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                        UPDATE ON NETRJS

A. INTRODUCTION

    In July 1971, CCN published RFC #189 defining NETRJS, a private
    protocol for remote job entry. NETRJS provides a Network interface
    to CCN's rje program called RJS (Remote Job Service).(3) As noted in
    an earlier RFC,(6) "RJS" is the proper name of a software package
    existing ony at CCN, not a generic term for rje.

    For over two years now, CCN has provided rje service to the Network
    using NETRJS. We know of the following distinct implementations of
    NETRJS user porgrams:

        RAND   OS/MVT on 370/158 (originally on 360/65)

        UCLA-NMC   SEX on Sigma 7

        Illinois   ANTS on PDP-11

        Utah   Tenex on PDP-10

        MIT-DMCG   ITS on PDP-10

        Harvard   DEC system on PDP-10

        UCSB   OS/MVT on 360/75

        ISI,BBN,NIC,I4   Tenex on PDP-10

    We apologize to anyone slighted by omission from this list. Writing
    a new user process for NETRJS has proved to be a modest and
    straightforward task.

    During the month of October, 1973, CCN processed 1373 batch jobs via
    NETRJS. The complete statistics are:

        1,373   Jobs submitted

        1,105   Jobs "printed"

            0   Jobs "punched"

49,400	Cards "read"
822,900	Lines "printed"
18,907	Pages "printed"
393.6	Connect hours

The average job submitted was 360 lines ("cards"), and returned 745 lines on 17.1 pages. These figures are fairly typical.

B. NEW ICP SOCKETS

At the request of the Socket Czar, Jon Postel, (see RFC #433) we intend to move the NETRJS ICP sockets from 11, 13, and 15 to 71, 73, and 75, respectively. At present, NETRJS is available from either socket subspace, so system programmers responsible for maintaining NETRJS user processes can switch over at their leisure. We plan to "decommit" sockets 11, 13, and 15 on July 1, 1974.

Those hosts which access NETRJS via socket 1 are unaffected.

C. NEW NETRJS

Last Fall, CCN installed a new implementation of its NETRJS server. An internal NETRJS rewrite was necessitated by other system changes and was timed to coincide with installation on September 5 of the "last release" of OS/360, Release 21.7. The new version of NETRJS contains a number of internal improvements over the original version written two years ago. There are also a few external differences, as follows:

   1. No More Squish

      The long-standing "squish" problem in NETRJS has been fixed. This problem arose because of the "squishiness" of Network data transfer, i.e. the variable delay between originator and receiver processes due to NCP buffering. The result was that a short print output file could be "transmitted" by RJS, dequeued, and discarded at CCN before the first message had actually reached the remote host. If the remote host crashed or the user tried to cancel (and save) the output stream, it was too late; the output was lost in the "squish". We were careless about this in the first version. Now NETRJS awaits the RFNM from the end-of-data mark before telling RJS to discard the job output.

2. Timeouts

The new verson is a little tougher on timeouts, to free CCN resources when users are slow.

a. Signon Timeout

If the user, after connecting to NETRJS and receiving the READY message, fails to send a valid SIGNON command within 3 minutes, CCN will close the Telnet connections.

b. Data Transfer Timeout

(1) CCN will abort the READER data transfer connection if the user site leaves the connection open without sending any bits for 5 minutes.

(2) CCN will abort the PRINTER or PUNCH data transfer connection if the user site stops accepting bits for 5 minutes.

3. New Messages

The NETRJS messages to the remote terminal have been revised to better distinguish problems at CCN, at the user site, or in the Network. See Reference 8 for a complete list.

4. Subsystem Interrupt

The user can send a Control-C to terminate his NETRJS session either before or after signon. Continuation is not possible after the Control-C.

This provides an escape for a user who for some reason can't signon or signoff or close his Telnet connection. If the user entered via the RJS command in Socket 1, Control C will return him to the Server Telnet command level.

One other improvement will reduce user frustration: NETRJS now returns an INVALID SIGNON message if the user enters anything but a valid SIGNON command after initially connecting to the NETRJS server.

