Sine Nomine Associates

SSH Client Suite for CMS
&
NJE for Open Systems

Neale Ferguson

CMS SSH Client Suite

- Suite of tools:
  - Secure Copy: PSCP
  - Secure FTP: PSFTP
  - Secure Shell: PTERM
- Modeled on Putty command line tools
- Key generation
- Uses public/private key pairs to eliminate the need for passwords
- Compatible with modern OpenSSH releases
- Not TLS 1.3 yet

CMS SSH Client Suite

- Supports:
  - Accessed SFS or minidisks
  - SFS specifications
  - Codepage translation

PSCP

- PSCP is a CMS implementation of the popular scp command available in many other environments. It provides a command-line client for encrypted file transfer between hosts originating from CMS to other machines

```
pscp filea.text.a green.example.com:/u/walters/filea.text
```

PSFTP

- PSFTP is an interactive text-based client for the SSH-based SFTP (secure file transfer) protocol. It resembles the classic text-mode FTP client, with additional commands to handle the EBCDIC environment

```
psftp –i private.ppk walters@green.example.com
```

PTERM

- PTERM is a line-mode terminal emulator for the CMS SSH package. It provides a way to interact with a terminal session over an encrypted channel. PTERM operates only in line mode; it does not provide 3270 or VT100 emulation. It may be used to run a remote command or start an interactive session

```
pterm walters@green.example.com sh -c 'mycommand < inputfile'
```

PUTTYGEN

- PUTTYGEN is a tool to generate and manipulate SSH public and private key pairs. It is part of the CMS SSH/PuTTY suite, although it can also interoperate with the private key formats used by some other SSH clients.

```
puttygen -t rsa -b 4096 -C "my home key" -o mykey.ppk
puttygen mykey.ppk -O private-openssh -o openssh.key
```

Sine Nomine Associates

NJE for Linux Systems

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Agenda

- NJE Overview
- Why NJE Today?
- Interesting Enhancements to a Linux-based Appliance
- Scenarios for Using the NJE/IP Bridge
  - Unattended Encrypted File Transfer
  - Development Workstation
  - Delivering Mainframe Output to a Program for Post-Processing
  - Remote execution of Linux applications from z/OS
- Q&A

Some Definitions

Term	Definition
Appliance	A pre-configured Linux-based “black box” implementing a specific function (for example, NJE) that is installed in a virtual machine or LPAR.
NJE	Network Job Entry: A facility for transmitting jobs (JCL and in-stream data sets), SYSOUT data sets, (job-oriented) operator commands/messages, and job accounting information from one computing system to another.
NJE/IP Bridge	Software that implements the NJE protocol and provides a CTC device driver that allows a bridge from a non-IP NJE system to an IP network.
NQS	The NJE/IP Bridge includes support for an optional batch submission and execution application for UNIX and UNIX-like systems. It is based on NQS (Network Queuing System).

NJE Overview

- Network Job Entry (NJE) is embedded in most IBM mainframe operating systems as a method of transmitting and receiving job streams, output, and interactive messages between nodes.
- Characteristics:
  - 8 character userid
  - 8 character node name
- Network is fully defined at all points (with some exceptions)

NJE Services

- Unattended File Transfer
- Interactive Message Transport
- Remote Job Submission
- Remote Printing
- Remote Management Traffic Delivery (PROP, etc)
- Set of Common Conventions for Delivering Jobs and Output
- OpenSSL support

NJE Overview

- NJE supported as a application over different transports
  - Native BSC communications
  - Native CTC communications
  - SNA networks
  - TCP/IP (VM, VSE, JES2 at z/OS 1.7+ only)
- Protocol governed by NJE Protocols and Formats manual

NJE Overview

- IBM has implemented NJE capability only for mainframe and iSeries OS
  - No AIX
  - No Linux
  - No Windows
  - No non-IBM workstation OS
- Large amounts of effort and expense necessary to integrate file transfer and output management capabilities between these systems

