No: 1
Date: 27/3/78

Design Aims and Philosophy

These notes are a description of the design aims and philosophy behind the Spooler process (SPOOLR) for EMAS 2900. They are intended as discussion notes for the EMAS 2900 team although they may be used to gain an overall impression of the facilities which will be provided by SPOOLR. Many points may change in detail but few should change in principle.

Contents

Relevant Papers

Director: Starting Batch Jobs

Communications: EMAS 2900 Communications Design and Implementation Notes

0. Introduction

The Spooler executive (SPOOLR) is a privileged System paged process which is automatically started by the System after an IPL. SPOOLR maintains a File Index on each of the on-line file system devices. In these Indexes it keeps queues of batch jobs to be run, and queues of files to be output to local peripherals and remote job entry (RJE) stations.

The facilities provided by Spooler include the control of local slow peripherals and communication with the Front End system to handle remote traffic. It accepts card, paper tape and RJE input to the System and carries out the spooling of all output to line printers, card punches, paper tape punches and RJE stations. It also controls the queuing of batch jobs, either detached from interactive terminals or entered on cards or from RJE stations.

1. Definitions

Document

A unit of spooling comprising control information and a file. Each document has a unique identifier. All references to documents are via their identifiers.
Note that the Spooler is not interested in the contents of the file, only in the control information.

Document Scheduling Parameters

The items in the control information which is part of each document. This information describes the document, e.g. its size, where it is going, where it came from.

File

In the context of the Spooler's work, various types of file, and documents without control information, are identified; e.g.:

* A job file, containing a complete batch job to be processed.

* A listing file, for example to be sent to a line printer.

* A file of binary data, for example containing graph plotter output.

Queue

A set of documents, ordered by priority, and size or time within priority levels.
Queues are served by streams (see next definition).

Streams

A communications path to a specific destination or from a specific source. Four types of stream are identified:

* Streams to local and remote peripherals (i.e. output communications streams)

* Streams from local and remote peripherals (i.e. input communications sreams)

* Batch job streams

* Streams to processes which receive queued files, e.g. JOBBER

Documents are received by SPOOLR on input streams and are put into queues, as determined by their scheduling parameters. Each such queue (e.g. a line printer queue) can be serviced by several streams (e.g. a stream for line printer 0, a stream for line printer 1, etc.). Whenever a queue contains a document appropriate to a stream currently inactive, SPOOLR activates the stream to deal with the document.
Streams are "queue servers".

Document Control Language

This language enables control to be exercised over documents after they have been queued.
Available to: Mainframe Operators
Remote Operators
Users

Each of these groups has different access.

Spooler Configuration

This is a file set up by the System Manager to define queues, streams, their attributes, the connections between them, etc. It is read by Spooler at each IPL to construct its tables and queues.

Operator Commands

These are commands available to local and remote operators for controlling streams.

2. Structure

A document and its descriptor, which is constructed from the document scheduling parameters, is held in the file system from which it originated.

Each queue is a linked list of document descriptors. After a System crash the queues can be completely rebuilt from the document descriptors.

When a document is placed in a queue all of the streams which serve this queue are searched, and if one is idle it is kicked to start the stream to serve the queue. If none is idle the document is just queued.

At Spooler start up, depending on the default status of the streams (either open or closed), the local streams are kicked or left idle. If the stream is to or from a remote device it is idle until the RJE terminal logs on, and is accepted or rejected depending on the status of the stream (either open or closed).

Batch streams are idle until process 1 (DIRECT) requests a number of batch streams to be started.

Streams which give documents to other processes, e.g. Jobber, are idle until such a process starts and requests a document.

Streams have default attachments to queues, but these may be changed dynamically. For example, if the local line printer is down it may be useful to serve the 'LP' queue with a remote line printer stream. When a document enters the Spooling system it acquires a unique identifier. This identifier consists of the file system number on which it is queued and a number in the range 1 to the number of descriptors held per file system. All subsequent references to the document are made using this unique identifier, which never changes.

All data transfers take place directly between files and a) devices on communications streams, b) batch jobs, or c) file processors (e.g. Jobber).

3. Input of Documents

Documents are input in two ways to the Spooler:

1) From other processes running in the EMAS 2900 System. These input documents are sent by users to the Spooler, either to be queued for batch execution, queued for printing or queued to be sent to an RJE.

2) From input communications streams. These documents come from local card readers, local paper tape readers, etc, or from RJE stations. They are dealt with according to their control parameters. They may be batch jobs for execution, files to be read into the file system, or files to be queued for printing or for output on another stream.

4. Output of Documents

Documents for output or execution are queued before being served by a stream. Queues are served by streams of three types:

1) Send File (Device type)	Sends a file to a local or remote device.
2) Start Process (Job type)	Initiates a batch job to process the document.
3) Give to Process (Process type)	Sends a file to a process which requests documents.

These queue servers only take files from queues when the server's parameters match those of the document to be handled. For example, the cpu time required by a job must be less than or equal to the current maximum on that stream; similarly with priority.

The 'Device Type' stream interface (type 1)

This uses the Communications Controller commands, i.e. CONNECT STREAM, ENABLE STREAM, etc. See the document "EMAS 2900 Communications Design and Implementation Notes".

