IBM TotalStorage Enterprise Storage Server Enhances Business Efficiency and Continuance with FlashCopy and PPRC Version 2

Overview
IBM continues to demonstrate leadership in business continuance with FlashCopy® and Peer to Peer Remote Copy (PPRC) enhancements for the IBM TotalStorage™ Enterprise Storage Server™ (ESS).

FlashCopy Version 2 enables business continuance solutions with the delivery of new FlashCopy functions and enhancements designed to help improve business efficiency, along with FlashCopy performance improvements designed to help minimize operational disruption.

- **Data Set FlashCopy** provides a new level of granularity for IBM zSeries™ and S/390® environments.
- **Multiple Relationship FlashCopy** allows a source to have multiple targets.
- **Incremental FlashCopy** delivers the capability to “refresh” a FlashCopy relationship.
- **Elimination of the Logical Subsystem Constraint** — A source and target relationship can span logical subsystems (LSS).
- **Reduced Establish Time** is designed to provide up to a 10 times reduction.

PPRC Version 2 provides new options for long-distance remote copy with the introduction of Asynchronous Cascading PPRC. Asynchronous Cascading PPRC enables the creation of three-site or two-site long-distance PPRC configurations by allowing a PPRC secondary volume to also serve as a PPRC primary volume in a another PPRC relationship.

Additionaly, many ESS users will benefit from the following support enhancements:
- IBM Standby Capacity On Demand for ESS (Standby CoD), offering capacity on demand to meet the changing storage needs of rapidly growing e-businesses.
- Copy services management improvements.
- ESS Command Line Interface (ESS CLI) support for additional activities.
- 72.8 GB disk eight-packs with 15,000 rpm drives on the Models F10 and F20.

Key Prerequisites
Refer to Hardware and Software Requirements section.

Planned Availability Date
June 27, 2003

At a Glance
New features and functions for the IBM TotalStorage ESS are designed to help improve business efficiency and continuity:

- FlashCopy Version 2, with support for all previous FlashCopy functions, plus these new enhancements:
  - Data Set FlashCopy
  - Multiple Relationship FlashCopy
  - Incremental FlashCopy
  - Elimination of the LSS constraint
  - FlashCopy establish time reduction
- PPRC Version 2, with support for all previous PPRC functions, plus Asynchronous Cascading PPRC for long-distance remote copy solutions.
- IBM Standby Capacity On Demand for ESS (Standby CoD), offering capacity on demand.

For ordering, contact:
Your IBM representative, an IBM Business Partner, or the Americas Call Centers at 800-IBM-CALL
Reference: YE001
FlashCopy Version 2 Enables Business Continuance Solutions with New Functions Providing Improved Business Efficiency

FlashCopy provides a point-in-time copy capability for data on the ESS. FlashCopy is designed to create a physical point-in-time copy of the data, with minimal interruption to applications, and make it possible to access both the source and target copies almost immediately.

FlashCopy Version 2 further enables business continuance solutions with the delivery of new FlashCopy functions and enhancements designed to help improve business efficiency, along with FlashCopy performance improvements designed to help minimize operational disruption. FlashCopy Version 2 includes support for all previous FlashCopy functions, plus the following:

- Data Set FlashCopy
- Multiple Relationship FlashCopy
- Incremental FlashCopy
- Additional enhancements:
  - Elimination of the LSS constraint
  - Establish time improvement
  - Consistency group commands
  - Inband commands over PPRC link

Data Set FlashCopy allows you to perform a FlashCopy of a data set in IBM @server zSeries and S/390 environments. This new level of granularity allows more efficient use of your ESS capacity and also helps reduce the background copy completion time since a FlashCopy no longer needs to be performed at a volume level when a copy of selected data sets within a volume is required. As with FlashCopy at the volume level, Data Set FlashCopy is fully supported by z/OS™ DFSMS.

