EMAS 2900 OPERATIONS NOTE

No: 1
Date: 7/3/78

Messages from Oper to Executive and User Processes

Currently during an EMAS session, three executive processes are created, namely "DIRECT", "VOLUMS" and "SPOOLR".

DIRECT performs the following functions:

1. file system maintenance
2. checking of log-in messages from the network
3. creation of other processes
4. dispatch of operator messages and broadcast messages to other processes

VOLUMS performs the following functions:

1. back-up
2. archive
3. reload of files from back-up and archive, and from System 4 tapes

SPOOLR performs the following functions:

1. queueing and dispatch of files from user processes destined for local or remote output devices, or for batch execution locally or remotely
2. scheduling of batch (background) jobs for local execution
3. receipt of files for local users or for local execution from local or remote devices

These three executive processes require to handle arriving request messages "on demand", i.e. they request a message ("POFF"), go to sleep if there isn't one, and take the next one if there is. These processes are said to require their messages "synchronously", and the special message forms

D/<message>	(for DIRECT)
V/<message>	(for VOLUMS)
S/<message>	(for SPOOLR)

are designed to supply <message> to the process on a "synchronous" service number.

Messages from the Oper to other processes, however, need to operate in an essentially asynchronous manner, and are therefore sent on a separate "asynchronous" service number, which is used when an "n/<message>" is typed

(e.g. 5/ST). Unlike the System 4 implementation, however, text messages are not sent using n/<message>, but via facilities in the executive process DIRECT: SET MSG, SEND MSG, BROADCAST and MSG<username> (see below).

The special Director functions, e.g. ST, XST, are requested using n/<message>. These asynchronous messages may also be sent to the executive processes if necessary, but asynchronous messages other than the ones listed below will simply be echoed with a question-mark by any process, with no other effect.

Text messages from Oper to user processes

D/SET MSG

This causes further input to DIRECT to be concatentated into a stored string. Input is terminated by a ":" (colon) on a line by itself, or after the 255th input character. When the ":" is typed, the stored string is played back on the Oper.

D/BROADCAST

This causes the stored message (see SET MSG) to be broadcast to all processes started from interactive terminals.

D/SEND MSG <username>

This sends the stored message (see SET MSG) to the user specified (if the process was started from an interactive terminal).
[Not implemented at 7th March 78.]

D/MSG <username>

This causes the next line typed to be sent as a text message to <username>.

In the last two cases, the message will be sent to <username> even if he is not logged in, but a flag 61, "Process not available", result is given. Later versions of the Subsystem will be able to pick up stored messages at process start-up.

Special Director asynchronous messages

n/ST

This causes process n to be stopped when Director for process n is next uninhibited. This is a "safe" way of killing a process, viz files and i/o streams are properly disconnected. It should normally be "immediately" effected. The process "FAILS 14".

n/XST

This causes the process to be killed instantaneously. This is potentially dangerous, as Director procedures may currently be updating a file index, for example. This should only be used if n/ST is patently having no effect. The process "FAILS 13".

The remaining asynchronous messages are for diagnostic purposes:

n/CMP

This prints the "master page tables" on the main log.

n/DIRMON i j

This sets the Director monitor variables DIRMON, DEPTH to i, j respectively.

(0 0 means "off".)

n/SIGMON i j

This sets the Director monitor variables SIGMON, MONITORING to i, j respectively.

Bits in the SIGMON word have meanings associated with the following values:

Bit-values	Action
1	print monitor
2	print string describing contingency
4	print dump of stack
8	print dump of gla
16	print master page
32	dump code around PC
64	print regs at contingency

MONITORING=1 causes PONs, POFFs, OUTs etc from the process to be monitored on the main log.

(0 0 means "off".)

General

D/PROMPT

This causes the DIRECT process to prompt for further input. The prompt is "DIRECT:". The "D/" may then be omitted from further input, and the "COMMAND" key should not be pressed.

PROMPT 0

to DIRECT causes the "DIRECT:" prompt to be removed.

D/CLOSE

This stops DIRECT, VOLUMS and SPOOLR.

