

# IBM i 7.3 Technology Refresh 7 enhances the IBM i portfolio of products

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## Overview

IBM<sup>(R)</sup> i, the integrated operating environment that runs on IBM Power<sup>(R)</sup> Systems with a reputation for robust architecture, exceptional security, and business resilience, is enhanced. IBM i 7.3 Technology Refresh (TR) 7 for the IBM i portfolio of products offers clients new features and enhancements across many of the components, such as:

- The Integrated Web Server (IWS) environment can now be deployed in a user-specified subsystem, giving users better control and management of system resources. The IWS has also improved the programmatic deployment functionality.
- Cluster administrative domain has increased usability of key functions, such as support to replicate an encrypted password, and allows changes to the synchronization option on inactive nodes.
- IBM Db2<sup>(R)</sup> for i includes new and improved SQL capabilities with attributes that are valued by business computing solutions.
- IBM PowerHA<sup>(R)</sup> SystemMirror<sup>(R)</sup> for i brings several enhancements to the PowerHA portfolio, including:
  - Improvements to the administrative domain, such as support for replicating user-profile passwords that have been set with the QSYSUPWD API
  - Integrated and streamlined recovery from a data center outage in a HyperSwap<sup>(R)</sup> with a LUN-level switching environment that enables HyperSwap protection to be restored with a single command
- IBM Backup, Recovery, and Media Services for i (BRMS) provides virtual tape image catalog and backup administration improvements.
- The RPG language of IBM Rational<sup>(R)</sup> Development Studio for i (RDS) includes overloading for procedure calls. RPG now has a framework to generate many other data languages, such as XML, JSON, YAML, and HTML from RPG data structures, that help enhance programmer productivity.
- IBM Rational Developer for i (RDi) includes refactoring functionality and improved indexing and searching within the preferences support.
- IBM i Access Client Solutions (ACS) schema support provides better search and find capabilities. Additionally, "Run SQL Scripts" has been enhanced with many updates, including content assist, integrated save-as favorites, timestamps showing query execution times, and more.
- With new open source enhancements, popular technologies for messaging between application components, storing data, and so on are easily available in RPM form.
- A new generation of enterprise 2.5-inch solid-state drives (SSD) improves enterprise-class reliability, endurance, and capacity characteristics.

- IBM i supports the new processor feature for 11-core or 22-core configurations of the IBM Power System S924 server, which provides additional choices for the scale-out market.
- SR-IOV logical ports can be assigned to IBM i LPARs that are configured with restricted I/O. This allows high-speed, low-latency network adapter usage while still being able to use Live Partition Mobility.
- License keys can be added to an IBM i LPAR through the HMC or Novalink interface. This saves time for administrators because they no longer need to sign in to each individual LPAR when additional keys are required. Managers of multitenancy environments with multiple servers will find this especially helpful, as will those migrating to a new server.

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## Key requirements

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IBM i 7.3 TR7 is supported on selected IBM Power Systems servers with:

- IBM POWER9™ technology-based processors
- IBM POWER8<sup>(R)</sup> technology-based processors
- IBM POWER7<sup>(R)</sup> or IBM POWER7+ processors

Clients using blades or IBM PureFlex<sup>(R)</sup> systems, and those using servers with IBM POWER6<sup>(R)</sup>, IBM POWER6+, or earlier processors, need to move to newer systems to take advantage of the new features in IBM i 7.3 TR7.

For up-to-date information on all types of code levels needed for support of a particular feature, see the [Power Systems Prerequisites](#) website.

See the [Technical Information](#) section for specific hardware and software prerequisites.

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## Planned availability date

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November 15, 2019

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## Description

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IBM i 7.3 TR7 offers clients new features and enhancements across many of the components in the IBM i portfolio of products. As in previous releases, the enhancements are delivered through a set of PTF groups, known as a Technology Refresh, and provide significant enhancements to developers and administrators.

Technical detail for IBM i enhancements delivered with IBM i 7.3 TR7 can be found on the IBM i developerWorks<sup>(R)</sup> Technology Updates wiki. This wiki is organized by subject matter.

To make it easy to find IBM i 7.3 TR7-specific enhancements, see the aggregated list of enhancements found on the [developerWorks](#) wiki landing page.

### **IBM i Operating System (5770-SS1)**

#### ***Integrated Web Server (IWS)***

The IWS is enhanced in several ways to help clients with the automated deployment of REST APIs, as well as customizations to give better control and management capabilities of the system resources:

- Users can now deploy the IWS server into user-created subsystems. This gives users control of the memory and processing resources being used by the IWS environment.

