z/VSE Live Virtual Class

z/VSE V5.1 Update

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Agenda

- Roadmap
- VSE strategy
- z/VSE 5.1 key functions
- 64 bit virtual
- CICS

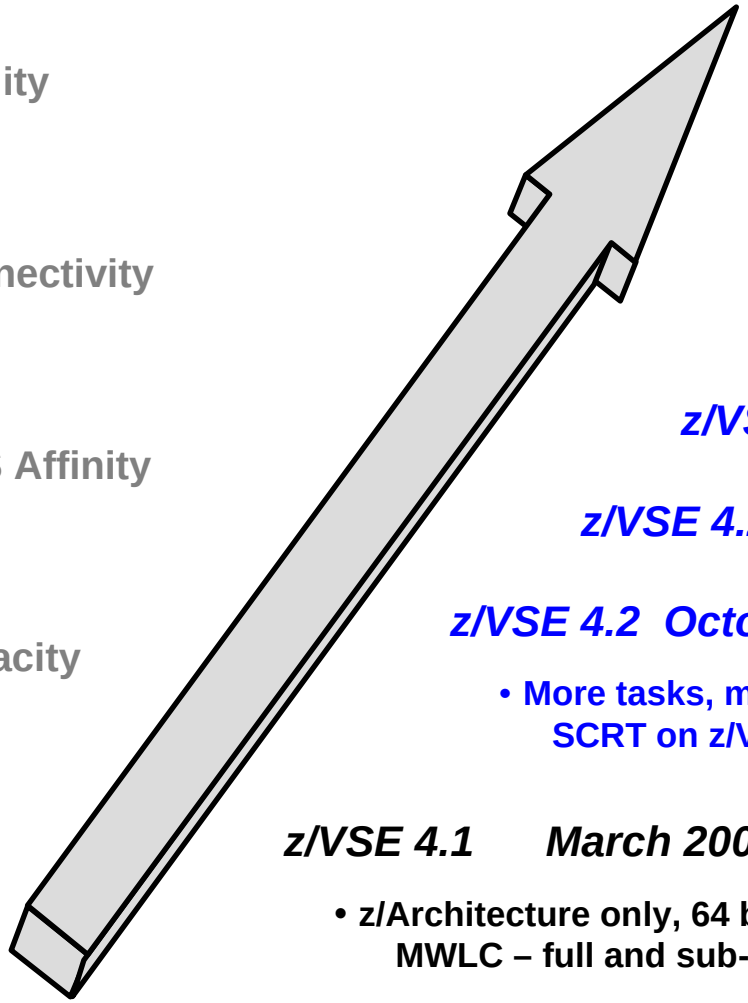
VSE Roadmap

Quality

Connectivity

z/OS Affinity

Capacity



z/VSE 5.1 planned GA 11/25/2011

- **64 bit virtual**
- **zEnterprise exploitation**
- **SOD: CICS Explorer**

z/VSE 4.3 11/2010

- **Virtual storage constraint relief, 4 digit cuus**

***z/VSE 4.2.2 04/2010* – IPv6/VSE 05/2010**

***z/VSE 4.2.1 July 2009* - PAV, EF for z/VSE 1.2**

z/VSE 4.2 October 2008, end of service 10/31/2012

- **More tasks, more memory, EF for z/VSE 1.1, CPU balancing, SCRT on z/VSE, SoD for CICS/VSE**

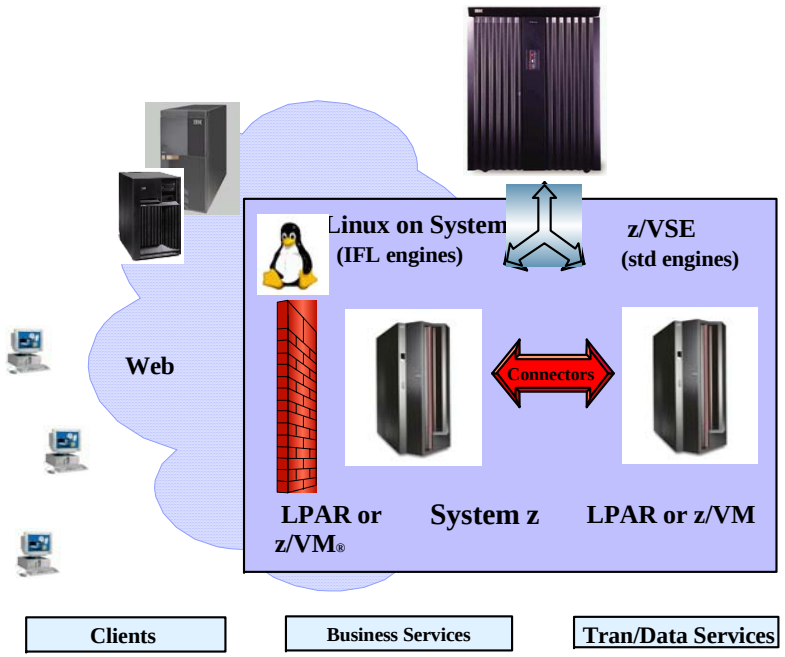
z/VSE 4.1 March 2007, end of service 04/30/2011

- **z/Architecture only, 64 bit real addressing, MWLC – full and sub-capacity pricing**

VSE Strategy

- Helps **Protect** your existing investments in core VSE programs, data, equipment, IT skills, *plus* business processes, end user training, etc.
  - modernize, i.e. extend VSE resources to Web
  - exploit IBM servers, storage, and software
- **Integrate** VSE with the rest of your IT based on open and industry standards
  - IBM middleware
  - VSE connectors and web services
- **Extend** with Linux on System z
  - infrastructure consolidation/simplification
  - add new infrastructure and/or line-of-business applications

Why Not Think Inside the Box?



z/VSE 4.3

- Announced: 10/2010, GA: 11/26/2010
- z/VSE 4.3.1 GA: 08/12/2011

- IBM System z10 / z196 / z114 exploitation
  - Dynamically add of CPUs
  - Large (1 megabyte) page support
  - Static power saving mode for SCRT (z196)

- Virtual storage constraint relief for 24 bit (CICS) programs

- 4 digit device addresses (CUUs)

- Basic Security Manager (BSM) will allow to protect MQ resources

- Monitoring agent based on SNMP (Simple Network Management Protocol)

- Linux Fast Path

- Pricing:
  - Sub-Capacity Reporting Tool (SCRT) – available on z9 / z10 / z196 / z114
  - Midrange Workload License Charges (MWLC) with sub-capacity option
  - z114: Advanced Entry Workload License Charge (AEWLC) pricing with sub-capacity option

- FSU from z/VSE 4.1 and 4.2

z/VSE 4.3 Migration Considerations

- Migrate to z/VSE 4.3.1 (+ latest PTF level)

- Parallel Access Volume support
  - Apply the latest Supervisor PTF level

- VSE/VSAM
  - Migration of VSAM catalogs
    - Don't use Fastcopy to migrate VSAM catalogs
    - Flashcopy all VSAM volumes allocated to a VSAM catalog
    - Migrate all recoverable VSAM catalogs to standard VSAM catalogs
      - **Before** the migration to z/VSE 4.3 or z/VSE 5.1
      - PTF for "automatic" migration soon