J.K. Yarwood

EMAS 2900 OPERATIONS NOTE

No: 2
Date: 5/9/79

Operation of a Card Punch Under EMAS 2900

It is normally necessary, when card punch output is being produced, for operator intervention between the punching of each file. This is because it is not always possible to tell where one punch file ends and the next begins. To alleviate the problem, EMAS 2900 uses the card punch in the following way.

Before a card output file can be punched, the operator must give the SPOOLR command

S/START CP0

This means that after each file output the card punch will stop - it will not go on to the next file. Also, at this point (i.e. after the file has been punched), SPOOLR will display a line of the following form on the OPER:

CP0 username filename size delivery

e.g. CP0 ERCC20 CARDOUTP 3K Room_2020_JCMB

The cards should then be removed from the card punch hopper, and the operator should either interpret the first card in the pack or write on the first card the information displayed on the OPER.

The cards are punched as follows:

Card 1	username filename delivery date time
Card 2	first line of file
.	
.	
.	
Card n-1	last line of file
Card n	as Card 1

Note that the date and time on the first card is the date and time at which the file was sent for punching, not the date and time it was punched.

W. Laing

No: 3
Date: 13/2/80

Automatic Issue of OPER Commands

At System start-up, and on command D/AUTOFILE at the OPER console, the DIRECT process attempts to connect a file of operator commands of the form D/<text>, V/<text> or S/<text>, each preceded by a time-of-day in the form hh.mm representing the times at which the commands are to be actioned. This Note describes the detailed operation of the scheme.

1. Default filename

At start-up the System attempts to connect the file MANAGR.AUTOFILE as the default file of commands. There is no message if the file cannot be found or is not permitted to DIRECT. Use of this default filename is inhibited by:

(a) previously destroying the file or withdrawing its permission to DIRECT, or
(b) giving command D/AUTOFILE 0 before the file system consistency check is complete, or
(c) giving command D/CLOSEUSERS before the file system consistency check is complete.

2. Assigning a file as the command file

To assign a file as the command file, or to re-assign the default or other command file, the command D/AUTOFILE is given at the OPER. The prompt "Give Auto-filename:" appears, and the next input line should be a "6.11-character" filename. For example:

```
MANAGR.AUTOFILE1
```

The effects are as follows:

* the file currently being used as a command file (if any) is disconnected
* the specified file is connected in read-mode if possible
* the relevant start-point in the file is found, as described below ("Description of operation")
* commands up to the current time are actioned

Possible responses are:

0	successful
32	file does not exist or no access permission
33	mode conflicts with a current connect mode
37	owner not found
89	invalid file

3. De-assigning the command file

The current command file is disabled by:

(a) D/AUTOFILE 0
or (b) D/AUTOFILE

which disconnects the current file and attempts to connect the file given in response to the "Give Auto-filename:" prompt.

4. File format

The file must be a character file conforming to the Edinburgh Subsystem conventions, otherwise the D/AUTOFILE command gives the result 89. Lines of the file which are to be recognised by the AUTOFILE scheme must have a time-of-day in the form hh.mm as the first five characters. All other lines are ignored. The times specified must be in the range 00.00 to 23.59; lines commencing with "times" outside this range are ignored. The times must be in ascending order, though several consecutive (non-ignored) lines may have the same time. If a line is incorrectly placed, result 89 is given by the D/AUTOFILE command. The file contents are ignored.

The rest of a line having a time as its first five characters may be:

(a) a command to DIRECT, e.g. D/USERS 30
or (b) a command to VOLUMS, e.g. V/REQLIST
or (c) a command to SPOOLR, e.g. S/BATCHSTREAMS 2
or (d) a marker line, IPL point (see "Description of operation", below)

Spaces following the time are ignored. Multiple spaces in the rest of the line are treated as single spaces. In marker lines only the characters "IPL" are significant. Commands should be in upper case. Lines not conforming to the descriptions (a) - (d) above are otherwise ignored.

Note that it is not currently feasible (for example) to initiate backup in VOLUMS, because there is no way of supplying data to the VOLUMS prompt in response to the V/BACKUP command. Methods could obviously be developed.

