IBM System Storage TS7650G Server with ProtecTIER Enterprise Edition V2 provides in-line data de-duplication

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At a glance

The TS7650G ProtecTIER De-duplication Gateway is designed to deliver high performance of in-line data de-duplication, and robust scalability, for the enterprise data center.

The use of disk cache as a de-duplicated storage pool, with existing backup applications offers a potentially lower total cost than conventional disk. To facilitate backup applications that are designed for use with tape storage, the TS7650G ProtecTIER De-duplication Gateway solution emulates a traditional tape library unit so deployment does not force any changes to customer’s existing data protection processes.

Solution advantages

• Can help address shrinking backup windows with fast backup and recovery
• Can significantly reduce the amount of disk storage needed for the backup/restore application
• Helps to improve the reliability of backups
• Requires minimal change to data protection infrastructure

For ordering, contact your IBM® representative, an IBM Business Partner, or IBM Americas Call Centers at 800-IBM-CALL (Reference: YE001).

Overview

The IBM System Storage™ TS7650G ProtecTIER De-duplication Gateway, comprised of the IBM System Storage TS7650G Server combined with IBM System Storage ProtecTIER Enterprise Edition software, is designed to address the data protection needs of enterprise data centers. The solution is designed to offer high performance, high capacity, robust scalability, and a choice of disk-based targets for backup and archive data.
The TS7650G ProtecTIER De-duplication Gateway is designed to offer:

- In-line data de-duplication powered by HyperFactor technology
- Powerful multicore virtualization and de-duplication engine
- Clustering support for higher performance and availability
- Fibre Channel Ports for host and server connectivity
- In-line data de-duplication performance up to 1,000 MB/s (clustered node) support
- Flexible storage choices and options
- Virtual tape emulation of up to 16 virtual tape libraries, up to 256 virtual tape drives on each server, and up to 500,000 virtual cartridges
- The TS7650G Server is a 6-core Intel® processor base with 24 total processor cores and 32 GB of memory.
- IBM's path failover technology
- LTO-2 and LTO-3 tape emulation
- TS3500 Tape Library emulation

The TS7650G ProtecTIER De-duplication Gateway is an enterprise-class data protection platform designed to quickly and safely protect business information while drastically reducing the amount of space required to store data.

Deploying the TS7650G ProtecTIER De-duplication Gateway can help organizations more efficiently protect their corporate data on disk-based storage while helping them manage the exponential growth of new data through reduction and elimination of duplicate data in their backups.

Key prerequisites

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway requires a standard Fibre Channel (FC) SAN and tape library environment. A wide variety of disk-based storage can be attached to this server gateway. Check the IBM Interoperability Guide for specific environmental information.

The IBM System Storage ProtecTIER Enterprise Edition V2 software is loaded on the IBM System Storage TS7650G Server to create a valid TS7650G ProtecTIER De-duplication Gateway. A separate order for ProtecTIER Enterprise Edition is required.

Planned availability date

March 6, 2009

Description

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway is a virtual tape library (VTL) that appears to back up applications as one or many automated tape libraries. This supports implementation of the TS7650G and ProtectTIER software with minimal change to existing backup policies, practices, or procedures. The backup application accesses virtual tape drives, robotics, and cartridges just as it would in a physical tape library environment.

Typical virtual tape library solutions provide about 2:1 compression of the data backed up. The TS7650G ProtecTIER De-duplication Gateway, featuring HyperFactor data de-duplication technology, provides up to 25:1 or more data volume reduction.
Data protection pain points in the data center

Enterprise data centers require a high performance, high capacity, reliable, and scalable disk-based data protection solution. Delivering high-level data protection is increasingly difficult for many reasons:

• Information volume is growing almost exponentially and must be protected.
• Shrinking backup and restore windows require more efficient high performance data protection solutions.
• Pressure to lower capital expenditures for data infrastructure is driving the need for a simpler way to deploy and manage data protection solutions.
• Increased need to more efficiently manage disk space of existing infrastructure by improving utilization of current hardware.
• Increasing need to support more efficient, easier to manage, disaster recovery strategies.