With Multiple Relationship FlashCopy, a source can now have FlashCopy relationships with multiple targets simultaneously. This flexibility allows you to initiate up to 12 FlashCopy establishments on a given LUN, volume, or data set, without needing to first wait for or cause previous relationships to end.

Incremental FlashCopy provides the capability to "refresh" a LUN or volume involved in a FlashCopy relationship. With Incremental FlashCopy, the initial relationship between a source and target is maintained. When a subsequent FlashCopy establish is initiated, only the data required to bring the target current to the source’s newly established point-in-time is copied. Incremental FlashCopy helps reduce the background copy completion time when only a subset of data on either the source or target has changed, giving you the option to perform a FlashCopy on a more frequent basis.

The direction of the “refresh” can also be reversed, in which case the LUN or volume previously defined as the target becomes the source for the LUN or volume previously defined as the source (and is now the target). Again, only the data required to bring the target current to the source’s point-in-time is copied. If no updates were made to the target since the last “refresh,” the direction change could be used to “restore” the source back to the previous point-in-time state.

Additional enhancements:

- Elimination of the LSS constraint: A FlashCopy source and target relationship can now span logical subsystems within an ESS. This new flexibility can help simplify administration and capacity planning for FlashCopy.

- Establish time improvement: Performance improvements in FlashCopy Version 2 are designed to provide up to a 10 times reduction in the time required to complete a FlashCopy establish command. With this significant reduction in establish time, operational interruption is further minimized and the benefits of FlashCopy to be extended into new application environments.

- Consistency group commands: New commands are available to facilitate the creation of FlashCopy consistency groups. With the FlashCopy Consistency Group command, the ESS will hold off I/O activity to a LUN or volume until the FlashCopy Consistency Group Created command is issued. Consistency groups can be used to help create a consistent point-in-time copy across multiple LUNs or volumes, and even across multiple ESSs.

- Inband commands over PPRC link: In a PPRC environment, commands to manage FlashCopy at the remote site can now be issued from the local or intermediate site and transmitted over the PPRC links. This new function eliminates the need for a network connection to the remote site solely for the management of FlashCopy.

Operational control for FlashCopy Version 2 functions (except Data Set FlashCopy) is provided by the ESS Specialist and Copy Services CLI. Data Set FlashCopy is controlled through z/OS DFSMS.

FlashCopy Version 2 is an optional feature to the ESS (feature numbers 86xx for the Model 800 and feature numbers 186x for the Models F20 and F10). In addition to supporting the new features and functions listed above, FlashCopy Version 2 also includes support for all previous FlashCopy functions.

Current FlashCopy customers can upgrade their existing FlashCopy license to FlashCopy Version 2. The upgrade, which is processed as a feature exchange, will be incrementally priced at the difference between the current purchase price of the existing FlashCopy license and the new FlashCopy Version 2 license.

PPRC Version 2 Delivers Asynchronous Cascading PPRC for Long-Distance Remote Copy Solutions

Peer-to-Peer Remote Copy (PPRC) is a hardware-based disaster recovery solution designed to provide real-time mirroring of logical volumes between two ESSs. PPRC Version 2 provides new options for long-distance remote copy solutions with the introduction of Asynchronous Cascading PPRC.

Asynchronous Cascading PPRC provides a long-distance remote copy solution for zSeries and open systems environments by allowing a PPRC secondary volume (involved in a PPRC synchronous relationship) to also simultaneously serve as a PPRC primary volume in a PPRC Extended Distance (PPRC-XD) relationship to the remote site. This new capability enables the creation of three-site or two-site Asynchronous Cascading PPRC configurations.

In a three-site configuration, the synchronous PPRC relationship is maintained between an ESS at the local site and an ESS at an intermediate site (located within 103 km of the local site). A PPRC-XD relationship is simultaneously maintained between the ESS at the intermediate site and an ESS at the remote site. The remote site can be located at distances well beyond 103 km from the intermediate site — with the distance
typically limited only by the capabilities of the network and channel extension technologies. When used with specific operational procedures, a three-site configuration can be designed to provide a data protection solution in the event of an unplanned outage at any one of the three sites. Alternatively, operational procedures, including the creation of a “safety copy” at the remote site using FlashCopy, can be used to design a solution that provides a consistent copy of the data at the remote site in the event of a regional outage affecting both the local and intermediate site.

