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zPDT –
Die System z für die Hosentasche

What's happening on a smarter planet?

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Agenda

- **IBM System z® Personal Development Tool (zPDT)**
    - **Technology**
    - **Features & Functions**
    - **Recent Enhancements**

- **IBM Rational Development and Test Environment (RD&T)**
    - **Application Development for System z on System x**

- **SVA**

- **Live Demo**

The IBM System z Personal Development Tool (zPDT)
Look at application development for IBM System z in a new way

- **The IBM System z Personal Development Tool (zPDT) is the technology behind several new application development tools from IBM.**

- **The zPDT technology can enable a virtual System z architecture environment that allows certain mainframe operating systems, middleware and software to run unaltered on Intel® and Intel-compatible platforms**
  - Such as, Lenovo Thinkpad® W Series or IBM System x® 3500 or 3650 server, or systems otherwise approved by IBM

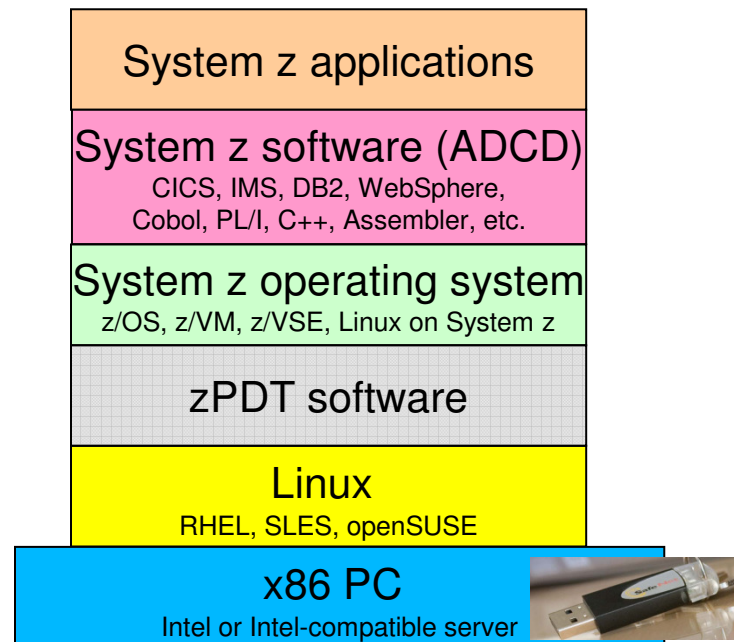- **Develop applications for System z without the System z hardware.**

The IBM System z Personal Development Tool (zPDT)
Externally available since October 30, 2009

- **The zPDT technology consists of hardware and software**
  - **zPDT hardware (1090-L01, -L02, -L03, USB hardware key) is a security key that authenticates the zPDT software**
    - Plugs into the USB port (looks like a 'memory stick')
    - The key expires annually and must be re-certified annually
    - The zPDT software will not run without the 1090 USB key installed
    - The 1090 can enable an environment with 1, 2, or 3 virtual engines
  - **zPDT software enables System z architecture**
    - Runs on a Linux for x86_64 environment

- **A zPDT-based system consists of many pieces:**
  - Thinkpad or System x (or equivalent)
  - zPDT hardware (1090 – in USB port)
  - 64-bit Red Hat or SUSE Linux on the Thinkpad or System x
  - zPDT software
  - ADCD: System z operating system(s) / middleware / tools

| System z applications |
| System z software (ADCD)
CICS, IMS, DB2, WebSphere,
Cobol, PL/I, C++, Assembler, etc. |
| System z operating system
z/OS, z/VM, z/VSE, Linux on System z |
| zPDT software |
| Linux
RHEL, SLES, openSUSE |
| x86 PC
Intel or Intel-compatible server |

zPDT functions (Page 1 of 3)

- **System z operating system support:**
  - Full 64-bit System z operation with both uniprocessor and multiprocessor configurations
  - Support for z/OS®, z/VM®, z/VSE™, and Linux® for System z

