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IBM @server zSeries
Hardware Update for zSTSU

z890/z990 GA2/4 Update

Harv Emery, Americas zSeries ATS
October 12, 2004

ON DEMAND BUSINESS™

October 2004

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zSeries

IBM

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z890 and z990 Highlights for October 29, 2004

- **On Demand**
  - ▸ On/Off Capacity on Demand test
  - ▸ Extended order staging for CIU-Express and On/Off CoD
  - ▸ z/OS and z/VM support for z890 CP speed change for On/Off CoD, CIU and CBU
  - ▸ Additional z800 – z890 upgrade paths
- **LAN**
  - ▸ New OSA-Express2 Gb Ethernet and 10 Gb Ethernet LR **(Planned January 2005)**
    - – Concurrent LIC updates*
    - – 640 TCP/IP Stacks
    - – Large send for TCP/IP traffic
    - – Layer 2 support
    - * Some infrequent LIC updates may not be concurrent
  - ▸ OSA-Express functional improvements
    - – Layer 2 Support
    - – Improved TCP/IP stack utilization
- **SAN**
  - ▸ Preview of FCP LUN access control **(Date to be announced)**
  - ▸ FICON™ purge path extended
- **Security**
  - ▸ New Crypto Express2 **(Planned January 2005)**
  - ▸ New Cryptographic Support
    - – 19-digit Personal Account Numbers **(Planned December 2004)**
    - – 2048-bit clear and secure key RSA operations
    - – Less than 512-bit clear key RSA operations
  - ▸ TKE 4.2 workstation with smart card reader support
  - ▸ z990 PR/SM™ EAL5 Certification
- **Availability, Clustering, and Virtualization**
  - ▸ GDPS/PPRC Multiplatform Resiliency for zSeries
  - ▸ Coupling Facility dispatcher improvements
  - ▸ New HMC, HMC flat panel, and HMC LAN connectivity features **(Planned November 2004)**
  - ▸ GA2/4 function designed for delivery by concurrent LIC updates

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Getting to GA4 Level, Required and Avoidable Outages

- Getting to GA2/4 (October 29, 2004) level requires LIC changes (MCLs) that are planned to be non-disruptive
  - ▸ Required OS service is likely to require IPL
- Getting to GA3 (May 2004) level is disruptive
  - ▸ Installing Driver 55 on z990 SE requires a POR
  - ▸ Required OS service likely to require IPL
- Helps to avoid additional PORs
  - ▸ MES add of an I/O cage
    - – Avoid MES by using "Plan ahead"
  - ▸ MES add of memory with memory card change
    - – Order more memory initially
  - ▸ HCD add a Logical Channel SubSystem
    - – Predefine with extra partitions
  - ▸ HCD change MAXDEV (maximum devices) in an LCSS
    - – Take the 63 K MAXDEV default
  - ▸ HCD add an LPAR or move one to a different LCSS
    - – Define '*' reserved partitions (z/OS 1.6)
    - – Define extra, named partitions and do not activate
  - ▸ Change I/O definition
    - – Use z/OS or z/VM dynamic I/O support
- Helps to avoid LPAR Deactivation/Activation
  - ▸ Change number of CPs, ICFs, IFLs, or zAAPs
    - – Define "Reserved" CPs, ICFs, IFLs, or zAAPs
  - ▸ Change partition memory
    - – Define "Reserved" memory element(s)
  - ▸ Change partition crypto-coprocessor access
    - – Predefine candidate crypto-coprocessor access

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zSeries LIC Change Planning Recommendations

- Driver (machine LIC = microcode) levels
  - ► No charge, ordered as an ECA by IBM service
  - ► HMC part is applicable to older machines and required on any HMC that will control a CEC at the new level (e.g. HMC at 55k for z890)
  - ► Old driver fix (MCL) support - at least 6 months after newer driver

- Driver and service recommendations – Stay current!
  - ► Plan nondisruptive MCL apply at least every 3 months
  - ► Plan two 4 hour outages for disruptive driver/fix apply each year

- Before a Driver or major LIC MCL change is made:
  - ► Apply/test OS maintenance listed in PSP as required to exploit
  - ► Review documentation from Resource Link
    - – Driver "Purpose and Description" from "Library"
    - – Driver "Exception Letter" from "Fixes"
    - – "EC/MCL Report" from "Machine Information" under "Tools"
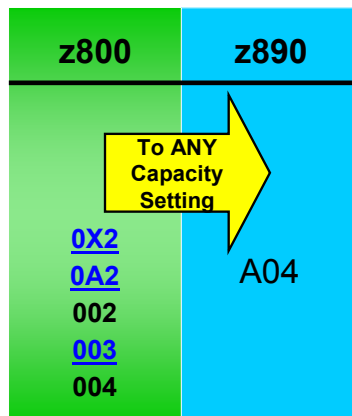 - ► Update operational procedures as required

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On-Demand

zSeries CIU and On/Off CoD

- **Order CIU and CoD "right to use" features**
  - ▸ Qualification, contracting, and pricing
  - ▸ Resource Link ID Authorization
- **Customer CIU or On/Off CoD order or On/Off CoD test order (up to 24 hours)**
  - ▸ Configure upgrade on Resource Link
  - ▸ Secondary Approval (Option)
  - ▸ Resource Link communicates with Remote Support Facility (RSF) to stage order and prepare download
- **Customer Order or Test Install**
  - ▸ Customer notified order ready
    - – **Order can now remain on Retain for an extended period. (Was 30 days.)**
  - ▸ Access Support Element (SE) using Hardware Management Console (HMC)
  - ▸ "Perform Model Upgrade"
  - ▸ Code obtained using RSF and installed on target machine

GA4/2_70   zSTSU October 2004   © 2004 IBM Corporation   **ON DEMAND BUSINESS**

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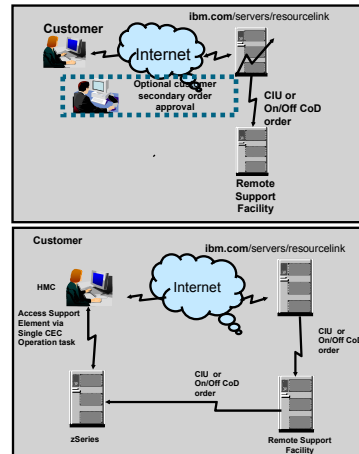
z800 to z890 Upgrades – New Model Support

z800	z890
To ANY Capacity Setting	
0X2	A04
0A2	
002	
003	
004	

e-Config will default to the next closest capacity setting models, but the user may change to _any_ capacity setting desired.

z800 → z890
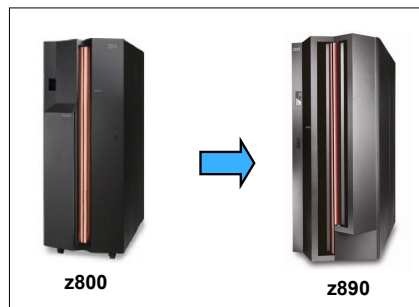
New for GA2 – 0X2, 0A2, and 003 upgrades.

GA4/2_80   zSTSU October 2004   © 2004 IBM Corporation   **ON DEMAND BUSINESS**

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z890 Upgrades – Concurrent support for z/OS and z/VM

- **Single Machine: 2086 and a single Model: A04**

- **A dramatic new way to consider upgrading**

- **One MCM per model with 5 Processor Units (PUs)**
  - ► Four PUs available for characterization
    - – CPs, IFLs, ICFs, or zAAPs
  - ► One PU standard as a SAP

- **Standard CPs –**

  - ► Four full capacity processors each with 7 capacity settings
    - – Entry point is 65% less capacity than z800-0E1 and largest capacity setting is 110% more than z800-004
  - ► Upgrades can be horizontal, vertical, or diagonal or whatever way best fits your needs. All are designed to be concurrent to hardware (no POR).
  - ► Horizontal upgrades add same speed CP and are designed to be OS concurrent
  - ► **Vertical or diagonal upgrades change CP speed (Formerly – IPL required)**
    - – **Designed to be concurrent: z/OS or z/OS.e 1.4 and higher with PTF for APAR OA07510**
    - – **Designed to be concurrent: z/VM 5.1 for Linux guests and z/OS guests with OA07510**

