

IBM i Memo to Users  
7.2

*Memo to Users*



**Note**

Before using this information and the product it supports, read the information in [“Notices” on page 59.](#)

This edition applies to version IBM i 7.2 (product number 5770-SS1) and to all subsequent releases and modifications until otherwise indicated in new editions. This version does not run on all reduced instruction set computer (RISC) models nor does it run on CISC models.

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## **Saving PDF files**

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# About IBM i Memo to Users

This information describes the changes in version 7, release 2, modification 0 (IBM® i 7.2) that could affect your programs or system operations. Use the information in this memorandum to prepare for changes on your current release and to use the new release.

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## Who should read this memorandum

The IBM i 7.2 Memo to Users contains information that is critical for several audiences.

This memorandum has four sections:

- Read this first provides information to be considered before you install IBM i 7.2. This section is intended for system and application programmers and for the person responsible for system management.
- Operating system contains new release changes to basic operating system functions. This section includes changes to systems management functions, such as configuration and tailoring the system, and changes that could affect the way things operate or appear in the new release. This section is intended for all users of the IBM i computers.
- Options provides information about new release changes that affect specific program options of the operating system. This section is intended for all users of the IBM i computers.
- Licensed programs contains new release changes that might affect existing applications. These changes might also affect applications that are saved on an IBM i 7.2 system to be restored on a previous release server. This section is intended for application programmers and system programmers who use the IBM i computers and its licensed programs, as well as for businesses with complex networks or application development businesses that have systems at different releases.

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## Additional incompatibility information

After the publication of the IBM i Memo to Users, updates to this document will be available in the English Internet version of the IBM Knowledge Center under IBM i 7.2 at this Web site:

[http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i/welcome](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i/welcome)

Technical changes to the text are indicated by a vertical line to the left of the change.

For other incompatibility information that was not available when this memorandum was published, see PTF cover letters and Authorized Problem Analysis Reports (APAR) information at:

<http://www.ibm.com/systems/support/i/databases/index.html>

For Preventive Service Planning - PSP information go to :

1. <http://www-01.ibm.com/support/docview.wss?uid=nas8N1021657>
2. Click **IBM i 720 PSPs**.

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## What's new

The following information was added or updated in this release of the information:

### What's new

The following revisions or additions have been made to the Memorandum to Users documentation since the first IBM i 7.2 publication:

- **April 2023 update**
  - [“Heritage IBM Navigator for i permanently removed from the system”](#) on page 32 was added.

- **October 2022 update**
  - [“CHGDEVTAP UNLOAD change now allowed while device is varied on” on page 21](#) was added.
- **April 2021 update**
  - [“OBJECT\\_STATISTICS\(\) table function changes for \\*USRPRF objects” on page 29](#) was added.
  - [“Updated EBCDIC Unicode maps for CCSIDs 1377 and 1388 ” on page 39](#) was added.
  - [“IBM Navigator for i requires 64-bit Java SE 8” on page 31](#) was added.
- **April 2019 update**
  - [“Upgrade planning ” on page 10](#) was updated.
  - [“Native database access behavior changes” on page 22](#) was updated.
  - [“Using reserved words as correlation names” on page 21](#) was added.
  - [“SAVLIBBRM command changes” on page 47](#) was added.
  - [“IBM TCP/IP Connectivity Utilities for i \(5770-TC1\)” on page 52](#) was updated.
- **August 2018 update**
  - [“SQL JSON functions duplicate key handling change” on page 29](#) was added.
- **June 2018 update**
  - [“Commands that have been changed by applying PTFs, might fail to compile with a CPD0043 when TGTRLS is not the current release” on page 19](#) was updated.
  - [“ILE RPG changes” on page 55](#) was updated.
- **April 2018 update**
  - [“SQE changed to hold jobs when query related temporary storage exceeds MAXTMPSTG” on page 29](#) was added.
  - [“ILE RPG changes” on page 55](#) was updated.
- **February 2018 update**
  - [“Minimum partition memory required for POWER9 ” on page 12](#) was added.
  - [“ Read before upgrading BRMS ” on page 46](#) was updated.
- **October 2017 update**
  - [“UPDATE using OVERRIDING USER VALUE” on page 24](#) was updated.
  - [“ILE RPG changes” on page 55](#) was updated.
  - [“ Read before upgrading BRMS ” on page 46](#) was added.
- **June 2017 update**
  - Links to PSP documentation were updated throughout the publication.
- **May 2017 update**
  - [“JV1 options support on IBM i 7.2” on page 46](#) was updated.
- **March 2017 update**
  - [“CREATE FUNCTION \(SQL scalar\) or CREATE FUNCTION \(SQL table\) with a data access classification of CONTAINS SQL may fail with SQLSTATE '2F004' and SQLCODE -579” on page 28](#) was added.
  - [“FULL OUTER JOIN change” on page 28](#) was added.
- **November 2016 update**
  - [“IBM Navigator for i primary access methodology” on page 31](#) was added.
  - [“Secure sockets layer \(SSL\) default cipher specification list changes” on page 36](#) was updated.
  - [“JV1 options support on IBM i 7.2” on page 46](#) was updated.
  - [“IBM WebSphere Application Server Versions 8.0 \(5733-W80\) and 8.5 \(5733-W85\)” on page 43](#) was updated.

