

z/OS Running on a Laptop: Rational Development & Test Environment for System z v.8.5 – Update and User Experience

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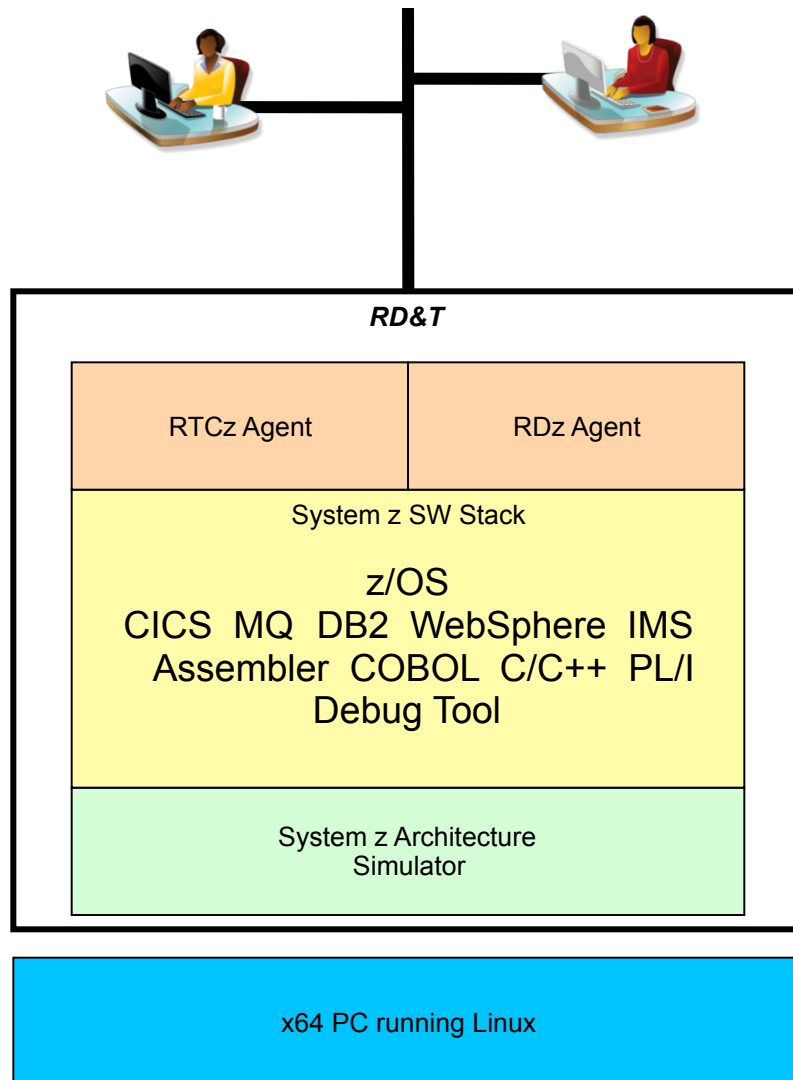
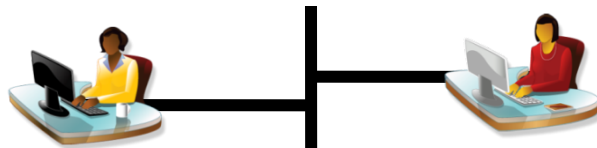
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Rational Development and Test Environment for System z v.8.5



The Rational Development and Test Environment for System z consists of:

- **System z Architecture Simulator (based on zPDT)**
 - ▶ System z Architecture Simulator provides System z architecture on Intel
 - ▶ Capable of running any System z compatible operating system. z/OS currently supported.
 - ▶ provides great flexibility in running a customized environment
- **Software stack** provides a choice of IBM middleware test environments
 - ▶ Actual middleware software (including z/OS)
 - ▶ Actual enterprise compilers
 - ▶ Actual APIs (no simulation)
- **RDz and RTCz agents**
 - ▶ Packaged for simplification
 - ▶ Still need RTC and RDz client license(s) to activate

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RDz UT ... what's new

- New Name → Rational Development and Test Environment for System z
- AKA:
 - RD&T
 - Rational Dev and Test

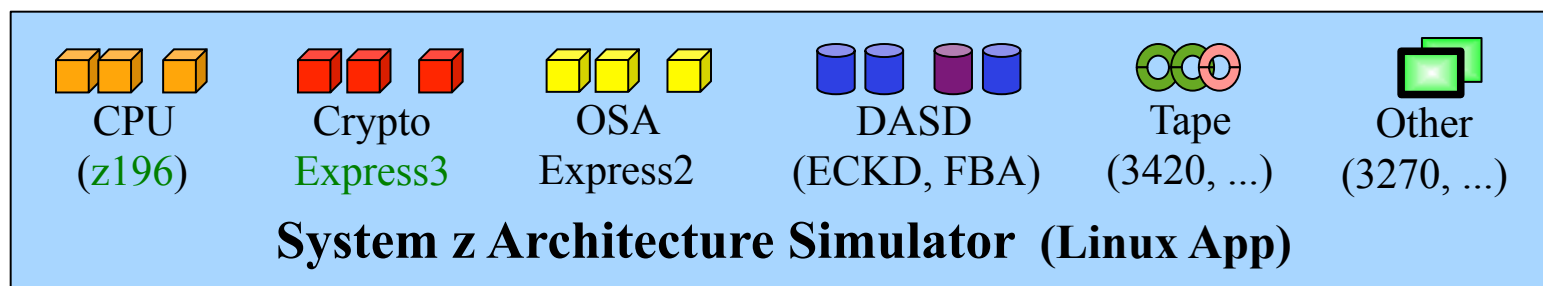
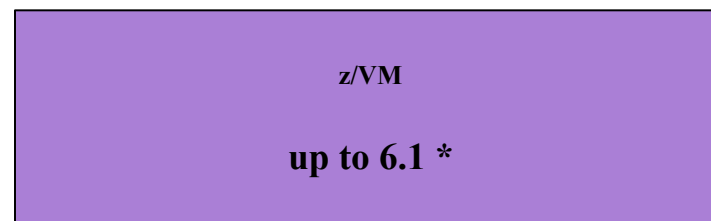
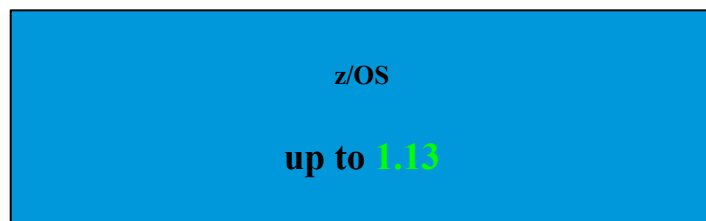
Dev and Test Environment for System z

- No RDz license required
- 3CP max capacity
- Floating License between users on single machine

System z Architecture Simulator Overview



Supported Client OS's

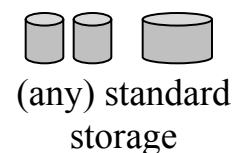
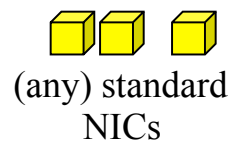
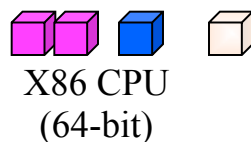