- **Up to 3 virtual CPUs (z196 compatible) enabled by the IBM 1090 USB key:**
  - The zPDT comes in three system sizes: one, two, or three virtual engines. The size of the virtual system is defined by the model of the 1090 USB hardware key (product number 1090-L01, 1090-L02, or 1090-L03, where the model number corresponds to the number of virtual engines).
  - Virtual engines can be configured as:
    - System z general purpose processors (CP)
    - System z Integrated Information Processor (zIIP)
    - System z Application Assist Processor (zAAP)
    - System z Integrated Facility for Linux (IFL)
  - Not more than ONE operating system instance per virtual engine, for example:
    - zPDT with three virtual engines can be configured as:
      - A single instance with three engines
      - Three instances with a single engine each
      - Two instances, one with two engines and the other with one engine
    - The z/VM operating system can be used to virtualize these configurations even further and create any number of engines and engine types within an instance (where terms & conditions allow).

zPDT functions (Page 2 of 3)

- **Memory:**
  - Greater than 2 GB of System z memory

- **Networking:**
  - Simulated OSA-Express2 adapter, in either QDIO or non-QDIO. This functionality is provided using ordinary Ethernet adapters on the x86 host machine.

- **Disk devices:**
  - Simulated ECKD disk
    - 3390 disk volumes, including variable sizes, and large EAV (Extended Address Volume) volumes
    - 3380 disk volumes
    - A CKD versioning function that allows a 3390 (or 3380) volume to be quickly restored to a specified point in time.
  - Simulated FBA disk (as used by z/VM and z/VSE)
    - 9336, any model, > 2 GB
  - Sharing of simulated ECKD and FBA across operating system instances

zPDT functions (Page 3 of 3)

- **Tape devices:**
  - Simulated 3420, 3422, 3480, 3490, 3490E, and 3590 devices
  - Selected SCSI-attached tape drives may be used directly by zPDT or via Linux staging functions. SCSI tape drives tested by IBM include:
    - IBM 3580 Ultrium (LTO)
    - IBM 3592 E05.
    - IBM TS1120
    - Fujitsu M2488E
  - Data Compression can be manually enabled for simulated tape devices or manually enabled for SCSI tape drives if the drive hardware supports compression
  - 3422 OMA simulated tape device can read TDF format

- **Other System z devices (simulated):**
  - Card reader (2540) with functions to process both EBCDIC and ASCII data
  - 1403-N1 or 3211 printer, including FCB emulation for 3211 functions
  - Local 3270 (via an emulated 3274) connections. Extended data stream is supported if the 3270 client supports it.
  - 3270 terminals
  - 3215 console, including several System z console interface functions
  - A 1090 device manager that allows Linux commands to be issued to the underlying Linux operating system from the System z operating system.

Updates with zPDT V1.2
Available since June 11, 2010

- **Emulated IBM System z Crypto Express2 (IBM 4764 PCI-X Crypto Coprocessor)**
  - Perform AES, DES, TDES, RSA, and SHA-1 cryptographic processes
  - Note 1 – No physical security as the function is emulated with no HW component.
  - Note 2 – The accelerator function of a crypto adapter is not available.

- **Emulated IBM 3088 CTC device**

- **z/OS Data migration utility**
  - Allows easy migration of 3380 and 3390 volumes to the zPDT-based system
    - Clone a 'big z/OS system' to the zPDT-based system
  - Consists of a client / server application
    - Linux client program "hckd2ckd" loaded on any supported Linux system
    - z/OS server program "zosserv" loaded on z/OS system and given authorization to access full volumes
  - Operation
    - Once the z/OS server program is installed and running, the Linux client can perform full volume copies of any 3380 or 3390 volume the server can access. Ensure the system is stable, with z/OS not writing to the disk.
    - After successful transfer, the output file is a valid zPDT CKD volume ready for use.