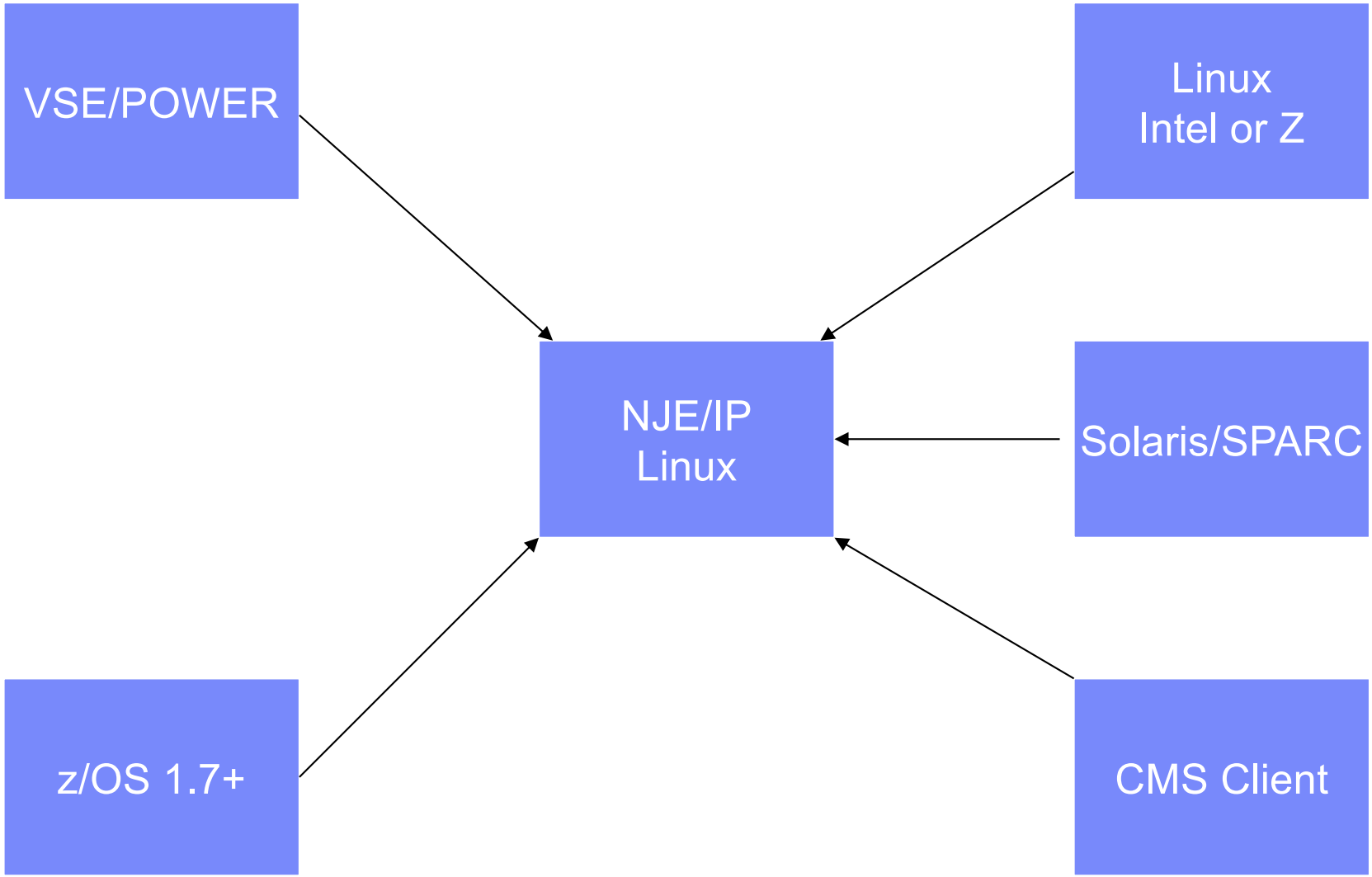
Why NJE Today?

- Why do NJE over IP?
  - Clean bidirectional integration of programmable workstations with mainframe data transfer
  - Leverage Linux-based development tooling and skills in tandem with mainframe services (right tool, right job).
  - Increasing necessity of data movement between IBM and non-IBM environments without complex automation requirements
  - Death of the 37x5 FEP
  - Demonstrate construction of Linux-based companion appliance

NJE/IP Bridge Features

- IP connections are protected with SSL if desired
- No SNA stack or SNA services are required on host or workstation
- NQS integration provides RJE function for Unix/Linux systems

Configuration Example



Scenario: Unattended File Transfer

Mainframe:

- DEST=(node, userid) in JCL
- SENDFILE/XMIT cmd

Open Systems:

- sendfile /etc/hosts userid@node

Benefits -

- Automatic retry
- Multiple file transmission in parallel
- Positive success/fail return code
- ASCII/EBCDIC translation if needed
- Easily automated with mainframe tools

Scenario: Development Workstation

- JCL submission operates identically to remote NJE workstation
- Any development tools available on the workstation can be used
- Preserves module attributes in transmission automatically (within scope of NJE protocol)
- Output can be automatically routed back to workstation w/o complex transfer procedure

- Possible uses:
  - Using COBOL or PL/I language-sensitive editing in Eclipse with z/OS COBOL applications
  - Online debugging using IDE against z/OS code
  - Low cost configuration management using CVS or Subversion for z/OS or VM applications