Host OS: (64-bit)

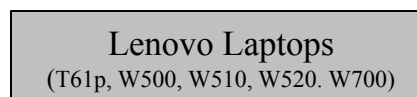
- open SuSE 11.2
- SLES 11.0-11.4
- RHEL 6.0 - 6.2



Supported Devices



Supported Systems



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Selected z/OS Software Products Licensed for Use with RD&T 8.5



- z/OS V1.12 and V1.13, including sub features
- WebSphere Application Server for z/OS V7.0, and V8.0
- CICS Transaction Server V4.1, and V4.2
- IMS V11.1
- DB2 for z/OS, V9.1 and V10.1
- WebSphere MQ for z/OS, V7.0.1
- IBM Java SDK for z/OS, V6.0, and V6.1
- Enterprise COBOL V4.2
- Enterprise PL/I V4.1
- XL C++ V1.12 and V1.13
- IBM Rational COBOL Runtime V6.0 (EGL)
- IBM Debug Tool V11.1
- Omegamon XE 5.1

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RD&T Device mapping file (devmap) – defining devices to z/OS

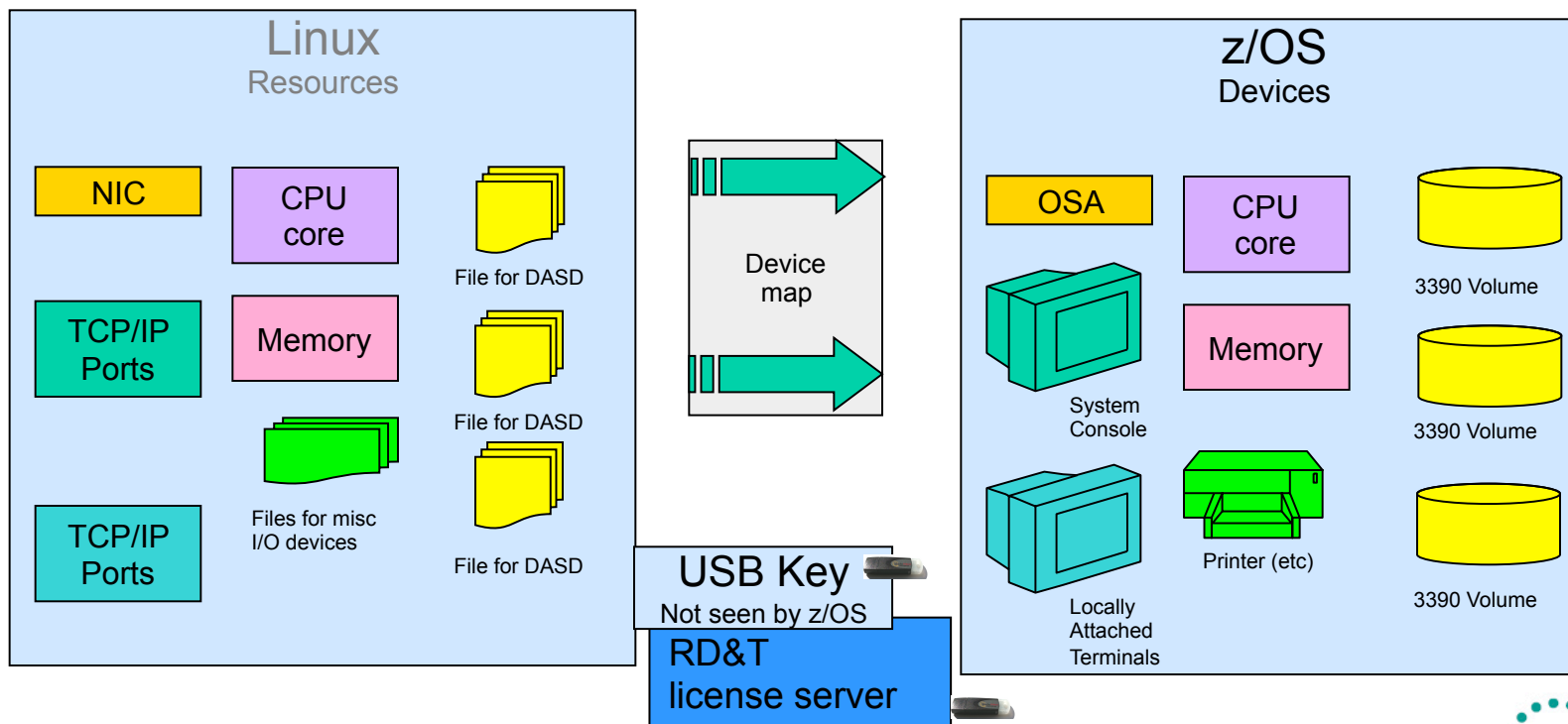
Device mapping file – maps the resources known to Linux to the devices known to z/OS

z/OS volumes are contained in Linux files

z/OS Communication device is a Linux Ethernet card or a logical tunnel device

z/OS printer or card readers can be Linux files

Other z/OS devices supported – SCSI tape drives, CTC, crypto express 2



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RD&T device mapping configuration – System/3270

- Device map you configure Simulator options and 3270 resources

[system]

```
memory 3000m          # define 2000 MB System z
processors 3           # use 2 or 3, if appropriate
3270port 3270          # port number for TN3270 connections
```

[manager]

```
name aws3274 0002      # define a few 3270 terminals
device 0700 3279 3274 mstcon
device 0701 3279 3274 tso
device 0702 3279 3274 tso
device 0703 3279 3274 tso
device 0704 3279 3274 tso
```


RD&T device mapping configuration – User Volumes

- Device map you configure User volumes <example>

[manager]

name awsckd 0001

device 0a80 3390 3990 /home/danab/z1090/disks/ZBRES1

device 0a81 3390 3990 /home/danab/z1090/disks/ZBRES2

device 0a82 3390 3990 /home/danab/z1090/disks/ZBSYS1

device 0a83 3390 3990 /home/danab/z1090/disks/ZBUSS1

device 0a84 3390 3990 /home/danab/z1090/disks/ZBPRD1

device 0a85 3390 3990 /home/danab/z1090/disks/ZBPRD2

device 0a86 3390 3990 /home/danab/z1090/disks/ZBPRD3

...

