The CMCC Terminal Process

IEN 132

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1. Introduction

The Catenet Monitoring and Control Center (CMCC) produces a basic information gathering system for the catenet and in particular the catenet gateways. Among the features included are:

- multiple user access to information
- selective display of throughput and status reports from gateways
- capability of sending specific inquiries to gateways
- limited status display of the catenet

The information gathered consists of throughput statistics, routing information, gateway description and the up/down status of each gateway and its interfaces.

The system consists of a control process and a number of user terminal processes. The control process communicates directly with the gateways, while the terminal processes communicate with the control process. Each terminal process sends requests to the control process to obtain information from the gateways and displays this information when it is received and can also put the information into a log file. In addition, the terminal processes can be used to display information stored by the control process.

Users can make requests for gateways to start or stop sending regular reports; to enable or disable the sending of event messages, known as traps; and to answer single inquiries. The regular reports consist of packet throughput statistics, routing tables and the up/down status of all interfaces in the gateway. Trap types include interface up or down and neighbor gateway up or down. To avoid conflicts, the CMCC prevents more than one user at a time from manipulating reports or traps in a gateway.

Using the report and trap information, the CMCC will maintain a representation of the up/down status of all the gateways and their interfaces. This representation can be displayed by a terminal process. In addition, the CMCC will generate a terminal alarm whenever it detects that a gateway or interface goes down or comes back up.

The CMCC is also designed to cope with gateways that do not implement all possible monitoring facilities. In these cases the user will be informed that the gateway could not satisfy the information request.

The document describes the use of the Monitoring terminal process as it is currently implemented. It is currently a basic information gathering and displaying process, and by and large the information gathered is only that which the Satnet gateways will provide. New features will be added, and the user interface made more sophisticated, as time goes on. At the moment there is no

on-line 'help' facility, so you will need this document with you when you start to use the terminal process.

Background information can be found in IEN 105, "ARPA Catenet Monitoring and Control", and IEN 131, "Gateway Monitoring Protocol", describes the message formats used for communicating with the gateways.

2. Commands

Commands fall into four categories:

- Commands to send messages to the gateways (control commands).
- Commands to control the output of messages received from the gateways (output commands).
- Commands to interrogate the CMCC's internal database (database commands).
- Other commands (miscellaneous).

Information sent by the gateways is considered to be either a report or a trap. A report gives the current value of some data, such as throughput counts, in the gateway; a trap is a message announcing some event in the gateway, such as a network interface going down.

The report types available are:

- Gateway description
- Echo
- Throughput counts
- Status of all interfaces
- Routing table

and the trap types are:

- Interface up/down
- Neighbor gateway up/down

These are explained more fully in IEN 131.

In the following command format descriptions, square brackets denote an optional entry, and curly brackets indicate a list from which at least one item must be chosen. Commands may be abbreviated as long as they are still unique; however, spelling errors are not allowed, even if the command has already been uniquely specified before the error was made. The minimum abbreviations are in capitals. A word or phrase enclosed in angle brackets indicates a variable whose name is to be supplied, for example <gateway name>. Words not contained in angle brackets and having no capitals are noise words and may be omitted.

Command input is terminated by a carriage return. Delete and control-A will delete a single character and control-U will delete an entire command. Errors in command input cause self-explanatory error messages to appear, for example BAD GATEWAY NAME. After an error message, all characters (including editing characters) up to the next carriage return are ignored.

2.1 Control commands

These are the commands concerned with obtaining reports and traps from the gateways. In order to start and stop regular reports, or enable or disable traps, a terminal process must have access control of the gateways affected. This access control is an internal software lock and is not anything that the gateways know about. A terminal process may directly request a single report from a gateway whether it has access control of that gateway or not. These requests go through the control process, and it is the control process which actually sends the request to the gateway.

2.1.1 Gain access control

The command

Gain <gateway name>

attempts to gain access control of a gateway. If no other terminal process has control of the gateway, then the reply

<gateway name> - OK

is given. If another terminal process does have control, then the reply

<gateway name> ALREADY CONTROLLED BY <user name>

will appear.