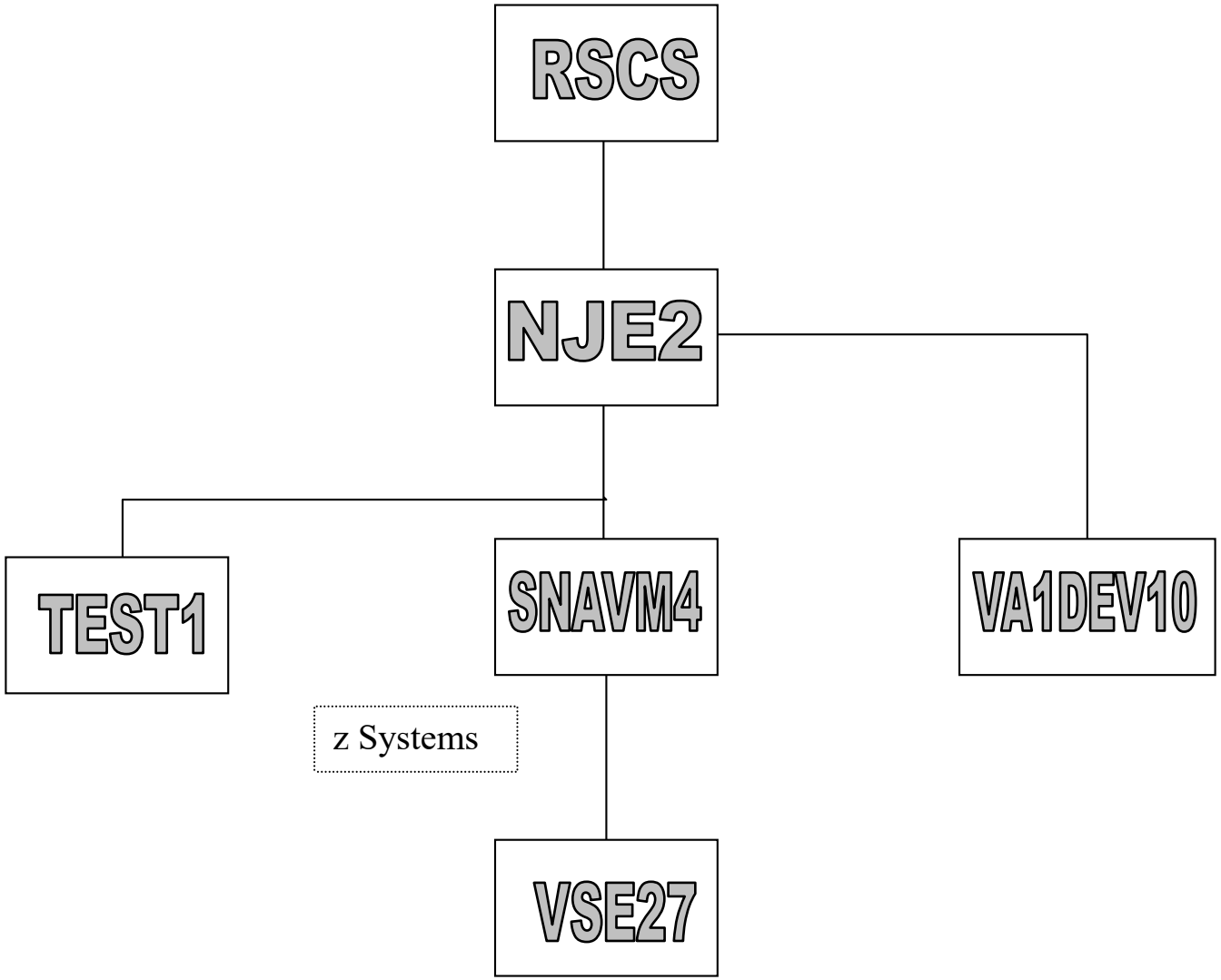
Scenario: Delivering Output to a Program

- Easy mapping of NJE node/userid to workstation program input via mapping table in NJE Bridge
- Mapping table specifies application and command line to use, and file is supplied to application standard input for processing
- Examples (not included, but easily constructed):
  - Automatic faxing of output to specified number
  - Line printer emulation for PostScript or PCL printers (full CUPS support, plus mainframe output management)
  - Automated PDF conversion and archival on DVD

Scenario: Remote Job Execution on Linux

- Available only on Unix/Linux variants
- Uses NQS to queue jobs and manage the remote execution.
- NQS selects system from a pool, transfers the job to the execution node and returns output and status info via NJE messages
- NJE/IP Bridge integration via program interface
- Messages and files produced by Linux application can be tracked and automated via standard mainframe tools (e.g., Netview, PROP, CA products, TWS, etc.)

Sample Configuration - Topology



Sample Configuration – Network Nodes

Node	Platform	O/S	IP Name
RSCS2	z Systems	z/VM 4.4	N/A
NJE2	z Systems	NJE/IP Appliance	nje2.vm.example.com
SNAVM5	z Systems	z/VM (RSCS)	vm.example.com
TEST1	X86_64	Fedora	test1.example.com
VA1DEV10	Sparc	Solaris 8	va1dev10.example.com
VSE27	z Systems	z/VSE	vse27.external.net

Linux Installation

```
rpm -Uhv nje-1.0-5.i386.rpm
Preparing...                ########################################### [100%]
   1:nje                    ########################################### [100%]
rpm -Uhv nqs-4.0-1.i386.rpm
Preparing...                ########################################### [100%]
   1:nqs                    ########################################### [100%]
NMAP_SUCCESS:  Successful completion.
NMAP_SUCCESS:  Successful completion.
 MID    PRINCIPAL NAME  ALIASES
 ---    --------------  -------
3232261406    test1.example.com      test1
Utility [nqsmkdirs]:  Creating: control/++++++.
Utility [nqsmkdirs]:  mkdir exited (0).
:
Utility [nqsmktrans]:  Exiting.
NQS manager[TCML_COMPLETE  ]:  Transaction complete at local host
NQS manager[TCML_COMPLETE  ]:  Transaction complete at local host
Queue standard created.
:
NQS manager[TCML_COMPLETE  ]:  Transaction complete at local host
```

NJE Configuration

Node	IP Name	Port	Device	Buffer Size
RSCS	N/A	N/A	600	31000
VA1DEV10	va1dev10.example.com	175	N/A	4096
TEST1	test1.example.com	175	N/A	4096
VSE27	vse27.external.net	175	N/A	24000
SNAVM4	vm.example.com	175	N/A	4096