- **October 2016 update**

- [“Planning for removal of support of adapters and configurations for releases following V7R3 of IBM i” on page 38](#) was added.
- [“DISPLAY\\_JOURNAL\(\) table function changes” on page 27](#) was added.
- [“SYSTOOLS.GROUP\\_PTF\\_CURRENCY/SYSTOOLS.GROUP\\_PTF\\_DETAIL changes” on page 27](#) was added.
- [“TIMESTAMP\\_FORMAT scalar function can return SQLSTATE '22007' and SQLCODE -20448” on page 27](#) was added.
- [“Workload Capping and SMP degree \\*OPTIMIZE change” on page 28](#) was added.
- [“IBM PowerHA SystemMirror for i \(5770-HAS\)” on page 49](#) was updated.

- **April 2016 update**

- [“End of support for Tivoli Storage Manager \(TSM\) APIs” on page 51](#) was added.
- [“Change to the event file EVFEVENT” on page 30](#) was added.
- [“Simple Network Management Protocol \(SNMP\) Install Actions” on page 36](#) was added.

- **October 2015 update**

- [“CRTUSRPRF, CHGUSRPRF, and RTVUSRPRF command changes” on page 20](#) was updated.
- [“IBM PowerHA SystemMirror for i \(5770-HAS\)” on page 49](#) was updated.

- **July 2015 update**

- [“Secure sockets layer \(SSL\) default cipher specification list changes” on page 36](#) was updated.
- [“SSLv3 protocol has been disabled for System SSL” on page 37](#) was updated.
- [“Integrated Server Support \(Option 29\)” on page 41](#) was updated.
- [“IBM WebSphere Application Server Versions 8.0 \(5733-W80\) and 8.5 \(5733-W85\)” on page 43](#) was updated.
- [“IBM TCP/IP Connectivity Utilities for i \(5770-TC1\)” on page 52](#) was added.

- **April 2015 update**

- RPG application and OPNQRYF key mismatches [“RPG application and OPNQRYF key mismatches might produce different results” on page 25](#) was added.
- Changes to the QSYS2.OBJECT\_STATISTICS table function [“Changes to the QSYS2.OBJECT\\_STATISTICS table function” on page 23](#) was added.
- [“IBM WebSphere Application Server Versions 8.0 \(5733-W80\) and 8.5 \(5733-W85\)” on page 43](#) was updated.

- **November 2014 update**



- IBM i installation load source requirements [“IBM i Installation load source requirements” on page 11](#) has been updated.
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- **October 2014 update**

- Simple Network Management Protocol Changes [“Simple Network Management Protocol \(SNMP\) changes” on page 36](#) was added.
- System i Navigator performance plug-in is no longer supported [“System i Navigator performance tools plug-in no longer supported” on page 31](#) was added.
- System i Navigator advanced job scheduler plug-in is no longer supported [“System i Navigator Advanced Job Scheduler plug-in is no longer supported” on page 31](#) was added.

## How to see what's new or changed

To help you see where technical changes have been made, this information uses:

- The  image to mark where new or changed information begins.
- The  image to mark where new or changed information ends.

To find other information about what's new or changed this release, see the [Memo to users](#).