5. Description of operation

When a file becomes assigned as the auto-command file, either at System start-up or at a successfuL D/AUTOFILE command, the file is searched from the end to find the most recent "IPL point" marker line (if any) whose time is earlier than the current time of day. Commands from that IPL point (or beginning of file) up to lines timed not later than the current time are immediately actioned. Each command is reported in two lines output at the OPER. For example:

```
1/ Auto-file command:
1/ S/BATCHSTREAMS 1
```

Thereafter as the time-of-day reaches the time of the next command (or commands), each command is executed, with the above two-line report on the OPER. At midnight a new pass of the file commences.

6. Example of an auto-command file

```
00.00  IPL point (redundant)
00.00  D/SCARCITY 20
00.00  D/PREEMPTAT 30
00.00  S/BATCHSTREAMS 1
  :
  :
12.00  IPL point              System development
12.00  D/SCARCITY 20
12.00  D/PREEMPTAT 30
  :
14.00  S/BATCHSTREAMS 1
  :
17.00  IPL point              System development
17.00  D/SCARCITY 20
17.00  D/PREEMPTAT 30
18.00  S/BATCHSTREAMS 1
```

J.K. Yarwood

EMAS 2900 OPERATIONS NOTE

No: 4
Date: 14/04/80

Commands to OPER in SUP26C

A picture may be displayed on a screen with the command

```
P  picture  screen
```

where picture may be

```
L   OPERLOG
P   Process List
S   SPOOLR's picture
V   VOLUMS's picture
```

and "screen" is the number of the screen. The PGF and PGB keys on the keyboard apply to the interactive screen (0) only. A picture on another screen can be paged forwards and backwards with the commands

```
F   screen
and
B   screen
```

Notes

1. All OPER stations are treated equally; the concept of MAINOP disappears.

2. To display a SPOOLR picture it is necessary to do both

```
S/...
and
P  S  screen
```

   Similarly for a VOLUMS picture.

A. Gibbons

EMAS 2900 OPERATIONS NOTE

No: 5
Date: 14/04/80

Commands to GPC in SUP26C

1. GPC QS dev

where dev is a device mnemonic, gives the status (i.e. NOT ALLOCATED or READY or REQUEST FIRED or SENSE FIRED or QUEUED or DISCONNECTED) of the device.

2. GPC ?

gives the status of all the GPC devices.

3. GPC CDS dev on/off

where dev is a device mnemonic and on/off is either ON or OFF, is used to connect or disconnect a device (strictly speaking a stream). A device may be disconnected from one GPC and connected on another. Only devices which are NOT ALLOCATED can be disconnected, and only devices which are DISCONNECTED can be connected.

Notes

1. When an LP is connected, the repertoire indicated by the thumbwheel settings is loaded. Thus

```
CDS OFF
CDS ON
```

can be used to change the repertoire.

2. In the case of magnetic tapes, the lowest mnemonic in a cluster (stream) should be specified. The whole cluster is disconnected and connected.

3. CDS may be used only on devices known to the system at IPL time, i.e. these given by

```
GPC ?
```

A. Gibbons

EMAS 2900 OPERATIONS NOTE

No: 6
Date: 24/4/81

CHOPSUPE and Supervisor OPER Commands

Note: Where a numeric parameter is required in the following commands, it may be specified in one of two ways: as a decimal number, e.g. 123, or as a hexadecimal number, in which case it is preceded by the letter 'X', e.g. X400.

CHOPSUPE Commands

(i) PON dsno dact p1 p2 p3 p4 p5 p6

PON a record to dsno<<16! dact with parameter 'p1' and optional parameters 'p2'.....'p6'. Unspecified parameters are not zero!

(ii) SRCE srce

Set the SRCE parameter in future PONs (see (i)) to 'srce'. (SRCE will otherwise be the relevant Oper.)

(iii) PLOT tsn file disc page npages (PLOT = Program Load Off Tape)

Load 'npages' of program 'file' from magnetic tape 'tsn' to 'disc' starting at 'page'.

E.g. PLOT MAC002 2 EMAS00 X380 256

(iv) PLOD disc1 p1 disc2 p2 npages (PLOD = Program Load Off Disc)

Copy 'npages' from 'disc1' starting at 'p1' to 'disc2' starting at 'p2'. There are no checks on this command; use with care!

