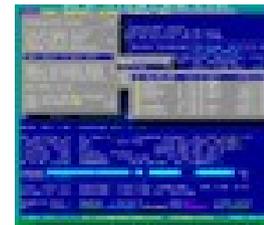


TxWin enhanced scripting

Jan van Wijk

TX enhanced scripting language
(as used with DFSee 9.03 and up)

FSYS - *software*



TxWin

Presentation contents

- TxWin and DFSee scripting history
- Design goals for scripting, alternatives
- High level layout of TxScript programs
- Script parameters and variables
- Expressions, available operators
- Built-in functions
- Control structures, program flow
- Expression substitution in commands

Who am I ?

Jan van Wijk

- Software Engineer, C, Rexx, Assembly, PHP
- Founded FSYS Software in 2001, developing and supporting DFSee from version 4 to 9.xx
- First OS/2 experience in 1987, developing parts of OS/2 1.0 EE (Query Manager, later DB2)
- Used to be a systems-integration architect at a large bank, 500 servers and 7500 workstations

Home page: <http://www.dfsee.com>

Dfsee scripting history

- Over time, to automate repeating and more complex tasks, several scripting methods have been (and still are!) used with DFSee:
 - BAT/CMD/SHELL scripts, calling DFSee
 - Rexx subcmd environment for OS/2 version
 - Native scripting, being a simple list of DFSee commands, executed sequentially, with simple error handling and parameter substitution

TxScript design goals

- Backwards compatible with existing .DFS scripts as far as possible, allowing re-use
- Direct access to much DFSee internal info, including disk sectors from a script
- Powerful expressions, variables and functions
To be used from and in the DFSee commandline too
- Conditional and looping control to allow more intelligent and powerful scripts

Note: For 'DFSee' you can read any hosting program that uses the TxScript engine from the TxLib library

Do we need another language ?

- Trying to avoid re-inventing yet another wheel, some alternatives have been considered:
 - Rexx, as used in OS/2 version already
 - Python, clean OO type language
 - Perl, very powerful, hackers heaven :-)
 - PHP, Ruby etc as used in WEB environments
- All had problems with integration in the hosting program (DFSee), availability on all required platforms, or added complexity for install etc.
- Developing a new language is fun, so YES :-)

High level layout of TxScript

- LINE-oriented, but ignores whitespace usage with the lines. Each line is either:
 - A comment line (ignored mostly :-)
 - An interpreter 'pragma' altering its behaviour
 - Program flow statements like IF or WHILE
 - An assignment to one or more script variables
 - A command to be passed to the host (DFSee) to be executed, including substitution of expressions

Example for script layout

```
;script example
```

```
;;defaultparam 1 5
```

```
IF $1 < $_parts
```

```
    Say $1 is OK!
```

```
ENDIF
```

- A comment line
- A pragma
- Control statement with an expression
- A command to be executed by DFSee
- End of the Control statement

Script parameters and variables

- Parameters to the script are positional, and named \$1 through \$9, \$0 is the scriptname
- Variables follow the 'Perl' syntax where possible, with a subset of the functionality
 - \$variable a scalar variable
 - \$array[index] scalar taken from an array
 - %array whole array
 - \$hash{key} scalar taken from a hash
 - #hash whole hash variable

System variables

- Variablenames starting with '\$_' are system variables (DFSee) and are read-only
 - They come as scalar and scalar-from-array variants
- Some examples (there are dozens :-)
 - `$_parts` total number of partitions, 1..n
 - `$_disk` current opened disk number
 - `$_this` sector number for current sector
 - `$_d_size[X]` size in sectors for disk nr X
 - `$_p_fsform[Y]` FS-format for partition nr Y
 - `$_b_sector[Z]` Contents of sector nr Z, in a (512 byte) binary string

Expression and variable values

- Variable and expression values are either:
 - A character string of arbitrary length, may contain any value from 0..255, allowing binary data manipulation
 - A 64-bit signed integer value, allowing huge numbers while maintaining the exact integer value
- Expression operators and built-in functions automatically convert between these
 - Other types like floating-point may be added later

Expressions, operators, functions

- Expression syntax and semantics are pretty close to those defined in 'Perl' and 'C' but are not exactly identical
- Operators work on 1, 2 or 3 operands:
 - Unary, like + - ! NOT 1 operand
 - Binary, like + * < = 2 operands
 - Ternary, (cond) ? exp1 : exp2 3 operands
- Functions take zero or more arguments and return a value (in an expression)

Operator precedence, high to low

\$name[]++ --

Atom, Term

- + ! ~

* / %

+ -

x

.