1-WAY	2-WAY	3-WAY	4-WAY
110			
			470

* Note: No mixing of standard CP capacity sizes in multi-engine machines
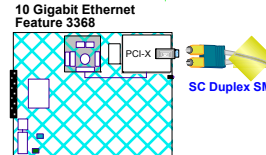
Think of the possibilities:
Define the processor the way your business requires!
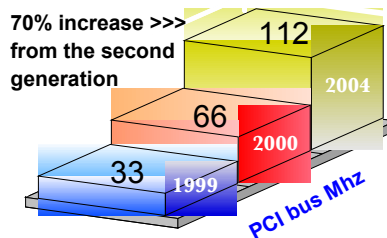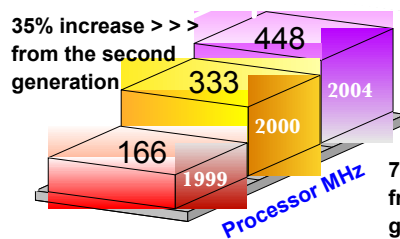

LAN

Slide 1:

z990 and z890 OSA-Express2

- **Newest member - 10 Gigabit Ethernet LR (long reach)**
  - One port per feature
  - 9 micron single mode fiber, SC Duplex connector
- **New - Gigabit Ethernet features**
  - Gigabit Ethernet LX (Long wavelength)
    - 9 micron single mode fiber, LC Duplex connector
  - Gigabit Ethernet SX (Short wavelength)
    - 50 or 62.5 micron multimode fiber, LC Duplex connector
  - Designed to achieve line speed - 1 Gbps in each direction
- **Support offered by both 10 GbE and GbE:**
  - Queued Direct Input/Output (QDIO) for TCP/IP traffic only
    - Use TN3270 or Enterprise Extender for SNA traffic
  - **Layer 2 support** for flexible and efficient data transfer
  - **640 TCP/IP stacks** for improved virtualization
  - **Large send** for CPU efficiency
  - **Concurrent LIC update** to help minimize network traffic disruption
- **CHPID type for all features and functions listed is OSD**
- **Planned Availability – January 28, 2005**

NEW!

10 Gigabit Ethernet Feature 3368 — SC Duplex SM

Gigabit Ethernet Features 3364 (LX), 3365 (SX) — LC Duplex SM, LC Duplex MM

GA4/2_110 zSTSU October 2004 © 2004 IBM Corporation

Slide 2:
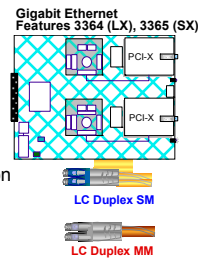
OSA-Express2 – Third Generation OSA-Express

Generation
Third . . . .
Second . . . .
First . . . .

35% increase >>> from the second generation — 448 (2004), 333 (2000), 166 (1999) — Processor MHz

70% increase >>> from the second generation — 112 (2004), 66 (2000), 33 (1999) — PCI bus Mhz
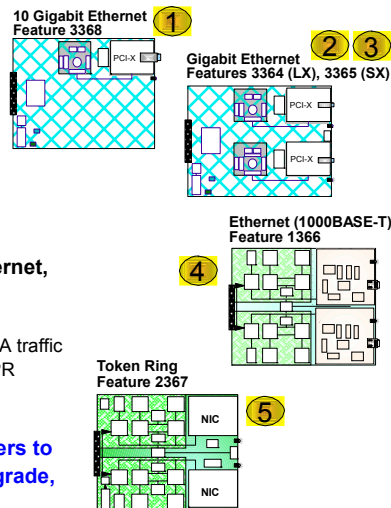
- OSA-Express2 is the **3rd generation** of Ethernet technology to deliver the throughput needed to help satisfy bandwidth-hungry applications

- OSA-Express2 GbE is designed to achieve line speed - 1 Gbps in each direction

GA4/2_120 zSTSU October 2004 © 2004 IBM Corporation

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OSA-Express2 Support Requirements

- **OSA-Express2 Gigabit Ethernet requires:**
  - ▶ z890 or z990 hardware LIC support for GA2/4 (October 29, 2004)
  - ▶ z/OS 1.3 or z/OS.e 1.3 or later
  - ▶ z/VM 3.1 or z/VM 4.3 or later with service (Planned January 28, 2005)
  - ▶ VSE/ESA 2.6 or later
  - ▶ TPF 4.1 PUT13 with service for APAR PJ27333
  - ▶ Linux on zSeries with Gigabit Ethernet support:
    - – SUSE SLES 8 or 9, Red Hat RHEL 3, Turbolinux TLES 8 or Conectiva CLEE
  - ▶ See the 2084DEVICE or 2086DEVICE PSP for any additional service required
- **OSA-Express2 10 Gigabit Ethernet requires:**
  - ▶ z890 or z990 hardware LIC support for GA2/4 (Planned January 28, 2005)
  - ▶ z/OS 1.3 or z/OS.e 1.3 or later
  - ▶ For Checksum Offload, z/OS or z/OS.e 1.5 or later
  - ▶ z/VM 3.1 or z/VM 4.3 or later with service (Planned January 28, 2005)
  - ▶ VSE/ESA 2.6 or later
  - ▶ TPF 4.1 PUT13 with service for APARs PJ27333 and PJ29930
  - ▶ Linux on zSeries with code IBM plans to deliver as Open Source in early 2005
  - ▶ See the 2084DEVICE or 2086DEVICE PSP for any additional service required

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## z890/990 OSA-Express2/OSA-Express new build features

- **Up to 48 network connections**
- **Up to 40 network connections - z890**
  - ▶ 24 on z890 capacity setting 110
- **Choose from 5 features**
  - ▶ OSA-Express2 10 GbE, GbE LX and SX
  - ▶ OSA-Express 1000BASE-T Ethernet
    - – Same Cat 5 cable as Fast Ethernet
  - ▶ Token Ring (4/16/100 Mbps)
    - – Cat 5 copper cable

- **Modes of Operation for 1000BASE-T Ethernet, Token Ring**
  - ▶ QDIO = TCP/IP traffic only
    - – TN3270 or Enterprise Extender for SNA traffic
  - ▶ Non-QDIO = TCP/IP and/or SNA/APPN/HPR
  - ▶ OSA-ICC for 1000BASE-T only

- **SOD - z990/z890 are the last zSeries servers to support Token Ring OSA - new build, upgrade, MES, or carry forward**

10 Gigabit Ethernet Feature 3368 ①

Gigabit Ethernet Features 3364 (LX), 3365 (SX) ② ③

Ethernet (1000BASE-T) Feature 1366 ④

Token Ring Feature 2367 ⑤

OSA-Express carry-forward features

- **Each feature has two identical ports, each capable of achieving line speed ***
- **Can be carried forward on an upgrade from a z900 or z800 (23xx features)**
- Gigabit Ethernet LX
  - ▸ 9 micron single mode **fiber**
  - ▸ # 1364 uses LC Duplex connector
  - ▸ # 2364 uses SC Duplex connector
- Gigabit Ethernet SX
  - ▸ 50 or 62.5 micron multimode **fiber**
  - ▸ # 1365 uses LC Duplex connector
  - ▸ # 2365 uses SC Duplex connector
- 1000BASE-T Ethernet (10/100/1000 Mbps)
  - ▸ Category 5 **copper**
- Fast Ethernet (10/100 Mbps)
  - ▸ Category 5 **copper**
- Token Ring (4/16/100 Mbps)
  - ▸ Category 5 **copper**
- Modes of Operation
  - ▸ QDIO for all = TCP/IP traffic only
    - −TN3270 or Enterprise Extender for SNA traffic
  - ▸ Non-QDIO = TCP/IP and/or SNA/APPN/HPR
    - −1000BASE-T Ethernet
    - −Token Ring
  - ▸ OSA-ICC
    - −1000BASE-T Ethernet (see following slide)
- * Actual throughput is dependent upon customer environment

NIC

NIC
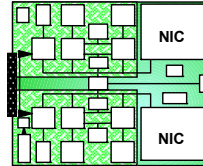
**Gigabit Ethernet LX
Features 2364, 1364**

**Gigabit Ethernet SX
Features 2365, 1365**

**1000BASE-T Ethernet
Feature 1366**

**Fast Ethernet
Feature 2366**

**Token Ring
Feature 2367**

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640 TCP/IP stacks for improved virtualization

