



IBM Introduces the IBM @server zSeries 990 Family of Servers

Overview

The IBM @server zSeries™ 990 represents a unique generation of scalable servers utilizing z/Architecture™. New building blocks are being introduced to extend the key platform characteristics (reliability, availability, scalability, clustering, quality of service) and respond with flexibility to the ever-changing business climate.

IBM delivers a new design to allow your businesses to be resilient in the unpredictable on demand world. With a range of four models, the newest members of the zSeries family deliver enriched functions — almost three times the processing power, four times the memory, and double the I/O capacity. Each model adds to the system's total resources. zSeries 990 supports double the number of Logical Partitions (LPARs), and introduces Logical Channel SubSystems (LCSS's) to facilitate horizontal growth.

To address the growing complexity of fiber optic connectivity in the Information Technology (IT) infrastructure, IBM Networking Services is introducing scalable fiber optic cabling services to help satisfy e-business infrastructure requirements at both the product level and the enterprise level.

Key Prerequisites

Refer to the **Software Requirements** section of this announcement.

Planned Availability Dates

- Models A08 and B16:
June 16, 2003
- The following features are planned to be available on September 15, 2003:
 - On/Off Capacity on Demand (CoD) Active CP (#9897)

- Customer Initiated Upgrade (CIU) Activation (#9899)
- Models C24 and D32:
October 31, 2003
- The following features and functions are planned to be available on October 31, 2003:
 - PCIX Cryptographic Coprocessor (PCIXCC) feature (#0868)
 - TKE 4.0 Code (#0851)
 - TKE Workstation with Token Ring (#0886)
 - TKE Workstation with Ethernet (#0889)
 - FCP for attachment to SCSI Devices in Linux environments
 - HiperSockets Layer 2 Switch Support in Linux environments
 - Spanning Internal Coupling channels and HiperSockets
 - Support for 30 LPARs
 - Concurrent Model Upgrade
 - Dynamic I/O Support for LCSS1
- Software Support for Exploitation of New Hardware Function is planned to be available as follows:
 - z/VM™ compatibility support for V3.1, V4.2, and V4.3 with limited exploitation of two LCSS's: May 13, 2003
 - z/VM 4.4 support for two LCSS's: August 15, 2003
 - z/VM support for 30 LPARs, Dynamic I/O for LCSS0 and LCSS1, and Internal Spanned Channels: October 31, 2003
 - z/OS™ support for two LCSS's, PCIXCC, and 30 LPARs: October 31, 2003
 - VSE/ESA™ support for two LCSS's and 30 LPARs: October 31, 2003

At a Glance

The new z990:

- Provides increased scalability — Almost three times the capacity of a z900
- Breaks the barrier — Doubling the number of supported Channel Path Identifiers (CHPIDs)
- Takes a giant step — Doubling the number of LPARs
- Quadruples the number of HiperSockets — Internal LANs
- Offers performance assists for Linux and z/VM
- Introduces OSA-Express enhancements
- Increases channel maximums for ESCON®, FICON™ Express, and OSA-Express
- Announces enhancements to fiber optic cabling services from IBM Networking Services
- Extends IBM's industry-leading SSL performance to greater than 11,000 SSL handshakes per second

For ordering, contact:

Your IBM representative, an IBM Business Partner, or the Americas Call Centers at

800-IBM-CALL

Reference: YE001

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Description

A z990 Technology Overview

z990 — The Platform Right-Sized for Server Consolidation: The design of z990 represents a major change for the zSeries platform. zSeries 990 introduces a new superscalar microprocessor architecture exploiting the CMOS9S-SOI technology and improving uniprocessor performance. A significant capacity increase has been achieved with the introduction of:

- Up to 256 gigabytes of memory
- Up to 96 gigabytes of bandwidth for data communication via up to 48 Self-Timed Interconnect (STI) host buses
- A new Channel SubSystem (CSS) — two Logical Channel SubSystems (LCSS's) can exist for horizontal growth, supporting up to 256 channels per LCSS for a total of 512 channels per system
- Double the number of Logical Partitions (LPARs) — now 30 LPARs
- Increased channel maximums for ESCON, FICON Express, and OSA-Express
- Quadruple the number of HiperSockets — now 16 internal LANs
- Three cryptographic options:
 - New CP Assist for Cryptographic Function (CPACF) on every Processor Unit (PU)
 - New PCI Cryptographic Coprocessor (PCIXCC) feature
 - PCI Cryptographic Accelerator (PCICA) feature
- Integrated Cluster Bus-4 (ICB-4), more than two times faster than an ICB-3
- Coupling Facility Control Code (CFCC) Level 12 supporting:
 - 64-bit addressing for larger structure sizes
 - Up to 48 internal tasks
 - Message Time Ordering
 - System-Managed Coupling Facility Structure Duplexing
- Up to 32 Processor Units (PUs)
 - Four models — each model indicates the maximum number of PUs available for purchase (Models A08, B16, C24, D32)
 - Each PU can be individually purchased

A Processor Unit is the generic term for the z/Architecture processor on the MultiChip Module (MCM) that can be characterized as a:

- Central Processor (CP) to be used by the operating system
- Integrated Coupling Facility (ICF) to be used by the Coupling Facility Control Code (CFCC)
- Integrated Facility for Linux (IFL)
- Additional System Assist Processor (SAP) to be used by the Channel SubSystem (CSS)

With the introduction of z990 and the four-model structure, only one CP, ICF, or IFL must be purchased and activated for any model. PUs can be purchased in single PU increments and are orderable by feature number.

Refer to the **Customer Initiated Capacity** section of this announcement for information on permanent and temporary capacity.

Server Consolidation Facilitated: With the expanded capacity of z990, and its new Channel SubSystem, there is a significant increase in system scalability, facilitating consolidation of multiple servers into one z990.

With z/OS V1.4 z990 Exploitation Support, you will be able to install more operating system images and up to a total of 512 channels (up to 256 channel maximum per operating system) allowing each z990 to access more I/O and networking channels — ESCON (up to 512 channels), FICON Express (up to 120 channels), and OSA-Express (up to 48 ports).

Models	PUs	Memory	SAPs	Spares	STIs	I/O Cages	Maximum CHPIDs
A08	1 to 8	8 to 64 GB	2	2	12	1 to 3	512
B16	1 to 16	8 to 128 GB	4	4	24	1 to 3	512
C24	1 to 24	8 to 192 GB	6	6	36	1 to 3	512
D32	1 to 32	8 to 256 GB	8	8	48	1 to 3	512

Note: There are 256 CHPIDs per LCSS.

The Performance Advantage

Performance Estimates with z/OS V1.4: IBM's Large Systems Performance Reference method provides comprehensive z/Architecture processor capacity data for different configurations of Central Processing Units across a wide variety of system control program and workload environments. For zSeries z990, z/Architecture processor capacity is defined with a 3XX notation, where XX is the number of installed Central Processing Units.

Compared to the z900, z990 is designed to offer the following z/Architecture Central Processing Unit performance advantage:

Expected performance relative to the 2064 z900 216:

2084-D32:

332: 2.46 — 2.98 times
331: 2.40 — 2.89 times
330: 2.35 — 2.80 times
329: 2.29 — 2.71 times
328: 2.23 — 2.62 times
327: 2.17 — 2.53 times
326: 2.11 — 2.44 times
325: 2.05 — 2.35 times

2084-C24, 2084-D32:

324: 2.00 — 2.26 times
323: 1.94 — 2.17 times
322: 1.88 — 2.08 times
321: 1.82 — 1.99 times
320: 1.76 — 1.90 times
319: 1.71 — 1.82 times
318: 1.65 — 1.73 times
317: 1.59 — 1.64 times

Relative to the corresponding 2064 z900 models, the expected performance of the following z990 configurations is:

2084-B16, 2084-C24, 2084-D32:

316: 1.51 to 1.55 times 2064-216
315: 1.52 to 1.55 times 2064-215
314: 1.52 to 1.55 times 2064-214
313: 1.52 to 1.55 times 2064-213
312: 1.52 to 1.55 times 2064-212
311: 1.52 to 1.56 times 2064-211
310: 1.52 to 1.56 times 2064-210
309: 1.52 to 1.56 times 2064-2C9

2084-A08, 2084-B16, 2084-C24, 2084-D32:

308: 1.52 to 1.56 times 2064-2C8
307: 1.52 to 1.57 times 2064-2C7
306: 1.52 to 1.57 times 2064-2C6
305: 1.53 to 1.57 times 2064-2C5
304: 1.53 to 1.58 times 2064-2C4
303: 1.53 to 1.58 times 2064-2C3
302: 1.54 to 1.59 times 2064-2C2
301: 1.54 to 1.61 times 2064-2C1

The above performance estimates are Internal Throughput Rate Ratios (ITRR) based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here. For more detailed performance information, consult the Large Systems Performance Reference (LSPR). Customers interested in LSPR should contact their IBM representative.

Performance Assists for Linux and z/VM

z990 Adapter Interruptions for Linux and z/VM

Reducing Host Programming and Adapter Overhead for FCP and OSD CHPID Types: The new z990, Linux for zSeries, and z/VM V4.4 are working together to provide performance improvements by exploiting extensions to the Queued Direct Input/Output (QDIO) architecture. **Adapter interruptions**, first added to z/Architecture with HiperSockets, is designed to provide an efficient, high-performance technique for I/O interruptions to reduce path lengths and overhead in both the host operating system and the adapter — FICON Express when using the FCP CHPID type, and OSA-Express when using the OSD CHPID type.

In extending the use of adapter interruptions to FCP and OSD (QDIO) channels, the programming overhead to process a traditional I/O interruption is reduced. This benefits OSA-Express TCP/IP support in both Linux for zSeries and z/VM, and FCP support in Linux for zSeries.

Adapter interruptions apply to a z990 FICON Express channel when in FCP mode (FCP CHPID type), which supports attachment of SCSI devices in a Linux for zSeries environment. Adapter interruptions apply to all of the OSA-Express features available on z990, whether offered as a new build or on an upgrade from z900 when in QDIO mode (OSD CHPID type). This support is exclusive to z990.

Note: HiperSockets supported adapter interruptions at introduction.

For Linux for zSeries support, refer to the following Web site for further information:

<http://www10.software.ibm.com/developerworks/opensource/linux390>

This support is available in z/VM V4.4. Refer to Software Announcement 203-128, dated May 13, 2003.

Refer also to the following Web site:

<http://www.ibm.com/zseries/zvm/>

The Queued Direct Input/Output (QDIO) architecture is utilized by:

- FICON Express when configured to support SCSI devices using the Fibre Channel Protocol (FCP CHPID type) in a Linux for zSeries environment
- HiperSockets (IQD CHPID type) for IP communication between LPARs, between an LPAR and a VM guest, or between VM guests
- All of the OSA-Express features in QDIO mode (OSD CHPID type)

QDIO continues to be the preferred architecture for high-speed communication, reducing host interruptions and improving response times.

z990 Performance Assist for V=V Guests in the z/VM Environment

Passthrough of Adapter Interruptions for FCP, IQD, and OSD CHPID Types: z990's support of virtual machine technology has been enhanced to include a new performance assist for virtualization of **adapter interruptions**. This new z990 performance assist is available to V=V guests (pageable guests) that support QDIO on z/VM V4.4. The deployment of adapter

interruptions improves efficiency and performance by reducing overhead.

The **z990 performance assist for V=V guests** is a passthrough architecture that reduces host programming overhead by avoiding the need to stop guest processing when adapter interruptions are presented. Without the assist, the z/VM control program must intercede to process and route the adapter interruptions.

The z990 performance assist improves Linux for zSeries performance under z/VM by allowing guest I/O — FICON (FCP CHPID type), HiperSockets (IQD CHPID type), and OSA-Express (OSD CHPID type) — to be handled with minimal z/VM overhead through direct presentation of adapter interruptions by the server to a pageable guest, boosting I/O performance.

This support is available in z/VM V4.4. Refer to Software Announcement 203-128, dated May 13, 2003.

Refer also to the following Web site:

<http://www.ibm.com/zseries/zvm/>

Breaking the Barrier — A New Channel SubSystem

Breaking the Barrier of 256 Channels: With the introduction of a new system structure and all of its scalability benefits, it is essential that the Channel SubSystem (CSS) also be scalable and permit “horizontal” growth. This is facilitated by allowing more than one Logical Channel SubSystem (LCSS) on a single z990. Consistent with this premise, IBM is introducing increased connectivity by offering the following channel/port maximums. For reference, the new maximums are contrasted with the z900 maximums.

Channel Type	z990 Maximum	z900 Maximum
ESCON	512	256
FICON Express	120	96
OSA-Express	48	24

The maximums for all other features remain the same as with z900.

The new Channel SubSystem structure offers the following:

- Two LCSS’s.
 - Each LCSS can have up to 256 channels defined.
 - Each LCSS can be configured with one to 15 Logical Partitions (LPARs).
 - Cannot exceed 30 LPARs per system.
- Spanned channels which can be shared among LPARs across LCSS’s. The following may be spanned:
 - Internal Coupling Channels (ICP CHPID type) for Parallel Sysplex®.
 - HiperSockets (IQD CHPID type).

Note: There is no change to the operating system maximums. One operating system image continues to support up to a maximum of 256 Channel Path Identifiers (CHPIDs).

Support for dynamic I/O configuration, with z/OS V1.4 z990 Exploitation Support and z/VM V4.4, will be extended to allow channel paths, control units, and devices to be dynamically added, changed, and deleted in multiple LCSS’s. However, dynamic I/O configuration is only supported in LCSS0 until October 2003.

Until z/OS V1.4 z990 Exploitation Support is available, z/OS can run only in a single LCSS. Therefore, z/OS may only execute in LCSS0. z/VM V4.4 may execute in LCSS0 and LCSS1. Refer to the **Software Requirements** section for more information on availability dates.

When z/VM is the controlling LPAR, z/VM’s dynamic I/O support is designed to handle all of the new elements of the multiple Channel SubSystem facility for dynamic I/O configuration changes. To dynamically change the I/O configuration one of two techniques can be employed:

- z/VM Control Program (CP) suite of interactive dynamic I/O commands
- HCM/HCD — New configuration management tools

The I/O SubSystem (IOSS) continues to be viewed as a single Input/Output Configuration Data Set (IOCD) across the entire system with up to two LCSS’s. Only one Hardware System Area (HSA) is used.

In the past, a two-digit identifier, a CHPID, was associated with a physical I/O connection. Now a three-digit Physical Channel Identifier (PCHID) is being introduced to accommodate the mapping of 512 channels to two LCSS’s with up to 256 CHPIDs each. CHPIDs continue to exist and will be associated with PCHIDs.

As a result of the introduction of PCHIDs, a new CHPID Mapping Tool (CMT) is being introduced and the CHPID report from the IBM Configurator For e-business (eConfig) is replaced by a PCHID report. CMT is available from Resource Link™ as a standalone PC-based program.

<http://www.ibm.com/servers/resourceLink>

Refer to z990 documentation for additional information on the new mapping tool, CHPIDs, and PCHIDs.

Spanned Channels

Transparent Sharing of ICs and HiperSockets: With the introduction of the new Channel SubSystem, transparent sharing of Internal Coupling Channels (ICs) and HiperSockets is possible. The Multiple Image Facility (MIF) allows sharing of channel resources across LPARs. ICs and HiperSockets can be configured as MIF **spanning channels**. Spanning channels is the ability for Internal Coupling Channels and HiperSockets channels to be configured to multiple Channel SubSystems, and be transparently shared by any or all of the configured LPARs without regard to the Logical Channel SubSystem to which the LPAR is configured. This support is applicable to Internal Coupling Channels (ICP CHPID type) for Parallel Sysplex and to HiperSockets (IQD CHPID type).

IC spanned channels has no prerequisite software requirements. HiperSockets spanned channels is supported in z/OS V1.2, z/OS V1.3, and z/OS V1.4 with PTFs. HiperSockets spanned channels is supported in z/VM V3.1, z/VM V4.2, z/VM V4.3, and z/VM 4.4. Refer to the **Software Requirements** section of this announcement for more information.

Another Breakthrough — More Subchannels for Increased Connectivity: With two Logical Channel SubSystems come more subchannels. There has been a 63k subchannel architectural limitation. Since there was one CSS, there was a maximum of 63k subchannels. With two Logical Channel SubSystems, each LCSS can have its own set of 63k subchannels.

With two Logical Channel SubSystems you can have:

- Up to a maximum of 63k devices/subchannels per LCSS
- Up to a maximum of 126k devices for two LCSS's
 - 2 LCSS's x 63k subchannels for each LCSS

Each LPAR can access the 63k devices in its assigned LCSS.

This capability relieves the I/O device configuration constraints experienced by large system configurations.

A Giant Step — Support for 30 Logical Partitions

Looking back in time, IBM introduced the Processor Resource/Systems Manager™ (PR/SM™) feature in February of 1988. Prior to that time, IBM mainframes could only be physically partitioned. When IBM introduced Logical Partitions (LPARs), a maximum of **four LPARs** was available, offering the flexibility to allocate the hardware resources.

In June of 1992, IBM introduced support for a maximum of **10 LPARs** and announced the Multiple Image Facility (MIF, also known as EMIF), which allowed sharing of ESCON channels across LPARs, and since that time has allowed sharing of all channels across LPARs (such as ISC-3, FICON Express, and OSA-Express).