TS7650G ProtecTIER De-duplication Gateway differentiators

The TS7650G ProtecTIER De-duplication Gateway features HyperFactor technology, which is designed to provide in-line de-duplication capabilities and boast the following core differentiators:

• In-line de-duplication: Helps avoid disruption to production activities.
• High performance: Cluster topology offers sustainable throughput of up to 1,000 MB/s in-line de-duplication capability regardless of repository size.
• Flexible disk-based storage options offer multiple configurations for different environments.
• Data reduction: provides up to 25:1 or more data volume reduction.
• ProtecTIER Enterprise edition software architecture supports up to 1 PB of data repository.
• Higher availability: Clustered configuration available to provide hardware redundancy in the event of a node failure.
• Data integrity: Helps avoid “hash collisions” or “false positive” data matches.
• Data agnostic: Not sensitive to data type, file name, or data structure of the specific backup application (unlike content-aware approaches).

TS7650G features and benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>Function</th>
<th>Targeted benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>HyperFactor de-duplication technology</td>
<td>In-line, high-performance, and scalable data de-duplication</td>
<td>Pattern recognition algorithm (not hash) that reduces storage needs by a factor of up to 25, helping to reduce costs and energy needs</td>
</tr>
<tr>
<td>HyperFactor technology performs byte-level differentials to support data integrity</td>
<td>Protection for business-critical data</td>
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<tr>
<td>Flexible configurations</td>
<td>Involves no client or host agents</td>
<td>Support improved backup success rates</td>
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<td></td>
<td>Qualified with leading enterprise backup applications operations</td>
<td>Improved backup and recovery</td>
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<tr>
<td></td>
<td>Acquisition costs up to 80% lower than standard VTL solutions</td>
<td>Changed economics - Total cost of ownership is dramatically lower than standard Gen 1 VTL solutions for most customers</td>
</tr>
</tbody>
</table>
Rich open standard architecture

ProtecTIER Enterprise Edition software architecture supports up to 1 PB of data repository.

Performance

Sustained in-line throughput rates
up to 500 MB/s per ProtecTIER server and up to 1,000 MB/s for cluster in real customer environments

Enable easy scaling of both performance and capacity

Throughput can scale to address data center requirements

TS7650G targeted benefits

With the TS7650G, you can expand the use of disk-based data protection, allowing faster access to critical backup and archive data.

- Radically reduce infrastructure costs through dramatically increased storage utilization
- Accelerated backup and recovery times
- Increased backup reliability
- Improved productivity with in-line de-duplication of the data backed up
- Delivers enterprise-class data integrity and availability

TS7650G ProtecTIER De-duplication Gateway

- Designed to deliver high-performance, high-capacity, enterprise-class data protection, powered by HyperFactor de-duplication technology, to the data center.
- Is available with a wide variety of back-end disk-based storage choices from IBM and its network of IBM Business Partners.

Accessibility by people with disabilities

A U.S. Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at


Section 508 of the U.S. Rehabilitation Act

The IBM System Storage TS7650G Server, Model DD3, is capable as of March 6, 2009, when used in accordance with IBM's associated documentation, of satisfying the applicable requirements of Section 508 of the Rehabilitation Act, provided that any assistive technology used with the product properly interoperates with it. A U.S. Section 508 Voluntary Product Accessibility Template (VPAT) can be requested via IBM's Web site at

http://www-03.ibm.com/able/product_accessibility/index.html

Product positioning

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway is designed to be a high-performance, high-capacity open systems disk-based data protection solution for large and mid-sized data center environments. The TS7650G solution can aid in data protection by helping deliver significant increases in operational efficiency, throughput, and data management capabilities via tape virtualization and data reduction.

The TS7650G is designed to help:

- Address shrinking backup windows with faster backup and recovery
- Reduce cost and increase storage capacity utilization
• Improve the reliability and quality of backups
• Increase levels of data protection with enterprise-class data integrity
• Support deployment with minimal change to IT infrastructure

The TS7650G is a tape virtualization data de-duplication server for open systems attached to SAN environments over Fibre Channel (FC) connection. It can help data centers improve their data protection operations, while reducing the storage required. The TS7650G presents itself to backup applications as a standard tape device, while offering the benefit of disk-based storage for fast backup and restores. The TS7650G features HyperFactor technology, a data de-duplication technology which searches for redundancy in the data while it is backed up. It only stores unique data but tracks all references, maintaining full quality of backup data. In addition, with the space saved through elimination of redundant data, organizations can retain more backups on-line, for a longer period of time, which enables them to recover critical data and files more quickly.

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway server differs from many other open systems virtual tape offerings through its in-line de-duplication performance. The TS7650G Server can back up and de-duplicate data in less time enabling customers to address their archiving and replication service level agreements (SLAs).

Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld® ID and password are required (use IBM ID).