- **Exclusive to OSA-Express2 (Planned January 28, 2005)**
  - ▸ 640 TCP/IP stacks per OSA-Express2 port/CHPID
- **Doubled the number of home IP addresses**
- **For hosting more images on zSeries**
- **Reduces the number of OSA features required to host multiple images**
- **Exclusive to OSA-Express2 (GbE, 10 GbE)**
  - ▸ QDIO mode only (CHPID type OSD)
- **Support planned by**
  - ▸ z/OS and z/OS.e V1.6 with HCD/HCM APARs OA09114/IR54497
  - ▸ z/VM V5.1 with service for VM63524 and PQ91421
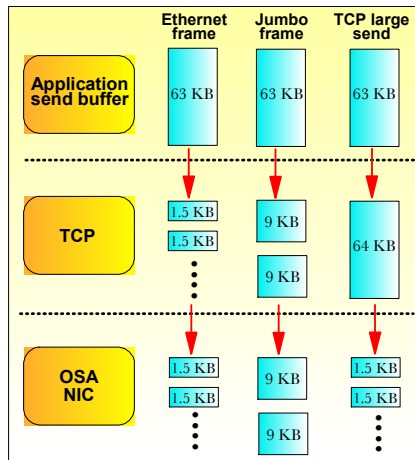 - ▸ Linux on zSeries with code IBM intends to deliver Open Source in early 2005

640

160
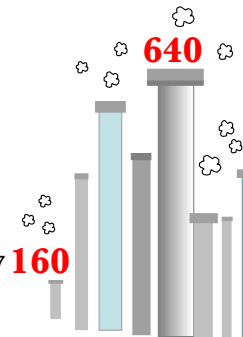
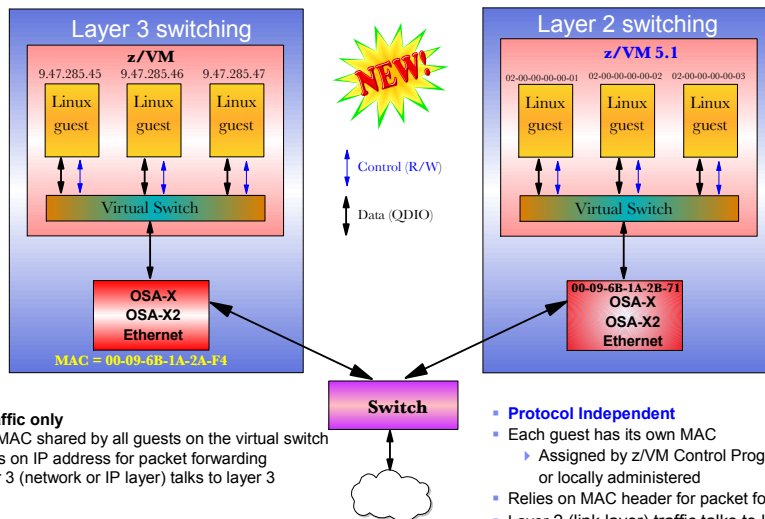| Limits	S/390 G5/G6	z900	z900	zSeries	z990	z990, z890 OSA-E	z990, z890 OSA-E2
OSD		Dec 00	Oct 01	May 02	Jun 03	Oct 04	Jan 05
Subchannels per stack	3	3	3	3	3	3	3
IP Stacks per port/CHPID on server	15	80	80	80	160	160	640 $
Subchannels per port	240	240	240	240	480	480	1920 $
IP stacks per LPAR	15	80	80	80	84	160	640 $
Devices per LPAR	240	240	240	240	254	480	1920 $
Maximum Control Units Supported	1	1	1	1	1	16	16

$ If multiple priorities for queues is enabled (one to four QDDIO priorities) the maximum remains at 160 stacks/480 devices

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OSA-Express2 Large Send Support

- **OSA-Express2 (GbE and 10 GbE)**
  (Planned January 28, 2005)
- **Segmentation of IP packets done by OSA NIC, not IP stack**

- **Offloads the <u>TCP segmentation</u> processing from host TCP/IP stack**
- **Host code path length reduced**
- **Sends 64 KB blocks to OSA**
- **Processing performed by OSA NIC**
  - ▸ TCP/IP checksum processing
  - ▸ TCP packet processing
  - ▸ Sends out 1.5 KB packets (1492 byte)

- **For outbound traffic only**
- **For IPv4, IPv6**
- **For unicast datagrams**

- **QDIO mode only (CHPID type OSD)**
- **Supported by Linux on zSeries with code IBM intends to deliver Open Source in early 2005**

	Ethernet frame	Jumbo frame	TCP large send
Application send buffer	63 KB	63 KB	63 KB
TCP	1.5 KB / 1.5 KB	9 KB / 9 KB	64 KB
OSA NIC	1.5 KB / 1.5 KB	9 KB / 9 KB	1.5 KB / 1.5 KB

Link layer transport for protocol-independent data transfer

Layer 3 switching

z/VM
9.47.285.45   9.47.285.46   9.47.285.47
Linux guest   Linux guest   Linux guest
Virtual Switch
OSA-X OSA-X2 Ethernet
MAC = 00-09-6B-1A-2A-F4

NEW!

Control (R/W)
Data (QDIO)

Layer 2 switching

z/VM 5.1
02-00-00-00-00-01   02-00-00-00-00-02   02-00-00-00-00-03
Linux guest   Linux guest   Linux guest
Virtual Switch
00-09-6B-1A-2B-71
OSA-X OSA-X2 Ethernet

Switch

- **IP traffic only**
- One MAC shared by all guests on the virtual switch
- Relies on IP address for packet forwarding
- Layer 3 (network or IP layer) talks to layer 3

- **Protocol Independent**
- Each guest has its own MAC
  - ▸ Assigned by z/VM Control Program or locally administered
- Relies on MAC header for packet forwarding
- Layer 2 (link layer) traffic talks to layer 2

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OSA-Express2 and OSA-Express Layer 2 Support

- **Function and Potential Benefits**
  - Provides protocol independence for network traffic
    - IPX, NetBios, SNA, AppleTalk, Decnet, IPv4, IPv6
  - May facilitate server consolidation onto z990 and z890
  - May reduce CPU utilization for router images/LPAR/guests
  - May reduce network configuration complexity
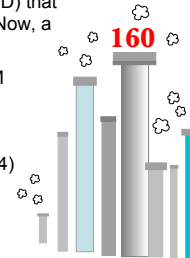
- **Support and Requirements**
  - Requires z890/990 hardware LIC support for GA2/4
    - z890/990 OSA-Express Ethernet (October 29, 2004)
      - All Ethernet features **EXCEPT** Fast Ethernet (FC #2366)
    - All z890/990 OSA-Express2 Ethernet (Planned January 28, 2005)
  - Requires z/VM 5.1
    - OSA-Express: APAR VM63538 (Planned December 3, 2004)
    - OSA-Express2: With additional service (Planned January 28, 2005)
  - Requires Linux with code IBM plans for Open Source delivery in:
    - October 2004 for kernel 2.4
    - Early 2005 for kernel 2.6
  - See 2084DEVICE or 2086DEVICE PSP for any additional service required

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OSA-Express Stack Utilization Improvement

- **Function and Potential Benefits**
  - OSA-Express features support 160 TCP/IP stacks. Previously, to use all those stacks, the CHPID had to be shared by multiple logical partitions (LPARs). There was a restriction (only allowing a single control unit definition per CHPID) that limited the number of stacks to 84 per LPAR. That restriction is lifted. Now, a single LPAR can contain all 160 stacks offered by OSA-Express.
  - Provides flexibility for OSA-Express configuration, especially with z/VM
  - Note: OSA-Express2 supports 640 stacks per LPAR.
- **Support and Requirements**
  - Requires z890/990 hardware LIC support for GA2/4 (October 29, 2004)
  - OSA-Express features Gigabit Ethernet (any), 1000Base-T Ethernet, Fast Ethernet, or Token-Ring configured as OSD (TCP/IP only)
  - Requires z/OS and z/OS.e V1.6 with service for HCD APAR OA03689
  - z/VM V3.1, V4.3 or later with service for APARs VM63524 and PQ91421 (Planned January 28, 2005)
  - See 2084DEVICE or 2086DEVICE PSP for any additional service required
  - Linux on zSeries current distributions:
    - SUSE SLES 8 or 9, Red Hat RHEL 3, or Conectiva CLEE

SAN

FCP LUN Access Control

Preview *

Without LUN Access Control

PRD1 PRD2 PRD3 LNX 2 LNX 3
LNX 1
z/VM
LCSS0 LCSS1

With LUN Access Control

PRD1 PRD2 PRD3 LNX 2 LNX 3
LNX 1
z/VM
LCSS0 LCSS1

- **No LUN Access Control**
  - ▸ Image access to shared FCP channel allows read-write access to all LUNs not masked
  - ▸ No concurrent LUN sharing
- **With LUN Access Control**
  - ▸ Image defined LUN access on shared FCP channel
  - ▸ Read-only LUN sharing
  - * Planned availability to be announced