device 0aa1 3390 3990 /home/danab/z1090/disks/ZBCIC2

<many more>

CICS 4.1

#(continue with WASnnn volumes if you installed them)

additional user volumes

device 0ab0 3390 3990 /home/danab/z1090/disks/PUBLIC

PUBLIC volume for temp data sets

device 0ab1 3390 3990 /home/danab/z1090/disks/USER00

USER00 for user data

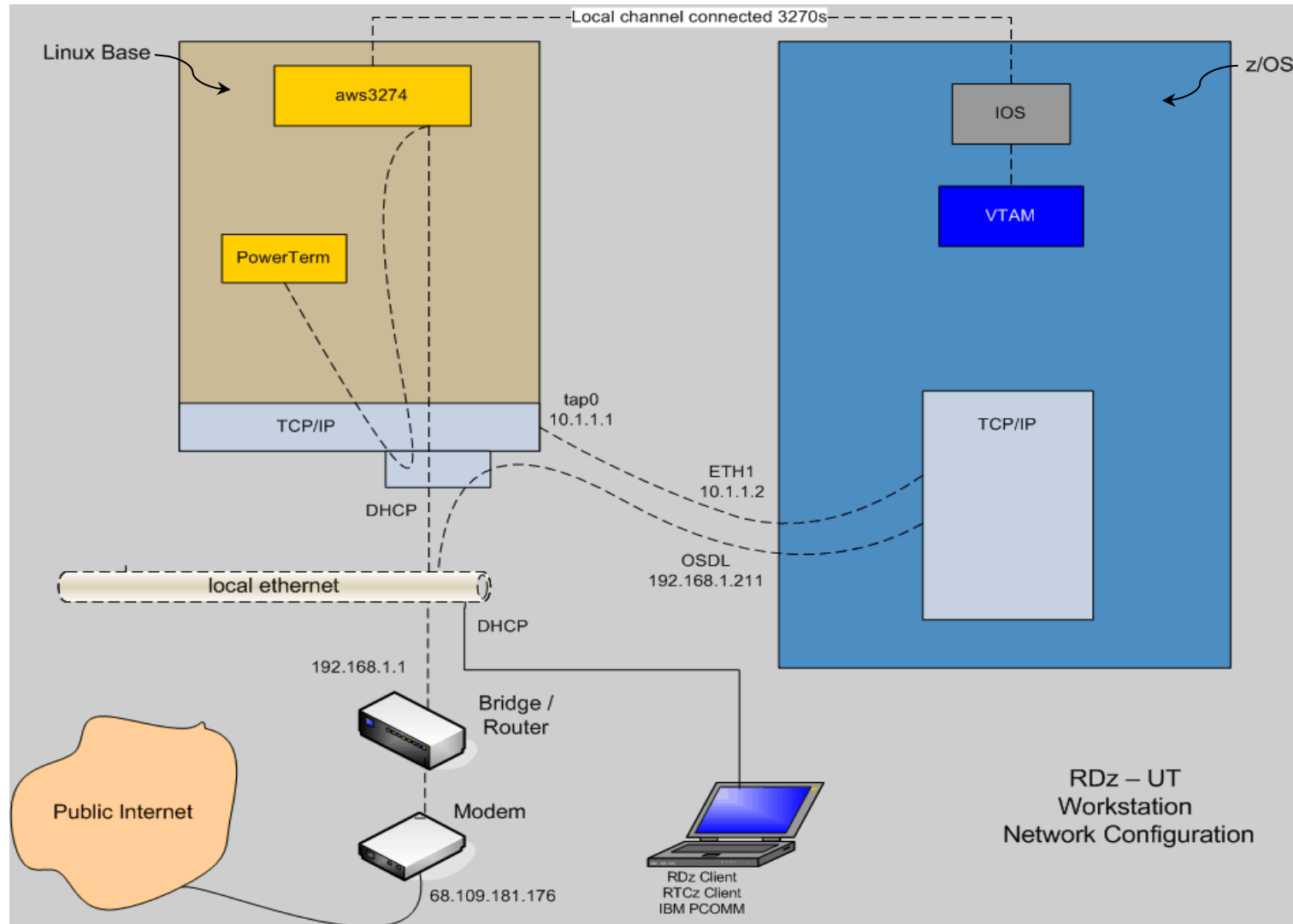
device 0ab3 3390 3990 /home/danab/z1090/disks/PAGE01

Paging volume

Inter-galactic network configuration

- Network configuration can be a challenge
- Knowledge required includes:
 - Network protocols
 - VTAM / SNA, TCP/IP
 - Network Appliances
 - Routers, Bridges, Hubs, Firewalls
 - Network Terminology
 - DHCP, static IP, NAT, TRLE, CSM
 - Configuration files
 - TCPIP.DATA, PROFILE.DATA, IPCONFIG, RESOLVER.CONFIG, resolv.conf, HOSTS.LOCAL
 - Operating systems and environments
 - Linux, RD&T Simulator, z/OS, USS
- This can get out of hand VERY quickly
- Our approach – keep it simple, but flexible
- Allow for multiple configuration options

Target Network Configuration for RD&T - Linux and z/OS



z/OS configuration

- z/OS Network configuration involves configuring multiple subsystems and multiple files. We will see some of these values again when we complete the RD&T configuration using the full RD&T device mapping.
- Required configuration steps
 - Define network devices in RD&T device mapping
 - Physical devices
 - Virtual tunnel devices
 - Define devices, links, routes in TCP/IP configuration files
 - Define VTAM TRLE endpoints in VTAM configuration files
- Additional z/OS network configuration steps will be completed after we ipl z/OS for the first time.

RD&T device mapping configuration

- We must define the devices z/OS will use to communicate with base Linux and the external subnet

- [manager] Defines the link to the physical ethernet adapter. The ethernet adapter side of this link is configured by the base network adapter utility in RHEL 6.2. We will define the other side of this link in z/OS TCP/IP and VTAM.

```
name awsosa 0009 --path=F0 --pathtype=OSD
device 400 osa osa --unitadd=0
device 401 osa osa --unitadd=1
device 402 osa osa --unitadd=2
```

- [manager] Defines the logical tunnel that allows communication between base Linux and z/OS. The Linux side of this tunnel is defined automatically by RHEL 6.2. We will define the other side of this link in z/OS TCP/IP and VTAM.

```
name awsosa 0019 --path=A0 --pathtype=OSD --tunnel_intf=y
device 404 osa osa --unitadd=0
device 405 osa osa --unitadd=1
device 406 osa osa --unitadd=2
```

z/OS VTAM configuration

- VTAM provides the device drivers for z/OS TCP/IP. We must define the TCP/IP device endpoints to VTAM
 - Note the device numbers defined here must match the device numbers in the device map
- z/OS VTAMLST
 - OSATRL1 VBUILD TYPE=TRL
 - OSATRL1E
TRLELNCTL=MPC,READ=(400),WRITE=(401),DATAPATH=(402), PORTNAME=ADM1ETP,MPCLEVEL=QDIO
 - OSATRL2E
TRLELNCTL=MPC,READ=(404),WRITE=(405),DATAPATH=(406), PORTNAME=PORT2,MPCLEVEL=QDIO

z/OS TCP/IP configuration

- Two primary z/OS TCP/IP configuration files
 - PROFILE.TCPIP – contains configuration parameters for the TCP/IP procedure
 - TCPIP.DATA – contains DNS and host information to aid in IP address to host name lookups
 - Network device configuration is primarily contained in PROFILE.TCPIP
 - The steps on the next chart will be completed after we IPL our z/OS machine for the first time

z/OS TCP/IP configuration

- PROFILE.TCPIP configuration

```

DEVICE ADM1ETP MPCIPA
LINK OSDL IPAQENET ADM1ETP
HOME 192.168.1.211 OSDL
DEVICE PORT2 MPCIPA
LINK ETH1 IPAQENET PORT2
HOME 10.1.1.2 ETH1