NJE Configuration…

- Node definition done in `/etc/nje/nje.conf`
- Performed with text editor
- Two main sections:
  - Global settings
  - Node definitions
- Changes can be picked via HUP signal to process:
  - `/etc/init.d/njed reload`

…NJE Configuration…

```
NAME              NJE2
IPADDRESS         nje2.vm.example.com
QUEUE             /var/spool/nje
CMDMAILBOX        UDP 127.0.0.1 175
LOG               /var/log/nje/nje.log
TABLE             /etc/nje/nje.route
INFORM            ROOT@VMSL932
USEREXITS         /etc/nje/file-exit.cf
MSGEXITS          /etc/nje/msg-exit.cf
LLEVEL            1
DEFAULT-ROUTE     SNAVM4
```

…NJE Configuration…

```
LINE 0 VSE27
 BUFSIZE         24000
 TIMEOUT         3
 IPPORT          175
 TCPNAME         vse27.bsinet.org
 TCP-SIZE        24000
 MAX-STREAMS     1

LINE 1 SNAVM5
 BUFSIZE         4096
 TIMEOUT         3
 IPPORT          175
 TCPNAME         VM.EXAMPLE.COM
 TCP-SIZE        8192
 MAX-STREAMS     7
```

…NJE Configuration…

```
LINE 3 VA1DEV10
 BUFSIZE         4096
 TIMEOUT         3
 IPPORT          175
 TCPNAME         va1dev10.example.com
 TCP-SIZE        8192
 MAX-STREAMS     7
```

…NJE Configuration

```
LINE 4 TEST1
 BUFSIZE          4096
 TIMEOUT          3
 IPPORT           175
 TCPNAME          test1.example.com
 TCP-SIZE         8192
 MAX-STREAMS      7
```

RSCS Configuration

```
LINKDEFINE NJE2 TYPE TCPNJE QUEUE SIZE RETRY NODE NJE2
PARM NJE2 TCPID=TCPIP HOSTN=NJE2.VM.EXAMPLE.COM
KEEPALIV=YES
ROUTE NODE NJE2 TO LINK NJE2
```

…VSE Configuration…

```
V27NBT   PNODE NODE=VSE27,                                              -
               LOCAL=YES,                                               -
               PORT=175
*
          PNODE NODE=NJE2,LOCAL=NO,IPHOSTAD=192.168.203.218,            -
               IPEXTRAD=010.033.204.020,PORT=0175,                      -
               AUTH=NET,BUFSIZE=32000
*
          END
```

Power PNODE Macro Definitions

…VSE Configuration

```
NETPOWER POWER
-
...
                  PNET=V27NBT,
-
...
```

Power Generation Macros

Starting NJE

```
systemctl start nje
Starting NJE daemon...NJE/IP Bridge licensed to: Example Company
Expires: 2010/12/31
Platform: s390x
done.
```

Command Interface…

- The `ucp` command is used to control the behavior of the NJE daemon
- Intended to be an administrator command so is placed in the `/usr/sbin` directory
- Operates by sending a message to the NJE daemon without waiting for response
- Response is directed to the user who issued the command (who may be logged on in multiple places)

Command Interface…

- The `njeAdmin` command is used to control the behavior of the NJE daemon via SNMP agent
- Intended to be an administrator command so is placed in the `/usr/sbin` directory
- Operates by sending a message to the SNMP daemon and waiting for response

…Command Interface…

```
ucp help
   ucp help
   HELP  - Show this message
   SHOW LINE/QUEUE - Show lines or queue status
   SHOW ROUTE [<node>] - Show routing information for all or <node>
   START LINE n - Start a closed line
   SHUT [ABORT] - Shutdown or abort the whole program
   STOP LINE - Stop a line
   RESCAN EXITS - Rescan file and message exits.
   RESCAN QUEUE - Rescan queue and requeue files.
   RESCAN ROUTE - Reopen route database.
   LOGLEVEL n - Set the loglevel to N
   ROUTE xxx TO yyy - Change the routing table.
        Route to  OFF  will delete the route entry.
   EXIT/QUIT - Exit this utility
```

…Command Interface…

```
njeAdmin --help
Command use:
   njeAdmin [flags] [command]
      where flags:
   --community -c [community] SNMP community string
   --target -t    [SNMP host] SNMP server address (defaults to localhost)
   --json   -j                Produce JSON output for SHOW commands


      where commands:
   HELP  - Show this message
   SHOW LINE/QUEUE [<lineno>] - Show lines or queue status
   SHOW ROUTE [<node>] - Show routing information for all or <node>
   SHOW LOCAL - Show information about the local node
   START LINE n - Start a closed line
   SHUT [ABORT] - Shutdown or abort the whole program
   STOP LINE - Stop a line
   RESCAN EXITS - Rescan file and message exits.
   RESCAN QUEUE - Rescan queue and requeue files.
   RESCAN ROUTE - Reopen route database.
   LOGLEVEL n - Set the loglevel to N
   EXIT/QUIT - Exit this utility.
```