??? {
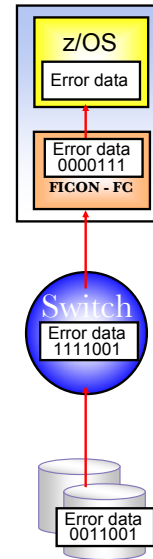LNX1 LNX1 LNX1
LNX2 LNX2 LNX2
LNX3 LNX3 LNX3
}

{
LNX1
LNX2
LNX3
} — **Read-only sharing**

LNX1 LNX2 LNX3

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FICON purge path extended for native FICON (CHPID type FC)

- **Designed to enhanced FICON problem determination**

- **Error-recovery function is extended**
  - ▸ Transfers error-related data and statistics
    - – Between the channel and entry switch
    - – Control unit and its entry switch
    - – To the host z/OS operating system
      - • Reported in EREP

- **Exclusive to z990 and z890**

- **Supported by z/OS and z/OS.e V1.4, and later, with PTFs for APAR 0A06846 and EREP APAR IR51695**

- **Requires supporting LIC on control units**

z/OS
Error data

Error data
0000111
FICON - FC

Switch
Error data
1111001

Error data
0011001

New FICON and FCP Capabilities

- **LUN Access Control (Preview only. Future hardware LIC update required)**
  - ▸ Designed to allow:
    - – Host-based control of operating system image access to SCSI devices as identified by their logical unit numbers (LUNs) on shared FCP channels.
    - – Read-only sharing of LUNs among multiple operating system images
  - ▸ Expected to require a future z890 or z990 hardware update and:
    - – Access Control Table XML program – Planned for download from Resource Link
    - – z/VM 4.4 and later with service for APAR VM63328 (Expected same date as LIC update)
      - • LUN Access Control for Linux guest LUNs
    - – Linux on zSeries
      - • For LUN Access Control, Linux on zSeries with LUN Access Control support:
        - • SUSE SLES 8 and SLES 9 or Conectiva CLEE
      - • For read-only sharing, above with additional code IBM plans for Open Source delivery in early 2005.
- **FICON Purge Path Extended for channels in native (FC) mode**
  - ▸ Designed to provide enhanced FICON Express problem determination and error-recovery by providing end-to-end error-related information to the host operating system.
  - ▸ Requires z890 or z990 hardware LIC support for GA2/4 (October 29, 2004) and:
    - – z/OS or z/OS.e 1.4 or later with service for APARs OA06846 and IR51695
    - – See 2084DEVICE or 2086DEVICE PSP for any additional service required

Security

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z890/z990 Crypto Roadmap to Crypto Express2

- z990/890 includes **NO** standard cryptographic function
- **CP Assist for Cryptographic Function (message security assist) Feature #3863**
    - Allows access to crypto functions from any CP (Limited to CP0 and CP1 on z900)
    - Supports limited clear key processing **running on the CP** – Compute intensive!
    - **NOT equivalent to CCF on older machines in function or offload**
- **PCIXCC Feature – Supports "Secure key" cryptographic processing**
- **PCICA Feature – Supports "Public key" SSL cryptographic processing**
- **Crypto Express2 – Combines function and performance of PCICA and PCICC**
- **Migration to z990 when CCF, PCICC or PCICA is in use on an older machine usually requires Crypto Express2, PCIXCC and/or PCICA on z890/990.**

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z990 Crypto – October 2004 announcement

Hardware / z/OS Crypto Support	G5/G6	z800/z900	z990 GA1	z990-GA2/GA3	z890-GA2 z990-GA4
Hardware	CCF PCICC	CCF PCICC PCICA	PCICA CPACF	PCIXCC PCICA CPACF	Crypto Express2 CPACF
Crypto Function	Clear key and Secure crypto	Clear key and Secure crypto	Clear key only	Clear key and Secure crypto	Clear key and Secure crypto
OS Support	OS/390 R10, z/OS 1.1+	CCF/PCICC: OS/390 R10, z/OS 1.1+ PCICA: z/OS 1.2+	z/OS 1.3 and 1.4	OS/390 2.10 and z/OS 1.2 to 1.6 Web deliverable	z/OS 1.3 to 1.6 Web deliverable

- CP Crypto Assist for Cryptographic Functions (CP Assist)
  - High performance clear key DES and SHA-1 engine in every CP
  - Some DES, TDES applications may also require PCIXCC or Crypto Express2
- Crypto Express2 (3rd Generation Crypto) NEW!
  - I/O Cage (STI) installable feature
  - Designed to add security-rich functions that previously required PCIXCC or PCICA
  - Designed provide the high performance SSL support that previously required PCICA


Crypto Express2 Support Requirements

- **z890 or z990 hardware LIC support for GA2/4 (Planned January 28, 2005)**
- **z/OS 1.3 or z/OS.e 1.3 or later with Web Deliverable:**
  - z990 and z890 Enhancements to Cryptographic Support
- **z/VM 5.1 or later with service (Planned January 28, 2005)**
  - Dedicated-queue support for clear key and secure key functions for z/OS guests
  - Shared- and dedicated-queue support for clear key functions for Linux on zSeries guests, with up to 256 dedicated queues
- **VSE/ESA 2.7 and IBM TCP/IP for VSE/ESA 1.5**
  - Clear key functions only
- **Linux on zSeries with code IBM plans to deliver Open Source in:**
  - October 2004 for kernel 2.4
  - Early in 2005 for kernel 2.6
- **See the 2084DEVICE or 2086DEVICE PSP for any additional service.**

Crypto Express2

- **Planned availability – January 28, 2005**
- **Dual Integrated Cryptographic Coprocessors**
  - ▶ Provides PCIXCC and PCICA functionality
- **Improved throughput over the PCIXCC**
  - ▶ Multitasking required to use both coprocessors
- **Scalable (no CP affinity) - 0 to 8 features**
  - ▶ The total number of Crypto Express2, PCICA and PCIXCC features cannot exceed 8 features per server
  - ▶ All 8 Crypto Express2 features can plug in a single I/O cage without restrictions
  - ▶ Minimum purchase increment is two (Crypto Express2 and/or PCIXCC)
- **Current applications expected to run without change**
- **Connection to STI interface; no external cables**
- **Fully programmable, User Defined Extensions (UDX) support**
- **Designed for FIPS 140-2 Level 4 Certification**
- **Trusted Key Entry (TKE) 4.X support**
  - ▶ Secure operational and master key loading
  - ▶ Smart Card Reader support (TKE 4.2 – October 2004)

PCIX Coprocessor

PCIX Coprocessor
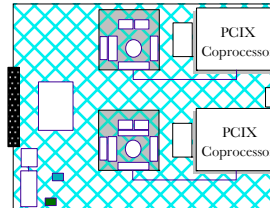
All z990/z890 cryptographic features are designed to be seamlessly managed by ICSF for optimum performance!

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19-digit Personal Account Numbers on z890/990

- **Function and Potential benefits**
  - ▶ Designed to meet the industry requirement for Card Validation Value (CVV) generate and verification services for 19-digit Personal Account Numbers (PANs).
    - – Old: 13-digit and 16-digit PANs
    - – New: 19-digit PAN
  - ▶ Designed to increase anti-fraud security
- **Requirements and Support**
  - ▶ Exclusive to z890 and z990 PCIXCC and Crypto Express2
  - ▶ PCIXCC with z890 or z990 hardware LIC support for GA2/4 (October 29, 2004)
    OR
  - ▶ Crypto Express2 with z890 or z990 hardware LIC support for GA2/4 (Planned January 28, 2005)
  - ▶ Requires z/OS or z/OS.e V1.6 with the **ICSF 64-bit Virtual Support for z/OS V1R6 and z/OS.e V1R6** Web deliverable planned for **December 17, 2004.**
  - ▶ See the 2084DEVICE or 2086DEVICE PSP for any additional service required

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2048-bit clear and secure key RSA operations

NEW!