Reference information

For information on IBM System Storage ProtecTIER Enterprise Edition V2, refer to Software Announcement 208-228, dated August 26, 2008.

Product number

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<th>Description</th>
<th>Machine</th>
<th>Model</th>
<th>Feature</th>
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<td>TS7650G Server</td>
<td>3958</td>
<td>DD3</td>
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<tr>
<td>Console Expansion</td>
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<td>2714</td>
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<td>Console Attachment</td>
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<td>2715</td>
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<td>Console Upgrade Card</td>
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<td>TS3000 System Console</td>
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<tr>
<td>Cluster Connection Kit</td>
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<td>4GB FC Dual Port HBA - Disk</td>
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<td>4GB FC Dual Port HBA - Host</td>
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<td>25 Meter LC/LC FC Cable</td>
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<td>Attach XIV</td>
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<td>9033</td>
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<td>Attach to other IBM Disk</td>
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<td>9038</td>
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<td>No New IBM Disk</td>
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<td>ProtecTIER EE V2</td>
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<td>9306</td>
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<td>Rack Mount</td>
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<td>9340</td>
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<td>No Factory Cables</td>
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Publications

The following publications are shipped with the product.
<table>
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<th>Title</th>
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<tr>
<td>IBM System Storage TS7600 with ProtecTIER Introduction and Planning Guide for the TS7650G (Gateway)</td>
<td>GC53-1152</td>
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<tr>
<td>IBM System Storage TS7600 with ProtecTIER Installation Roadmap Guide for the TS7650G (Gateway)</td>
<td>GC53-1154</td>
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<tr>
<td>IBM System Storage TS7600 with ProtecTIER Problem Determination Guide for the TS7650G Gateway (3958 D01, 3958 D03, &amp; 3958 API)</td>
<td>GC53-1157</td>
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IBM Publications Center Portal

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

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided, as well as payment options via credit card. A large number of publications are available online in various file formats, which can currently be downloaded free of charge.

Publications are available on the IBM Publications Center Web site and are included on the IBM System Storage TS7600 ProtecTIER - TS7650 & TS7650G Publications CD-ROM LCD8-1271-00 (part number 45E6762).

To order additional selected hardcopy publications for a fee or download free PDF format publications, visit the IBM Publications Center Web site

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

Services

Global Technology Services

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an On Demand Business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or visit

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

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit


Select your country, and then select the product as the category.
Technical information

Specified operating environment

Physical specifications

4U rack drawer:

- Width: 443.6 mm (17.46 in)
- Depth: 720.2 mm (28.35 in)
- Height: 172.8 mm (6.80 in)
- Min/Max configuration: 43.2 kg (95 lb)

Operating environment

Temperature:

- 10° to 35° C (50° to 95° F) at 0 to 914 m (0 to 3,000 ft)
- 10° to 32° C (50° to 90° F) at 914 to 2,133 m (3,000 to 7,000 ft)
- Relative humidity: 8% to 80%
- Maximum altitude: 2,133 m (7,000 ft)

Electrical:

- 200 to 240 (nominal) V ac; 50 Hz or 60 Hz; System 8 A
- Input kilovolt-amperes (kVA) (approximately):
  - Minimum configuration: 0.39 kVA (two power supplies)
  - Typical configuration: 0.82 kVA (two power supplies)
  - Maximum configuration: 1.65 kVA (two power supplies)

Btu output:

- Ship configuration: 1,297 Btu/hr (380 watts)
- Typical configuration: 2,730 Btu/hr (800 watts)
- Full configuration: 5,425 Btu/hr (1590 watts)

Noise level horizontal position: 6.6 bels

Equipment approvals and safety:

- FCC Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- IEC/UL 60950-1, 1st Edition
- CAN/CSA C22.2 No. 60950-1-03
- NOM-019 *

* This server is certified by the respective UL and NOM agencies.

Hardware requirements

General platform prerequisites

IBM System Storage TS7650G ProtecTIER De-duplication Gateway is based on the IBM System x3850 M2 server technology.

Tested platforms are listed in the Installation Guide under Release Notes.
A TS7650G clustered solution with IBM ProtecTIER De-duplication software requires the following hardware, included in the Cluster Connection Kit (feature number 3447):

- **Power switch**: A network power switch, which is used to automatically control the power to a failed node.
- **Network switch**: Two Ethernet switches, which are used to connect the TS7650G Servers with the network power switch, the user console, and the TSSC.

