```
/*<html>
<span id="gsh" data-title="GShell" data-author="sato@its-more.jp">
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<link rel="icon" id="GshFaviconURL" href=""><!-- place holder -->
<span hidden="" id="GshVersion">gsh--0.4.0--2020-09-13--SatoxITS</span>
<title>GShell-0.4.0 by SatoxITS</title>
<header id="GshBanner" height="100px" onclick="shiftBG();" style="">
<div align="right"><note><a href="http://archive.gshell.org">GShell</a> version 0.4.0 // 2020-09-13 // SatoxITS</note></div>
</header>
<h2>GShell // a General purpose Shell built on the top of Golang</h2>
<p>
<note>
It is a shell for myself, by myself, of myself. --SatoxITS(^-^)
</note>
</p>
<span id="gsh-WinId" onclick="win_jump('0.1');">0</span>
<span id="GshMenu">
| <span id="gsh-menu-exit" onclick="html_close();"></span>
| <span id="gsh-menu-fork" onclick="html_fork();">Fork</span>
| <span id="GshMenuStop" onclick="html_stop(this,true);">Stop</span>
| <span id="GshMenuFold" onclick="html_fold(this);">Unfold</span>
| <span id="gsh-menu-cksum" onclick="html_digest();">Digest</span>
| <span id="GshMenuSign" onclick="html_sign(this);" style="">Source</span>
<!-- | <span id="gsh-menu-pure" onclick="html_pure(this);">Pure</span> -->
|</span>
*/
/*
<details id="GshStatement" class="gsh-document"><summary>Statement</summary>
<h3>Fun to create a shell</h3>
<p>For a programmer, it must be far easy and fun to create his own simple shell
rightly fitting to his favor and necessities, than learning existing shells with
complex full features that he never use.
I, as one of programmers, am writing this tiny shell for my own real needs,
totally from scratch, with fun.
</p><p>
For a programmer, it is fun to learn new computer languages.  For long years before
writing this software, I had been specialized to C and early HTML2 :-).
Now writing this software,  I'm learning Go language, HTML5, JavaScript and CSS
on demand as a novice of these, with fun.
</p><p>
This single file "gsh.go", that is executable by Go, contains all of the code written
in Go. Also it can be displayed as "gsh.go.html" by browsers. It is a standalone
HTML file that works as the viewer of the code of itself, and as the "home page" of
this software.
</p><p>
Because this HTML file is a Go program, you may run it as a real shell program
on your computer.
But you must be aware that this program is written under situation like above.
Needless to say, there is no warranty for this program in any means.
</p>
<address>Aug 2020, SatoxITS (sato@its-more.jp)</address>
</details>
*/
/*
<details id="GshFeatures" class="gsh-document"><summary>Features</summary><p>
</p>
<h3>Vi compatible command line editor</h3>
<p>
The command line of GShell can be edited with commands compatible with
<a href="https://www.washington.edu/computing/unix/vi.html"><b>vi</b></a>.
As in vi, you can enter <i><b>command mode</b></i> by <b>ESC</b> key,
then move around in the history by <b><code>j k / ? n N</code></b>,
or within the current line by <b><code>l h f w b 0 $ %</code></b> or so.
</p>
</details>
*/
/*
<details id="gsh-gindex">
<summary>Index</summary><div class="gsh-src">
Documents
    <span class="gsh-link" onclick="jumpto_JavaScriptView();">Command summary</span>
Go lang part<span class="gsh-src" onclick="document.getElementById('gsh-gocode').open=true;">
    Package structures
        <a href="#import">import</a>
        <a href="#struct">struct</a>
    Main functions
        <a href="#comexpansion">str-expansion</a>   // macro processor
        <a href="#finder">finder</a>        // builtin find + du
        <a href="#grep">grep</a>        // builtin grep + wc + cksum + ...
        <a href="#plugin">plugin</a>        // plugin commands
        <a href="#ex-commands">system</a>       // external commands
        <a href="#builtin">builtin</a>      // builtin commands
        <a href="#network">network</a>      // socket handler
        <a href="#remote-sh">remote-sh</a>  // remote shell
        <a href="#redirect">redirect</a>    // StdIn/Out redireciton
        <a href="#history">history</a>      // command history
        <a href="#rusage">rusage</a>        // resouce usage
        <a href="#encode">encode</a>        // encode / decode
        <a href="#IME">IME</a>      // command line IME
        <a href="#getline">getline</a>      // line editor
        <a href="#scanf">scanf</a>      // string decomposer
        <a href="#interpreter">interpreter</a>  // command interpreter
        <a href="#main">main</a>
</span>
JavaScript part
    <a href="#script-src-view" class="gsh-link" onclick="jumpto_JavaScriptView();">Source</a>
    <a href="#gsh-data-frame" class="gsh-link" onclick="jumpto_DataView();">Builtin data</a>
CSS part
    <a href="#style-src-view" class="gsh-link" onclick="jumpto_StyleView();">Source</a>
References
    <a href="#" class="gsh-link" onclick="jumpto_WholeView();">Internal</a>
    <a href="#gsh-reference" class="gsh-link" onclick="jumpto_ReferenceView();">External</a>
Whole parts
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Source</a>
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Download</a>
    <a href="#whole-src-view" class="gsh-link" onclick="jumpto_WholeView();">Dump</a>

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

package main // gsh main

// <a name="import">Imported packages</a> // <a href="https://golang.org/pkg/">Packages</a>
import (
    "fmt"       // <a href="https://golang.org/pkg/fmt/">fmt</a>
    "strings"   // <a href="https://golang.org/pkg/strings/">strings</a>
    "strconv"   // <a href="https://golang.org/pkg/strconv/">strconv</a>
```

```
    "sort"      // <a href="https://golang.org/pkg/sort/">sort</a>
    "time"      // <a href="https://golang.org/pkg/time/">time</a>
    "bufio"     // <a href="https://golang.org/pkg/bufio/">bufio</a>
    "io/ioutil" // <a href="https://golang.org/pkg/io/ioutil/">ioutil</a>
    "os"        // <a href="https://golang.org/pkg/os/">os</a>
    "syscall"   // <a href="https://golang.org/pkg/syscall/">syscall</a>
    "plugin"    // <a href="https://golang.org/pkg/plugin/">plugin</a>
    "net"       // <a href="https://golang.org/pkg/net/">net</a>
    "net/http"  // <a href="https://golang.org/pkg/net/http/">http</a>
    //"html"    // <a href="https://golang.org/pkg/html/">html</a>
    "path/filepath" // <a href="https://golang.org/pkg/path/filepath/">filepath</a>
    "go/types"  // <a href="https://golang.org/pkg/go/types/">types</a>
    "go/token"  // <a href="https://golang.org/pkg/go/token/">token</a>
    "encoding/base64"   // <a href="https://golang.org/pkg/encoding/base64/">base64</a>
    "unicode/utf8"  // <a href="https://golang.org/pkg/unicode/utf8/">utf8</a>
    //"gshdata" // gshell's logo and source code
    "hash/crc32"    // <a href="https://golang.org/pkg/unicode/hash/crc32/">crc32</a>
)

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

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

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

const (
    NAME = "gsh"
    VERSION = "0.4.0"
    DATE = "2020-09-13"
    AUTHOR = "SatoxITS(^-^)/"
)
var (
    GSH_HOME = ".gsh"   // under home directory
    GSH_PORT = 9999
    MaxStreamSize = int64(128*1024*1024*1024) // 128GiB is too large?
    PROMPT = "> "
    LINESIZE = (8*1024)
    PATHSEP = ":"   // should be ";" in Windows
    DIRSEP = "/"    // canbe \ in Windows
)

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

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

// <a href="https://tools.ietf.org/html/rfc3230">Digest</a>
const ( // SumType
```

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

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

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

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

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

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

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

// <a name="comexpansion">str-expansion</a>
// - this should be a macro processor
func strsubst(gshCtx *GshContext,str string,histonly bool) string {
    rbuff := []byte{}
    if false {
        //@@U Unicode should be cared as a character
        return str
    }
    //rstr := ""
    inEsc := 0 // escape characer mode
    for i := 0; i < len(str); i++ {
        //fmt.Printf("--D--Subst %v:%v\n",i,str[i:])
        ch := str[i]
        if inEsc == 0 {
            if ch == '!' {
                //leng,xrstr := substHistory(gshCtx,str,i,rstr)
                leng,rs := substHistory(gshCtx,str,i,"")
                if 0 < leng {
    //_,rs := substHistory(gshCtx,str,i,"")
    rbuff = append(rbuff,[]byte(rs)...)
                    i += leng
                    //rstr = xrstr
                    continue
                }
            }
            switch ch {
                case '\\': inEsc = '\\'; continue
```

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

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

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

// <a name="encode">Encode / Decode</a>
// <a href="https://golang.org/pkg/encoding/base64/#example_NewEncoder">Encoder</a>
func (gshCtx *GshContext)Enc(argv[]string){
    file := os.Stdin
    buff := make([]byte,LINESIZE)
    li := 0
    encoder := base64.NewEncoder(base64.StdEncoding,os.Stdout)
    for li = 0; ; li++ {
        count, err := file.Read(buff)
        if count <= 0 {
            break
        }
        if err != nil {
            break
        }
        encoder.Write(buff[0:count])
    }
    encoder.Close()
}
func (gshCtx *GshContext)Dec(argv[]string){
    decoder := base64.NewDecoder(base64.StdEncoding,os.Stdin)
    li := 0
    buff := make([]byte,LINESIZE)
    for li = 0; ; li++ {
```

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

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

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

```
        return -1
    }
    defer file.Close()
    if gsh.CmdTrace { fmt.Printf("--I-- cksum %v %v\n",path,argv) }

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

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

// <a name="finder">Finder</a>
// finding files with it name and contents
// file names are ORed
// show the content with %x fmt list
// ls -R
// tar command by adding output
type fileSum struct {
    Err int64   // access error or so
    Size    int64   // content size
    DupSize int64   // content size from hard links
    Blocks  int64   // number of blocks (of 512 bytes)
    DupBlocks int64 // Blocks pointed from hard links
    HLinks  int64   // hard links
    Words   int64
    Lines   int64
    Files   int64
    Dirs    int64   // the num. of directories
    SymLink int64
    Flats   int64   // the num. of flat files
    MaxDepth    int64
    MaxNamlen   int64   // max. name length
    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 []string,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
}

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

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

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

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

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

```
1750
1751        nio += 1
1752        total += int64(rlen)
1753        rem -= int64(rlen)
1754        if rem <= 0 {
1755            break
1756        }
1757    }
1758    Done := time.Now()
1759    Elps := float64(Done.Sub(Start))/1000000000 //Seconds
1760    TotalMB := float64(total)/1000000 //MB
1761    MBps := TotalMB / Elps
1762    fmt.Printf(Elapsed(Start)+"--In- X: %s (%v/%v/%v) %v %.3fMB/s\n",
1763        what,total,size,nio,absize(total),MBps)
1764    return total
1765 }
1766 func tcpPush(clnt *os.File){
1767    // shrink socket buffer and recover
1768    usleep(100);
1769 }
1770 func (gsh*GshContext)RexecServer(argv[]string){
1771    debug := true
1772    Start0 := time.Now()
1773    Start := Start0
1774 //  if local == ":" { local = "0.0.0.0:9999" }
1775    local := "0.0.0.0:9999"
1776
1777    if 0 < len(argv) {
1778        if argv[0] == "-s" {
1779            debug = false
1780            argv = argv[1:]
1781        }
1782    }
1783    if 0 < len(argv) {
1784        argv = argv[1:]
1785    }
1786    port, err := net.ResolveTCPAddr("tcp",local);
1787    if err != nil {
1788        fmt.Printf("--En- S: Address error: %s (%s)\n",local,err)
1789        return
1790    }
1791    fmt.Printf(Elapsed(Start)+"--In- S: Listening at %s...\n",local);
1792    sconn, err := net.ListenTCP("tcp", port)
1793    if err != nil {
1794        fmt.Printf(Elapsed(Start)+"--En- S: Listen error: %s (%s)\n",local,err)
1795        return
1796    }
1797
1798    reqbuf := make([]byte,LINESIZE)
1799    res := ""
1800    for {
1801        fmt.Printf(Elapsed(Start0)+"--In- S: Listening at %s...\n",local);
1802        aconn, err := sconn.AcceptTCP()
1803        Start = time.Now()
1804        if err != nil {
1805            fmt.Printf(Elapsed(Start)+"--En- S: Accept error: %s (%s)\n",local,err)
1806            return
1807        }
1808        clnt, _ := aconn.File()
1809        fd := clnt.Fd()
1810        ar := aconn.RemoteAddr()
1811        if debug { fmt.Printf(Elapsed(Start0)+"--In- S: Accepted TCP at %s [%d] <- %v\n",
1812            local,fd,ar) }
1813        res = fmt.Sprintf("220 GShell/%s Server\r\n",VERSION)
1814        fmt.Fprintf(clnt,"%s",res)
1815        if debug { fmt.Printf(Elapsed(Start)+"--In- S: %s",res) }
1816        count, err := clnt.Read(reqbuf)
1817        if err != nil {
1818            fmt.Printf(Elapsed(Start)+"--En- C: (%v %v) %v",
1819                count,err,string(reqbuf))
1820        }
1821        req := string(reqbuf[:count])
1822        if debug { fmt.Printf(Elapsed(Start)+"--In- C: %v",string(req)) }
1823        reqv := strings.Split(string(req),"\r")
1824        cmdv := gshScanArg(reqv[0],0)
1825        //cmdv := strings.Split(reqv[0]," ")
1826        switch cmdv[0] {
1827            case "HELO":
1828                res = fmt.Sprintf("250 %v",req)
1829            case "GET":
1830                // download {remotefile|-zN} [localfile]
1831                var dsize int64 = 32*1024*1024
1832                var bsize int = 64*1024
1833                var fname string = ""
1834                var in *os.File = nil
1835                var pseudoEOF = false
1836                if 1 < len(cmdv) {
1837                    fname = cmdv[1]
1838                    if strBegins(fname,"-z") {
1839                        fmt.Sscanf(fname[2:],"%d",&dsize)
1840                    }else
1841                    if strBegins(fname,"{") {
1842                        xin,xout,err := gsh.Popen(fname,"r")
1843                        if err {
1844                        }else{
1845                            xout.Close()
1846                            defer xin.Close()
1847                            in = xin
1848                            dsize = MaxStreamSize
1849                            pseudoEOF = true
1850                        }
1851                    }else{
1852                        xin,err := os.Open(fname)
1853                        if err != nil {
1854                            fmt.Printf("--En- GET (%v)\n",err)
1855                        }else{
1856                            defer xin.Close()
1857                            in = xin
1858                            fi,_ := xin.Stat()
1859                            dsize = fi.Size()
1860                        }
1861                    }
1862                }
1863                //fmt.Printf(Elapsed(Start)+"--In- GET %v:%v\n",dsize,bsize)
1864                res = fmt.Sprintf("200 %v\r\n",dsize)
1865                fmt.Fprintf(clnt,"%v",res)
1866                tcpPush(clnt); // should be separated as line in receiver
1867                fmt.Printf(Elapsed(Start)+"--In- S: %v",res)
1868                wcount := fileRelay("SendGET",in,clnt,dsize,bsize)
1869                if pseudoEOF {
1870                    in.Close() // pipe from the command
1871                    // show end of stream data (its size) by OOB?
1872                    SoftEOF := fmt.Sprintf("((SoftEOF %v))",wcount)
1873                    fmt.Printf(Elapsed(Start)+"--In- S: Send %v\n",SoftEOF)
1874
```