In June of 1997, IBM announced increased support — up to **15 LPARs**.

The evolution continues with a giant step — **doubling** the number of LPARs supported! IBM is announcing support for **30 LPARs**, 15 LPARs per LCSS. This support is exclusive to z990 and is planned to be available in October 2003.

Customer Initiated Capacity — Technology On Demand

Customer Initiated Upgrade Enhancement: When your business needs additional capacity quickly, Customer Initiated Upgrade (CIU) with the Express option is here to deliver it.

CIU is designed to allow you to respond to sudden increased capacity requirements by downloading and applying an IBM @server zSeries Processor Unit (PU) and/or memory upgrade via the Web, using IBM Resource Link and the Remote Support Facility. IBM now has a faster process for upgrading your server. With the Express option on CIU, an upgrade may be installed within a few hours after order submission.

Permanent Upgrades

Orders (MES's) of Processor Units (PUs) and memory for IBM @server zSeries systems that can be delivered by Licensed Internal Code, Control Code (LIC CC) are eligible for CIU delivery. This includes the upgrade of PUs for z800, z900, and z990 as well as memory for z900 and z990 systems up to the maximum available on the installed system.

Temporary Capacity

IBM eServer™ On/Off Capacity on Demand: When your business needs short-term additional capacity, On/Off Capacity on Demand (On/Off CoD) is designed to deliver it. On/Off CoD is designed to temporarily turn on as Central Processors (CPs), previously uncharacterized PUs, unassigned CPs, and unassigned Integrated Facilities for Linux (IFLs) that are available within the current model. This capability cannot coexist with Capacity Backup Upgrade (CBU). On/Off CoD is delivered

through the function of CIU. To participate in this offering, you must have installed CIU Enablement (#9898) and On/Off CoD Enablement (#9896). Subsequently, you may concurrently install temporary capacity by ordering On/Off CoD Active CP (#9897) up to the number of current CPs, and use it for an indeterminate time.

You will be billed on a 24-hour basis. Each month your bill will be calculated for the sum of all orders installed within the prior month. Monitoring will occur through the server Call Home facility and a bill will be generated if the capacity has been enabled for any portion of a calendar month. You will continue to be billed for use of temporary capacity until you return the server to the original state. After concurrently returning to the original state, you may choose to activate a new On/Off CoD upgrade which can be different from the previous upgrade. When you dispose of the server, or decide that you want to disable future temporary upgrades, you are required to remove the enablement feature, On/Off CoD Enablement (#9896).

IBM eServer On/Off Capacity on Demand from IBM Global Financing: Let IBM Global Financing, the world's leading provider of IT financing, assist in your acquisition of IBM leading-edge technology.

Through Total Solution Financing we provide a single source that allows you to consolidate your solution including hardware, software, and services. You have a single contract — an innovative and tailored solution that helps make acquiring your IBM @server fast, easy, and affordable.

Through our Total Usage Financing offering we can provide financing for your on demand needs. Match your investment to your usage with competitive financing for your fixed and variable costs for On/Off Capacity on Demand.

Connectivity Abounds

What's New with HiperSockets?: HiperSockets, first introduced in October 2001, employs the Queued Direct Input/Output (QDIO) architecture for very high speed internal TCP/IP communication (network within the box — an independent internal LAN) between programs running on z/OS, on z/VM, on Linux for zSeries, or as guests under z/VM, whether in the same or in different LPARs on the same system. A synchronous data mover function transfers data at memory access speed with very low latency.

HiperSockets Now Supported by VSE/ESA: In VSE/ESA V2.7, IBM extended the support for HiperSockets to include the VSE/ESA environment. TCP/IP for VSE/ESA V1.5 (a new release) provides support for HiperSockets.

Refer to Software Announcement 203-043, dated February 18, 2003.

HiperSockets VLAN Support in a Linux Environment: Virtual Local Area Networks (VLANs), IEEE standard 802.1q, is now being offered for HiperSockets in a Linux for zSeries environment. VLANs can reduce overhead by allowing networks to be organized for optimum traffic flow; the network is organized by traffic patterns rather than physical location. This enhancement permits traffic to flow on a VLAN connection both over HiperSockets and between HiperSockets and an OSA-Express GbE, 1000BASE-T Ethernet, or Fast Ethernet feature.

In April of 2002, this support was offered on z800 and z900 for the OSA-Express Ethernet features (GbE, Fast Ethernet) in a Linux for zSeries environment.

HiperSockets — Up To 16 Internal LANs and Up To 4096 TCP/IP Stacks: When HiperSockets was introduced, up to four internal Local Area Networks (LANs) could be configured. That number is now being increased to up to 16 internal LANs. In addition, the number of communication queues is being increased to 4096 communication queues instead of the current 1024 communication queues. Since each TCP/IP stack requires one communication queue, this means 4096 TCP/IP stacks are now supported (instead of 1024 TCP/IP stacks). A HiperSockets channel must be spanned in order to communicate between LPARs in different LCSS's.

This support is exclusive to z990. There are no prerequisite software requirements.

HiperSockets Broadcast Support for IPv4 Packets — Linux, z/OS, z/VM: Internet Protocol Version 4 (IPv4) broadcast packets are now supported over HiperSockets internal LANs. TCP/IP applications that support IPv4 broadcast, such as OMROUTE when running Routing Information Protocol Version 1 (RIPv1), can send and receive broadcast packets over HiperSockets interfaces.

This support is exclusive to z990. Broadcast for IPv4 packets is supported by Linux for zSeries. Support is planned to be available in z/OS V1.5. Support is also offered in z/VM V4.4. Refer to Software Announcement 203-131, dated May 13, 2003. Refer to Software Announcement 203-128, dated May 13, 2003.

TCP/IP broadcast support for the OSA-Express features was announced in April 2002, and was made available in the following environments: z/VM V4.3 (May 2002), z/OS V1.4 (September 2002), and Linux for zSeries.

For Linux for zSeries support, refer to the following Web site for further information:

<http://www10.software.ibm.com/developerworks/opensource/linux390>

HiperSockets Spanned Channels: As previously mentioned, HiperSockets (IQD CHPID type) can be configured to multiple Channel SubSystems and transparently shared by any or all configured LPARs without regard to the LCSS to which the LPAR is configured. Refer to the **Planned Availability** and **Software Requirements** sections of this announcement.

HiperSockets — Transparently Bridging Traffic in a Linux Environment: New Linux Layer 2 Switch (Linux L2S) support can simplify network addressing between HiperSockets and OSA-Express. You can now seamlessly integrate HiperSockets-connected operating systems into external networks, without requiring intervening network routing overhead, thus increasing performance and simplifying configuration.

With the new Linux Layer 2 Switch support, you can now configure a special-purpose Linux operating system instance, which can transparently bridge traffic between a HiperSockets internal Local Area Network (LAN) and an external OSA-Express network attachment, similar to a real Layer 2 switch which bridges between different network segments. This support can make the internal HiperSockets network address connection appear as if it were directly connected to the external network.

This Linux L2S support facilitates consolidation of physically dispersed servers using Linux on zSeries, without requiring additional network configuration changes. In addition, the Linux L2S support can increase scalability, allowing a single zSeries system to now host increasing numbers of operating system images and their associated network connectivity by consolidating the

multiple systems, including their HiperSockets IP address space requirements, into a single IP network domain.

The Linux L2S support is performed using the next-hop-IP-address in the Queued Direct Input/Output (QDIO) header, instead of using a Media Access Control (MAC) address. Therefore, Virtual Local Area Networks (VLANs) in a switched Ethernet fabric are not supported by this Linux Layer 2 Switch support. Operating system images using only HiperSockets to communicate among each other with no external network connection see no difference, and the HiperSockets support and the networking characteristics are unchanged.

Refer to the **Planned Availability** and **Software Requirements** sections for Linux for zSeries support.

Doubling ESCON Connectivity to Facilitate Server Consolidation: With the introduction of two Logical Channel SubSystems (LCSS's), it is now possible to define up to a maximum of 512 ESCON channels on your z990, up to a maximum of 35 features. The maximum number of configurable channels is 256 per CSS and per operating system image.

The high-density, 16-port Enterprise Systems CONnection (ESCON) feature can have 15 active ports. One is always reserved as a spare in the event of a failure of one of the other ports. When four ports are ordered, two 16-port ESCON features are installed and two ports are activated on each feature. After the first pair, ESCON features are installed in increments of one. ESCON channels continue to be ordered in increments of four.

Fiber Quick Connect, an Integrated Quick Connect for ESCON Channels: Fiber Quick Connect (FQC), coupled with the IBM Fiber Transport System (FTS) from IBM Network Integration and Deployment Services for enterprise fiber cabling, delivers a solution designed to reduce the amount of time required for on-site installation and setup of cabling, to minimize disruptions, and to isolate the activity away from the active system as much as possible. FQC facilitates adds, moves, and changes of ESCON multimode fiber optic cables in the data center and can reduce fiber connection time by up to 80%.

The Fiber Quick Connect feature, for factory installation of IBM FTS direct-attach fiber harnesses, may be the right answer for your installation, to minimize the number of jumper cables exiting the server and residing under the floor. FQC supports all installed ESCON features in all installed I/O cages.

Cabling is a customer responsibility. Refer to the IBM Networking Services section of this announcement for information on fiber optic cabling available from IBM Global Services. Refer to the *IBM Sales Manual* for more information on Fiber Quick Connect.

Parallel Channels No Longer Supported: Parallel channels features are not supported on z990. They are not offered as a new build option, and are not offered on an upgrade from z900. This satisfies the Statement of General Direction in the Hardware Announcement dated October 3, 2000.

Customers who are still using parallel-attached devices can obtain a parallel channel converter product:

- The IBM ESCON Converter Model 1, 9034-001, which may be available through IBM Global Financing (IGF).
- A third-party parallel channel converter product such as the Optica 34600 FXBT.

For more information about Optica offerings, contact Optica at:

New for FICON Express

A 25% Increase in the Number of FICON Express Channels: z990 now supports up to a maximum of 60 FICON Express features, a total of **120 FICON channels**. This is a 25% growth over what was available on z900. Fibre CONnection (FICON) Express continues to be a high-performance I/O channel optimized for efficient, high-speed communication. The FICON Express SX and LX features are capable of supporting an average of 3600 start I/Os per second on a channel that is 50% utilized.

The FICON Express features offer multiple I/O connectivity options:

Function	CHPID Type	Connectivity
FICON Bridge	FCV	ESCON devices
FICON Native	FC	FICON devices
FICON CTC	FC	Server-to-Server or LPAR-to-LPAR
Fibre Channel Protocol	FCP	SCSI devices/Linux

The FICON Express features support a 1 gigabit per second (Gbps) or 2 Gbps link data rate, auto-negotiating the speed, point-to-point, without application or end-user intervention. Two features continue to be available — FICON Express LX (long wavelength) for use with 9 micron single mode fiber optic cabling, and FICON Express SX (short wavelength) for use with 50 or 62.5 micron multimode fiber optic cabling. Refer to the *Sales Manual* for a more complete description of these features.

The most common use of these features continues to be FICON Native with large infrastructures often feeding terabytes of storage.

Fiber optic cabling is a customer responsibility. Refer to the **Fiber Optic Cabling Services from IBM Networking Services** section of this announcement for information on fiber optic cabling services.

Cascaded Director Support: On January 31, 2003, IBM made generally available the FICON Cascaded Director function. FICON Cascading enables two FICON Directors to be interconnected, or cascaded. FICON Cascading, used for cross-site connectivity, can minimize the number of channels and cross-site connections, reducing implementation costs for disaster recovery applications such as Geographically Dispersed Parallel Sysplex™ (GDPS™) and Remote Copy. This support is applicable to z800, z900, and z990. Support is offered in z/OS V1.3 with PTFs or later releases. Support is also available in z/VM V4.4.

For more information on Cascaded Directors, consult the I/O Connectivity Web site at:

<http://www.ibm.com/servers/eserver/zseries/connectivity>

Maximum Unrepeated Distance between Cascaded Directors: For information regarding the maximum unrepeated distance supported between cascaded directors, refer to the following Web sites:

<http://www.ibm.com/storage/inrange>

<http://www.ibm.com/storage/mcdata>

FCP for Attachment to SCSI Devices in Linux Environments: The Fibre Channel Protocol (FCP) capability, supporting attachment to Small Computer

System Interface (SCSI) devices in Linux for zSeries environments, was made available for z800 and z900 February 20, 2003.

Refer to the **Planned Availability** section of this announcement for availability of FCP on z990.

Refer to the connectivity Web site listed at the end of this section for updated information on supported devices.

For Linux operating as a guest under VM, z/VM V4.3 or later is required. For Linux for zSeries support, refer to the Web site listed at the end of this section.

FICON/FCP Intermix: On March 31, 2003, zSeries announced support for intermixing Fibre CONnection (FICON) and the Fibre Channel Protocol (FCP) within the same physical FICON Director. FICON/FCP intermix is supported on the McDATA Intrepid 6000 Series Directors and INRANGE FC/9000 Directors. Now a single director may be shared, on a port-by-port basis, between FICON-capable servers/devices and FCP-capable servers/devices.

FICON/FCP Intermix facilitates asset utilization. If you have chosen to implement small director footprints which can scale up over time, this may be of assistance as you pursue that strategy.

The Control Unit Port (CUP) continues to be used to communicate with operating systems, including Linux.

For additional details, refer to FICON/FCP White Papers which are available at the following Web sites.

http://www.inrange.com/resource_center/features/protocol_intermix.php

<http://www.mcdata.com/knowcenter/white/index.html>

For Linux for zSeries support of FCP, refer to the following Web site for further information:

<http://www10.software.ibm.com/developerworks/opensource/linux390>

For more information, consult IBM's I/O Connectivity Web site:

<http://www.ibm.com/servers/eserver/zseries/connectivity/#fcp>

Update on the OSA-Express Family of LAN Adapters

Now 48 Connections To Your Network: With the introduction of z990, its increased processing capacity, and the availability of multiple Channel SubSystems, the Open Systems Adapter family of Local Area Network (LAN) adapters is also expanding by offering up to a maximum of 24 features per system, versus the maximum of up to 12 features per system on prior generations. You now have 48 ports of LAN connectivity. You can choose any combination of OSA-Express features: the new OSA-Express Gigabit Ethernet LX (#1364), the new OSA-Express Gigabit Ethernet SX (#1365), the new OSA-Express 1000BASE-T Ethernet (#1366), and the current OSA-Express Token Ring (#2367). You can also carry forward on an upgrade from z900, OSA-Express Gigabit Ethernet LX (#2364), OSA-Express Gigabit Ethernet SX (#2365), OSA-Express Fast Ethernet (#2366), and OSA-Express Token Ring (#2367).

New OSA-Express Gigabit Ethernet Features: A new generation of Open Systems Adapter-Express (OSA-Express) Gigabit Ethernet (GbE) features is being offered with z990, and new feature numbers are being introduced. These new features are offered on new builds

and replace the current OSA-Express GbE features (#2364, #2365) which can also be brought forward to z990 on an upgrade from z900.

The new OSA-Express Gigabit Ethernet SX (short wavelength) and OSA-Express Gigabit Ethernet LX (long wavelength) features support **Checksum Offload**, and have a new connector type, LC Duplex, replacing the current SC Duplex connector. This conforms to the fiber optic connectors currently in use for ISC-3 and the FICON Express features which began shipping October 31, 2001.

The new OSA-Express GbE features continue to be dual-port features occupying a single I/O slot, and utilize one CHPID per port, two CHPIDs per feature. The OSA-Express GbE features continue to support Queued Direct Input/Output (QDIO) mode only, full-duplex operation, and jumbo frames.

The current OSA-Express GbE features are supported on z990 on an upgrade from z900, OSA-Express Gigabit Ethernet LX (#2364) and OSA-Express Gigabit Ethernet SX (#2365). The connector remains the same, SC Duplex.

These new features are exclusive to z990. There are no unique software dependencies for the new OSA-Express Gigabit Ethernet features, with the exception of the Checksum Offload support. Refer to the Checksum Offload text in this announcement for more details. Checksum offload support is planned to be available in z/OS V1.5. Refer to the Web site for Linux for zSeries support.

Refer to the standards section of this announcement for conformance information as well as additional information on the features.

New Ethernet Feature Being Introduced — 1000BASE-T Ethernet: IBM is introducing a new copper Ethernet feature with z990. This new feature is offered on new builds and replaces the current OSA-Express Fast Ethernet (#2366), which can also be brought forward to z990 on an upgrade from z900.

This new feature, 1000BASE-T Ethernet, is capable of operating at 10, 100, or 1000 Mbps (1 Gbps) using the same Category 5 Unshielded Twisted Pair (UTP) cabling infrastructure that is utilized for Fast Ethernet. The new gigabit over copper adapter allows a migration to gigabit speeds wherever there is a copper cabling infrastructure instead of a fiber optic cabling infrastructure. The new 1000BASE-T Ethernet feature supports:

- Auto-negotiation
- A QDIO and a non-QDIO environment allowing you to make the most of your TCP/IP and SNA/APPN®/HPR environments at up to gigabit speeds
- Checksum Offload when in QDIO mode

When configured at 1 Gbps, the 1000BASE-T Ethernet feature has the following attributes:

- Operates in QDIO mode or non-QDIO mode
- Carries SNA (non-QDIO mode) and TCP/IP packets (QDIO or non-QDIO mode)
- Operates in full-duplex mode only
- Supports jumbo frames in QDIO mode

There are no unique software dependencies for the new 1000BASE-T Ethernet feature, with the exception of the Checksum Offload support. Checksum Offload support is planned to be available in z/OS V1.5. Refer to the Web site for Linux for zSeries support.