**Management console**:
The IBM System Storage TS7650G ProtecTIER De-duplication Gateway must have a console in order to perform system installation and maintenance. One console (monitor, keyboard, and mouse) is required for each server. If more than one ProtecTIER server needs to be accessed, they can be connected to a console via a switch box or via a terminal server. You must place it as a separate order from the TS7650G Server.

The console must be capable of operating one of the following operating systems:

- Windows® XP, or Windows Server 2003
- Red Hat Enterprise 4, or later

The console must also have:

- At least 100 MB of available disk space
- At least 256 MB of RAM

The console must have access to the ProtecTIER service nodes at IP address (port 3501 is open on the firewall).

Confer with your IBM representative for console configuration alternatives.

**Supported storage systems**

- IBM System Storage DS8300
- IBM System Storage DS8100
- IBM System Storage DS4800
- IBM System Storage DS4700
- IBM System Storage DS5300
- IBM System Storage DS5100
- IBM SVC
- XIV Gen1, Nextra
- XIV Gen2
- HDS AMS1000
- HDS AMS2300
- EMC CX300, CX500, CX700

A current list of supported open system configurations for the TS7650G server is available from the following Web site:

http://www.ibm.com/systems/support/storage/config/ssic/index.jsp

**Software requirements**

Ordering the ProtecTIER PID is required when the gateway hardware is ordered.

To create a valid TS7650G ProtecTIER De-duplication Gateway, the customer must order the following software PIDs and hardware features in the initial order:

- 3958-DD3, TS7650G Gateway with feature number 9306
- 5639-XXB, ProtecTIER Enterprise Edition V2 software
- One of the following software maintenance PIDs:
– 5639-XXC 1 year registration
– 5639-XXJ 2 year registration
– 5639-XXE 3 year registration
– 5639-XXL 4 year registration
– 5639-XXK 5 year registration

Refer to IBM System Storage ProtecTIER Enterprise Edition V2 Software Announcement 208-228, dated August 26, 2008, for more information on the IBM System Storage ProtecTIER Enterprise Edition V2 software.

Refer to IBM System Storage ProtecTIER Enterprise Edition V2.2 software with additional 2-year, 4-year, and 5-year Software Maintenance agreements, Software Announcement 209-031, dated February 10, 2009.

Operating system prerequisites

The appropriate Linux® operating system is included with the IBM System Storage ProtecTIER Enterprise Edition V2 software.

Connectivity prerequisites

The supported Fiber Channel switches are listed in the System Storage Operation Center (SSIC) located at

http://www-03.ibm.com/systems/support/storage/config/ssic/

If this IBM System Storage TS7650G ProtecTIER De-duplication Gateway server is to be accessed via ProtecTIER Manager installed on another computer, network connections must be configured to allow access.

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway front end links will be up only after configuring a repository.

File system prerequisites

The IBM System Storage TS7650G ProtecTIER De-duplication Gateway stores data in Red Hat Global File Systems (GFS). The number and size of the file systems depends on the size and parameters of your configured repository.

Tivoli® Storage Manager and other compatible software offerings can provide storage and tape management software for the TS7650G. Supporting software and applications must be obtained separately from IBM, IBM Business Partners, or ISVs. For a current list of compatible software, call your IBM representative, or visit

http://www.ibm.com/servers/storage/tape

Compatibility

Virtual emulation

The IBM System Storage TS7650G ProtecTIER Gateway emulates, in both stand-alone and clustered configurations, the IBM System Storage TS3500 tape library with IBM Ultrium 2 Tape Drives or Ultrium 3 Tape Drives, and the Quantum P3000 tape library with DLT Tape Drives.

Limitations

Both TS7650G Servers in a clustered configuration must be installed in the same rack.
Planning information

Customer responsibilities

Physical planning is a customer responsibility. Detailed planning information is in the IBM System Storage TS7600 with ProtecTIER Introduction and Planning Guide for the TS7650G (Gateway) GC53-1152.

Rack installations

The TS7650G Server is a 4U rack-drawer model designed to be installed in a 19-inch rack cabinet designed for 26-inch deep devices, such as the NetBAY42 ER, NetBAY42 SR, NetBAY25 SR, or NetBAY11.

When the TS3000 System Console (TSSC), feature number 2730, is purchased with the TS7650G Server, it must be installed in the same rack as the TS7650G Server at a suggested height between 14U (24.5 inches), and 22U (38.5 inches). The TSSC requires 2U space in the rack.