…Command Interface

```
ucp show line
NJE2: NJE/IP Bridge version 1.0(sna)/200511022000, Lines status:
NJE2: Line.0 VSE27 (0x439a48)   0 (Q=0000)  ACTIVE      TCP
NJE2:  Bufinfo: InAge=23.319s, RecvSize=0, XmitAge=24.851s, XmitSize=0
NJE2:  Flags: AUTO_RESTART|DEFERRED_OK|RELIABLE|RESET_BCB|VMNET_FORMAT|XMIT_QUEUE
NJE2:  1 streams in service.  WrSum: 1fil/1659699B  RdSum: 1fil/2366615B
NJE2: Line.1 SNAVM5 (0x460348)   0 (Q=0000)  ACTIVE      TCP
NJE2:  Bufinfo: InAge=18.120s, RecvSize=0, XmitAge=18.120s, XmitSize=0
NJE2:  Flags: AUTO_RESTART|DEFERRED_OK|RELIABLE|RESET_BCB|VMNET_FORMAT|XMIT_QUEUE
NJE2:  7 streams in service.  WrSum: 0fil/4399346B  RdSum: 0fil/4384771B
NJE2: Line.2 RSCS2    (0x486c48)   0 (Q=0000)  ACTIVE      CTC
NJE2:  Bufinfo: InAge=1.494s, RecvSize=6, XmitAge=515347.294s, XmitSize=0
NJE2:  Flags: AUTO_RESTART|DEFERRED_OK|RELIABLE|RESET_BCB|SLOW_ILEAVE|XMIT_QUEUE
NJE2:  2 streams in service.  WrSum: 0fil/310B  RdSum: 2fil/2793544B
NJE2: Line.3 VA1DEV10   (0x44cec8)   0 (Q=0000)  ACTIVE      TCP
NJE2:  Bufinfo: InAge=24.848s, RecvSize=0, XmitAge=24.851s, XmitSize=0
NJE2:  Flags: AUTO_RESTART|RELIABLE|RESET_BCB|SLOW_ILEAVE|VMNET_FORMAT|XMIT_QUEUE
NJE2:  7 streams in service.  WrSum: 1fil/1743081B  RdSum: 3fil/5222288B
NJE2: Line.4 TEST1 (0x4737c8)   2 (Q=0000)  Retry       TCP
NJE2:  Bufinfo: InAge=1209479.239s, RecvSize=0, XmitAge=1209180.335s, XmitSize=24
NJE2:  Flags: AUTO_RESTART|CALL_ACK|RELIABLE|VMNET_FORMAT|WAIT_V_A_BIT|XMIT_QUEUE
NJE2: End of Q SYS display
```

…Command Interface

```
njeAdmin -c public show line -j
{
   "lines" :
   [
     {
        "line" : 0,
        "node" : "CMSNJE",
        "type" : "TCPv4",
        "status" : "LISTEN",
        "tcpName" : "172.17.22.1",
        "filesIn" : 0,
        "filesOut" : 0,
        "bytesIn" : 0,
        "bytesOut" : 0,
        "bufSize" : 1024,
        "ordering" : "FIFO",
        "streams" : 1,
        "ipPort" : 4175,
        "FilesQueued:" : 0
     },
     {
        "line" : 1,
        "node" : "ZOS19",
        "type" : "TCPv4",
        "status" : "LISTEN",
        "tcpName" : "172.18.4.67",
        "filesIn" : 0,
        "filesOut" : 0,
        "bytesIn" : 0,
        "bytesOut" : 0,
        "bufSize" : 4096,
        "ordering" : "FIFO",
        "streams" : 1,
        "ipPort" : 175,
        "FilesQueued:" : 0
     },
   ]
}
```

Querying a Remote Node

```
send -c rscs2 q sys
RSCS2: Link                              Line
RSCS2: Name      Status      Type        Addr LU Name   Logmode   Queueing
RSCS2: NJE2      active      NJE         0800 ...       ...       priority
RSCS2: 1 link found
```

```
send -c test1 cpq cpu
TEST1: CPU: x86_64
```

Submitting a Job from Linux…

```
* $$ JOB JNM=PRINTLOG,CLASS=P,LDEST=(,NEALE),XDEST=VSE27,NTFY=YES
* $$ LST CLASS=O
// JOB TEST NOTIFY
// EXEC PRINTLOG,SIZE=PRINTLOG,PARM='F4'
/*
/&
* $$ EOJ
```

```
submit @vse27 test.jcl
VSE27: 1Q5DI  EXECUTION COMPLETED FOR PRINTLOG 00575 ON VSE27,
RC=****, TIME=16:28:56
NJE2: FILE (0575) spooled to NEALE -- origin NJE2(NEALE) 11/18/05
16:16:06 EST
NJE2: FILE (0575) spooled to NEALE -- origin NJE2(NEALE) 11/18/05
16:16:06 EST
VSE27: 1RA0I  OUTPUT PRINTLOG 00575(00133) TRANSMITTED TO NJE2 FOR
NJE2 O-TR1
```

…Submitting a Job from Linux

```
qrdr
QRDR: Spool dir: `/var/spool/nje/NEALE/'
From:               To:                 FName:    FExt:     Type   Form:
SpoolID
NEALE@NJE2          NEALE@NJE2          PRINTLOG OUTPUT     PRT O
0112
Found 1 file.
```

```
peek 1
// JOB TEST NOTIFY                                        DATE 11/18/2005, CLOCK 16/28/53
// EXEC PRINTLOG,SIZE=PRINTLOG,PARM='F4'
1S54I  PHASE PRINTLOG IS TO BE FETCHED FROM IJSYSRS.SYSLIB
OPTIONS SPECIFIED:   F4                                          11/18/2005 PAGE      1

 COUNT     MESSAGE TEXT                                                CLOCK     DATE     CONSOLE

     1 ********** LOGGING RESUMED AFTER VSE SYSTEM RE-IPL ********* 10:56:40 09/21/2005
```

```
receive 112
ls -l printlog.output
-rw-r--r--  1 neale users 10976 2005-11-18 16:28 printlog.output
```