Refer to the standards section of this announcement for conformance information as well as additional information on the feature.

Checksum Offload for IPv4 Packets when in QDIO Mode — Linux and z/OS: A new function, **Checksum Offload**, offered for the new OSA-Express GbE and 1000BASE-T Ethernet features, is being introduced for the Linux for zSeries and z/OS environments. Checksum Offload provides the capability of calculating the Transmission Control Protocol (TCP), User Datagram Protocol (UDP), and Internet Protocol (IP) header checksums. Checksum verifies the correctness of files. By moving the checksum calculations to a Gigabit or 1000BASE-T Ethernet feature, host CPU cycles are reduced and performance is improved.

When checksum is offloaded, the OSA-Express feature performs the checksum calculations for Internet Protocol Version 4 (IPv4) packets. This function applies to packets which actually go onto the Local Area Network (LAN) or come in from the LAN. When multiple IP stacks share an OSA-Express, and an IP stack sends a packet to a next hop address owned by another IP stack sharing the OSA-Express, OSA-Express sends the IP packet directly to the other IP stack without placing it out on the LAN. Checksum Offload does not apply to such IP packets. This function does not apply to IPv6 packets. TCP/IP will continue to perform all checksum processing for IPv6 packets. This function also does not apply to ICMP checksum processing. TCP/IP will continue to perform processing for ICMP checksum.

Checksum Offload is supported by the new OSA-Express GbE features (#1364, #1365) and the new 1000BASE-T Ethernet feature (#1366). This is applicable to the QDIO mode only.

Checksum offload support is planned to be available in z/OS V1.5. Refer to Software Announcement 203-131, dated May 13, 2003.

For Linux for zSeries support, refer to the following Web site for further information:

<http://www10.software.ibm.com/developerworks/opensource/linux390>

Full VLAN Support for z/OS to Increase Traffic Flow when in QDIO Mode: z/OS Communications Server (CS) now supports Virtual Local Area Network Identifications (VLAN IDs). Support is offered for one global VLAN (ID) per Internet Protocol (IP) version per TCP/IP stack:

- One Global VLAN (ID) for IPv4 and
- One Global VLAN (ID) for IPv6

Previously CS supported VLAN priority tagging. CS will support both priority tagging and VLAN IDs.

VLAN support conforms to the IEEE 802.1q standard which defines a VLAN as a subset of the active topology of the LAN. VLANs ease the administration of logical groups of users so that they can communicate as if they were on the same LAN. VLANs increase traffic flow and reduce overhead by allowing the organization of networks by traffic patterns rather than by physical location.

Full VLAN support is offered in z/OS V1.5 Communications Server. Full VLAN support is available on the following OSA-Express features: 1000BASE-T Ethernet (#1366), Fast Ethernet (#2366), and Gigabit Ethernet (#2364, #2365, #1364, #1365) when in QDIO mode.

Refer to Software Announcement 203-131, dated May 13, 2003.

Virtual Local Area Network (VLAN) Support in z/VM: z/VM V4.4 now exploits the VLAN technology and conforms to the IEEE 802.1q standard. TCP/IP for z/VM supports Virtual Local Area Network Identifications (VLAN IDs). Support is offered for one global VLAN ID for IPv4. The z/VM TCP/IP stack supports one VLAN ID per OSA-Express port. Each port can be configured with a different VLAN ID.

Support is offered for the following OSA-Express features: 1000BASE-T Ethernet (#1366), Fast Ethernet (#2366), and Gigabit Ethernet (#2364, #2365, #1364, #1365) when in QDIO mode.

Refer to Software Announcement 203-128, dated May 13, 2003.

VLAN support in a Linux for zSeries environment was delivered for the OSA-Express Fast Ethernet and Gigabit Ethernet features in QDIO mode in April 2002 for z800 and z900.

Intrusion Detection Services (IDS) Enhancements when in QDIO Mode: Introduced in z/OS V1.2 Communications Server, Intrusion Detection Services can help detect attacks on the TCP/IP stack that would potentially harm its ability to function normally and cause a misuse of system resources.

In z/OS V1.5 Communications Server, interface flood detection (Denial of Service — DoS) will be added to the current IDS.

These enhancements are exclusive to z990 and are supported by all of the OSA-Express features supported on z990 when in QDIO mode (OSD CHPID type) — one of the IP Assist functions.

Refer to Software Announcement 203-131, dated May 13, 2003.

Now 160 TCP/IP Stacks per OSA-Express Port when in QDIO Mode: TCP/IP connectivity is now increased with the capability to allow up to a maximum of 160 IP stacks per OSA-Express port and 480 devices. There is up to a maximum of 84 IP stacks and 255 devices per LPAR. There continue to be four QDIO priorities. Previously, the OSA-Express features, when configured for QDIO, had been capable of supporting up to 80 IP stacks and 240 devices.

This support is applicable to all of the OSA-Express features available on z990, either as a new build z990 or on an upgrade to z900 when using QDIO mode (OSD CHPID type). This support is offered in the z990 Licensed Internal Code (LIC). There are no prerequisite software requirements.

OSA/SF Java™ GUI for Client Operating System Independence: A new version of the Open Systems Adapter Support Facility (OSA/SF) is being introduced and includes a Java-based Graphical User Interface (GUI) in support of the client application. The Java GUI is independent of any operating system/server (transparent to operating system), and is expected to operate wherever the Java 1.4 runtimes are available. Interoperability testing has been performed for Windows® 2000, Windows XP, and Linux for zSeries. In the past, workstation support was downloaded to a client supporting Windows NT®, Windows 95, or OS/2®. Use of the GUI is optional; a REXX command interface is also included with OSA/SF. OSA/SF is not required to set up the OSA-Express features in QDIO mode (OSD CHPID type).

OSA/SF has been, and continues to be, integrated in z/OS, OS/390®, z/VM, and VSE/ESA and runs as a host application. For OSA/SF, Java GUI communication is

supported via TCP/IP only. In the past, communication was supported via EHLAPI (3270), APPC, and TCP/IP.

This new integrated version of OSA/SF is a complete replacement for the currently integrated versions in z/OS, OS/390, and VSE/ESA. This new version of OSA/SF is not being offered as a separately orderable program product.

The Open Systems Adapter Support Facility (OSA/SF) is used primarily to:

- Manage all OSA ports
- Configure all OSA non-QDIO ports
- Configure ATM LANE ports on G3 — G6 Servers, z800, and z900
- Configure local MAC

This deliverable is a complete replacement for OSA/SF V2.1 (5655-B57). A separately orderable program product is no longer available. This new integrated version is applicable to all in service releases of z/OS, OS/390, z/VM, and VSE/ESA.

In the z/OS environment, delivery will be via the z/OS V1.4 z990 Compatibility Support feature (for release z/OS V1.4) and z990 Compatibility for Selected Releases Web deliverable (for releases OS/390 V2.10, z/OS V1.2, and z/OS V1.3). In the z/OS environment, the new integrated version of OSA/SF can coexist with OSA/SF V2.1 and does not overlay it.

The new version of OSA/SF is integrated in z/VM V4.4 and replaces V2.1. In currently supported versions/releases of z/VM, and VSE/ESA, the new version of will be delivered as a PTF and will overlay OSA/SF V2.1.

This support is applicable to all OSA-Express and OSA-2 features on all supported servers.

Note: The OSA-2 features are not available on z990.

Refer to Software Announcement 203-131, dated May 13, 2003.

Refer to Software Announcement 203-128, dated May 13, 2003.

OSA-Express Direct SNMP Subagent Support for dot3StatsTable: Now the OSA-Express Direct Simple Network Management Protocol (SNMP) subagent support is offered for Ethernet data for the dot3StatsTable from the SNMP EtherLike-MIB module in RFC 2665, which provides statistics for Ethernet interfaces. These statistics can assist in the analysis of network traffic congestion.

This support is applicable to all of the OSA-Express Ethernet features supported on z990, whether GbE, 1000BASE-T Ethernet, or Fast Ethernet when in QDIO mode (OSD CHPID type). Support for the dot3StatsTable is also available for the Ethernet features (GbE, Fast Ethernet) offered on z800 and z900 when in QDIO mode. OSA/SF is no longer a prerequisite for this function. This support is offered for z990, z900, and z800. For z900 and z800 support, refer to the PSP bucket for OSA. This support is offered for z/OS V1.4 or later. Refer to the appropriate PSP bucket for PTFs.

In April 2002, IBM announced Direct SNMP subagent support. Prior to the OSA-Express Direct SNMP subagent, OSA-Express management data was only available from the z/OS Communications Server TCP/IP subagent which required the Open Systems Adapter Support Facility (OSA/SF) to obtain the data. With the release of the OSA-Express Direct SNMP subagent, OSA/SF was no longer required to manage SNMP data for OSA-Express.

At that time support was offered for the “SNMP get” command in the z/OS V1.4 environment. Support for the “SNMP get” command was also made available in the Linux for zSeries environment.

OSA-Express Direct SNMP MIB Module: An updated Simple Network Management Protocol (SNMP) Management Information Base (MIB), which supports all of the OSA-Express features that can exist in a zSeries 990, is available on Resource Link. The updated SNMP MIB includes support for:

- New Gigabit Ethernet features
- New 1000BASE-T Ethernet feature
- Logical Channel SubSystems (LCSS’s)
- Updated performance table with more detailed information

The MIB can be found on Resource Link.

<http://www.ibm.com/servers/resourcelink>

OSA-Express ATM No Longer Supported: The OSA-Express Asynchronous Transfer Mode (ATM) features are not supported on z990. They are not offered as a new build option and are not offered on an upgrade from z900. This satisfies the Statement of General Direction in the Hardware Announcement dated April 30, 2002.

If ATM connectivity is still desired, a multiprotocol switch or router with the appropriate network interface (for example, 1000BASE-T Ethernet, Gigabit Ethernet) can be used to provide connectivity between the z990 and an ATM network.

OSA-2 FDDI No Longer Supported: The OSA-2 Fiber Distributed Data Interface (FDDI) feature is not supported on z990. It is not offered as a new build option and is not offered on an upgrade from z900. This satisfies the Statement of General Direction in the Hardware Announcement dated October 4, 2001.

If FDDI connectivity is still desired, a multiprotocol switch or router with the appropriate network interface (for example, 1000BASE-T Ethernet, Gigabit Ethernet) can be used to provide connectivity between the z990 and a FDDI LAN.

Further Integration of Cryptographic Support with z990

New Cryptographic Function on Every Processor Unit (PU): To achieve the required throughput and implement new functions while maintaining balanced usage of system resources, integrated hardware is key. zSeries 990 introduces the Message Security Assist Architecture along with the new CP Assist for Cryptographic Function (CPACF), delivering cryptographic support on every Processor Unit (PU) with DES and TDES data encryption/decryption and SHA-1 hashing. This offers balanced use of system resources and is designed to provide unprecedented scalability—a z990 can have from one to 32 PUs, depending upon model—and data rates at 2X or more faster than the CMOS Cryptographic Coprocessor Facility (CCF). Since these cryptographic functions are implemented in each and every PU, the association of cryptographic functions to specific PUs, as was done with previous generations of zSeries, is eliminated.

The DES and TDES functions use clear key values. The SHA-1 hash function is shipped enabled. However, DES and TDES functions require enablement of the CPACF function (#3863) for export control.

For IBM and customer written programs the CPACF for DES, TDES, and SHA-1 functions can be invoked by five new problem state instructions as defined by an extension to the zSeries architecture.

Support is also available via the Integrated Cryptographic Service Facility (ICSF) via the z/OS V1.4 z990 Compatibility Support feature for z/OS V1.4, z990 Cryptographic CP Assist Support Web deliverable for z/OS V1.3, and z990 Cryptographic Support Web deliverable for z/OS V1.2 and OS/390 V2.10.

Secure Encrypted Transactions with Higher Performance

— **New PCIXCC:** The PCIX Cryptographic Coprocessor (PCIXCC) (#0868) is a replacement for the PCI Cryptographic Coprocessor (PCICC) (#0861) and the CMOS Cryptographic Coprocessor Facility that were offered on z900. All of the equivalent PCICC functions that are implemented are designed to offer higher performance. In addition, the functions on the CMOS Cryptographic Coprocessor Facility used by known applications have also been implemented in the PCIXCC feature.

The PCIXCC feature supports:

- Secure cryptographic functions
- Use of secure encrypted key values
- User-Defined Extensions

The installation of the CPACF feature (#3863) is required to enable the use of the PCIXCC feature. Support is available via the Integrated Cryptographic Service Facility (ICSF) and the z990 Cryptographic Support Web deliverable for z/OS V1.4, z/OS V1.3, z/OS V1.2, and OS/390 V2.10. Refer to the **Software Requirements** section for availability dates. Refer to the Supplemental section, **Limitations** section of this announcement for more information.

User-Defined Extensions to Support Unique Requirements:

User-Defined Extensions to the Common Cryptographic Architecture (CCA) support program that executes within the PCIX Cryptographic Coprocessor will be supported via an IBM Service Offering. For unique customer applications, the PCIX Cryptographic Coprocessor will support the loading of customized cryptographic functions on z990. Support is available via ICSF and the z990 Cryptographic Support. Refer to the **Software Requirements** section for availability dates.

Under a special contract with IBM, PCIX Cryptographic Coprocessor customers will gain the flexibility to define and load custom cryptographic functions themselves. This service offering can be requested via the IBM “Cryptocards” Web site by selecting the “Custom Programming” option.

<http://www.ibm.com/security/cryptocards/>

The Web site will direct the customer’s request to an IBM Global Services (IGS) location appropriate for the customer’s geographic location. A special contract will be negotiated between IGS and the customer, covering development of the UDX by IGS per the customer’s specifications as well as an agreed-upon level of the UDX. The contract may also include e-mail/telephone/on-site support if so negotiated (IGS may subcontract any piece of this work to a third-party vendor).

PCICA — Continued Cryptographic Support for the e-business Environment:

The PCI Cryptographic Accelerator (PCICA) feature, supported on z900, is available on z990 and may be carried forward on upgrades from z900 to z990. This hardware-based cryptographic solution continues to address the high Secure Sockets Layer (SSL) performance needs of on

demand businesses. The SSL and Transport Layer Security (TLS) protocols are essential and widely used protocols to help support secure e-business applications. Compute-intensive public key cryptographic processes, as used by SSL/TLS, can be offloaded from the host to the PCICA feature to reduce CP usage and to increase system throughput. Each PCICA feature can support up to 30 LPARs (up to 15 LPARs per PCI Cryptographic Accelerator card — there are two cards per PCICA feature).

The new z990 server, with six PCICA features and 16 CPs active, is designed to provide increased secure Web transaction performance by supporting greater than 11,000 SSL handshakes per second. To enable the use of the PCICA feature, the CPACF feature (#3863) must be installed.

With VSE/ESA V2.7 and IBM TCP/IP for VSE/ESA V1.5, support is offered for the PCICA feature. Refer to the **Limitations** section and **Software Requirements** section of this announcement for further information on the PCICA feature.

Trusted Key Entry (TKE) 4.0 Code Level Workstation: The TKE 4.0 code level workstation is an optionally priced feature that provides a basic key management system. The key management system allows an authorized person a method for key identification, exchange, separation, update, backup, and management. The TKE workstation is a tool for security administrators to use in setting up and establishing the security policy and placing it into production. The TKE feature is a combination of workstation hardware and software networked-connected to z990. The TKE workstation and 4.0 code level are designed to provide a secure, remote, and flexible method of providing Master Key Entry, and to remotely manage PCIX Cryptographic Coprocessors.

z990 Cryptographic Migration: The IBM PCI Cryptographic Accelerator (#0862) is supported on z990, and can be carried forward on an upgrade from z900. Customers with TKE 3.X installed workstations may carry them forward to control legacy systems only. An update from TKE 3.0 or TKE 3.1 code level to TKE 4.0 code level is required to control the z990. To use the TKE function, the PCIX Cryptographic Coprocessor (PCIXCC) feature, the TKE 4.0 code level, and the CP Assist for Cryptographic Function (CPACF) must be installed.

Refer to the **Software Requirements** section of this announcement for Web deliverables to support PCICA and TKE and exploit PCIXCC.

Fiber Optic Cabling Services from IBM Networking Services

Fiber optic cabling complexity continues to be a part of the Information Technology (IT) infrastructure as diverse protocols (ESCON, FICON, FCP, Gigabit Ethernet) and industry-standard small form factor (SFF) connectors continue to proliferate in the enterprise. If your enterprise has multiple generations of products, the problem can be exacerbated. Even more critical is the availability of skills and dedicated personnel tasked to support the short-term as well as the long-term requirements of the IT infrastructure in addition to supporting the open systems e-business environment.