The 'Job type' stream interface (type 2)

Batch input

The message to start a batch job is of the following structure:

```
integer DEST, SRCE, IDENT, FSYS, string (11) SPOOLR FILE
```

Contents of SPOOLR FILE:

```
VSN          integer
FSYS         integer
USER         string (6)
BACKPASS     string (6)
IDENT        integer
INST CNTR    integer
FILENAME     string (31)
OUTDEVICE    string (15)
```

The reply is of the form:

```
integer DEST, SRCE, IDENT, FLAG

FLAG:   1 - SYSTEM FULL
        2 - INVALID USERNAME
        3 - INVALID PASSWORD
        4 - ALREADY LOGGED ON
        5 - CANNOT START PROCESS
        6 - WORK FILE FAILURE
        7 - NO USER SERVICE
        8 - SPOOLR FILE NOT AVAILABLE
```

When a batch job stops, a message is sent to Spooler from process 1 (DIRECT):

```
recordformat DEST, SRCE, integer ID, CONCURR, MOREJOBS, REASON
```

CONCURR = Number of processes still running with username.
MOREJOBS = Number of batch process to be started.

Note that if ID=-1, only MOREJOBS is relevant.

The 'Process type' stream interface (type 3)

a) REQUEST — Process asks Spooler for next file in specified queue. Spooler replies when it has a file to send:

```
REPLY   name of file
```

b) FINISH — Process replies that it is finished with file.

c) REQUEUE — Process requests spooler to requeue file.

5. Controlling Spooler

There are four ways of controlling the Spooler process. These are more fully described in sections 6 to 9, but a brief explanation is given here.

1) Configuring Spooler

Each time the Spooler is started, a configuration is read in which defines the queues and streams to be used. This configuration is normally defined by each installation's System Manager.

2) Document Scheduling

Each time a document is sent to the Spooler, either from a process or on an input stream, parameters describing the document must be supplied. They are used to schedule the document, and are equivalent to the information found in the JOB card of other systems.

3) Document Control Commands

These commands are available to display the status of documents and allow their parameters to be changed once they are in the Spooling system. For example, a command is available to delete a queued document. There are different classes of access to documents for mainframe operators, remote operators and interactive users. It is also possible to enquire (for a limited period) about documents after they have left the Spooling system.

4) Operator Commands

Mainframe and remote operators require commands to control the streams in which their documents are being handled. Mainframe operators also require facilities to accept and refuse RJE log-ons.

6. Spooler Configuration

The Spooler configuration is an installation-dependent file of parameters which specifies to the Spooler which queues it has to maintain, the default parameters for documents put into these queues, and the streams which are to serve these queues. Streams are of various types: input and output communication streams to local peripherals, input and output streams to Remote Job Entry stations, streams to start batch jobs, and streams to send documents to other processes (e.g. JOBBER).

Queues are specified by giving them a name and a specification of default parameters for documents to be placed in that queue.

Examples

1) Defining a line printer queue:

```
QUEUE = LP              ! The queue is to be known as LP.

USER = SPOOLR           ! Documents which do not have USER specified are
                            to be known as SPOOLR documents.

DELIVERY = SPOOLED OUTPUT ! Documents with no delivery set are to
                            have this delivery.

START = 32              ! Byte in file at which output is to start (by
                            default).

PRIORITY = 1            ! The default priority of the document.

TIME = NA               ! This is not applicable to a line printer queue.

FORMS = 0               ! Default forms required.

MODE = ISO              ! Default output mode.

COPIES = 1              ! Default number of copies to be output.

RERUN = YES             ! Default is to reprint document if caught in a
                            System crash.
```

2) Defining a local line printer stream:

```
RMT = LOCAL          ! Location of device.

STREAM = LP0         ! Name of device.

STATUS = OPEN        ! Default status of device at SPOOLR startup.

NAME = X'06000000'   ! Adaptor no.: (dev type)<<24 ! (dev no.)<<16
                       etc.

QUEUE = LP           ! Queue to be served.

LIMIT = 256          ! Maximum size of document to be accepted, in
                       kilobytes.

FORMS = 0            ! Default forms type in printer.

MODE = ISO           ! Default output mode.

LOWEST PRIORITY = 1  ! Lowest document priority to be accepted.

TYPE = DEVICE OUTPUT ! Type of stream.
```

Note: Streams only accept documents when

STREAM LIMIT $\geq$ DOCUMENT LIMIT (SIZE or TIME)

and LOWEST PRIORITY $\leq$ DOCUMENT PRIORITY

and STREAM FORMS = DOCUMENT FORMS

and STREAM MODE = DOCUMENT MODE

Similar queues can be defined for batch jobs and documents queued for handling by other processes.

There are three types of output stream which can be defined:

1) DEVICE (document sent to a device)

2) JOB (document input to a batch process started)

3) PROCESS (document input to a running process, i.e. JOBBER)

Other parameters specified in the Spooler configuration include the number of documents which can be simultaneously queued and the number of document descriptors to be held per file system.

7. Document Scheduling Parameters

These are set by the user when he sends his document to be put into a Spooler queue or read into a file. Not all of these parameters are relevant for all queues, and defaults are supplied by the installation for each parameter where relevant.