In a two-site configuration, the synchronous PPRC relationship is maintained between two ESSs, both of which are located at the local site, or within a single ESS. A PPRC-XD relationship is simultaneously maintained to an ESS at the remote site, which can be located at long distances from the local site. With operational procedures, including the creation of a “safety copy” at the remote site using FlashCopy, solutions can be designed providing a consistent copy of the data at the remote site in the event of an outage at the local site.

Operational control for PPRC Version 2 is provided by the ESS Specialist and Copy Services CLI.

For zSeries and S/390 environments, operational control for zSeries and S/390 volumes involved in PPRC configurations can be managed by IBM’s Geographically Dispersed Parallel Sysplex™ (GDPS™) offering. GDPS, an industry-leading e-business availability solution available through IBM Global Services, is a multi-site solution designed to provide the capability to manage remote copy configurations and storage, automate Parallel Sysplex® operational tasks, and perform failure recovery — from a single point of control.

PPRC Version 2 is an optional feature to the ESS (feature numbers 85xx for the Model 800 and feature numbers 185x for the Models F20 and F10). In addition to supporting Asynchronous Cascading PPRC configurations, PPRC Version 2 also includes support for all previous PPRC functions, including synchronous PPRC and PPRC-XD.

Current PPRC customers can upgrade their existing PPRC license to PPRC Version 2. The upgrade, which is processed as a feature exchange, will be incrementally priced at the difference between the current purchase price of the existing PPRC license and the new PPRC Version 2 license.

IBM Standby Capacity On Demand for ESS Delivers Storage On Demand

IBM Standby Capacity On Demand for ESS (Standby CoD) provides “standby” storage for the ESS and allows you to access the extra storage capacity whenever the need arises. With Standby CoD, IBM will install up to six Standby CoD Disk Eight-Packs in your ESS for a nominal charge. At any time, you can logically configure your Standby CoD for use — a nondisruptive activity that does not require intervention from IBM. Upon logical configuration, you will be charged for the capacity.

Standby CoD replaces A Step Ahead and includes the following enhancements:

- An ESS can have up to six Standby CoD Disk Eight-Packs.
- Standby CoD Disk Eight-Packs can be installed as a field upgrade into existing Models 800 and F20.
- The Standby CoD Disk Eight-Pack convenience charge and annual renewal charge have been reduced.

IBM offers capacity on demand solutions that are designed to meet the changing storage needs of rapidly growing e-businesses. Standby CoD is designed to provide you with the ability to tap into additional ESS storage and is particularly attractive if you have rapid or unpredictable growth, or if you simply want the knowledge that the storage will be there when you need it.

Contact your IBM sales representative or Business Partner to obtain additional information regarding Standby CoD terms and conditions.

**ESS Copy Services Management Enhancements**

The ESS Copy Service Server, which resides on an ESS cluster, manages copy services functions among the ESSs within its domain. This function is enhanced with support for the following:

- Improved availability with the option to configure dual active copy services servers, thereby allowing either server to initiate tasks or monitor domain status.
- Customer capability to reconfigure the domain without CE assistance.
- Domain-wide reset capability.

Additionally, the Volumes panel on the ESS Specialist is enhanced with new icons designed to help improve the recognition of copy services relationship types and states.

**ESS Command Line Interface (CLI) Enhancements**

The ESS CLI, designed to help automate routine logical configuration and storage management tasks, is enhanced with support to perform additional functions that previously could be performed only using the ESS Specialist. New activities include:

- Volume space management (create and delete)
- User management (list, create, and delete)
- Remote service management (list, create, and delete)
- List problems notification
- List performance counters
- Creation of CKD volumes
- Deletion of PAVs

The ESS CLI is provided with the ESS at no additional charge. The ESS CLI client is available for the AIX®, HP-UX, Linux™, Solaris, and Windows 2000 operating system environments.