- **Function and Potential Benefits**
  - ▸ 2048-bit clear and secure key RSA management capability
    - – Support of new Automated Teller Machine (ATM) standards
  - ▸ The 2048-bit functional control vector will support four ICSF services: Public Key Decrypt, Symmetric Key Import, Symmetric Key Export, and Symmetric Key Generate
  - ▸ Designed to increase anti-fraud security
- **Requirements and Support**
  - ▸ PCICC with **Feature #0867 for z800 and z900** (**Not applicable to CCF**) **OR**
  - ▸ PCIXCC on z890 or z990 **OR**
  - ▸ Crypto Express2 with z890 or z990 hardware LIC support for GA2/4 (Planned Jan 28, 2005)
  - ▸ On z800 or z900 with PCICC: z/OS 1.3 or z/OS.e 1.3 or later
  - ▸ On z890 or z990: z/OS 1.3 or z/OS.e 1.3 or later with:
    - – For PCIXCC: z990 Cryptographic Support
    - – For Crypto Express2 and PCIXCC: z990 and 890 Enhancements to Cryptographic Support
  - ▸ On z800 or z900 with PCICC, z/VM 4.3 or later for Linux on zSeries guests.
  - ▸ On all hardware, z/VM 5.1 for support of z/OS and Linux on zSeries guests.
    - – For Crypto Express2, with service planned January 28, 2005
  - ▸ See 2084DEVICE or 2086DEVICE PSP bucket for any required service
  - ▸ For Crypto Express2, Linux on zSeries with code IBM plans to deliver Open Source in:
    - – October 2004 for kernel 2.4
    - – Early in 2005 for kernel 2.6
  - ▸ For PCIXCC or PCICC, Linux on zSeries with clear key RSA support:
    - – SUSE SLES 8 or 9, Red Hat RHEL 3, Turbolinux TLES 8, or Conectiva CLEE

Less than 512-bit clear key RSA operations on z890/990

- **Function and Potential Benefits**
  - ▸ Designed to allow clear key RSA operations using keys less than 512-bits including ICSF Callable services and their corresponding verbs: Digital Signature Verify (CSNDDSV), Public Key Encrypt (CSNDPKE), and Public Key Decrypt (CSNDPKD).
  - ▸ May allow the migration of some additional cryptographic applications to z890 and z990 servers without rewriting the applications.
- **Requirements and Support**
  - ▸ **Currently Available for PCICC on z800 and z900**
  - ▸ New for z890 and z990 PCIXCC and Crypto Express2
  - ▸ PCIXCC with z890 or z990 hardware LIC support for GA2/4 (October 29, 2004)
    OR
  - ▸ Crypto Express2 with z890 or z990 hardware LIC support for GA2/4 (Planned January 28, 2005)
  - ▸ z/OS 1.3 or z/OS.e 1.3 or later with Web Deliverable:
    - – For PCIXCC: z990 Cryptographic Support
    - – For Crypto Express2 and PCIXCC: z990 and 890 Enhancements to Cryptographic Support
  - ▸ z/VM 5.1 or later with service (Planned January 28, 2005)
    - – Support for z/OS guests
  - ▸ See the 2084DEVICE or 2086DEVICE PSP for any additional service required

z990 Security Certifications

- **Cryptographic Security Certification**
  - ▶ Crypto Express2 – Designed to meet FIPS 140-2 Level 4
  - ▶ PCIXCC – Designed to meet FIPS 140-2 Level 4
  - ▶ TKE 4.2 Smart Cards – Certified to meet FIPS 140-2 Level 2
- **Common Criteria (ISO/IEC 15408) Evaluation Assurance Levels**
  Reference: http://niap.nist.gov/cc-scheme/
  - ▶ z990 PR/SM – EAL5 (With z800 and z900, currently* the only server to receive EAL5)
  - ▶ z/OS 1.6 – Under evaluation for Controlled Access Protection Profile (CAPP) EAL3+ and Labeled Security Protection Profile (LSPP) EAL3+
  - ▶ z/VM V5.1 with the RACF® for z/VM – IBM has applied for Controlled Access Protection Profile (CAPP) EAL3+ and the Labeled Security Protection Profile (LSPP) EAL3+
  - ▶ SUSE LINUX SLES 8 – Controlled Access Protection Profile (CAPP) EAL3+
  - * As of September 20, 2004

Availability and Clustering

GDPS/PPRC Multiplatform Resiliency for zSeries

NEW!

Site 1   ESS   PPRC   ESS   Site 2

- **Designed for customers with distributed applications**
- **SAP application server running on Linux on zSeries**
  - ▸ SAP DB server running on z/OS
- **Coordinated near-continuous availability and DR solution for z/OS and Linux guests running under z/VM**
- **GDPS® exploits z/VM HyperSwap function to switch to secondary disks mirrored by PPRC**
- **Requires:**
  - ▸ z/VM 5.1 and
  - ▸ IBM Tivoli System Automation for Multiplatforms 1.2

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z990 CFCC Level 14 – z890/990 GA2/4

- **Function and Potential Benefit**
  - ▸ Contains improvements to the CF dispatcher and internal serialization mechanisms designed to better manage coupled workloads

- **Requirements and Support**
  - ▸ Requires z890/990 hardware LIC support for GA2/4 (October 29, 2004)
  - ▸ z/OS 1.3 or z/OS.e 1.3 and higher
  - ▸ z/OS 1.4 and higher
    - – Optional APAR fix OA08742 to allow sysplex connectors to request structure allocation in a Level 14 Coupling Facility
  - ▸ z/VM 3.1 and z/VM 4.3 and higher for virtual CF support

- **CF Storage Sizing with CFCC level 14**
  - ▸ May increase storage requirements
  - ▸ Use CFSIZER tool to determine:
    www.**ibm.com**/servers/eserver/zseries/cfsizer/

NEW!

1 to 32 Systems

zSeries continues to meet the requirements for advanced clustering

z990 GA3 availability enhancement for CFCC changes
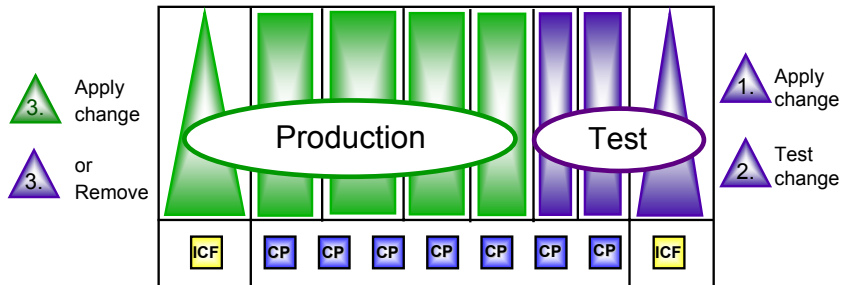
Apply previously disruptive CFCC changes with little disruption to z990
- Disruption occurs one CFCC LPAR at a time to activate or remove a change
- Allows rolling CFCC maintenance across CF LPARs
  - Similar to rolling z/OS maintenance across OS images
- Helps reduce the requirement to isolate test CFs from production OS/CF images

Note: Some very infrequent CFCC related changes may still require power-on-reset

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New HMC, TKE, Flat Panels and T/R MAU

- **New Hardware Management Console (HMC) features** (November 2004)
  - **FC0079** HMC with DVD-RAM drive and dual Ethernet
  - **FC0080** HMC with DVD-RAM drive and both Token-Ring and Ethernet
- **New Trusted Key Entry workstation and Smart Card Reader**
  - **FC0846** TKE with DVD-RAM drive and Token-Ring (November 2004)
  - **FC0849** TKE with DVD-RAM drive and Ethernet (November 2004)
  - **FC0887** Smart Card Reader - Requires TKE 4.2 LIC (October 2004)
  - **FC0888** Additional Smart Cards (October 2004)
- **New Flat Panel Displays** (November 2004)
  - **FC6094** 17-inch flat panel display
  - **FC6095** 20-inch flat panel display
- **New z990 T/R MAU FC0088** (November 2004)
  - 8 Token-Ring ports
  - Previously shipped automatically, now orderable
- **Increased HMC feature support**
  - Up to 10 HMCs with displays
  - Up to 10 T/R MAUs and Ethernet Switches
- **Note:**   **Ordering z990 SEs with dual Ethernet (FC3063) is recommended when dual Ethernet HMCs and Ethernet TKEs are selected.**
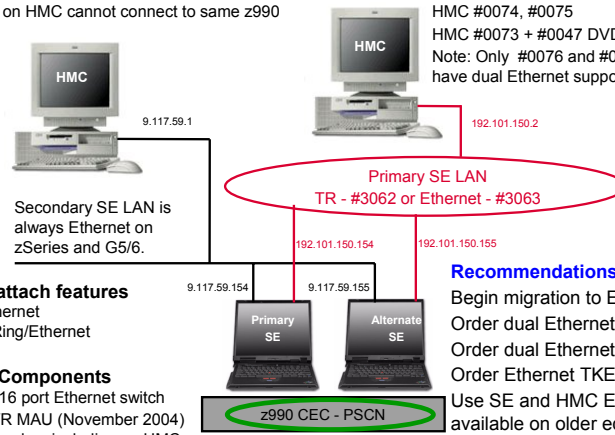
z990 HMC configuration and feature recommendations

Currently orderable HMCs (November 2004):
HMC #0079 – Dual Ethernet
HMC #0080 – Ethernet/Token-Ring
Note: Both LANs on HMC cannot connect to same z990

Old HMCs OK:
HMC #0077, #0078
HMC #0076 conversion of #0075
HMC #0074, #0075
HMC #0073 + #0047 DVD
Note: Only #0076 and #0077 have dual Ethernet support

HMC

HMC

9.117.59.1

192.101.150.2

Primary SE LAN
TR - #3062 or Ethernet - #3063

Secondary SE LAN is always Ethernet on zSeries and G5/6.