When two TS7650G Servers are purchased and installed to form a two node cluster, both servers must be installed in within the same rack. It is encouraged to install the servers in contiguous space.

If using a non-IBM rack, the cabinet must meet the EIA-310-D standards with a depth of at least 71.1 cm (28 in). Also, adequate space (approximately 5 cm (2 in) for the front bezel and 2.5 cm (1 in) for air flow) must be maintained from the slide assembly to the front door of the rack cabinet to allow sufficient space for the door to close and provide adequate air flow.

Customers are responsible for obtaining the appropriate adapters and cables.

You are responsible for downloading or obtaining from IBM, and installing designated Machine Code (microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM machine) and other software updates in a timely manner from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes; however, you may be charged for that service.

Cable orders

Fibre Channel cables are required to attach the TS7650G Server (3958 Model DD3) to various server adapters. The cables can be customer supplied or ordered with the TS7650G Server with feature number 6025.

25 Meter LC/LC Fibre Channel Cable (#6025)

This feature provides a 25 m (82 ft.) 50.0/125 micrometer short wavelength multimode fiber-optic cable with LC duplex connectors on both ends.

Note: This cable is for attaching a TS7650G Server (that has an LC duplex connector) to switches, disk subsystem, or hosts with LC duplex Fibre Channel connectors.

Direct customer support

Eligible customers can obtain installation and usage assistance through ASK Support using the search words TS7650G, 3958-DD3, or 5639-XXB.

IBM Global Services

IBM Technical Support Services provides comprehensive hardware and software support, including hardware and software implementation for the IBM System Storage TS7650G Server. Technical Support Services are designed to support your installations of IBM Virtualization Engine™ hardware and software. Offering the best solutions for storage management and data migration, IBM Technical Support Services can assist you in developing and deploying...
storage solutions to enable your success and satisfaction. For more information, contact your
IBM representative or Business Partner.

Security, auditability, and control

This product uses the security and auditability features of 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.

IBM Electronic Services

IBM has transformed its delivery of hardware and software support services to help you achieve
higher system availability. Electronic Services is a Web-enabled solution that offers an exclusive,
no-additional-charge enhancement to the service and support available for IBM servers. These
services are designed to provide the opportunity for greater system availability with faster
problem resolution and preemptive monitoring. Electronic Services comprises two separate, but
complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single Internet entry point that replaces the multiple entry
points traditionally used 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 Electronic Service Agent™ is no-additional-charge software that resides on your server. It
monitors events and transmits system inventory information to IBM on a periodic, client-defined
timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early
knowledge about potential problems enables IBM to deliver proactive service that may result
in higher system availability and performance. In addition, information collected through the
Service Agent is made available to IBM service support representatives when they help answer
your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for
problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, visit

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

Terms and conditions

Volume orders: Contact your IBM representative.

IBM Global Financing
Yes

Warranty period
One year

Warranty service
If required, IBM provides repair or exchange service depending on the types of warranty service
specified for the machine. IBM will attempt to resolve your problem over the telephone, or
electronically via an IBM Web site. You must follow the problem determination and resolution
procedures that IBM specifies. Scheduling of service will depend upon the time of your call
and is subject to parts availability. If applicable to your product, parts considered Customer
Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

Service levels are response-time objectives and are not guaranteed. The specified level of
warranty service may not be available in all worldwide locations. Additional charges may apply
outside IBM's normal service area. Contact your local IBM representative or your reseller for country- and location-specific information.

**On-site Service**

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Service level is 24 hours per day, 7 days a week, 4 hour average, same day response. Same day service level includes the installation of Tier 1 CRUs at no additional charge.

**Warranty service upgrades**

During the warranty period, warranty service upgrades provide an enhanced level of On-site Service for an additional charge. Service levels are response-time objectives and are not guaranteed. Refer to the Warranty service section for additional details.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability.

**On-site Service**

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are:

- 24 hours per day, 7 days a week, 4 hour average response
- 24 hours per day, 7 days a week, 2 hour average response

Customer Replaceable Units (CRUs) may be provided as part of the machine's standard warranty CRU Service except that you may install a CRU yourself or request IBM installation, at no additional charge, under one of the On-site Service levels specified above. For additional information on the CRU Service, see the warranty information.

**Maintenance services**

If required, IBM provides repair or exchange service depending on the types of maintenance service specified for the machine. IBM will attempt to resolve your problem over the telephone or electronically, via an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response-time objectives and are not guaranteed. The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country- and location-specific information. The following service selections are available as maintenance options for your machine type.