Name	Use
USER	Name of the user owning the document.
PASS	Background password of user.
DEST	Name of queue or file the document is destined for.
SRCE	Name of file or device the document came from.
TIME	Cpu limit in seconds if document is a job.
DELIV	Delivery information of output from job or of file being output.
PRIO	Priority at which document is to be queued.
COPIES	Number of copies of document to be output.
FORMS	Form type required for output.
MODE	Mode of output: ISO, EBCDIC or BINARY.
ORDER	Order of job execution. Job run after all jobs for this user with value of ORDER < current run.
START	Byte in file at which output is to start.
LENGTH	Number of bytes to be output.
RERUN	Specifies whether document to be re-queued if caught in a System crash.
TAPES	Number of tapes required by the job.
DISCS	Number of discs required by the job.

Queue names are distinguished from filenames by their first character being a full stop.

Examples of document scheduling parameters

1) Sending a file to the line printer queue .LP:

```
DEST=.LP, USER=ERCC20, SRCE=LISTFILE, START=32, LENGTH=7194, DELIV=ERCC
```

2) Detaching a job to the batch job queue:

```
DEST=.BATCH, USER=ERCC20, SRCE=JOBFILE, TIME=75
```

When Documents are input from local or remote peripherals, the document scheduling parameters must be distinguished from the document. This is done by starting each line containing document scheduling parameters with //DOC and terminating the document with //DOCEND.

Example

Inputting a file to be listed on the line printer.

```
//DOC DEST=.LP, USER=ERCC20, DELIV=FRONT DOOR
    <file to be printed on the line printer>
//DOCEND
```

8. Document Control Commands

Once documents are queued by the Spooler for execution or for output, it is necessary for local (i.e. mainframe) operators, RJE operators and interactive users to be able to control the documents in the queues and enquire about their status. Below are described a set of commands to facilitate this. There are three classes of access to these documents:

1) Mainframe operators: complete access.

2) RJE operators: read access to all queues, but can only change documents queued for their RJE or sent from their RJE.

3) Users: read access and change access to their own documents only.

Commands	Params
COUNT	<rje><queue><docs>
FIND	<rje><queue><docs>
DISPLAY	<rje><queue><docs>
RUSH	<rje><queue><docs>
HOLD	<rje><queue><docs>
RELEASE	<rje><queue><docs>
DELETE	<rje><queue><docs>
MOVE	<rje><queue><docs> TO <rje><queue>
PRIORITY	<rje><queue><docs><numeric>
COPY	<rje><queue><docs> TO <rje><queue>
ROUTE	<rje><queue><docs> TO <rje><queue>

If command comes from

1) Mainframe operator: nothing is done

2) RJE operator: <rje> is set

3) A user: <username> is set

where:

<rje> = <rmtname> / <>

<queue> = <queuename> / <>

<docs> = <ident> / 'ALL' / <username>'.'<ident> / <>

Commands	Use
COUNT	Count all documents as specified by params. E.g.: 1) COUNT RMT25 counts all documents queued for RMT25 2) COUNT RMT25 BATCH counts all documents owned by RMT25 in batch queue 3) COUNT RMT25 BATCH ERCC20 counts all documents sent by RMT25 into the BATCH queue for user ERCC20.
FIND	Give summary of specified document.
DISPLAY	Display all information about documents as specified by parameters.
RUSH	Rush the document to the head of its queue.
HOLD	Hold the document specified in the queue.
RELEASE	Release the document specified from the held state.
DELETE	Delete the documents as specified.
MOVE	Move the documents specified to another queue.
PRIORITY	Set the priority of the documents specified.
COPY	Put copy of the documents specified in another queue but also leave them in the current queue.
ROUTE	Set the destination of output from a batch job.

9. Operator Commands

Some commands are available only to the mainframe operator, e.g. the accepting or rejecting of RJE log-ons, but other stream control commands are available to remote and local operators. Remote operators can only control streams connected to their RJE.

Mainframe only commands

Command	Parameters	Use
ACCEPT	<rje> or ALL	Allow RJE(s) to log on.
REFUSE	<rje> or ALL	Prevent RJE(s) from logging on.
WINDUP	<rje> or ALL	Allow current transaction to complete and log off RJE.
ABORT	<rje> or ALL	Log off RJE without finishing current transaction.
BROADCAST	<message>	Send message to all currently logged on RJEs.
NOTICEBOARD	<message>	Set message to be sent to all RJEs at log on.

Device commands for all operators

<device> = <RJE>'.'<devicename>/<devicename>

<device> FORMS = n <device> LIMIT = n <device> PRIORITY = n	Set device/stream characteristics.
<device> TO <queue>	Start device serving specified queue.
<device> ?	Find status of device.
BACKSPACE <device> FORWARDSPACE <device> INTERRUPT <device> RESTART <device> CONTINUE <device>	Device control commands not relevant to all devices.

W. Laing

Finding out about Spooler's Configuration from a Subsystem

To find out which queues are available to a Subsystem a file belonging to Spooler called SPOOLR.CFILE must be connected in read shared mode, with the file system number specified as -1. File "CFILE" has a standard Edinburgh Subsystem header with the last two type-dependent words specifing the number of Spooler's queues and the number of Spooler's streams. The format of the file header is defined below.