D.   CLARIFICATIONS AND AMENDMENTS TO NETRJS PROTOCOL

   Over the past two years, system programmers writing NETRJS user
   processes have pointed out areas of the protocol which were poorly
   defined in RFC #189. In addition a few minor changes have been made,
   largely as the result of implementation accidents.

       1.   The jobname header of a print file does not have an ASA
            carriage control byte. However, it will be encoded in the
            format (compressed or truncated) selected by a particular
            VRBT.

       2.   The punch connection sends 81 byte records, the first byte
            being a blank carriage control character. This is contrary to
            RFC #189 and is illogical; it was an implementation bug which
            we kept for compatibility.

       3.   Page 3 of RFC #189 defined fixed values for the user's data
            transfer sockets relative to his Telnet sockets. In fact,
            NETRJS does not enforce these user data transfer sockets but
            will accept RFC's for any user sockets.

       4.   RFC #189 specified a choice of two character mappings for the
            virtual remote batch terminal: EBCDIC and ASCII (-68). An
            ASCII-63 mapping was later added for the convenience of users
            with Model 33-like keyboards (RAND, actually). The ASCII-63
            mapping is selected by doing an ICP to socket 75 or by
            entering "TTYRJS" in CN's Telnet Server. figure 1 shows the
            actual ASCII-63 mapping in use today. This supercedes the
            earlier version of the mapping, shown in RFC 338.

       5.   The ASCII-68 mapping specified in RFC 189 was also changed to
            provide unique mappings for all ASCII characters. The present
            ASCII-68 mapping used by both NETRJS and TSO at CCN is shown
            in Figure 1.

E.   RJS TERMINAL OPTIONS

   When a new NETRJS virtual terminal is defined, certain options are
   available; these options are listed below. If the user does not
   specify otherwise, CCN will use truncated data format and turn all
   other options on.

       1. Truncated/Compressed Data Format

          As explained in RFC 189, a virtual remote batch terminal under
          RJS may use either the turncated data format (default) or the

compressed format for printer and punch output. With the
truncated format, CCN merely removes trailing blanks from each
output line; if compressed format is specified, CCN will also
encode strings of inbedded blanks or other repeated characters.
CCN will accept either format in the card reader stream,
regardless of the terminal option. See Reference 9 for
discussion of the virtues of compression.

2. Automatic Coldstart Job Resubmission

If "R" (Restart) is specified in the accounting field on the
JOB card and if this option is chosen, RJS will automatically
resubmit the job from the beginning if the CCN operating system
should be "coldstarted" before all output from the job is
returned. Otherwise, the job will be lost and must be
resubmitted from the remote terminal in case of a coldstart.

3. Automatic Output RESTART

With this option, transmission of printer output which is
interrupted by a broken connection always starts over at the
beginning. Without this option, the output is backspaced
approximately one page when restarted, unless the user forces
the output to start over from the beginning with a RESTART
command when the printer connection is re-opened and before
printing begins.

4. Password Protection

This option allows a password to be supplied when a terminal is
signed on, preventing unauthorized use of the terminal ID.

5. Suppression of Punch Separator and Large Letters.

This option suppresses both separator cards which RJS normally
puts in front of each punched output deck, and separator pages
on printed output containing the job name in large block
letters. These separators are an operational aid when the
ouptut is directed to a real printer or punch, but generally
undesirable for an ARPA user who is saving the output in a file
for on-line examination.

F. WARNING ON TENEX NETRJS USER PROCESS (6)

The Tenex implementation of NETRJS user program is a command normally
called "RJS". This program has some pitfalls of which users should
be aware.

   1. For strictly historical reasons, the commonly-available
       version of the Tenex RJS command uses Socket 15, and
       therefore, the ASCII-63 translation. We hope to propagate
       soon a version which uses the ASCII-68 mapping via Socket 73,
       and stamp out the earlier version.

   2. The Tenex RJS command fails to recognize the US character
       sometimes used instead of CR LF as end-of-line. As noted in
       RFC 571, the Tenex user FTP program has the same problem.