**On-site Service**

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

Service levels are:

- 24 hours per day, 7 days a week, 4 hour average response
- 24 hours per day, 7 days a week, 2 hour average response

**Customer Replaceable Unit (CRU) Service**

If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), and depending upon the maintenance service offerings in your geography,
IBM will ship the CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM upon your request.

Based upon availability, CRUs will be shipped for next business day delivery. IBM specifies, in the materials shipped with a replacement CRU, whether a defective CRU must be returned to IBM. When return is required, (1) return instructions and a container are shipped with the replacement CRU and (2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

CRUs may be provided as part of the machine's standard maintenance service except that you may install a CRU yourself or request IBM installation, at no additional charge, under any of the On-site Service levels specified above.

Usage plan machine
No

IBM hourly service rate classification
Two

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.

Field-installable features
Yes

Model conversions
No

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 1-800-IBM-SERV (426-7378); in other countries, contact the local IBM office.

The Installation and Planning Guide specifies site preparation, physical requirements, and installation (operating) environment and any cabling included in the installation along with the approximate installation time in hours. Customer requests for installation of items not covered in the installation guide may be performed at IBM's hourly service rate designated for the machine.

Graduated program license charges apply
No

Licensed machine code
IBM Machine Code is licensed for use by a customer on the IBM machine for which it was provided by IBM under the terms and conditions of the IBM License Agreement for Machine Code, to enable the machine to function in accordance with its specifications, and only for the capacity authorized by IBM and for which the customer has acquired. You can obtain the agreement by contacting your IBM representative or at


Machine using LMC Type Model: 3958-DD3

IBM may release machine code changes to the IBM System Storage TS7650G Server. IBM plans to make machine code changes for most components of the TS7600 solution available for download from the IBM System Storage technical support worldwide Web. Note that not all machine code changes may be available via the support Web site. If the machine does not function as warranted and your problem can be resolved through your application of downloadable machine code, you are responsible for downloading and installing these designated machine code changes as IBM specifies. IBM has responsibility for installing
changes that IBM does not make available for you to download. If you would prefer, you may request IBM to install downloadable machine code changes; however, you may be charged for that service.

For available machine code changes, refer to

http://www.ibm.com/servers/storage/support/

Educational allowance
A reduced charge is available to qualified education customers. The educational allowance may not be added to any other discount or allowance.

Pricing

For additional information and current prices, contact your local IBM representative.

Product charges

<table>
<thead>
<tr>
<th>Description</th>
<th>Machine Type</th>
<th>Model Number</th>
<th>Feature Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS7650G Server</td>
<td>3958</td>
<td>DD3</td>
<td></td>
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<tr>
<td>Console Expansion</td>
<td></td>
<td>2714</td>
<td></td>
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<tr>
<td>Console Attachment</td>
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<td>2715</td>
<td></td>
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<tr>
<td>Console Upgrade Card</td>
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<td>2719</td>
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<tr>
<td>TS3000 System Console</td>
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<td>2730</td>
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<tr>
<td>TS Cluster Connection Kit</td>
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<td>3447</td>
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<tr>
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<tr>
<td>4GB FC Dual Port HBA - Host</td>
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<td>25 Meter LC/LC FC Cable</td>
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<td>6025</td>
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<td>Attach DS8000</td>
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<td>Attach DS5000</td>
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<td>Attach DS4000</td>
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<td>Attach XIV</td>
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<td>9033</td>
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<tr>
<td>Attach to other IBM Disk</td>
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<td>9038</td>
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<tr>
<td>No New IBM Disk</td>
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<td>9039</td>
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<td>ProtecTIER EE V2</td>
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<td>Rack Mount</td>
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<td>9340</td>
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<tr>
<td>No Factory Cables</td>
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<td>9700</td>
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</table>

No cables are required with these feature numbers.

If field installed on a purchased machine, parts removed or replaced become the property of IBM and must be returned.
<table>
<thead>
<tr>
<th>Description</th>
<th>Machine Type</th>
<th>Model</th>
<th>Feature</th>
<th>List Price</th>
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<td>TS3000 SYSTEM CONSOLE</td>
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<td>CLUSTER CONNECTION KIT</td>
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<td>4GB FC DUAL PORT HBA DISK</td>
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<td>DD3</td>
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For ServiceElect (ESA) maintenance service charges, contact IBM Global Services at 888-IBM-4343 (426-4343).

**Maintenance charges**

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