**ESS Interoperability Enhancements**

- The extensive interoperability of the ESS has been expanded to include 32-bit Fibre Channel attachment support for Microsoft Windows Server 2003. This interoperability allows an ESS to connect to clustered and nonclustered Windows servers using switched fabric topology through supported host bus adapters and supported SAN Switches.
- The ESS interoperability has been extended to include support for Sun Cluster 3.0 Fibre Channel attachment through Sun Servers with Solaris operating environments.
- The ESS is interoperable with UnitedLinux distributions of the Linux operating system running in the Intel environments.

Refer to the ESS Interoperability Matrix for details on all of these enhancements:

Feature Exchange

PPRC and FlashCopy Version 2: Upgrades to a higher capacity license (a numerically higher feature number) are processed using a feature exchange. The upgrade will be priced as the delta between the current purchase price of the features removed and added.

Upgrades from FlashCopy and PPRC Version 1 to FlashCopy and PPRC Version 2 are also processed as a feature exchange. The feature exchange to Version 2 can be made to either the same or a higher capacity level. The upgrade will be priced as the delta between the current purchase price of the features removed and added.

- PPRC Version 1 #182x features can be exchanged for PPRC Version 2 #185x features.
- PPRC Version 1 #82xx features can be exchanged for PPRC Version 2 #85xx features.
- FlashCopy Version 1 #183x features can be exchanged for FlashCopy Version 2 #186x features.
- FlashCopy Version 1 #83xx features can be exchanged for FlashCopy Version 2 #86xx features.

A feature exchange to a lower capacity level (a numerically lower feature number) is not supported, with the following exception:

- Within a given advanced function type, #8x99 (0 TB (disable)) feature can be exchanged for any #8xxx feature. The feature exchange must be processed against both the ESS Model 800 8xxx feature number and ESS Function Authorization 8xxx feature number.

Preview

IBM plans to enhance PPRC Version 2 to support the use of Fibre Channel (FCP) as the communications link between the PPRC primary and PPRC secondary machine. This added flexibility is intended to allow users to better leverage and exploit their Fibre Channel infrastructure, availability, and capacity. This support is planned for availability on the ESS Model 800.

IBM also plans to enhance the ESS API with support for copy services configuration and use activities. The ESS API is designed to be compatible with the Storage Management Initiative Specification (SMIS), as defined by the Storage Networking Industry Association (SNIA). These enhancements demonstrate IBM’s continued support for Common Information Model (CIM) and Web Based Enterprise Management (WBEM) technologies as the common interface for the discovery and management of resources in a multi-vendor storage area network.

The delivery of these enhancements is targeted for the fourth quarter of 2003.

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

Reference Information

Refer to:

- Hardware Announcement 103-037, dated February 17, 2003, IBM TotalStorage Enterprise Storage Server Delivers “Bluefin” Support (SNIA SMIS) with the ESS API, and enhances Linux Support and Interoperability
- Hardware Announcement 102-279, dated October 22, 2002, IBM TotalStorage Enterprise Storage Server Offers New Price/Performance Options with 145.6 GB Drives and Simplified Storage Administration with CLI

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Publications

The following publication has been updated to reflect this announcement:

<table>
<thead>
<tr>
<th>Title</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM TotalStorage™ Enterprise Storage</td>
<td>GC26-7444</td>
</tr>
<tr>
<td>Server Introduction and Planning Guide</td>
<td></td>
</tr>
</tbody>
</table>

Publications shipped with the ESS will be updated with planned availability of the features and functions in this announcement.