Updates with zPDT V1.2.1
Available since Dec 15, 2010

- **Emulated Coupling Facility** - write applications that leverage Parallel Sysplex
  - z/OS Coupling Facility function is only available under z/VM
    - Each CF and z/OS is a z/VM guest
  - No support for physical or emulated coupling links
    - Multiple zPDT systems cannot be clustered
  - Coupling Facility "startup" configuration (z/OS V1.13 as a guest of z/VM) available on request, additional T&Cs apply
    - The corresponding redbook discusses z/OS 1.11, however the differences are very minor

- **z/VM Data migration utility**
  - Allows easy migration of 3380, 3390, and FBA volumes to the zPDT-based system
    - Clone a 'big z/VM system' to the zPDT-based system
  - Consists of a client / server application
    - Linux client program "hckd2ckd" loaded on any supported Linux system
    - Server program "zvmserv" loaded on z/VM system and given authorization to access full volumes
  - Operation
    - Once the z/VM server program is installed and running, the Linux client can perform full volume copies of any 3380, 3390 or FBA volume the server can access. Ensure the system is stable, with z/VM not writing to the disk.
    - After successful transfer, the output file is a valid zPDT CKD or FBA volume ready for use.

Updates with zPDT V1.2.2
Available since June 30, 2011

- **CP Assist for Cryptographic Function (CPAF)**
  - Message Security Assist 3
    - Protected Key Support
  - Message Security Assist 4
    - New functions for additional chaining options (CFB, OFB counter modes)
    - New functions for XTS-AES

- **Unique Identifier Management Daemon (UIMD)**
  - New services to manage unique identifiers within zPDT
    - CPU Serial Number
    - LPAR Number
  - Maintains consistent serial numbers per zPDT instance

- **New Utilities**
  - PDSUTIL
    - Allows editing of emulated ECKD PDS members (e.g. z/OS files) from x86_64 Linux
  - LISTVTOC
    - Provides VTOC listing of z/OS emulated ECKD file from x86_64 Linux

Updates with zPDT V1.3
Available since March 30, 2012

- **z196 CPU Architecture**
  - Increased scalability
  - Improved code efficiency and improved execution of CPU-intensive workloads
  - Improved RAS

- **z196 Crypto – Crypto Express3 compatible (CEX3C)**
  - AES, DES and T-DES based confidentiality and message integrity
  - RSA-based and ECC-based digital signature generation and verification and message hashing
  - Supported Key Management Algorithms

- **Coupling (D93G R17 SL 4.8)**

- **Performance**
  - Instruction execution
  - Improved shared emulated ECKD locking

Updates with zPDT V1.4
Available since December 14, 2012

- **zEC12 CPU Architecture**
  - **Transactional Execution Facility** to eliminate software locking overhead increasing parallelism and scalability
  - **Runtime Instrumentation Facility** to help improve self-tuning for just-in-time compilers
  - New PL/I compilers get a performance boost from enhancements to decimal format conversions
  - **2 GB page frames** offer performance improvements for Java and others
  - **Miscellaneous Instruction Extension Facility** for JAVA enhancements to array bounds checking, and memory fetching efficiency

- **zEC12 Crypto Emulation Enhancements**
  - Key wrapping enhancements
  - Derived Unique Key Per Transaction (DUKPT) for MAC encryption keys
  - Secure Cipher Text Translate 2 Support
  - Compliance with new random number generator (RNG) standards
  - EMV (American Express, MasterCard, Visa) support

- **Coupling (CFLevel 18)**
  - **Improved serviceability and protection of Coupling Facility Structures**
    - Verification of local cache controls from a Coupling Facility cache structure connector
    - Non-disruptive capture and collection of extended diagnostic structure data from CF
  - **Performance Enhancements**
    - Enhanced time improvements when dynamically altering the entry/element ratio or the size of the cache structure
    - DB2 conditional write to a group pool buffer (GPB)
    - Performance throughput enhancements for parallel cache castout processing
    - CF storage class and castout class contention avoidance

zPDT limitations

- **The zPDT environment does NOT support all System z function, such as:**
  - Physical Parallel, ESCON®, FCP, FICON® and High Performance FICON channels
  - Physical Coupling Links
  - External Time Reference (ETR)
  - Server Time Protocol (STP)
  - IBM zEnterprise System function, e.g.
    - Inbound Workload Queuing
    - z/OS FICON Discover
    - Auto Configuration
  - List-directed IPL
  - MIDAWs
  - Logical channel subsystems
  - HiperSockets™
  - Multiple I/O paths per device
  - Not all CHSC functions are supported

- **zPDT does not produce an environment equal to a larger System z.**
  - Some aspects of a larger system are unlikely to be met in any very small environment.
    - Inability to verify and enhance the scalability of a program
    - Inability to run application programs that require hundreds of MIPS.
  - A zPDT system is not recommended for very fine-level performance tuning that is sensitive to memory location, cache functions, and pipeline optimization.
  - In addition, the zPDT platform does not nearly have the same quality of service as does a mainframe in terms of availability and connectivity.