```

```

BEGINRoutes;

```

Destination	Subnet Mask	First Hop		Link	Size
ROUTE 192.168.1.0	255.255.255.0		= OSDL	MTU	DEFAULTSIZE
ROUTE 10.0.0.0	255.0.0.0		= ETH1	MTU	DEFAULTSIZE
ROUTE DEFAULT	192.168.1.1		OSDL	MTU	DEFAULTSIZE

```

ENDRoutes;

```

```

START ADM1ETP
START PORT2

```

Completing the network configuration



- Update TCPIP.DATA with your Hostname, Domain name, and DNS server addresses
- If you are using a HOSTS file for local hostname lookup, update your HOSTS file dataset to include host to IP address associations that you want to resolve on the local host
- Stop TCPIP with a STOP TCPIP command
- Start TCPIP with a START TCPIP command
- TCPIP should come up and you should have connectivity to your locally configured network through your router/ bridge

Things to make your life with RD&T easier



- Create a startup script
 - startpdt.sh – used to define terminals and initialize system z simulator environment

```
#!/bin/bash
echo "start of RD&T setup"
awsstart /z113/aprof1-z113 --clean
sleep 4
echo "RD&T started"
x3270 -port 3270 -oversize 132x43 mstcon@localhost &
sleep 2
x3270 -port 3270 -oversize 132x43 localhost &
sleep 2
echo "terminals defined"
echo "end of RD&T setup"
echo " Issue ipl 0a80 parm 0a82xx command"
ipl 0a80 parm 0a82cs
```

Things to make your life with RD&T easier – (cont.)



- Your first IPL
 - Open a terminal window
 - Issue the commands
 - `./startpdt.sh`
 - *Defines RD&T environment and terminals*
 - `ipl 0a80 parm 0a82cs`
 - *ipls z/OS on sysres volume 0a80*
 - *points to ipl parameters in SYS1.IPLPARM on volume 0a82*
 - *points to initialization parameters in PDS member IEASYS82*
 - *System will use SYS1.PARMLIB concatenation defined when ADCD system was generated. In this case, for the first IPL IEASYS82 will be picked up from the PARMLIB supplied with the ADCD – ‘ADCD.Z113.PARMLIB’.*
 - *IEASYS82 does a cold start of JES2 and brings up the system with a default configuration for VTAM and TCP/IP. Until customization of TCP/IP is completed, the only terminal interface that will work is the VTAM attached terminal defined with x3270.*

Things to make your life with RD&T easier – (cont.)



- Shutting down RD&T
 - From the z/OS console issue the commands:
 - S SHUTDOWN – does an orderly shutdown of z/OS and its major subsystem components
 - When VTAM ends, issue the \$P JES2 command
 - When JES2 ends, enter the QUIESCE command – this will force a waitstate on all processors. You will see this in the terminal window you have open.
 - In your open terminal window, issue the command
 - awsstop –stops the RD&T system z simulator and stops all x3270 windows
 - Exit from terminal window
 - Proceed with shutdown of Linux



IPL Parameters and Configuration Options

LOADPARM	CMD	VTAM	OMVS	PROG	LPA	Shutdown	Description
CS,WS	CS,CW	APPL	CS	01	01	Shutdown	JES2 only
4C,4W	4C,4W	C4	42	42	42	Shut4w	CICS 4.2, MQ 7.0.1
CC,CW	CC,CW	CI	CI	CI	CI	Shutcw	CICS 4.1, MQ 7.0.1
1C,1W	1C,1W	DBA	DA	DA	00	Shut1w	DB2 10.1
9C,9W	9C,9W	D9	D9	D9	00	Shut9w	DB2 9.1
IC,IW	IC,IW	IC	CS	IM	00	Shutdown	IMS 11.1
BC,BW	BC,BW	BB	BB	BB	00	Shutdown	WAS 8.0, DB2 10.1
DC,DW	DC,DW	DB	DB	DB	42	Shutdb	DB2 10.1, CICS 4.2, MQ 7.0.1
AC,AW	AC,AW	ALL	00	AL	42	Shutaw	DB2 10.1, CICS 4.2, MQ 7.0.1, IMS 11.1
EC,EW	EC,EW	EW	EW	EW	EW	Shutew	All

Example - **ipl 0a80 parm 0a82cs** – results in a cold start of the system with JES2

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Initial RD&T z/OS Customization

- RACF configuration
 - Copy the default RACF database to a user location
 - Make a backup of the RACF database
 - Update ICHRIN00 to point to the new RACF databases
- Update SYS1.IPLPARM for new system parameter configurations
- Update MSTRJCL for PROCLIB concatenation
- Allocate and update USER library configuration
 - PARMLIB
 - PROCLIB
 - TCPPARMS
 - CLIST
 - VTAMLST
- USS Customization
 - Add required HFS, ZFS libraries
 - Customize RESOLVER
- Network configuration – VTAM, TCPIP

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Additional RD&T z/OS configuration