ESS publications are available at:

http://ssddom02.storage.ibm.com/techsup
/webnav.nsf/support/2105

Publications can be ordered from your IBM representative, by direct order, or through the Publication Notification System (PNS) Web site at:


The Publications Center is a worldwide central repository for IBM product publications and marketing material. This site offers customized search functions to locate publications. This site also offers access to the Publication Notification System, a site where you can subscribe to receive e-mail notifications regarding new or revised publications that are of interest to you.

The Publications Center can be accessed at:

http://www.ibm.com/shop/publications/order

Technical Information

Specified Operating Environment

Hardware and Software Requirements: The ESS ships with IBM Licensed Internal Code (LIC) that is licensed for use by a customer on a specific machine, designated by serial number, under the terms and conditions of the IBM Customer Agreement or the IBM Agreement for Licensed Internal Code.

All features and functions in this announcement are supported on the ESS Models 800, F10, and F20, and require ESS Licensed Internal Code (LIC) level 2.2.0, or later, except as noted below.

- 72.8 GB, 15,000 rpm disk drives require ESS LIC level 2.1.1, or later.
- Standby CoD is supported on the Models 800 and F20 only; ESS LIC level requirements are based upon the Standby CoD features selected.

Refer to the ESS Interoperability Matrix for a list of interoperable environments and configurations, including minimum operating system levels for the functions included in this announcement:


PPRC Version 2: PPRC Version 2 must be purchased for both the primary and secondary ESS. In three-machine Asynchronous Cascading PPRC configurations, PPRC Version 2 must also be purchased for the intermediate ESS.

FlashCopy® is not required when using PPRC Version 2. However, FlashCopy can provide additional value and flexibility when used in Asynchronous Cascading PPRC configurations. Only FlashCopy Version 2 is supported with PPRC Version 2.

PPRC requires the installation of at least one ESCON® Host Adapter (#3011, #3012, or #3013) for each ESS in the PPRC configuration to provide the PPRC communications link. For highest availability offered by the ESS, IBM recommends that more than one ESCON adapter per ESS be used for the PPRC connectivity.

PPRC is supported with the use of ESCON Directors, DWDMs, and channel extenders. A current list of supported environments, configurations, networks, and products is available at:


Vendors should be consulted regarding hardware and software prerequisites when using their products in an ESS PPRC configuration. IBM is not responsible for third-party products.

When using channel extender products with PPRC, the channel extender vendor will determine the maximum distance supported between the primary and secondary ESS. The vendors should be contacted for their distance capability, line quality requirements, and WAN attachment capabilities.

IBM Standby Capacity On Demand for ESS (Standby CoD): Standby CoD Disk Eight-Packs (#213x and #215x) must be ordered in pairs of the same type (quantity of two). Up to six Standby CoD Disk Eight-Pack features are supported on the Models 800 and F20, subject to the following:

- Four Standby CoD Disk Eight-Packs require a minimum of eight Disk Eight-Pack features (#212x and #214x).
- Six Standby CoD Disk Eight-Packs require a minimum of ten Disk Eight-Pack features (#212x and #214x).

DFSMS Support: z/OS™ and OS/390® PTFs are required to provide DFSMS support for Data Set FlashCopy, Multiple Relationship FlashCopy, and elimination of the...
LSS constraint. The IBM Support Center should be contacted for the current PTF information.

**Limitations:** The ESS supports the intermixing of 10,000 rpm and 15,000 rpm Disk Eight-Pack features subject to the following limitations:

- For a given capacity, the 15,000 rpm Disk Eight-Pack features (#214x and #215x) cannot be intermixed with 10,000 rpm Disk Eight-Pack features (#212x and #213x) of the same capacity.
  - Feature numbers 2142 and 2152 (18.2 GB, 15,000 rpm) cannot be intermixed with feature number 2122 or feature number 2132 (18.2 GB, 10,000 rpm).
  - Feature numbers 2143 and 2153 (36.4 GB, 15,000 rpm) cannot be intermixed with feature number 2123 or feature number 2133 (36.4 GB, 10,000 rpm).
  - Feature numbers 2144 and 2154 (72.8 GB, 15,000 rpm) cannot be intermixed with feature number 2124 or feature number 2134 (72.8 GB, 10,000 rpm).