- **Anyone needing any of the function outlined above should consider a traditional System z server.**

zPDT technology tested on hardware and software

- **The zPDT technology has been tested with the following configurations:**

64-bit Intel Linux tested:			
- openSUSE levels tested :	11.3	11.4	12.1
- SLES levels tested :	11 SP1	11 SP2	
- RHEL levels tested :	6.0	6.1	6.2

Intel-based Hardware Systems tested			
- Laptops :	Lenovo T61P	Lenovo W500 Dual Core	Lenovo W700 Dual Core	Lenovo W700, W510, W520, W530 Quad Core
- Servers:	IBM System X 3850	IBM System x 3500 M1, M2, M3, M4	IBM System x 3650 M1, M2, M3, M4	IBM System x 3755 M1, M3
- <u>Additional minimum requirements</u> :			
x86 Cores :	One (or more) more core(s) than number of zPDT virtual engines		
Memory :	1 GB for 64-bit Linux plus 2 GB for the System z OSes (ie. minimum of 3 GB)		
Disk space :	z/OS ADCD – 80 GB, z/VM – 20 GB, z/VSE – 10 GB, Linux for System z – 10 GB		

SCSI Tape Drives tested:	Fujitsu M2488E	IBM 3580 (LTO)	IBM 3592E05

z/OS Levels tested:	1.11	1.12	1.13

z/VM Levels tested :	5.3	5.4	6.1

z/VSE Levels tested :	4.2	4.3	5.1

Linux on System z Levels tested :	SLES 10	SLES 11 SP1	RHEL 5.2	RHEL 5.4

- **If you choose to build your own zPDT system, test your hardware first!**
  - Validate hardware configuration is meeting minimum system requirements (tool provided)
  - Test hardware and Linux distribution to ensure appropriate drivers and functions work (Ethernet, wireless, USB, etc)
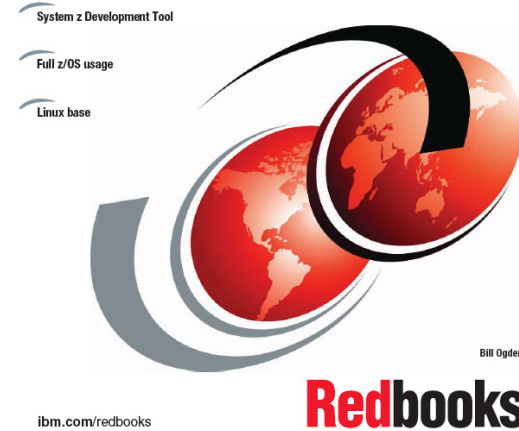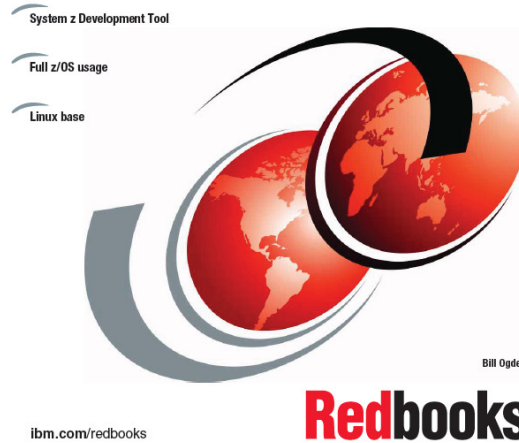
zPDT documentation

SG24-7721

IBM

IBM System z
Personal Development Tool
Volume 1 Introduction and Reference

System z Development Tool

Full z/OS usage

Linux base

Bill Ogden

Redbooks

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IBM System z
Personal Development Tool
Volume 2 Installation and Basic Use