To better satisfy the cabling requirements of z800, z900, and z990, **IBM Networking Services** has enhanced their fiber optic cabling services. **IBM Network Integration and Deployment Services for zSeries fiber cabling** provides planning and installation services for individual fiber optic connections. **IBM Network Integration and Deployment Services for enterprise fiber cabling** provides planning for IBM Fiber Transport System trunking components and

installation services for small, medium, and large enterprises.

Refer to Services Announcement 603-012, dated May 13, 2003.

IBM Networking Services is continually working to ensure IBM has a comprehensive set of services geared for today and tomorrow. These services take into consideration the requirements for all of the protocols/media types supported on zSeries (for example, ESCON, FICON, Coupling Links, OSA), whether the focus is the data center, Storage Area Network (SAN), Local Area Network (LAN), or end-to-end enterprise.

Fiber optic cabling services from **IBM Networking Services** make the most of your cabling investments. IBM has the skills to facilitate the design and installation of your cabling with the consulting services so critical when the clock matters. Knowing that new installations, upgrades, and relocations require flawless execution, comprehensive solutions are available to reduce the complexity and simplify the process. The **zSeries fiber cabling services** and **enterprise fiber cabling services** have been designed to solve the IT infrastructure dilemmas at the product level and the enterprise level.

These services can meet the needs of your system configurations be they small, medium, or large. IBM connectivity experts will help you select the option that is best suited to achieve your business goals, to simplify the zSeries deployment with effective on-site fiber optic cable planning and installation support.

Fiber optic cables, cable planning, labeling, and installation are all customer responsibilities for new z990 installations and upgrades. Fiber optic conversion kits and Mode Conditioning Patch (MCP) cables are not orderable as features on z990. Installation Planning Representatives (IPRs) and System Service Representatives (SSRs) will not perform the fiber optic cabling tasks without a services contract.

Under the **zSeries fiber cabling services** umbrella there are **three** options to provide individual fiber optic cables (jumper cables, conversion kits, MCP cables) for connecting to z800, z900, or z990.

- Option 1 — Fiber optic jumper cabling package (available today for z800 and z900). IBM does the detailed planning. This option includes planning, new cables, installation, and documentation. An analysis of the zSeries channel configuration, I/O devices, and any existing fiber optic cabling is required to determine the appropriate fiber optic cables.
- Option 2 — Fiber optic jumper cable migration and reuse for a zSeries upgrade (new option). This option includes planning, reuse of existing cables, and documentation. IBM organizes the existing fiber optic cables based upon the new z990 connection details. Relabeling, rerouting, and reconnection to the appropriate z990 channels is performed. New cables are not offered as a part of this option.
- Option 3 — Fiber optic jumper cables and installation (new option). The customer tells us what they need. They do the detailed planning. The service includes new cables, installation, and documentation. Planning and providing the list of required cables are customer responsibilities.

Options 1 and 2 can be combined within one statement of work to provide complete upgrade coverage.

Under the **enterprise fiber cabling services** umbrella there are **two** options to provide fiber optic trunk cables

(fiber optic trunk cables, fiber harnesses, panel-mount boxes) for connecting to the z800, z900, or z990.

- Option 1 — zSeries fiber optic trunk cabling package (new option). IBM reduces the cable clutter under the floor. An analysis of the zSeries (z800, z900, z990) channel configuration and any existing fiber optic cabling is performed to determine the required FTS fiber optic trunking commodities (trunk cables, harnesses, panel-mount boxes). This option includes zSeries planning, FTS fiber optic trunking commodities, installation, and documentation. This option does not include enterprise-level planning.
- Option 2 — Enterprise fiber cabling services. IBM organizes the entire enterprise. This option includes enterprise planning, new cables, fiber optic trunking commodities, installation, and documentation. This is the most comprehensive set of services.

A complete evaluation of the enterprise ensures your long-term planning goals can be achieved.

Enterprise fiber cabling services employ the use of a proven modular cabling system, the Fiber Transport System (FTS), which includes trunk cables, zone cabinets, and panels for your servers, directors, and storage devices.

FTS supports Fiber Quick Connect (FQC), a fiber harness integrated in the zSeries frame for “quick” connect, which is offered as a feature on zSeries for connection to ESCON channels.

Whether you choose a packaged service or a custom service, high-quality components are used to facilitate moves, adds, and changes in the enterprise to prevent extending your maintenance “window.”

Refer to the **Planning Information** and **Cabling Responsibilities** sections of this announcement for more information or contact IBM Global Services for details.

Parallel Sysplex Marches On

Enhancing the Scalability of Parallel Sysplex: All z990 servers ship with Coupling Facility Control Code (CFCC) Level 12, which includes support for:

- 64-bit addressing to support larger structure sizes and to eliminate the 2 gigabyte (GB) “control store” line in the Coupling Facility (CF). With this support, the distinction between “control store” and “non-control store” (data storage) in the Coupling Facility is eliminated, and large central storage can be used for all Coupling Facility control and data objects.
- Up to 48 internal tasks for improved multiprocessing of CF requests.
- System-Managed Coupling Facility Structure Duplexing.
- Message Time Ordering.

As server and Coupling Facility link technologies have improved over the years, the synchronization tolerance between systems in a Parallel Sysplex has become more rigorous. To help ensure that any exchanges of time-stamped information between systems in a Parallel Sysplex involving the Coupling Facility observe the correct time ordering, time stamps are now included in the message-transfer protocol between the systems and the Coupling Facility. Therefore, when a Coupling Facility is configured as an ICF on any z990, the Coupling Facility requires connectivity to the same Sysplex Timer® that the other systems in its Parallel Sysplex are using for time

synchronization. If the ICF is on the same server as a member of its Parallel Sysplex, no additional Sysplex Timer connectivity is required, since the server already has connectivity to the Sysplex Timer. However, when an ICF is configured on a z990 which does not host any systems in the same Parallel Sysplex, it is necessary to attach the server to the Sysplex Timer.

Enhancing the Availability of Parallel Sysplex: z990 fully supports System-Managed CF Structure Duplexing. This is a set of architectural extensions to Parallel Sysplex in support of duplexing of Coupling Facility structures for high availability. All three structure types — cache structures, list structures, and locking structures — can be duplexed using this architecture.

The IBM technical paper *System Managed CF Structure Duplexing* (GM13-0103) includes information about:

- The cost/benefit trade-offs in duplexing
- Determining which structures should be duplexed in a specific Parallel Sysplex

This paper is available at:

<http://www.ibm.com/server/eserver/zseries/psd>

Support for these extensions on z990 is on the same schedule as the entire zSeries family of servers and prerequisites CFCC Level 12 with current maintenance including the CFCC compatibility code as well as z/OS V1.2 and later with the service as defined in the CFDUPLEXING PSP bucket.

System-Managed CF Structure Duplexing is now available exclusively through a Readiness Review process which was announced on April 8, 2003. Refer to Hardware Announcement 103-089, dated April 8, 2003.

System-Managed CF Structure Duplexing also requires the appropriate level for the exploiter support. Installing these releases and enabling this new function provides the necessary base for highly available Coupling Facility structure data through the redundancy of duplexing. Additionally, it enhances Parallel Sysplex ease of use by reducing the complexity of CF structure recovery, and may also enable some installations to eliminate the requirement for standalone CFs in their Parallel Sysplex configuration.

z990 Coupling Connectivity for Parallel Sysplex

ICs, ICBs, and ISC-3 on z990: Like its predecessor, z990 supports Internal Coupling Channels (ICs), Integrated Cluster Bus (ICB), and InterSystem Channel-3 (ISC-3) for passing information back and forth in a Parallel Sysplex environment. These technologies are all members of the family of coupling connectivity options available on z990.

ICs are for internal communication between Coupling Facilities defined in LPARs and z/OS images on the same server. ICBs are used for server-to-server communication over short distances. The newest ICB member, ICB-4, supports a link data rate of 2 gigabytes per second (GBps), compared to ICB-3 which supports a link data rate of 1 GBps. ICBs carry traffic over 10 meter (33 feet) copper cables, of which 3 meters is reserved for intraserver connection.

The InterSystem Channel-3 (ISC-3) is another member of the family of Coupling Link options available on z990. ISC-3s support a link data rate of 2 gigabits per second (Gbps) and carry traffic over 9 micron single mode fiber optic cables. Refer to the *Sales Manual* for more information on the ISC-3 feature.

z990 supports:

- Internal Coupling Channels — up to a maximum of 32 ICs
- Integrated Cluster Bus-2 (ICB-2) to attach G5/G6 Servers to z990 — up to a maximum of 8 links
- Integrated Cluster Bus-3 (ICB-3) to attach z800s and z900s to z990 — up to a maximum of 16 links
- Integrated Cluster Bus-4 (ICB-4) to attach z990 to z990 — up to a maximum of 16 links
- InterSystem Channel-3 (ISC-3) — up to a maximum of 32 links

The maximum number of external Coupling Links combined (ICB-2, ICB-3, ICB-4, and active ISC-3 links) cannot exceed 32 per system.

There are unique cables for ICB-2, ICB-3, and ICB-4. Refer to the *Sales Manual* for more information on these cables.

Sysplex Timer Model 1 Reaching End of Service: The Sysplex Timer Model 1, 9037-001, has an announced worldwide end of service (EOS) date of December 31, 2003. The Sysplex Timer Model 1, a critical component of any multi-CEC sysplex or Parallel Sysplex, will no longer be supported by IBM after December 31, 2003. IBM recommends that you begin the planning to replace all Sysplex Timer Model 1s with Sysplex Timer Model 2s.

The Sysplex Timer Model 2 is a full replacement box for the Sysplex Timer Model 1. There is no upgrade path from the Sysplex Timer Model 1 to the Sysplex Timer Model 2. An International Technical Support Organization (ITSO) Redpaper, Migration Planning for the 9037 Model 2 Sysplex Timer, REDP3666, is available. Refer to the following Web site for a link to the Redpaper.

<http://www.ibm.com/server/eserver/zseries/psa>

Contact your local IBM support representative for a detailed migration procedures document.

Refer to Services Announcement 602-015, Declaration of Plan to Discontinue, dated June 18, 2002.

Geographically Dispersed Parallel Sysplex (GDPS) Enhancements: GDPS, an industry leading e-business continuity solution, is a multisite solution that is designed to provide the capability to manage the remote copy configuration and storage subsystems, automate Parallel Sysplex operational tasks, and perform failure recovery from a single point of control, thereby helping to improve application availability. GDPS supports both the synchronous Peer-to-Peer Remote Copy (PPRC), as well as the asynchronous Extended Remote Copy (XRC) forms of remote copy. Depending on the form of remote copy, the solution is referred to as GDPS/PPRC or GDPS/XRC.

GDPS/PPRC and GDPS/XRC have been enhanced to include new functions.

GDPS/PPRC HyperSwap™ Function: The GDPS/PPRC HyperSwap function is designed to broaden the continuous availability attributes of GDPS/PPRC.

Stage 1 of the GDPS/PPRC HyperSwap function provided the ability to:

- Transparently switch all primary PPRC disk subsystems with the secondary PPRC disk subsystems for a planned switch reconfiguration

- Perform disk configuration maintenance and planned site maintenance without requiring any applications to be quiesced.

Stage 1 of GDPS/PPRC HyperSwap function became generally available in December 2002.

Stage 2 of GDPS/PPRC HyperSwap function will contain additional function to transparently switch to use secondary PPRC disk subsystems in the event of unplanned outages of the primary PPRC disk subsystems or a failure of the site containing the primary PPRC disk subsystems.

Stage 2 of GDPS/PPRC HyperSwap support allows:

- Production systems to remain active during a disk subsystem failure. Disk subsystem failures will no longer constitute a single point of failure for an entire Parallel Sysplex.
- Production systems to remain active during a failure of the site containing the primary PPRC disk subsystems if applications are cloned and exploiting data sharing across the two sites. Even though the workload in the second site will need to be restarted, an improvement in the Recovery Time Objective (RTO) will be accomplished.

Stage 2 of GDPS/PPRC HyperSwap is planned to be generally available second quarter 2003.

GDPS/PPRC Management for Open Systems Logical Unit Numbers (LUNs): GDPS/PPRC technology has been extended to manage a heterogeneous environment of z/OS and open systems data. If installations share their disk subsystems between the z/OS and open systems platforms, GDPS/PPRC, running in a z/OS system, can manage the PPRC status of devices that belong to the other platforms and are not even defined to the z/OS platform. GDPS/PPRC will also provide data consistency across both z/OS and open systems data.

GDPS/PPRC management of open systems LUNs is planned to be generally available second quarter 2003.

Performance Enhancements for GDPS/PPRC and GDPS/XRC Configurations

- Concurrent activation of Capacity Backup Upgrade (CBU) can now be performed in parallel across multiple servers, which results in an improved RTO. This improvement applies to both the GDPS/PPRC and GDPS/XRC configurations.
- In a GDPS/XRC configuration, it is often necessary to have multiple System Data Movers (SDMs) — the number of SDMs is based on many factors, such as the number of volumes being copied and the I/O rate. Functions are now capable of being executed in parallel across multiple SDMs, thus providing improved scalability for a coupled SDM configuration.

Performance enhancements for GDPS/PPRC and GDPS/XRC became generally available March 24, 2003.

These GDPS enhancements are applicable to z800, z900, and z990.

For a complete list of other supported hardware platforms and software prerequisites, refer to the GDPS executive summary white paper, available at:

<http://www.ibm.com/server/eserver/zseries/psa>

SNA Operations Management

With the industry move to TCP/IP networks, Systems Network Architecture (SNA) Operations Management commands will no longer be supported on z990 servers. These commands were previously used by the System Automation for OS/390 product as well as NetView®. It is recommended that you now use the Simple Network Management Protocol (SNMP) Application Programming Interfaces (APIs) for your automation needs.

- If you previously used the System Automation for OS/390 product, you must now use Version 2.2 or later. This will allow you to define an automation policy for SNMP APIs rather than a policy for SNA Operations Management commands.
- If you directly used the SNA Operations Management commands on NetView, you must now use an SNMP agent and the SNMP APIs for systems automation management.

For detailed information on the SNMP APIs commands and environment requirements, refer to *zSeries Application Programming Interfaces* (SB10-7030). For more information on the SNA Operations Management command support that is not offered on z990, refer to *Managing Your Processors* (GC38-0452). Both publications are available on IBM Resource Link.

Reliability, Availability, and Serviceability (RAS)

Continuing to provide high availability and continuous reliable operation, zSeries 990 delivers significant new features for Reliability, Availability, and Serviceability (RAS).

Fault Tolerant Interconnect Design: The memory design of the z990 Models B16, C24, and D32 provides a fault tolerant dual interconnect fabric. The z990 is designed to prevent a single failure within the fabric from disrupting full memory access.

Enhanced PU Sparing: Transparent sparing for failed Processor Units (PUs) is enhanced for z990. In addition to PU sparing on an MCM, the z990 is designed to support sparing to other MCMs in Models B16, C24, and D32 in the unlikely event that an MCM has no spares.

Concurrent Model Upgrade: In October 2003, a z990 can be upgraded to a larger z990 model via the concurrent installation of additional processor units, memory, and I/O links with no disruption to current operations.

Sparing for Storage Protect Keys: The robust configuration of the Storage Protect Keys has been enhanced with chip sparing. Already a triple-array with parity protection and voting, the Key structure for z990 has added sparing, similar to Main Memory chip sparing, to further enhance the availability of this critical function.

Failure Containment for the Memory Bus Adapter (MBA): Memory Bus Adapters are designed to provide the critical link between the z990 Processor Units and the I/O subsystem. The Model A08 has three MBAs, the B16 has six MBAs, the C24 has nine MBAs, and the Model D32 has 12 MBAs. In the unlikely event of a catastrophic failure of an MBA chip, the z990 is designed to isolate the failure of that chip such that the remaining MBA chips continue to operate. This helps minimize the impact of a failure and allows for scheduling maintenance.

Enhanced Firmware Simulation: The z990 process for design, development, and test of Licensed Internal Code (LIC) has been significantly enhanced with the use of

simulation to improve quality and early availability. Virtually every action/reaction of the code can be tested with the simulated hardware/code of the rest of the server. The result is to discover and correct design errors much earlier in the process.

These new features, together with legacy features such as high levels of recovery, concurrent processor upgrade, concurrent memory upgrade, concurrent I/O upgrade, and concurrent maintenance for hardware and LIC give the z990 a very impressive RAS structure.

Software Pricing

For updated software pricing, refer to Software Announcement 203-130, Software Pricing for IBM @server zSeries 990 and Enhancements to Variable Workload Charges (VWLC) dated May 13, 2003.

Resource Link

Resource Link is a customized Web-based solution, helping to provide customers everything needed to plan for, install, and maintain IBM @server zSeries and IBM S/390® servers and associated software. Simply register for a Resource Link user ID and password to access product Planning, Education, and Library services, all without charge.

- Subscribe to Resource Link content for e-mail notification any time content changes.
- Create Personal Folders to organize site information according to your personal interests.