- CICS
  - CICS Coexistence Environment removed
  - DL/I 1.12 replaces DL/I VSE 1.11 and DL/I DOS/VS 1.10
  - CICS/VSE 2.3
    - Not supported by DL/I 1.12
    - No longer on base tapes

z/VSE V5.1

- Preview: 04/12/2011, Announcement: 10/12/2011, planned GA 11/25/2011
- 64-bit virtual addressing
- Introduces Architectural Level Set (ALS) that requires System z9 or later
- IBM zEnterprise 196 (z196) and IBM zEnterprise 114 (z114) exploitation
  - Support Static Power Save Mode for MWLC clients with subcapacity option (z196 only)
  - 4096-bit RSA keys with Crypto Express3 for enhanced security
  - Support of OSA-Express for zBX (CHPID OSX) to participate in an Intra Ensemble Data Network (IEDN) in z/VM guest or LPAR
- Exploitation of IBM System Storage options
  - Copy Export function of TS7700 Virtualization Engine for disaster recovery
  - Multi-Cluster Grid support of the TS7700 Virtualization Engine Series (TS7700)
  - IBM Storwize V7000 Midrange Disk System (z/VSE 4.2 and later)
  - IBM XIV (z/VSE 4.2 and later)
- Fast Service Upgrade (FSU) from z/VSE 4.2 and z/VSE 4.3
- Pricing
  - Midrange Workload License Charge (MWLC) pricing with sub-capacity option
  - z114: Advanced Entry Workload License Charge (AEWLC) pricing with sub-capacity option

z/VSE V5.1

- Networking enhancements
  - IPv6 support for Linux Fast Path
  - z/VSE z/VM IP Assist (VIA) exploitation
  - TCP/IP communication using Layer 2 (Data Link Layer)
  - Virtual Local Area Network (VLAN) support for OSA Express and Hipersockets
    - Global VLAN supported by TCP/IP for VSE/ESA and IPv6/VSE
    - General VLAN supported by IPv6/VSE

- IPv6/VSE
  - Large TCP window support, can increase throughput
  - 64 bit virtual exploitation, large TCP window storage allocated above the bar
  - Layer 2 support
  - VLAN support

- System management enhancements
  - SNMP Trap Client Extension monitoring – API

- High availability and disaster recovery enhancements
  - Copy Export function of TS7700 Virtualization Engine for disaster recovery
  - Multi-Cluster Grid support of the TS7700 Virtualization Engine Series (TS7700)
  - GDPS (Geographically Dispersed Parallel Sysplex) client (in a z/VM guest)
    - z/VSE supports heartbeat only
    - GDPS K-system can only monitor z/VSE
    - GDPS K-system can manage z/VM and therefore can manage z/VSE indirectly

z/VSE V5.1 …

- System enhancements
  - Language Environment enhancements
    - PL/I multitasking enhancements
    - C run-time socket API to include IPv6 related functions
    - Callable service sample for programs
    - Additions to system programmer C samples
    - Updated LE/C support for Librarian Members, and updates to the CEETRACE utility.
  - E-busness connector enhancements
    - VSE Script Connector to support LIBR access
  - VSE/POWER
    - Token as new job attribute to address spooled output

- CICS - Statement of general direction (SOD):
  - IBM intends to provide CICS Explorer capabilities for CICS TS for VSE/ESA, to deliver additional value.

All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

VSE Support for System z

VSE Release	z800 / z900	z890 / z990	System z9 / z10 / z196 / z114	VSE EoS
z/VSE V5.1 (GA 4Q/2011)	**No**	**No**	**Yes**	**tbd**
z/VSE V4.3	**Yes**	**Yes**	**Yes**	**tbd**
z/VSE V4.2	**Yes**	**Yes**	**Yes**	**10/31/2012**
z/VSE V4.1	Yes	Yes	Yes	04/30/2011
z/VSE V3.1	Yes	Yes	Yes	07/31/2009
VSE/ESA V2.7	Yes	Yes	Yes	02/28/2007
VSE/ESA V2.6	Yes	Yes	Yes	03/2006
VSE/ESA V2.5	Yes	No	No	12/2003
VSE/ESA V2.4	Yes	No	No	06/2002
VSE/ESA V2.3	No	No	No	12/2001

IBM zEnterprise exploitation

- 64 bit real addressing - up to 32 GB (System z)
- 64 bit virtual virtual addressing – up to 90 GB (System z)
- Large page support (z10, zEnterprise)
- Dynamic add of logical CPs (z10, zEnterprise)
- Linux Fast Path (LFP) in z/VM mode LPAR (z10, zEnterprise)
- Exploitation of the z/VSE z/VM IP Assist (zEnterprise)

IBM zEnterprise exploitation

- 4096-bit RSA key support with configurable Crypto Express3 (z10, zEnterprise)
- zEnterprise and zEnterprise BladeCenter Extension (zBX) support
  - "native" Intra Ensemble Data Network (IEDN)
  - Virtual LAN support
  - Layer 2 support
  - IEDN communication using the z/VM VSWITCH
- Static power save mode supported for SCRT (z196 only)
- Statement of general direction:
  - The IBM zEnterprise 196 and IBM zEnterprise 114 are the last System z servers to support ESCON channels.
  - HiperSockets Completion Queue on z196 and z114
  - See IBM Hardware Announcement 111-136, July 12, 2011

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IBM zEnterprise exploitation

```
query dspace
AR 0015                DSIZE    MAX  PARTMAX    COMMAX  VDISK    DFSIZE
AR 0015 DEFINED:       20480K   256       16        20      1      960K
AR 0015 ACTUAL:         6880K     7        4         4      1
AR 0015
AR 0015 AREA DSPS  AREA DSPS  AREA DSPS  AREA DSPS  AREA DSPS  AREA DSPS
AR 0015  BG     1   FB     4   F3     2
AR 0015
AR 0015 MFRAME(31):        0(    0)
AR 0015
AR 0015 1I40I  READY
```

- Large page (1 megabyte page) for data spaces
  - Better exploitation of large processor storage
  - No configuration options required
  - Transparent to applications
  - Not supported in z/VM guests

- Dynamic add of logical CPs
  - Ability to dynamically add logical central processors (CPs) without preplanning
  - Logical processor add from HMC/SE
  - Allows adding CPs to LPAR without re-IPL of the z/VSE system
  - Capacity of the z/VSE V4.3 system may be in-/decreased dependent on workload needs
  - New SYSDEF TD parameters (STARTSBY / STOPSBY) to manage the additional CPs
  - Not supported in z/VM guests

```
query td
AR 0015   CPU    STATUS     SPIN_TIME     NP_TIME  TOTAL_TIME  NP/TOT
AR 0015    00    ACTIVE             0       16367       26978   0.606
AR 0015    01    INACTIVE
AR 0015    02    INACTIVE
AR 0015    03    STANDBY
AR 0015          ----------------------------------------------------
AR 0015  TOTAL                      0       16367       26978   0.606
AR 0015
AR 0015                  NP/TOT:  0.606       SPIN/(SPIN+TOT):  0.000
AR 0015   OVERALL UTILIZATION:     0%         NP UTILIZATION:     0%
AR 0015
AR 0015   CPU BALANCING:         NOT ACTIVATED
AR 0015
AR 0015   ELAPSED TIME SINCE LAST RESET:        4026069
AR 0015  1I40I   READY
```

Encryption Facility for z/VSE

- Optional priced feature for VSE Central Functions
- Supports the use of SAM files, VSE/VSAM files, VSE library members, tapes, virtual tapes as input or output
- Requires CP Assist for Cryptographic Function (CPACF)
  - no charge feature, only on z890, z990, z9, z10, z114 and z196 servers
- Extends affinity between z/VSE and z/OS
  - Function roughly equivalent to EF for z/OS 1.1
  - Compatible with EF for z/OS V1.1 (Encryption Facility System z format)
    - EF for z/VSE tapes can be read by EF for z/VSE, EF for z/OS, EF for z/OS Java Client, and Decryption Client for z/OS,
    - EF for z/OS V1.1 and EF for z/OS Java client tapes can be read by EF for z/VSE
- EF for z/VSE 1.2
  - Supports z/VSE 4.2 and later
  - Supports openPGP standard
  - OpenPGP exploits 4096-bit RSA keys (z10, zEnterprise)