E.g. PLOD EMAS00 X100 EMAS01 0 55

(v) LABEL disc vol

Write the six-character volume label 'vol' to 'disc' defined as its device mnemonic.

E.g. LABEL ED01 EMAS01

(vi) ILABEL disc vol

As LABEL (see (v)) but an IPL bootstrap program is written as part of the volume label.

(vii) FORMAT drive lc uc lt ut

Format the disc on drive 'drive' in standard EMAS format, where:

lc = lower cylinder
uc = upper cylinder
lt = lower track
ut = upper track

Each pair lc, uc and lt, ut may be replaced by -1, meaning format all cylinders or tracks respectively.

E.g. FORMAT ED21 -1 -1 formats the whole disc on ED21.

(viii) GPC text

PON 'text' to the GPC routine.

Text may be one of the following:

a) ?

Give status of all devices.

b) QS dev

Gives the status of the single device whose mnemonic is 'dev'.

c) CDS dev onoff

Where 'dev' is a mnemonic and 'onoff' is either ON or OFF. This configures the device ON or OFF. Only devices which are not allocated may be configured off, and only devices which are disconnected may be configured on.

Notes

* If the device is a tape cluster the lowest deck should be given; the whole cluster is disconnected or connected.

* LPs have their reps loaded when connected; thus CDS OFF followed by CDS ON may be used to reload the rep.

* CDS may not be used on FEPs (except when they have gone down), as these cannot yet be deallocated.

* The device may be reconfigured to another GPC between a CDS OFF and a CDS ON.

d) CDM ZXn dev

The command CDM is used to configure in to the system GPC attached devices that were not GROPED at IPL time. For each GPC having a spare stream there is a dummy device with a mnemonic of the form ZXn. To configure in say, CP0, CDM is used thus:

GPC CDM ZX0 CP0

If successful the response is: GPC: CP0 ptsm DISCNCTD

Otherwise the response is: GPC ??CDM ZX0 CP0

The device can now be made available to the system with the CDS command (see above).

Notes

* Any ZX device displayed by the command GPC ? may be used for CDM.

* CDM may also be used to configure out devices provided they are disconnected. (i.e. have been CDS'd off.)

* CDM is not available for OPERs or MT devices.

* If the required device is an FEP then the following action should be taken:

```
GPC CDM ZXn FEn
GPC CDS FEn ON
FEPUP n
```

(ix) SLOAD fsys page

Load into store and activate the supervisor which starts at 'page' on file system 'fsys'.

E.g. SLOAD 0 X40

(x) DUMP tsn disc npages

Copy 'npages' of 'disc' starting at page 0 to file 1 on magnetic tape 'tsn'.

E.g. DUMP JM0001 EMAS00 X400

(xi) PRIME tsn disc npages

Write 'npages' from file 1 of magnetic tape 'tsn' to 'disc', starting at page 0.

(xii) POFFMON n (0<=n<=1)

If 'n' is zero POFF monitoring is switched off, otherwise it is switched on.

(xiii) KMON serv n (0<=n<=1)

If 'n' is zero then switch off monitoring of kernel service 'serv', otherwise switch monitoring on.

Note that this will not take effect until the kernel is loaded.

(xiv) UNPLOT tsn file disc page npages

As PLOT (see (iii)), but from disc to magnetic tape.

(xv) INH serv

Inhibit service 'serv'.

(xvi) UNINH serv

Uninhibit service 'serv'.

(xvii) DIRVSN n

When director is to be loaded, use version 'n', where 1<=n<=3 (default is version 0).

(xviii) DT date time

Set the date and time, where 'date' is of the form ddmmyy and 'time' is of the form hhmm.

(xix) XDUMP addr len

Print a hexadecimal dump of store from virtual address 'addr' of length 'len' bytes.

(xx) REP at with

Replace the integer at virtual address 'at' with the value 'with'.

(xxi) ISR n

Display the contents of image store location 'n'. Invalid 'n' will cause a System crash!

(xxii) ISW n x

Replace the contents of image store location 'n' with 'x'.

(xxiii) SHOW addr len

Display 'len' bytes of data from address 'addr' (len <= 64).