The Resource Link Web address is:

<http://www.ibm.com/servers/resourcelink>

Other Resource Link functions include the use of Forums to collaborate with fellow product owners, links to hardware and software Fixes, hardware and software Problem solving databases, Services for servers, software, and solutions, and Tools designed for specific server and software planning, installation, and configuration. Resource Link content includes:

- Customized Planning Aids — Allow for the planning, arrival, and installation of @server hardware on order. All that is needed is an order number and the Configuration Control Number (CCN) to access the planning aids that were customized for a specific order. Included in these planning aids are the feature numbers that affect the weight, height, power requirements, cooling, and cables necessary for system installation. The aids also provide customized system information for processor codes and descriptions, system power information, frame requirements, cooling requirements, and hardware management console and support element information.
- Customer Initiated Upgrade (CIU) — An IBM Resource Link Web-based solution that enables customers to set up, order, and download microcode for vertical upgrades of process and/or memory. CIU simplifies planning and installation because no IBM service visit is required to perform the upgrade.
- CHPID Mapping Tool — Downloadable from Resource Link, this tool allows you to map hardware I/O ports on order to your IOCP CHPID definitions. An availability option automatically maps hardware I/O ports to CHPIDs minimizing single points of failure. Use of this tool is not mandatory, but recommended for all new z990 hardware builds or for upgrades from

a z900 processor to a z990, as well as for making changes to an already installed machine after hardware upgrades that change or increase the number of channels.

- **Fiber Cabling Service** — Provides the cabling connectivity necessary for installing your new z990 processor. Because IBM offers a wide range of cables and cabling solutions to meet customer requirements for connecting I/O and networks, this cabling service is available through your IBM service representative from Resource Link.
- **Education** — Use this free, online education to train and refresh skills at the convenience of your enterprise. Product education includes planning, introduction, getting started, and “how to” courses. Learn how to use your IBM server products before your system arrives.
- **Library** — View, print, or download documents on IBM hardware and software products. These documents include product overviews, users guides, planning information, parts catalogues, and safety documentation. Also available are product and description documents, which contain high-level descriptions of specific microcode driver and version levels for each machine family including EC changes for the associated Hardware Management Console and Support Element.
- **Machine Information** — View or search for machine information from reports for machines with IBM maintenance agreements. Simply register for machine information on Resource Link and receive authorization to view reports based on machine serial number as well as links to MES content information. The report data is collected from IBM servers on a weekly basis using the Call Home feature, which transmits critical machine data and also detects failures or pending failures.

Product Positioning

The IBM z990 is the latest member of the zSeries family. This design represents a major change in the direction of the zSeries platform. The implementation of the superscalar microprocessor provides for improvements in the performance of new workloads as well as maintaining excellent performance for traditional workloads. By providing an increase in capacity almost triple that of the z900 Model 216, doubling the number of CHPIDs, doubling the number of LPARs, quadrupling the number of HiperSockets, and increasing the number of FICON channels by 25%, this server will provide you with the ability to improve application performance, increase the number of users supported, support more transactions, increase scalability, and consolidate workloads beyond what is available on a z800 or a z900.

Statement of General Direction

IBM intends to support four Logical Channel SubSystems (LCSS's) on the z990 (256 channels each).

IBM intends to support up to 60 LPARs on the z990.

IBM intends to support spanning of appropriate external channel types on the z990.

IBM intends to support greater than 16 CPs in a single image on appropriate releases of z/OS and z/VM on the z990.

IBM intends to provide z/VM guest support for the PCI Cryptographic Coprocessor (PCIXCC) feature.

IBM intends to support an optional Smart Card Reader, attached to a TKE workstation, permitting secure storage, convenient transport, and rapid re-entry of key parts via Smart Cards for z990 models.

IBM intends to support secure Operational Key Entry via the TKE workstation on the z990.

IBM intends to support Initial Program Load (IPL) from Fibre Channel Protocol (FCP)-attached disks.

IBM intends to enable Linux for zSeries to support PCIXCC.

IBM intends to deliver new function that will reduce the duration of an outage associated with certain Coupling Facility Control Code (CFCC) LIC upgrades or changes. In the future, CFCC LIC changes will be designed to never require that the entire server be down to apply a patch or upgrade. Only the LPAR running the CFCC LIC being upgraded will need to be restarted, and then only if the patch is “disruptive.” This availability enhancement will be especially important to customers who run their Parallel Sysplex using Internal Coupling Facilities (ICFs) and who may have multiple ICFs on the same server.

The z990 will be the last zSeries server to support Parallel Sysplex connectivity using ICB-2 links. These links provide connection between 9672 G5/G6 servers and z990 servers.

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

IBM Electronic Services

IBM Global Services has transformed its delivery of hardware and software support services to put you on the road to higher systems availability. IBM Electronic Services is a Web-enabled solution that provides you with an exclusive, no-additional-charge enhancement to the service and support on the IBM @server. You should benefit from greater system availability due to faster problem resolution and pre-emptive monitoring. IBM Electronic Services comprises two separate but complementary elements: IBM Electronic Services news page and IBM Electronic Service Agent™.

IBM Electronic Services news page provides you with a single Internet entry point that replaces the multiple entry points traditionally used by customers to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The IBM Electronic Service Agent is no-additional-charge software that resides on your IBM @server system that is designed to proactively monitor selected I/O events and transmit software inventory and maintenance level to IBM on a periodic customer-defined timetable. The IBM Electronic Service Agent tracks software inventory, I/O hardware error logs, and performance information. If the server is under a current IBM maintenance service agreement or within the IBM warranty period, the Service Agent automatically reports selected I/O hardware problems to IBM. Early knowledge about potential problems enables IBM to provide proactive service that maintains higher system availability and performance. In addition, information collected through the Service Agent will be made available to IBM service support representatives when they are helping answer your questions or diagnosing problems.

To learn how IBM Electronic Services can work for you, visit:

<http://www.ibm.com/support/electronic>

z990 I/O Feature Summary

There is a total of 84 I/O slots in three I/O cages (28 I/O slots per cage). One to three I/O cages can be installed.

The cryptographic features utilize I/O slots, so they are included in the table. Integrated Cluster Bus (ICB), namely ICB-2 (to connect z990 to G5/G6 servers) and ICB-3 (to connect z990 to z800 and z900), have special distribution cards (referred to as STI-2 and STI-3 respectively) occupying I/O slots, so ICBs are also included in this table. ICB-4 (to connect z990 to z990) does not require distribution cards and is therefore not included in the table.

The cryptographic features have PCI cards (either accelerator cards or coprocessors). They do not have ports and do not use fiber optic cables.

Two Logical Channel SubSystems (LCSS's) are supported with a maximum of 256 Channel Path Identifiers (CHPIDs) per LCSS for a total of 512 CHPIDs per system.

Feature Name	Minimum Features	Maximum Features	— Per System —		Purchase Increments
			Maximum Increments/Ports	Increments/Ports per Feature	
ESCON, 16-port	0 ¹	35	512	16 ²	4 ³
FICON Express ⁷	0 ¹	60 ⁹	120 ⁹	2	1
STI-2	0	4	NA	2	NA
ICB-2 link ⁸	0 ¹	NA	8	NA	1
STI-3	0	8	NA	2	NA
ICB-3 link ⁸	0 ¹	NA	16	NA	1
ISC-3 M	0	8	NA	4 ⁴	NA
ISC link ⁸	0 ¹	NA	32	NA	1
OSA-Express ⁷	0	24	48	2	1
PCICA ^{6 7}	0	6 ⁵	12	2 accelerator cards	1
PCIXCC ^{6 7}	0	4	4	1 coprocessor	1

NA = Not Applicable

Notes:

- At least one I/O feature or Coupling Link feature must be present; ESCON/FICON or ICB/ISC.
- One port is available as a spare; 15 ports may be activated.
- 16-port ESCON is offered in 4-port increments. Ports are activated across all installed 16-port ESCON features. After the first pair, ESCON cards are installed in increments of one.
- ISC-3 M is the "mother" card which supports two "daughter" cards. Each daughter card has two ports. ISC-3 is offered in 1-port increments (ISC link); ports are activated across all installed ISC-3 M features.
- The total number of PCICAs cannot exceed two features per I/O cage.
- The total number of PCICAs and PCIXCCs cannot exceed eight features per system.
- The total number of FICON Express, OSA-Express, PCICA, and PCIXCC cannot exceed 20 features per I/O cage and 60 features per system.
- The maximum number of external Coupling Links combined (ICB-2, ICB-3, ICB-4, and active ISC-3 links) cannot exceed 32 per system.
- Maximum of 48 FICON features/96 channels on Model A08.

Trademarks

The e-business logo, zSeries, z/Architecture, z/VM, z/OS, VSE/ESA, FICON, Resource Link, Processor Resource/Systems Manager, PR/SM, IBM eServer, GDPS, Geographically Dispersed Parallel Sysplex, HyperSwap, and Electronic Service Agent are trademarks of International Business Machines Corporation in the United States or other countries or both.

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IBM US Announcement Supplemental Information

May 13, 2003

Education Support

The following worldwide courses are planned for classroom delivery:

- Configuring a zSeries™ 990 (OZ05)
- Complex Systems Availability and Recovery for S/390® and zSeries 900 (ES830)
- z/Architecture™ for IBM zSeries (OZ09T)
- S/390 Parallel Sysplex® Operation and Recovery (H4057)
- Advanced Parallel Sysplex Operations and Recovery Workshop (ES900)

OZ050 will be made available in July. Updates to the other courses will be made available after September 2003. Descriptions of courses and training solutions with links to enrollment are on the Web site:

<http://www-3.ibm.com/services/learning/us/>

Select category zSeries and S/390.

In the U.S. and Canada call 800-IBM-TEACH (426-8322) to enroll in one or more of these classes.

Publications

The following publications are shipped with the product.

Title	Order Number
Installation Manual	G229-9036
Service Guide	G229-9039
Safety Notices	G229-9038
Safety Inspection	G229-9037

Publications for z990 can be obtained via Resource Link™ by accessing the following Web site:

<http://www.ibm.com/servers/resourcelink>

Using the instructions on the Resource Link panels, obtain a user ID and password. Resource Link has been designed for easy access and navigation.

Publications that are available in the Library section of Resource Link are listed below.

1. Application Programming Interfaces (SB10-7030)
2. Capacity Backup Upgrade User's Guide (SC28-6823)
3. CHPID Mapping Tool User's Guide (GC28-6825)

4. ESCON® & FICON™ CTC Reference (SB10-7034)
5. Hardware Management Console Operations Guide (SC28-6819)
6. Installation Manual for Physical Planning (IMPP) (GC28-6824)
7. Installation Manual (G229-9036)
8. IOCP User's Guide (SB10-7037)
9. Maintenance Information for Desktop Consoles (GC38-3115)
10. Maintenance Information for Fiber Optic Links (SY27-2597)
11. Maintenance Information for ThinkPads (GC38-3117)
12. OSA-Express Customer's Guide and Reference (SA22-7935)
13. Parts Catalog (G123-7474)
14. Planning for Fiber Optic Links (GA23-0367)
15. PR/SM™ Planning Guide (SB10-7036)
16. Safety Inspection (G229-9037)
17. Safety Notices (G229-9038)
18. Service Guide (G229-9039)
19. Standalone IOCP User's Guide (SB10-7040)
20. Support Element Operations Guide (SC28-6820)
21. System Overview (SA22-1032)

Technical Information

Specified Operating Environment

Physical Specifications

2084 Servers: The mechanical package for the IBM @server zSeries 990 conforms to EIA™ guidelines for frames. Packaging for new build systems is two frames. Upgrades will be contained within the two frames initially shipped. Note that height reduction for transport is available. Keep in mind that the height of the z990 is equal to the height of a reduced z900. When considering placement of a z990, review clearances for doors to be opened. A new build system at the minimum level will consist of two frames with one I/O cage. The maximum will consist of two frames with three I/O cages. 60 Amp service is required.

This announcement is provided for your information only. For additional information, contact your IBM representative, call 800-IBM-4YOU, or visit the IBM home page at: <http://www.ibm.com>.

Environmental Specifications — Server Models

	New Build Minimum System Model A08 with One I/O Cage	New Build Maximum System Model D32 with Three I/O Cages
Power Requirements 50/60 Hz, kVA	4.5 kW	15.8 kW
Heat Output kBtu/hr	18.36	51.0
Air Flow CFM (at 16°C) Air Flow m ³ /min	580 CFM	1432 CFM
Floor Space		
—Sq meters	2.49	2.49
—Sq feet	26.78	26.78
Including service clearance		
—Sq meters	5.45	5.45
—Sq feet	58.69	58.69
Approximate weight		
System with IBF Feature		
—Kg	1263	2007
—Lb	2779	4415
System without IBF Feature		
—Kg	1174	1738
—Lb	2582	3824

Dimensions

	Depth	Width	Height
System with All Covers			
—Inches	62.1	62.1	76.4
—Centimeters	157.7	157.7	194.1
System with Covers and Reduction			
—Inches	62.1	62.1	70.3
—Centimeters	157.7	157.7	178.5
Each Frame with One Side Cover and without Packaging			
—Inches	46.2	30.7	76.4
—Centimeters	117.3	78.0	194.1
Each Frame on Casters with One Side Cover and with Packaging			
—Inches	47.6	32.4	76.9
—Centimeters	120.9	82.2	195.3
Each Frame with One Side Cover and with Packaging (ARBO)			
—Inches	51.5	36.5	87.6
—Centimeters	130.8	92.7	222.5

See your IBM representative for the available width and height reduction transport option for return of z900 or 9672 systems. There is no feature option available for width. There is height reduction on z990. However, keep in mind that the z990 is equal in height to a height reduced z900. Therefore, one may not automatically assume that a reduction is necessary due to their experience with z900. Check the height and only order as necessary.

Standards

- PCIXCC feature designed for FIPS 140-2 Level 4 Certification —October 2003.

The OSA-Express family of LAN adapters conforms to the following standards.

- Ethernet (10BASE-T)
 - IEEE 802.2 Logical Link Control
 - IEEE 802.3 CSMA/CD
 - ISO/IEC 8802-3
 - DIX Version 2
- Ethernet (100BASE-TX)
 - IEEE 802.3u CSMA/CD
- Ethernet (1000BASE-T)
 - IEEE 802.1p
 - IEEE 802.1q
 - IEEE 802.3ab
 - IEEE 802.3ac
 - IEEE 802.3ad

- IEEE 802.3u
- IEEE 802.3x
- PCI v2.2
- Ethernet (1000BASE-SX, 1000BASE-LX)
 - DIX Version 2
 - IEEE 802.1p
 - IEEE 802.1q
 - IEEE 802.3ac
 - IEEE 802.3ad
 - IEEE 802.3x
 - IEEE 802.3z
 - PCI v2.2
- Token Ring
 - IEEE 802.2 Logical Link Control
 - IEEE 802.5 MAC
 - ISO/IEC 8802-5

The OSA-Express family of LAN adapters have the following characteristics:

OSA-Express Gigabit Ethernet SX (#1365)

- Data rate: 1000 Mbps (1 Gbps)
- Operating mode: Full duplex
- Channel type: OSD (QDIO)
- Traffic type: TCP/IP only
- Frame size: IEEE 802.3: 1492 bytes
- Frame size: DIX V2: 1500 bytes; for jumbo frame 8992 bytes
- Connector type: LC Duplex
- Port count: Two
- Cable types: Multimode fiber (50 or 62.5 micron)

OSA-Express Gigabit Ethernet LX (#1364)

- Data rate: 1000 Mbps (1 Gbps)
- Operating mode: Full duplex
- Channel type: OSD (QDIO)
- Traffic type: TCP/IP only
- Frame size: IEEE 802.3: 1492 bytes
- Frame size: DIX V2: 1500 bytes; for jumbo frame 8992 bytes
- Connector type: LC Duplex
- Port count: Two
- Cable types: Single mode fiber (9 micron); accommodates reuse of existing multimode fiber (50 or 62.5 micron) when used with a pair of mode conditioning patch (MCP) cables

OSA-Express 1000BASE-T Ethernet (#1366)

- Data rate: 10 Mbps, 100 Mbps, or 1000 Mbps
- Operating modes: Auto-negotiate, half duplex, full duplex
- Channel types: OSD (QDIO) or OSE (non-QDIO)
- Traffic types: TCP/IP and/or SNA/APPN® /HPR
- Frame size: IEEE 802.3: 1492 bytes
- Frame size: DIX V2: 1500 bytes; for jumbo frame 8992 bytes (when operating at 1 Gbps)
- Connector type: RJ-45
- Port count: Two

- Cable type: EIA/TIA Category 5 Unshielded Twisted Pair (UTP) cable with a maximum length of 100 meters (328 feet)

OSA-Express Token Ring (#2367)

- Data rate: 4 Mbps, 16 Mbps, or 100 Mbps
- Operating modes: Autosense, 4 Mbps half or full duplex, 16 Mbps half or full duplex, 100 Mbps full duplex
- Channel types: OSD (QDIO) or OSE (non-QDIO)
- Traffic types: TCP/IP and/or SNA/APPN/HPR
- Frame size: 4 Mbps, up to 4550 bytes; 16/100 Mbps, up to 18200 bytes
- Connector types: RJ-45 or DB-9 D shell
- Port count: Two
- Cable types: EIA/TIA Category 5 Unshielded Twisted Pair (UTP) cable with a maximum length of 100 meters (328 feet) and an RJ-45 connector or a Shielded Twisted Pair (STP) cable with a DB-9 D Shell connector

Operating Environment: Refer to the *zSeries Installation Manual — Physical Planning (IMPP)* that is available via IBM's Resource Link.