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## Installing IBM i 7.2 over IBM i 6.1

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If you are installing IBM i 7.2 over IBM i 6.1, you should also read the *IBM i Memo to Users* for i 7.1. It contains incompatibility-related information about the new functions and enhancements incorporated in IBM i 7.1.

You can order this document by typing the following command: **SNDPTFORD SF98036**

In addition to the SNDPTFORD command, you can also view the *7.1 IBM i Memo to Users* in the IBM Knowledge Center under the IBM i 7.1 release :

[https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i)

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## Discontinued support for certain software and hardware

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It is important that, as a customer, you review and understand all new software release considerations.

This is especially true of discontinued support for selected software and hardware products or features. This information is contained within the IBM i announcement material. To get the most current information about discontinued products or features along with suggested replacements, go to the [Planning to upgrade to IBM i 7.2](#) page at:

<https://www.ibm.com/support/pages/node/668151>

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## PTF numbers in this memorandum

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Program temporary fix (PTF) numbers in this memorandum might have been superseded.

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## Memorandums for previous releases

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How to access Memorandum to Users from previous releases.

You can view these documents in the IBM Knowledge Center under the IBM i release needed:

[https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i)

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## Prerequisite and related information

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Use the IBM Knowledge Center as your starting point for looking up IBM i technical information.

[http://www.ibm.com/support/knowledgecenter/#!/ssw\\_ibm\\_i/welcome](http://www.ibm.com/support/knowledgecenter/#!/ssw_ibm_i/welcome)

The IBM Knowledge Center contains information about important topics such as Java(TM), TCP/IP, Web serving, secured networks, logical partitions, high availability, control language (CL) commands, and system application programming interfaces (APIs). It also includes links to related IBM Redbooks® and Internet links to other IBM Web sites such as the IBM home page. With every new hardware order, you receive the IBM i Access Client Solutions CD. IBM i Access Client Solutions replaces its predecessor IBM i Access for Windows. IBM i Access Client Solutions may be used for console connections and is capable of running directly from the CD. See the Getting Started document in the Documentation directory on the IBM i Access Client Solutions CD for more information. The IBM i Access Family offers client/server capabilities for connecting personal computers to IBM i computers.

The IBM Prerequisite tool provides compatibility information for hardware features and helps to plan a successful system upgrade by providing prerequisite information for currently available features and features to be added to the system at a later date.

The IBM Prerequisite tool can be accessed here: [http://www.ibm.com/systems/electronic/support/e\\_dir/eserverprereq.nsf](http://www.ibm.com/systems/electronic/support/e_dir/eserverprereq.nsf).

## How to send your comments

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Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this memorandum or any other IBM i documentation, complete the readers' comment form at the back of this memorandum.

For comments on books or IBM i content in the IBM Knowledge Center, use the comment feature in the topic of interest within IBM Knowledge Center.



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# Read this first

Read this section before doing anything else.

## Current customers - read before you install

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Read the release planning documents before you install 7.2

The following publication contains additional information that you should read and understand before you install this release. All the sources that are referenced are on the Internet and can be found through various links at the following website: [http://www.ibm.com/support/knowledgecenter/#!/ssw\\_ibm\\_i/welcome](http://www.ibm.com/support/knowledgecenter/#!/ssw_ibm_i/welcome)

**Note:** After the release of IBM i 7.2, updates to IBM i topics contained in the IBM Knowledge Center will be available in the English Internet version. To review these updates, click **Information Updates** under IBM i 7.2 in the IBM Knowledge Center.

Access the Internet version. The instructions refer you to several sources:

- The [Installing, upgrading, or deleting IBM i and related software](#) topic in the IBM Knowledge Center contains software preinstallation information and information about installing or upgrading the operating system release, part of the release, or related licensed programs. You can also order a printed version of this PDF (SC41-5120) with your software upgrade orders or new hardware orders.
- The Preventive Service Planning (PSP) Information provides information about software problems you might encounter as you install the new release. To access the PSP database:
  1. Go to **Roadmap to IBM i Preventive Service Planning Documentation** at <http://www-01.ibm.com/support/docview.wss?uid=nas8N1021657.html>.
  2. Scroll down and select **IBM i 720 PSPs**

Alternatively, you can obtain PSP from your software service provider. The following items are included in PSP:

- The PSP identifier for information that pertains to installing IBM i 7.2 is SF98180.