Sending Commands to VSE

```
send -c @VSE27 d a
VSE27: 1R48I  C-RV ,TCP,    AWAITING     NODE=BSIVM43
VSE27: 1R48I  C-RV ,TCP,    AWAITING     NODE=BSIVSE26
VSE27: 1R48I  C-RV ,TCP,    AWAITING     NODE=BSIVSE31
VSE27: 1R48I  C-RV ,TCP,    PROCESSING   NODE=NJE2
VSE27: 1R48I  C-RV ,TCP,    AWAITING     NODE=BSIJCB
VSE27: 1R48I  C-RV ,TCP,    AWAITING     NODE=TEIVM43
VSE27: 1R48I   BG,FEC,A0I,,      INACTIVE,
VSE27: 1R48I   F2,FEC,L2,,  CICSICCF,00573,2
VSE27: 1R48I   F3,FEC,K3,,  VTAMSTRT,00025,3
:
:
VSE27: 1R48I   F3,FEE,,,  VTAMSTRT,00025,A        21 LINES SPOOLED,QNUM=01886
:
VSE27: 1R48I   Z3,FEE,,,  FTPS20  ,00289,O        25 LINES SPOOLED,QNUM=01879
:
:
VSE27: 1R48I   R1,FEE,,,  ITAMTEST,00572,O       170 LINES SPOOLED,QNUM=01881
VSE27: 1R48I   F2,FEE,,,  CICSICCF,00573,A      1864 LINES SPOOLED,QNUM=01870
VSE27: 1R48I  RDR,00C,A,,
VSE27: 1R48I  PUN,00D,O,VM,      INACTIVE,
VSE27: 1R48I  LST,00E,O,1,VM,      INACTIVE,
```

Sending Commands to VM

```
send -c @snavm5 q sys
SNAVM5: Link                              Line
SNAVM5: Name      Status      Type        Addr LU Name   Logmode   Queueing
SNAVM5: PUCC      inactive    TCPNJE      0000 ...       ...       size
SNAVM5: MARIST    connect     TCPNJE      0000 ...       ...       size
SNAVM5: FSFZVM51  active      TCPNJE      0000 ...       ...       size
SNAVM5: FC3       inactive    TCPNJE      0000 ...       ...       size
SNAVM5: NJE2      connect     TCPNJE      0000 ...       ...       size
SNAVM5: D26TEST   active      TCPNJE      0000 ...       ...       size
SNAVM5: 6 links found
```

```
send -m neale@snavm5 Hello VM!
SNAVM5: DMTRGX332E NEALE not receiving
```

Sending Files

```
sendfile neale@snavm5 printlog.output
SNAVM5: DMTAXM104I File (0134) spooled to NEALE -- origin NJE2(NEALE)
11/18/05 17:35:37 CDT
```

```
query rdr all *
ORIGINID FILE CLASS RECORDS  CPY HOLD DATE  TIME     NAME     TYPE     DIST
RSCS     0664 A PUN 00000142 001 NONE 11/18 16:33:48 PRINTLOG OUTPUT   NEALE
```

```
tag query file 664
FILE (0134) ORIGIN NJE2     NEALE    11/18/05 17:35:38 CDT     JOBID 00134
```

```
peek 664
0664     PEEK     A0  V 132  Trunc=132 Size=109 Line=0 Col=1 Alt=0
File A.PRINTLOG.OUTPUT from NEALE at NJE2 Format is NETDATA.
* * * Top of File * * *
"// JOB TEST NOTIFY                                DATE 11/18/2005, CLOCK 16/28/53
// EXEC PRINTLOG,SIZE=PRINTLOG,PARM='F4'
"1S54I PHASE PRINTLOG IS TO BE FETCHED FROM IJSYSRS.SYSLIB"OPTIONS SPECIFIED:F4
                         11/18/2005 PAGE      1
```

Receiving PDS from z/OS

- PDS members maybe sent from z/OS individually and received
- Entire PDS is received as a tarball under the id of the PDS
- tar –xf will extract members

Directing Output to Printers

```
LPR      NJE2 *        *        *   *     *        *        *       default
RUN   /usr/local/bin/rprint $FRUSER $FRNODE $FID $SPOOL $CLASS $TOUSER $TONODE
$FNAME $FTYPE $TAG $DIST
```

/etc/nje/file-exit.cf

```
* $$ JOB JNM=PRINTLOG,CLASS=P,LDEST=(,LPR),XDEST=VSE27,NTFY=YES
* $$ LST CLASS=O
// JOB TEST NOTIFY
// EXEC PRINTLOG,SIZE=PRINTLOG,PARM='F4'
/*
/&
* $$ EOJ
```

Using NQS for batch execution…

```
#!/bin/sh
id
hostname
hostname --domain
uname -a
date
env
cat /proc/cpuinfo
```