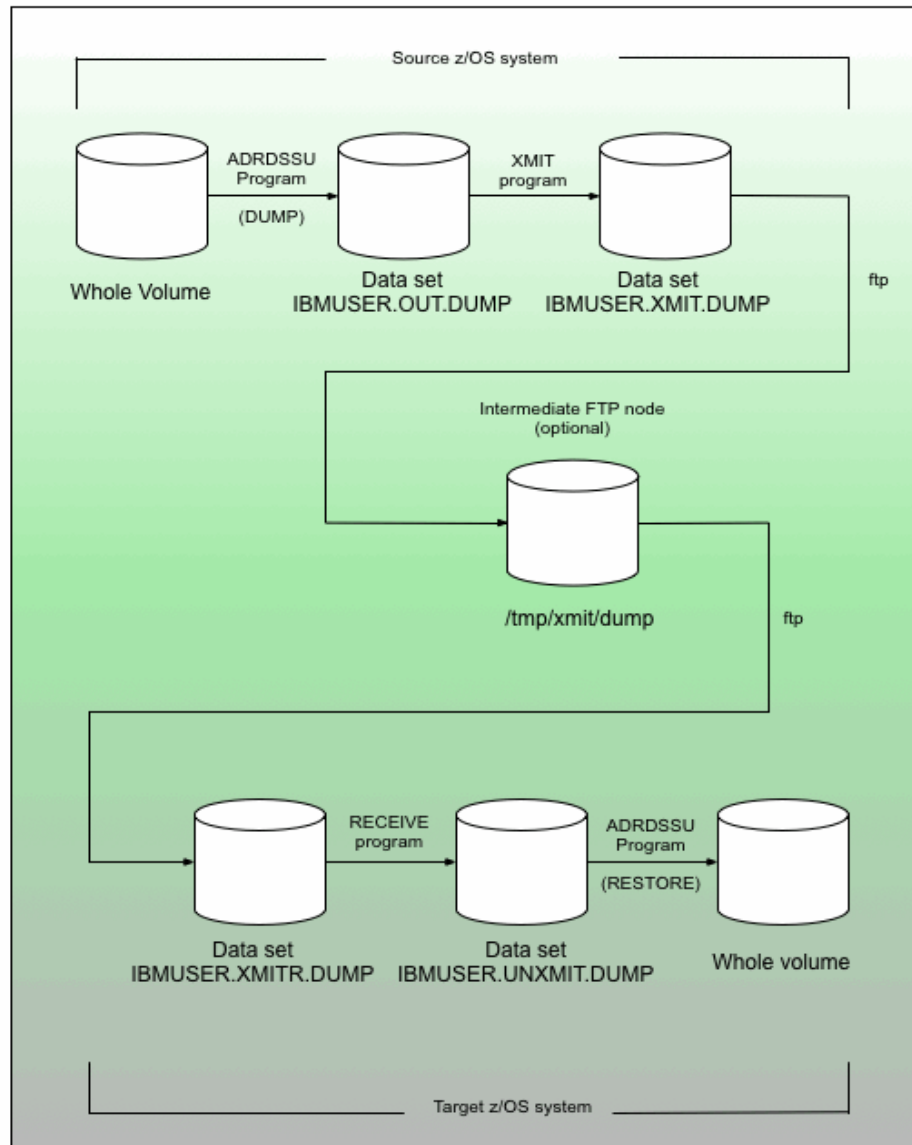
- LOGON PROC customization
 - Update logon PROCs for custom datasets
- USS MSG10 customization
 - Update custom login screen
- SMF customization
- LOGREC customization
- RRS configuration
- LLA, VLF configuration
- System DUMP configuration
- System Logger configuration
- Subsystem customization
 - CICS, IMS, DB2, DB2, WAS, MQ, HTTP
- Tools customization
 - RDz (RSED, LOCKD, JMON)
 - RTC (Build Toolkit, ISPF Gateway, ISPF Client)

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Accessing Existing z/OS Data

- Multiple data types
 - Sequential files, PDS's, PDSE's, HFS, ZFS, DB2 databases, IMS databases, VSAM files, ICF Catalogs
 - Multiple ways to access data
- TCP/IP
 - RDz
 - FTP
 - NFS
 - SMB
 - NJE
- Dataset migration
 - ADRDSSU
- DASD volume migration
 - Complete volumes (3380 or 3390) are transferred. This includes IPL text, volume labels, VTOC, *and unallocated space*. The logical contents of the volume are not examined. Data sets on the volume are not recognized. The utility copies and transfers all the tracks on the volume.
 - RD&T DASD Migration Utility – zPDTMSRV, hckd2ckd

Provisioning Using ADRDSSU



1. Create user storage on RD&T system

Allocate linux disk space to hold a 3390 volume dump and to hold a reformatted volume dump.

```
alcckd /z/USER01 -d3390-3
```

```
alcckd /z/USER02 -d3390-3
```

```
alcckd /z/USER03 -d3390-3
```

2. Activate user volumes on RD&T system

Update devmap or issue awsmount for new volume(s).

lpl z/OS system.

Initialize new volume(s) with label and VTOC.

Vary new volume(s) online.

3. Create source dump on source system

A normal ADRDSSU job is used to dump the source volume.

4. Xmit dump on source system

Create xmit formatted dump.

5. Send dump to RD&T system

Send the xmit-formatted dump using an ftp connection from source z/OS to target z/OS. (May use intermediate FTP node.)

6. Receive dump on RD&T system

Pre-allocated datasets on the receiving z/OS system. One data set is the target of an ftp transfer from Linux (or some other source) and the other is for the output of the TSO RECEIVE function. This last data set is then the input to a RESTORE job.

7. Format dump on RD&T system

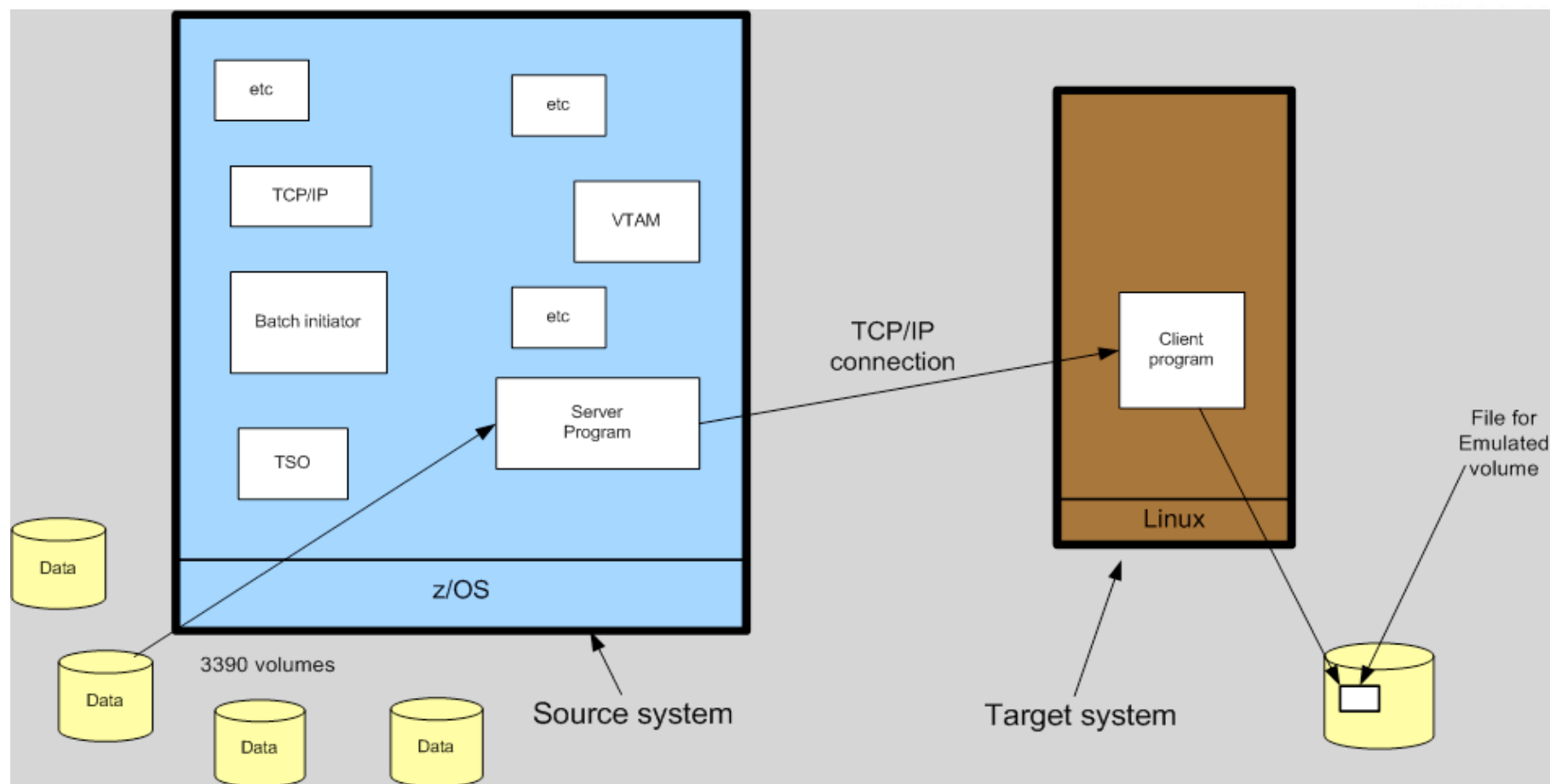
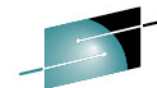
Use TSO to reformat the dump into the original format created by ADRDSSU.