```
                    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
}

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

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

```
    }

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

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

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

    if inTCP { // TCP
        dport, err := net.ResolveTCPAddr("tcp",remote);
        if err != nil {
            fmt.Printf("Address error: %s (%s)\n",remote,err)
            return
        }
        conn, err := net.DialTCP("tcp",nil,dport)
        if err != nil {
            fmt.Printf("Connection error: %s (%s)\n",remote,err)
            return
        }
        file, _ := conn.File();
        fd := file.Fd()
        fmt.Printf("Socket: connected to %s, socket[%d]\n",remote,fd)

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

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

```
2375
2376        savfd := gshPA.Files[1]
2377        gshPA.Files[1] = fd;
2378        gshCtx.gshellv(argv[2:])
2379        gshPA.Files[1] = savfd
2380        file.Close()
2381        conn.Close()
2382    }
2383 }
2384 func (gshCtx*GshContext)saccept(inTCP bool, argv []string) {
2385    gshPA := gshCtx.gshPA
2386    if len(argv) < 2 {
2387        fmt.Printf("Usage: -ac [host]:[port[.udp]]\n")
2388        return
2389    }
2390    local := argv[1]
2391    if local == ":" { local = "0.0.0.0:9999" }
2392    if inTCP { // TCP
2393        port, err := net.ResolveTCPAddr("tcp",local);
2394        if err != nil {
2395            fmt.Printf("Address error: %s (%s)\n",local,err)
2396            return
2397        }
2398        //fmt.Printf("Listen at %s...\n",local);
2399        sconn, err := net.ListenTCP("tcp", port)
2400        if err != nil {
2401            fmt.Printf("Listen error: %s (%s)\n",local,err)
2402            return
2403        }
2404        //fmt.Printf("Accepting at %s...\n",local);
2405        aconn, err := sconn.AcceptTCP()
2406        if err != nil {
2407            fmt.Printf("Accept error: %s (%s)\n",local,err)
2408            return
2409        }
2410        file, _ := aconn.File()
2411        fd := file.Fd()
2412        fmt.Printf("Accepted TCP at %s [%d]\n",local,fd)
2413
2414        savfd := gshPA.Files[0]
2415        gshPA.Files[0] = fd;
2416        gshCtx.gshellv(argv[2:])
2417        gshPA.Files[0] = savfd
2418
2419        sconn.Close();
2420        aconn.Close();
2421        file.Close();
2422    }else{
2423        //port, err := net.ResolveUDPAddr("udp4",local);
2424        port, err := net.ResolveUDPAddr("udp",local);
2425        if err != nil {
2426            fmt.Printf("Address error: %s (%s)\n",local,err)
2427            return
2428        }
2429        fmt.Printf("Listen UDP at %s...\n",local);
2430        //uconn, err := net.ListenUDP("udp4", port)
2431        uconn, err := net.ListenUDP("udp", port)
2432        if err != nil {
2433            fmt.Printf("Listen error: %s (%s)\n",local,err)
2434            return
2435        }
2436        file, _ := uconn.File()
2437        fd := file.Fd()
2438        ar := uconn.RemoteAddr()
2439        remote := ""
2440        if ar != nil { remote = ar.String() }
2441        if remote == "" { remote = "?" }
2442
2443        // not yet received
2444        //fmt.Printf("Accepted at %s [%d] <- %s\n",local,fd,"")
2445
2446        savfd := gshPA.Files[0]
2447        gshPA.Files[0] = fd;
2448        savenv := gshPA.Env
2449        gshPA.Env = append(savenv, "REMOTE_HOST="+remote)
2450        gshCtx.gshellv(argv[2:])
2451        gshPA.Env = savenv
2452        gshPA.Files[0] = savfd
2453
2454        uconn.Close();
2455        file.Close();
2456    }
2457 }
2458
2459 // empty line command
2460 func (gshCtx*GshContext)xPwd(argv[]string){
2461    // execute context command, pwd + date
2462    // context notation, representation scheme, to be resumed at re-login
2463    cwd, _ := os.Getwd()
2464    switch {
2465    case isin("-a",argv):
2466        gshCtx.ShowChdirHistory(argv)
2467    case isin("-ls",argv):
2468        showFileInfo(cwd,argv)
2469    default:
2470        fmt.Printf("%s\n",cwd)
2471    case isin("-v",argv): // obsolete emtpy command
2472        t := time.Now()
2473        date := t.Format(time.UnixDate)
2474        exe, _ := os.Executable()
2475        host, _ := os.Hostname()
2476        fmt.Printf("{PWD=\"%s\"",cwd)
2477        fmt.Printf(" HOST=\"%s\"",host)
2478        fmt.Printf(" DATE=\"%s\"",date)
2479        fmt.Printf(" TIME=\"%s\"",t.String())
2480        fmt.Printf(" PID=\"%d\"",os.Getpid())
2481        fmt.Printf(" EXE=\"%s\"",exe)
2482        fmt.Printf("}\n")
2483    }
2484 }
2485
2486 // <a name="history">History</a>
2487 // these should be browsed and edited by HTTP browser
2488 // show the time of command with -t and direcotry with -ls
2489 // openfile-history, sort by -a -m -c
2490 // sort by elapsed time by -t -s
2491 // search by "more" like interface
2492 // edit history
2493 // sort history, and wc or uniq
2494 // CPU and other resource consumptions
2495 // limit showing range (by time or so)
2496 // export / import history
2497 func (gshCtx *GshContext)xHistory(argv []string){
2498    atWorkDirX := -1
2499    if 1 < len(argv) && strBegins(argv[1],"@") {
```

```
        atWorkDirX,_ = strconv.Atoi(argv[1][1:])
    }
    //fmt.Printf("--D-- showHistory(%v)\n",argv)
    for i, v := range gshCtx.CommandHistory {
        // exclude commands not to be listed by default
        // internal commands may be suppressed by default
        if v.CmdLine == "" && !isin("-a",argv) {
            continue;
        }
        if 0 <= atWorkDirX {
            if v.WorkDirX != atWorkDirX {
                continue
            }
        }
        if !isin("-n",argv){ // like "fc"
            fmt.Printf("!%-2d ",i)
        }
        if isin("-v",argv){
            fmt.Println(v) // should be with it date
        }else{
            if isin("-l",argv) || isin("-l0",argv) {
                elps := v.EndAt.Sub(v.StartAt);
                start := v.StartAt.Format(time.Stamp)
                fmt.Printf("@%d ",v.WorkDirX)
                fmt.Printf("[%v] %11v/t ",start,elps)
            }
            if isin("-l",argv) && !isin("-l0",argv){
                fmt.Printf("%v",Rusagef("%t %u\t// %s",argv,v.Rusagev))
            }
            if isin("-at",argv) { // isin("-ls",argv){
                dhi := v.WorkDirX // workdir history index
                fmt.Printf("@%d %s\t",dhi,v.WorkDir)
                // show the FileInfo of the output command??
            }
            fmt.Printf("%s",v.CmdLine)
            fmt.Printf("\n")
        }
    }
}
// !n - history index
func searchHistory(gshCtx GshContext, gline string) (string, bool, bool){
    if gline[0] == '!' {
        hix, err := strconv.Atoi(gline[1:])
        if err != nil {
            fmt.Printf("--E-- (%s : range)\n",hix)
            return "", false, true
        }
        if hix < 0 || len(gshCtx.CommandHistory) <= hix {
            fmt.Printf("--E-- (%d : out of range)\n",hix)
            return "", false, true
        }
        return gshCtx.CommandHistory[hix].CmdLine, false, false
    }
    // search
    //for i, v := range gshCtx.CommandHistory {
    //}
    return gline, false, false
}
func (gsh*GshContext)cmdStringInHistory(hix int)(cmd string, ok bool){
    if 0 <= hix && hix < len(gsh.CommandHistory) {
        return gsh.CommandHistory[hix].CmdLine,true
    }
    return "",false
}

// temporary adding to PATH environment
// cd name -lib for LD_LIBRARY_PATH
// chdir with directory history (date + full-path)
// -s for sort option (by visit date or so)
func (gsh*GshContext)ShowChdirHistory1(i int,v GChdirHistory, argv []string){
    fmt.Printf("!%-2d ",v.CmdIndex) // the first command at this WorkDir
    fmt.Printf("@%d ",i)
    fmt.Printf("[%v] ",v.MovedAt.Format(time.Stamp))
    showFileInfo(v.Dir,argv)
}
func (gsh*GshContext)ShowChdirHistory(argv []string){
    for i, v := range gsh.ChdirHistory {
        gsh.ShowChdirHistory1(i,v,argv)
    }
}
func skipOpts(argv[]string)(int){
    for i,v := range argv {
        if strBegins(v,"-") {
        }else{
            return i
        }
    }
    return -1
}
func (gshCtx*GshContext)xChdir(argv []string){
    cdhist := gshCtx.ChdirHistory
    if isin("?",argv ) || isin("-t",argv) || isin("-a",argv) {
        gshCtx.ShowChdirHistory(argv)
        return
    }
    pwd, _ := os.Getwd()
    dir := ""
    if len(argv) <= 1 {
        dir = toFullpath("~")
    }else{
        i := skipOpts(argv[1:])
        if i < 0 {
            dir = toFullpath("~")
        }else{
            dir = argv[1+i]
        }
    }
    if strBegins(dir,"@") {
        if dir == "@0" { // obsolete
            dir = gshCtx.StartDir
        }else
        if dir == "@!" {
            index := len(cdhist) - 1
            if 0 < index { index -= 1 }
            dir = cdhist[index].Dir
        }else{
            index, err := strconv.Atoi(dir[1:])
            if err != nil {
                fmt.Printf("--E-- xChdir(%v)\n",err)
                dir = "?"
            }else
            if len(gshCtx.ChdirHistory) <= index {
                fmt.Printf("--E-- xChdir(history range error)\n")
                dir = "?"
            }else{
```

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

// <a name="rusage">Resource Usage</a>
func sRusagef(fmtspec string, argv []string, ru [2]syscall.Rusage)(string){
    // ru[0] self , ru[1] children
    ut := TimeValAdd(ru[0].Utime,ru[1].Utime)
    st := TimeValAdd(ru[0].Stime,ru[1].Stime)
    uu := (ut.Sec*1000000 + int64(ut.Usec)) * 1000
    su := (st.Sec*1000000 + int64(st.Usec)) * 1000
    tu := uu + su
    ret := fmt.Sprintf("%v/sum",abbtime(tu))
    ret += fmt.Sprintf(", %v/usr",abbtime(uu))
    ret += fmt.Sprintf(", %v/sys",abbtime(su))
    return ret
}
func Rusagef(fmtspec string, argv []string, ru [2]syscall.Rusage)(string){
    ut := TimeValAdd(ru[0].Utime,ru[1].Utime)
    st := TimeValAdd(ru[0].Stime,ru[1].Stime)
    fmt.Printf("%d.%06ds/u ",ut.Sec,ut.Usec) //ru[1].Utime.Sec,ru[1].Utime.Usec)
    fmt.Printf("%d.%06ds/s ",st.Sec,st.Usec) //ru[1].Stime.Sec,ru[1].Stime.Usec)
    return ""
}
func Getrusagev()([2]syscall.Rusage){
    var ruv = [2]syscall.Rusage{}
    syscall.Getrusage(syscall.RUSAGE_SELF,&ruv[0])
    syscall.Getrusage(syscall.RUSAGE_CHILDREN,&ruv[1])
    return ruv
}
func showRusage(what string,argv []string, ru *syscall.Rusage){
    fmt.Printf("%s: ",what);
    fmt.Printf("Usr=%d.%06ds",ru.Utime.Sec,ru.Utime.Usec)
    fmt.Printf(" Sys=%d.%06ds",ru.Stime.Sec,ru.Stime.Usec)
    fmt.Printf(" Rss=%vB",ru.Maxrss)
    if isin("-l",argv) {
        fmt.Printf(" MinFlt=%v",ru.Minflt)
        fmt.Printf(" MajFlt=%v",ru.Majflt)
        fmt.Printf(" IxRSS=%vB",ru.Ixrss)
        fmt.Printf(" IdRSS=%vB",ru.Idrss)
        fmt.Printf(" Nswap=%vB",ru.Nswap)
    fmt.Printf(" Read=%v",ru.Inblock)
    fmt.Printf(" Write=%v",ru.Oublock)
    }
    fmt.Printf(" Snd=%v",ru.Msgsnd)
    fmt.Printf(" Rcv=%v",ru.Msgrcv)
    //if isin("-l",argv) {
        fmt.Printf(" Sig=%v",ru.Nsignals)
    //}
    fmt.Printf("\n");
}
func (gshCtx *GshContext)xTime(argv[]string)(bool){
    if 2 <= len(argv){
        gshCtx.LastRusage = syscall.Rusage{}
        rusagev1 := Getrusagev()
        fin := gshCtx.gshellv(argv[1:])
        rusagev2 := Getrusagev()
        showRusage(argv[1],argv,&gshCtx.LastRusage)
        rusagev := RusageSubv(rusagev2,rusagev1)
        showRusage("self",argv,&rusagev[0])
        showRusage("chld",argv,&rusagev[1])
        return fin
    }else{
        rusage:= syscall.Rusage {}
        syscall.Getrusage(syscall.RUSAGE_SELF,&rusage)
        showRusage("self",argv, &rusage)
        syscall.Getrusage(syscall.RUSAGE_CHILDREN,&rusage)
        showRusage("chld",argv, &rusage)
        return false
    }
}
func (gshCtx *GshContext)xJobs(argv[]string){
    fmt.Printf("%d Jobs\n",len(gshCtx.BackGroundJobs))
    for ji, pid := range gshCtx.BackGroundJobs {
        //wstat := syscall.WaitStatus {0}
```

```
        rusage := syscall.Rusage {}
        //wpid, err := syscall.Wait4(pid,&wstat,syscall.WNOHANG,&rusage);
        wpid, err := syscall.Wait4(pid,nil,syscall.WNOHANG,&rusage);
        if err != nil {
            fmt.Printf("--E-- %%%d [%d] (%v)\n",ji,pid,err)
        }else{
            fmt.Printf("%%%d[%d](%d)\n",ji,pid,wpid)
            showRusage("chld",argv,&rusage)
        }
    }
}
func (gsh*GshContext)inBackground(argv[]string)(bool){
    if gsh.CmdTrace { fmt.Printf("--I-- inBackground(%v)\n",argv) }
    gsh.BackGround = true // set background option
    xfin := false
    xfin = gsh.gshellv(argv)
    gsh.BackGround = false
    return xfin
}
// -o file without command means just opening it and refer by #N
// should be listed by "files" comnmand
func (gshCtx*GshContext)xOpen(argv[]string){
    var pv = []int{-1,-1}
    err := syscall.Pipe(pv)
    fmt.Printf("--I-- pipe()=[#%d,#%d](%v)\n",pv[0],pv[1],err)
}
func (gshCtx*GshContext)fromPipe(argv[]string){
}
func (gshCtx*GshContext)xClose(argv[]string){
}

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

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

    fdix := 0
    mode := os.O_RDONLY

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

    return false
}

//fmt.Fprintf(res, "GShell Status: %q", html.EscapeString(req.URL.Path))
func httpHandler(res http.ResponseWriter, req *http.Request){
    path := req.URL.Path
    fmt.Printf("--I-- Got HTTP Request(%s)\n",path)
    {
        gshCtxBuf, _ :=  setupGshContext()
        gshCtx := &gshCtxBuf
        fmt.Printf("--I-- %s\n",path[1:])
        gshCtx.tgshelll(path[1:])
    }
    fmt.Fprintf(res, "Hello(^-^)/\n%s\n",path)
}
func (gshCtx *GshContext) httpServer(argv []string){
    http.HandleFunc("/", httpHandler)
    accport := "localhost:9999"
    fmt.Printf("--I-- HTTP Server Start at [%s]\n",accport)
    http.ListenAndServe(accport,nil)
}
func (gshCtx *GshContext)xGo(argv[]string){
    go gshCtx.gshellv(argv[1:]);
}
func (gshCtx *GshContext) xPs(argv[]string)(){
}

// <a name="plugin">Plugin</a>
// plugin [-ls [names]] to list plugins
// Reference: <a href="https://golang.org/src/plugin/">plugin</a> source code
func (gshCtx *GshContext) whichPlugin(name string,argv[]string)(pi *PluginInfo){
    pi = nil
    for _,p := range gshCtx.PluginFuncs {
        if p.Name == name && pi == nil {
            pi = &p
        }
        if !isin("-s",argv){
            //fmt.Printf("%v %v ",i,p)
            if isin("-ls",argv){
                showFileInfo(p.Path,argv)
            }else{
                fmt.Printf("%s\n",p.Name)
            }
        }
    }
    return pi
}
func (gshCtx *GshContext) xPlugin(argv[]string) (error) {
```

```
    if len(argv) == 0 || argv[0] == "-ls" {
        gshCtx.whichPlugin("",argv)
        return  nil
    }
    name := argv[0]
    Pin := gshCtx.whichPlugin(name,[]string{"-s"})
    if Pin != nil {
        os.Args = argv // should be recovered?
        Pin.Addr.(func())()
        return nil
    }
    sofile := toFullpath(argv[0] + ".so") // or find it by which($PATH)

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

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

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

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

    if 0 < len(fmts) {
        for xi := 0; xi < len(fmts); xi++ {
            fch := fmts[xi]
            if fch == '%' {
                if xi+1 < len(fmts) {
                    curfmt = string(fmts[xi+1])
 gsh.iFormat = curfmt
                    xi += 1
    if xi+1 < len(fmts) && fmts[xi+1] == '(' {
        vals,leng := scanUntil(fmts[xi+2:],")")
        //fmt.Printf("--D-- show fmt(%v) val(%v) next(%v)\n",curfmt,vals,leng)
        gsh.printVal(curfmt,vals,optv)
        xi += 2+leng-1
        outlen += 1
    }
                    continue
                }
            }
            if fch == '_' {
                hi,leng := scanInt(fmts[xi+1:])
                if 0 < leng {
```