The information within this PSP describes late-breaking installation information, and is grouped by product area. To receive this PSP information by using electronic customer support, type the following command on an IBM i command line:

**SNDPTFORD SF98180**

- The PSP identifier for information that pertains to problems discovered since the availability of the current cumulative PTF package is SF98720. Information within this PSP describes all PTFs released since the current cumulative PTF package began shipping. It also contains information about all known high-impact and pervasive problems that are not included in the latest cumulative PTF package. To receive this PSP information by using electronic customer support, type this command on an IBM i command line:

**SNDPTFORD SF98720**

- The PSP identifier for information that pertains to installing IBM i 7.2 hardware and HMC is MF98720. Review this PSP information before you install either new IBM i models or hardware devices. To receive this PSP information by using electronic customer support, type this command on an IBM i command line:

**SNDPTFORD MF98720**

- The PSP identifier for information that pertains to system upgrades and data migrations is SF98172. Information within this PSP describes upgrade and migration corrections. Review this PSP information before you upgrade your system model or migrate your data between systems. To receive this PSP information by using electronic customer support, type the following command on an IBM i command line:

## **SNDPTFORD SF98172**

- The IBM i PTF maintenance strategy. A PTF maintenance strategy is recommended for all IBM i customers. This might reduce the impact to IBM i operations that result from unplanned outages or program failures.

## **Required PTFs before you upgrade to IBM i 7.2**

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PTFs might be required before you upgrade to 7.2

As you plan for your IBM i installation or upgrade, ensure that you review the "Required PTFs for upgrading to IBM i" at <https://www.ibm.com/support/pages/required-ptfs-upgrading-ibm-i-72>

If you are upgrading from IBM i 6.1, for example, you need to load and apply certain PTFs to be able to accept online software agreements. If you are using image catalogs to upgrade from either IBM i 6.1 or IBM i 7.1 certain PTFs are required. Both of these preparation steps are included in the Installing, upgrading, or deleting page found here: [https://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/rzahc/rzahc1.htm](https://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahc/rzahc1.htm) and related software IBM Knowledge Center topics.

To review the "Required PTFs for upgrading to IBM i 7.2", go to the page: <https://www.ibm.com/support/pages/node/3032175> and select Updates and PTFs.

## **Upgrade planning**

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Documentation resources important to consult before you upgrade:

The Systems Management Planning web page <https://www.ibm.com/support/pages/node/668129> provides links to various planning tools and information.

The IBM i mapping web page <https://www.ibm.com/support/pages/node/6023368> lists operating system support by model.

On the Planning web page <https://www.ibm.com/support/pages/node/668155>, select Upgrade Planning and then Future Software/Hardware. Follow the link to Software for advanced planning information including BOSS option, LPP and LPP option availability changes.. Check this information and use it to plan future solutions for enhancements, upgrades, or migrations.

## **IBM i 7.2 requires POWER6 or newer hardware**

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IBM i 7.2 will not install on POWER5 hardware. Attempts to install 7.2 on any POWER5 hardware, including the following models, fail with a B6000423 system reference code:

- 515
- 520
- 525
- 550
- 570
- 595

## **Tape and optical device types that are not supported on IBM i 7.2**

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The following tape and optical device types have either reached end of service, were only supported on POWER5 or require an IOP for attachment. They are not supported on IBM i 7.2.

- IBM 3995 Optical Library
- 3570 tape library - all drive types
- 3573 tape library with LVD LTO3 and HH LTO3 tape drives
- 3575 tape library - all drive types



- 3576 tape library with LVD LTO3 drives
- 3490 tape device and library - all models
- 3580-001 HVD tape drive
- 3580-002 HVD tape drive
- 3580-002 LVD tape drive
- 3580-003 LVD tape drive
- 3581 tape library - all drive types
- 3582 tape library - all drive types
- 3583 tape library - all drive types
- 3584 tape library with HVD LTO1 and LTO2 drives
- 3584 tape library with LVD LTO2 drives
- 3590 tape device and library - all models
- 5753 SLR60 tape drive
- 5754 SLR100 tape drive
- 5755 HH LTO2 LVD tape drive
- 6120 VXA2 tape drive
- 6258 DAT72 tape drive
- 6279 VXA3 tape drive
- 6382 SLR5 tape drive
- 6383 MLR1S tape drive
- 6384 SLR60 tape drive
- 6386 MLR3 tape drive
- 6387 SLR100 tape drive
- 7207-122 SLR5 tape drive
- 7207-330 SLR60 tape drive
- 7208 8mm tape drive - all models
- 9348 1/2 inch reel tape drive

## IBM i Installation load source requirements

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Load source size increased to 70 GB

If you have already upgraded to the April 2014 version of IBM i 7.2, you can skip this section as it no longer applies.