Spooler has this file connected in write mode with read access permitted to all users. Therefore it should be borne in mind that some of the values in this file are constantly changing. Two IMP record arrays are maintained in this file, one describing the queues in the spooling system and the other the streams managed by the Spooling system.

Relevant record formats and sizes

1. File header format. Size 32 bytes.

```
recordformat FHF(integer END, START, SIZE, TYPE, SPARE, c
   DATETIME, QUEUES, STREAMS)
```

START — specifies the number of bytes from the start of the file at which the record array describing the queues starts. The record array describing the STREAMS starts after the queues array, i.e. (START + QUEUES*QUEUE ENTRY SIZE) bytes from the start of the file.

QUEUES — specifies the size of the record array describing the queues in the configuration.

STREAMS — specifies the size of the record array describing the streams in the configuration.

2. Queue entry format. Size 128 bytes.

```
recordformat QUEUEF(string(15) NAME, c
   byteintegerarray STREAMS(0 : 15), c
   string(7) DEFAULT USER, c
   string(31) DEFAULT DELIVERY, c
   integer DEFAULT START, DEFAULT PRIORITY, DEFAULT TIME, c
   DEFAULT FORMS, DEFAULT MODE, DEFAULT COPIES, DEFAULT RERUN, c
   LENGTH, HEAD, MAX LENGTH, MAX ACR, SPARE2, SPARE3, AMOUNT)
```

NAME — specifies the name by which the queue is known.

STREAMS — specifies the streams which are serving this queue. If an element in the array is non zero it contains a stream number i.e. an index into the stream record array.

DEFAULTS — various default values a document is given when added to the queue if they are not already specified.

LENGTH the current number of entries in the queue.

MAX LENGTH the maximum length to which the queue is allowed to grow.

MAX ACR the maximum ACR level at which a user process can be and still be able to access the queue.

AMOUNT the total amount, i.e. bytes or seconds, currently queued. If DEFAULT TIME <= 0 then the amount is in bytes, otherwise the amount is in seconds.

3. Stream entry format. Size 80 bytes.

```
recordformat STREAMF(string(15) RMT, DEVICE, c
   integer STATUS, NAME, QUEUE, LIMIT, c
   byteinteger FORMS, LOWEST PRIORITY, HEADER TYPE, c
   HEADER NUMBER, integer SPARE1, COMMS STREAM, SECTION, c
   BYTES SENT, BYTES TO GO, SERV ROUT, DOCUMENT)
```

RMT the location of the device or batch stream.

DEVICE the name of the stream.

STATUS the current status of the stream:

0 - CLOSED
1 - OPEN
2 - IDLE
3 - ACTIVE
4 - CONNECTING
5 - DISCONNECTING
6 - ABORTING
7 - SUSPENDING

NAME is only relevant for input or output streams. NAME is derived from three numbers:

1. DEVICE TYPE<<24
2. DEVICE NUMBER<<16
3. EXTERNAL STREAM NUMBER if DEVICE TYPE is a Front End.

Device Types:

3 - Card Punch
4 - Card Reader
6 - Line Printer
14 - Front End Processor

QUEUE the queue number which this stream is attached to, unless it is an input device, when the queue number specifies the output queue for that input device.

LIMIT the current limit on that stream, i.e. in Kilobytes or Seconds.

FORMS the current forms type selected.

LOWEST PRIORITY the lowest priority of document which the stream will currently handle.

HEADER TYPE the type of banner generated if the stream is an output device:

0 - NONE
1 - LINE PRINTER
2 - TAPE PUNCH
3 - CARD PUNCH

COMMS STREAM the communications stream currently allocated to the stream if the stream is an input or output device.

SERV ROUT specifies the type of stream:

0 - Output Device
1 - Input Device
2 - Job, i.e. batch job
3 - Process, i.e. JOBBER, JOURNL

DOCUMENT if non-zero, specifies the current document being handled by the stream. It is interpreted in the form FSYS<<24!DOC NO, expressed as a six-character string "nndddd", with "nn" in the range 00 - 99 and "dddd" in the range 0001 - 9999.

W. Laing

EMAS 2900 SPOOLER NOTE

No: 4
Date: 20/10/79

Spooler Information Facilities for Subsystems

This is a brief description of how a subsystem writer can provide

(a) commands to find out about documents queued by SPOOLR, and

(b) commands to delete queued documents

There are currently three commands which can be issued by a subsystem:

QUEUE queuename, filename

DELETE document identifier

FIND document identifier, filename

where underlined parameters are obligatory.

These commands should be sent to SPOOLR using the DMESSAGE procedure. In the message string they must be preceded by "COMMAND ". For example:

```
MESSAGE = "COMMAND QUEUE BATCH,".BFILE
LEN = LENGTH(MESSAGE)
ERR = DMESSAGE("SPOOLR",LEN,1,-1,ADDR(MESSAGE)+1)
```

(See the EMAS 2900 Subsystem Writer's Manual, Appendix 1, for details of DMESSAGE.)