System z Development Tool

Full z/OS usage

Linux base

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Personal Development Tool
Volume 3 Additional Topics

System z Development Tool

Full z/OS usage

Linux base

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Redbooks

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SG24-7859

IBM

IBM System z
Personal Development Tool
Volume 4 Coupling and Parallel Sysplex

Basic use of Coupling Facility
functions with zPDT

Using the Parallel Sysplex AD-CD
starter system

Details for building the
starter system

Bill Ogden

Redbooks

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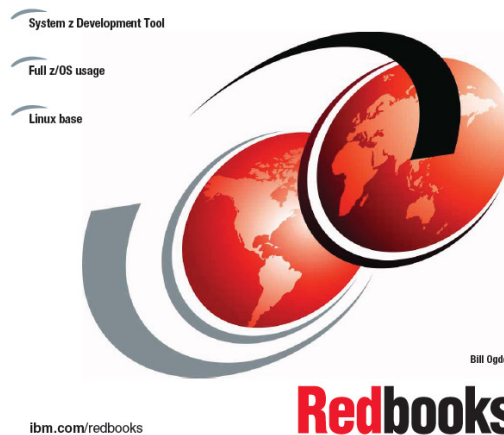
zPDT technology is available to ...

- **IBMers** - to provide education and demonstration of IBM products and services.
  - Go to BluePedia, look up zPDT on how to order, and build your own system

- **Independent Software Vendors (ISVs)** who develop, test, support, and demonstrate commercially available applications on and for the z/OS, z/VM, z/VSE, and Linux for System z platforms.
  - zPDT as part of IBM System z Developer Discount (zDD) Program
  - Full application development lifecycle

- **Commercial Customers** incl. service providers, system integrators, contractors, business partners, ISVs, … anybody who currently develop or plan to develop applications or services for z/OS.
  - zPDT as part of Rational Development and Test Environment for System z (RD&T), formerly called Rational Development for System z Unit Test feature (RDz UT)
  - Pre-production z/OS environments only

- **Academic Initiative for System z** – Professors, teachers, academic employees, etc.
  - For hands-on classes, demonstrations, education & training, research, application development, etc. – not for production use
  - Pilot program with select schools successfully completed
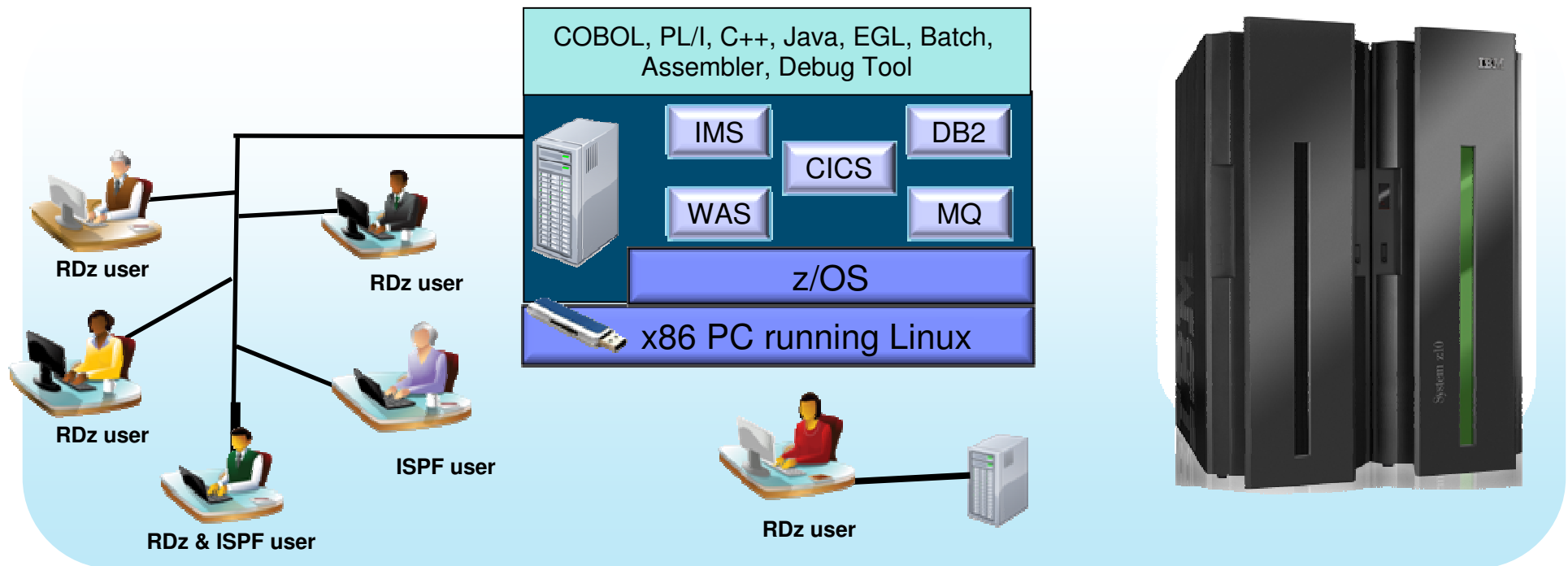 - Academic Initiative offering currently being finalized