192.101.150.154   192.101.150.155

z990 SE LAN attach features
#3063 – Dual Ethernet
#3062 – Token-Ring/Ethernet

9.117.59.154   9.117.59.155

HMC/SE LAN Components
#0089 – 10/100, 16 port Ethernet switch
#0088 – 8 port T/R MAU (November 2004)
Note: Offered on orders including an HMC

Primary SE   Alternate SE

z990 CEC - PSCN

Recommendations
Begin migration to Ethernet
Order dual Ethernet HMCs
Order dual Ethernet SEs
Order Ethernet TKEs
Use SE and HMC Ethernet available on older equipment

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zSeries Hardware Management Console (HMC)

- **z990 HMC levels support older machines**
  - No migration/compatibility issues
- **Supported HMCs are 0073, 0074, 0075, 0076, 0077, 0078, 0079 and 0080**
  - FC0078 and older HMCs no longer orderable as of November 2004
  - **FC0076** – Orderable on G6, z800, z900, z990, z890 with 0075 HMC
    - MES only – Changes FC0075 to Dual Ethernet from T-R/Ethernet
  - **FC0079** – Dual Ethernet HMC orderable on G6, z800, z900, z990, z890
  - **FC0080** – Ethernet/Token-Ring HMC orderable on G6, z800, z900, z990, z890
- **Requires HMC LIC level 1.8.2 (Included on z990 LIC Driver 55 - GA3).**
  Must be ordered by Service for supported HMCs to support z990 GA3 function
- **SOD: z890 and z990** - Last zSeries to offer T-R connection to SEs
- **SOD: HMCs and TKEs announced with future zSeries**
  - Will NOT offer T-R connectivity
  - Will support HMC/TKE LIC only, no additional application function
    - No support for ESCON® director, Sysplex Timer or DWM console function
- **Recommendation – Begin SE/HMC/TKE migration to Ethernet**

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Statements of Direction

Statement of Direction - z/OS Comm Server

- **August 2004: It is IBM's intent to support VTAM in z/OS Communications Server for the foreseeable future.** Customers have a substantial investment in 3270 and SNA applications. We continue to support and enhance VTAM's capabilities while integrating it with new technologies. IBM has no plans at this time to discontinue SNA support in z/OS Communications Server. As of June 2004, customers can, for selected SNA workloads, use Communications Server products for Linux, Linux on zSeries, Microsoft™ Windows™, and AIX® to replace some of the old SNA infrastructure components, such as the IBM 3745/46 or other channel-attached SNA controllers. z/OS Communications Server can replace some SNA Network Interconnect (SNI) workloads using Enterprise Extender and Extended Border Node functions.
It is IBM's intent to introduce an additional solution in 2005 that uses NCP (Network Control Program) software running within Linux on zSeries. The intent is to provide a migration path for customers who use traditional SNA (including SNA Network Interconnect (SNI)) to communicate with their business partners. This solution can allow them to continue using traditional SNA without a dependency on IBM 3745 and 3746 Communications Controller hardware.

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

SNA support options

- **Options for z/OS environments:**
  - Communications Server for z/OS
    - Help reduce dependency on 3745/46 with Enterprise Extender EBN support for B2B SNA communications

- **Options for Linux environments**
  - Communications Server for Linux on zSeries
    - New options for environments with outboard SNA/IP integration points
    - For selected SNA workloads

Statement of direction*

- **Communication Controller for Linux on zSeries (planned availability 2005)**
  - Selected NCP (Network Control Program) Software functions running within Linux on zSeries are planned
  - Can allow customers to continue using traditional SNA without a dependency on IBM 3745 and 3746 Communications Controller hardware.

Diagram labels: z/OS SNA applications; Statement of Direction*; z/OS Communications Server; Communication Controller for Linux on zSeries (select functions); Communications Server for Linux on zSeries (select functions); OSA-E; OSA-E; OSA-E; 3745/46 NCP; IP-based wide area Network; SNA Network; IP-based wide area Network

* All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

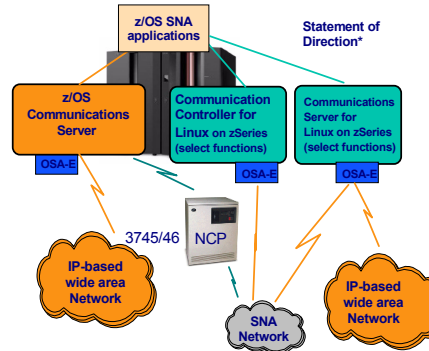GA4/2_430 zSTSU October 2004 © 2004 IBM Corporation ON DEMAND BUSINESS

Statements of Direction for z990 and z890

- **October 2004: OSA-Express Token Ring not to be offered**: The zSeries 890 and 990 are expected to be the last zSeries servers to offer a Token Ring feature. It is intended that the OSA-Express Token Ring feature will not be available for ordering on a new build or upgraded server, or for carrying forward on an upgrade.
  A migration from a Token Ring to an Ethernet environment should be a part of all strategic LAN planning.

- **April 2004: Token Ring on HMC, SE, TKE workstation, IBM 2074:** The z890 and z990 will be the last zSeries servers to offer Token Ring adapter features on the Hardware Management Consoles (HMCs), Support Element (SEs), and Trusted Key Entry (TKE) workstations. The IBM 2074 Model 3 Console Support Controller will be the last controller to offer Token Ring adapter features.
  IBM zSeries is making these statements to allow enterprises sufficient opportunity to prepare for a migration to Ethernet environments.

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

GA4/2_440 zSTSU October 2004 © 2004 IBM Corporation ON DEMAND BUSINESS

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Statements of Direction for z990 and z890

- **April 2004: Hardware Management Consoles (HMCs):** Beginning with the next zSeries server, after the IBM zSeries 890 and 990, all new HMCs on all currently marketed zSeries servers are intended to become closed platforms. They will support only the HMC application and not the installation of other applications such as the IBM ESCON Director and the IBM Sysplex Timer console applications.

  When available, the next-generation HMC is expected to communicate only with G5 Servers, and above (Multiprise 3000, G5/G6, z800, z900, z890, z990). TCP/IP is intended to be the only communications protocol supported.

- **April 2004: ISC-3s in compatibility mode:** IBM intends z890 and z990 to be the last family of zSeries servers to support:
  - ▸ Attachment of ISC-3 links to HiPerLinks (ISC-2) on G5/G6 servers
  - ▸ Compatibility mode (CHPID types CFS and CFR) definitions for ISC-3 links

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Statements of Direction for z990 and z890

- **April 2004: Greater than 24 CPs:** IBM intends to support greater than 24 CPs, or combined CPs and zAAPs, in a single LPAR in the future on the appropriate releases of z/OS and z/VM in combination with designated zSeries servers.

- **April 2004: Greater than 30 LPARs:** On May 13, 2003, IBM made the following statements of direction regarding the z990 and z/OS:
  - ▸ IBM intends to support up to 60 LPARs on the z990.
  - ▸ IBM intends to provide support for up to 60 LPARs running z/OS on a single z990 effective with z/OS V1.6.
  - ▸ IBM intends for z/VM V4.4 or later to provide support for up to 60 Logical Partitions (LPARs) with corresponding support on a z990 or future server.

  Based on additional evaluation of requirements, IBM now intends to support greater than 30 LPARs on a future zSeries server.