- Users can now deploy the IWS servers and other servers automatically using the scripting interfaces. A property file is required for deployment, and this new script enables users to programmatically generate the property file as part of the automatic deployment.

For additional details on these new updates, see the [Integrated Web Services for IBM i](#) wiki landing page.

### ***Enhanced unmap support for IBM Spectrum<sup>®</sup> Virtualize***

The SCSI unmap support in IBM i for storage based on Spectrum Virtualize is enhanced to enable the processing of the unmap commands to occur in the background. This can improve performance for systems that may have been driving a lot of SCSI unmap commands to storage. A background task now frees the storage that has been deallocated from an IBM i perspective and allows for better management of data reduction pools.

### ***Dynamic LUN expansion with the IBM DS8900 storage controller***

IBM i now supports the changing of the size of the LUN that comes on an IBM DS8900 storage controller. If the LUN type on a DS8900 is a variable LUN size (models 050 and 099), that LUN can increase in size. The IBM i host does not fully recognize the size change immediately but begins processing to prepare the internal structures for the size increase. After the next IPL, the full capacity of the new LUN size is usable. This can be utilized on all disks, including the load source.

### ***Clustering enhancements***

With system administrators in mind, cluster administrative support is added to replicate an encrypted password that was previously set using the QSYSUPWD API. Before, the use of the QSYSUPWD API caused the user profile to be inconsistent, and manual intervention was required to correct it. Capability is added to allow a change to the synchronization option when a cluster node is inactive, increasing flexibility for timing of synchronization.

### ***Db2 for i***

With IBM i 7.3 TR7, Db2 for i focuses on new and advanced SQL capabilities and the ability to use SQL to access IBM i operating system details.

Application developers using IFS for source code control can utilize embedded SQL with CCSID 1208 source code on ILE C and ILE C++ SQL Precompilers.

In the tradition of recent Technology Refreshes, IBM i services are added and enhanced, providing useful SQL-based alternatives to IBM i commands and APIs:

- SQL alternatives to the Display Program (DSPPGM) and Display Service Program (DPSRVPGM) control language (CL) commands enable the use of SQL for application impact analysis, application implementation management, and many other application-specific use cases.
- The IFS\_OBJECT\_STATISTICS() UDTF table function is added, bringing an SQL alternative to the Retrieve Directory Information (RTVDIRINF) command. This new, general-purpose SQL table function can be used to find and manage objects within the integrated file system (IFS).
- The IFS\_JOB\_INFO, IFS\_OBJECT\_USAGE\_INFO, and IFS\_OBJECT\_USAGE\_JOBS table functions are added as SQL alternatives to Retrieve Object References (QP0LROR) and Retrieve Referenced Objects (QP0LRRO) APIs. These new SQL table functions make it easy to capture essential detail about IFS usage for systems-management and application-management use cases.

These and other enhancements are delivered through Db2 for i PTF Group SF99703. For Db2 for i PTF Group details, see the [Db2 for IBM i PTF Group](#) wiki landing page. See the [IBM i Technology Updates](#) wiki on developerWorks to learn more about these and other Db2 for i enhancements.

## Licensed Program Products

### **PowerHA SystemMirror for i (5770-HAS)**

#### *Administrative domain enhancements*

The administrative domain in PowerHA is used for automatically synchronizing security-related and configuration-related objects, such as user profiles, system values, and device descriptions, between nodes in a PowerHA cluster. A change to a resource on one node results in the same change occurring on the other nodes in the cluster.

Enhancements to the administrative domain include:

- Support for replicating encrypted passwords set with the QSYSUPWD API. Previously, the use of the QSYSUPWD API caused the user-affected profile to be marked as inconsistent within the administrative domain.
- Improved control over changing the synchronization option for an administrative domain using the CHGCAD command. Previously, all nodes in the administrative domain had to be active in the cluster to change the synchronization option. The synchronization option can now be changed even when some nodes in the administrative domain are inactive.

#### *Improved integrated and streamlined data center outage recovery in a HyperSwap with LUN-level switching environment*

HyperSwap provides near-continuous availability in the event of a storage outage. This enables applications to continue running with minimal impact to end users. When combined with LUN-level switching, the solution also provides protection against server hardware outages, operating system and software outages, and local data center outages. Before, if a data center outage occurred in a HyperSwap with LUN-level switching environment, the environment switched to the backup data center. However, restoration of HyperSwap protection after the original data center came back online required several manual steps. PowerHA is enhanced to integrate and automate the restoration of HyperSwap protection in these scenarios by using a single command for simplified recovery.

