MX2 Multitasking Kernel

for Atari ST computers

by

Fred Brooks

1 Introduction

•Due to my now being a multimillionaire I am forever giving away the complete source and the complete program is now:

```
!!!       PUBLIC DOMAIN     !!!

!!!          FREE           !!!
```

•As a service to help down and out C programmers around the world you can still send a donation to:

```
Fred Brooks
4145 44ST #5
San Diego CA 92105
```

•You will receive a thank you and can continue to live with a clear conscience.

•MX2 V2.3.0 A multitasking and multiuser environment for ATARI ST. Written using TDI Modula-2 3.01a Compiler For TOS Versions 11/20 1985 and 04/22 1987 Other Versions may not run correctly.

•This set of programs are NOT for sale by anyone and I reserve all rights to it's ownership.

MX2 is a multitasking environment to aid in program development for the ATARI ST. It was developed in Modula-2 but can be used with any language such as C, BASIC, or PASCAL. Suggested system minimum requirements are 1 MEG of memory with a double-sided disk drive. A hard disk drive will greatly improve system performance.

2 Notes:

I have tuned this kernel for use with the GULAM shell. I have had no problems using it except with the TE communications command. It locks up my background xmodem routines if used.

3 System Generation:

The MX2.INF file contains the system generation parameters. It is an ASCII files that can be edited with the UE editor in GULAM or any ASCII editor This files allows you to change the default system boot parameters If this file does not exist the default values are: numeric values are in decimal

```
Init Command              : IP CLI.PRG
System Memory             : 32000
Alt Program HOTKEY        : 3276800
Normal Mouse HOTKEY       : 3211264
Cursor Mouse HOTKEY       : 3014656
Reboot HOTKEY             : 1245184
Reserved Memory           : 32000
```

The initialization command is normally used to load the SHELL program. The CLI.PRG enables GULAM.PRG to multitask then loads the program. If the program is exited the kernel will respawn the SHELL. To load a program other than the SHELL edit the line to to IP "name of program".

System memory is the size of the memory reserved by MX2 to allocate for it's internal data structures. The default size should be adequate for 7 MX2 processes with a workspace of 2K each.

Reserved memory is the size of the memory block that will be split off of the main memory heap. This memory should still be available with GEM programs that allocate all available memory with a malloc(-1).

4 MX2.ACC:

The MX2.ACC will not work correctly if you try to run two or more GULAM shells. Because both would be GEM programs and the AES would hang or get lost . If you want to have a remote or wish to run two shells from the desk to please select the OFF option from the desk ACC before starting up the second shell with the go.g script file or by typing the commands. I am trying to work around this problem.

5 LOGIN and PASSWD file:

•The MX2 password system uses five fields separated by a colon. •The file 'passwd' contains all password records.

- field 1 userid
- field 2 password
- field 3 path
- field 4 program
- field 5 comment

```
Example        mx2::::
```

Is the minimum password record. It contains only the userid field with the other fields set to null. This would login user 'mx2' with no password to the default path 'current path' and run the default program 'gulam.prg'.

```
Example        fred:AXKHRWQ:c\mx2:gulam.prg: login as me using my work id
```

Would login user 'fred' using encrypted password 'AXKHRWQ' to drive 'c' path '/mx2' "note if a drive is specified DO NOT use a colon between the drive character and the path" and run program 'gulam.prg'. The comment is not used by the program and is there to inform the user. The program field could have been a null entry or any other valid program. The program field may include subdirectories. ie ':\mx2\gulam.prg:'

The 'passwd.prg' is used to set and change user passwords. New users must have a null field 2 when it is created. Passwords MUST be set with the passwd.prg.

```
USAGE:          passwd fred
                        ^
                      user
```

Where fred is a system username in field 1 of a password record. If there is no password the program will ask for a new password. If a password already exists you will be asked for the old password first, then if it is correct you can change the password. Passwords must be at least 4 characters long.

Examine the supplied passwd file for more examples.

6 Interface Libraries:

The SYSCALL module is the standard interface for user programs to the MX2 Multitasking system. It includes functions to starting ending and controlling concurrent processes. The TDILIB contains the TDI MODULA-2 3.01a libraries. I will include a portable C library as soon as I can translate the code over.