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

    optv := []string{}
    for _,v := range argv {
        if strBegins(v,"-"){
            optv = append(optv,v)
            argv = argv[1:]
        }else{
            break;
        }
    }
    if 0 < len(argv) {
        fmts = strings.Join(argv," ")
    }
    gsh.printfv(fmts,div,argv,optv,gsh.iValues)
}
func (gsh*GshContext)Basename(argv[]string){
    for i,v := range gsh.iValues {
        gsh.iValues[i] = filepath.Base(v)
    }
}
func (gsh*GshContext)Sortv(argv[]string){
    sv := gsh.iValues
    sort.Slice(sv , func(i,j int) bool {
        return sv[i] < sv[j]
    })
}
func (gsh*GshContext)Shiftv(argv[]string){
    vi := len(gsh.iValues)
    if 0 < vi {
        if isin("-r",argv) {
            top := gsh.iValues[0]
            gsh.iValues = append(gsh.iValues[1:],top)
        }else{
            gsh.iValues = gsh.iValues[1:]
        }
    }
}

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

```
            gsh.iValues = v
        }
        gsh.iValStack = gsh.iValStack[0:depth-1]
        fmt.Printf("depth=%d %s\n",len(gsh.iValStack),gsh.iValues)
    }else{
        fmt.Printf("depth=%d\n",depth)
    }
}

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

    if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv((%d))\n",len(argv)) }
    if len(argv) <= 0 {
        return false
    }
    xargv := []string{}
    for ai := 0; ai < len(argv); ai++ {
        xargv = append(xargv,strsubst(gshCtx,argv[ai],false))
    }
    argv = xargv
    if false {
        for ai := 0; ai < len(argv); ai++ {
            fmt.Printf("[%d] %s [%d]%T\n",
                ai,argv[ai],len(argv[ai]),argv[ai])
        }
    }
    cmd := argv[0]
    if gshCtx.CmdTrace { fmt.Fprintf(os.Stderr,"--I-- gshellv(%d)%v\n",len(argv),argv) }
    switch { // https://tour.golang.org/flowcontrol/11
    case cmd == "":
        gshCtx.xPwd([]string{}); // emtpy command
    case cmd == "-x":
        gshCtx.CmdTrace = ! gshCtx.CmdTrace
    case cmd == "-xt":
        gshCtx.CmdTime = ! gshCtx.CmdTime
    case cmd == "-ot":
        gshCtx.sconnect(true, argv)
    case cmd == "-ou":
        gshCtx.sconnect(false, argv)
    case cmd == "-it":
        gshCtx.saccept(true , argv)
    case cmd == "-iu":
        gshCtx.saccept(false, argv)
    case cmd == "-i" || cmd == "<" || cmd == "-o" || cmd == ">" || cmd == "-a" || cmd == ">>" || cmd == "-s" || cmd == "><":
        gshCtx.redirect(argv)
    case cmd == "|":
        gshCtx.fromPipe(argv)
    case cmd == "args":
        gshCtx.Args(argv)
    case cmd == "bg" || cmd == "-bg":
        rfin := gshCtx.inBackground(argv[1:])
        return rfin
    case cmd == "-bn":
        gshCtx.Basename(argv)
    case cmd == "call":
        _,_ = gshCtx.excommand(false,argv[1:])
    case cmd == "cd" || cmd == "chdir":
        gshCtx.xChdir(argv);
    case cmd == "-cksum":
        gshCtx.xFind(argv)
    case cmd == "-sum":
        gshCtx.xFind(argv)
    case cmd == "-sumtest":
        str := ""
        if 1 < len(argv) { str = argv[1] }
        crc := strCRC32(str,uint64(len(str)))
        fprintf(stderr,"%v %v\n",crc,len(str))
    case cmd == "close":
        gshCtx.xClose(argv)
    case cmd == "gcp":
        gshCtx.FileCopy(argv)
    case cmd == "dec" || cmd == "decode":
        gshCtx.Dec(argv)
    case cmd == "#define":
    case cmd == "dic" || cmd == "d":
        xDic(argv)
    case cmd == "dump":
        gshCtx.Dump(argv)
    case cmd == "echo" || cmd == "e":
        echo(argv,true)
    case cmd == "enc" || cmd == "encode":
        gshCtx.Enc(argv)
    case cmd == "env":
        env(argv)
    case cmd == "eval":
        xEval(argv[1:],true)
    case cmd == "ev" || cmd == "events":
        dumpEvents(argv)
    case cmd == "exec":
        _,_ = gshCtx.excommand(true,argv[1:])
        // should not return here
    case cmd == "exit" || cmd == "quit":
        // write Result code EXIT to 3>
        return true
    case cmd == "fdls":
        // dump the attributes of fds (of other process)
    case cmd == "-find" || cmd == "fin" || cmd == "ufind" || cmd == "uf":
        gshCtx.xFind(argv[1:])
    case cmd == "fu":
        gshCtx.xFind(argv[1:])
    case cmd == "fork":
        // mainly for a server
    case cmd == "-gen":
        gshCtx.gen(argv)
    case cmd == "-go":
        gshCtx.xGo(argv)
    case cmd == "-grep":
        gshCtx.xFind(argv)
    case cmd == "gdeq":
        gshCtx.Deq(argv)
    case cmd == "genq":
        gshCtx.Enq(argv)
    case cmd == "gpop":
        gshCtx.Pop(argv)
    case cmd == "gpush":
        gshCtx.Push(argv)
    case cmd == "history" || cmd == "hi": // hi should be alias
        gshCtx.xHistory(argv)
    case cmd == "jobs":
        gshCtx.xJobs(argv)
    case cmd == "lnsp" || cmd == "nlsp":
        gshCtx.SplitLine(argv)
    case cmd == "-ls":
```

```
        gshCtx.xFind(argv)
    case cmd == "nop":
        // do nothing
    case cmd == "pipe":
        gshCtx.xOpen(argv)
    case cmd == "plug" || cmd == "plugin" || cmd == "pin":
        gshCtx.xPlugin(argv[1:])
    case cmd == "print" || cmd == "-pr":
        // output internal slice // also sprintf should be
        gshCtx.Printv(argv)
    case cmd == "ps":
        gshCtx.xPs(argv)
    case cmd == "pstitle":
        // to be gsh.title
    case cmd == "rexecd" || cmd == "rexd":
        gshCtx.RexecServer(argv)
    case cmd == "rexec" || cmd == "rex":
        gshCtx.RexecClient(argv)
    case cmd == "repeat" || cmd == "rep": // repeat cond command
        gshCtx.repeat(argv)
    case cmd == "replay":
        gshCtx.xReplay(argv)
    case cmd == "scan":
        // scan input (or so in fscanf) to internal slice (like Files or map)
        gshCtx.Scanv(argv)
    case cmd == "set":
        // set name ...
    case cmd == "serv":
        gshCtx.httpServer(argv)
    case cmd == "shift":
        gshCtx.Shiftv(argv)
    case cmd == "sleep":
        gshCtx.sleep(argv)
    case cmd == "-sort":
        gshCtx.Sortv(argv)

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

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

func (gsh*GshContext)gshelll(gline string) (rfin bool) {
    argv := strings.Split(string(gline)," ")
    fin := gsh.gshellv(argv)
    return fin
}
func (gsh*GshContext)tgshelll(gline string)(xfin bool){
    start := time.Now()
    fin := gsh.gshelll(gline)
    end := time.Now()
    elps := end.Sub(start);
    if gsh.CmdTime {
        fmt.Printf("--T-- " + time.Now().Format(time.Stamp) + "(%d.%09ds)\n",
            elps/1000000000,elps%1000000000)
    }
    return fin
}
func Ttyid() (int) {
    fi, err := os.Stdin.Stat()
    if err != nil {
        return 0;
    }
    //fmt.Printf("Stdin: %v Dev=%d\n",
    //  fi.Mode(),fi.Mode()&os.ModeDevice)
    if (fi.Mode() & os.ModeDevice) != 0 {
        stat := syscall.Stat_t{};
        err := syscall.Fstat(0,&stat)
        if err != nil {
            //fmt.Printf("--I-- Stdin: (%v)\n",err)
        }else{
            //fmt.Printf("--I-- Stdin: rdev=%d %d\n",
            //  stat.Rdev&0xFF,stat.Rdev);
            //fmt.Printf("--I-- Stdin: tty%d\n",stat.Rdev&0xFF);
            return int(stat.Rdev & 0xFF)
        }
    }
    return 0
}
func (gshCtx *GshContext) ttyfile() string {
    //fmt.Printf("--I-- GSH_HOME=%s\n",gshCtx.GshHomeDir)
    ttyfile := gshCtx.GshHomeDir + "/" + "gsh-tty" +
         fmt.Sprintf("%02d",gshCtx.TerminalId)
         //strconv.Itoa(gshCtx.TerminalId)
    //fmt.Printf("--I-- ttyfile=%s\n",ttyfile)
    return ttyfile
}
func (gshCtx *GshContext) ttyline()(*os.File){
```

```
    file, err := os.OpenFile(gshCtx.ttyfile(),os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
    if err != nil {
        fmt.Printf("--F-- cannot open %s (%s)\n",gshCtx.ttyfile(),err)
        return file;
    }
    return file
}
func (gshCtx *GshContext)getline(hix int, skipping bool, prevline string) (string) {
    if( skipping ){
        reader := bufio.NewReaderSize(os.Stdin,LINESIZE)
        line, _, _ := reader.ReadLine()
        return string(line)
    }else
    if true {
        return xgetline(hix,prevline,gshCtx)
    }
    /*
    else
    if( with_exgetline && gshCtx.GetLine != "" ){
        //var xhix int64 = int64(hix); // cast
        newenv := os.Environ()
        newenv = append(newenv, "GSH_LINENO="+strconv.FormatInt(int64(hix),10) )

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

//== begin ========================================================= getline
/*
 * getline.c
 * 2020-0819 extracted from dog.c
 * getline.go
 * 2020-0822 ported to Go
 */
/*
package main // getline main
import (
    "fmt"       // <a href="https://golang.org/pkg/fmt/">fmt</a>
    "strings"   // <a href="https://golang.org/pkg/strings/">strings</a>
    "os"        // <a href="https://golang.org/pkg/os/">os</a>
    "syscall"   // <a href="https://golang.org/pkg/syscall/">syscall</a>
    //"bytes"       // <a href="https://golang.org/pkg/os/">os</a>
    //"os/exec" // <a href="https://golang.org/pkg/os/">os</a>
)
*/

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

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

    /*
    argv := strings.Split(cmdstr," ")
    fmt.Fprintf(os.Stderr,"--I-- system(%v)\n",argv)
    //cmd := exec.Command(argv[0:]...)
    cmd := exec.Command(argv[0],argv[1],argv[2])
    cmd.Stdin = strings.NewReader("output of system")
    var out bytes.Buffer
    cmd.Stdout = &out
    var serr bytes.Buffer
    cmd.Stderr = &serr
    err := cmd.Run()
    if err != nil {
```

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

func fopen(file string,mode string)(fp*os.File){
    if mode == "r" {
        fp,err := os.Open(file)
        if( err != nil ){
            fmt.Printf("--E-- fopen(%s,%s)=(%v)\n",file,mode,err)
            return NULL_FP;
        }
        return fp;
    }else{
        fp,err := os.OpenFile(file,os.O_RDWR|os.O_CREATE|os.O_TRUNC,0600)
        if( err != nil ){
            return NULL_FP;
        }
        return fp;
    }
}
func fclose(fp*os.File){
    fp.Close()
}
func fflush(fp *os.File)(int){
    return 0
}
func fgetc(fp*os.File)(int){
    var buf [1]byte
    _,err := fp.Read(buf[0:1])
    if( err != nil ){
        return EOF;
    }else{
        return int(buf[0])
    }
}
func sfgets(str*string, size int, fp*os.File)(int){
    buf := make(StrBuff,size)
    var ch int
    var i int
    for i = 0; i < len(buf)-1; i++ {
        ch = fgetc(fp)
        //fprintf(stderr,"--fgets %d/%d %X\n",i,len(buf),ch)
        if( ch == EOF ){
            break;
        }
        buf[i] = byte(ch);
        if( ch == '\n' ){
            break;
        }
    }
    buf[i] = 0
    //fprintf(stderr,"--fgets %d/%d (%s)\n",i,len(buf),buf[0:i])
    return i
}
func fgets(buf StrBuff, size int, fp*os.File)(int){
    var ch int
    var i int
    for i = 0; i < len(buf)-1; i++ {
        ch = fgetc(fp)
        //fprintf(stderr,"--fgets %d/%d %X\n",i,len(buf),ch)
        if( ch == EOF ){
            break;
        }
        buf[i] = byte(ch);
        if( ch == '\n' ){
            break;
        }
    }
    buf[i] = 0
    //fprintf(stderr,"--fgets %d/%d (%s)\n",i,len(buf),buf[0:i])
    return i
```