Agenda

- **IBM System z® Personal Development Tool (zPDT)**
  - **Technology**
  - **Features & Functions**
  - **Recent Enhancements**

- **IBM Rational Development and Test Environment (RD&T)**
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- **Live Demo**

Announcing the Rational Development & Test Environment

COBOL, PL/I, C++, Java, EGL, Batch, Assembler, Debug Tool

IMS   CICS   DB2
WAS   MQ

z/OS

x86 PC running Linux

RDz user
RDz user
RDz user
ISPF user
RDz & ISPF user
RDz user

- Liberate developers to rapidly prototype new applications
- Develop and test System z applications anywhere, anytime!
- Free up mainframe development MIPS for production capacity
- Eliminate costly delays by reducing dependencies on operations staff

Ausbildung von jungen Mainframe Nachwuchs

- Fiducia nutzt das System zur Ausbildung junger Mainframe Entwickler und Systemadministratoren.

- Azubis und Studenten testen, spielen und entwickeln auf einer realen, binärkompatiblen z/OS Umgebung.

- Schnelle Wiederherstellung des Systems im Fehlerfall (ähnlich einem VMWare Image).

- Einzigartiges Sandbox System – aktuell gibt es keine bessere Möglichkeit Nachwuchs für den Mainframe auszubilden ohne Auswirkungen auf die Produktivumgebung zu befürchten

RD&T Currency

RD&T 8.5 current with nearly all GA levels of major IBM middleware, improved over UT 8.0.3

Component	RDz UT 8.0.3	RD&T V8.5
z Architecture	z10	z196
z/OS	1.11	1.12, 1.13
CICS	4.1, 3.2	3.2, 4.1, 4.2
IMS	11.1	11.1
MQ	7.0	7.0
DB2	9.1, 10.1	9.1, 10.1
WAS	7.0	7.0, 8.0
COBOL	4.2	4.2
PL/I	3.9	4.1, 4.2

☐ Current with platform

RD&T Usage Scenarios – Common threads

- **Where do builds take place?**

  - Compilations can be done in RD&T or the mainframe
 - Production builds should always take place on mainframe

- **Where does source code reside?**

  - This is a major design point
    - ➢ Moving data can be manual, semi-automated or fully distributed.

- **How does one move source or data from/to RD&T?**

  - Move data from/to RD&T much like you would to an LPAR
    - ➢ RDz drag and drop, FTP, sftp, XMIT, NFS, DFS, etc