7 Communications:

Also included is a no frills communications program. COM.TOS without options sets the AUX port to 1200BPS. COM.TOS # "where # is a number" will set the AUX port to the speed according to the table.

```
0       =     300BPS
1       =     1200BPS
2       =     2400BPS
4       =     4800BPS
9       =     9600BPS
H       =     19200BPS
```

Use the [Undo] key to exit back to the CLI.

8 MX2 Hotkeys:

Hotkeys for several functions are included. These are the default keys they can be changed in the MX2.INF file.

`ALT m` Load and switch to second CLI or program, the screen and status of the first cli are saved. If used after the second CLI was loaded this command will switch back and forth between the two. It is recommended that this command only be used in TOS programs. If a you only press RETURN after the program name prompt the CLI.PRG will automatically be loaded.

`ALT r` Will REBOOT the computer. This is the same as pressing the reset button on the ST.

9 Background Timer:

`CRON` is the background program timer. When MX2 starts the file `CRONTAB` is read into memory. CRONTAB lists the start time and frequency of the MX2 command on that line to be executed. To stop the `CRON` from running the entries in the `CRONTAB` file you can rename it or after the CLI is running issue the "SYS CRON OFF" command to stop.

All times are in minutes. You may have up to 16 entries in the CRONTAB file. The format of the CRONTAB file is.

```
Start Time      Frequency       Command
0               60              SYS BP DUMMY.PRG
```

midnight every hour run the DUMMY.PRG in background

10 NETWORKING:

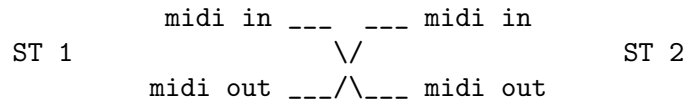
‘`netaux.prg`’
networking program that uses the aux port.

‘`netmidi.prg`’
networking program that uses the midi port.

‘`neta.g`’ Gulam script file to start the netaux.prg in background.

‘`netm.g`’ Gulam script file to start the netmidi.prg in background.

The network uses the MIDI or AUX port to allow a second ST that is also running MX2 to use the remote ST’s drives. The remote drives can be used just like your local drives but they will of course be slower because of the transfer of the data through the MIDI or AUX ports. The remote drives will start as the second drive ID after the last drive that you have on the local ST. For example if you have drives A,B,C,D,E,F then the remote drives will be H,I,J,K,L,M respectively. To use the C drive on the remote system simply use the J: drive on the CLI. Be sure to cross connect the midi cables ie... the MIDI out to the MIDI in on the other ST and vice verse.



If the AUX port is selected for the network a NULL modem cable should be used for direct connect or a normal modem cable for use through remote lines. The BAUD rate can be set by the CLI or a DESK ACC.

The MX2NET.PRG is a standalone network driver that runs from the DESKTOP or another GEM program. It may be installed in an AUTO folder or run from the DESKTOP. It will allow disk sharing between ST’s that are not both using the MX2 environment.

11 MISC:

The condition of the CapsLock is shown by an asterisk in the upper right corner.