To install 15,000 rpm Disk Eight-Pack features into an ESS that already contains Disk Eight-Pack features of the same capacity (but at 10,000 rpm), those existing Disk Eight-Pack features must first be converted either to 10,000 rpm Disk Eight-Pack features of the same capacity or to Disk Eight-Pack features of a different capacity using the Disk Eight-Pack feature conversions.

**Planning Information**

**Customer Responsibilities**

**Physical Configuration Planning:** Your disk marketing specialist can help you plan and select the ESS physical configuration and features. Introductory information, including required and optional features, can be found in the *IBM TotalStorage Enterprise Storage Server Introduction and Planning Guide* (SC26-7444).

Capacity and performance planning assistance is also available. Through the use of Disk Magic, your disk marketing specialist can help you plan and anticipate performance characteristics for specific workloads by modeling proposed configurations.

**Installation Planning:** Installation planning is a customer responsibility. Information about planning the installation of your ESS, including equipment, site, and power requirements, can be found in the *IBM TotalStorage Enterprise Storage Server Introduction and Planning Guide* (SC26-7444).

**Logical Configuration Planning and Application:** Logical configuration planning is a customer responsibility. Logical configuration refers to the creation of RAID ranks, volumes, and/or LUNs, and the assignment of the configured capacity to servers.

During the ESS installation, your disk marketing specialist can help you plan your initial logical configuration, and IBM will apply the logical configuration to the machine.

Following the ESS installation, all modifications to the logical configuration are a customer responsibility and can be performed using the ESS Specialist, ESS CLI, or ESS API. IBM Global Services will also modify the logical configuration (fee-based services).

Refer to the following publications for additional information:

- IBM TotalStorage Enterprise Storage Server Configuration Planner for Open Systems Hosts (SC26-7477)
- IBM TotalStorage Enterprise Storage Server Configuration Planner for S/390® and IBM @server zSeries™ Hosts (SC26-7476)
- IBM TotalStorage Enterprise Storage Server Web Interface User’s Guide (SC26-7448)

**PPRC and FlashCopy Planning and Implementation:** The implementation and use of PPRC and FlashCopy require appropriate planning. Detailed information is available in ESS publications, as well as in the following IBM Redbooks:

- IBM TotalStorage Enterprise Storage Server: Implementing Copy Services in an Open Environment (SG24-5757)
- IBM TotalStorage Enterprise Storage Server: Implementing ESS Copy Services with IBM @server zSeries (SG24-5680)

Planning and implementation services for ESS copy services are offered by IBM Global Services (IGS). For additional information, contact your IBM representative or visit:

http://www.ibm.com/services

**Model 800:** Advanced functions on the Model 800 are enabled and authorized based upon the physical capacity of the ESS.

Physical capacity is calculated by multiplying each Disk Eight-Pack feature by its respective "Physical Capacity" value shown in Table 1 and then summing the values. All Disk Eight-Packs, including Standby CoD and Step Ahead Disk Eight-Packs, must be included in the capacity calculation.

For PPRC Version 2 and FlashCopy Version 2, the license purchased must be equal to or greater than the total physical capacity of the ESS.

Advanced functions require the selection of ESS Model 800 feature numbers and the purchase of the matching IBM 2240 ESS Function Authorization feature numbers:

- The ESS Model 800 feature number enables a given function on the ESS at a given capacity level.
- The ESS Function Authorization feature number authorizes use of the given advanced function at the given capacity level on the ESS machine for which it was purchased.

The ESS Model 800 8xxx feature numbers and the ESS Function Authorization 8xxx feature numbers are corequisites and must always correspond to one another.