Other examples of messages which could be sent to SPOOLR via DMESSAGE:

COMMAND QUEUE ,FRED

COMMAND DELETE 010236

COMMAND FIND 020937,FRED

The general error flags which may be returned by these calls are:

201 Bad Params

214 Command Not Known

The parameters given should be of the form:

queuename — The name of a SPOOLR queue, i.e. up to fifteen characters long, not preceded by a "."

filename — A valid EMAS 2900 file name

document identifier — A six character numerical identifier, of which the first two characters specify the caller's file system.

Some comments about these commands:

QUEUE

This command returns information described below about all of the files a user has in SPOOLR's queues or in a particular queue. The filename specified is created in the callers file index and should not already have existed. Its format is described below. If the queue specified does not exist the effect is as if the caller had no files in the queue. The error flags returned by this command are:

15 No Free File Descriptors

16 File Already Exists

17 Insufficient Free Cells

18 Bad Filename

236 SPOOLR File Error

DELETE

This command takes only one parameter: a document identifier. The document specified must be in a queue for this command to take effect. For example, a job in execution or a file currently being printed cannot be deleted. The result of calling this command is passed back in the flag from DMESSAGE. The error flags returned by the command are:

205 Document Not Queued

213 Invalid Descriptor

236 SPOOLR File Error

FIND

This command takes two parameters both of which are mandatory: a document identifier and a file name. The comments about the filename given under the command QUEUE also apply here. The document descriptor may refer to a document which is not currently in a queue; for example, the document may be being executed or may have been deleted. This command currently can trace the last 1000 documents on each file system. The error flags returned by the command are:

15 No Free File Descriptors

16 File Already Exists

17 Insufficient Free Cells

18 Bad Filename

213 Invalid Descriptor

236 SPOOLR File Error

File returned by SPOOLR

The file returned by SPOOLR has the standard Edinburgh Subsystem header shown below. Note that if FILE HEADER_START = FILE HEADER_END then the file is empty.

```
%RECORDFORMAT FHF(%INTEGER END, START, SIZE, TYPE, SPARE0, %C
                  DATETIME, SPARE1, SPARE2)
```

The file returned contains (FILE HEADER_END - FILE HEADER_START)//256 entries. Each entry is 256 bytes, in the following format:

```
%RECORDFORMAT INFOF(%INTEGER VSN, STATE, %C
   %STRING (7) IDENT, USER, %C
   %STRING (15) DEST, SRCE, OUTPUT, %C
   %STRING (31) NAME, DELIVERY, %STRING (63) MESSAGE, %C
   %INTEGER DATE AND TIME RECEIVED, DATE AND TIME STARTED, %C
   DATE AND TIME OUTPUT STARTED, DATE AND TIME DELETED, %C
   DATA START, DATA LENGTH, TIME, OUTPUT LIMIT, PHYSICAL SIZE, %C
   PRIORITY, START AFTER DATE AND TIME, AHEAD, %C
   %BYTEINTEGER FORMS, MODE, COPIES, ORDER, RERUN, TAPES, %C
   DISCS, FAILS)
```

where:

VSN — The format version. Currently 1.

STATE — The state of the document. The states are:

0 Deleted
1 Queued
2 Sending
3 Running
4 Receiving
5 Processing

IDENT — The document identifier: two characters specifying the file system and four characters specifying a unique value.

USER — The username of the caller.

DEST — The name of the queue which the document is or was in.

SRCE — The name of the file or remote which the document came from.

OUTPUT — Not currently used.

NAME — The name the user gave to the document.

DELIVERY — The delivery information to be sent with the document when it is output.

MESSAGE — Not currently used.

DATE AND TIME RECEIVED — The date and time at which the document was placed in the queue.

DATE AND TIME STARTED — The date and time at which the document started execution or printing.

DATE AND TIME OUTPUT STARTED Not currently used.

DATE AND TIME DELETED The date and time at which the document was deleted.

DATA START If TIME is zero, the offset from the start of the file of the data which is to be output.

DATA LENGTH If TIME is zero, the number of bytes to be output.

TIME The job cpulimit in seconds.

OUTPUTLIMIT Not currently used.

PHYSICAL SIZE Not currently used.

PRIORITY The current priority of the document. Note that negative values specify that the document is HELD at the modulus of the value given.

1 VLOW
2 LOW
3 STD
4 HIGH
5 VHIGH

START AFTER DATE AND TIME The date and time until which the document is HELD in the queue.

AHEAD The accumulated bytes or seconds queued in front of this document.

FORMS The forms type required by this document.

MODE The mode which the data in the document is in. The values are:

0 - ISO
1 - EBCDIC
2 - BINARY

COPIES The number of copies to be output. Note that 0 means 1.

ORDER The order in which the document is to be removed from the queue, relative to other documents. Only relevant if non-zero.

RERUN Whether the document is to be requeued or deleted if caught in a System crash. 0 - No; 1 - Yes.

TAPES Not currently used.

DISCS Not currently used.

FAILS The number of times the document has failed in execution. Only relevant if RERUN = Yes.