To get started, see the [IBM PowerHA SystemMirror for i](#) wiki page for more information.

### **Backup, Recovery, and Media Services for i (5770-BR1)**

BRMS has added the following new enhancements:

- Improved virtual tape image catalog management for backups using a virtual device. When BRMS uses a virtual device for a backup, the device will be unloaded from the image catalog and varied off to free up any resources that were used by the BRMS backup process.
- The select user-space support now includes cumulative incremental \*ALLUSR backups. Starting in IBM i 7.2, BRMS changed to use the save/restore LIB(\*SELECT) parameter to utilize a select user-space to specify the libraries to back up. This allows for more than 300 libraries in a single save command. The initial support did not include \*ALLUSR cumulative incremental backups. The restriction of an \*ALLUSR cumulative incremental has been removed.
- Added the Change Control Group Attributes (Q1ACHGCGA) API. BRMS has added a new customer API that provides a program call to specify the control group attributes for the devices and media policies to use for the backup.
- Enhanced volume selection for concurrent backup-tape reservations. Scheduling concurrent backups in a BRMS network using the same shared tape resource can cause volume selection collisions. The BRMS volume selection process has been changed to better manage concurrent volume selection to protect against two backups selecting the same volume.
- Improved the backup omit processing to combine GUI web omits and green screen backup policy omits for libraries. BRMS used a hierarchy of precedence for processing backup omits. Omits created with the GUI would be given precedence

over other omits. This hierarchy has been changed to provide a way to combine GUI omits with backup omits.

- Enhanced the backup control group exit program with the ability to run at the end of a control group. The BRMS control group exit program can now run at the end of a control group, in addition to after each item is backed up. This enables new exit-program processing for control-group failures.

### ***Rational Development Studio for i (5770-WDS)***

RPG is the most widely used programming language for IBM i development. Rational Development Studio for i delivers additional enhancements requested by new RPG programmers familiar with many open source languages. These enhancements focus on making RPG programmers even more productive.

- A new OVERLOAD keyword has been added to prototypes so programmers can list procedures and programs that they want to use when calling an overloaded prototype. Users can define simple prototypes, such as Print, and depending on the parameters passed, the actual program or procedure called is determined by the signature of the passed parameters.
- A new DATA-GEN opcode has been added to provide a robust and flexible infrastructure to create many new data documents, such as XML, JSON, YAML, and HTML, based on the contents of an RPG data structure. This is accomplished by using a generator program that does the processing. DATA-GEN is a similar technology to the DATA-INTO opcode previously provided.
- New parameter option OPTIONS(\*EXACT) causes the RPG compiler to be stricter about the parameters that can be passed on a prototyped call. With OPTIONS(\*EXACT), parameters passed by reference must exactly match the prototype. Parameters defined with CONST or VALUE must be able to be converted to the prototyped parameter type without loss of data, either through decimal truncation, string truncation, or CCSID conversion.

For more information, see the [RPG Cafe](#) website.

### ***Rational Developer for i (5733-RDW)***

Continuous focus on developer productivity and ease-of-use modern programming yields improved RDi features and usability.

The following new features have been delivered in RDi 9.6.0.7:

- Improved SQL formatting and SQL syntax verification
- New preference index that enables you to search all the preferences and shows you the structure of the preferences
- Addition of a library list control that adjusts the library list being used within a connection
- Continued expansion and enhancements of the refactoring support within RDi

For more information on these and other enhancements, see the [IBM Rational Developer for i Hub](#) wiki on developerWorks.

### ***IBM i Access Client Solutions (5733-XJ1)***

ACS interface enhancements are focused on improving the tools used by database engineers and system managers to manage and access the necessary information on IBM i.

- Schemas: The filter and search capabilities within schemas are improved to make finding things faster and more intuitive. Additionally, schemas support is enhanced for quick positioning, so users can rapidly move about the list based upon a keystroke.
- Run SQL Scripts: In this Technology Refresh, features are added that help SQL users create, save, and better understand their SQL statements.
  - Users can now get assistance on the tables and columns to select when building SQL statements.