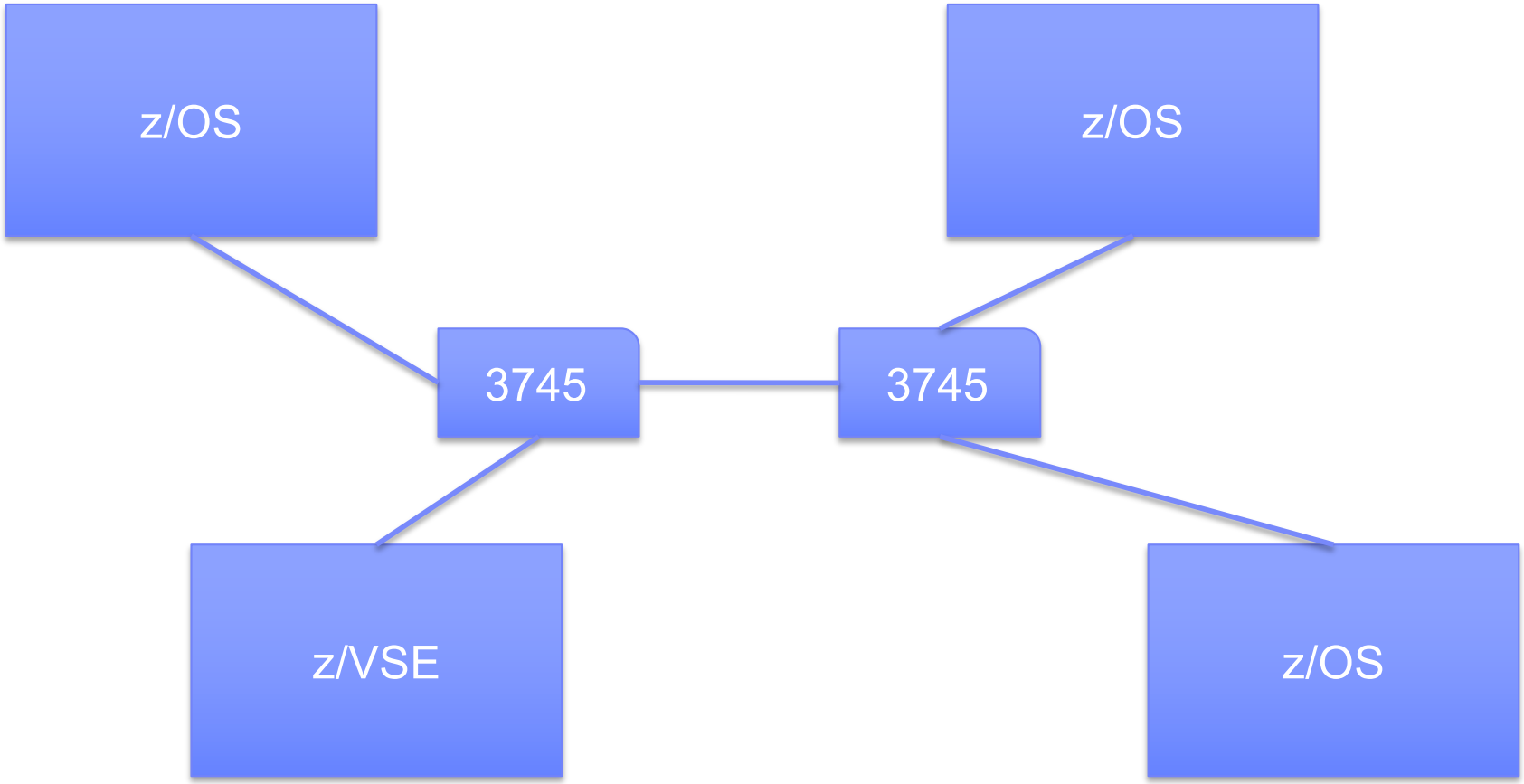
```
sendfile test sh job at nje2
File TEST SH A1 sent to JOB at NJE2 on 11/21/05 12:40:32
Ready;
From NJE2(NJEANON): NQS request: R0188 (0.NJE2.vm.example.com)
beginning at 12:40 on NJE2.vm.example.com
From NJE2(NJEANON): NQS request: R0188 (0.NJE2.vm.example.com)
end at 12:40 on NJE2.vm.example.com
From NJE2(NJEANON): NQS request: R0188 (0.NJE2.vm.example.com)
end at 12:40 on NJE2.vm.example.com
```