### **Load source requirements for the November 2014 - IBM i 7.2 Technology Refresh 1**

Starting with IBM i 7.2 TR1, the minimum loadsource requirements have changed for external and virtual loadsource LUNs. The minimum loadsource sizes are listed below:

- Minimum of 35 GB for 520-byte sectors (DS8000, virtual disks with VIOS as server)
- Minimum of 41 GB (to get 35 GB useable space) for 512-byte sectors (SVC, Storwize, virtual disks with VIOS VSCSI or IBM i as server)
- Minimum of 70 GB for Native-attached SAS (Both 520-byte or 4K sectors)

Note that PTFs are required on an IBM i 6.1, 6.1.1, or 7.1 partition before upgrading to IBM i 7.2.

For details about calculating "usable space", about the required PTFs, and other details, see the developerWorks topic [IBM i and Related Software](#).

### **Load source requirements for April 2014 - IBM i 7.2 release**

The November 2014 IBM i Technology Refresh 1 has changed the loadsource requirements and also fixed issues with RAIDed Native-attached SAS drives. You should consider obtaining IBM i Technology Refresh 1 or later LIC media before continuing on with the upgrade.

Successful installation of IBM i 7.2 requires the following for each server or logical partition:

- The minimum load source disk size for IBM i 7.2 is 70 GB. This size is based on storage with 520-byte sectors. Two cautionary notes :
  - If the IBM i partition is using disks with 512-byte sectors, for example a partition hosted by IBM i or IBM i on storage that is attached by Virtual SCSI, the storage that is allocated for the load source needs to be approximately 80 GB to allow the IBM i partition to see the required 70 GB.
  - If you have a 70 GB load source disk that is going to be included in a RAID 5 or RAID 6 configuration, you must upgrade to 7.2 before you configure RAID. After the upgrade, you can start RAID including the load source. Examples of disks that fall into this category are #1884/198B (69.7 GB 15K RPM SAS SFF DISK) or #3676/433B (69.7GB 15K RPM SAS DISK DRIVE) disks.

Before you upgrade, ensure that the server meets disk storage requirements for upgrades. In the IBM Knowledge Center review the "Ensuring the system meets disk storage requirements for upgrades" topic for instructions. Here is a link: [http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/rzahc/rzahcevaldskstorreq.htm](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahc/rzahcevaldskstorreq.htm)

- In addition, all server models with IBM i 7.1 or earlier releases installed require more reserved storage before IBM i 7.2 can be installed. Your upgrade will stop during the installation if you do not allocate the additional space. In the IBM Knowledge Center consult the "Required: Allocating additional space for Licensed Internal Code" topic for instructions. Here is a link: [http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/rzahc/allocatespacelic.htm](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahc/allocatespacelic.htm)

## Minimum partition memory required for POWER9

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For POWER9 or POWER9 compatibility mode, the minimum partition memory required to IPL and IBM i partition is 1 GB. The recommended minimum partition memory for an IBM i partition is 2 GB.

## Plan for your Operations Console installation or upgrade

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The console features matching the connectivity that you plan to use should be specified as part of the order for your new IBM i or Power® system.

### LAN attached Operations Console prerequisite information

Prerequisite information for LAN attached Operations Console users who are upgrading to, or installing, IBM i 7.2:

If you are upgrading to IBM i 7.2 and you want to replace an existing console with a LAN attached Operations Console, upgrade the system before you migrate the console. This prevents any conflict between the existing console and the Operations Console.

For all upgrades and installations, you need to establish a connection between the system and Operations Console PC using the 11111111 (eight 1's) service tools user ID. The default password for this user ID is 11111111; however, this password might have been changed following a previous installation. This default user ID ensures a successful reauthentication of the client connection to the system. When you receive the operating system release upgrade, the shipped service tools user IDs (except 11111111) are expired. To reauthenticate the client connection to the system, enter the service tools user ID of 11111111 (eight 1's) and either the default password of eight 1's or the password you might have previously created for this user ID. This is especially important for automatic installations.