RD&T based build

- **Development on RD&T with host-based SCM:**
  - Copy code and data to RD&T as needed
  - Use RDz or other methods to run a standard compile/debug cycle
  - When tests and changes are complete, merge changes back to mainframe
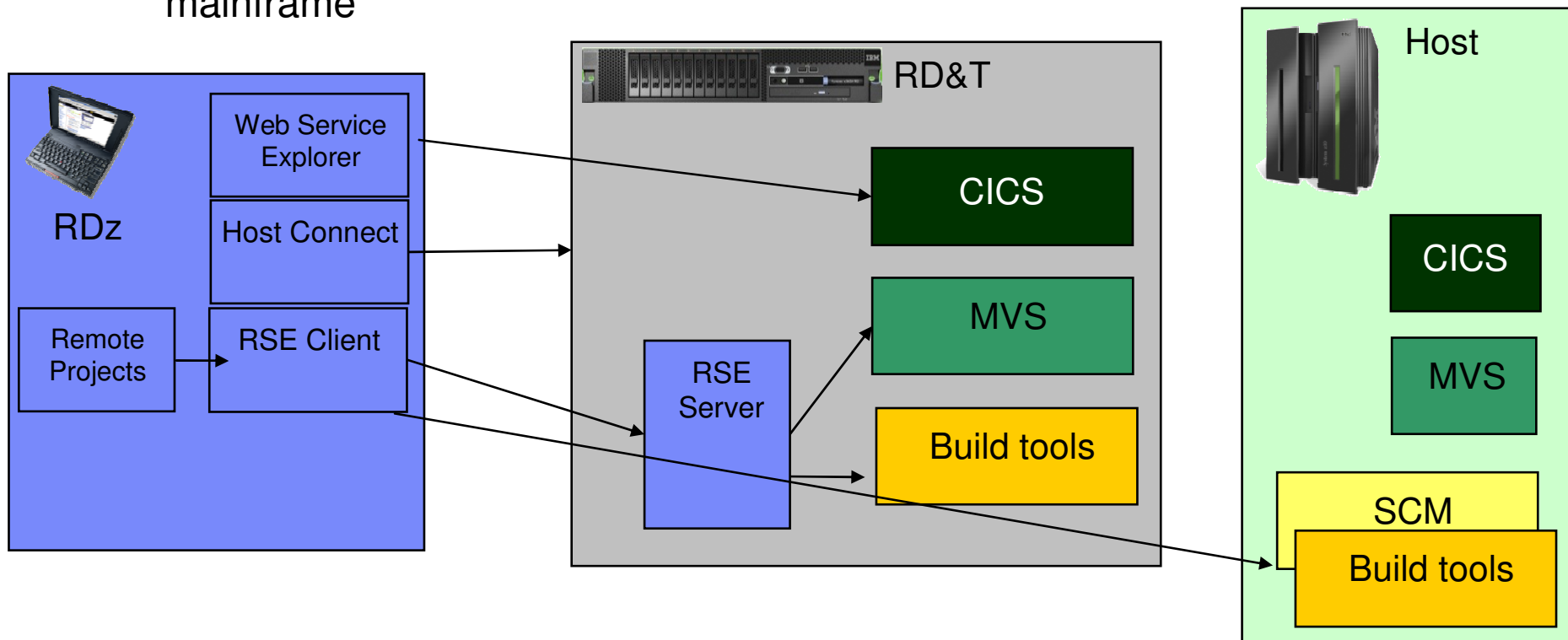
Distributed SCM and Build