W. Laing

EMAS 2900

SPOOLER 11I

Preview of changes/additions to spooler

Definites

i. Multiple queues served by one stream - the queues will be serviced equally in round robin fashion by the stream (as opposed to the current method of empty first queue, then second etc).

ii. Will allow trailing spaces on final //DOC card for a job.

iii. TAPES=n (where n is number of simultaneous decks required) will have the effect of holding the job and be job marked as a tape job in the batch queue.

iv. S/PRINT will send a copy to JOURNAL.

v. Spooler log will be limited to 128K.

vi. Fast version of Remove Zeros (from Kent) to be incorporated.

vii. Refresh will be removed or handled in a different way.

Possibles

i. S/DISPLAY nnnnnn
also will accept S/DISPLAY <USER>.<JOBNAME> <QUEUE>

John Henshall
4th June 1980

Intended implementation date 1.7.80

Any outstanding urgent requirements?

Mainframe only Spooler Commands

Informative Commands

K.WORD	K.WORD/PARAM
FE	<n(0,99)>
LAST	
NEXT	

Actions Commands (* See also Remote and Mainframe Spooler Commands)

K.WORD	K.WORD/PARAM	K.WORD/PARAM	K.WORD/PARAM
LOGON	< RNAME >	FE<n(0,99)>	< NADD >
LOGOFF	<RA>		
WINDUP	<RA>		
OPEN	TO	< RA >	
CLOSE	TO	< RA >	
TIE	DOWN	< RA >	
SWITCH	{ < RNAME > / { .ALL	TO / FROM	FE<n(0,99)> / FE<n(0,99)>
POLL			
CONNECTFE	<n(0,99)>		
DISCONNECTFE	<n(0,99)>		
SETMSG	<TEXT>|&<TEXT>		
BROADCAST	<RA>		
EOF	< SNAME >		
START	SA >		
STOP	<>|<SA>		
ATTACH	< SNAME >	TO	< QNAME >
DETACH	< SNAME >	FROM	< QNAME >
ABORT *	.ALL		
BATCHSTREAMS *	<n(0,16) >		
SELECT	< IDENT >		
TIDY	FSYS	.ALL |<n(0,99)>	
PRINT	<>|<QNAME>		
MON	< n(0,9)>		
PROMPT	ON/OFF		
CONFIG	<>|< FILENAME >		

Remote and Mainframe Spooler commands

Informative commands

K.WORD	K.WORD/PARAM	K.WORD/PARAM	K.WORD/PARAM
STREAM	<SNAME>		
S	<SNAME>		
STREAMS	<>|<n(0,255)>		
SS	<>|<n(0,255)>		
QUEUE	<QNAME>	<>|<USER>|<n(0,255)>	<>|<n(0,255)>
Q	<QNAME>	<>|<USER>|<n(0,255)>	<>|<n(0,255)>
QUEUES	<>|<n(0,255)>		
QS	<>|<n(0,255)>		
DISPLAY	<DOC>		
BATCHSTREAMS			
REMOTES	<>|<n(0,255)		
RS	<>|<n(0,255)		
REMOTE	<RNAME>		
R	<RNAME>		

Action Commands

K.WORD	K.WORD/PARAM	K.WORD/PARAM	K.WORD/PARAM	
ABORT	<SNAME>			
PRIORITY	<IDENT>|<SNAME>	<PRI>		
LIMIT	<SNAME>	n(0,)		
FORMS	<SNAME>	n(0,255)		
RUSH	<IDENT>			
HOLD	<IDENT>			
RELEASE	<IDENT>			
DELETE	<IDENT>|<USER>.ALL|<QNAME>.ALL	<>|<QNAME>		
MOVE	{ <IDENT>|<QNAME>.ALL { <USER>.ALL	TO <QNAME>	<QNAME> TO	<QNAME>
COPY	<IDENT>	TO	<QNAME>	
OFFER	<QNAME>			
WITHDRAW	<QNAME>			

Note : When issued by a remote operator the 'Action Commands' given above will only be permitted where

i) the Stream<SNAME> is 'owned' by that remote.
or ii) the document<IDENT> either
a) originates from that remote
or b) resides in a queue that is served by a stream 'owned' by that remote.

In the case of MOVE and COPY the receiving queue must be either 'owned' by the actioning remote or the 'owning' remote must have 'OFFERed' the queue.

Note : local line printer is always 'OFFERed' in this sense.

Remote only Spooler Commands

Action Commands

K.WORD	K.WORD/PARAM	K.WORD/PARAM
LOGON	< RNAME >	<PASS >
LOGOFF		
WINDUP		
MSG	< TEXT >	

&	
ON	
OFF	
.ALL	LITERALS
FE	

<RINTEGER>	INTEGER IN A SPECIFIED RANGE
<FILE>	A valid file name
<USER>	A valid user name
<QNAME>	A valid queue name
<SNAME>	A valid stream name
<RNAME>	A valid remote name
<IDENT>	A valid document identifier
<TEXT>	A valid piece of text
<PASS>	A valid remote password
<NADD>	A valid network address
<>	No qualifier

<n(x,y)>	<RINTEGER>
<FILENAME>	<FILE>/<USER>.<FILE>
<SA>	.ALL/<SNAME>
<QA>	.ALL/<QNAME>
<RA>	.ALL/<RNAME>
<DOC>	<IDENT>/<USER>.<FILE>
<PRI>	VLOW/LOW/STD/HIGH/VHIGH

3.4 Spooler Commands

The EMAS Spooler (process name SPOOLR) is responsible for the administration of all "queues" within the System (e.g. batch input, printer output etc.). The queues are defined by a configuration file read when the SPOOLR process starts up; the name of the current configuration file is displayed on the OPER at that time.