```
}
func fputc(ch int , fp*os.File)(int){
    var buf [1]byte
    buf[0] = byte(ch)
    fp.Write(buf[0:1])
    return 0
}
func fputs(buf StrBuff, fp*os.File)(int){
    fp.Write(buf)
    return 0
}
func xfputss(str string, fp*os.File)(int){
    return fputs([]byte(str),fp)
}
func sscanf(str StrBuff,fmts string, params ...interface{})(int){
    fmt.Sscanf(string(str[0:strlen(str)]),fmts,params...)
    return 0
}
func fprintf(fp*os.File,fmts string, params ...interface{})(int){
    fmt.Fprintf(fp,fmts,params...)
    return 0
}

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

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

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

    dicName := ""
    dicURL := ""
    if 0 < len(argv) {
        arg = argv[0]
        dicName = arg
        argv = argv[1:]
    }
    if 0 < len(argv) {
        dicURL = argv[0]
        argv = argv[1:]
    }
    if false {
        fprintf(stderr,"--Dd-- com(%v) opt(%v) arg(%v)\n",cmd,opt,arg)
    }
    if cmd == DIC_COM_LOAD {
        //dicType := ""
        dicBody := ""
        if !builtin && dicName != "" && dicURL == "" {
            f,err := os.Open(dicName)
            if err == nil {
                dicURL = dicName
            }else{
```

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