Examples:

BBN - OK

and

UCL ALREADY CONTROLLED BY UKSAT

2.1.2 Start or stop reports or traps

The general form of a control command is:

```
[NO] {REPort<report>} from{ALL      } [{<n>       }][At <m>]
              type       {<gateway>}  {Indefinite}
                           name

[NO] {Trap  <trap  >} from{ALL      }
              type       {<gateway>}
                           name
```

The NO option turns off a report, or disables a trap.

<report type> is one of:

Description	(type 0)
ECho	(1)
Thruput	(2)
Allints	(3)
Routing	(7)

and <trap type> is a selection from:

Interface	(type 1)
Neighbor	(2)

Report types 4-6 and trap type 3, which are mentioned in the Gateway Monitoring Protocol document, are not implemented yet.

The "from{ALL }"
{<gateway name>}

option defines the gateways affected. A gateway name is an identifier of up to 15 characters. Gateway names may be abbreviated.

<n>
Indefinite

defines the number of times the gateway is to produce the report. The default is 1. Indefinite means until further notice, i.e. until a NO REPort command is issued.

At <m>

defines the reporting interval. The default is 60 seconds.

Example:

REPort Thruput from UCL 25 At 60

turns on a regular report, and

NO Trap Interface from BBN

disables a trap.

If the terminal process does not have access control of a gateway, then a commands starting with NO, or containing parameters specifying a number of reports or reporting interval, will cause the message

<gateway name> NOT CONTROLLED

to be output, and the command will be ignored.

The terminal process reports any format errors in the commands by self-explanatory error messages, for example BAD TRAP TYPE. It also reports on the results of the requests by messages of the form:

<gateway name>{WILL}<report/trap type(s)>
{WONT} [- TIMED OUT]

"TIMED OUT" will appear if no response at all was obtained from the gateway. The control process tries to obtain a response up to three times at 30 second intervals before causing this message to appear.

2.1.3 Relinquish control of a gateway

To relinquish control of gateways, the command

RELease {<gateway name>}
{ALL }

is entered. The monitor responds with

<gateway name> - RELEASED

This is to allow other users to have access control of the gateway. The Quit command (see below) also releases all gateways currently controlled by the terminal process.

2.2 Output Commands

The output commands are concerned with the information that appears on a terminal, or is output to the log file. The commands available are as follows:

- Find out which reports/traps are collected/enabled.
- Find out which reports/traps are being output.
- Output selected reports/traps for selected gateways.

The display outputs corresponding to the commands are given in section 3.

2.2.1 Find out reports/traps being collected/output

```
Which {Reports} {Collected}
      {Traps  } {Displayed}
                {Logged   }
```

The response to this command is described in section 3.4.1.

2.2.2 Output selected reports/traps

```
[NO]{Display}{<report type>}[from{ALL          }]
    {Log    }{<trap   type>}     {<gateway name>}
```

where <report type> and <trap type> are named as in the REPort command, above and the

```
"from {ALL             }"
      {<gateway name>}
```

option indicates the relevant gateways, as in the REPort command. If there is no log file open, then a Log command opens a file called 'CMCC_LOG.<date>', where <date> is of the form 22-MAR-80. A NO Log comand leaves the log file open, even if the result of the command is that nothing is being logged; closing of the log file is done by a separate command (see below).

Examples:

```
Display Thruput from ALL
NO Log INTerface from UCL
```

2.2.3 Close the Log File

A "NO Log" command turns off logging for the specified report type/gateway combination, but leaves the log file open. The command

```
UNLog
```

turns off all logging and closes the log file.

2.3 Database query commands

Currently there is only one of these.

2.3.1 Give current Catenet description

The command is

Catenet

and it gives a display of the gateway connections to each network, and the status of those connections. See display 3.4.2.

2.4 Other commands

Currently there is only one of these, too.

2.4.1 Leave the terminal process

The command is

Quit

and it releases any controlled gateways before displaying

STOPPING...

and halting the process. Terminating the process with a control-C will not release controlled gateways and is therefore inadvisable. There is a separate command to release gateways without halting; see section 2.1.3.

3. Output Formats

There are the following output types:

- Outputs for reports and traps.
- Outputs for messages generated by the control process.
- Database query displays.

Each output is preceded by the time expressed as four digits (hhmm). Any output except the database displays may appear either in the log file or on the terminal or both, depending on the output commands that have been entered. The information is presented in the same format in both cases.