8. Restore the volume on RD&T system

Restore the z/OS volume.

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Provisioning Using the DASD Migration Facility



- Start server program on z/OS
 - START MIGRATER
- Start client program on linux
 - `hckd2ckd 192.168.2.211:3990 /z/SYSCFG -v SYSCFG`

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Customer configuration scenario's

Single User scenario



Usage Case

- Portable usage for consulting, education, demonstrations
- Education of new sys. progs
- Individual developers/hackers/testers



Configuration

- Multi-Core i7+ Laptop / desktop
- Personal copy of
 - Linux 64 bit, zPDT simulator,
 - zOS volumes

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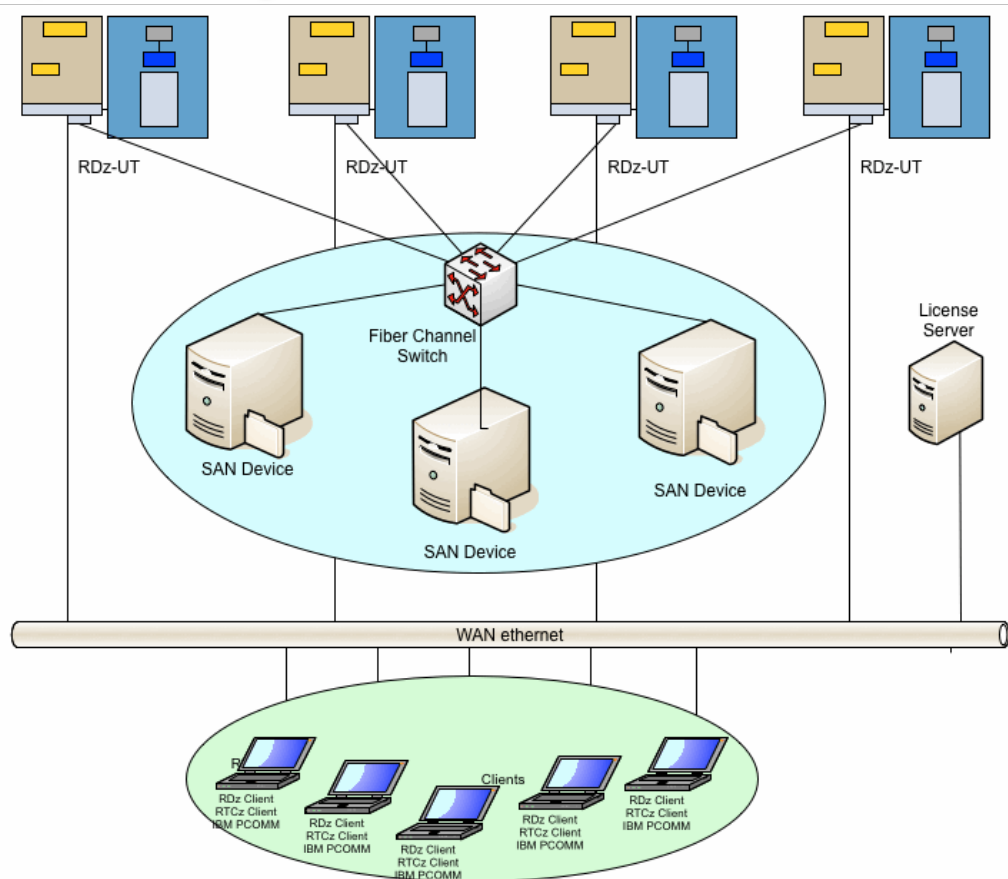
Customer configuration scenario's

Team scenario



Usage Case

- Team of developers or testers
- Education of new sys. Progs
- Multiple zOS configurations



Configuration

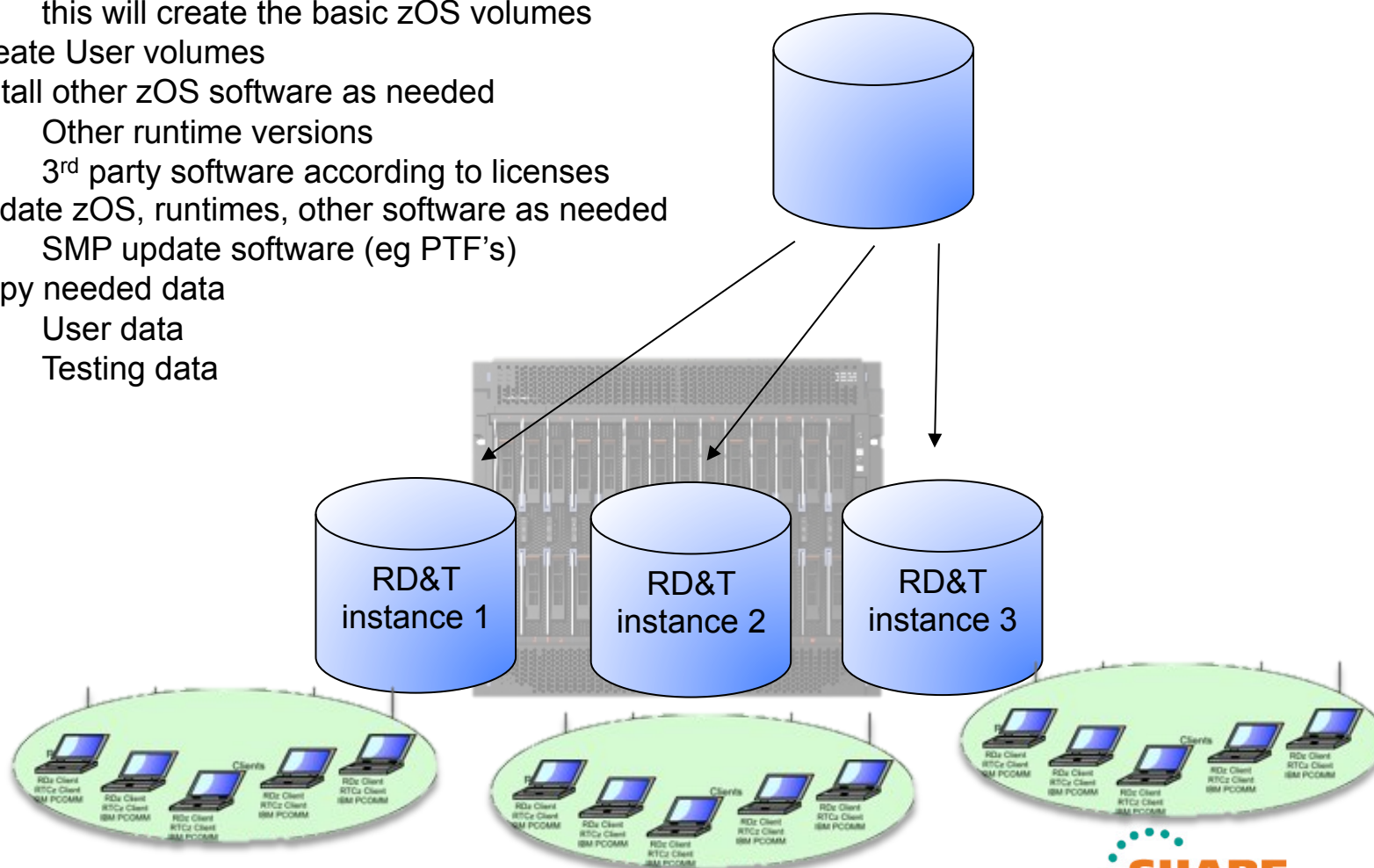
- WAN network – connects to WAN for access to network resources
- SAN network – connects to SAN for access to storage volumes