```
3875
3876     var info = false
3877     if info {
3878         fprintf(stderr,"--Id-- Conguraturations!! WorldDic is now activated.\r\n")
3879         fprintf(stderr,"--Id-- enter \"dic\" command for help.\r\n")
3880     }
3881 }
3882 func readDic()(int){
3883     /*
3884     var rk *os.File;
3885     var dic = "MyIME-dic.txt";
3886     //rk = fopen("romkana.txt","r");
3887     //rk = fopen("JK-JA-morse-dic.txt","r");
3888     rk = fopen(dic,"r");
3889     if( rk == NULL_FP ){
3890         if( true ){
3891             fprintf(stderr,"--%s-- Could not load %s\n",MyIMEVER,dic);
3892         }
3893         return -1;
3894     }
3895     if( true ){
3896         var di int;
3897         var line = make(StrBuff,1024);
3898         var pat string
3899         var out string
3900         for di = 0; di < 1024; di++ {
3901             if( fgets(line,sizeof(line),rk) == NULLSP ){
3902                 break;
3903             }
3904             fmt.Sscanf(string(line[0:strlen(line)]),"%s %s",&pat,&out);
3905             //sscanf(line,"%s %[^\r\n]",&pat,&out);
3906             romkana[di].pat = pat;
3907             romkana[di].out = out;
3908             //fprintf(stderr,"--Dd- %-10s %s\n",pat,out)
3909         }
3910         dicents += di
3911         if( false ){
3912             fprintf(stderr,"--%s-- loaded romkana.txt [%d]\n",MyIMEVER,di);
3913             for di = 0; di < dicents; di++ {
3914                 fprintf(stderr,
3915                     "%s %s\n",romkana[di].pat,romkana[di].out);
3916             }
3917         }
3918     }
3919     fclose(rk);
3920
3921     //romkana[dicents].pat = "//ddump"
3922     //romkana[dicents].pat = "//ddump" // dump the dic. and clean the command input
3923     */
3924     return 0;
3925 }
3926 func matchlen(stri string, pati string)(int){
3927     if strBegins(stri,pati) {
3928         return len(pati)
3929     }else{
3930         return 0
3931     }
3932 }
3933 func convs(src string)(string){
3934     var si int;
3935     var sx = len(src);
3936     var di int;
3937     var mi int;
3938     var dstb []byte
3939
3940     for si = 0; si < sx; { // search max. match from the position
3941         if strBegins(src[si:],"%x/") {
3942             // %x/integer/ // s/a/b/
3943             ix := strings.Index(src[si+3:],"/")
3944             if 0 < ix {
3945                 var iv int = 0
3946                 //fmt.Sscanf(src[si+3:si+3+ix],"%d",&iv)
3947                 fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
3948                 sval := fmt.Sprintf("%x",iv)
3949                 bval := []byte(sval)
3950                 dstb = append(dstb,bval...)
3951                 si = si+3+ix+1
3952                 continue
3953             }
3954         }
3955         if strBegins(src[si:],"%d/") {
3956             // %d/integer/ // s/a/b/
3957             ix := strings.Index(src[si+3:],"/")
3958             if 0 < ix {
3959                 var iv int = 0
3960                 fmt.Sscanf(src[si+3:si+3+ix],"%v",&iv)
3961                 sval := fmt.Sprintf("%d",iv)
3962                 bval := []byte(sval)
3963                 dstb = append(dstb,bval...)
3964                 si = si+3+ix+1
3965                 continue
3966             }
3967         }
3968         if strBegins(src[si:],"%t") {
3969             now := time.Now()
3970             if true {
3971                 date := now.Format(time.Stamp)
3972                 dstb = append(dstb,[]byte(date)...)
3973                 si = si+3
3974             }
3975             continue
3976         }
3977         var maxlen int = 0;
3978         var len int;
3979         mi = -1;
3980         for di = 0; di < dicents; di++ {
3981             len = matchlen(src[si:],romkana[di].pat);
3982             if( maxlen < len ){
3983                 maxlen = len;
3984                 mi = di;
3985             }
3986         }
3987         if( 0 < maxlen ){
3988             out := romkana[mi].out;
3989             dstb = append(dstb,[]byte(out)...);
3990             si += maxlen;
3991         }else{
3992             dstb = append(dstb,src[si])
3993             si += 1;
3994         }
3995     }
3996     return string(dstb)
3997 }
3998 func trans(src string)(int){
3999     dst := convs(src);
```

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

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

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

    var buf [1]byte

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

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

func visibleChar(ch int)(string){
    switch {
        case '!' <= ch && ch <= '~':
            return string(ch)
    }
    switch ch {
        case ' ': return "\\s"
        case '\n': return "\\n"
        case '\r': return "\\r"
        case '\t': return "\\t"
    }
    switch ch {
        case 0x00: return "NUL"
        case 0x07: return "BEL"
        case 0x08: return "BS"
        case 0x0E: return "SO"
        case 0x0F: return "SI"
        case 0x1B: return "ESC"
        case 0x7F: return "DEL"
    }
    switch ch {
        case EV_IDLE: return fmt.Sprintf("IDLE")
        case EV_MODE: return fmt.Sprintf("MODE")
    }
    return fmt.Sprintf("%X",ch)
}
func recvEvent(fd int){
    var buf = make([]byte,1)
    _,_ = syscall.Read(fd,buf[0:1])
    if( buf[0] != 0 ){
        romkanmode = true
    }else{
        romkanmode = false
    }
}
func (gsh*GshContext)xScanReplay(hix int,replay bool,repeat int,tempo float64,argv[]string){
    var Start time.Time
    var events = []Event{}
    for _,e := range Events {
        if hix == 0 || e.CmdIndex == hix {
            events = append(events,e)
        }
    }
    elen := len(events)
    if 0 < elen {
        if events[elen-1].event == EV_IDLE {
            events = events[0:elen-1]
        }
    }
    for r := 0; r < repeat; r++ {
        for i,e := range events {
            nano := e.when.Nanosecond()
            micro := nano / 1000
            if Start.Second() == 0 {
                Start = time.Now()
            }
            diff := time.Now().Sub(Start)
            if replay {
                if e.event != EV_IDLE {
                    putEvent(e.event,0)
                    if e.event == EV_MODE { // event with arg
                        putEvent(int(e.evarg),0)
```

```
                    }
                }
            }else{
            fmt.Printf("%7.3fms #%-3v !%-3v [%v.%06d] %3v %02X %-4v %10.3fms\n",
                    float64(diff)/1000000.0,
                    i,
                    e.CmdIndex,
                    e.when.Format(time.Stamp),micro,
                    e.event,e.event,visibleChar(e.event),
                    float64(e.evarg)/1000000.0)
            }
            if e.event == EV_IDLE {
                d := time.Duration(float64(time.Duration(e.evarg)) * tempo)
                //nsleep(time.Duration(e.evarg))
                nsleep(d)
            }
        }
    }
}
func dumpEvents(arg[]string){
    hix := 0
    if 1 < len(arg) {
        fmt.Sscanf(arg[1],"%d",&hix)
    }
    for i,e := range Events {
        nano := e.when.Nanosecond()
        micro := nano / 1000
        //if e.event != EV_TIMEOUT {
        if hix == 0 || e.CmdIndex == hix {
            fmt.Printf("#%-3v !%-3v [%v.%06d] %3v %02X %-4v %10.3fms\n",i,
                e.CmdIndex,
                e.when.Format(time.Stamp),micro,
                e.event,e.event,visibleChar(e.event),float64(e.evarg)/1000000.0)
        }
        //}
    }
}
func fgetcTimeout(fp *os.File,usec int)(int){
    ch := fgetcTimeout1(fp,usec)
    if ch != EV_TIMEOUT {
        now := time.Now()
        if 0 < len(Events) {
            last := Events[len(Events)-1]
            dura := int64(now.Sub(last.when))
            Events = append(Events,Event{last.when,EV_IDLE,dura,last.CmdIndex})
        }
        Events = append(Events,Event{time.Now(),ch,0,CmdIndex})
    }
    return ch
}

var TtyMaxCol = 72 // to be obtained by ioctl?
var EscTimeout = (100*1000)
var (
    MODE_VicMode    bool    // vi compatible command mode
    MODE_ShowMode   bool
    romkanmode  bool    // shown translation mode, the mode to be retained
    MODE_Recursive  bool    // recursive translation
    MODE_CapsLock   bool    // software CapsLock
    MODE_LowerLock  bool    // force lower-case character lock
    MODE_ViInsert   int // visible insert mode, should be like "I" icon in X Window
    MODE_ViTrace    bool    // output newline before translation
)
type IInput struct {
    lno     int
    lastlno     int
    pch     []int   // input queue
    prompt      string
    line        string
    right       string
    inJmode     bool
    pinJmode    bool
    waitingMeta string  // waiting meta character
    LastCmd     string
}
func (iin*IInput)Getc(timeoutUs int)(int){
    ch1 := EOF
    ch2 := EOF
    ch3 := EOF
    if( 0 < len(iin.pch) ){ // deQ
        ch1 = iin.pch[0]
        iin.pch = iin.pch[1:]
    }else{
        ch1 = fgetcTimeout(stdin,timeoutUs);
    }
    if( ch1 == 033 ){ /// escape sequence
        ch2 = fgetcTimeout(stdin,EscTimeout);
        if( ch2 == EV_TIMEOUT ){
        }else{
            ch3 = fgetcTimeout(stdin,EscTimeout);
            if( ch3 == EV_TIMEOUT ){
                iin.pch = append(iin.pch,ch2) // enQ
            }else{
                switch( ch2 ){
                    default:
                        iin.pch = append(iin.pch,ch2) // enQ
                        iin.pch = append(iin.pch,ch3) // enQ
                    case '[':
                        switch( ch3 ){
                            case 'A': ch1 = GO_UP; // ^
                            case 'B': ch1 = GO_DOWN; // v
                            case 'C': ch1 = GO_RIGHT; // >
                            case 'D': ch1 = GO_LEFT; // <
                            case '3':
                ch4 := fgetcTimeout(stdin,EscTimeout);
                                if( ch4 == '~' ){
                //fprintf(stderr,"x[%02X %02X %02X %02X]\n",ch1,ch2,ch3,ch4);
                                    ch1 = DEL_RIGHT
                                }
                        }
                    case '\\':
                //ch4 := fgetcTimeout(stdin,EscTimeout);
                //fprintf(stderr,"y[%02X %02X %02X %02X]\n",ch1,ch2,ch3,ch4);
                        switch( ch3 ){
                            case '~': ch1 = DEL_RIGHT
                        }
                }
            }
        }
    }
    return ch1
}
func (inn*IInput)clearline(){
    var i int
    fprintf(stderr,"\r");
```

```
    // should be ANSI ESC sequence
    for i = 0; i < TtyMaxCol; i++ { // to the max. position in this input action
        fputc(' ',os.Stderr);
    }
    fprintf(stderr,"\r");
}
func (iin*IInput)Redraw(){
    redraw(iin,iin.lno,iin.line,iin.right)
}
func redraw(iin *IInput,lno int,line string,right string){
    inMeta := false
    showMode := ""
    showMeta := "" // visible Meta mode on the cursor position
    showLino := fmt.Sprintf("!%d! ",lno)
    InsertMark := "" // in visible insert mode

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

    if( 0 < len(iin.waitingMeta) ){
        inMeta = true
        if iin.waitingMeta[0] != 033 {
            showMeta = iin.waitingMeta
        }
    }
    if( romkanmode ){
        //romkanmark = " *";
    }else{
        //romkanmark = "";
    }
    if MODE_ShowMode {
        romkan := "--"
        inmeta := "-"
        inveri := ""
        if MODE_CapsLock {
            inmeta = "A"
        }
        if MODE_LowerLock {
            inmeta = "a"
        }
        if MODE_ViTrace {
            inveri = "v"
        }
        if MODE_VicMode {
            inveri = ":"
        }
        if romkanmode {
            romkan = "\343\201\202"
            if MODE_CapsLock {
                inmeta = "R"
            }else{
                inmeta = "r"
            }
        }
        if inMeta {
            inmeta = "\\"
        }
        showMode = "["+romkan+inmeta+inveri+"]";
    }
    Pre := "\r" + showMode + showLino
    Output := ""
    Left := ""
    Right := ""
    if romkanmode {
        Left = convs(line)
        Right = InsertMark+convs(right)
    }else{
        Left = line
        Right = InsertMark+right
    }
    Output = Pre+Left
    if MODE_ViTrace {
        Output += iin.LastCmd
    }
    Output += showMeta+Right
    for len(Output) < TtyMaxCol { // to the max. position that may be dirty
        Output += " "
        // should be ANSI ESC sequence
        // not necessary just after newline
    }
    Output += Pre+Left+showMeta // to set the cursor to the current input position
    fprintf(stderr,"%s",Output)

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

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

    CmdIndex = len(gsh.CommandHistory)
    if( isatty(0) == 0 ){
        if( sfgets(&iin.line,LINESIZE,stdin) == NULL ){
            iin.line = "exit\n";
        }else{
```

```
        }
        return iin.line
    }
    if( true ){
        //var pts string;
        //pts = ptsname(0);
        //pts = ttyname(0);
        //fprintf(stderr,"--pts[0] = %s\n",pts?pts:"?");
    }
    if( false ){
        fprintf(stderr,"! ");
        fflush(stderr);
        sfgets(&iin.line,LINESIZE,stdin);
        return iin.line
    }
    system("/bin/stty -echo -icanon");
    xline := iin.xgetline1(prevline,gsh)
    system("/bin/stty echo sane");
    return xline
}
func (iin*IInput)Translate(cmdch int){
    romkanmode = !romkanmode;
    if MODE_ViTrace {
        fprintf(stderr,"%v\r\n",string(cmdch));
    }else
    if( cmdch == 'J' ){
        fprintf(stderr,"J\r\n");
        iin.inJmode = true
    }
    iin.Redraw();
    loadDefaultDic(cmdch);
    iin.Redraw();
}
func (iin*IInput)Replace(cmdch int){
    iin.LastCmd = fmt.Sprintf("\\%v",string(cmdch))
    iin.Redraw();
    loadDefaultDic(cmdch);
    dst := convs(iin.line+iin.right);
    iin.line = dst
    iin.right = ""
    if( cmdch == 'I' ){
        fprintf(stderr,"I\r\n");
        iin.inJmode = true
    }
    iin.Redraw();
}
// aa 12 a1a1
func isAlpha(ch rune)(bool){
    if 'a' <= ch && ch <= 'z' || 'A' <= ch && ch <= 'Z' {
        return true
    }
    return false
}
func isAlnum(ch rune)(bool){
    if 'a' <= ch && ch <= 'z' || 'A' <= ch && ch <= 'Z' {
        return true
    }
    if '0' <= ch && ch <= '9' {
        return true
    }
    return false
}

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

    lastRune,lastSize = utf8.DecodeRuneInString(str[0:])
    if isAlnum(lastRune) {
```

```
        r,z := utf8.DecodeRuneInString(str[lastSize:])
        if 0 < z && isAlnum(r) {
            inWord = true
        }
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        lastW = i // the last alnum if in alnum word
        i += lastSize
    }
    if inWord {
        goto DISP
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        i += lastSize
    }
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            break
        }
        lastW = i
        i += lastSize
    }
DISP:
    if 0 < lastW {
        iin.line = iin.line + str[0:lastW]
        iin.right = str[lastW:]
    }
    //fmt.Printf("\n(%d)[%s][%s]\n",i,iin.line,iin.right)
    //fmt.Printf("") // set debug messae at the end of line
}
// 0.2.8 2020-0901 created
func (iin*IInput)GotoNEXTW(){
    str := iin.right
    if len(str) <= 0 {
        return
    }
    lastSize := 0
    var lastRune rune
    var found = -1
    i := 1
    for i < len(str) {
        lastRune,lastSize = utf8.DecodeRuneInString(str[i:])
        if lastSize <= 0 { break } // broken data?
        if !isAlnum(lastRune) { // character, type, or string to be searched
            found = i
            break
        }
        i += lastSize
    }
    if 0 < found {
        if isAlnum(lastRune) { // or non-kana character
        }else{ // when positioning to the top o the word
            found += lastSize
        }
        iin.line = iin.line + str[0:found]
        if 0 < found {
            iin.right = str[found:]
        }else{
            iin.right = ""
        }
    }
    //fmt.Printf("\n(%d)[%s][%s]\n",i,iin.line,iin.right)
    //fmt.Printf("") // set debug messae at the end of line
}
// 0.2.8 2020-0902 created
func (iin*IInput)GotoPAIRCH(){
    str := iin.right
    if len(str) <= 0 {
        return
    }
    lastRune,lastSize := utf8.DecodeRuneInString(str[0:])
    if lastSize <= 0 {
        return
    }
    forw := false
    back := false
    pair := ""
    switch string(lastRune){
        case "{": pair = "}"; forw = true
        case "}": pair = "{"; back = true
        case "(": pair = ")"; forw = true
        case ")": pair = "("; back = true
        case "[": pair = "]"; forw = true
        case "]": pair = "["; back = true
        case "<": pair = ">"; forw = true
        case ">": pair = "<"; back = true
        case "\"": pair = "\""; // context depednet, can be f" or back-double quote
        case "'": pair = "'"; // context depednet, can be f' or back-quote
        // case Japanese Kakkos
    }
    if forw {
        iin.SearchForward(pair)
    }
    if back {
        iin.SearchBackward(pair)
    }
}
// 0.2.8 2020-0902 created
func (iin*IInput)SearchForward(pat string)(bool){
    right := iin.right
    found := -1
    i := 0
    if strBegins(right,pat) {
        _,z := utf8.DecodeRuneInString(right[i:])
        if 0 < z {
            i += z
        }
    }
    for i < len(right) {
        if strBegins(right[i:],pat) {
            found = i
            break
        }
```

```
        _,z := utf8.DecodeRuneInString(right[i:])
        if z <= 0 { break }
        i += z
    }
    if 0 <= found {
        iin.line = iin.line + right[0:found]
        iin.right = iin.right[found:]
        return true
    }else{
        return false
    }
}
// 0.2.8 2020-0902 created
func (iin*IInput)SearchBackward(pat string)(bool){
    line := iin.line
    found := -1
    i := len(line)-1
    for i = i; 0 <= i; i-- {
        _,z := utf8.DecodeRuneInString(line[i:])
        if z <= 0 {
            continue
        }
        //fprintf(stderr,"-- %v %v\n",pat,line[i:])
        if strBegins(line[i:],pat) {
            found = i
            break
        }
    }
    //fprintf(stderr,"--%d\n",found)
    if 0 <= found {
        iin.right = line[found:] + iin.right
        iin.line = line[0:found]
        return true
    }else{
        return false
    }
}
// 0.2.8 2020-0902 created
// search from top, end, or current position
func (gsh*GshContext)SearchHistory(pat string, forw bool)(bool,string){
    if forw {
        for _,v := range gsh.CommandHistory {
            if 0 <= strings.Index(v.CmdLine,pat) {
                //fprintf(stderr,"\n--De-- found !%v [%v]%v\n",i,pat,v.CmdLine)
                return true,v.CmdLine
            }
        }
    }else{
        hlen := len(gsh.CommandHistory)
        for i := hlen-1; 0 < i ; i-- {
            v := gsh.CommandHistory[i]
            if 0 <= strings.Index(v.CmdLine,pat) {
                //fprintf(stderr,"\n--De-- found !%v [%v]%v\n",i,pat,v.CmdLine)
                return true,v.CmdLine
            }
        }
    }
    //fprintf(stderr,"\n--De-- not-found(%v)\n",pat)
    return false,"(Not Found in History)"
}
// 0.2.8 2020-0902 created
func (iin*IInput)GotoFORWSTR(pat string,gsh*GshContext){
    found := false
    if 0 < len(iin.right) {
        found = iin.SearchForward(pat)
    }
    if !found {
        found,line := gsh.SearchHistory(pat,true)
        if found {
            iin.line = line
            iin.right = ""
        }
    }
}
func (iin*IInput)GotoBACKSTR(pat string, gsh*GshContext){
    found := false
    if 0 < len(iin.line) {
        found = iin.SearchBackward(pat)
    }
    if !found {
        found,line := gsh.SearchHistory(pat,false)
        if found {
            iin.line = line
            iin.right = ""
        }
    }
}
func (iin*IInput)getstring1(prompt string)(string){ // should be editable
    iin.clearline();
    fprintf(stderr,"\r%v",prompt)
    str := ""
    for {
        ch := iin.Getc(10*1000*1000)
        if ch == '\n' || ch == '\r' {
            break
        }
        sch := string(ch)
        str += sch
        fprintf(stderr,"%s",sch)
    }
    return str
}

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

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

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

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

        ch = iin.Getc(1000*1000)

        if ch != EV_TIMEOUT && first {
            first = false
            mode := 0
            if romkanmode {
```

```
4875                mode = 1
4876            }
4877            now := time.Now()
4878            Events = append(Events,Event{now,EV_MODE,int64(mode),CmdIndex})
4879        }
4880        if ch == 033 {
4881            MODE_ShowMode = true
4882            MODE_VicMode = !MODE_VicMode
4883            iin.Redraw();
4884            continue
4885        }
4886        if MODE_VicMode {
4887            switch ch {
4888                case '0': ch = GO_TOPL
4889                case '$': ch = GO_ENDL
4890                case 'b': ch = GO_TOPW
4891                case 'e': ch = GO_ENDW
4892                case 'w': ch = GO_NEXTW
4893                case '%': ch = GO_PAIRCH
4894
4895                case 'j': ch = GO_DOWN
4896                case 'k': ch = GO_UP
4897                case 'h': ch = GO_LEFT
4898                case 'l': ch = GO_RIGHT
4899                case 'x': ch = DEL_RIGHT
4900                case 'a': MODE_VicMode = !MODE_VicMode
4901                    ch = GO_RIGHT
4902                case 'i': MODE_VicMode = !MODE_VicMode
4903                    iin.Redraw();
4904                    continue
4905                case '~':
4906                    right,head := delHeadChar(iin.right)
4907                    if len([]byte(head)) == 1 {
4908                        ch = int(head[0])
4909                        if( 'a' <= ch && ch <= 'z' ){
4910                            ch = ch + 'A'-'a'
4911                        }else
4912                        if( 'A' <= ch && ch <= 'Z' ){
4913                            ch = ch + 'a'-'A'
4914                        }
4915                        iin.right = string(ch) + right
4916                    }
4917                    iin.Redraw();
4918                    continue
4919                case 'f': // GO_FORWCH
4920                    iin.Redraw();
4921                    ch = iin.Getc(3*1000*1000)
4922                    if ch == EV_TIMEOUT {
4923                        iin.Redraw();
4924                        continue
4925                    }
4926                    SearchPat = string(ch)
4927                    SearchForw = true
4928                    iin.GotoFORWSTR(SearchPat,gsh)
4929                    iin.Redraw();
4930                    continue
4931                case '/':
4932                    SearchPat = iin.getstring1("/") // should be editable
4933                    SearchForw = true
4934                    iin.GotoFORWSTR(SearchPat,gsh)
4935                    iin.Redraw();
4936                    continue
4937                case '?':
4938                    SearchPat = iin.getstring1("?") // should be editable
4939                    SearchForw = false
4940                    iin.GotoBACKSTR(SearchPat,gsh)
4941                    iin.Redraw();
4942                    continue
4943                case 'n':
4944                    if SearchForw {
4945                        iin.GotoFORWSTR(SearchPat,gsh)
4946                    }else{
4947                        iin.GotoBACKSTR(SearchPat,gsh)
4948                    }
4949                    iin.Redraw();
4950                    continue
4951                case 'N':
4952                    if !SearchForw {
4953                        iin.GotoFORWSTR(SearchPat,gsh)
4954                    }else{
4955                        iin.GotoBACKSTR(SearchPat,gsh)
4956                    }
4957                    iin.Redraw();
4958                    continue
4959            }
4960        }
4961        switch ch {
4962            case GO_TOPW:
4963                iin.GotoTOPW()
4964                iin.Redraw();
4965                continue
4966            case GO_ENDW:
4967                iin.GotoENDW()
4968                iin.Redraw();
4969                continue
4970            case GO_NEXTW:
4971                // to next space then
4972                iin.GotoNEXTW()
4973                iin.Redraw();
4974                continue
4975            case GO_PAIRCH:
4976                iin.GotoPAIRCH()
4977                iin.Redraw();
4978                continue
4979        }
4980
4981        //fprintf(stderr,"A[%02X]\n",ch);
4982        if( ch == '\\' || ch == 033 ){
4983            MODE_ShowMode = true
4984            metach := ch
4985            iin.waitingMeta = string(ch)
4986            iin.Redraw();
4987                // set cursor //fprintf(stderr,"???\b\b\b")
4988            ch = fgetcTimeout(stdin,2000*1000)
4989                // reset cursor
4990            iin.waitingMeta = ""
4991
4992            cmdch := ch
4993            if( ch == EV_TIMEOUT ){
4994                if metach == 033 {
4995                    continue
4996                }
4997                ch = metach
4998            }else
4999            /*
```

```
            if( ch == 'm' || ch == 'M' ){
                mch := fgetcTimeout(stdin,1000*1000)
                if mch == 'r' {
                    romkanmode = true
                }else{
                    romkanmode = false
                }
                continue
            }else
            */
            if( ch == 'k' || ch == 'K' ){
                MODE_Recursive = !MODE_Recursive
                iin.Translate(cmdch);
                continue
            }else
            if( ch == 'j' || ch == 'J' ){
                iin.Translate(cmdch);
                continue
            }else
            if( ch == 'i' || ch == 'I' ){
                iin.Replace(cmdch);
                continue
            }else
            if( ch == 'l' || ch == 'L' ){
                MODE_LowerLock = !MODE_LowerLock
                MODE_CapsLock = false
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'u' || ch == 'U' ){
                MODE_CapsLock = !MODE_CapsLock
                MODE_LowerLock = false
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'v' || ch == 'V' ){
                MODE_ViTrace = !MODE_ViTrace
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else
            if( ch == 'c' || ch == 'C' ){
                if 0 < len(iin.line) {
                    xline,tail := delTailChar(iin.line)
                    if len([]byte(tail)) == 1 {
                        ch = int(tail[0])
                        if( 'a' <= ch && ch <= 'z' ){
                            ch = ch + 'A'-'a'
                        }else
                        if( 'A' <= ch && ch <= 'Z' ){
                            ch = ch + 'a'-'A'
                        }
                        iin.line = xline + string(ch)
                    }
                }
                if MODE_ViTrace {
                    fprintf(stderr,"%v\r\n",string(cmdch));
                }
                iin.Redraw();
                continue
            }else{
                iin.pch = append(iin.pch,ch) // push
                ch = '\\'
            }
        }
        switch( ch ){
            case 'P'-0x40: ch = GO_UP
            case 'N'-0x40: ch = GO_DOWN
            case 'B'-0x40: ch = GO_LEFT
            case 'F'-0x40: ch = GO_RIGHT
        }
        //fprintf(stderr,"B[%02X]\n",ch);
        switch( ch ){
            case 0:
                continue;

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

            case EV_TIMEOUT:
                iin.Redraw();
                if iin.pinJmode {
                    fprintf(stderr,"\\J\r\n")
                    iin.inJmode = true
                }
                continue
            case GO_UP:
                if iin.lno == 1 {
                    continue
                }
                cmd,ok := gsh.cmdStringInHistory(iin.lno-1)
                if ok {
                    iin.line = cmd
                    iin.right = ""
                    iin.lno = iin.lno - 1
                }
                iin.Redraw();
                continue
            case GO_DOWN:
                cmd,ok := gsh.cmdStringInHistory(iin.lno+1)
                if ok {
                    iin.line = cmd
                    iin.right = ""
                    iin.lno = iin.lno + 1
                }else{
                    iin.line = ""
                    iin.right = ""
                    if iin.lno == iin.lastlno-1 {
                        iin.lno = iin.lno + 1
                    }
                }
                iin.Redraw();
                continue
```

```
            case GO_LEFT:
                if 0 < len(iin.line) {
                    xline,tail := delTailChar(iin.line)
                    iin.line = xline
                    iin.right = tail + iin.right
                }
                iin.Redraw();
                continue;
            case GO_RIGHT:
                if( 0 < len(iin.right) && iin.right[0] != 0 ){
                    xright,head := delHeadChar(iin.right)
                    iin.right = xright
                    iin.line += head
                }
                iin.Redraw();
                continue;
            case EOF:
                goto EXIT;
            case 'R'-0x40: // replace
                dst := convs(iin.line+iin.right);
                iin.line = dst
                iin.right = ""
                iin.Redraw();
                continue;
            case 'T'-0x40: // just show the result
                readDic();
                romkanmode = !romkanmode;
                iin.Redraw();
                continue;
            case 'L'-0x40:
                iin.Redraw();
                continue
            case 'K'-0x40:
                iin.right = ""
                iin.Redraw();
                continue
            case 'E'-0x40:
                iin.line += iin.right
                iin.right = ""
                iin.Redraw();
                continue
            case 'A'-0x40:
                iin.right = iin.line + iin.right
                iin.line = ""
                iin.Redraw();
                continue
            case 'U'-0x40:
                iin.line = ""
                iin.right = ""
                iin.clearline();
                iin.Redraw();
                continue;
            case DEL_RIGHT:
                if( 0 < len(iin.right) ){
                    iin.right,_ = delHeadChar(iin.right)
                    iin.Redraw();
                }
                continue;
            case 0x7F: // BS? not DEL
                if( 0 < len(iin.line) ){
                    iin.line,_ = delTailChar(iin.line)
                    iin.Redraw();
                }
                /*
                else
                if( 0 < len(iin.right) ){
                    iin.right,_ = delHeadChar(iin.right)
                    iin.Redraw();
                }
                */
                continue;
            case 'H'-0x40:
                if( 0 < len(iin.line) ){
                    iin.line,_ = delTailChar(iin.line)
                    iin.Redraw();
                }
                continue;
        }
        if( ch == '\n' || ch == '\r' ){
            iin.line += iin.right;
            iin.right = ""
            iin.Redraw();
            fputc(ch,stderr);
            break;
        }
        if MODE_CapsLock {
            if 'a' <= ch && ch <= 'z' {
                ch = ch+'A'-'a'
            }
        }
        if MODE_LowerLock {
            if 'A' <= ch && ch <= 'Z' {
                ch = ch+'a'-'A'
            }
        }
        iin.line += string(ch);
        iin.Redraw();
    }
EXIT:
    return iin.line + iin.right;
}

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

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