<< >>

== != < > <= >=

=== !==

eq ne lt gt le ge

- Variable, indexed and auto incr/decr
- String, number, function nested-expr or ternary
- Unary operators
- Binary multiply/division
- Binary plus/minus
- String replication
- String concatenation
- Numeric bit-shift
- Numeric compare
- Same value AND type
- String compare

Operator precedence, part 2

&
^
|

- Bitwise AND
- Bitwise XOR
- Bitwise OR

&&
||

- Logical AND (C-style)
- Logical OR (C-style)

=
,

- Assignment
- Comma, multi-expression

NOT
AND
OR

- Logical NOT (Perl style)
- Logical AND (Perl style)
- Logical OR (Perl style)

Built-in functions, A-F

abs
b32
b2asc
b2int
chr
canceled
confirmed
defined
drivefs
drivelabel
drives
drivespace
exists
filext
fnbase

- Absolute value, numeric
- Clip to 32-bit unsigned
- Binary string to ASCII
- Binary string to reversed int
- ASCII value for number
- Test for canceled last operation
- Confirmation Yes/No/Cancel
- Is variable defined
- FS-name for drive letter
- Label string for drive letter
- All drive letters in string
- Freespace in KiB for drive
- File exists
- Set default file extension
- Extract filename without ext

Built-in functions, G-M

fnfile
fnpath
getcwd
h2asc
h2int
i2dec
i2hex
index
lc
left
length
mkdir
max
min
message

- Extract filename without path
- Extract path only, no filename
- Get current working directory
- Get string from hex-ascii str
- Get integer from hex-ascii str
- Convert int to decimal str
- Convert int to hexadecimal str
- Find substring in string
- Return lowercased string
- Left adjust string, pad/clip
- Get length of string
- Create full directory path
- Ret maximum of values
- Ret minimum of values
- Message popup, until [OK]

Built-in functions, O-Z

ord
prompt
replace
sec2gib
sec2kib
sec2mib
reverse
right
rindex
strip

substr
uc
undef

- Numeric value 1st char in str
- Popup question, return string
- Replace characters in string
- Get GiB value for #sectors
- Get KiB value for #sectors
- Get MiB value for #sectors
- Reverse characters in string
- Right adjust string pad/clip
- Reverse find substring in str
- Strip leading/trailing chars from a string (default spaces)
- Extract substring from string
- Return uppercased string
- Undefine (free) a variable releasing any used storage

Control structures, branching

IF (condition)

statement-list

- Like the Perl IF, not using a {} block but an ENDIF keyword

ELSEIF (condition)

statement-list

- () parenthesis on conditions optional

ELSE

statement-list

- Any number of the ELSEIF clause

ENDIF

- ELIF, ELSIF and ELSEIF accepted

Control structures, looping

WHILE (condition)
 statement-list
ENDWHILE

- Like Perl or 'C' but not using a {} block but an explicit end

FOR init;condition;iterator
 statement-list
ENDFOR

- () parenthesis on conditions optional

DO
 statement-list
UNTIL (condition)

- Loop can be exited using 'break'
- 'continue' or the perl 'last' are considered

Command expression substitution

- Transparent, replacing expressions by the result of the expression, when starting with a variable:
 - `$_this + 100`
 - `Wipe z $start $_d_cylsize * 25`
 - `Say You have $_parts partitions on $_disks disks`
- Explicit, enclose in curly brackets if NOT starting with a variable, or any conflicting syntax:
 - `Restore {$imgfile} -P:$partition ; -P would conflict`
 - `Say we are in: {getcwd()} ; not a variable`

Miscellaneous comments

- Keywords are case-insensitive (IF, WHILE)
- Parenthesis on conditions are optional
- Conditions must be on a single line, or use explicit line continuation
- Lines are 'continued' using '\' as last char allowing long expressions to be spread over more than one physical line

Miscellaneous comments

- Script syntax is checked BEFORE running any statement, except expressions to be substituted in commands (to be refined :-)
- Single '\$' characters in commands will be left 'as-is' so can be used freely, but when directly followed by any alphabetic a-z/A-Z it could be mistaken for a variable and you need to escape that by doubling the '\$' character as: '\$\$'
- There may be application level mechanisms too, that allow switching variable substitution on/off. Would result in better readable commands ...

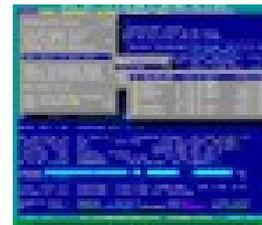
Considered improvements

- User defined functions
- More/better array and hash variable handling and manipulation (perl like)
- A FOREACH loop/iterator control ??
- Floating point variables
- Basic file-I/O, read/write text and binary

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Questions ?

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