- The query execution timestamp within a Run SQL Scripts Results window is now displayed.
- Users can extract the SQL used to create a Run SQL Scripts Results window.
- To improve the user experience by seeing results appear quickly, ACS SQL scripts do a partial load (100 at a time) of resulting records before displaying. Upon a scroll action, additional records are displayed.
- Users can easily add their own "Insert from Examples" with the click of a button. Users can customize "Insert from Examples" categories and descriptions, as well as provide additional locations for saved scripts.
- Users can see the source script for "Insert from Examples".
- Useful examples for every new SQL service are provided in this Technology Refresh.

## Open source

### ZeroMQ

The ZeroMQ core engine in C++ (libzmq) has been delivered in RPM form. ZeroMQ is an open source universal messaging library. It is an important building block, as numerous applications rely on this technology. For more information, see the [ZeroMQ website](#).

The Python bindings (pyzmq) are also available, making the ZeroMQ capabilities easily available to Python applications on IBM i. For more information, see the [PyZMQ Documentation](#) site.

### Redis

The open source in-memory store mechanism is now available in RPM form. It has several uses, such as a message broker, cache, or database. It helps with enabling applications that use this technology or is commonly used to support new development of web applications, particularly Node.js. For more information, see the [Redis website](#). For more information on how to get started with RPMs, see the [IBM i RPM Open Source](#) Git repository.

## Hardware and firmware

IBM i 7.3 TR7 supports FW940, which provides the most up-to-date POWER9 functionality.

Several enhancements provide operational efficiency and increased configuration flexibility:

- A new generation of enterprise 2.5-inch solid-state SSDs, which incorporates the latest 3D NAND technology.
- A new processor feature for 11-core or 22-core configurations of the Power System S924 server, which provides additional choices for the scale-out market.
- The HMC or Novalink command-line interface can be used to add license keys to an IBM i LPAR.
- Dynamic LPAR (DLPAR) can be used to assign SR-IOV logical ports to LPARs that are configured with restricted I/O. This configuration has the benefit of high-speed, low-latency traffic, which enables users to later make use of Live Partition Mobility. DLPAR can also be used to remove the SR-IOV logical ports from the LPAR prior to the LPM action.

Additional details about these and other hardware-related enhancements can be found on the [IBM i developerWorks Technology Updates](#) wiki landing page.

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## Reference information

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For additional information on IBM i, see:

- Software Announcement [ZP19-0548](#), dated October 8, 2019(IBM PowerVM<sup>®</sup> 3.1.1, IBM PowerVC V1.4.4, and IBM Virtual HMC (vHMC) 9.1.940 offer new enhancements)
- Hardware Announcement [ZG19-0085](#), dated October 8, 2019(IBM POWER9 and IBM POWER8 technology-based systems deliver hardware enhancements)

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## Program number

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Program number	VRM	Program name
5770-SS1	7.3	IBM i 7.3 TR7

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## Offering Information

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Product information is available on the [IBM Offering Information](#) website.

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## Publications

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None

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## Services

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### **Global Technology Services**

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Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings for the efficient installation, implementation, or integration of this product.

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## Technical information

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### **Specified operating environment**

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#### **Hardware requirements**

IBM i 7.3 TR7 is supported on selected Power Systems servers with POWER9, POWER8, POWER7+, or POWER7 processors. Clients using blades or PureFlex systems, and those using servers with POWER6 or POWER6+ or earlier processors, need to move to newer systems to take advantage of the new features in IBM i 7.3 TR7.

For up-to-date information on all types of code levels needed for support of a particular feature, see the [Power Systems Prerequisites](#) website.

For additional information, see the [System to IBM i maps](#) website.

#### **Software requirements**

To find the supporting technical details for the topics found in this announcement letter for IBM i 7.3, see the [TR7 enhancements](#) website.

#### **IBM Support**

[IBM Support](#) is your gateway to technical support tools and resources that are designed to help you save time and simplify support. IBM Support can help you find answers to questions, download fixes, troubleshoot, submit and track problem cases, and build skills. Learn and stay informed about the transformation of IBM Support, including new tools, new processes, and new capabilities, by going to the [IBM Support Insider](#).

You can also access the [Service requests and PMRs](#) website for additional support options.

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## **Planning information**

IBM i 7.3 is the last release to support POWER7 or POWER7+ processor-based systems.

### ***Packaging***

This offering is delivered through the internet and as physical media.

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## **Security, auditability, and control**

IBM i uses the security and auditability features of IBM i.