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Setup scenario

Create a base image

- Install RD&T
 - this will create the basic zOS volumes
- Create User volumes
- Install other zOS software as needed
 - Other runtime versions
 - 3rd party software according to licenses
- Update zOS, runtimes, other software as needed
 - SMP update software (eg PTF's)
- Copy needed data
 - User data
 - Testing data



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Helpful linux utilities

- Setup commands
 - Validate a devmap file
 - awsckmap aprof1
 - awsckmap /bill/map123.txt
 - awsckmap aprof1 -list
 - Allocate a system volume
 - alcckd /z/WORK01 -d3390-3
 - alcckd /z/WORK02 -s9000 -d3390
 - alcckd /z/WORK03 -d3390-1 -z
- Basic operation
 - Start RD&T
 - awsstart aprof1
 - awsstart aprof --clean
 - Stop RD&T
 - awsstop

More helpful linux utilities

- lpl a system
 - ipl 0a80
 - lpl 0a80 parm 0a82cs
- Mount a volume to linux
 - awsmount 560 -m
 - awsmount 560 -o
- Obtain the status of a volume
 - awsstat
 - awsstat 0a80 0a82
- Send a z/OS system command to z/OS from linux
 - oprmsg 'V CN(*),ACTIVATE'

Common Questions

1. What is the maximum number of developers a RD&T server can support?

- This can vary depending on the underlying hardware and development activity. Desktops can typically support 3-5 users. Server class machines can support up to 15-25 users.

2. How can I get test data for use in RD&T?

- Customers can use existing tools like IDCAMS, DB2 utilities, etc. to extract test data and then download it to the RD&T machine. RD&T provides a DASD volume migration utility that can download an entire 3390 DASD volume onto the RD&T machine.

3. Can I run other levels of the middleware provided?

- RD&T is supplied with a standard set of software middleware, compilers, and runtimes. The included license covers this software at the supplied versions. Special license terms and conditions for other versions/ releases of software may be created as long as the requested software is currently in service and remains in service 6 months from the sales date.

4. Can I use other IBM tools in the RD&T environment?

- ESW zOTC or zMLC tools (like PD tools) currently are not licensed for use with RD&T. Passport Advantage products can be used in the RD&T environment. Exceptions to these rules are handled on a case by case basis with individual IBM product owners.

5. Can I run third party software?

- Yes, if the third party license allows this. Customers must work with their software vendor to determine licensing considerations.

Additional Questions

6. Does RD&T require linux skills?

- Linux skills are required to setup the host linux operating system and to allocate linux resources for the System z architecture simulator
- Some linux networking skills are helpful
- Linux program installation and maintenance skills are also required

7. Does RD&T require system programming skills?

- z/OS does require system programming skills to set up the development and/or testing environments.
- IBM recommends setting up one box and then cloning that configuration to other boxes.

8. What about security?

- RACF is installed, but with minimal configuration.
- The sample configuration guide has suggestions for basic security.
- Security is a site choice. The ability to customize z/OS on a platform designed for individuals or small teams may:
 - *Provide better testing opportunities*
 - *Provide customization for individual productivity gains*
 - *Provide opportunities to learn about z/OS fundamentals*

RD&T installation and configuration documentation



- IBM Rational Development and Test Environment for System z Quick Start Guide (GI13-1802-03)
- IBM Rational Development and Test Environment for System z USB Hardware Device Quick Start Guide (GI11-9147-02)
- Installation: System z Personal Development Tool Redbooks
 - Basic instructions for installation/ configuration of Linux, zPDT, and starter z/OS system
 - References
 - System z Personal Development Tool Volume 1: Introduction and Reference (SG24-7721) (version 4 or later)
 - System z Personal Development Tool Volume 2: Installation and Basic Usage (SG24-7722) (version 4 or later)
 - System z Personal Development Tool Volume 3: Additional Topics (SG24-7723) (version 5 or later)
- Configuring z/OS with IBM Rational Development and Test Environment for System z - z/OS 1.12 (SC14-7281-03), z/OS 1.13 (SC14-7281-04)
 - Contains basic instructions and examples for z/OS system customization
 - Isolate base configuration files from customized files
 - Store user data on a separate disk
 - Configure TCP/IP settings
 - Configure security for critical system files
 - Create user IDs
 - Other minor but common changes to z/OS
 - System programmer assistance will be required to replicate specific conventions, security models, subsystems, etc

RD&T Resources on the Web

- Rational System z Development and Test Hub
 - <http://ibm.co/rationalsystemzdevtest>
- RD&T Support Forum
 - <http://www.ibm.com/developerworks/forums/forum.jspa?forumID=2283>
- RD&T on ibm.com
 - <http://www-01.ibm.com/software/rational/products/devtest/systemz/>

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RD&T machine specifications

- Processor
 - Recommended configuration is 2.4 Ghz Intel i7 quad core or equivalent
- RAM
 - Recommended configuration is 8-16 GB
- Disk space
 - 20 GB for base Linux / zPDT install
 - 50-350 GB for z/OS install
- Network
 - 100MB / 1GB Ethernet adapter (shared by Linux and z/OS)
 - Wireless (OK for Linux, not recommended for z/OS)
- USB
 - Required for hardware key
 - License server may used



RD&T installation overview

- Install Linux, including x3270 (or another 3270 emulator)
- Create a group and userid to own the System z architecture simulator
- Install the System z architecture simulator
- Customize several Linux files (sysctl.conf, /etc/profile.local, /etc/profile, .bashrc)
- Install a sample device mapping file
- Activate your USB license keys
- Install z/OS and other System z software
 - Unzip or untar the volumes
 - Customize or create a device mapping file
 - Start the System z architecture simulator and IPL your operating system
 - Install and/or configure RDz host, CICS, IMS, DB2, MQ, WAS, etc