```
    }else{
        fprintf(stderr,"\r\ngotline: ");
        trans(line);
        //printf("%s\n",line);
        printf("\n");
    }
*/
}
//== end ========================================================== getline

//
// $USERHOME/.gsh/
//      gsh-rc.txt, or gsh-configure.txt
//              gsh-history.txt
//              gsh-aliases.txt // should be conditional?
//
func (gshCtx *GshContext)gshSetupHomedir()(bool) {
    homedir,found := userHomeDir()
    if !found {
        fmt.Printf("--E-- You have no UserHomeDir\n")
        return true
    }
    gshhome := homedir + "/" + GSH_HOME
    _, err2 := os.Stat(gshhome)
    if err2 != nil {
        err3 := os.Mkdir(gshhome,0700)
        if err3 != nil {
            fmt.Printf("--E-- Could not Create %s (%s)\n",
                gshhome,err3)
            return true
        }
        fmt.Printf("--I-- Created %s\n",gshhome)
    }
    gshCtx.GshHomeDir = gshhome
    return false
}
func setupGshContext()(GshContext,bool){
    gshPA := syscall.ProcAttr {
        "", // the staring directory
        os.Environ(), // environ[]
        []uintptr{os.Stdin.Fd(),os.Stdout.Fd(),os.Stderr.Fd()},
        nil, // OS specific
    }
    cwd, _ := os.Getwd()
    gshCtx := GshContext {
        cwd, // StartDir
        "", // GetLine
        []GChdirHistory { {cwd,time.Now(),0} }, // ChdirHistory
        gshPA,
        []GCommandHistory{}, //something for invokation?
        GCommandHistory{}, // CmdCurrent
        false,
        []int{},
        syscall.Rusage{},
        "", // GshHomeDir
        Ttyid(),
        false,
        false,
        []PluginInfo{},
        []string{},
        " ",
        "v",
        ValueStack{},
        GServer{"",""}, // LastServer
        "", // RSERV
        cwd, // RWD
        CheckSum{},
    }
    err := gshCtx.gshSetupHomedir()
    return gshCtx, err
}
func (gsh*GshContext)gshelllh(gline string)(bool){
    ghist := gsh.CmdCurrent
    ghist.WorkDir,_ = os.Getwd()
    ghist.WorkDirX = len(gsh.ChdirHistory)-1
    //fmt.Printf("--D--ChdirHistory(@%d)\n",len(gsh.ChdirHistory))
    ghist.StartAt = time.Now()
    rusagev1 := Getrusagev()
    gsh.CmdCurrent.FoundFile = []string{}
    fin := gsh.tgshelll(gline)
    rusagev2 := Getrusagev()
    ghist.Rusagev = RusageSubv(rusagev2,rusagev1)
    ghist.EndAt = time.Now()
    ghist.CmdLine = gline
    ghist.FoundFile = gsh.CmdCurrent.FoundFile

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

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

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

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

    prevline := ""
```

```
    skipping := false
    for hix := len(gshCtx.CommandHistory); ; {
        gline := gshCtx.getline(hix,skipping,prevline)
        if skipping {
            if strings.Index(gline,"fi") == 0 {
                fmt.Printf("fi\n");
                skipping = false;
            }else{
                //fmt.Printf("%s\n",gline);
            }
            continue
        }
        if strings.Index(gline,"if") == 0 {
            //fmt.Printf("--D-- if start: %s\n",gline);
            skipping = true;
            continue
        }
        if false {
            os.Stdout.Write([]byte("gotline:"))
            os.Stdout.Write([]byte(gline))
            os.Stdout.Write([]byte("\n"))
        }
        gline = strsubst(gshCtx,gline,true)
        if false {
            fmt.Printf("fmt.Printf %%v - %v\n",gline)
            fmt.Printf("fmt.Printf %%s - %s\n",gline)
            fmt.Printf("fmt.Printf %%x - %s\n",gline)
            fmt.Printf("fmt.Printf %%U - %s\n",gline)
            fmt.Printf("Stouut.Write -")
            os.Stdout.Write([]byte(gline))
            fmt.Printf("\n")
        }
        /*
        // should be cared in substitution ?
        if 0 < len(gline) && gline[0] == '!' {
            xgline, set, err := searchHistory(gshCtx,gline)
            if err {
                continue
            }
            if set {
                // set the line in command line editor
            }
            gline = xgline
        }
        */
        fin := gshCtx.gshelllh(gline)
        if fin {
            break;
        }
        prevline = gline;
        hix++;
    }
    return *gshCtx
}
func main() {
    gshCtxBuf := GshContext{}
    gsh := &gshCtxBuf
    argv := os.Args
    if 1 < len(argv) {
        if isin("version",argv){
            gsh.showVersion(argv)
            return
        }
        comx := isinX("-c",argv)
        if 0 < comx {
            gshCtxBuf,err := setupGshContext()
            gsh := &gshCtxBuf
            if !err {
                gsh.gshellv(argv[comx+1:])
            }
            return
        }
    }
    if 1 < len(argv) && isin("-s",argv) {
    }else{
        gsh.showVersion(append(argv,[]string{"-l","-a"}...))
    }
    script(nil)
    //gshCtx := script(nil)
    //gshelll(gshCtx,"time")
}

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

```

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

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

var WnnDic = //<span id="gsh-wnn-dic">
"data:text/dic;base64,"+
"PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL2Rp"+
"Y3ZlcglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNXbm5ccy8vXHMyMDIwLTA4MzAK"+
"R1NoZWxsCUdTaGVsbArjgo/jgZ/jgZcJ56eBCndhdGFzaGkJ56eBCndhdGFzaQnnp4EK44Gq"+
"44G+44GICeWQjeWJjQpuYW1hZQnlkI3liY0K44Gq44GL44GuCeS4remHjgpuYWthbm8J5Lit"+
"6YeOCndhCeOCjwp0YQnjgZ8Kc2kJ44GXCnNoaQnjgZcKbm8J44GuCm5hCeOBqgptYQnjgb4K"+
"ZQnjgYgKaGEJ44GvCm5hCeOBqgprYQnjgYsKbm8J44GuCmRlCeOBpwpzdQnjgZkKZVxzCWVj"+
"aG8KZGljCWRpYwplY2hvCWVjaG8KcmVwbGF5CXJlcGxheQpyZXBlYXQJcmVwZWF0CmR0CWRh"+
"dGVccysnJVklbSVkLSVIOiVNOiVTJwp0aW9uCXRpb24KJXQJJXQJLy8gdG8gYmUgYW4gYWN0"+
"aW9uCjwvdGV4dGFyZWE+Cg=="
//</span>

var SumomoDic = //<span id="gsh-sumomo-dic">
"data:text/dic;base64,"+
"PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
"cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTdWlvbW9ccy8vXHMyMDIwLTA4MzAK"+
"c3UJ44GZCm1vCeOCggpubwnjga4KdQnjgYYKY2hpCeOBoQp0aQnjgaEKdWNoaQnlhoUKdXRp"+
"CeWGhQpzdW1vbW8J44GZ44KC44KCCnN1bW9tb21vCeOBmeOCguOCguOCggptb21vCeahgwpt"+
"b21vbW8J5qGD44KCCiwsCeOAgQouLgnjgIIKPC90ZXh0YXJlYT4K"
//</span>

var SijimiDic = //<span id="gsh-sijimi-dic">
"data:text/dic;base64,"+
"PGlldGEgY2hhcnNldD0iVVRGLTgiPgo8dGV4dGFyZWEgY29scz04MCByb3dzPTQwPgovL3Zl"+
"cglHU2hlbGxcc0lNRVxzZGljdGlvbmFyeVxzZm9yXHNTaGlqaW1pXHMvL1xzMjAyMC0wODMw"+
"CnNpCeOBlwpzaGkJ44GXCmppCeOBmAptaQnjgb8KbmEJ44GqCmplCeOBmOOChQp4eXUJ44KF"+
"CnUJ44GGCm5pCeOBqwprbwnjgZMKYnUJ44G2Cm5uCeOCkwpubwnjga4KY2hpCeOBoQp0aQnj"+
"gaEKa2EJ44GLCnJhCeOCiQosLAnjgIEKLi4J44CCChnhuYW5hCeS4gwp4anV1CeWNgQp4bmkJ"+
"5LqMCmtveAnlgIsKa29xCeWAiwprb3gJ5YCLCm5hbmFqdXVuaXgJNzIKbmFuYWp1dW5peHgJ"+
"77yX77ySCm5hbmFqdXVuaVgJ77yX77ySCuS4g+WNgeS6jHgJNzIKa29idW5uCeWAi+WIhgp0"+
"aWthcmFxCeOBoeOBi+OCiQp0aWthcmEJ5YqbCmNoaWthcmEJ5YqbCjwvdGV4dGFyZWE+Cg=="
//</span>

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

//</span>
/*
<details id="references"><summary>References</summary><div class="gsh-src">
<p>
<a href="https://golang.org">The Go Programming Language</a>
<iframe src="https://golang.org" width="100%" height="300"></iframe>

<a href="https://developer.mozilla.org/ja/docs/Web">MDN web docs</a>
 <a href="https://developer.mozilla.org/ja/docs/Web/HTML/Element">HTML</a>
 CSS:
   <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/CSS_Selectors">Selectors</a>
   <a href="https://developer.mozilla.org/en-US/docs/Web/CSS/background-repeat">repeat</a>
 HTTP
 JavaScript:
 ...
</p>
</div></details>
*/
/*
<details id="html-src" onclick="frame_open();"><summary>Raw Source</summary><div>

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

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

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

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

</div></details>
*/
/*
<div id="GshFooter" style=""></div><!-- ----------- END-OF-VISIBLE-PART ----------- -->

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

<span id="GStat">
 [ GShell Status Line ]<br>
</span>
<div id="GPos" align="right"></div>
<div id="GLog"></div>
<span id="GMenu" onclick="GShellMenu(this)"></span>
<span id="GTop"></span>
<div id="GShellPlane" onclick="showGShellPlane();"></div>
<div id="RawTextViewer"></div>
<div id="RawTextViewerClose" onclick="hideRawTextViewer()"> CLOSE </div>

<style id="GshStyleDef">
```

```
#LineNumbered table,tr,td {
  margin:0;
  padding:4px;
  spacing:0;
  border:12px;
}
textarea.LineNumber {
  font-size:12px;
  font-family:monospace,Courier New;
  color:#282;
  padding:4px;
  text-align:right;
}
textarea.LineNumbered {
  font-size:12px;
  font-family:monospace,Courier New;
  padding:4px;
  wrap:off;
}
#RawTextViewer{
  z-index:0;
  position:fixed; top:0px; left:0px;
  width:100%; height:50px;
  overflow:auto;
  color:#fff; background-color:rgba(128,128,256,0.4);
  font-size:12px;
  spellcheck:false;
}
#RawTextViewerClose{
  z-index:0;
  position:fixed; top:-100px; left:-100px;
  color:#fff; background-color:rgba(128,128,256,0.4);
  font-size:20px; font-family:Georgia;
  white-space:pre;
}
#GShellPlane{
  z-index:0;
  position:fixed; top:0px; left:0px;
  width:100%; height:50px;
  overflow:auto;
  color:#fff; background-color:rgba(128,128,256,0.6);
  font-size:12px;
}
#GTop{
  z-index:9;
  opacity:1.0;
  position:fixed; top:0px; left:0px;
  width:320px; height:20px;
  color:#fff; background-color:rgba(0,0,0,0.4);
  color:#fff; font-size:12px;
}
#GPos{
  z-index:12;
  position:fixed; top:0px; left:0px;
  opacity:1.0;
  width:640px; height:30px;
  color:#fff; background-color:rgba(0,0,0,0.4);
  color:#fff; font-size:12px;
}
#GMenu{
  z-index:2000;
  position:fixed; top:250px; left:0px;
  opacity:1.0;
  width:100px; height:100px;
  color:#fff;
  color:#fff; background-color:rgba(0,0,0,0.0);
  color:#fff; font-size:16px; font-family:Georgia;
  background-repeat:no-repeat;
}
#GStat{
  z-index:8;
  xopacity:0.0;
  position:fixed; top:20px; left:0px;
  width:640px; height:90px;
  color:#fff; background-color:rgba(0,0,0,0.4);
  font-size:20px; font-family:Georgia;
}
#GLog{
  z-index:10;
  position:fixed; top:50px; left:0px;
  opacity:1.0;
  width:640px; height:60px;
  color:#fff; background-color:rgba(0,0,64,0.2);
  font-size:12px;
}
#GshGrid {
  z-index:11;
  xopacity:0.0;
  position:fixed; top:0px; left:0px;
  width:320px; height:30px;
  color:#9f9; font-size:16px;
}
xbody {display:none;}
.gsh-link{color:green;}
#gsh {border-width:1;margin:0;padding:0;}
#gsh {font-family:monospace,Courier New;color:#ddf;font-size:8px;}
#gsh header{height:100px;}
#xgsh header{height:100px;background-image:url(GShell-Logo00.png);}
#GshMenu{font-size:14pt;color:#f88;}
#GshFooter{height:100px;background-size:80px;background-repeat:no-repeat;}
#gsh note{color:#000;font-size:10pt;}
#gsh h2{color:#24a;font-family:Georgia;font-size:18pt;}
#gsh h3{color:#24a;font-family:Georgia;font-size:16pt;}
#gsh details{color:#888;background-color:#fff;font-family:monospace;}
#gsh summary{font-size:16pt;color:#fff;background-color:#8af;height:30px;}
#gsh pre{font-size:11pt;color:#223;background-color:#fafff;}
#gsh a{color:#24a;}
#gsh a[name]{color:#24a;font-size:16pt;}
#gsh .gsh-src{white-space:pre;font-family:monospace,Courier New;font-size:11pt;}
#gsh .gsh-src{background-color:#faffff;color:#223;}
#gsh-src-src{spellcheck:false}
#src-frame-textarea{white-space:pre;font-family:monospace,Courier New;font-size:11pt;}
#src-frame-textarea{background-color:#faffff;color:#223;}
.gsh-code {white-space:pre;font-family:monospace !import;}
.gsh-code {color:#088;font-size:11pt; background-color:#eef;}
.gsh-golang-data {display:none;}
#gsh-WinId {color:#000;font-size:14pt;}

.gsh-document {font-size:11pt;background-color:#fff;font-family:Georgia;}
.gsh-document {color:#000;background-color:#fff !import;}
.gsh-document > h2{color:#000;background-color:#fff !import;}
.gsh-document details{color:#000;background-color:#fff;font-family:Georgia;}
.gsh-document p{max-width:550pt;color:#000;background-color:#fff;font-family:Georgia;}
.gsh-document address{width:500pt;color:#000;background-color:#fff;font-family:Georgia;}

