMode = !MODE_EditMode
                                        ch = GO_RIGHT
                                case 'i': MODE_EditMode = !MODE_EditMode
                                        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
                        }
                }

                //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
}
// Main loop
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"))
```

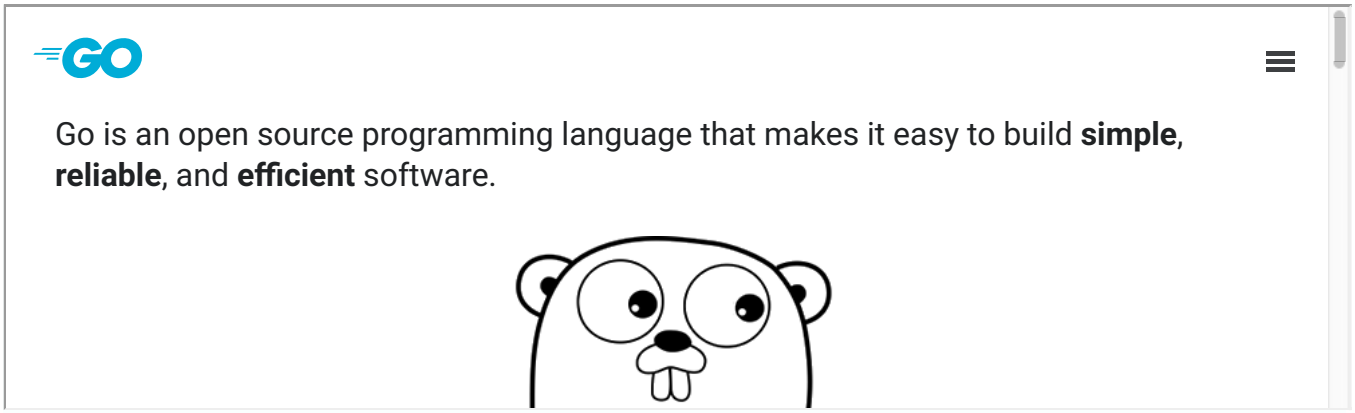
```
                }
                gline = strsubst(gshCtx,gline,true)
                if false {
                        fmt.Printf("fmt.Printf %%v - %v\n",gline)
                        fmt.Printf("fmt.Printf %%s - %s\n",gline)
                        fmt.Printf("fmt.Printf %%x - %s\n",gline)
                        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")
}
//
```

▼ Considerations

```
// – 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
```

▼ References

The Go Programming Language




```
MDN web docs
 HTML
 CSS:
   Selectors
   repeat
 HTTP
 JavaScript:
 …
```

/ /

▶ Raw Source

/ /

--> */