TCP/IP Connectivity for z/VSE

- TCP/IP connectivity for IPv4 communication
  - TCP/IP for VSE/ESA 1.5 – licensed from CSI International
  - IPv6/VSE – licensed from Barnard Software, Inc. (BSI)
  - Linux fast path (LFP)
  - EZA socket interface, new function calls
  - LE/C socket API
- TCP/IP connectivity for IPv6 communication
  - IPv6/VSE
  - EZA socket interface, new function calls
  - Linux Fast Path (z/VSE 5.1)
- All TCP/IP stacks can run concurrently within one z/VSE system
- z/VM queue-I/O assist for real networking devices
  - Performance assist for OSA-Express adapters and HiperSockets

IPv6/VSE

- Announced: 04/06/2010, GA 05/28/2010, updated

- Full function IPv4 (with November update) and IPv6 stack with applications
  - MWLC with sub-capacity option for IPv6/VSE product
  - Supported releases: z/VSE 4.2 plus PTFs, z/VSE 4.3 or z/VSE 5.1
  - Optional Product of z/VSE 4.3 and z/VSE 5.1

- IPv6 solution for z/VSE
  - Includes the IPv6 stack, IPv6 APIs and IPv6-enabled applications
    - IBM's EZA Assembler interfaces support IPv4 and IPv6 communication
  - Extends 32 bit addresses (used in IPv4) to 128 bit addresses
  - To meet requirements of governmental agencies for products

- z/VSE 5.1 enhancements
  - Large TCP window support, can increase throughput
  - 64 bit virtual exploitation, large TCP window storage allocated above the bar
  - Layer 2 (data link layer) and Layer 3 (IP layer) support
  - VLAN support
  - On extended base tape

IPv6/VSE - Functionality

- IPv6/VSE's dual stack support: allows IPv6-enabled applications to transparently communicate with partners via either IPv6 or IPv4 network
- IPv6 tunneling: encapsulates IPv6 datagrams within IPv4 packets allows communication with IPv6 networks, even if local infrastructure is IPv4
- IPv4 and IPv6 enabled applications:
  - FTP server, FTP client
  - Batch FTP client
  - TN3270E server
  - NTP client / server to query time of day to synch TOD clock
  - System logger client to log e.g. z/VSE messages to Linux
  - Batch email client
  - Batch LPR + TN3270E / FTP / DIRECT printer sessions
  - Batch remote execution client
  - Batch PING
  - GZIP data compression
  - REXX automation
  - DBCS support: FTP client / server, LPR, batch email client, GZIP

z/VSE 5.1 Networking Enhancements

- Layer 3 (IP layer)
  - TCP/IP stack uses IP packets that include IP addresses
  - Default mode for OSA Express and HiperSockets
  - Supported by TCP/P for VSE/ESA and IPv6/VSE
  - Used on z/VSE 5.1 and prior releases

- Layer 2 (data link layer) support
  - TCP/IP stack uses Ethernet frames with MAC addresses
  - Required for IPv6 communication through the z/VM VMSWITCH
  - Supported by IPv6/VSE
  - Can be used on z/VSE 5.1 only

z/VSE 5.1 Networking Enhancements …

- Virtual LAN (VLAN) support
  - Allows to divide a physical network into separate logical networks
  - For OSA Express and HiperSocket devices
  - Layer 3: VLANs can be transparently used by TCP/IP for VSE/ESA and IPv6/VSE
  - Layer 2: VLANs can be used by IPv6/VSE only

- Global VLAN support
  - One global VLAN per link
  - Global VLANs defined in IJBOCONF – to be used OSX devices
  - IEDN requires OSA Express for zBX devices (OSX)

Linux Fast Path (LFP)

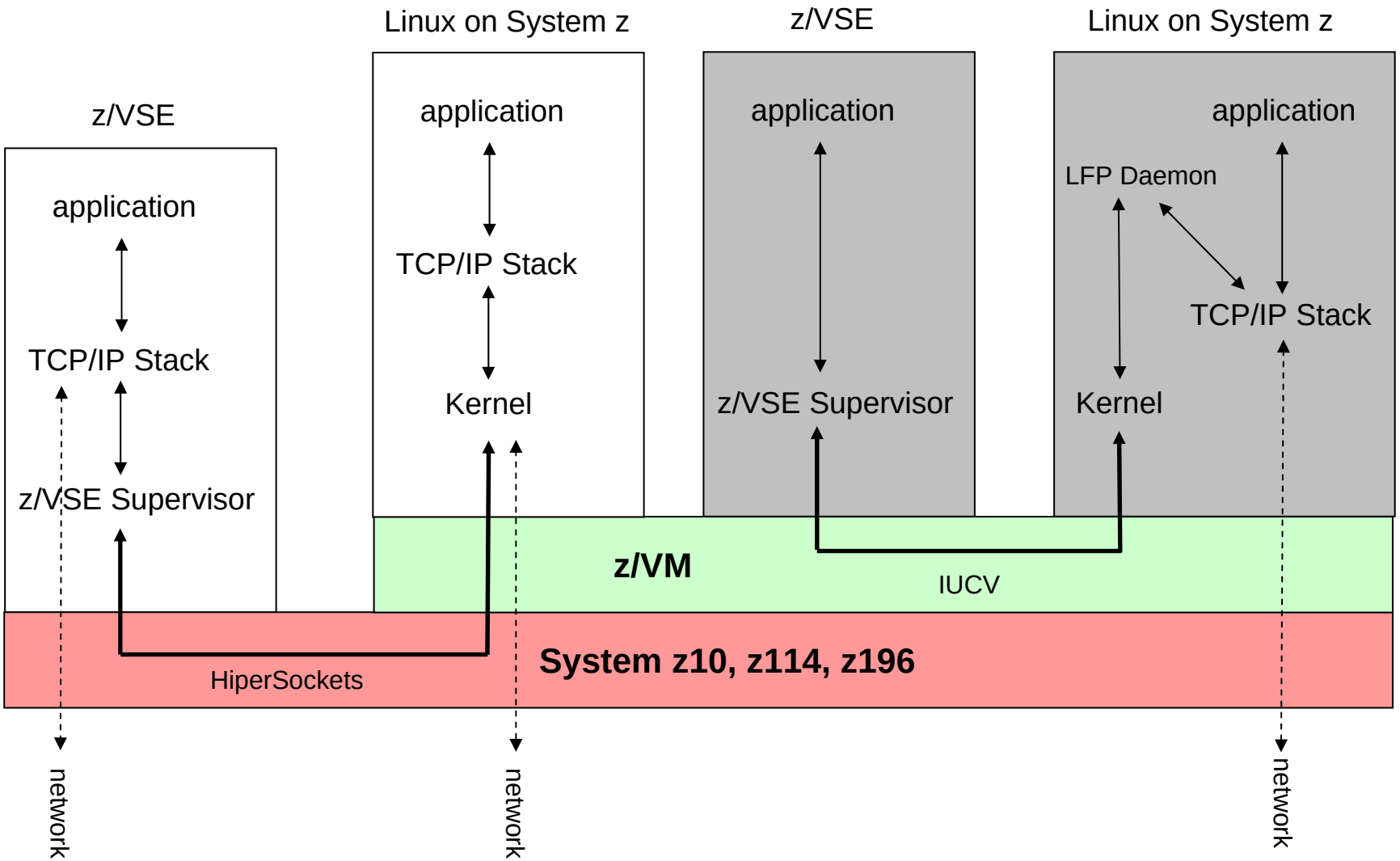
- Provided with the z/VSE base product – no additional charge (z/VSE 4.3 or higher)