```

```
 @media print {
  #gsh pre{font-size:11pt !import;}
 }
</style>

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


iVBORw0KGgoAAAANSUhEUgAAAQEAAAB/CAYAAADvs3f4AAAAAXNSR0IArs4c6QAAAHhlWElm\
TU0AKgAAAAgABAEaAAUAAAABAAAAPgEbAAUAAAABAAAARgEoAAMAAAABAAIAAIdpAAQAAAAB\
AAAATgAAAAAAAABIAAAAAQAAAEgAAAABAAOgAQADAAAAAQABAACgAgAEAAAAAQAAAQGgAwAE\
AAAAAQAAAH8AAAAAYx1BhgAAAAlwSFlzAAALEwAACxMBAJqcGAAAF3RJREFUeAHtnQuUFNWZ\
x++t7ukZ3iCggO/jY6Osb8WgMzAvn7uG4+bISTR7YnQXdQPCkGj2aNwlD2MSlRkeUaPnoCdu\
4iuJx7jriYZ50DOGmF2VqIBEiSggCoiMMA+mu+vu//ZMD9U1dau6a2aUbv91GKrq3vvdx6/q\
fnXvdx8tBA8SIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAES\
IAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIAESIIFDl4A8dLP2\
2eXs9H9+ftSkSdHxsic2qqdE7YusS+1qaalKfnY5YsokMHwEPtdK4MQFz5UeExlbLYSaYUl5\
npDiLKXEZClFiRM53JSUaq9ScqcU6i+2kK3StuONy5reEGKJ7Qw7mOvKec2ToqOiZwoljhFS\
jbOVHCstMRb3USXEJ8hFu7DsdmFb2+xU4vWWFVXbBpMeZUlAE/hcKoGab66eKGOlNykh56PC\
HxH2VVBKoRKqh3qUeKi1YdaOfONJ56OkdI6w5BwomnOQlyPzi0N9DLmXpFK/60p2P/Piyovf\
N8mfM+/nJWNGnjw9KqOToLVGSFt2p2Ril1gn3ij0Vk7YsoWVMzEuVPfPlRKYdfOak2LRSB0q\
zrWocCOG6qEhvgRaCj/dktj3g7dXXH4gKN6aRS0zpYzerqS6Ytx4dYrqT6RAoZDQqfk79SKTHu/e+9FN\
L66as88pU/PN1lC3TLQJKSc73dPXSr20ur7iiwPcC8QhbnNnCyhUIlryyOTQvYF5JfvqBL7jx\
+cNHjBj5gJRyDl39o84D40H2Qtx8THaPeFuIOU+w1C+KnyhK5FGEv0WUMoLY\
rikbd9gHEP52VgQl4h89FUA6kJJyYFbbQbnzLJg4zFiesnDHCwvUoeiVQObBU6TUNYkVJyhL\
+zGhUh9nSqOqrm0mdm3DRfv7F53H/7z+jM6ggnK11mNfIKxcXmoFE65Hl1SlT9\
UJ6toACF7F9VF58NBfDHT0MBaE74Ent+eWrrWr+Lz/QTw60AdB7QJUjps/OA7cOoBNBCeMUZ\
ttCu/coG28fLpvKElTPFV8juRasEahbvFAMOc4+OfeBdyb8L4tz9XeSXFAMOc\
bgGgov0glzgGGw4jF392xnHhdc+Mwf3JTjfntZ2yC1YJBJXNUt5KIKyck1sxXRdld6BmcevN\
aJovy/VBacMevqEP46/ZlnJjt9jx17VL53Zl5Mtvap1QGlNHw5pQDqXyNTQlZ2b8nGcMG2ZV\
qOoFjSdYvV0AZzDfayidv6FJ35CS4jXZk9hir7e27zm6p3T8hLJpkYicJpV1HtK/DJFU4Jw1\
lImhxM5IR9fzzgRKx4w/C+HQSPE+krbIyrN3qEPTNahsHaLDs2xh5Q5NCoPPVdEpgcqbm/8e\
7/zdOaHptag/mlKJ77U0Vb5hJ5RTHUkVGVExEX9H+ccVgl\
pd/CfU42AK2IUPlvTK1L/sJjyE5PVHqr728NzvfUzvvDODGy9GoopuuhmNLNfcTx48YHL2qH\
f/8hpXVu/43rQg9xtq6YtcvlXDC3fmWDQn9nbf2le7wKE1bOwY36wKPU\
hrauc6ZcWdkcjUZK8EUXMae71zUqwCu2nbi6eVn5Ji+Dsg1mAwzcd0xQk7HSxLV2QyFqEbN6\
W5b4rPy9jJxNyy7JSVD2bvNN/I9kZOKO/gxm2tKzDmbX2+/ubnqhCP\
2m6iBAQPV8e8VVCLHscEv8RCEDg39zzv23ZNGMZtW\
Ht/ITOLTrhFuXJMIVzjVdv/D6k+hOKtJq+P9Re30VsrmWw7PwKR+FkYR\
fNn2qOPD7TcyN+0rvXGo8vT68VGq36qhLLb+NJpFLx4egA\
nNE+/nL38bnXZCf3Dx5zTwHXgzZrLrLnRqmuPcTHCa4YF9lUq\
cnI5D6GwJYd6kYCs8htuyGUhVDA3S/vTBGFrYGlGdVw1dtzwOHK\
tqiNcRlpUlVrhTpDcFF3wNt+cWLpNBuTR7OvWbZsCjQFQzhbW8\
Rp8v5QAKGOvTXmm5gTfkMMQajRHXPgoW3jqjnDSyoUyvK\
S/fQQc+NfbQC2TgkhGHR7THqFTD8C/rHtpiY4mWLx8MBXnXfb\
mgwkAFXGRJNXx6b1SChT9AOG6VbrUuzIcgrgScoZPOtypZ1MWl+gbVtEz5UxQPBSKumTvzBhDKnVhvDU\
HoE5Zm/XDaCnFodBYvqqIgPK6ubr5kIFE0ap8+S8IAR48Vjh7\
9cSjPMNYAYBMjxaTHF4ZoqeHV6vg9Iq4wWmVbMrWYcE2qXZ1m7n\
8tmJWk5zJKAOKEuUIgZr6vp6Ttrj0tRm3GLR0HYZyk2\
nnJtvMYm/6k/ls0qWzfUZnZ8QaSqTbOV0LCHUi06J4WGYr\
PeGfuNDPDdMcvs6DZcHt3\
P\
d8Vu2bs//ouw2k9edukt2ULtd8\
P5h8S55w4\
G0nCqL4/1\
ZmrwuNjBZz7z0UaiBc\
MBHvF9lbC7xsqQkuzn24CytO3nZkt6Q7Un9KBA8tXvNRvJ2Vf4dFH\
2HDhmZaM4pCgq/+6xbSgTlaWBI7EcRLVzo4AE8nwgn35XTeITrgOg1VlEHtLzm\
IiFBGwBSHlz9xYZYXRd+Qf1EREvJyq8sn1fNzjGNTbxgmmqhMqIE+ci\
jL6HbYa8xfwoS7qmSNBbaKMb\
YbVjRPqzHljpW7dsWj9IjFwEfDwOiWwLHQGUzQzfsJTXX9Rp\
mEBHSbZL8ZNKbGGaN0Ow\
iEqUJL4R2RKOWtAmf4RlPx75RHNPqYkqYj3UnGVm9mGkxmR\
BHCZRkXlMSdRJaU+SK2XxzhdKOM\
KOTDXmQT1oX8zsRomaHOFr5kRfUQG1X8nTBQUbCT8o3NJ\
mAuCMoJk5eQDm64E8X/wCRsOjhAPrVmVlKTDbVVQ7UW8\
Uk77mdjc0n4RM7mkFAMEJVcdKY6UZzBsukxDLpC4WV7tPBuyuTOTydrupaD\
r4WLrRnMMlU4sQbH0EZLnSPUOnFPa+ehZH+DUDyZnCsvt3GvXkOYY8eirnR\
oESUBqBIpMY7ej0cb3AVBEnGbVhTUgg0YxWuuv3eo3KhNu8g7A6l2AVg7\
zSoxkNyEG95gl\
BTp4dD9b4ue\
kgPxGmH7ZGEpzqfUANqqHZUjrmx1BhLBpXdy5LTgDrYUAw7Iw\
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I4afr5Q5EXMARkAoI2CCP2xvJNV+lMZ78LkH3V27LWVt2n9w4/+6JqdkxJPLqd7b1TADkw1p\
nIhS+QSI+HiEw5RPuVengV20d6Nf7K0t1oF1dj/ikUsatCEBEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiABEiAB\
EiABEiABEiABEiABEiABEiABEhD/B9wOq7SGUV++AAAAAElFTkSuQmCC";

ITSmoreQR="\
iVBORw0KGgoAAAANSUhEUgAAAG8AAABvAQMAAADYCwwjAAAABlBMVEX///9BaeFHqDaJAAAB\
HklEQVQ4jdXTsa2EMAwGYCMX7sICkVgjXVaCBe7CArASXdaIlAWgS4HwM5zEVS+mvSgS+ZBQ\
8gcb4BdHyzwv8szMSaUBHNm+KAd4QC8LDpDn8ogT4UpPGci2jI8IGFx3eLwPWaHknVyWecev\
UEbDXaB0X2aNjueYDOzNklQassPCkjc4nW3E1SfwqYk6jU/vAkPhg0AlSFhve8Jt0dkwDMwr\
yMGSSuPyWHAr19k0tkV2sb3sdW2rUCqW88g4Rp1A9s1JPv9cTplNRD4XFkin8XaQCIwT6Lzq\
ZO8dHw/4+U2GzqlS8gbqVmkfr1N6YXK8OqlD0OmlGTMvzPERA8AL9vvbOifpSoL33fsVytrL\
S9wiqDzznhUI38v5n783/gBuUs2eLg1c8gAAAABJRU5ErkJggg==";

</script>

<script id="gsh-script">
//document.getElementById('GshFaviconURL').href = GShellFavicon
document.getElementById('GshFaviconURL').href = GShellInsideIcon
//document.getElementById('GshFaviconURL').href = ITSmoreQR
//document.getElementById('GshFaviconURL').href = GSellLogo

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

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

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

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

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

```
6125 html_stop(document.getElementById('GshMenuStop'),false) // onInit.
6126 //html_stop(bannerElem(),false) // onInit.
6127
6128 //https://www.w3schools.com/jsref/met_win_setinterval.asp
6129 function shiftBanner(){
6130     var now = new Date().getTime();
6131     //"console.log("now="+(now%10))
6132     if( !bannerIsStopping ){
6133         bannerStyle.backgroundPosition = ((now/10)%100000)+" 0";
6134     }
6135 }
6136 setInterval(shiftBanner,10); // onInit.
6137
6138 //  <a href="https://developer.mozilla.org/ja/docs/Web/API/Window/open">window.open()</a>
6139 // from embedded html to standalone page
6140 var MyChildren = 0
6141 function html_fork(){
6142     MyChildren += 1
6143     WinId = document.getElementById('gsh-WinId').innerHTML + "." + MyChildren;
6144     newwin = window.open("",WinId,"");
6145     src = document.getElementById("gsh");
6146     srchtml = src.outerHTML
6147     newwin.document.write("/*<"+"html>\n");
6148     newwin.document.write(srchtml);
6149     newwin.document.write("<"+"/html>\n");
6150     newwin.document.getElementById('gsh-menu-exit').innerHTML = "Close";
6151     newwin.document.getElementById('gsh-WinId').innerHTML = WinId;
6152     newwin.document.close();
6153     newwin.focus();
6154 }
6155 function html_close(){
6156     window.close()
6157 }
6158 function win_jump(win){
6159     //win = window.top;
6160     win = window.openner; // https://developer.mozilla.org/ja/docs/Web/API/window.opener
6161     if( win == null ){
6162         console.log("jump to window.opener("+win+")(Error)\n")
6163     }else{
6164         console.log("jump to window.opener("+win+")\n")
6165         win.focus();
6166     }
6167 }
6168
6169 // 0.2.9 2020-0902 created chekcsum of HTML
6170 CRC32UNIX = 0x04C11DB7 // Unix cksum
6171 function byteCRC32add(bigcrc,octstr,octlen){
6172     var crc = new Int32Array(1)
6173     crc[0] = bigcrc
6174
6175     let oi = 0
6176     for( ; oi < octlen; oi++ ){
6177         var oct = new Int8Array(1)
6178         oct[0] = octstr[oi]
6179         for( bi = 0; bi < 8; bi++ ){
6180             //console.log("--CRC32 "+crc[0]+" "+oct[0].toString(16)+" ["+oi+"."+bi+"]\n")
6181             ovf1 = crc[0] < 0 ? 1 : 0
6182             ovf2 = oct[0] < 0 ? 1 : 0
6183             ovf = ovf1 ^ ovf2
6184             oct[0] <<= 1
6185             crc[0] <<= 1
6186             if( ovf ){ crc[0] ^= CRC32UNIX }
6187         }
6188     }
6189     //console.log("--CRC32 byteAdd return crc="+crc[0]+","+oi+"/"+octlen+"\n")
6190     return crc[0];
6191 }
6192 function strCRC32add(bigcrc,stri,strlen){
6193     var crc = new Uint32Array(1)
6194     crc[0] = bigcrc
6195     var code = new Uint8Array(strlen);
6196     for( i = 0; i < strlen; i++){
6197         code[i] = stri.charCodeAt(i) // not charAt() !!!!
6198         //console.log("=== "+code[i].toString(16)+" <<== "+stri[i]+"\n")
6199     }
6200     crc[0] = byteCRC32add(crc,code,strlen)
6201     //console.log("--CRC32 strAdd return crc="+crc[0]+"\n")
6202     return crc[0]
6203 }
6204 function byteCRC32end(bigcrc,len){
6205     var crc = new Uint32Array(1)
6206     crc[0] = bigcrc
6207     var slen = new Uint8Array(4)
6208     let li = 0
6209         for( ; li < 4; ){
6210                 slen[li] = len
6211         li += 1
6212                 len >>= 8
6213                 if( len == 0 ){
6214                         break
6215         }
6216         }
6217         crc[0] = byteCRC32add(crc[0],slen,li)
6218         crc[0] ^= 0xFFFFFFFF
6219         return crc[0]
6220 }
6221 function strCRC32(stri,len){
6222     var crc = new Uint32Array(1)
6223     crc[0] = 0
6224     crc[0] = strCRC32add(0,stri,len)
6225     crc[0] = byteCRC32end(crc[0],len)
6226     //console.log("--CRC32 "+crc[0]+" "+len+"\n")
6227     return crc[0]
6228 }
6229 function getSourceText(){
6230     version = document.getElementById('GshVersion').innerHTML
6231     sfavico = document.getElementById('GshFaviconURL').href;
6232     sbanner = document.getElementById('GshBanner').style.backgroundImage;
6233     spositi = document.getElementById('GshBanner').style.backgroundPosition;
6234     sfooter = document.getElementById('GshFooter').style.backgroundImage;
6235
6236     if( document.getElementById('GJC_1') ){ GJC_1.remove() }
6237
6238     // these should be removed by CSS selector or class, after sevaed to non-printed attribute
6239     GshBanner.removeAttribute('style');
6240     GshFooter.removeAttribute('style');
6241     document.getElementById('GshMenuSign').removeAttribute("style");
6242     styleGMenu = GMenu.getAttribute("style")
6243     GMenu.removeAttribute("style");
6244     styleGStat = GStat.getAttribute("style")
6245     GStat.removeAttribute("style");
6246     styleGTop = GTop.getAttribute("style")
6247     GTop.removeAttribute("style");
6248     styleGshGrid = GshGrid.getAttribute("style")
6249     GshGrid.removeAttribute("style");
```