Hardware Requirements

Specified Operating Environment: The functions delivered on June 16, 2003, are included with MCM EC# J12312, HMC EC# J11855, and CFCC Product Release Level 12 Service Level 12.06 EC# J12240.

z990 supports LPAR mode only.

In a Parallel Sysplex environment with z990 servers, all z900- or z800-based Coupling Facilities must be running CFCC Level 12 with current maintenance including CFCC compatibility code. G5/G6-based Coupling Facilities must be running CFCC Level 11.

Peripheral Hardware and Device Attachments: For the appropriate peripheral hardware and device attachments, contact your IBM representative.

IBM devices previously attached to IBM S/370™ or S/390 systems are supported for attachment to z990 I/O channels, unless noted. The subject I/O devices must meet ESCON or FICON architecture requirements to be supported. I/O devices that meet OEMI architecture requirements are supported only via a parallel channel converter. Prerequisite Engineering Change Levels may be required. For further details, contact IBM service personnel.

Note: IBM cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions regarding the capabilities of non-IBM products should be addressed to the suppliers of those products.

TKE Workstation: Customers with TKE 3.X installed workstations may carry forward the features listed below to control legacy systems only. An update from TKE 3.0 or TKE 3.1 code level to TKE 4.0 code level is required to control the z990. Workstations updated to the TKE 4.0 code level may be used to control 9672 Generation 5 and 6, z800, z900, and z990 servers. To use the TKE function on a z990, the PCIX Cryptographic Coprocessor (PCIXCC) feature, the TKE 4.0 code level, and the CP Assist for Cryptographic Function (CPACF) must be installed.

- TKE with Token Ring (#0866)
- TKE with Ethernet (#0869)
- TKE with Token Ring (#0876)
- TKE with Ethernet (#0879)
- TKE with Token Ring (#0886)
- TKE with Ethernet (#0889)

Software Requirements

Mode of Operation: The z990 supports LPAR mode only.

Linux for zSeries Support: The currently available distributions SuSE SLES 7, SuSE SLES 8, Red Hat 7.1, and Red Hat 7.2 support compatibility and exploitation of 30 LPARs and 2 LCSS's. Support to further exploit z990 functions will be delivered as an Open Source Contribution via:

<http://www10.software.ibm.com/developerworks/opensource/linux390>

An initial version is planned to be delivered on June 30, 2003, to exploit the z990 for users performing their own Linux build. An updated version is planned to follow on July 25, 2003, and is intended for our Linux Distribution Partners to package for z990 exploitation support. IBM is working with its distribution partners to provide these functions in future distribution releases.

z/OS™, z/VM™, VSE/ESA™, and TPF Support and Availability by Date: The new models of IBM @server zSeries 990 are planned to be supported on the following schedule:

- May 13, 2003
 - TPF V4R1 is compatible with z990.
 - z/VM compatibility support for V3.1, z/VM V4.2, and z/VM V4.3 and limited exploitation for two LCSS's when running on a Z990 server. Dynamic I/O configuration is supported when only LCSS0 is defined. Refer to the z/VM subset of the 2084DEVICE Preventive Service Planning (PSP) bucket prior to installing a z990.
- June 13, 2003
 - z/OS V1R4 z990 Compatibility Support: This orderable, unpriced, and optional feature is required to allow z/OS V1R4 to run on a z990 server. It is required on all systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF image is greater than 15 (x"F"). With regards to cryptography, it provides support for the PCICA feature and the CP Assist for Cryptographic Function for z/OS V1R4.
 - z990 Compatibility for Selected Releases: This Web deliverable provides support to allow OS/390® V2.10, z/OS V1.2, and z/OS 1.3 to run on a z990. It is required on all OS/390 V2.10, z/OS V1.2, z/OS 1.3, and z/OS.e V1.3 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F").
 - z990 Cryptographic CP Assist Support for z/OS V1R3: This Web deliverable provides support in z/OS V1.3 for the PCICA adapter and CP Assist for Cryptographic Function (#3863).
 - z/OS.e V1.4 z990 Coexistence: This orderable, unpriced, and optional feature is required on all z/OS.e V1.4 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is
- June 16, 2003
 - VSE/ESA compatibility is provided on VSE/ESA V2 R5, VSE/ESA V2 R6, and VSE/ESA V2 R7. For the latest information on compatibility support requirements, refer to the VSE subset of the 2084DEVICE Preventive Service Planning (PSP) bucket prior to installing the z990 server.
- August 15, 2003
 - z/VM V4.4 and later releases will provide additional exploitation support for the following functions:
 - Two Logical Channel SubSystems.
 - Dynamic I/O configuration in only LCSS0.
 - Adapter interruptions for OSA-Express and FCP Channels.
 - Performance Assist for V=V guests in z/VM environment.
- October 31, 2003
 - z/OS V1.4 z990 Exploitation Support: This orderable, unpriced, and optional feature provides exploitation support for two Logical Channel SubSystems and 30 LPARs.
 - z990 Cryptographic Support: This Web deliverable will provide exploitation support for z/OS 1.4 for PCIXCC (#0868).
 - z/OS.e V1.4 Coexistence Update: This orderable, unpriced, and optional feature allows customers to maintain a consistent code base for z/OS and z/OS.e. It contains the z/OS.e Coexistence feature. Note that z/OS.e cannot execute on a z990 server.
 - z/VM V4.4 and later releases will provide further exploitation support for the following functions:
 - 30 LPARs.
 - Dynamic I/O Support for LCSS0 and LCSS1.
 - Internal Spanned Channels (ICs and HiperSockets).
- November 28, 2003
 - z990 Cryptographic Support: This Web deliverable extends exploitation support for the CP Assist for Cryptographic Function (#3863), PCICA, and PCIXCC features to z/OS V1.3 and z/OS V1.2.
- December 31, 2003
 - z990 Cryptographic Support: This Web deliverable extends exploitation support for the CP Assist for Cryptographic Function (#3863), PCICA, and PCIXCC features to OS/390 V2.10.
- Note that z/OS.e cannot execute on a z990 server. z/OS.e releases are provided to permit coexistence within a Parallel Sysplex and maintain consistent code levels with z/OS.

Software Support Availability by Operating System and Level: The new models of IBM @server zSeries 990 are planned to be supported by operating system release on the schedules indicated below for each release.

z/OS V1.4

- June 13, 2003

- z/OS V1.4 z990 Compatibility Support Feature: This orderable, unpriced, and optional feature is required to allow z/OS V1.4 to run on a z990 server. It is also required on all systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF image is greater than 15 (x"F"). With regards to cryptography, it provides support for the PCICA feature and the CP Assist for Cryptographic Function for z/OS V1R4.

- October 31, 2003

- z/OS V1.4 z990 Exploitation Support: This orderable, unpriced, and optional feature provides exploitation support for two Logical Channel SubSystems and 30 LPARs.
- z990 Cryptographic Support: This Web deliverable will provide exploitation support for z/OS V1R4 for PCIXCC (#0868).

z/OS V1.3

- June 13, 2003

- z990 Compatibility for Selected Releases: This Web deliverable provides support to allow OS/390 V2.10, z/OS V1.2, and z/OS 1.3 to run on a z990. It is required on all OS/390 V2.10, z/OS V1.2, z/OS 1.3, and z/OS.e V1.3 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F").
- z990 Cryptographic Assist Support for z/OS V1R3: This Web deliverable provides support on z/OS V1.3 for the PCICA adapter and CP Assist for Cryptographic Function (#3863).

- November 28, 2003

- z990 Cryptographic Support: This Web deliverable will provide exploitation support for z/OS V1R3 for PCIXCC (#0868).

z/OS V1.2

- June 13, 2003

- z990 Compatibility for Selected Releases: This Web deliverable provides support to allow OS/390 V2.10, z/OS V1.2, and z/OS 1.3 to run on a z990. It is required on all OS/390 V2.10, z/OS V1.2, z/OS 1.3, and z/OS.e V1.3 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F").

- November 28, 2003

- z990 Cryptographic Support: This Web deliverable will extend exploitation support for the CP Assist for Cryptographic Function (#3863), PCICA, and PCIXCC features to z/OS V1.2.

OS/390 V2.10

- June 13, 2003

- z990 Compatibility for Selected Releases: This Web deliverable provides support to allow OS/390 V2.10, z/OS V1.2, and z/OS 1.3 to run on a z990. It is required on all OS/390 V2.10, z/OS V1.2, z/OS 1.3, and z/OS.e V1.3 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F").

- December 31, 2003

- z990 Cryptographic Support: This Web deliverable will provide exploitation support for the CP Assist for Cryptographic Function (#3863), PCICA, and PCIXCC features on OS/390 V2.10.

z/OS.e V1.3

- June 13, 2003

- z990 Compatibility for Selected Releases: This Web deliverable provides support to allow OS/390 V2.10, z/OS V1.2, and z/OS 1.3 to run on a z990. It is required on all OS/390 V2.10, z/OS V1.2, z/OS 1.3, and z/OS.e V1.3 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F"). z/OS.e cannot execute on a z990 server.

z/OS.e V1.4

- June 13, 2003

- z/OS.e V1.4 z990 Coexistence Feature. This orderable, unpriced, and optional feature is required on all z/OS.e V1.4 systems in a Parallel Sysplex when a z/OS or CF image in that same Parallel Sysplex is running on a z990 and the LPAR ID of the operating system or CF is greater than 15 (x"F").

- October 31, 2003

- z/OS.e V1.4 Coexistence Update: This Web deliverable allows customers to maintain a consistent code base for z/OS and z/OS.e. It contains the z/OS.e Coexistence feature. Note that z/OS.e cannot execute on a z990 processor.

z/VM

- May 13, 2003

- z/VM compatibility support for V3.1, z/VM V4.2, and z/VM V4.3 and limited exploitation for two LCSS's when running on a z990 server. Dynamic I/O configuration is supported when only LCSS0 is defined. Refer to the z/VM subset of the 2084DEVICE Preventive Service Planning (PSP) bucket prior to installing a z990.

- August 15, 2003

- z/VM V4.4 and later releases will provide additional exploitation support for the following functions:
 - Two Logical Channel SubSystems.
 - Δ Dynamic I/O configuration in only LCSS0.
 - Adapter interruptions for OSA-Express and FCP Channels.
 - Performance Assist for V=V guests in z/VM environment.

- October 31, 2003

- z/VM V4.4 and later releases will provide further exploitation support for the following functions:
 - 30 LPARs.
 - Dynamic I/O Support for LCSS0 and LCSS1.
 - Internal Spanned Channels (ICs and HiperSockets).

VSE/ESA

- June 16, 2003
 - VSE/ESA compatibility is provided on VSE/ESA V2 R5, VSE/ESA V2 R6, and VSE/ESA V2 R7. For the latest information on compatibility support requirements, refer to the VSE subset of the 2084DEVICE PSP bucket prior to installing the z990 server.

Software Requirements for the FICON Express Features: The minimum software requirements for the FICON Express features installed in a z990 are identified.

FICON Express (FCV CHPID type) attachment to the ESCON Director Model 5 FICON Bridge feature requires at a minimum:

- OS/390 V2.10
- z/VM V3.1, z/VM V4.2
- VSE/ESA V2.5
- TPF V4.1 at PUT 16

FICON Express (FC CHPID type), including Channel-To-Channel (CTC), requires at a minimum:

- OS/390 V2.10
- z/VM V3.1, z/VM V4.2
- VSE/ESA V2.5
- Linux Kernel V2.4
- TPF V4.1 at PUT 16

FICON Express (FCP CHPID type), for support of Linux environments, requires at a minimum:

- z/VM V4.3 (for Linux as a guest under z/VM)
- z/VM V4.4 for
 - Performance Assist for Adapter Interruptions
 - Performance Assist for V=V Guests
- SuSE Linux Enterprise Server 8

For current SuSE security fixes and patches, refer to the SuSE Linux Maintenance Web site at:

<http://support.suse.de/psdb/>

Cascaded FICON Directors (FC CHPID type), including CTC with Cascading, requires at a minimum:

- OS/390 V2.10 (see note below)
- z/OS V1.3 with PTFs
- z/OS V1.4 with PTFs
- z/VM V4.4
- VSE/ESA V2.5
- Linux Kernel V2.4
- TPF V4.1 at PUT 16

Note: OS/390 V2.10 can support a cascaded configuration. z/OS V1.3 is required in an LPAR to dynamically define a cascaded director, for dynamic I/O changes, and to use the enhanced display functions. Refer to the 9032/9042 PSP buckets.

Software Requirements for Cryptographic Functions: The following are required as indicated to support cryptographic function on z990:

- z990 Cryptographic Assist Support for z/OS V1.3: This Web deliverable will provide support for the CP Assist for Cryptographic Function (#3863) and the PCICA (#0862) feature for z/OS V1R3.
- z/OS V1.4 z990 Compatibility Support: This orderable, unpriced, and optional feature provides the CP Assist for Cryptographic Function (#3863) and the PCICA (#0862) feature on z/OS V1R4.

- z990 Cryptographic Support: This Web deliverable provides support for the CP Assist for Cryptographic Function (#3863), PCICA (#0862), and PCIXCC (#0868) features for z/OS V1R4, z/OS V1R3, z/OS V1R2, and OS/390 V2R10. A staged rollout is planned. Review the Software Support Availability by Operating System and Level of the Software Requirements for specific plans for each software level.

The following is required for User-Defined Extensions (UDX) support:

- One or more PCIXCC features
- An HMC
- A TKE workstation at 4.0 code level, if the UDX requires access control point
- z/OS V1.4
- z990 Cryptographic Support a Web deliverable feature

The minimum software requirements for the CP Assist for Cryptographic Function (CPACF), PCI Cryptographic Accelerator (PCICA), and PCIX Cryptographic Coprocessor (PCIXCC) are as follows:

For CPACF:

- z/OS V1.3
- z/OS V1.2, OS/390 V2.10 (available by year end 2003)
- z/VM V3.1, V4.2, and later

For PCICA:

- z/OS V1.3
- z/OS V1.2, OS/390 V2.10 (available by year end 2003)
- z/VM V4.2 with PTFs (for Linux Guests only)
- VSE/ESA V2.7 and IBM TCP/IP for VSE/ESA V1.5
- Linux 2.4.7 for zSeries

For PCIXCC:

- z/OS V1.4
- z/OS V1.2, V1.3, OS/390 V2.10 (available by year end 2003)

Software Requirements for the OSA-Express Features:

The minimum software requirements for the OSA-Express features available on a z990 are identified. Other functions, not identified in this announcement, may also have unique software prerequisites. For further details, including the QDIO and non-QDIO modes of operation, consult the *Open Systems Adapter — Express Customer's Guide and Reference* (SA22-7935) or refer to the Preventive Service Planning (PSP) bucket for OSA.

- OS/390 V2.10, all features and modes
- z/VM V3.1, all features and modes with exception noted below
- z/VM V4.2 (required for OSA-Express Token Ring in QDIO mode)
- VSE/ESA V2.6, all features and modes
- Linux Kernel V2.4 (supports the QDIO mode only)
- TPF 4.1 at PUT 13 (supports Gigabit Ethernet only)

Checksum Offload for IPv4 Packets applies to OSA-Express Gigabit Ethernet (#1364, #1365) and 1000BASE-T Ethernet (#1366) when in QDIO mode (OSD CHPID type) and is supported by the following operating systems.

- Linux for zSeries. Refer to the Web site at the end of this section.

- z/OS V1.5.

VLAN (802.1q) support applies to OSA-Express 1000BASE-T Ethernet (#1366), Fast Ethernet (#2366), and Gigabit Ethernet (#2364, #2365, #1364, #1365) when in QDIO mode (OSD CHPID type) and is supported by the following operating systems.

- z/OS V1.5 Communications Server
- z/VM V4.4

Intrusion Detection Services applies to all of the OSA-Express features supported on z990 when in QDIO mode (OSD CHPID type) and is supported by the following operating system.

- z/OS V1.5 Communications Server

160 TCP/IP stacks per OSA-Express port applies to all of the OSA-Express features supported on z990 when in QDIO mode (OSD CHPID type).

There are no prerequisite software requirements.

New Version of OSA/SF and Java™ GUI: A new version of the Open Systems Adapter Support Facility (OSA/SF) is available. This deliverable is a complete replacement of OSA/SF Version 2 Release 1 (5655-B57), is integrated in the operating systems, and will be shipped as a PTF where applicable. Refer to the appropriate PSP bucket. This support applies to all of the OSA-Express and OSA-2 features and to all servers that support them. The new version of OSA/SF with the Java GUI is integrated in the operating systems and is available as follows:

- z/OS V1.4 z990 Compatibility Support feature.
- z990 Compatibility for Selected Releases Web deliverables.
 - OS/390 V2.10, z/OS V1.2, z/OS V1.3.
 - New version can coexist with OSA/SF V2.1.
- Integrated in z/VM V4.4.
 - Overlays OSA/SF V2.1.
- z/VM V3.1, z/VM V4.2, z/VM V4.3 delivered as a PTF.
 - Overlays OSA/SF V2.1.
- VSE/ESA V2.6 delivered as a PTF.
 - Overlays OSA/SF V2.1.