- LFP uses an IUCV connection between z/VSE and Linux on System z
  - Both – z/VSE and Linux – need to be z/VM guests of the same z/VM
  - Routes IPv4 or IPv6 socket request to Linux on System z
    - Without using the local TCP/IP stack
  - LFP daemon on Linux forwards the socket request to the Linux TCP/IP stack
  - Will run best in **z/VM mode LPAR** (z/VM 5.4 or higher)
    - Available on z10, z114 and z196
    - Linux on System z on IFL, z/VSE on standard processors

- LFP is transparent to IBM socket APIs
  - Supported APIs: LE/C socket API, EZA socket / EZASMI interface, …
  - Transparent to IBM applications (DB2 client, Connectors, Power PNET)
  - No standard TCP/IP applications (Telnet, FTP, …) provided
  - IPv6/VSE: TCP/IP applications can exploit LFP

- System requirements:
  - z/VM 5.4 or higher
  - Linux on System z distribution (min. SLES 10 SP3 or RHEL 5.5)

Linux Fast Path (LFP) …

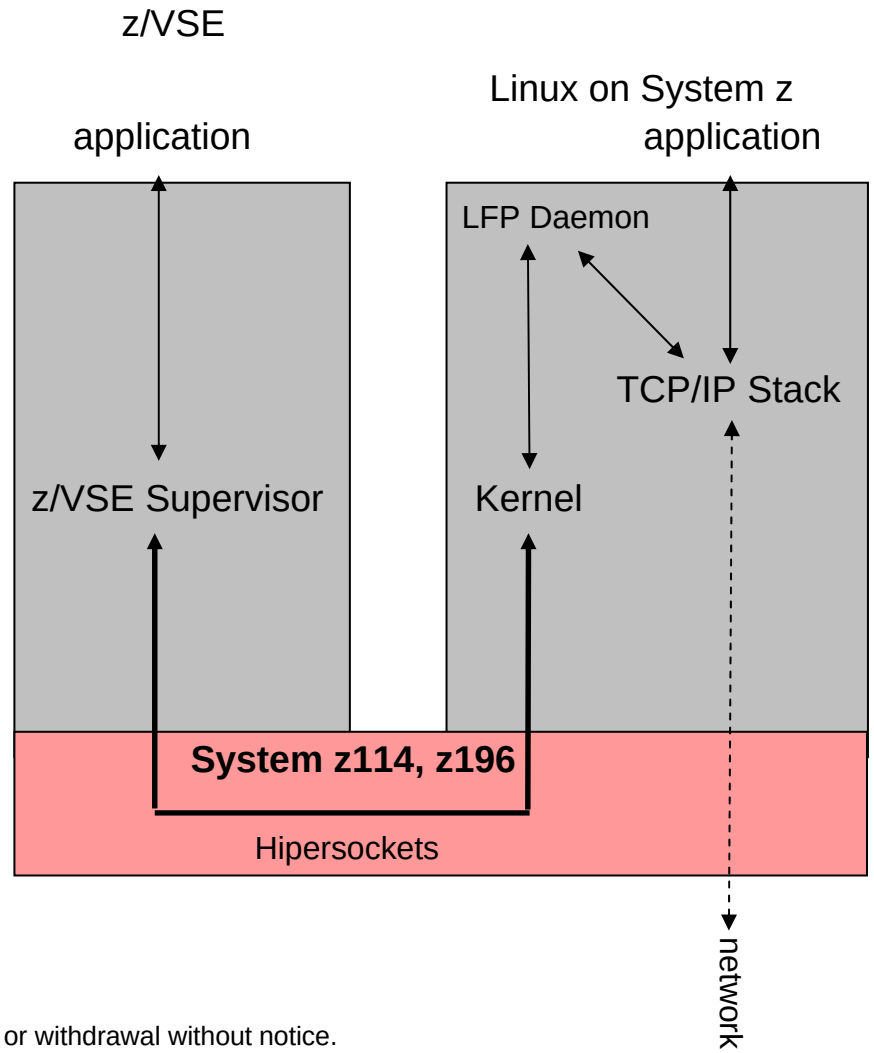


Linux Fast Path (LFP) …

Statement of general direction:

HiperSockets Completion Queue:
IBM plans to support transferring HiperSockets messages asynchronously, in addition to the current synchronous manner on z196 and z114. This could be especially helpful in burst situations. The Completion Queue function is designed to allow HiperSockets to transfer data synchronously if possible and asynchronously if necessary, thus combining ultra-low latency with more tolerance for traffic peaks. HiperSockets Completion Queue is planned to be supported in the z/VM and z/VSE environments.