Commands to SPOOLR are input in the form:

S/keyword parameter

The following is divided into the various areas of activity which Spooler controls; namely Stream Control, Queue Control, general commands, and Remote Station Control.

Stream Control

These commands manipulate "streams"; each "stream" serves one or more output queues, or one input queue. Where the word "stream" appears in a command, it may be replaced by the name of a device or stream (e.g. LP0, JOB0) or, except where noted otherwise, by ".ALL" in order to specify all streams.

ABORT stream - abort the current transaction on the specified stream without allowing it to complete; note that the document is requeued and restarted immediately, since the stream will not actually be stopped.

Example: S/ABORT LP23

ATTACH stream TO queue

- cause the specified stream to serve an additional queue. If a stream is attached to more than one queue, documents are taken from each queue, in rotation. Only one queue may be associated with an input stream.

  It is used, for example, to send documents queued for "LP" to the device "LP23" rather than the local "LP0" if "LP0" is down.

  Example: S/ATTACH LP23 TO LP

DETACH stream FROM queue

- stop the specified stream from serving the specified queue.

  Example: S/DETACH LP23 FROM LP

EOF stream - terminate binary input.

Example: S/EOF CR0

FORMS stream n - set the forms type for the stream to n. Note that documents are only sent down streams when the forms they require are the same as those set on the stream. Also note that 0 <= n <= 255. The ".ALL" form may not be used.

Example: S/FORMS GP23 1

LIMIT stream n - set the limit for single documents on the stream to n, which must be >=0. n may be an output limit in bytes, an input limit in seconds, etc. The ".ALL" form may not be used.

Example: S/LIMIT JOB1 600

PRIORITY stream/ident priority

- set the specified priority on the stream or doc. Note that, currently, the VLOW priority must be used at all times. The ".ALL" form may not be used. "priority" may be one of the following:

VLOW, LOW, STD, HIGH, VHIGH

Examples: S/PRIORITY LP0 VLOW
S/PRIORITY 000569 VHIGH

START stream - start the specified stream. The stream will then serve its queue as required. This command must be given after Spooler has started, as most streams are initially stopped; line printer paper may thus be lined up before printing starts. The LIMIT command (see below) can be used in conjunction with the START command.

Examples: S/START .ALL
S/START LP14 LIMIT 100

STOP stream - abort the specified stream (if active) and stop any further activity on that stream, (but for STOP with no parameter, see under "General Commands" below).

Example: S/STOP LP23

WINDUP stream - set the limit to zero on the specified stream(s) so that no new activity takes place on that stream, although the current activity is allowed to complete.

Example: S/WINDUP LP14

Queue Control

The commands manipulate items ("documents") within Spooler's queues. In the following commands, the mnemonic qudoc can be replaced by any of the following:

ident	- is the full six digit unique identifier for the queue item, e.g. 020043.
queue ident	- is the queue name followed by the unique identifier.
queue user name	- is the queue name, the user who owns the document, and the document name.

COPY ident TO queue- make a COPY of the document and add it to queue.

Example: S/COPY 000376 TO LP23

DELETE qudoc or
DELETE user.ALL queue or
DELETE queue.ALL

- delete the specified document from its queue. The document is effectively destroyed.

Example: S/DELETE 100562
S/DELETE ERC009.ALL LP23
S/DELETE LP23.ALL

DISPLAY qudoc - display full details of the specified document.

Example: S/DISPLAY 090724

HOLD qudoc - hold the specified document in the queue until it is DELETEd or RELEASEd.

Example: S/HOLD LP14 ERCC02 TESTFILE

MOVE qudoc TO queue or
MOVE queue.ALL TO queue or
MOVE user.ALL queue TO queue

- move the specified document to a different queue.

Examples: S/MOVE 100562 TO LP
S/MOVE LP23.ALL TO LP
S/MOVE ERC001.ALL LP23 TO LP

The receiving queue must be either 'owned' by the actioning remote or the 'owning' remote must have 'OFFERed' the queue. This restriction does not apply if the action comes from the mainframe.)

RELEASE qudoc - release the specified "held" document, so that it may leave the queue.

Example: S/RELEASE 200401

RUN <strm> <doc> - forces stream <strm> to run job <doc> regardless of BATCHSTREAMS setting and stream limit, but subject to all other checks; e.g. PRIORITY, AFTER.

Example: S/RUN JOB2 000469

RUSH qudoc - set the priority of the specified document to maximum.

Example: S/RUSH 210211

SELECT qudoc - select a "media" batch job to run. A "media" batch job will be held by Spooler, indicating to the operators the media required; e.g. 2MTU, 1EDU. The SELECT command gives the operator the ability to schedule media jobs.

General Commands

The commands specified below are not specific to stream or queue control. The mnemonics used are as follows:

onoff	- means ON or OFF.
pageno	- means a page number for display; may be omitted for the first page (page 0).
queue	- means a queue name.
stream	- means a stream name.