…Using NQS for batch execution

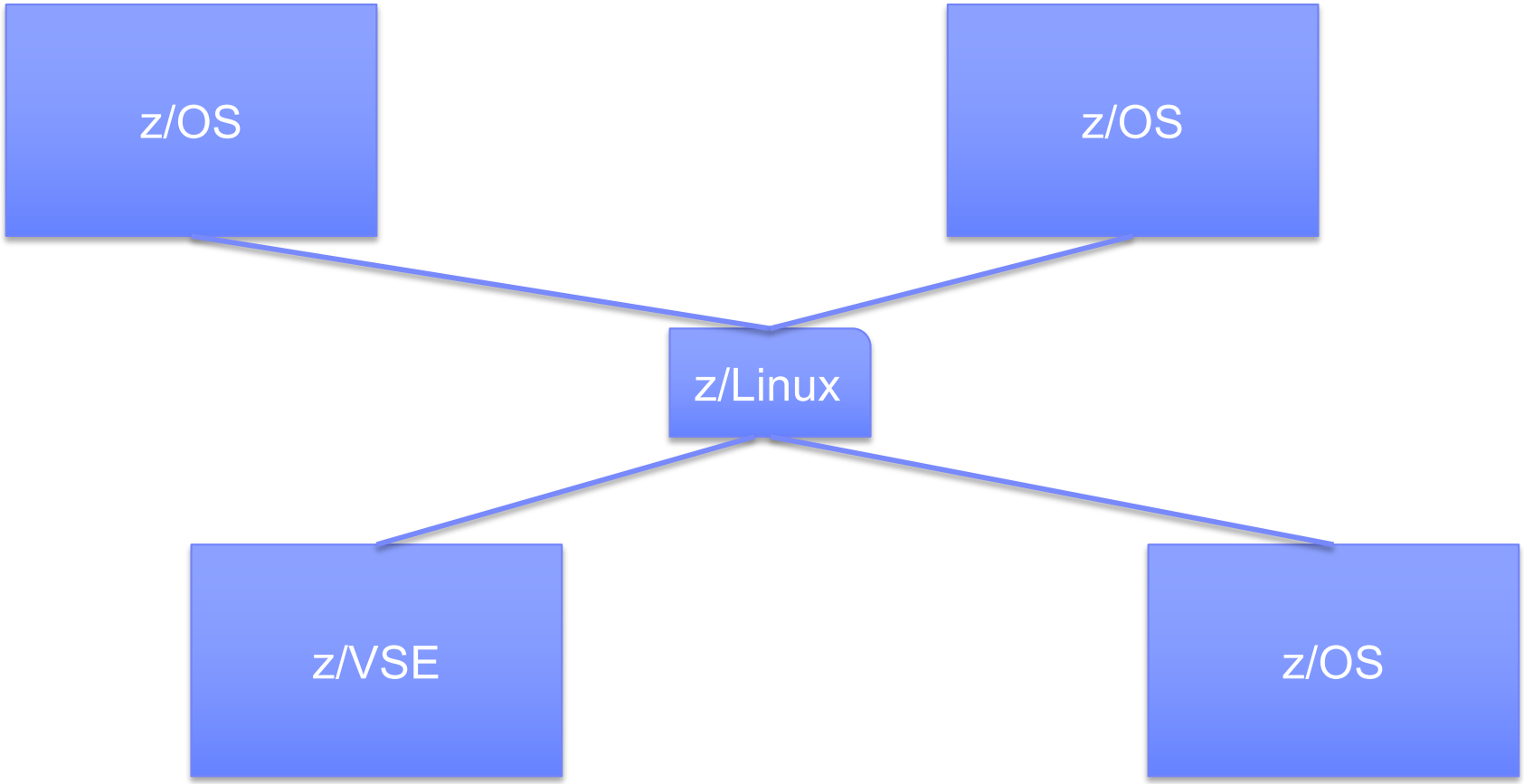
```
RDR FILE 0677 SENT FROM RSCS      PRT WAS 0189 RECS 0000 CPY  001 A NOHOLD NO
 DMTAXM104I File (0036) spooled to NEALE -- origin NJE2(ROOT) 11/21/05 13
 :08 CDT
RDR FILE 0678 SENT FROM RSCS      PRT WAS 0190 RECS 0062 CPY  001 A NOHOLD NO
 DMTAXM104I File (0037) spooled to NEALE -- origin NJE2(ROOT) 11/21/05 13
 :08 CDT
q r all *
ORIGINID FILE CLASS RECORDS  CPY HOLD DATE  TIME     NAME       TYPE     DIST
RSCS     0677 A PRT 00000000 001 NONE 11/21 12:40:44 NJE_ERR   00000000 ROOT
RSCS     0678 A PRT 00000062 001 NONE 11/21 12:40:44 NJE_OUT   00000000 ROOT
```

```
peek 678
0678     PEEK     A0  V 132  Trunc=132 Size=62 Line=0 Col=1 Alt=0
File NJE_OUT 00000000 from ROOT at NJE2 Format is PRINT.
* * * Top of File * * *
uid=1001(njeanon) gid=1003(njeanon) groups=1003(njeanon)
nje2
vm.example.com
Linux nje2 2.6.5-7.191-s390 #1 SMP Tue Jun 28 14:58:56 UTC 2005 s390 s390
s390 GNU/Linux
Mon Nov 21 12:40:42 EST 2005
```

Case Study – A Nordic Financial Institution



Case Study – A Nordic Financial Institution



Summary

- NJE/IP enables IBM and non-IBM operating systems to interoperate in a natural, supported, integrated fashion
- Allows rapid implementation of sophisticated output and application development solutions at very low cost.
- Enables IBM and non-IBM systems to leverage common and sophisticated system management solutions already in place in either environment
- In environments where the only SNA networking in place is to support a NJE link between z/OS and a system supported by NJE/IP, NJE/IP can facilitate the elimination of SNA networking.

Further Information

- “Using the NJE/IP Bridge: A Sample Configuration and Example White Paper” - http://sinenomine.net/node/525
- “z/OS Network Job Entry – Formats and Protocols”, SA22-7539-00.