<table>
<thead>
<tr>
<th>ESS Advanced Function</th>
<th>Model 800 Feature Numbers</th>
<th>ESS Function Authorization Feature Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPRC Version 2</td>
<td>2105-800 #85xx</td>
<td>2240-PRC #85xx</td>
</tr>
<tr>
<td>FlashCopy Version 2</td>
<td>2105-800 #86xx</td>
<td>2240-FLC #86xx</td>
</tr>
</tbody>
</table>

Model 800 Authorization Feature Numbers: 8xxx
Models F10 and F20: Advanced functions on the Models F10 and F20 are enabled based upon RAID-5 effective capacity.

RAID-5 effective capacity is calculated by multiplying each Disk Eight-Pack feature by its respective “6+P Array” value shown in Table 1 and then summing the values. All Disk Eight-Packs, including Standby CoD and Step Ahead Disk Eight-Packs, must be included in the capacity calculation.

For PPRC Version 2 and FlashCopy Version 2, the license purchased must be equal to or greater than the total RAID-5 effective capacity of the ESS.

Table 1: Disk Eight-Pack Capacity Chart

<table>
<thead>
<tr>
<th>Disk Size</th>
<th>Physical Capacity</th>
<th>RAID 10 6+P Array</th>
<th>RAID 5 7+P Array</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.2 GB</td>
<td>145.6 GB</td>
<td>52.50 GB</td>
<td>105.20 GB</td>
</tr>
<tr>
<td>36.4 GB</td>
<td>291.2 GB</td>
<td>105.12 GB</td>
<td>210.45 GB</td>
</tr>
<tr>
<td>72.8 GB</td>
<td>582.4 GB</td>
<td>210.39 GB</td>
<td>420.92 GB</td>
</tr>
<tr>
<td>145.6 GB</td>
<td>1,164.8 GB</td>
<td>420.78 GB</td>
<td>841.84 GB</td>
</tr>
</tbody>
</table>

1. A gigabyte (GB) equals one billion bytes when referring to disk capacity.
2. Effective capacity represents the approximate portion of the Disk Eight-Pack that is usable for customer data. All available capacity may not get fully utilized due to overheads on logical devices and/or a loss of capacity due to a configured set of logical devices. Also note that while this table assumes that arrays map directly to Disk Eight-Packs, arrays are actually created using eight drives of the same type and the drives are not necessarily contained within the same Disk Eight-Pack.

Cable Orders: No cables are required.

Direct Customer Support: Direct customer support for the 2105 ESS is provided by IBM Operational Support Services — Support Line. This fee service can enhance your productivity by providing voice and electronic access into the IBM support organization. IBM Operational Support Services — Support Line will help answer questions pertaining to product and feature usage (“how to”), configuration, and product compatibility for eligible products. For a list of the products supported via Support Line, visit the following Web site:

http://www.ibm.com/services/sl/products/

For more information on services, call 800-IBM-4YOU (426-4968).

Security, Auditable, and Control

This product uses the security and auditability features of the host hardware, host software, and/or application software to which it is attached.

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.

IBM hardware products are manufactured from new parts and used parts. In some cases, the hardware product may have been previously installed. Regardless, IBM’s warranty terms apply.

MES Discount Applicable: No

Field Installable Feature: Yes

Warranty Period: Three years

Customer Setup: No

Licensed Internal Code: Same license terms and conditions as designated machine.

Prices

Contact your IBM representative for prices information for this announcement.

Order Now

To order, contact the Americas Call Centers, your local IBM representative, or your IBM Business Partner.

To identify your local IBM representative or IBM Business Partner, call 800-IBM-4YOU (426-4968).

Phone: 800-IBM-CALL (426-2255)
Fax: 800-IBM-FAX (242-6329)
Internet: ibm.direct@vnet.ibm.com
Mail: The Americas Call Centers
Dept. YE001
P.O. Box 2690
Atlanta, GA 30301-2690

Reference: YE001
The Americas Call Centers, our national direct marketing organization, can add your name to the mailing list for catalogs of IBM products.

**Note:** Shipments will begin after the planned availability date.

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