OSA-Express Direct SNMP subagent support for dot3StatsTable applies to all of the OSA-Express Ethernet features supported on z990, whether GbE, 1000BASE-T Ethernet, or Fast Ethernet when in QDIO mode (OSD CHPID type).

- z/OS V1.4 or later with PTFs. Refer to the PSP bucket.

Software Requirements for HiperSockets Enhancements

HiperSockets Support in a VSE/ESA Environment

- VSE/ESA V2.7

HiperSockets VLAN (802.1q) support is supported by the following operating system.

- Linux for zSeries. Refer to the Web site at the end of this section.

HiperSockets support — 16 Internal LANs and 4096 TCP/IP stacks is new for HiperSockets (IQD CHPID type), and is exclusive to z990.

There are no prerequisite software requirements.

HiperSockets support of Broadcast for IPv4 packets is supported by the following operating systems.

- Linux for zSeries. Refer to the Web site.
- z/OS V1.5.
- z/VM V4.4.

<http://www10.software.ibm.com/developerworks/opensource/linux390>

HiperSockets (IQD CHPID type) Spanned Channels is supported by the following operating systems.

- z/OS support is available via the following PTFs.
 - OA02212/UA01784 for z/OS V1.2 and z/OS V1.3
 - UA01785 for z/OS V1.4
- z/VM V3.1, z/VM V4.2, z/VM V4.3, and z/VM V4.4

HiperSockets — Transparently Bridging Traffic (L2S Support)

- Linux for zSeries. Support is expected to be aligned with delivery of the hardware support which is planned for October 31, 2003.

Software Requirements for Performance Assists

Adapter Interruptions are applicable to the FICON Express features (FCP CHPID type) and OSA-Express features (OSD CHPID type) and are supported by the following operating systems.

- z/VM V4.4.
- Linux for zSeries. Refer to the Web site listed previously.

The Performance Assist for V=V Guests is applicable to the FICON Express features (FCP CHPID type), HiperSockets (IQD CHPID type), and OSA-Express features (OSD CHPID type) and is supported by the following operating system.

- z/VM V4.4

Compatibility: zSeries 800 may not be upgraded to a zSeries 990.

Limitations

Mode of Operation: The z990 supports LPAR mode only. Basic mode will not be supported.

OS/390 2.10 and z/OS Limited to LCCS0: OS/390 V2.10, z/OS V1.2, z/OS V1.3, and z/OS V1.4, with z990 compatibility code installed, can only be IPLed using LCCS0 when running in LPAR mode. However, these releases may run as a guest under z/VM 4.4, where z/VM 4.4 is using any channel subsystem. Therefore, you may run z/OS (or OS/390 V2.10) in LCSS0, and z/VM in LCSS1 where one or more z/OS images are running as guests. Note the z/OS V1.4 with the z/OS V1.4 z990 Exploitation feature installed can be IPLed using any LCSS.

Dynamic I/O: Support for dynamic I/O configuration, with z/OS V1.4 z990 Exploitation Support and z/VM V4.4, is planned to be extended to allow channel paths, control units, and devices to be dynamically added, changed, and deleted in multiple LCSS's. However, dynamic I/O configuration is only supported in LCSS0 until October 2003.

Until z/OS V1.4 z990 Exploitation Support is available, z/OS can run only in a single LCSS. Therefore, z/OS may only execute in LCSS0. z/VM V4.4 may execute in LCSS0 and LCSS1.

z/VM is providing compatibility support for V3.1, V4.2, and V4.3 and limited exploitation of two LCSS's when running on a z990 server. Dynamic I/O configuration is supported when only LCSS0 is defined. z/VM V4.4 may execute in LCSS0 and LCSS1. However, until October 2003, dynamic I/O is supported in only LCSS0.

Refer to the **Software Requirements** section for more information on availability dates for z/OS and z/VM.

When z/VM is the controlling LPAR, z/VM's dynamic I/O support is designed to handle all of the new elements of the multiple Channel SubSystem facility for dynamic I/O configuration changes. To dynamically change the I/O configuration, one of two techniques can be employed:

- z/VM Control Program (CP) suite of interactive dynamic I/O commands
- HCM/HCD — New configuration management tools

TKE Limitations: Customers with TKE 3.X installed workstations may carry forward the features listed below to control legacy systems only. An update from TKE 3.0 or TKE 3.1 code level to TKE 4.0 code level is required to control the z990. Workstations updated to the TKE 4.0 code level may be used to control 9672 Generation 5 and 6, z800, z900, and z990 servers. To use the TKE function on a z990, the PCI Cryptographic Coprocessor (PCICC) feature, the TKE 4.0 code level, and the CP Assist for Cryptographic Function (CPACF) must be installed. Refer to the **Software Requirements** section for availability dates.

- TKE with Token Ring (#0866)
- TKE with Ethernet (#0869)
- TKE with Token Ring (#0876)
- TKE with Ethernet (#0879)
- TKE with Token Ring (#0886)
- TKE with Ethernet (#0889)

Cryptographic Limitations on the z990: The maximum number of PCICC features (#0868) is limited to four per system (one processor per feature). The total number of PCICAs (#0862) and PCICCs (#0868) cannot exceed eight per system. The number of PCICA features cannot exceed six (12 accelerator features). To enable any cryptographic function on the z990, the CP Assist for Cryptographic Function (#3863) must be installed and enabled to use PCICC, TKE 4.0 code level hardware, and/or PCICA. Review the **Hardware Requirements**, **Software Requirements**, and **Planned Availability** sections.

SNA Operations Management: With the industry move to TCP/IP networks, Systems Network Architecture (SNA) Operations Management commands will no longer be supported on z990 servers. These commands were previously used by the System Automation for OS/390 product as well as NetView®. It is recommended that you now use the Simple Network Management Protocol (SNMP) Application Programming Interfaces (APIs) for your automation needs.

- If you previously used the System Automation for OS/390 product, you must now use Version 2.2 or later. This will allow you to define an automation policy for SNMP APIs rather than a policy for SNA Operations Management commands.
- If you directly used the SNA Operations Management commands on NetView, you must now use an SNMP agent and the SNMP APIs for systems automation management.

For detailed information on the SNMP APIs commands and environment requirements, refer to *zSeries*

Application Programming Interfaces (SB10-7030). For more information on the SNA Operations Management command support that is not offered on z990, refer to *Managing Your Processors* (GC38-0452). Both publications are available on Resource Link.

Planning Information

Customer Responsibilities

Customer Responsibilities for Site Preparation: Information on customer responsibilities for site preparation can be found in the following publications which are available in the Library section of Resource Link at:

<http://www.ibm.com/servers/resourceLink>

- System Overview (SA22-1032)
- Systems Assurance Product Review (SAPR) Guide (SA02-018)
- Planning for Fiber Optic Links (GA23-0367)
- zSeries 990 Installation Manual — Physical Planning (GC28-6824)

This document contains information necessary for planning the physical installation of a zSeries 990 system. It includes physical specifications, power and cooling data, cabling, and additional details required for physical installation planning. The intended audience for this document includes all customer personnel who are responsible for providing the necessary and appropriate environment for the successful installation and operation of a zSeries 990 system.

Cable Orders

Fiber Optic Cable Orders: Fiber optic cables for z800, z900, and z990 are available via IBM Networking Services.

IBM Networking Services is enhancing its fiber cabling services to ensure that IBM has a comprehensive set of scalable solutions to address all cabling requirements, from product level to enterprise level. IBM Network Integration and Deployment Services for zSeries fiber cabling provides planning and installation services for individual fiber optic connections. IBM Network Integration and Deployment Services for enterprise fiber cabling provides planning, IBM Fiber Transport System trunking components, and installation services for small, medium, and large enterprises.

IGS has the expertise and personnel available to effectively plan and deploy the appropriate cabling with the future in mind. These services may include planning, consultation, cable selection, installation, and documentation, depending upon the services selected.

These services are designed to be right-sized for your products or the end-to-end enterprise, and to take into consideration the requirements for all of the protocols/media types supported on zSeries (for example, ESCON, FICON, Coupling Links, OSA) whether the focus is the data center, Storage Area Network (SAN), Local Area Network (LAN), or end-to-end enterprise.

IBM Networking Services is designed to deliver convenient, packaged services to help reduce the complexity of planning, ordering, and installing fiber optic cables. The appropriate fiber cabling is selected based upon the product requirements and the installed fiber plant.

The services are packaged as follows:

Under the **zSeries fiber cabling services** umbrella there are **three** options to provide individual fiber optic cables (jumper cables, conversion kits, MCP cables) for connecting to z800, z900, or z990, each option incorporating a specific set of services.

- Option 1 — Fiber optic jumper cabling package (available today for z800 and z900). IBM does the detailed planning. This option includes planning, new cables, installation, and documentation. An analysis of the zSeries channel configuration, I/O devices, and any existing fiber optic cabling is required to determine the appropriate fiber optic cables.
- Option 2 — Fiber optic jumper cable migration and reuse for a zSeries upgrade (new option). IBM organizes the existing fiber optic cables based upon the new z990 connection details. Relabeling, rerouting, and reconnection to the appropriate z990 channels is performed. New cables are not offered as a part of this option.
- Option 3 — Fiber optic jumper cables and installation (new option). The customer tells us what they need. They do the detailed planning. The service includes new cables, installation, and documentation. Planning and providing the list of required cables are customer responsibilities.

Options 1 and 2 can be combined within one statement of work to provide complete upgrade coverage.

Under the **enterprise fiber cabling services** umbrella there are **two** options to provide IBM Fiber Transport System (FTS) trunking commodities (fiber optic trunk cables, fiber harnesses, panel-mount boxes) for connecting to the z800, z900, and z990.

- Option 1 — zSeries fiber optic trunk cabling package (new option). IBM reduces the cable clutter under the floor. An analysis of the zSeries (z800, z900, z990) channel configuration and any existing fiber optic cabling is performed to determine the required FTS fiber optic trunking commodities (trunk cables, harnesses, panel-mount boxes). This option includes zSeries planning, FTS fiber optic trunking commodities, installation, and documentation. This option does not include enterprise-level planning.

- Option 2 — Enterprise fiber cabling services. IBM organizes the entire enterprise. This option includes enterprise planning, new cables, fiber optic trunking commodities, installation, and documentation. This is the most comprehensive set of services.

Refer to the services section of Resource Link for further details. Access Resource Link at:

<http://www.ibm.com/servers/resourcelink>

Cabling Responsibilities: Fiber optic cables, cable planning, labeling, and placement are all customer responsibilities for new installations and upgrades. Fiber optic conversion kits and Mode Conditioning Patch (MCP) cables are not orderable as features on z990. Installation Planning Representatives (IPRs) and System Service Representatives (SSRs) will not perform the fiber optic cabling tasks without a services contract.

The following tasks are required to be performed by the customer prior to machine installation.

- All fiber optic cable planning.
- All purchasing of correct, qualified, fiber optic cables.
- All installation of any required MCP cables.
- All installation of any required Conversion Kits.
- All routing of fiber optic cables to correct floor cutouts for proper installation to server.
 - Use the Physical CHannel Identifier (PCHID) report or the report from the CHannel Path Identifier (CHPID) Mapping Tool to accurately route all cables.
- All labeling of fiber optic cables with PCHID numbers for proper installation to server.
 - Use the PCHID report or the report from the CHPID Mapping Tool to accurately label all cables.

Additional service charges may be incurred during the server installation if the above cabling tasks are not accomplished as required.

The table lists the connectors and cabling supported for each of the features available for ordering on the z990. For convenience, those features brought forward on an upgrade from z900 are also listed.

Feature Number	Feature Name	Connector Type	Cable Type
0219	ISC-3 link	LC Duplex	9 micron SM
6154	ETR	MTRJ	62.5 micron MM
2323	16-port ESCON	MTRJ	62.5 micron MM ¹
2319	FICON Express LX	LC Duplex	9 micron SM ²
2320	FICON Express SX	LC Duplex	50, 62.5 micron MM
1364	OSA-E GbE LX ³	LC Duplex	9 micron SM
2364 ⁴	OSA-E GbE LX	SC Duplex ⁵	9 micron SM
1365	OSA-E GbE SX	LC Duplex	50, 62.5 micron MM
2365 ⁴	OSA-E GbE SX	SC Duplex ⁵	50, 62.5 micron MM
1366	OSA-E 1000BASE-T ⁶	RJ-45	Category 5 UTP ⁷
2366 ⁴	OSA-E Fast Ethernet	RJ-45	Category 5 UTP
2367	OSA-E Token Ring	RJ-45	UTP or STP ⁸

1. MM is multimode fiber.
2. SM is single mode fiber.
3. OSA-E refers to OSA-Express.
4. Brought forward to z990 on an upgrade from z900.
5. The OSA-Express GbE features brought forward from z900 have a different connector (SC Duplex) than the new OSA-E GbE features (LC Duplex).
6. 1000BASE-T is the new Ethernet feature.
7. UTP is Unshielded Twisted Pair.
8. STP is Shielded Twisted Pair.

Fiber Quick Connect (FQC), a fiber harness integrated in the zSeries frame for “quick” connect, is offered as a feature on zSeries for connection to ESCON channels.

Cables for Integrated Cluster Bus (ICB) links continue to be available as features. Refer to the *Sales Manual* for a list of these cables and their feature numbers.

For further details regarding the features, refer to the *Sales Manual*, the *Physical Planning Manual*, or the *General Information Manual (GIM)* available on Resource Link.

Note: IBM Networking Services can satisfy your fiber optic as well as your copper cabling requirements.

Installability: Average Installation time for a zSeries 990 is approximately 16 hours. This does not include planning hours. This assumes the Pre-Installation Configuration Service, a full System Assurance Product Review, and implementation of the cable services have been performed. See your IBM representative for details on these services.

Security, Auditability, and Control

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

Terms and Conditions

This product is available for purchase under the terms of the IBM Customer Agreement.

Each IBM machine is manufactured from parts that may be new or used. In some cases, a machine may not be new and may have been previously installed.

Regardless, IBM’s appropriate warranty terms apply.

IBM Global Financing: Yes

Warranty Period: One year

Warranty Service: IBM On-Site Repair (IOR), 24 hours a day, 7 days a week, same-day response

Usage Plan Machine: No

IBM Hourly Service Rate Classification: Three

Mid-Range System Option: No

Corporate Service Option: The announced product is an eligible machine for the Corporate Service Option of the IBM Customer Agreement. A revised exhibit will be available at a later date.

	Discount Percent	
	Three Year	Five Year
System	14%	19%

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

Rental Offering: No

Field-Installable Features: Yes

Model Conversions: Yes

Machine Installation: Installation is performed by IBM. IBM will install the machine in accordance with the IBM installation procedures for the machine. In the United States, contact IBM at 800-IBM-SERV (426-7378); in other countries contact the local IBM office. Information on site preparation, physical requirements, and installation (operating) environment and any cabling included in the installation along with the approximate installation time in hours can be found in the *zSeries 990 Installation Manual — Physical Planning (GC28-6824)*.

Cabling Responsibilities: The following tasks must be performed by the customer prior to machine installation if the cabling services contract is not purchased:

- All fiber optic cable planning.
- All purchasing of correct, qualified, fiber optic cables.
- All installation of any required Mode Conditioning Patch cables.
- All installation of any required Conversion Kits.
- All routing of fiber optic cables to correct floor cutouts for proper installation to machine.
 - Use the Physical CHannel Identifier (PCHID) report or the report from the Channel Path Identifier (CHPID) Mapping Tool to accurately route all cables.
- All labeling of fiber optic cables with PCHID numbers for proper installation to machine.
 - Use the PCHID report or the report from the CHPID Mapping Tool to accurately label all cables.

Additional service charges may be incurred during the machine installation if the above cabling tasks are not accomplished as directed.

Customer requests for installation of items not covered in the installation guide may be performed at IBM’s hourly service rate designated for this machine.

Graduated Charges: Yes

The following table provides the Software Groups and Processor MSUs for all zSeries z990 servers announced to date.

2084	Processor MSUs	Software Group	2084	Processor MSUs	Software Group
301	77	80	317	886	IMLC
302	147	IMLC	318	927	IMLC
303	213	IMLC	319	973	IMLC
304	277	IMLC	320	1018	IMLC
305	337	IMLC	321	1062	IMLC
306	395	IMLC	322	1106	IMLC
307	451	IMLC	323	1149	IMLC
308	503	IMLC	324	1192	IMLC
309	551	IMLC	325	1234	IMLC
310	601	IMLC	326	1276	IMLC
311	647	IMLC	327	1317	IMLC
312	691	IMLC	328	1358	IMLC
313	733	IMLC	329	1398	IMLC
314	772	IMLC	330	1436	IMLC
315	810	IMLC	331	1474	IMLC
316	844	IMLC	332	1512	IMLC

Licensed Internal Code: IBM Licensed Internal Code (LIC) is licensed for use by a customer on a specific machine, designated by serial number, under the terms and conditions of the IBM Agreement for Licensed Internal Code, to enable a specific machine to function in accordance with its specifications, and only for the capacity authorized by IBM and for which the customer has paid.

Prices

Prices are available upon request.