   3. The Tenex RJS command truncates without warning card images
       exceeding 80 characters in length.

G. REFERENCES ON NETRJS

   1. "Interim NETRJS Specifications", R. T. Braden. RFC #189: NIC
      #7133, July 15, 1971.

      This is the basic system programmer's definition document, and is
      really the final specification. The proposed changes mentioned on
      the first page of RFC #189 were never implemented, since the DTP
      then in vogue became obsolete.

   2. "NETRJS Remote Operator Commands", R. T. Braden. NIC #7182,
      August 9, 1971

      This document together with References 3 and 8 define the remote
      operator (i.e. user) command language for NETRJS, and form the
      basic user documentation for NETRJS at CCN.

   3. "Implementation of a Remote Job Service", V. Martin and T. W.
      Springer. NIC #7183, July, 1971.

   4. "Remote Job Entry to CCN via UCLA Sigma 7; A scenario", UCLA/CCN.
      NIC #7748, November 15, 1971.

      This document described the first NETRJS user implementation
      available on a server host. This program is no longer of general
      interest.

    5. "Using Network Remote Job Entry", E. F. Harslem. RFC #307: NIC
       #9258, February 24, 1972.

       This document is out of date, but describes generally the Tenex
       NETRJS user process "RJS".

    6. "EBCDIC/ASCII Mapping for Network RJS", R. T. Braden. RFC #338:
        NIC #9931, May 17, 1972.

       The ASCII-63 mapping described here is no longer correct, but
       CCN's standard ASCII-68/EBCDIC mapping is described correctly.

    7. "NETRJT--Remote Job Service Protocol for TIP's", R. T. Braden.
       RFC #283: NIC 38165, December 20, 1971.

       This was an attempt to define an rje protocol to handle TIPs.
       Although NETRJT was never implemented, many of its features are
       incorporated in the current Network standard RJE protocol.

    8. "CCN NETRJS Server Messages to Remote User", R. T. Braden. NIC
       #20268, November 26, 1973.

    9. "FTP Data Compression", R. T. Braden. RFC #468: NIC #14742,
       March 8, 1973.

FIGURE 1. NETRJS CHARACTER MAPPINGS AT UCLA-CCN

   The character set of the VRBT (VIRTUAL Remote Batch Terminal) is
   determined by the initial connection to RJS, as follows:

VRBT Character Set	ICP Socket	OR	Server Telnet Command
EBCDIC	71		RJS
ASCII-68	73		ARJS
ASCII-63(tty)	75		TTYRJS

   These mappings are as follows:

   ASCII-68 Mapping:

      Corresponding graphics are mapped one-to-one.

      Unmatched graphics are mapped as in the table below.

      ASCII-68 controls are mapped one-to-one onto the matching
      EBCDIC controls, with DC4(ASCII) mapped onto TM(EBCDIC).

   ASCII-63 Mapping:

      Corresponding graphics are mapped one-to-one.

      ASCII codes X'61' - X'7A' (the ASCII-68 lower case letters are
      mapped onto EBCDIC lower case.

      Unmatched graphics are mapped as shown in the table below.

      ASCII-63 controls X'00' - X'1F' are mapped as for ASCII-68.

      ASCII codes X'60' and X'7B' - X'7E' are mapped as shown in the
      following table.

EBCDIC	ASCII-68 VRBT	ASCII-63 VRBT
vertical bar X'4F'	vertical bar X'7C'	open bracket X'5B'
not sign X'5F'	tilde X'7E'	close bracket X'5D'
cent sign X'4A'	back slash X'5C'	back slash X'5C'
underscore X'6D'	underscore X'5F'	left arrow X'5F'
. X'71'	up arrow X'5E'	up arrow X'5E'
open bracket X'AD'	open bracket X'5B'	. X'7C'
close bracket X'BD'	close bracket X'5D'	. X'7E'
. X'8B'	open brace X'7B'	. X'7B'
. X'9B'	close brace X'7D'	. X'7D'
. X'79'	accent X'60'	. X'60'

Note : this page is available on-line as HELP RJSCHARS in CCN's
Telnet Server (Socket 1). The on-line version is set up to be
typed out on an ASCII-68 terminal.