3.1 Report Outputs

In the following descriptions, <internet address> is the four bytes of an internet address, expressed in decimal, and separated by commas. A <gateway name> may be a character identifier followed by a slash and a network number, for example "BBN/4", or an <internet address>.

Each report has a <sequence number> field of the form # 50. For regular reports this is the sequence number of the report;

for a single report it is the report identification number assigned to the request by the control process.

3.1.1 Gateway description

```
<gateway name > <sequence number> GATEWAY DESCRIPTION:
INTERFACES:
    <internet address>,...
NEIGHBORS:
    <gateway name>,...
```

where the "interfaces" list gives the internet address of each of the gateway's interfaces. These are ordered in the same way as in the reports.

Example:

```
RSRE # 0 GATEWAY DESCRIPTION:
INTERFACES:
     11,3,2,42;  25,6,0,0;
NEIGHBORS:
     UCL/11
```

3.1.2 Throughput transit matrix

```
<gateway name> <sequence number> THROUGHPUT COUNTS:
TO \ FROM <net name> <net name> DROPPED
<net name> <count>    <count>    <count>
<net name> <count>    <count>    <count>
```

The counts are cumulative counts.

Example:

```
BBN  # 50 THROUGHPUT COUNTS:
TO \ FROM  SATNET   ARPANET DROPPED
SATNET      1        123      5
ARPANET     13       4        1
```

3.1.3 Echo

The report is

```
<gateway name> <sequence number> ECHO HEARD
```

Example:

```
NDRE # 4 ECHO HEARD
```

3.1.4 Status of all interfaces

<gateway name><sequence number> INTERFACE TO <net name> {UP }...
{DOWN},

for as many network interfaces as necessary.

Example:

COMSAT # 26 INTERFACE TO SATNET UP, COMSAT-NET DOWN

3.1.5 Routing data

<gateway name> <sequence number> ROUTING TABLE:

NETWORK NUMBER DISTANCE GATEWAYS
<net> <hop count> <gateway name>, <gateway name>,...

This gives, for the gateway, the minimum distance to each network plus a list of the neighbor gateway(s) on the minimum distance path(s). If the gateway is known to the CMCC, then the <gateway name> will be the name, otherwise it will be expressed as an <internet address>.

Example:

BBN # 50 ROUTING TABLE:

NETWORK NUMBER	DISTANCE	GATEWAYS
1	2	10,0,0,38;
4	0	
11	1	UCL/4

3.2 Trap Outputs

There is one output type for each trap type. There is nothing in a trap message corresponding to the <sequence number> in a report.

3.2.1 Interface up/down

<gateway name> TRAP MESSAGE: INTERFACE TO <net> {UP }
{DOWN}

Example:

BBN TRAP MESSAGE: INTERFACE TO SATNET DOWN

3.2.2 Neighbor gateway up/down

<gateway name> TRAP MESSAGE: <Internet address> {UP }
{DOWN}

Example:

NDRE TRAP MESSAGE: 10,0,0,38; DOWN

3.3 Messages generated by the control process

These messages are to do with gateway reports timing out, and coming back up again.

3.3.1 Gateway reports time out

<gateway name> NOT REPORTING.

This will be issued if the gateway reports have not been received for three minutes.

3.3.2 Gateway restarts reporting

<gateway name> REPORTING AGAIN.

This is issued as soon as a message is received from a gateway that has timed out.

3.4 Other displays

These are the displays which show information stored at the monitoring center.

3.4.1 List reports/traps collected/enabled and output

<report type list> from <gateway name>
<trap type list> from <gateway name>

These are produced in response to a "Which"... command, as appropriate. See section 2.2.1.

Examples:

THRUPUT, ALLINTS FROM BBN

3.4.2 Catenet description

The display is a matrix showing for each gateway the status or existence of its connections to each network. If a gateway is connected to a network then the matrix entry consists of two counts, being the number of interfaces to the network which are up, and down. If there is no connection to a network then the entry is a period.

```
            <net>  <net>  <net>

<gateway>  { UP }   .      .
           {DOWN}
<gateway>  - GATEWAY DOWN -
```

and so on for all gateways. The "- GATEWAY DOWN -" display means that no regular report has been received from the gateway within the last three minutes.

Example:

```
            ARPANET   SATNET  UCLNET
UCL            .        UP     DOWN
BBN           UP        UP       .
NDRE        - GATEWAY DOWN -
```