```
    styleGPos = GPos.getAttribute("style");
    GPos.removeAttribute("style");
    GPos.innerHTML = "";
    styleGLog = GLog.getAttribute("style");
    GLog.removeAttribute("style");
    GLog.innerHTML = "";
    styleGShellPlane = GShellPlane.getAttribute("style")
    GShellPlane.removeAttribute("style")
    styleRawTextViewer = RawTextViewer.getAttribute("style")
    RawTextViewer.removeAttribute("style")
    styleRawTextViewerClose = RawTextViewerClose.getAttribute("style")
    RawTextViewerClose.removeAttribute("style")

    GshFaviconURL.href = "";

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

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

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

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

    GStat.setAttribute("style",styleGStat)
    GMenu.setAttribute("style",styleGMenu)
    GTop.setAttribute("style",styleGTop)
    GLog.setAttribute("style",styleGLog)
    GPos.setAttribute("style",styleGPos)
    GshGrid.setAttribute("style",styleGshGrid)
    GShellPlane.setAttribute("style",styleGShellPlane)
    RawTextViewer.setAttribute("style",styleRawTextViewer)
    RawTextViewerClose.setAttribute("style",styleRawTextViewerClose)
    return orgtext
}
function getDigest(){
    var text = ""
    text = getSourceText()
    var digest = ""
    tlen = text.length
    digest = strCRC32(text,tlen) + " " + tlen
    return { text, digest }
}
function html_digest(){
    version = document.getElementById('GshVersion').innerHTML
    let {text, digest} = getDigest()
    alert("cksum: " + digest + " " + version)
}
function charsin(stri,char){
    ln = 0;
    for( i = 0; i < stri.length; i++ ){
        if( stri.charCodeAt(i) == char.charCodeAt(0) )
            ln++;
    }
    return ln;
}

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

    alert(result)
}

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

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

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

    text = sign + text

    txthtml = '<' + 'table id="LineNumbered"><' + 'tr><' + 'td>'
        + '<' + 'textarea cols=5 rows=' + Lines + ' class="LineNumber">'
    for( i = 1; i <= Lines; i++ ){
```

```
        txthtml += i.toString() + '\n'
    }
    txthtml += ""
        + '<' + '/textarea>'
        + '<' + '/td><' + 'td>'
        + '<' + 'textarea cols=150 rows=' + Lines + 'spellcheck="false"'
        + ' class="LineNumbered">'
        + text + '<'+'/textarea>'
        + '<' + '/td><' + '/tr><' + '/table>'

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

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

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

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

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

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

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

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

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

    GshBanner.setAttribute('style',styleBanner)
    GshFooter.setAttribute('style',styleFooter)
}
function fill_CSSView(){
    part = document.getElementById('GshStyleDef')
    view = document.getElementById('gsh-style-view')
    view.innerHTML = ""
```

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

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

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

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

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

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

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

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

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

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

function nextSib(e){
    n = e.nextSibling;
    for( i = 0; i < 100; i++ ){
        if( n == null ){
            break;
        }
        if( n.nodeName == "DETAILS" ){
            return n;
        }
        n = n.nextSibling;
    }
    return null;
}
function prevSib(e){
    n = e.previousSibling;
```

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

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

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

function DateLong(){
    d = new Date()
    return  d.getFullYear() + "/" + d.getMonth() + "/" + d.getDate() + " "
        + d.getHours() + ":" + d.getMinutes() + ":" + d.getSeconds()
        + "." + d.getMilliseconds()
        + " " + d.getTimezoneOffset()/60
        + " "
        + d.getTime()  + "." + d.getMilliseconds()

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

    //}
    GStat.style.width = window.innerWidth
    //if( document.getElementById("GPos") != null ){
        GPos.style.width = window.innerWidth
        GPos.style.top = window.innerHeight - 30; //GPos.style.height
    //}
    if( document.getElementById("GLog") != null ){
        GLog.style.width = window.innerWidth
        GLog.innerHTML = ""
    }
    if( document.getElementById("GLog") != null ){
        //GLog.innerHTML = "Resize: w=" + window.innerWidth +
        //", h=" + window.innerHeight
    }
    showCurElementPosition(ev)
}
function GShellResize(){
    GShellResizeX("[RESIZE]")
}
window.onresize = GShellResize

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

    GTop.style.backgroundColor = "rgba(0,0,0,0.0)"
    GshGrid.style.left = '250px';
    GshGrid.style.zIndex = 0
    return
    oy = oe.getBoundingClientRect().top.toFixed(0)
    ox = oe.getBoundingClientRect().left.toFixed(0)
    y = e.getBoundingClientRect().top.toFixed(0)
    x = e.getBoundingClientRect().left.toFixed(0)
    window.scrollTo(x,y)
    ny = e.getBoundingClientRect().top.toFixed(0)
    nx = e.getBoundingClientRect().left.toFixed(0)
    GLog.innerHTML = "["+oy+","+ox+"]->["+y+","+x+"]->["+ny+","+nx+"]"
}
var MyHistory = ""
function showGShellPlane(){
    if( GShellPlane.style.zIndex == 0 ){
        GShellPlane.style.zIndex = 1000;
        GShellPlane.style.left = 30;
        GShellPlane.style.height = 320;
        GShellPlane.innerHTML = DateLong() + "<br>" +
            "-- History --<br>" + MyHistory;
    }else{
        GShellPlane.style.zIndex = 0;
        GShellPlane.style.left = 0;
        GShellPlane.style.height = 50;
        GShellPlane.innerHTML = "";
    }
}
var SuppressGJShell = false
function jgshCommand(event){
```

```
    if( SuppressGJShell ){
        return
    }
    key = event
    keycode = key.code
    //GStat.style.width = window.innerWidth
    GStat.style.backgroundColor = "rgba(0,0,0,0.4)"

    console.log("JSGsh-Key:"+keycode+"(^-^)/")
    if( keycode == "Digit0" ){ // fold side-bar
        // "Zero page"
        showGShellPlane();
    }else
    if( keycode == "Digit1" ){ // fold side-bar
        primary.style.width = "94%"
        secondary.style.width = "0%"
        secondary.style.opacity = 0
        GStat.innerHTML = "[Single Column View]"
    }else
    if( keycode == "Digit2" ){ // unfold side-bar
        primary.style.width = "58%"
        secondary.style.width = "36%"
        secondary.style.opacity = 1
        GStat.innerHTML = "[Double Column View]"
    }else
    if( keycode == "KeyU" ){ // fold/unfold all
        html_fold(GshMenuFold);
        location.href = "#"+CurElement.id;
    }else
    if( keycode == "KeyO" || keycode == "ArrowRight" ){ // fold the element
        CurElement.open = !CurElement.open;
    }else
    if( keycode == "ArrowRight" ){ // unfold the element
        CurElement.open = true
    }else
    if( keycode == "ArrowLeft" ){ // unfold the element
        CurElement.open = false
    }else
    if( keycode == "KeyI" ){ // inspect the element
        e = CurElement
        GLog.innerHTML = "Current Element: " + e + "<br>"
            + "name="+e.nodeName + ", "
            + "id="+e.id + ", "
            + "children="+e.childNodes.length + ", "
            + "parent="+e.parentNode.id + "<br>"
            + "text="+e.textContent
        GStat.style.backgroundColor = "rgba(0,0,0,0.8)"
        return
    }else
    if( keycode == "KeyM" ){ // memory the position
        MemElement = CurElement
    }else
    if( keycode == "KeyN" || keycode == "ArrowDown" ){ // next element
        e = nextSib(CurElement)
        if( e != null ){
            setColor(CurElement,"SUMMARY","#fff")
            setColor(e,"SUMMARY","#8f8") // should be complement ?
            oe = CurElement
            CurElement = e
            //location.href = "#"+e.id;
            ScrollToElement(oe,e)
        }
    }else
    if( keycode == "KeyP" || keycode == "ArrowUp" ){ // previous element
        oe = CurElement
        e = prevSib(CurElement)
        if( e != null ){
            setColor(CurElement,"SUMMARY","#fff")
            setColor(e,"SUMMARY","#8f8") // should be complement ?
            CurElement = e
            //location.href = "#"+e.id;
            ScrollToElement(oe,e)
        }else{
            e = document.getElementById("GshBanner")
            if( e != null ){
                setColor(CurElement,"SUMMARY","#fff")
                CurElement = e
                ScrollToElement(oe,e)
            }else{
                e = document.getElementById("primary")
                if( e != null ){
                    setColor(CurElement,"SUMMARY","#fff")
                    CurElement = e
                    ScrollToElement(oe,e)
                }
            }
        }
    }else
    if( keycode == "KeyR" ){
        location.reload()
    }else
    if( keycode == "KeyJ" ){
        GshGrid.style.top = '120px';
        GshGrid.innerHTML = '(>_<){Down}';
    }else
    if( keycode == "KeyK" ){
        GshGrid.style.top = '0px';
        GshGrid.innerHTML = '(^-^){Up}';
    }else
    if( keycode == "KeyH" ){
        GshGrid.style.left = '0px';
        GshGrid.innerHTML = "('_'){Left}";
    }else
    if( keycode == "KeyL" ){
        GLog.innerHTML +=
            'screen='+screen.width+'px'+'<br>'+
            'window='+window.innerWidth+'px'+'<br>'
        GshGrid.style.left = (document.documentElement.clientWidth-160).toString(10)+'px';
        GshGrid.innerHTML = '(@_@){Right}';
    }else
    if( keycode == "KeyS" ){
        html_stop(GshMenuStop,true)
    }else
    if( keycode == "KeyF" ){
        html_fork()
    }else
    if( keycode == "KeyC" ){
        window.close()
    }else
    if( keycode == "KeyD" ){
        html_digest()
    }else
    if( keycode == "KeyV" ){
        e = document.getElementById('gsh-digest')
        if( e != null ){
```

```
            showDigest(e)
        }
    }

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

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

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

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

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

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

</script>

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

<script id="GJConsoleScript" class="GJConsole">
  var PS1 = "% "
  function GJC_Keydown(keyevent){
    key = keyevent.code
    if( key == "Enter" ){
        GJC_Command(this)
        this.value += "\n" + PS1 // prompt
    }else
    if( key == "Escape"){
        SuppressGJShell = false
        GshMenu.focus() // should be previous focus
    }
  }
  var GJC_SessionId
  function GJC_SetSessionId(){
    var xd = new Date()
    GJC_SessionId = xd.getTime() / 1000
  }
  GJC_SetSessionId()
  function GJC_Memory(mem,args,text){
    argv = args.split(' ')
    cmd = argv[0]
    argv.shift()
    args = argv.join(' ')
    ret = ""

    if( cmd == 'clear' ){
        Permanent.setItem(mem,'')
    }else
    if( cmd == 'read' ){
        ret = Permanent.getItem(mem)
    }else
    if( cmd == 'save' ){
        val = Permanent.getItem(mem)
        if( val == null ){ val = "" }
        d = new Date()
        val += d.getTime()/1000+" "+GJC_SessionId+" "+document.URL+" "+args+"\n"
        val += text.value
        Permanent.setItem(mem,val)
    }else
    if( cmd == 'write' ){
```

```
        val = Permanent.getItem(mem)
        if( val == null ){ val = "" }
        d = new Date()
        val += d.getTime()/1000+" "+GJC_SessionId+" "+document.URL+" "+args+"\n"
        Permanent.setItem(mem,val)
    }else{
        ret = "Commands: write | read | save | clear"
    }
    return ret
  }
  function GJC_Command(text){
    lines = text.value.split('\n')
    line = lines[lines.length-1]
    argv = line.split(' ')
    text.value += '\n'
    if( argv[0] == '%' ){ argv.shift() }
    cmd = argv[0]
    argv.shift()
    args = argv.join(' ')
    if( cmd == 'cont' ){
        bannerIsStopping = false
        GshMenuStop.innerHTML = "Stop"
    }else
    if( cmd == 'date' ){
        text.value += DateLong()
    }else
    if( cmd == 'echo' ){
        text.value += args
    }else
    if( cmd == 'fork' ){
        html_fork()
    }else
    if( cmd == 'last' ){
        //h = document.createElement("span")
        //h.innerHTML = MyHistory
        //text.value += h.innerHTML
        tx = MyHistory.replace("\n","")
        text.value += tx.replace("<"+"br>","\n") + "xxxx<"+"br>yyyy"
    }else
    if( cmd == 'reload' ){
        location.reload()
    }else
    if( cmd == 'mem' ){
        text.value += GJC_Memory('GJC_Storage',args,text)
    }else
    if( cmd == 'stop' ){
        bannerIsStopping = true
        GshMenuStop.innerHTML = "Start"
    }else
    if( cmd == 'who' ){
        text.value += "SessionId="+GJC_SessionId+" "+document.URL
    }else
    if( cmd == 'wall' ){
        text.value += GJC_Memory('GJC_Wall','write',text)
    }else
    {
        text.value += "Commands: help | echo | date | last | mem | who | wall | fork | nife"
    }
  }

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

  function GJC_FocusIn(){
    this.spellcheck = false
    SuppressGJShell = true
    this.onkeydown = GJC_Keydown
    this.style.zIndex = 20000
    this.style.width = window.innerWidth
    this.style.height = 400
    this.style.backgroundColor = "rgba(0,0,0,1.0)"
    this.style.color = "rgba(255,255,255,1.0)"
  }
  function GJC_FocusOut(){
    SuppressGJShell = false
    this.removeEventListener('keydown',GJC_Keydown);
  }

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

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

  // TODO: focus handling
</script>
<!-- ----- GJConsole END } ----- -->
</span>

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