Supervisor commands

(i) The following CHOPSUPE commands are also available in Supervisor:

PON	SRCE	PLOD	PLOT	GPC	DUMP	PRIME
KMON	UNPLOT	INH	UNINH	DIRUSN	XDUMP	REP
ISR	ISW	SHOW				

(ii) STARTD

Restart DIRECT process after it has failed or been accidentally stopped.

(iii) OPER <text>

Will pass text to the Oper handler; not yet implemented.

(iv) DDUMP label page

Read 'page' from the disc with label 'label' and dump it on the Mainlog in hex.

E.g. DDUMP BUSH20 X800

(v) SLAVES n

Turn all slaves off (n=0) or on (n=-1).

(vi) P ident n

Display picture 'ident' on screen 'n' of the Oper on which the command was entered.

Idents are currently as follows:

P = Process list
L = Oper Log
S = Spooler Picture

'n' (0<=n<=3) gives the screen no, 0 being the interactive screen. If 'n' is omitted 0 is assumed.

(vii) B n (1<=n<=3)
F n

Page the picture currently on screen (displayed by the previous command) Backwards or Forwards by one screenful. Screen 0 is manipulated by the Page Forward and Page Backward keys.

(viii) TRACE

This command is provided to control tracing options in special tracing Supervisors used in research. It has no effect on standard Supervisors.

Dual Supervisors support also:

(ix) OCP n onoff

(where onoff is either ON or OFF) Configures OCP n ON or OFF.

(x) SAC n onoff

Configures SAC n ON or OFF.

(xi) SMAC n onoff

Configures SMAC n ON or OFF.

J. Maddock
P.D. Stephens

—Preliminary—

EMAS 2900: Summary of facilities for controlling interactive access

Control is available to the System Manager under the following headings:

i limitation of maximum numbers of interactive users, both globally and in subgroups based on user identifiers. Process 1, DIRECT, provides the control via the D/USERS command, which has been described in a separate document.

ii limitation of interactive session length (clock time). A default of infinity applies unless the D/SESSION LENGTH command is used to reduce it. In addition the maximum session length can be set for individual users by means of the MANAGR command SET SESSION LENGTH. The default or individual setting may be in the range 5 minutes to 4 hours.

iii limitation of OCP time per interactive session. This is not currently implemented, but would follow the pattern of ii above, with a global default, re-settable, and the ability to set specific maxima for individual users.

iv limitation of OCP time per interaction. This also is not currently implemented, and might be based on limitations on calls on DSET IC, relating same to calls on REQUEST INPUT or REQUEST OUTPUT. Satisfactory means of implementation have not yet been proposed.

v limitation of access to the system at times at which resource for interactive computing is deemed to be scarce. A scheme is proposed in a paper (17.11.79) by RR McLeod for the Edinburgh Charging and Allocation Committee. In summary, each user accreditted to the system has a share in the scarce resources; the share units are distributed regularly, and are consumed only during times of scarcity, currently defined simply by a level of interactive use (number of interactive users). Users who currently have no remaining scarce-resource units are denied access to the system at times of scarcity. The accompanying paper gives full details of the implementation.

It is believed that i, ii and v above will form a satisfactory and sufficiently flexible control scheme for the three currently - envisaged installations.

K. Yarwood
5th December 1979

— Preliminary —

EMAS 2900: Director Implementation details for the scarce-resource units scheme

1. Allocation of Units

The Custodians of the scarce-resource units hold a "share-register", being a specification of what proportions of units are to be distributed to faculties, departments, groups of users or individual users. Director procedure DSFI is called, by a privileged program operated by the Custodians, to distribute units according to the register. The DSFI procedure can also be used by a privileged program to assign an individual user to a group-holder of scarce-resource units. The effects of this assignation are as follows:

i when an assigned user is eligible to have his units decremented (viz. during a period of scarcity), units are actually subtracted from his group-holder's total. (The assigned user has no units of his own: the distribution program must ensure that "his" units are given to his group-holder).

ii when an assigned user reads his current unit total, using procedure DSFI (non-privileged entry), the value obtained is the total owned by his group-holder.

In addition, any user (not being an assigned user) may give some or all of his units to any other user using the non-privileged Director procedure DDONATE.