Products

Description	Machine Type	Model	Feature Number	MMMC Indicator	Init/MES
IBM eServer™ zSeries 990	2084	A08		X	
		B16		X	
		C24		X	
		D32		X	
HMC			0075		Both
I/O Cage Full Card Airflo			0112		Both
I/O Cage ISC-D Airflow			0113		Both
CEC			0152		Both
ISC-Mother Card			0217		Both
ISC-Daughter Card			0218		Both
ISC-3 Port on F/C 218			0219		Both
STI AFB-C 1/2 Airflow			0225		Both
ICB Cable Connect ICB2			0226		Both
ICB Cable Connect ICB3			0227		Both
ICB-4 Cable Connects			0228		Both
eSTI-M Card			0322		Both
IFL			0516	X	Both
Unassigned IFL			0517		Both
Integrated Coupling Facil			0518	X	Both
Optional SAP			0519		Both
CP			0716		Both
TKE 4.0 Card Code			0851		Both
PCI Crypto Accel			0862		Both
PCI X Crypto Coprocessor			0868		Both
TKE w/TR			0886		Both
TKE w/EN			0889		Both
ICB-2 Function Enablement			0992		Both
ICB-3 Function Enablement			0993		Both
8 GB Memory Card			1008		Both
16 GB Memory Card			1016		Both
32 GB Memory Card			1032		Both
OSA Express GbE LX			1364		Both
OSA Express GbE SX			1365		Both
OSA Express 1000Base-T EN			1366		Both
Unassigned CP			1716		MES
LICC Ship via Net Indicator			1750		MES
CUoD-Ctl for Plan Ahead			1995		Both
CUoD-Concurrent Cond			1999		Both

JCM OPS			2029		Both
FICON Express LX			2319		Both
FICON Express SX			2320		Both
16 Port ESCON Cd			2323		Both
Escon Chan Port Enable			2324		Both
OSA-Express HiSpeed TR			2367		Both
STI Rebalance			2400		MES
8 GB Memory			2601		Both
16 GB Memory			2602		Both
24 GB Memory			2603		Both
32 GB Memory			2604		Both
40 GB Memory			2605		Both
48 GB Memory			2606		Both
56 GB Memory			2607		Both
64 GB Memory			2608		Both
US English			2924		Init
Spanish —Non Spain			2930		Init
Canadian French			2935		Init
Brazilian Portuguese			2979		Init
Service Element w/TR and EN			3062		Both
Service Element w/Dual EN			3063		Both
IBF-360			3210		Both
ICB-4 Function Enablement			3393		Both
CPACF DES/TDES Enablement			3863		Both
STI-2 Extender Card			3992		Both
STI-3 Extender Card			3993		Both
Zero-Way Processor			4400	X	Both
1-Way Processor			4401	X	Both
2-Way Processor			4402	X	Both
3-Way Processor			4403	X	Both
4-Way Processor			4404	X	Both
5-Way Processor			4405	X	Both
6-Way Processor			4406	X	Both
7-Way Processor			4407	X	Both
8-Way Processor			4408	X	Both
Display — 17 inch Black			6092		Both
Display — 21 inch Black			6093		Both
ETR 1 Port			6154		Both
Power Sequence Controller			6501		Both
CBU CP			7800		Both
MTRJ Harness Group 6ft A01/Z01			7937		Both
MTRJ Harness Group 8ft Z15			7938		Both
MTRJ Harness Group 5ft A01/Z01			7941		Both
FQC 1st Bracket+Mount Hdw			7943		Both
FQC Additional Brackets			7944		Both
14ft 340-415V Line Cord (WT)			8985		Both
6ft 250V 60A Line Cord (Chi)			8992		Both
6ft 480V 30A Line Cord (Chi)			8994		Both
14ft 250V Cord (U.S., Can, Jap)			8993		Both
14ft 480V Line Cord (U.S.)			8995		Both
Multi Order Ship Flag			9000		Both
Multi Order Rec Only Flag-NB			9001		Both
Multi Order Rec Only Flag-MES			9002		Both
RPO Action Flag			9003		Both
Downgraded PUs Per Request			9004		Both
On/Off CoD Enablement			9896		Both
On/Off CoD Active CP Day			9897		MES
CIU Enablement (Flag)			9898		Both
CIU Activation (Flag)			9899		MES
Northern Hemisphere			9930		Both
Southern Hemisphere			9931		Both
Site Tool Kit			9964		Both
Height Reduct for 2084			9975		Init
2064 Frame Height Reduct for Ret			9976		MES
2064 Frame Width Reduct for Ret			9977		MES
IBM eServer	2084	A08			
zSeries 990					
Model A08			1108	X	Both
A08, 1 I/O Cage			7711		Both
A08, 2 I/O Cages			7712		Both
A08, 3 I/O Cages			7713		Both

IBM eServer zSeries 990	2084	B16			
Model B16			1216	X	Both
B16, 1 I/O Cage			7721		Both
B16, 2 I/O Cages			7722		Both
B16, 3 I/O Cages			7723		Both
IBM eServer zSeries 990	2084	C24			
Model C24			1324	X	Both
C24, 1 I/O Cage			7731		Both
C24, 2 I/O Cages			7732		Both
C24, 3 I/O Cages			7733		Both
IBM eServer zSeries 990	2084	B16 C24 D32			
72 GB Memory			2609		Both
80 GB Memory			2610		Both
88 GB Memory			2611		Both
96 GB Memory			2612		Both
104 GB Memory			2613		Both
112 GB Memory			2614		Both
120 GB Memory			2615		Both
128 GB Memory			2616		Both
9-Way Processor			4409	X	Both
10-Way Processor			4410	X	Both
11-Way Processor			4411	X	Both
12-Way Processor			4412	X	Both
13-Way Processor			4413	X	Both
14-Way Processor			4414	X	Both
15-Way Processor			4415	X	Both
16-Way Processor			4416	X	Both
IBM eServer zSeries 990	2084	C24 D32			
136 GB Memory			2617		Both
144 GB Memory			2618		Both
152 GB Memory			2619		Both
160 GB Memory			2620		Both
168 GB Memory			2621		Both
176 GB Memory			2622		Both
184 GB Memory			2623		Both
192 GB Memory			2624		Both
17-Way Processor			4417	X	Both
18-Way Processor			4418	X	Both
19-Way Processor			4419	X	Both
20-Way Processor			4420	X	Both
21-Way Processor			4421	X	Both
22-Way Processor			4422	X	Both
23-Way Processor			4423	X	Both
24-Way Processor			4424	X	Both
IBM eServer zSeries 990	2084	D32			
Model D32			1432	X	Both
200 GB Memory			2625		Both
208 GB Memory			2626		Both
216 GB Memory			2627		Both
224 GB Memory			2628		Both
232 GB Memory			2629		Both
240 GB Memory			2630		Both
248 GB Memory			2631		Both
256 GB Memory			2632		Both
25-Way Processor			4425	X	Both
26-Way Processor			4426	X	Both
27-Way Processor			4427	X	Both
28-Way Processor			4428	X	Both
29-Way Processor			4429	X	Both

30-Way Processor	4430	X	Both
31-Way Processor	4431	X	Both
32-Way Processor	4432	X	Both
D32, 1 I/O Cage	7741		Both
D32, 2 I/O Cages	7742		Both
D32, 3 I/O Cages	7743		Both

If field installed on a purchased machine, parts removed or replaced become the property of IBM and must be returned.

The following features are not orderable on the 2084 z990 models. However, if they are installed at the time of an upgrade to the z990 they may be retained.

Token Ring/HMC	0023
Ethernet/HMC	0024
3270/HMC PCI	0036
WAC Card	0038
DVD	0047
HMC Console	0073
HMC Console	0074
TKE Hardware (for Token Ring)	0866
TKE Hardware (for Ethernet)	0869
TKE Hardware (for Token Ring)	0876
TKE Hardware (for Ethernet)	0879
9 SM SCDup/50 MM ESCON MCP	0103
9 SM SCDup/50 MM SCDup MCP	0104
9 SM SCDup/62.5 MM SCDup MCP	0105
9 SM SCDup/62.5 MM ESCON MCP	0106
9 SM LCDup/50 MM SCDup MCP	0108
9 SM LCDup/62.5 MM SCDup MCP	0109
9 SM LCDup/SCDup Conv Kit	0110
9 SM LCDup/62.5 MM ESCON MCP	0111
62.5 MM MTRJ/ESCON Conv Kit	2325
50 MM LCDup/SCDup Conv Kit	2326
62.5 MM LCDup/SCDup Conv Kit	2327
62.5 MM LCDup/ESCON Conv Kit	2328
62.5 MM LCDup/MTRJ Conv Kit	2329
62.5 MM SCDup/LCDup Conv Kit	2330
9 SM SCDup/LCDup Conv Kit	2331
OSA-Express GbE LX	2364
OSA-Express GbE SX	2365
OSA-Express Fast EN	2366
Display — 17 inch White	6090
Display — 21 inch White	6091

For ServiceEject (ESA) Maintenance Service Charges, contact IBM Global Services at 888-IBM-4343 (426-4343).

Feature Conversions

For all feature conversions, returned parts and continuous maintenance apply.

From Type	From Feature	To Type	To Feature	2064	1071	2084	4400
				2064	1072	2084	4400
				2064	1073	2084	4400
Processor conversions:				2064	1074	2084	4400
				2064	1075	2084	4400
2064	1051	2084	4400	2064	1076	2084	4400
2064	1052	2084	4400	2064	2061	2084	4400
2064	1053	2084	4400	2064	2062	2084	4400
2064	1054	2084	4400	2064	2063	2084	4400
2064	1055	2084	4400	2064	2064	2084	4400
2064	1056	2084	4400	2064	2065	2084	4400
2064	1057	2084	4400	2064	2066	2084	4400
2064	1058	2084	4400	2064	2067	2084	4400
2064	1059	2084	4400	2064	2068	2084	4400
2064	1061	2084	4400	2064	2069	2084	4400
2064	1062	2084	4400	2064	2070	2084	4400
2064	1063	2084	4400	2064	2071	2084	4400
2064	1064	2084	4400	2064	2072	2084	4400
2064	1065	2084	4400	2064	2073	2084	4400
2064	1066	2084	4400	2064	2074	2084	4400
2064	1067	2084	4400	2064	2075	2084	4400
2064	1068	2084	4400	2064	2076	2084	4400
2064	1069	2084	4400	2064	1051	2084	4401
2064	1070	2084	4400	2064	1052	2084	4401

2064	1053	2084	4401	2064	2071	2084	4402
2064	1054	2084	4401	2064	2072	2084	4402
2064	1055	2084	4401	2064	2073	2084	4402
2064	1056	2084	4401	2064	2074	2084	4402
2064	1057	2084	4401	2064	2075	2084	4402
2064	1058	2084	4401	2064	2076	2084	4402
2064	1059	2084	4401	2064	1051	2084	4403
2064	1061	2084	4401	2064	1052	2084	4403
2064	1062	2084	4401	2064	1053	2084	4403
2064	1063	2084	4401	2064	1054	2084	4403
2064	1064	2084	4401	2064	1055	2084	4403
2064	1065	2084	4401	2064	1056	2084	4403
2064	1066	2084	4401	2064	1057	2084	4403
2064	1067	2084	4401	2064	1058	2084	4403
2064	1068	2084	4401	2064	1059	2084	4403
2064	1069	2084	4401	2064	1061	2084	4403
2064	1070	2084	4401	2064	1062	2084	4403
2064	1071	2084	4401	2064	1063	2084	4403
2064	1072	2084	4401	2064	1064	2084	4403
2064	1073	2084	4401	2064	1065	2084	4403
2064	1074	2084	4401	2064	1066	2084	4403
2064	1075	2084	4401	2064	1067	2084	4403
2064	1076	2084	4401	2064	1068	2084	4403
2064	2061	2084	4401	2064	1069	2084	4403
2064	2062	2084	4401	2064	1070	2084	4403
2064	2063	2084	4401	2064	1071	2084	4403
2064	2064	2084	4401	2064	1072	2084	4403
2064	2065	2084	4401	2064	1073	2084	4403
2064	2066	2084	4401	2064	1074	2084	4403
2064	2067	2084	4401	2064	1075	2084	4403
2064	2068	2084	4401	2064	1076	2084	4403
2064	2069	2084	4401	2064	2061	2084	4403
2064	2070	2084	4401	2064	2062	2084	4403
2064	2071	2084	4401	2064	2063	2084	4403
2064	2072	2084	4401	2064	2064	2084	4403
2064	2073	2084	4401	2064	2065	2084	4403
2064	2074	2084	4401	2064	2066	2084	4403
2064	2075	2084	4401	2064	2067	2084	4403
2064	2076	2084	4401	2064	2068	2084	4403
2064	1051	2084	4402	2064	2069	2084	4403
2064	1052	2084	4402	2064	2070	2084	4403
2064	1053	2084	4402	2064	2071	2084	4403
2064	1054	2084	4402	2064	2072	2084	4403
2064	1055	2084	4402	2064	2073	2084	4403
2064	1056	2084	4402	2064	2074	2084	4403
2064	1057	2084	4402	2064	2075	2084	4403
2064	1058	2084	4402	2064	2076	2084	4403
2064	1059	2084	4402	2064	1051	2084	4404
2064	1061	2084	4402	2064	1052	2084	4404
2064	1062	2084	4402	2064	1053	2084	4404
2064	1063	2084	4402	2064	1054	2084	4404
2064	1064	2084	4402	2064	1055	2084	4404
2064	1065	2084	4402	2064	1056	2084	4404
2064	1066	2084	4402	2064	1057	2084	4404
2064	1067	2084	4402	2064	1058	2084	4404
2064	1068	2084	4402	2064	1059	2084	4404
2064	1069	2084	4402	2064	1061	2084	4404
2064	1070	2084	4402	2064	1062	2084	4404
2064	1071	2084	4402	2064	1063	2084	4404
2064	1072	2084	4402	2064	1064	2084	4404
2064	1073	2084	4402	2064	1065	2084	4404
2064	1074	2084	4402	2064	1066	2084	4404
2064	1075	2084	4402	2064	1067	2084	4404
2064	1076	2084	4402	2064	1068	2084	4404
2064	2061	2084	4402	2064	1069	2084	4404
2064	2062	2084	4402	2064	1070	2084	4404
2064	2063	2084	4402	2064	1071	2084	4404
2064	2064	2084	4402	2064	1072	2084	4404
2064	2065	2084	4402	2064	1073	2084	4404
2064	2066	2084	4402	2064	1074	2084	4404
2064	2067	2084	4402	2064	1075	2084	4404
2064	2068	2084	4402	2064	1076	2084	4404
2064	2069	2084	4402	2064	2061	2084	4404
2064	2070	2084	4402	2064	2062	2084	4404

2064	1063	2084	4408	2064	1054	2084	4410
2064	1064	2084	4408	2064	1055	2084	4410
2064	1065	2084	4408	2064	1056	2084	4410
2064	1066	2084	4408	2064	1057	2084	4410
2064	1067	2084	4408	2064	1058	2084	4410
2064	1068	2084	4408	2064	1059	2084	4410
2064	1069	2084	4408	2064	1061	2084	4410
2064	1070	2084	4408	2064	1062	2084	4410
2064	1071	2084	4408	2064	1063	2084	4410
2064	1072	2084	4408	2064	1064	2084	4410
2064	1073	2084	4408	2064	1065	2084	4410
2064	1074	2084	4408	2064	1066	2084	4410
2064	1075	2084	4408	2064	1067	2084	4410
2064	1076	2084	4408	2064	1068	2084	4410
2064	2061	2084	4408	2064	1069	2084	4410
2064	2062	2084	4408	2064	1070	2084	4410
2064	2063	2084	4408	2064	1071	2084	4410
2064	2064	2084	4408	2064	1072	2084	4410
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2084	2620	2084	2623	2084	2630	2084	2632
2084	2620	2084	2624	2084	2631	2084	2632
2084	2620	2084	2625				
2084	2620	2084	2626				
2084	2620	2084	2627				
2084	2620	2084	2628				
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2084	2621	2084	2632				
2084	2622	2084	2623				
2084	2622	2084	2624	2064	0866	2084	0869
2084	2622	2084	2625	2064	0876	2084	0879
2084	2622	2084	2626	2064	0886	2084	0889
2084	2622	2084	2627	2084	0866	2084	0869
2084	2622	2084	2628	2084	0876	2084	0879
2084	2622	2084	2629	2084	0886	2084	0889
2084	2622	2084	2630				
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2084	2622	2084	2632				
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2084	2624	2084	2631	2084	7712	2084	7733
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2084	2625	2084	2626	2084	7712	2084	7743
2084	2625	2084	2627	2084	7713	2084	7723
2084	2625	2084	2628	2084	7713	2084	7733
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2084	2627	2084	2632	2084	7723	2084	7733
2084	2628	2084	2629	2084	7723	2084	7743
2084	2628	2084	2630	2084	7731	2084	7732

Processor PU Conversions:

TKE Feature Conversions:

Other Feature Conversions:

2084	7731	2084	7733
2084	7731	2084	7741
2084	7731	2084	7742
2084	7731	2084	7743
2084	7732	2084	7733
2084	7732	2084	7742
2084	7732	2084	7743
2084	7733	2084	7743
2084	7741	2084	7742
2084	7741	2084	7743
2084	7742	2084	7743
2084	1108	2084	1216
2084	1108	2084	1324
2084	1108	2084	1432
2084	1216	2084	1324
2084	1216	2084	1432
2084	1324	2084	1432

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