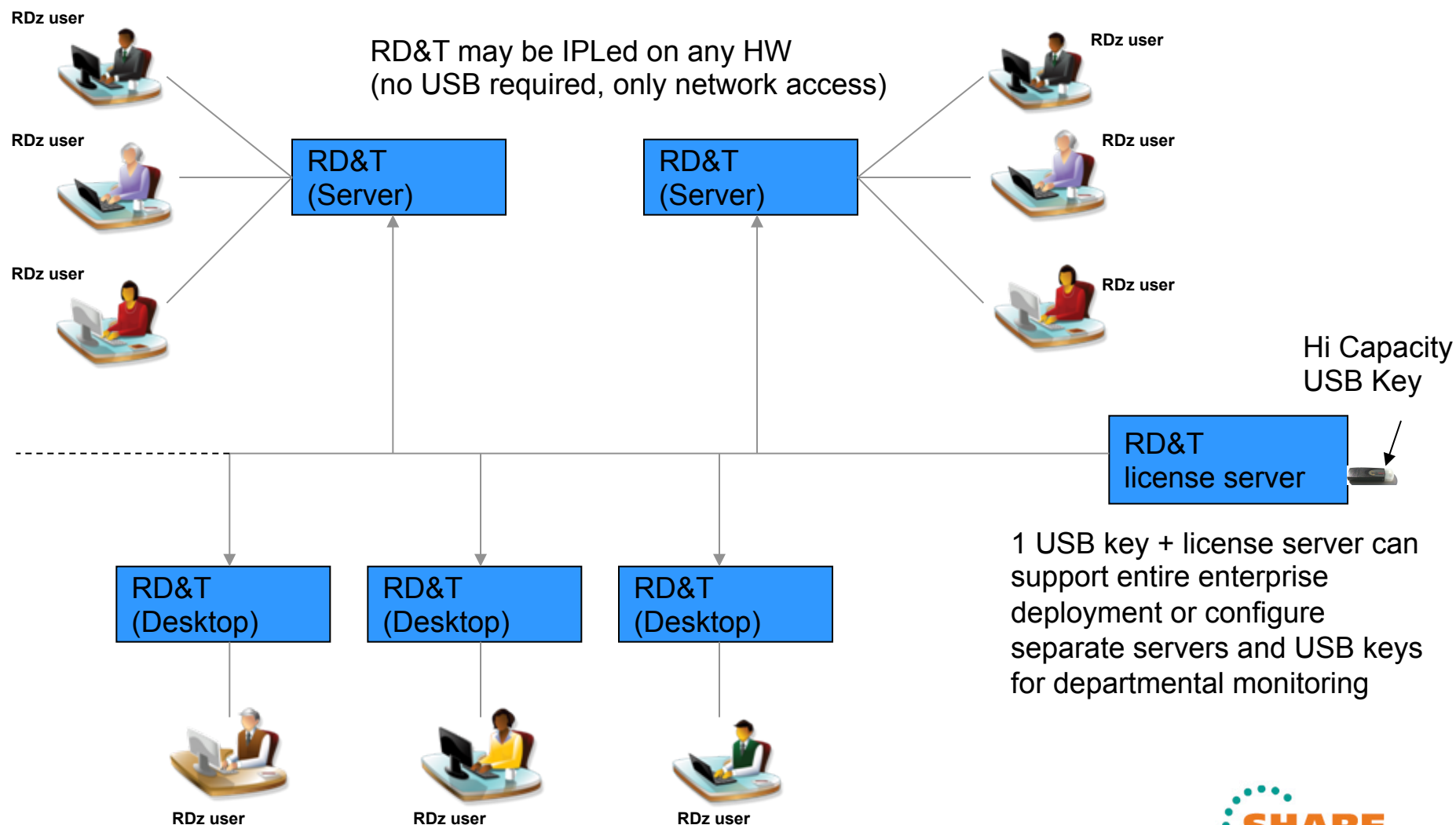
How to activate an RD&T license file and hardware key

- Access the RD&T Hub
<http://ibm.com/rationalsystemzdevtest>
- Access the Rational License Key Center
<https://licensing.subscribe.net.com/control/ibmr/login>
- Provide your hardware key information and request a license file
- FTP the license file to the machine where you installed the RD&T system z software simulator
- Activate the license with the following command while under root authority
 - `SecureUpdateUtility -u myrequest.upw`
where *myrequest.upw* is the license file you received from the Rational License Key Center

RD&T overall network goals

- Allow multiple configurations without requiring file / configuration updates
 - Communication from Base Linux to z/OS
 - Communication from z/OS to Base Linux
 - Communication from intranet subnet to both base Linux and z/OS
 - Communication from both base Linux and z/OS to intranet subnet
 - Communication from both base Linux and z/OS to WAN / external internet
 - Communication from WAN / external internet to both base Linux and z/OS
- Allow for DHCP client access for base Linux
- Provide fixed IP address for z/OS
- Open firewalls within intranet
- Use NAT to WAN / external internet
- Have no dependencies on any specific network components
- Provide good performance to and from both base Linux and z/OS
- Entire configuration must be portable

License Server with RD&T 8.5



Complete your sessions evaluation online at SHARE.org/AnaheimEval



Network configuration details

- Basic configuration
 - Intel i7 Quad core 2.4 Ghz or better workstation running:
 - RHEL 6.2 Linux
 - RD&T running z/OS 1.13
 - External Router / Bridge / NAT firewall
 - DHCP address for base Linux
 - Reserved static IP address for z/OS
 - Additional client workstations using DHCP

Router / Bridge configuration

- Obtain a good Router that can also be configured as a Bridge
 - Should include a Firewall with NAT
 - Should have at least 2 wired ethernet ports and a WAN port
 - Wireless is ok, however, we will not be configuring our hosts to use it
 - Examples:
 - Linksys WRT610N, DLINK DAP-1522, Apple Airport Extreme
- Configure as a Router
 - When operating from a home office, configure your network appliance as a router to extend your WAN network to your z/OS configuration
- Configure as a Bridge
 - When you operating away from the home or office with an isolated network (ie. A customer site) configure your appliance as a bridge. This will create a private network subnet.
- Only difference is access to from WAN/ internet from base Linux/ z/OS

Router / Bridge configuration – (cont.)

- Define a non-routable subnet
 - eg. 192.168.1, 10.1.1
- Enable DHCP for first 50 addresses of subnet
 - eg. 192.168.1.1-49, 10.1.1.1-49
 - Base Linux, additional client machines will get their addresses from this pool
- Reserve some static IP addresses
 - eg. 192.168.1.200-249, 10.1.1.200-249
 - z/OS will use an address from this range
- Enable Firewall and NAT translation
- Open required firewall ports to WAN / internet
 - Telnet, FTP(s), SSH, HTTP(s)

Linux server configuration

- Setup your linux network adapter to obtain a DHCP address from the Router / Bridge
- That's it for the workstation