BATCH - display the current batch stream settings.

BATCHSTREAMS n lim

- set the maximum number of batch jobs which may be run at once. If n is set to 0 no further batch jobs will be started.

  Example: S/BATCHSTREAMS 3

  An overriding upper limit for any job started can be set (lim):

  Example: S/BATCHSTREAMS 7 30

  This would allow up to 7 streams to run jobs of no more than 30 seconds.

CONFIG n filename - set the name of the configuration file to be used by Spooler on Fsys n when it is next started. The Spooler prompt should be ON when using this command (see below).

  Example: S/CONFIG 0 MANAGR.NEWCONF

  If filename is omitted the current configuration filename will be printed.

FEPUP - re-establish communication with a Front End which has crashed and been re-IPLed.

FEPDOWN - clear down communications with a Front End.

LAST - page backwards the current Spooler display on OPER.

MON n - switch internal Spooler monitoring on. n=0-9 depending on the level of monitoring required.

NEXT - page forward the current Spooler display on the OPER.

PRINT - send copies of Spooler's log to the line printer queue and to the JOURNL queue.

PROMPT onoff - PROMPT ON causes Spooler to prompt for further input. The prompt is "SPOOLR:". The "S/" may then be omitted from further input, and the "COMMAND" key should not be pressed unless input is to go to a process other than SPOOLR. PROMPT OFF causes the "SPOOLR:" prompt to be discontinued.

QUEUE [user.ALL] queue [pageno]
or Q [user.ALL] queue [pageno]

- (items in [..] brackets are optional) display the specified page (or page 0) of the specified queue for the specified user (or all users if none specified). The long form (QUEUE) gives additional information about streams attached to the queue, defaults, etc. The short form (Q) does not list AFTER documents that have not yet become eligible to be released by Spooler; they will only be listed by QUEUE.

Example: S/QUEUE LP23
S/Q BATCH
S/Q LP 1
S/Q ERC009.ALL LP23

QUEUES pageno
or QS pageno - display Spooler's queue, which contain files, jobs, etc. Totals (KBYTES or SECS as appropriate) are also given. The long form (QUEUES) shows all queues; the short form (QS) shows only the non-empty queues.

Examples: S/QUEUES 1
S/QS

STOP - stop all the active streams, when they are all idle, the Spooler process is stopped.

STREAM stream
or S stream - display the current status of the specified stream. If the stream is currently active, or has just finished being active, details of the document being processed are displayed. There is currently no difference in the action taken for the two alternative forms of this command.

Examples: S/STREAM LP23
S/S LP23

STREAMS pageno
or SS pageno - display all streams, and which process they are active for. The long form (STREAMS) shows all streams; the short form (SS) shows only the active streams.

Examples: S/STREAMS
S/SS

Commands for Controlling Remote Stations

The commands specified below are used to control remote terminals for remote job entry, input-output, etc. The definition of "remote" is given first.

remote - means a remote terminal name. Where this appears, it may be replaced by ".ALL" in order to specify all remotes.

BROADCAST remote - send the text message stored by the MSG command to remote.

Example: S/BROADCAST T15

CLOSE remote - refuse logons from the specified remote(s).

Example: S/CLOSE .ALL

LOGOFF remote - force logoff of the specified remote(s).

LOGON remote FEn network address

- should be used to log on a pre-logged on terminal after the terminal has been logged off. A pre-logged on terminal can be moved to a different Front End by logging it off and then logging it on again.

Example: S/LOGON T80 FE2 80 80

MSG text - store a text message for subsequent BROADCAST to remotes.

OPEN remote - accept logons from the specified remote(s).

POLL - initiate the polling of the FEPs to decide whether any FEP is a better 'route' than the current 'logged on' FEP for any remote; if so the remote is cleanly SWITCHED to this FEP. Polling is done automatically approximately every half hour.

SWITCH remote TO FEn or
SWITCH remote FROM FEn

- force a remote to switch from its current FEP to the defined FEP.

Example: S/SWITCH T14 TO FE2

TIE remote - tie down a remote to its current FEP.

Example: S/TIE T14

REMOTE remote
or R remote - display the current status of the specified remote There is currently no difference in the action taken for the two alternative forms of this command.

Examples: S/REMOTE T14
S/R T14

REMOTES pageno
or RS pageno - display the status of all remotes (for the REMOTES command) or all logged-on remotes (for the RS command).

Examples: S/REMOTES 1
S/RS

WINDUP remote - set the limit on all streams on the specified remote to zero, so that no new activity may take place on it. Current activities are allowed to complete. Further activity may be allowed to complete. Further activity may be allowed by means of the LIMIT command.

Example: S/WINDUP .ALL

Remote-only Spooler Commands

There are a number of commands which are only relevant to remote terminal operation.

DISABLE - disable the operator console from inputting any further commands.

ENABLE - enable the operator console for input after the DISABLE command. A password is prompted for at this stage.

OFFER queue - offer the queue to all other remotes for transferring documents to this queue. In the case of the MOVE and COPY commands the receiving queue must be either 'owned' by the actioning remote or the 'owning' remote must have OFFERed the queue.

WITHDRAW queue - withdraw the OFFER.