See IBM Hardware Announcement 111-136, July 12, 2011



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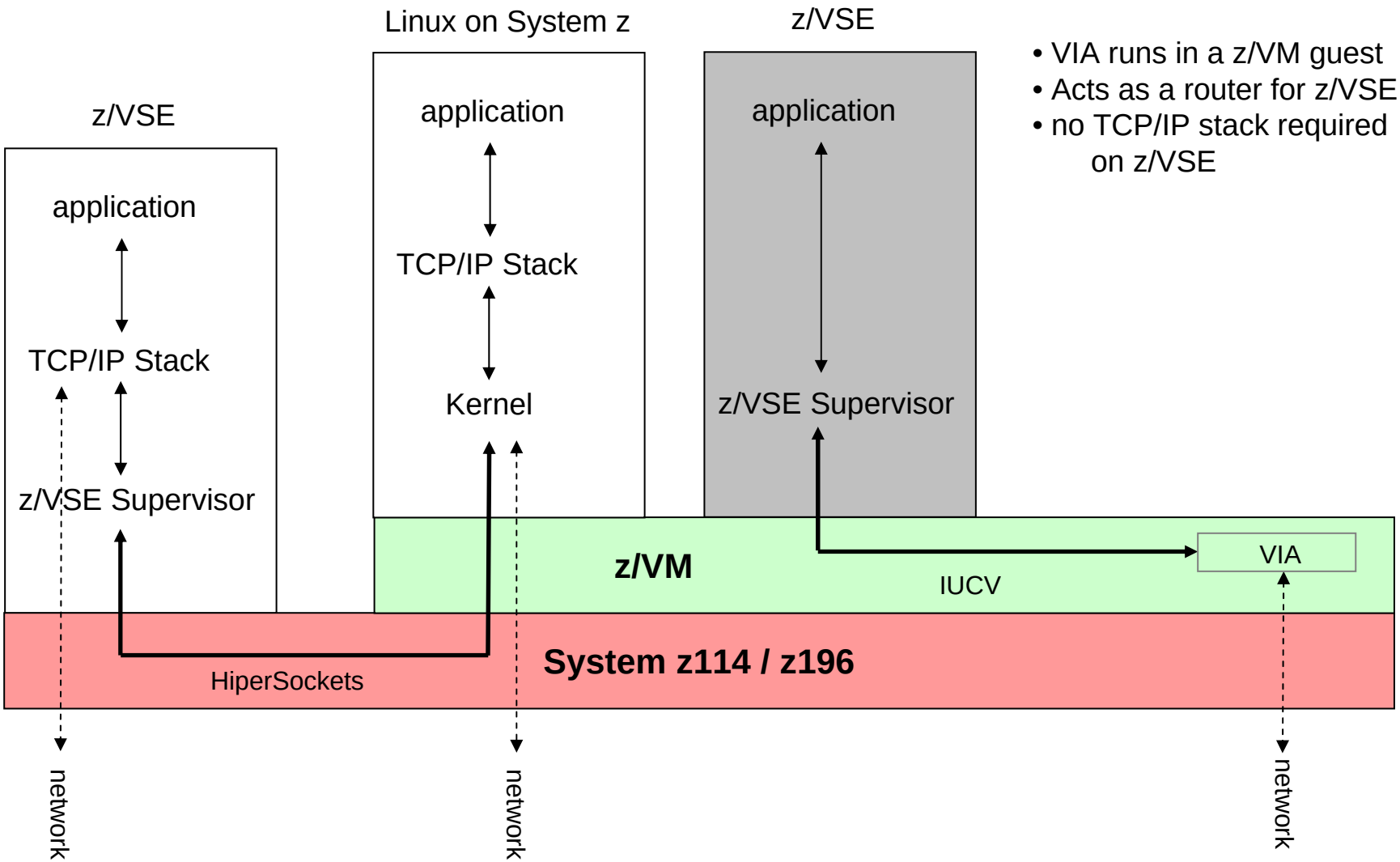
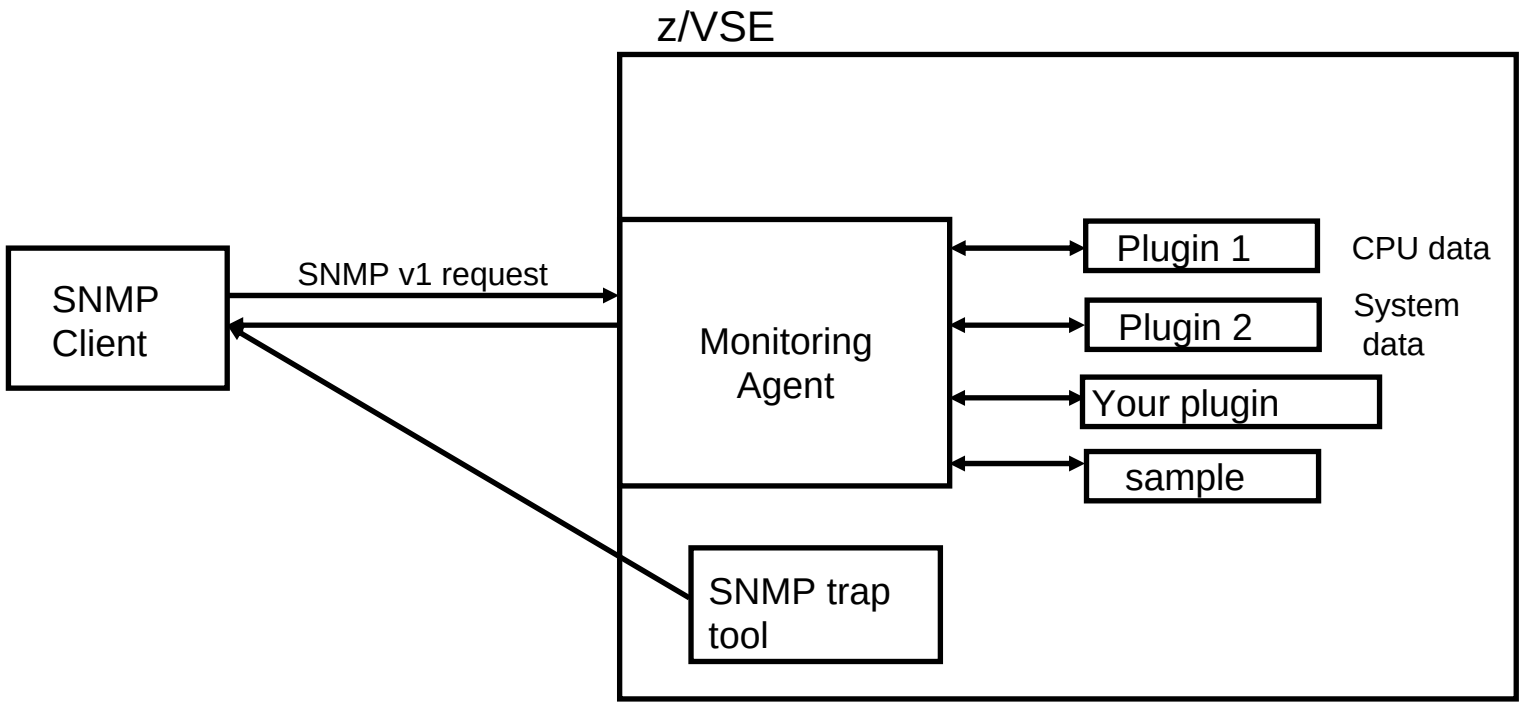
z/VSE z/VM IP Assist (VIA) – z/VSE 5.1



- VIA runs in a z/VM guest
- Acts as a router for z/VSE
- no TCP/IP stack required on z/VSE

Connectors

- SNMP Connector
  - SNMP (Simple Network Management Protocol) V1 protocol
  - Allows to monitor system events on a network
  - Clients can retrieve z/VSE specific system and performance data
  - Performance monitors may collect the data for planning purposes
  - SNMP Trap Client Extension monitoring – API



z/VSE 5.1: 64 bit virtual

- Support 64 bit virtual addressing
- 64 bit area can be used for **data only**
  - No instruction execution above the bar
- **z/OS affinity:** APIs (IARV64 services) - to manage memory objects – compatible with z/OS
  - Private memory objects for use in one address space
  - Shared memory objects to be shared among multiple address spaces
- Maximum VSIZE still limited to 90 GB
- Advantages:
  - Eases the access of large amounts of data
    - E.g. instead of using and managing data spaces
  - Reduces complexity of programs
    - Data contained in primary address space
  - Chosen design has no dependencies to existing APIs, minor impact on existing system code

64 bit virtual – Define System Limits

SYSDEF statement to define the limits for memory objects

- Before IARV64 macro can be used.
- SYSDEF MEMOBJ,MEMLIMIT=,SHRLIMIT=,LFAREA=,LF64ONLY
  - MEMLIMIT – maximum virtual storage available for memory objects
    - Theoretical maximum value is VSIZE.
  - SHRLIMIT – maximum virtual storage available for shared memory objects
    = size of extended area, included in MEMLIMIT
  - LFAREA – maximum real storage to fix private memory objects
  - LF64ONLY – YES|NO – memory objects are fixed in 64 bit frames only

- Example:

```
sysdef memobj,memlimit=1g,shrlimit=500m,lfarea=10m
AR 0015 1I40I  READY
```

64 bit virtual – Display Memory Object Information

- QUERY command to retrieve memory object information
  - QUERY MEMOBJ displays
    - Effective settings of MEMLIMIT, SHRLIMIT; LFAREA, LF64ONLY
    - Summary information: virtual storage consumption of private / shared memory objects
  - QUERY MEMOBJ,ALL displays
    - Additional statistic information
    - Virtual storage consumption of shared memory objects
    - Virtual storage consumption of private memory objects per partition
  - Example

```
query memobj
AR 0015              LIMITS   USED        HWM
AR 0015 MEMLIMIT:    1024M      0M         1M
AR 0015 SHRLIMIT:     500M      0M         0M
AR 0015 LFAREA:         10M         0K         0K
AR 0015 LF64ONLY: NO
AR 0015 1I40I  READY
```