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

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## **Ordering information**

Consult your IBM representative.

There is no new ordering information in this release.

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## **Charge metric**

Not applicable

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## **Terms and conditions**

The information provided in this announcement letter is for reference and convenience purposes only. The terms and conditions that govern any transaction with IBM are contained in the applicable contract documents such as the IBM International Program License Agreement, IBM International Passport Advantage<sup>(R)</sup> Agreement, and the IBM Agreement for Acquisition of Software Maintenance.

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The IBM Agreement for Acquisition of Software Maintenance (Z125-6011) applies for Subscription and Support and does not require client signatures.

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telephone assistance (voice support for defects during normal business hours), as well as access to updates, releases, and versions of the program as long as support is in effect.

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**License Information number**

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See the [License Information documents](#) web page on the IBM Software License Agreement website for more information.

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**Limited warranty applies**

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Yes

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**Limited warranty**

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IBM warrants that when the program is used in the specified operating environment, it will conform to its specifications. The warranty applies only to the unmodified portion of the program. IBM does not warrant uninterrupted or error-free operation of the program or that IBM will correct all program defects. You are responsible for the results obtained from the use of the program.

IBM provides you with access to IBM databases containing information on known program defects, defect corrections, restrictions, and bypasses at no additional charge. For further information, see the [IBM Support Guide](#).

IBM will maintain this information for at least one year after the original licensee acquires the program (warranty period).

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**Program support**

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Subscription and Support includes telephone assistance, as well as access to updates, releases, and versions of the program as long as support is in effect. You will be notified of discontinuance of support with 12 months' notice.

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**Money-back guarantee**

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If for any reason you are dissatisfied with the program and you are the original licensee, you may obtain a refund of the amount you paid for it, if within 30 days of your invoice date you return the program and its PoE to the party from whom you obtained it. If you downloaded the program, you may contact the party from whom you acquired it for instructions on how to obtain the refund.

For clarification, note that for programs acquired under any of IBM's On/Off Capacity on Demand (On/Off CoD) software offerings, this term does not apply since these offerings apply to programs already acquired and in use by you.

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**Volume orders (IVO)**

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No

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**Passport Advantage applies**

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No

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**Usage restrictions**

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Yes

See the [License Information documents](#) web page on the IBM Software License Agreement website for more information.

## **Software Subscription and Support applies**

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Yes. All distributed software licenses include Software Subscription and Support (also referred to as Software Maintenance) for a period of 12 months from the date of acquisition, providing a streamlined way to acquire IBM software and assure technical support coverage for all licenses. Extending coverage for a total of three years from date of acquisition may be elected.

While your Software Subscription and Support is in effect, IBM provides you assistance for your routine, short duration installation and usage (how-to) questions, and code-related questions. IBM provides assistance by telephone and, if available, electronic access, only to your information systems (IS) technical support personnel during the normal business hours (published prime shift hours) of your IBM support center. (This assistance is not available to your end users.) IBM provides Severity 1 assistance 24 hours a day, every day of the year. For additional details, go to the [IBM Support Handbooks](#) web page.

Software Subscription and Support does not include assistance for the design and development of applications, your use of programs in other than their specified operating environment, or failures caused by products for which IBM is not responsible under this agreement.

## **IBM Operational Support Services - Support Line**

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No

## **System i Software Maintenance applies**

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Yes

## **Variable charges apply**

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No

## **Educational allowance available**

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Yes. When ordering through the program number process, a 15% education allowance applies to qualified education institution clients.

Education Software Allowance Program applies when ordering through the program number process.

## **ESAP available**

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Yes, to qualified clients.

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## **Statement of good security practices**

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IT system security involves protecting systems and information through intrusion prevention, detection, and response to improper access from within and outside your enterprise. Improper access can result in information being altered, destroyed, or misappropriated or can result in misuse of your systems to attack others. Without a comprehensive approach to security, no IT system or product should be considered completely secure and no single product or security measure can be completely effective in preventing improper access. IBM systems and products are designed to be part of a regulatory compliant, comprehensive security approach, which will necessarily involve additional operational procedures, and may require other systems, products, or services to be most effective.

**Important:** IBM does not warrant that any systems, products, or services are immune from, or will make your enterprise immune from, the malicious or illegal conduct of any party.

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## Prices

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There is no new prices information in this release.

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## Announcement countries

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All European, Middle Eastern, and African countries, except Islamic Republic of Iran, Sudan, and Syrian Arab Republic.

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