- **Development on RD&T with distributed SCM:**
  - SCM manages movement of code to and from mainframe.
  - Builds may be done either on RD&T or on mainframe (depending on SCM).
  - Test outputs installed by SCM on RD&T.
  - Use RDz or other methods to run a standard compile/debug cycle
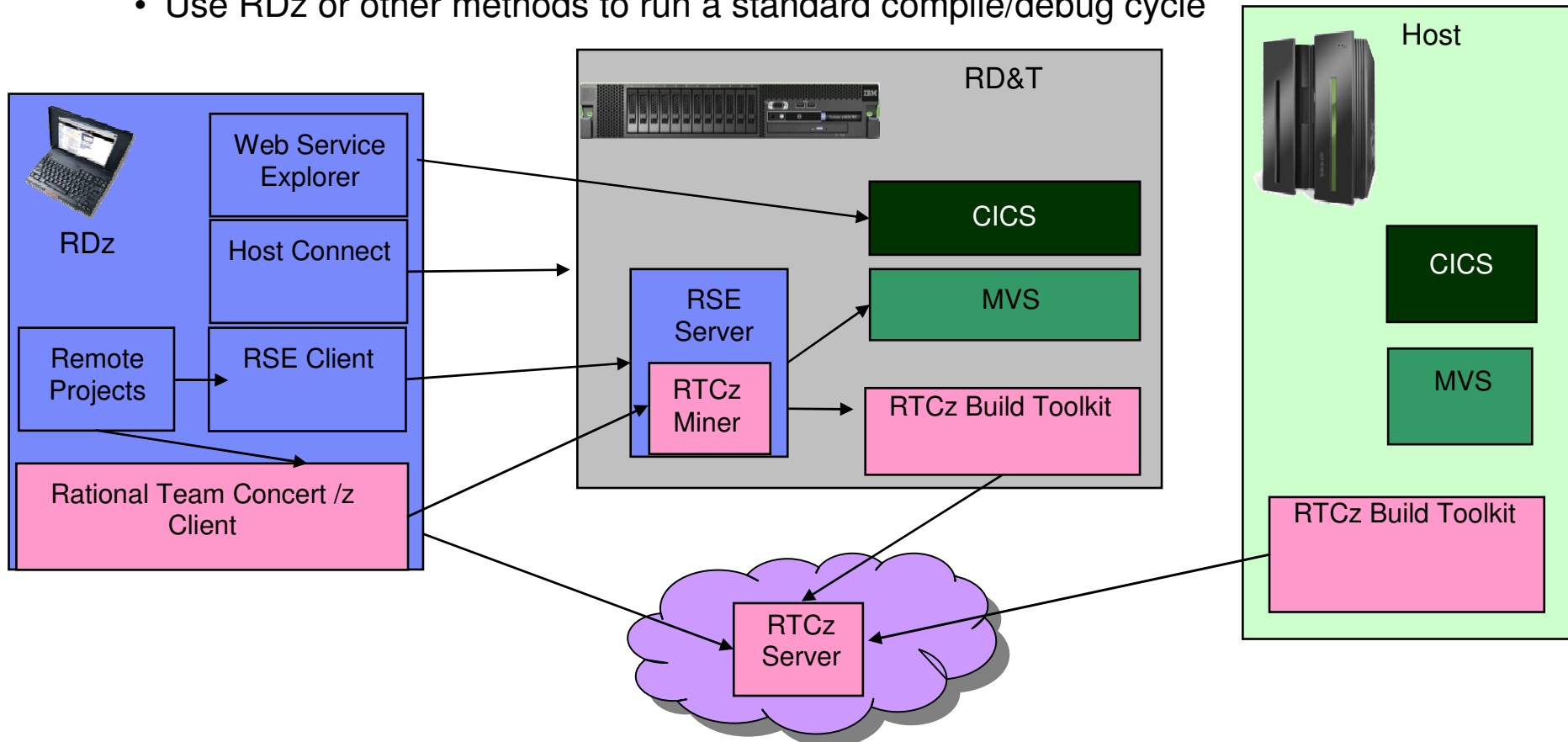
RD&T host machine specifications

- ## Underlying Linux requirement
  - Red Hat Enterprise Linux 5.3 (RHEL 5.3) – 64-bit
  - OpenSUSE 10.3, 11.0, and 11.1 – 64-bit

- ## Base machine must have:
  - Processor
    - Minimum practical configuration is 2.0 Ghz i5 / i7 4 core
  - RAM
    - 4 GB minimum
    - Recommended is 1 GB for base Linux + 3 GB per processor core enabled for RDz-UT
  - Disk space
    - 20 GB for base Linux / zPDT install
    - 120-220 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 1091 hardware key

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SVA – SYSTEM VERTRIEB ALEXANDER GMBH

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www.sva-zhosting.com/de/zpdt/ibm_zpdt.php
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- Largest IBM System z Partner in Germany

- more than 300 employees and >30 System Engineers for System z

- Authorized and certified zPDT Reseller in Europe

- zHosting Service for System z Developers in Europe

- System z managed services for commerical customers in Europe

- German IBM Business Partner with highest customer satisfaction since 6 years

- Largest IBM Storage Partner in Europe

- Most successfull IBM virtualization partner in Europe

Live-Demo