**Important:** During a manual IPL of the system, if no console has been specified before, you will receive two extra screens to confirm the setting of the console type. The first requires pressing F10 to accept your current console type and the second shows that a value did not previously exist (a zero is present for the old value) and the new value is shown. Pressing Enter exits and sets the console type automatically. The IPL continues to the IPL or Install the System screen. This condition is most likely to occur during the installation of a new partition but might happen on your first manual IPL of IBM i 7.2; for example, the

A-mode IPL following the restore of Licensed Internal Code during the upgrade or install when a console value of zero is found.

## High Availability

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High availability considerations

Before you upgrade your system to IBM i 7.2, make sure your cluster version is 7. If you have 5770-HAS (IBM PowerHA SystemMirror for i) installed, make sure your HA version is 2.2. The Change Cluster Version (**CHGCLUVER**) command can be used to adjust the current version of the cluster and the PowerHA product.

Support was added to Cluster administrative domain to monitor owner and authority attributes for all monitor resource entries in cluster version 8. So if a user does not want to monitor owner and authority attributes, then they must list all the attributes they are interested in, instead of coding \*ALL.

## Hardware considerations before upgrading to IBM i 7.2 on Power6

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### IBM i 7.2 will not support RIO/HSL loops or drawers on POWER6

RIO/HSL I/O drawer feature codes include:

- #0595/5095/7311-D20
- #0694
- #0696
- #5790/7311-D11
- #5094/5294/5096/5296
- #5088/0588
- #5791/5794/7040-61D

### IBM i 7.2 on Power6 does not support IOPs or IOP based adapters

IOPless (Smart IOA) options are available for all I/O attachments (except Twinax and IXS) and provide more efficient attachment of I/O. Customers using IOP based I/O must move off IOPs to enable upgrading to IBM i 7.2.

IOP feature codes are:


- #2843
- #2844
- #2847 (SAN Boot)
- #3705

Note that there can be differences in the specific devices supported with or without an IOP by IBM i. For example some older tape libraries such as the 3590 require an IOP-based adapter. Or there may be a functional difference without an IOP, for example SDLC or X.25 on WAN/LAN adapters require an IOP. A partial list of adapters supported on POWER6 servers which require an IOP includes:

- #4746 Twinax Workstation Controller (which means no twinax displays/printers unless an OEM conversion device is used)
- #4812/4813 Integrated xSeries Server (IXS) (use iSCSI alternative)
- #2757/2780/5580/5778 Disk Controllers (use newer disk controllers)
- #2787/5761/5760 Fiber Channel Adapters (use newer Fibre Channel Adapters)
- #2749 HVD SCSI Adapter or Ultra Media

## **IBM i 7.2 can be hosted by IBM i 6.1.1 or i 7.1 on POWER6**

For customers on POWER6® with RIO/HSL loops, IBM i 7.2 can be hosted by IBM i 7.1 or IBM i 6.1.1 on that hardware. For more information, reference the IBM i hosting IBM i section in the Virtualization chapter in this IBM Redbooks publication:

[IBM i 7.1 Technical Overview with Technology Refresh Updates](#) 

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# IBM i operating system

This section describes changes to the IBM i operating system and its functions. Changes to systems management functions, such as configuring and tailoring the system, are also included.

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## Programming Considerations

Release to release programming considerations.

### Output file(OUTFILE) changes

Release to release Output file(OUTFILE) considerations

Applications using LVLCHK(\*YES) might be affected by changes to IBM-supplied system output files in this release. IBM commands and APIs that generate database output files might add new fields to the end of record formats, or use all or part of existing reserved fields for additional information returned each release. Adding new fields to the record format, even to the end of the record, changes the level check value for the file. This might cause an application with LVLCHK(\*YES) to fail with a level check error. If a level check error does occur, review the application to determine which system file it uses. New fields have been added to IBM-supplied database files in each release of IBM i.

### Output(\*PRINT) changes

Release to release Output(\*PRINT) considerations

Applications specifying OUTPUT(\*PRINT) to generate spooled output from commands must be able to tolerate changes to the record layout in the spooled file. From release to release, commands that support that option can add, change, or remove records from the output. Any application that has a dependency on the record layout for a specific command might have to change.