IARV64 Macro

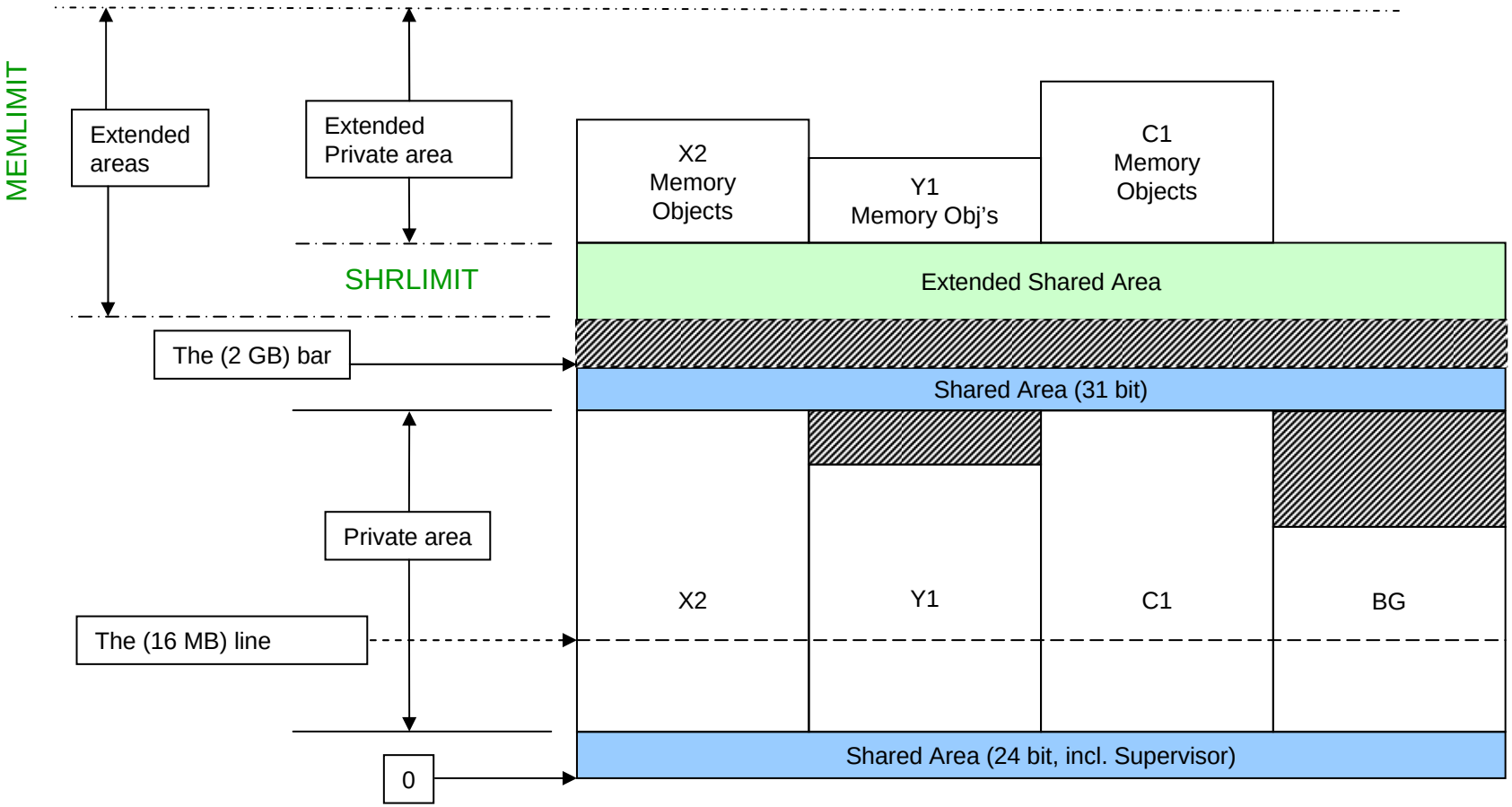
- IARV64 macro - ported from z/OS – provides services to
  - Creates and frees storage areas above the bar
  - Manage the physical frames behind the storage

- Programs use the IARV64 macro to obtain memory objects

- Services (IARV64 REQUEST=):
  - GETSTORE – create a private memory object
  - GETSHARED – create a memory object that can be shared across multiple address spaces
  - SHAREMEMOBJ – request that the specified address space be given access to a shared memory object
  - DETACH – free one or more memory objects
  - PAGEFIX – fix pages within one or more private memory objects
  - PAGEUNFIX – unfix pages within one or more private memory objects

  - GETSTORE / GETSHARED KEY parameter (default key = key of caller)
    - Unauthorized caller can set key 9 (all tasks can run in key 9)
    - Authorized callers can set any key

64 bit virtual - Address Space Layout



64 bit virtual - Considerations

- Memory objects can be allocated for data only.
  RMODE 64 is not supported. Interrupt handlers do not support execution above the bar.

- High level languages (COBOL, PL/I, C, RPG, …) do not support AMODE 64.
  - High Level Assembler support only.

- LOAD / CDLOAD and the linkage editor do not support AMODE 64.
- Space switching Program Calls (ss-PCs) are not supported in AMODE 64.
- All z/VSE system services (Supervisor, VSAM, BAM, DL/I, …) to be called in AMODE 24 / 31.
- Data areas for system services including I/O buffers to be allocated below the bar.

- The Supervisor code continues to use the short form of the PSW (8 byte).

- 64 bit addressing is not supported in ICCF pseudo partitions.
- CICS services **do not** support 64 bit registers or AMODE 64.

CICS

- z/VSE 4.3 will no longer offer CICS/VSE 2.3 as part of the z/VSE 4.3 base
  - Fulfills the statement of direction in announcement from October 9, 2007
  - Coexistence environment removed which includes DL/I V1.10
  - Migration from CICS/VSE to CICS TS on z/VSE 4.2 or earlier
  - Most migration inhibitors should be removed with recent improvements
    - Basic Security Manager (BSM) enhancements
    - More tasks
    - Virtual constraint relief

CICS …

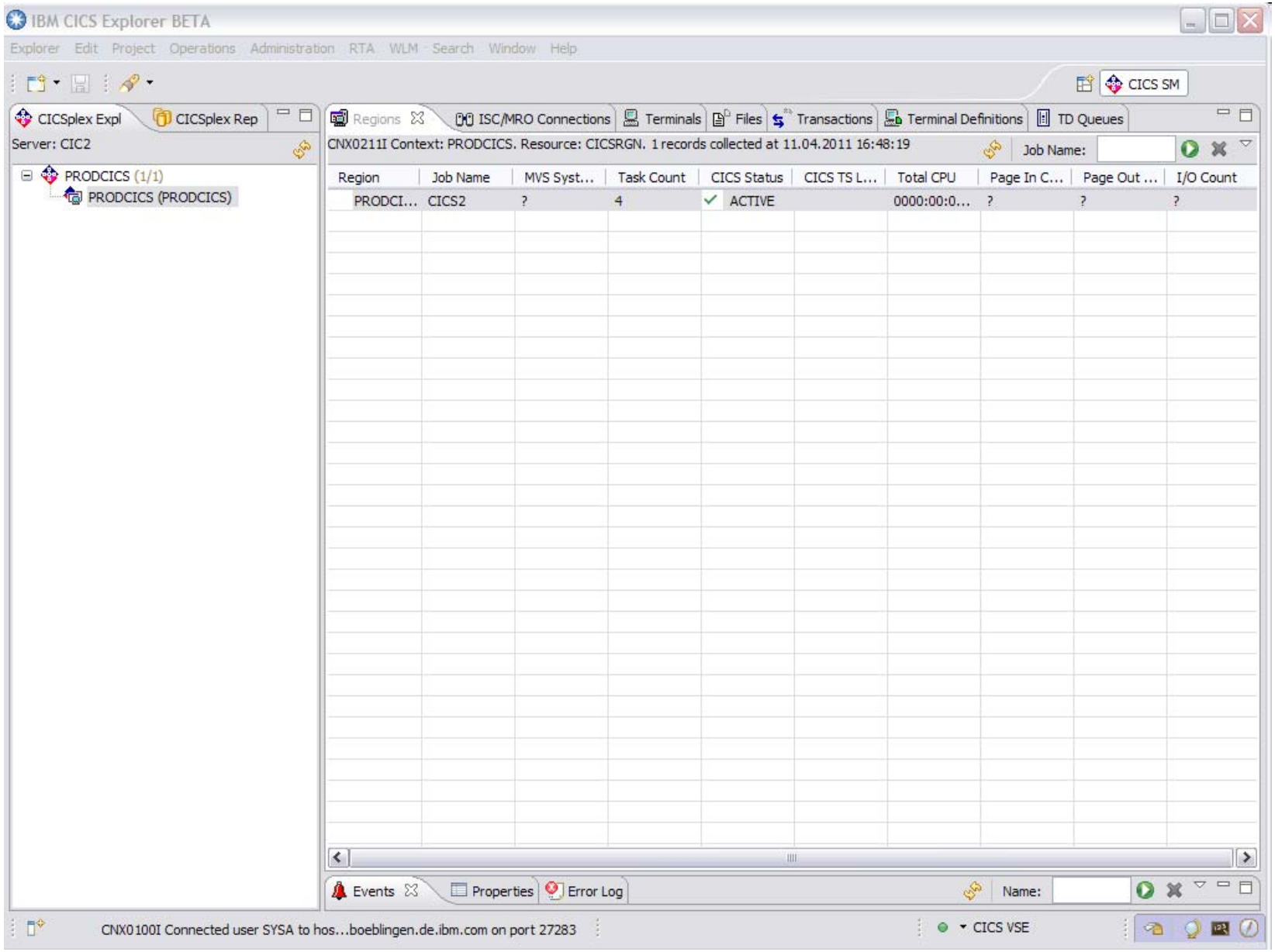
- CICS/VSE 2.3
  - Not supported on z/VSE 5.1
  - End of service: 10/31/2012