12 Known Bugs, Fixes and Improvements:

- V1.1.0 Process priorities are now fixed.
- V1.0.0 The spooler will not work with networked files.
- V1.0.0 MX2.ACC accessory will allow MX2 to multitask in some GEM programs. The TDI editor will allow MX2 to switch when running this accessory.
- V1.1.0 Improved the MX2.ACC to multitask with more gem programs. I have used a vector to read the Super stack of the ACC and passed it to the scheduler to help it know when it's safe to context switch.
- V2.1.0 Added code so the MX2.ACC does not soak up cpu time until MX2 has started. The desk accessory check every 10 seconds for the MX2 running flag then it starts a zero time event timer call.
- V1.0.0 Some programs will start up ok but on exit cause the system to crash.
- V2.0.0 I hope I have solved this problem. Most programs should run correctly now without problems. Some programs won't run with the GULAM shell even without MX2.
- V1.0.2 Added KILL command to terminate processes and their children. This command will not work with programs run as background processes.
- V1.1.0 Added support for use of AUX port for network along with MIDI.
- V1.1.0 Added I/O options for selecting ports on background programs. Example a 'sys bp -a -p cli.prg' would start command shell that uses the aux port for input and uses the printer port for output. You could send input from the main CLI by using the 'submita.prg' Example: 'submita ls' would send the the ls command into the aux buffer which the cli would read and send the directory output to the printer.
- V1.1.0 Changed usage of reserved memory.
- V2.2.0 Fix bug in PS command that displayed incorrect start time and date for processes.
- V2.2.1 Remove PS command code from kernel. All code is now is the PS Program.
- V2.3.0 I have deleted the trap 15 interface because of problems with a few programs. There is now a vector to all the MX2 system routines.
- V2.3.0 Added user device drivers. When a background program is started one of the drivers in the range of 0 to 3 may be selected. The device driver routines types are defined in the ATOMIC.DEF file. All bios calls to the keyboard and screen will be redirected the these routines. Of course user will have to load the address of his routines into the correct entry in the DeviceTable. A call to get the system variables will allow you to get the correct address of the DeviceTable. Look at the file device.mod for an example to how to load and use the device drivers.

13 MX2 Commands:

() mandatory parameter, [ ] optional parameter priorities range from 1 to 10 where 10 gets the most CPU time. Always use SYS before all commands if run from the CLI.

14 Program Commands:

`IP` Run Interactive Program. This is normally only used to run the mx2 CLI when the kernel first boots. The kernel will respawn the program if it terminates or exits.

```
USAGE : IP [priority] (filename) [command]
        SYS IP [priority] (filename) [command]
```

`BP` Run Background Program. Background programs use the same I/O vectors as the process that started it.

```
USAGE : BP [-pacmn0123] [-pacmn0123] [priority] (filename) [command]
        SYS BP [-pacmn0123] [-pacmn0123] [priority] (filename) [command]
```

The -pacmn0123 argument allows for controlling the port that the program STDIO will use for INPUT and OUTPUT. The first argument is for INPUT, the second for OUTPUT. parameters are:

```
  p : printer port
  a : rs232 port
  c : console 'keyboard or screen'
  m : midi port
  n : null device
0-3 : userdefinable I/O drivers
```

The NULL device always returns a ready status for input and output. If the port options are missing CON I/O will use the console and screen.

```
Example:    'sys bp -a -p doit.prg' will cause the doit program
             to use the rs232 port for INPUT and will print
             OUTPUT through the printer port.
```

`FP` Run Foreground Program. Foreground programs always use the normal ST I/O vectors. Use it to run programs that use the ST screen and keyboard from processes that are redirected to the RS232 or other ports.

```
USAGE : FP [-pacmn0123] [-pacmn0123] [priority] (filename) [command],
        SYS FP [-pacmn0123] [-pacmn0123] [priority] (filename) [command]
```

The -pacmn0123 argument allows for controlling the port that the program STDIO will use for INPUT and OUTPUT. The first argument is for INPUT, the second for OUTPUT. parameters are:

```
  p : printer port
  a : rs232 port
  c : console 'keyboard or screen'
  m : midi port
  n : null device
0-3 : userdefinable I/O drivers
```

The NULL device always returns a ready status for input and output. If the port options are missing CON I/O will use the console and screen.

```
Example:    'sys fp -a -a cli.prg' will cause the cli program
             to use the rs232 port for INPUT and OUTPUT.
```

`PORT` Select stdio ports.

```
USAGE : PORT (pid) [-pacmn0123] [-pacmn0123]
        SYS PORT (pid) [-pacmn0123] [-pacmn0123]
```

The -pacmn0123 argument allows for controlling the port that the process STDIO will use. This command will not affect the main CLI.

15 XMODEM Commands:

`XR` Receive a XMODEM file from remote computer.

```
USAGE : XR ([-]filename)
```

This command will start a background process to download a file. If the download is complete a single bell will sound at the console. If the download aborted for some reason four bells will sound. Transfers default to CRC, a - in front of the filename will cause a switch to checksum error-checking.