### Security audit record changes

Release to release Security audit record considerations

Changes made to security auditing for this release might affect applications that read those audit records. Actions that were not audited in previous releases might now be audited. Existing audit records might have been changed by the addition of new fields in a reserved area of the audit record or at the end of the audit record. Existing fields might contain new values. Applications that read the audit records should be changed to tolerate these types of changes.

### Programs that use customized versions of IBM-supplied commands

Release to release considerations for programs that use customized version of IBM-supplied commands

Some IBM i functions that use IBM-supplied control language (CL) commands that are not library-qualified in this release might be changed in a future release to specify a specific library, \*NLVLIBL or \*SYSTEM, for the library qualifier. Applications that depend on using their own version of commands instead of the IBM-supplied commands might not work as they had on earlier releases. These applications should be changed to use the retrieve command exit point (QIBM\_QCA\_RTV\_COMMAND) or the change command exit point (QIBM\_QCA\_CHG\_COMMAND) that allows your exit program to get control and possibly change the command that is used.

## Changes to system printer files and other IBM-supplied objects

Release to release considerations for possible changes to system printer files and other IBM-supplied objects

The **MAXRCDS** parameter for **QSYSPRT** and **QPSAVOBJ** printer device files has always been 100 000. During an upgrade, the default value has not changed for system printer files. Customization of IBM-supplied printer files is lost on a release upgrade. To preserve those changes, you need to rerun your changes to printer system files each release.

Changes to many types of IBM-supplied objects are lost during an upgrade because the copy of the object in the IBM product library is replaced by the new copy of the object.

## API changes

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Release to release API changes

### IBM i License program API changes

IBM i License Program Version/Release/Modification (VRM) format changes in APIs

When dealing with the release information for IBM i Licensed Programs, the 'V', the 'R', and the 'M' represent extraneous information. Each of these values can be implied rather than explicitly stated when stored internally and passed about programmatically. In the current LP architecture, the character 'V' is always in position 1 of the six character **VvRrMm** field. Therefore, explicitly storing or programmatically passing the character 'V' when dealing with an IBM i LP is unnecessary. Its existence can be implied as being part of a **VvRrMm** field. The same statement can be applied to the character 'R' and character 'M' in the **VvRrMm** fields. As such, V1R1M0 could be interpreted as being the same as 010100. The first two characters are always the version, the third and fourth characters are always the release, and the fifth and sixth characters are always the modification.

Licensed Program interfaces will be altered to handle both VRM data in the old format with hardcoded 'V', 'R', and 'M' values and also without the user explicitly including the 'V', the 'R', and the 'M'. This support is only allowed for products that need to use expanded values for their version, release, or modification. Products that do not build to support the expanded VRM fields will still use the old **VvRrMm** format with the documented interfaces.

If a function is manipulating an undetermined product ID, or a function could potentially be handling a varying list of products, the code should be capable of handling a VRM format of **VvRrMm** with the 'V', 'R', and 'M' characters included and a VRM formation of **vvrmm** where the 'V', 'R', and 'M' characters are not returned, 100901 (which would represent V10R9M1) for example.

When interrogating the release of one specific product, the VRM information is likely to be of a known format. For example, if a function is looking at information for only 5770WDS, the VRM will be handled as V7R2M0. If a function is retrieving product information for SLIC or the Operating System, the VRM is returned as V7R2M0.

Substringing of the VRM output from the various interfaces might need to be adjusted to handle Licensed Programs that exceed a value of 9 for the version value or release value. It may no longer be safe to assume that the first character is always 'V', the third character is always 'R', and the fifth character is always 'M'.

The following License program APIs are changed for IBM i 7.2:

- QLPACAGR
- QLPLPRDS
- QLPRAGR
- QSZSPTPR
- QSZCRTPD
- QSZCRTPL

- QSZMPRLS
- QSZPKGPO
- QSZRTVPR
- QSZSLTPR
- QLZAADDK
- QLZADDLI
- QLZAGENK
- QLZARLS
- QLZAREQ
- QLZARTV
- QLZARTVK

## PTF API changes

PTF Software Product APIs product version and release field changes

The PTF Software Product APIs will be modified to accept expanded VRM input and/or return expanded VRM output using existing CHAR(6) Release fields. Input Release fields will allow either the old VxRyMz format or the new vvrmm format where version vv and release rr must be a number from 00 through 35 and modification mm must be a number from 00 through 09 or a letter from 0A through 0Z. The new vvrmm format is only required on input fields when the product version or release is greater than 9. Output Release fields will return the old VxRyMz format if the product version and release are both less than or equal to 9. The new vvrmm format will be returned only when the product version or release is greater than 9.