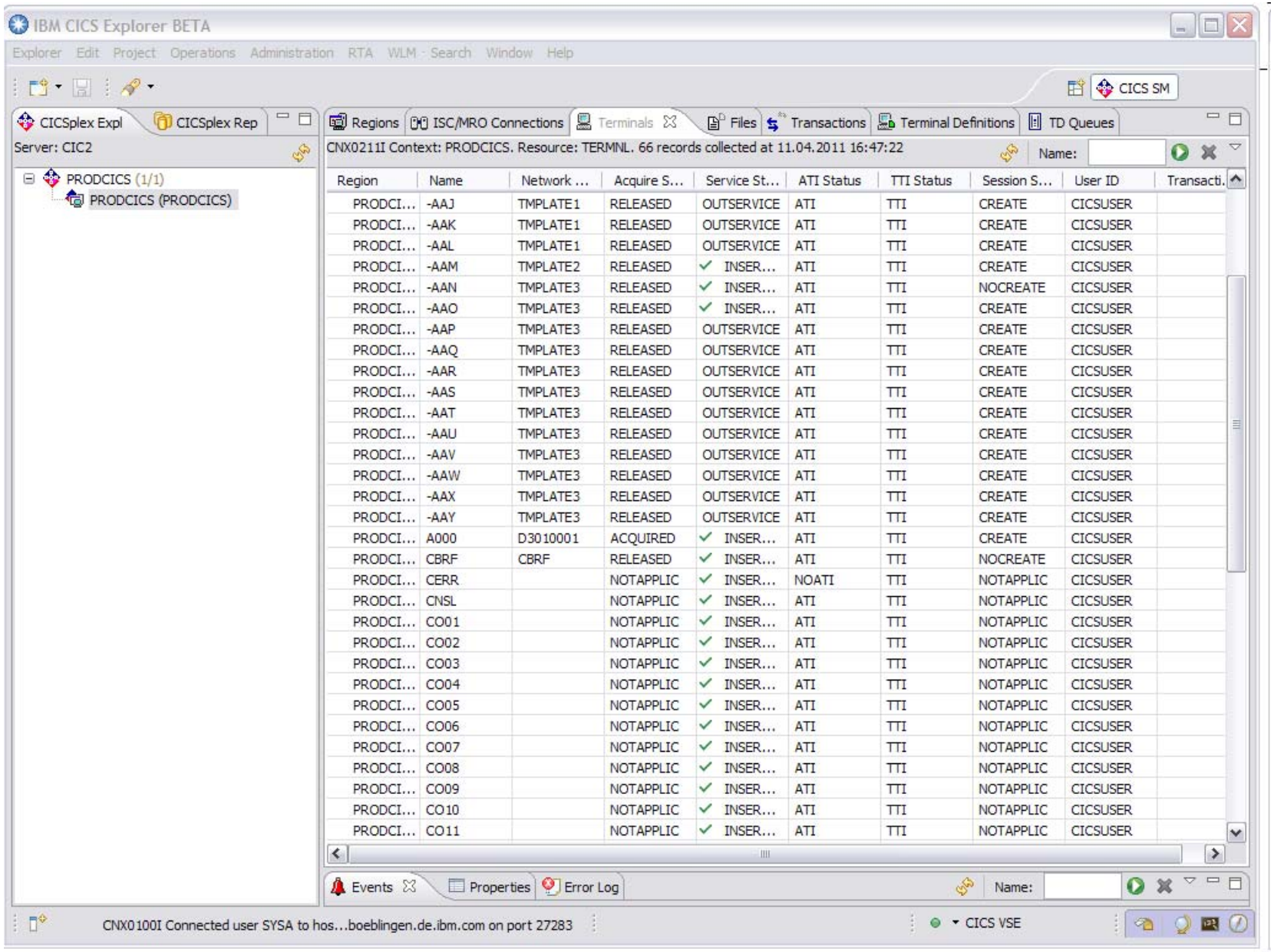
- DOS/VS RPG II compiler support for CICS TS
  - Allows RPG programs implemented for CICS/VSE V2.3 to run with CICS TS
  - Will be available on z/VSE 4.2 (z/VSE 4.1) via PTF (see Info. APAR II4447)