`XT` Send a XMODEM file to a remote computer.

```
USAGE : XT ([-]filename)
```

This command will start a background process to upload a file. If the upload is complete a single bell will sound at the console. If the upload aborted for some reason four bells will sound. Transfers default to CRC, a - in front of the filename will cause a switch to checksum error-checking.

`XA` Abort XMODEM transfers.

```
USAGE : XA
```

This command will abort all xmodem background processes.

`XS` XMODEM Status.

```
USAGE : XS
```

This command will display the status of a xmodem up or download.

16 Process Priority:

NICE : Change Process Priority.

`USAGE : NICE (priority) [pid], SYS NICE (priority) [pid]`

If NICE is called without a pid the current process will be used.

17 PROCESS COMMANDS:

`HP` Halt Process.

`USAGE : HP (pid), SYS HP (pid)`

Pid is the process id number of the process you wish to Halt. To start up a halted process use the WP command. The HP command takes a process out of the ready list and removes it from the CPU but NOT from memory.

`WP` Wakeup Process.

`USAGE : WP (pid), SYS WP (pid)`

Pid is the process id number of the halted process you wish to Wakeup. The WP command puts the process back into the ready list to be run in it's time slot.

`KILL` KILL Process.

`USAGE : KILL (pid), SYS KILL (pid)`

Pid is the process id number of the process you wish to terminate. The KILL command removes the process from the ready list and releases it's workspace back to the system process memory.

18 Background Timer Commands:

`CRON` Background Scheduler Timer.

```
USAGE : SYS CRON [ON OFF]
```

CRON with no options will display the current timer table entries. CRON OFF disables the timer. CRON ON read the CRONTAB file, reloads the timer table then enables the timer.

19 MX2 Utility Programs:

19.1 Process Status Commands:

`PS.PRG` Process Status.

```
USAGE : PS
```

Display description of all system processes.

`PS.PRG -z` Zombie Process Status.

```
USAGE : PS -z
```

Display description of all inactive system processes.

`PID.PRG` Process Identifier.

```
USAGE : PID
```

Returns the Process Identifier of the current process.

`REDIR.PRG`

Program to redirect screen and keyboard I/O to the RS232 port.

`COM.PRG` Program to communicate thru the RS232.

`SUBMIT.PRG [cmd]`

Program to send string on the command line to the keyboard buffer.

```
SUBMITA.PRG [cmd] send string to RS232 buffer.
SUBMITM.PRG [cmd] send string to MIDI buffer.
```

`MX2.ACC` Desk accessory to allow MX2 to multitask in some GEM programs. You can disable GEM Multitasking if you click on the Desk menu bar for MX2 and select the OFF button.

19.2 SYS.PRG Usage:

The SYS.PRG reads it's command line and submits the command the the MX2 kernel. It's use to give MX2 commands from another program such at GULAM. Example "SYS BP LOOP.PRG" will load and run LOOP.PRG as a background process. All MX2 commands can be used. To get a process status enter "SYS PS"

20 Useful Script Files:

`startlp.g`
: Gulam script file to start the background spooler. This runs the SPOOLER.PRG as a background process.

`pr.g`
: This Gulam script file will copy the file(s) on it's command line to the MX2 spool directory than start the SPOOLER.PRG if it has already been run as a background process.

`go.g`
: Gulam script file will start a background shell that uses the AUX port for I/O.

21 Design and Implementation:

MX2 is not a CLI shell. It provides a platform for system services for a CLI or programs. When MX2 boots it looks for CLI.PRG in its directory. If it exists it will be run as an Interactive Process as the command shell.

22 Setup:

First create a directory \MX2, Move the MX2VX.X.X archive into this directory. Unarchive the main archive. The source.arc and tdilib.arc file may be placed into separate directories and unarchived. You MUST have a copy of GULAM.PRG for the SHELL. It is included with the main archive. Start the MX2.PRG causing the CLI.PRG will load and be ready for user login into the system.

I have included a few batch files to set up and to help run a CLI in background to the RS232 port. Please let me know of any fixes that you come up with or improvements.

HOME PHONE 619-584-0281 San Diego CA. 5PM-10PM Please.

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