The following details will appear in the EMAS 2900 Subsystem Writer's Manual in due course:

i Extensions to Director procedure DSFI

Type = 33	Get or Set scarcity ration. An integer value is returned or set, respectively being the number of scarce-resource units. The units are notionally 0.01 pence as derived from the installation charging formula. In the case of Get (but not Set) scarcity ration, if the user is assigned to a group-holder of units the value relates to the group-holder's ration. The "Set" option is available only to privileged calling programs.
Type = 37	Get or Set a group-holder to whom USER is (or is to be) assigned. The parameter value is a string (6) <username>. The "Set" option is available only to privileged calling programs. If a USER is already assigned to a group-holder when the "Set" option is called, the old group-holder username is discarded. No user should be assigned to a group-holder username which itself is assigned to a further group-holder username; however, Director makes no check on/

on the data-structure being created, and relies on the Custodians' programs to keep the structure valid.

ii New Director procedure DDONATE

external integerfn DDONATE (string(6) USER, int FSYS, UNITS)

This procedure enables the process owner (provided he is not assigned to a group-holder) to give some or all of his current scarce-resource unit total to any other USER (on disc FSYS) on the system. If UNITS exceeds the process owner's current total then it is limited to his current total. If UNITS is negative the procedure call has no effect. Otherwise UNITS are subtracted from his current total and added to USER's total, or to USER's group-holder's total if USER is assigned to a group holder.

Possible error results: 37, 60.

iii New fields in the user-information-segment, record format UINFF (available on the 2970 in file DIRARC.CFILE_UINFF)

SCARCITY	the number of concurrent interactive processes at or above which interactive computing resource is deemed to be scarce.
PREEMPT AT	the number of concurrent interactive processes at or above which users having no scarce-resource units are liable for pre-emption (i.e. automatic logoff) as a result of users logging on who do possess units.
SESSEND	(this field is not related to the subject of this document!). The session-end time (as seconds from midnight) at which the process will be automatically terminated. Zero indicates that there is no specified automatic session-end outstanding for the process. This field is set only at process start-up, according to the default or individual maximum session length setting for the process. (It will not be reset if a process becomes eligible for pre-emption during a time of scarcity, nor will it be reset if a system-close time is specified by the machine operators after the process has started). SESSEND will be set to < session length > past midnight if the period from process start-up to session end spans midnight.

RESUNITS/

RESUNITS	this field is always a copy of the process owner's current scarce-resource units total (or that of his group-holder if he is assigned to one).

2. Consumption of Units

A number of concurrent interactive users (by default being "large") is taken to define a level at and above which interactive computing resource is deemed to be scarce. At and above this level, each current user's scarce-resource units are decremented (but not below zero) according to the installation charging formula. This applies both to batch and interactive sessions. The number of interactive users defining scarcity may be re-set by the DIRECT command

D/SCARCITY n

3. Control of Access to the System

Interactive resources are deemed to be scarce if the number of interactive processes equals or exceeds a value, n, "large" by default and re-settable by the DIRECT command D/SCARCITY n.

When a user attempts to log on, following the checks against restrictions of users belonging to specified groups the scarce-resource tests are performed as follows:

i If resources are not currently scarce, log-on is allowed whatever the user's (or his group-holder's) scarce-resource unit total. However, if his total is currently zero, his process is marked for possible pre-emption as described below.

ii If resources are currently scarce and the user has no scarce-resource units, the log-on is rejected with the message "NO RESOURCE".

iii If resources are currently scarce and the user has scarce-resource units, the log-on is allowed. In addition, if the current number of interactive processes exceeds a value, n, "large" by default and re-settable by the DIRECT command D/PRE EMPT AT n, then the oldest process if any is marked for pre-emption as described in i above, and that process is terminated in about 6 to 8 minutes, with 5 and 2-minute "END OF SESSION" warnings.

Initiation of batch jobs will be subject to the following additional controls (implemented by SPOOLR):

i no jobs with priority less than HIGH will be initiated at times of scarcity.

ii no jobs will be run at times of scarcity for users whose scarce-resource units (or those of his group-holder) are zero.

K. Yarwood
5th December, 1979