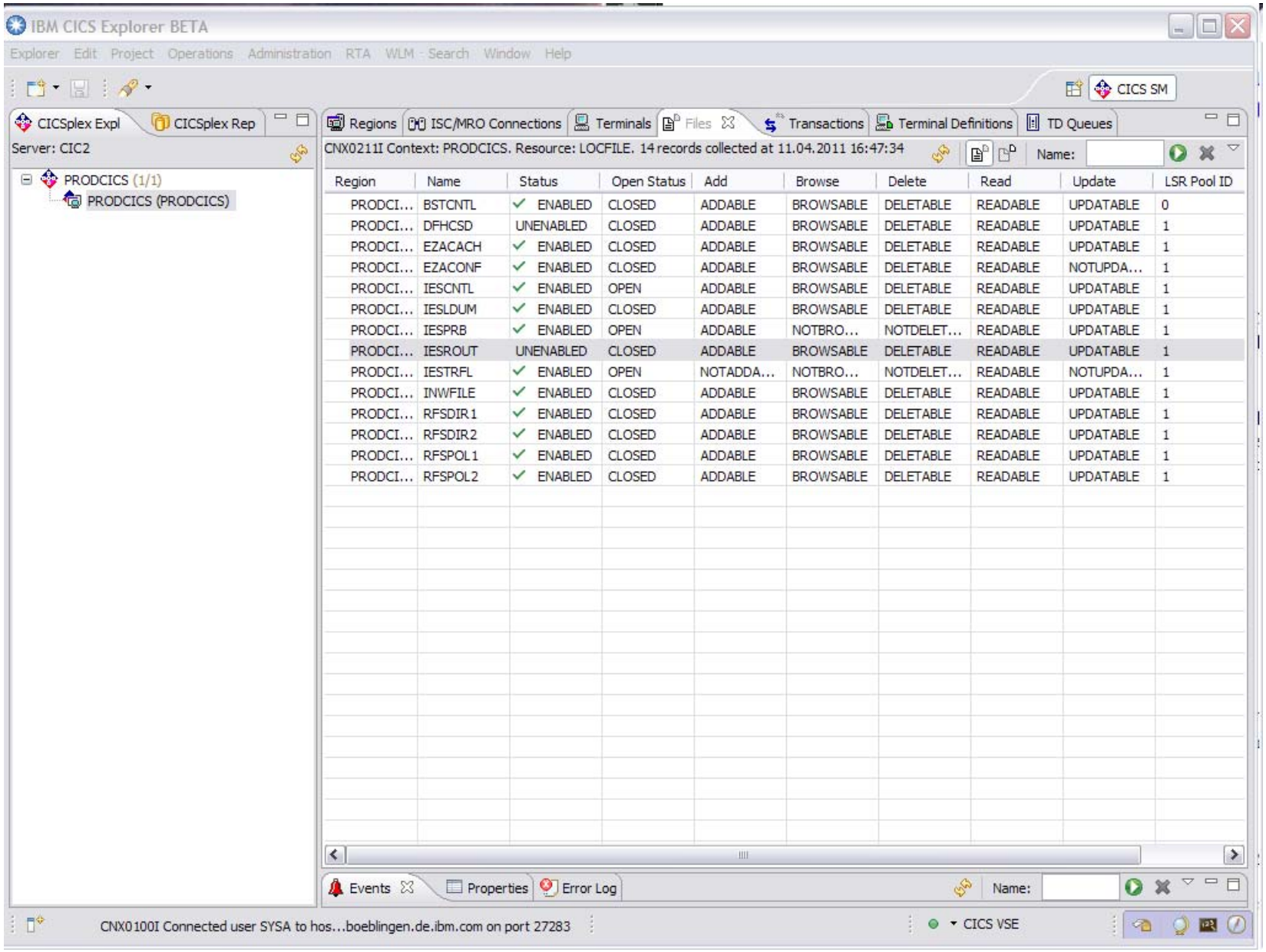
- New DL/I VSE 1.12 release since z/VSE 4.3
  - Optional product of z/VSE 4.3 and z/VSE 5.1 (the only DL/I release)
  - Provides constraint release (DL/I resources moved above the 16 MB line)
  - Replaces DL/I VSE 1.11 and DL/I DOS/VS 1.10
  - Does not support CICS/VSE 2.3

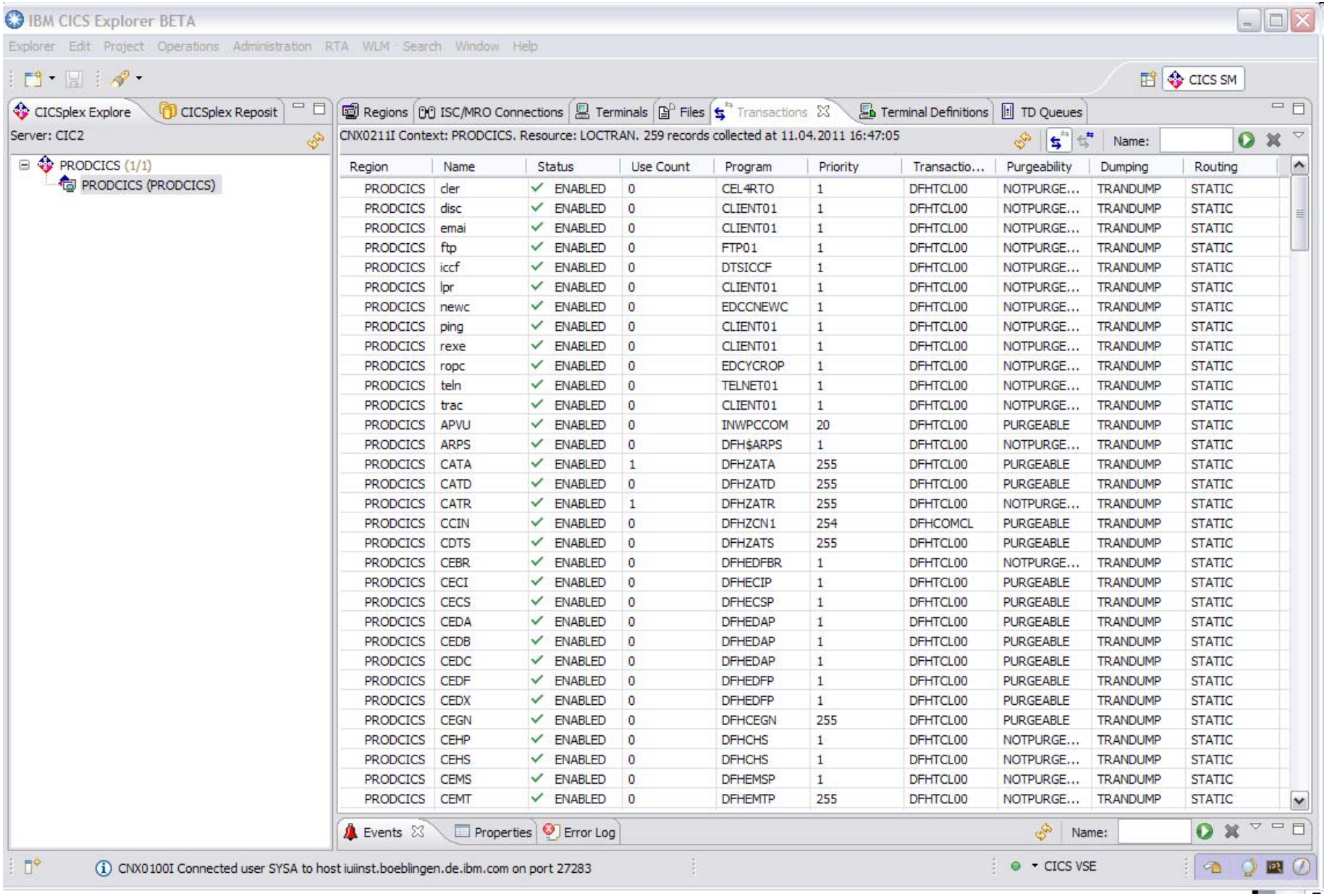
CICS TS for VSE/ESA SOD

- SOD: IBM intends to provide CICS Explorer capabilities for CICS TS for VSE/ESA, to deliver additional value.
  - New face to CICS
  - Integration point for CICS tooling
    - System management tools
  - Eclipse-based user interface on workstation
  - Connects to CICS TS via TCP/IP
    - Communication via HTTP requests









More Information

… on VSE home page: http://ibm.com/vse

- Hints and Tips for :
  - z/VSE V4.2: ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/pdf3/zvse41/hint9mm2.pdf
  - z/VSE V4.3: available soon

- 64 bit virtual information:
  - IBM z/VSE Extended Addressability, Version 5 Release 1
  - IBM z/VSE System Macro Reference, Version 5 Release 1

- IBM Redbooks:
  - Introduction to the New Mainframe: z/VSE Basics
    http://www.redbooks.ibm.com/abstracts/sg247436.html?Open
  - Security on IBM z/VSE
    http://www.redbooks.ibm.com/redpieces/abstracts/sg247691.html
    New draft: http://www.redbooks.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg247691.html?Open
  - z/VSE Using DB2 on Linux for System z
    http://www.redbooks.ibm.com/abstracts/sg247690.html?Open