  This new SOD represents a modification to IBM's previously expressed direction "...to support up to 60 LPARs on z990..." which no longer represents IBM's intent.

  When support for greater than 30 LPARs is made available on a future zSeries server, it is IBM's intention to have support included in z/OS 1.6 and later, and z/VM 4.4 and later.

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Statements of Direction satisfied in GA2/4

- **May 2003: Smart Card Reader support by TKE Workstation**
  - ▶ October 2004 TKE 4.2 Workstation

- **April 2004: OSA-Express Layer 2 support**
  - ▶ Planned December 2004 – OSA-Express and z/VM 5.1
  - ▶ Planned January 2005 – OSA-Express2 and z/VM 5.1
  - ▶ Open Source code delivery for Linux on zSeries
    - – Planned October 2004 for kernel 2.4
    - – Planned early 2005 for kernel 2.6

Backup Charts

z990: z/OS and OS/390 Cryptographic Support

- **Cryptographic Support Web deliverables (downloads)**
  www.**ibm.com**/servers/eserver/zseries/zos/downloads
    - ▸ **"z990 Cryptographic Support"** – GA2 (No longer available)
    - ▸ **"z990 and z890 Enhancements to Cryptographic Support"** – GA3 (May 28, 2004)
    - ▸ "**ICSF 64-bit Virtual Support for z/OS V1R6 and z/OS.e V1R6** – Planned December 17, 2004
- **Function**
    - ▸ Designed to enable both clear key and secure key cryptography
    - ▸ Unpriced Web deliverable allows a z990 server to support CP Assist for Cryptographic Function, PCICA, PCIXCC and Crypto Express2 hardware cryptography features
    - ▸ Supports:
        - – z/OS 1.3 or z/OS.e 1.3 (z890 only) and later and, formerly, OS/390 2.10 and z/OS 1.2
        - – TKE 4.2 LIC (FC0853) – Supports smart card reader (**z890/990 GA2/4 – October 2004**)
        - – TKE 4.1 LIC (FC0852) – Supports operational key entry (**z990 GA3 – May 2004**)
        - – TKE 4.0 LIC (FC0851) – Carry forward from z900
    - ▸ Reference "ICSF Systems Programmer's Guide", SA22-7520-06 or later
      www.ibm.com/**servers/eserver/zseries/zos/bkserv/r4pdf/crypto.html**
    - ▸ z/OS 1.4 level publications support all earlier releases

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Key References for IBM eServer z990 and z890

- **z990 Website:** www.**ibm.com**/servers/eserver/zseries/z990/
  z890 Website: www.**ibm.com**/servers/eserver/zseries/z890/

- **z890 and z/OS and z990 and z/OS Reference Guides:**
  www.**ibm.com**/servers/eserver/zseries/library/refguides/pdf/gm130229.pdf
  www.**ibm.com**/servers/eserver/zseries/library/refguides/pdf/gm130522.pdf

- **z890 and z990 Specification Sheets:**
  www.**ibm.com**/servers/eserver/zseries/library/specsheets/pdf/gm130230.pdf
  www.**ibm.com**/servers/eserver/zseries/library/specsheets/pdf/gm130512.pdf

- **z890 and z990 FAQs:**
  www.**ibm.com**/servers/eserver/zseries/faq/pdf/z990_faq.pdf
  www.**ibm.com**/servers/eserver/zseries/faq/pdf/z890_faq.pdf

- **Resource Link™:** www.**ibm.com**/servers/resourcelink
    - ▸ zSeries Web site for no-additional-charge hardware support
    - ▸ Access to the zSeries library and other information required for migration

- **IBM Redbooks:** www.redbooks.**ibm.com**
  (Search Redbooks Keyword = z990 or z890)

Additional z990 cryptographic support documents

- TechDocs site: www.**ibm.com**/support/techdocs
  Search terms: **z990 AND cryptographic**

WP100345	Secure Key or Clear Key: Application Migration & Crypto Hardware on z990
PRS698	Crypto for VTAM® and TCP/IP Applications on the z990 Platform
FLASH10234	Can You Use Crypto for VTAM and TCP/IP Applications on the z990 Platform?
TD101100	zSeries 990 Hardware Cryptography Considerations
WP100245	Understanding the Crypto Hardware Available for zSeries and S/390
FLASH10236	z/OS & OS/390 Software Requirements for the z990

- Redbooks site: www.redbooks.**ibm.com**
  Search terms: **z990 AND cryptographic**

SG24-7070	IBM zSeries 990 (z990) Cryptography Implementation	NEW!

Operating System Support Summary for z990

Operating Systems	ESA/390 (31-bit)	z/Architecture™ (64-bit)	Compatibility	Exploitation
OS/390 Version 2 Release 10 (No longer supported)	Yes	Yes	Yes³	No
z/OS Version 1 Release 2 (Support ends 10/04)	No¹	Yes	Yes³	No
z/OS Version 1 Release 3 (Support ends 03/05)	No¹	Yes	Yes³	No
z/OS Version 1 Release 4 Feature required for exploitation	No¹	Yes	Yes³	Yes³
z/OS Version 1 Release 5	No	Yes	Included³	Included³
z/OS Version 1 Release 6	No	Yes	Included³	Included³
Linux for S/390	Yes	No	Yes	Yes
Linux for zSeries	No	Yes	Yes	Yes
z/VM Version 3 Release 1 (Support ends 12/05)	Yes	Yes	Yes	No
z/VM Version 4 Release 3 (Support ends 05/05)	Yes	Yes	Yes	No
z/VM Version 4 Release 4	Yes	Yes	Included	Included
z/VM Version 5 Release 1	No	Yes	Included	Included
VSE/ESA Version 2 Release 6, 7	Yes	No	Yes	No²
z/VSE*⁴ 3.1 (Planned availability 2005)	Yes	No	Yes	Yes
TPF Version 4 Release 1 (ESA mode only)	Yes	No	Yes	No

1 - ESA/390 31-bit mode permitted for migration and disaster recovery purposes only
2 - VSE 2.7 exploits Thin Interrupts with 4Q04 SPE
3 - Web Deliverable for Secure Crypto
4 - z/VSE can execute in 31-bit mode only. It does not implement z/Architecture, and specifically does not implement 64-bit mode capabilities.
    z/VSE is designed to exploit select features of IBM zSeries hardware.

z/OS Support

		G3-G4	G5/G6 MP3000	z800 z900	z890 z990	End of Service	Coexistence Migration Policy	Ship Date
OS/390	2.8	x	x	x		09/02	1.2	09/99
	2.9	x	x	x		09/03	1.3	03/00
	2.10	x	x	x	x^c	09/04	1.4	09/00
z/OS	1.1		x	x		03/04	1.4	03/01
	1.2		x	x	x^c	10/04	1.5	10/01
	1.3		x	x	x^c	03/05	1.6	03/02
	1.4		x	x	x	03/07	1.7*	09/02
	1.5		x	x	x	03/07*	1.8*	03/04
	1.6			x	x	09/07*	1.8*	09/04

Only z/OS 1.6 is orderable. The z/OS 1.4 exploitation feature remains orderable until 12/2006*.

x^c - Compatibility support – does not exploit new z990 features. **Web download available only until 12/31/2004*.**
Bimodal Accommodation Offering is available for z/OS 1.2, 1.3, and 1.4. It is not available for later releases.
* - Planned date or release

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z/VM and VSE/ESA Support Summary Dates

		G3-G4	G5/G6 MP3000	z800	z890	z900	z990	End of Mkt	End of Service	Ship Date
VSE/ESA	2.5	x	x	x		x	x^c	12/01	12/03	09/00
	2.6*	x	x	x	x^c	x	x^c	****		12/01
	2.7*		x	x	x	x	x			03/03
z/VSE***	3.1		x	x	x	x	x			2005**
z/VM	3.1	x	x	x	x^c	x	x^c	8/04	12/05**	02/01
	4.1		x	x		x	x^c	10/01	06/03	07/01
	4.2		x	x		x	x^c	5/02	12/03	10/01
	4.3		x	x	x^c	x	x^c	8/03	05/05**	05/02
	4.4*		x	x	x	x	x		09/06**	08/03
	5.1*			x	x	x	x		09/07**	09/04

x^c - Compatibility support
* Releases currently orderable
** Announced date

*** z/VSE 3.1 is designed to exploit some features of IBM zSeries processors but does not implement z/Architecture and does not implement 64-bit mode capabilities.
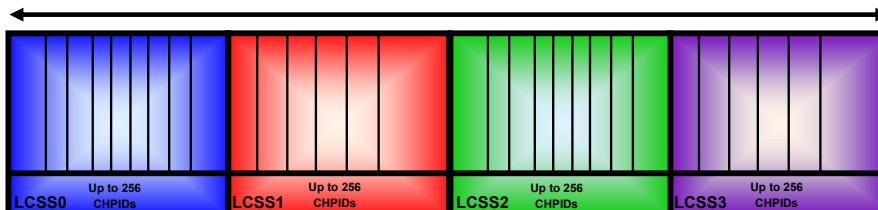**** VSE/ESA 2.6 can be ordered only as a "Service Option" with VSE/ESA 2.7.

Key References for z990 Operating Systems

- **Primary Operating System Web sites for z990 and z890**
  - ▸ z/OS: www.**ibm.com**/servers/eserver/zseries/zos/
    - – Downloads: www.**ibm.com**/servers/eserver/zseries/zos/downloads/
    - – Migration:
      www.**ibm.com**/servers/eserver/zseries/zos/bkserv/zos_migration_manuals.html
    - – Library: www.**ibm.com**/servers/eserver/zseries/zos/bkserv/
  - ▸ z/VM: www.vm.**ibm.com**/
  - ▸ Linux on zSeries: www.**ibm.com**/servers/eserver/zseries/os/linux/
  - ▸ VSE/ESA: www.**ibm.com**/servers/eserver/zseries/os/vse/
- **OS Preventative Service Planning (PSP) Buckets for z990 and z890**
  - ▸ z/OS: Upgrade = 2084DEVICE, Subset = 2084/ZOS
    Upgrade = 2086DEVICE, Subset = 2086/ZOS
  - ▸ z/VM: Upgrade = 2084DEVICE, Subset = 2084Z/VM
    Upgrade = 2086DEVICE, Subset = 2086Z/VM
  - ▸ VSE/ESA: Upgrade = 2084DEVICE, Subset = 2084VSE/ESA
    Upgrade = 2086DEVICE, Subset = 2086VSE/ESA

Linux Compatibility and Exploitation for z990

- **Linux on zSeries distributions provide Compatibility *and* Exploitation Support**

- **Available through**
  - ▸ Red Hat Enterprise Linux AS*
    - – http://www.redhat.com/apps/commerce/rhel/as/#ibmz390
  - ▸ SUSE LINUX Enterprise Server 8 or 9*
    - – http://www.suse.com/us/business/products/server/sles/index.html
  - ▸ Turbolinux Enterprise Server 8*
    - – http://www.turbolinux.com
  - ▸ Conectiva CLEE
    - – http://www.conectiva.com.br

LCSS0 Up to 256 CHPIDs	LCSS1 Up to 256 CHPIDs	LCSS2 Up to 256 CHPIDs	LCSS3 Up to 256 CHPIDs

(*) support of more than one LCSS (each Linux instance can use channels in only one LCSS, but can run in an LCSS greater then 0) and can run an LPAR with an ID greater than 0F.

z990 GA4 I/O Feature Summary

Maximum of 1024 CHPIDs, three I/O cages, 28 I/O slots per I/O cage, total of 84 I/O slots

z990 Feature	Per Server Minimum Features	Per Server Maximum I/O Slots used by Features	Per Server Maximum Connections	Ports/channels/ Increments per Feature	Purchase Increments
16-port ESCON	0 (1)	69 (2)	1024 channels (2)	16 channels (3)	4 channels
FICON Express	0 (1)	60 (2) (4)	120 channels	2 channels	1 feature
STI-2 (5) ICB-2 link	0 / 0 (1)	4 / N/A	N/A / 8 links (6)	2 outputs / N/A	N/A / 1 link
STI-3 (5) ICB-3 link	0 / 0 (1)	8 / N/A	N/A / 16 links (6)	2 outputs / N/A	N/A / 1 link
ICB-4 link	0 (1)	N/A (7)	16 links (6)	N/A	1 link
ISC-3	0 (1)	12	48 links (6) (8)	4 links	1 link
OSA-Express2 GbE, 10 GbE	0	24 (4) (9)	48 ports	2 or 1 (10 GbE has 1)	1 feature
OSA-Express *	0	24 (4) (9)	48 ports	2 ports	1 feature
Crypto Express2	0	8 (4) (10)	16 coprocessors	2 coprocessors	1 feature (12)
PCICA **	0	6 (4) (10) (11)	12 accelerator cards	2 accelerators	1 feature
PCIXCC **	0	4 (4) (10)	4 coprocessors	1 coprocessor	1 feature (12)

Notes:
1) A minimum of one I/O feature (ESCON, FICON Express) or one Coupling Link (ICB, ISC-3) is required.
2) Maximum of 48 ESCON features (720 active channels) on Model A08, 48 FICON Express features on A08
3) Each ESCON feature has 16 channels of which 15 channels may be activated. One channel is always reserved as a spare.
4) The maximum quantity of FICON Express, OSA-Express2, OSA-Express, Crypto Express2, PCICA, and PCIXCC features in combination cannot exceed 20 features per I/O cage and 60 features per server.
5) The STI distribution cards, which support ICB-2 and ICB-3, reside in the I/O cage. Each STI distribution card occupies one I/O slot.
6) The maximum number of Coupling Links combined (ICs, ICB-2s, ICB-3s, ICB-4s, and active ISC-3 links) cannot exceed 64 per server.
7) ICB-4s do not require connectivity to a card in the I/O cage. ICB-4s are not included in the maximum feature count for I/O slots.
8) A maximum of 32 ISC-3s can be defined in compatibility mode (operating at 1 Gbps, instead of 2 Gbps).
9) The maximum quantity of OSA-Express2 and OSA-Express features cannot exceed 24 features per server.
10) The maximum quantity of Crypto Express2, PCICA, and PCIXCC features cannot exceed eight features per server.
11) The maximum quantity of PCICA features cannot exceed two features per I/O cage.
12) Crypto Express2 and/or PCIXCC feature minimum is 0 or 2.

* When OSA-Express2 GbE becomes available the OSA-Express GbE features are no longer orderable.
** No longer orderable when Crypto Express 2 features become available.

No cable features orderable on z990 or z890 except ICB cables

- Cable planning, ordering, labeling, and installation are all customer responsibilities for new z990 or z890 installations and MES upgrades.

- Fiber-optic conversion kits and Mode Conditioning Patch (MCP) cables are not orderable as z990 or z890 product feature codes.

- Service Representatives installing z990 or z890 will plug prepared cables into the CEC but will not perform other tasks to plan, order, label and install cables without a Services contract.

- To serve the cabling needs of z990 and z890 customers, IBM Global Services has enhanced their fiber-optic cabling services.
  - There are now five cabling service options available for customers.
  - Reference: Resource Link under "Services":
    www.ibm.com/servers/resourcelink/

- **Recommendation: Develop a plan for cables early and use IGS services**

z990 Features: Connectors / Cables

Feature Code	Feature Name	Connector Type	Cable Type
0219	ISC-3 link	LC Duplex	9 micron SM
6154	External Time Reference (ETR)	MTRJ	62.5 micron MM
2324	ESCON channel	MTRJ	62.5 micron MM
2319	FICON Express LX	LC Duplex	9 micron SM
2320	FICON Express SX	LC Duplex	50, 62.5 micron MM
2364	OSA-Express GbE LX	SC Duplex	9 micron SM
2365	OSA-Express GbE SX	SC Duplex	50, 62.5 micron MM
2366	OSA-Express Fast Ethernet	RJ-45	Category 5 UTP
2367	OSA-Express Token Ring	RJ-45	STP or UTP
1364	OSA-Express GbE LX	LC Duplex	9 micron SM
1365	OSA-Express GbE SX	LC Duplex	50, 62.5 micron MM
1366	OSA-Express 1000BASE-T Ethernet	RJ-45	Category 5 UTP
3364	OSA-Express2 GbE LX	LC Duplex	9 micron SM
3365	OSA-Express2 GbE SX	LC Duplex	50, 62.5 micron MM
3368	OSA-Express2 10 GbE LR	SC Dupldex	9 micron SM

SM = Single mode fiber, MM = Multimode fiber, LX = Long wavelength transceiver,
SX = Short wavelength transceiver, UTP = Unshielded Twisted Pair,
STP - Shielded Twisted Pair, LR = Long Reach transceiver

End of Presentation