The following PTF Software Product APIs are updated with expanded VRM information:

- Copy Program Temporary Fix to Save File (QPZCPYSV) API
- Create Program Temporary Fix (QPZCRTFX) API
- Create PTF Group (QpzCreatePtfGroup) API
- Generate Program Temporary Fix Name (QPZGENNM) API
- Log Program Temporary Fix Information (QPZLOGFX) API
- List Program Temporary Fixes (QpzListPTF) API
- List PTF Group Details (QpzListPtfGroupDetails) API
- Retrieve Program Temporary Fix Information (QPZRTVFX) API
- Program Temporary Fix Exit Program

## Retrieve User Information API changes

The Retrieve User Information API will now return 8-byte storage values.

The Retrieve User Information (QSYRUSRI) API, format USRI0300, will now return larger 8-byte storage values for maximum storage allowed, storage used, IASP maximum storage allowed, and IASP storage used. The 4-byte storage values will still contain valid information until the value exceeds 2,147,483,647, then the 4-byte storage value will be -2.

## TCP Pascal APIs removed

Applications that use the TCP/UDP Pascal APIs must be converted to use sockets APIs

Support for these APIs was removed in V4R1 when the Pascal compiler was withdrawn from support in V3R7, but existing applications that use these APIs were allowed to function until now.

Users with applications that use the APIs that need to be converted can refer to Appendix H, “Converting from the Pascal API to the Sockets API” PDF document: [SC41-5420-00 TCP/IP Configuration & Reference V4R1 PDF](#)

These APIs are removed in IBM i 7.2 :

- BeginTcpIp
- EndTcpIp
- Handle
- Unhandle
- TcpAbort
- TcpClose
- TcpOpen
- TcpFReceive
- TcpFSend
- TcpStatus
- TcpWaitOpen
- TcpWaitReceive
- TcpWaitSend
- UdpClose
- UdpOpen
- UdpReceive
- UdpSend
- UdpStatus

## Work Management API changes

### Work Management API changes for run priority

The work management APIs QUSLJOB, QGYOLJOB, and QWTRTVTA will now return a value for Run priority (job) (key 1802) for the case where the job is on the job queue and a value has been set that will override the class when the job becomes active. If the job is on the job queue and no value has been set, the APIs will return 0.

### QUSLJOB, QUSRJOB, QGYOLJOB, QWTRTVTA API changes

The QUSLJOB, QUSRJOB, QGYOLJOB, QWTRTVTA APIs will now return a new special value 0 for \*CLS on keys 1302 (Maximum processor time) and 1305 (Maximum temporary storage time allowed, in megabytes). Values will be returned for jobs on job queues, including the special value of -1 for \*NOMAX.

## C and C++ language runtime changes

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### free() and realloc() function changes

In releases before IBM i 7.2, the free() and realloc() functions did not always generate a message when used to free or reallocate heap storage from a different activation group. This restriction is documented but was not always handled correctly. Extra checking is enabled in 7.2 to correctly diagnose the improper usage and generate a C2M1212 diagnostic message when these functions are used to free or reallocate storage from a different activation group.



## Header File Changes for C and C++

Because the C11 and C++11 standards override the previous C99 standard, in IBM i 7.2, usage of the `__STDC_FORMAT_MACROS` macro was removed from `<inttypes.h>` to enable the macros for format specifiers within C++, and usage of the `__STDC_LIMIT_MACROS` macro and the `__STDC_CONSTANT_MACROS` macro was removed from `<stdint.h>` to enable the macros for limits of integer types within C++. As a result, the macros within `<inttypes.h>` and `<stdint.h>` are now unconditionally defined for both C and C++.

In releases before 7.2, the `erf()`, `erfc()` and `hypot()` functions were declared within `<math.h>` only when the `LANGlvl(*EXTENDED)` compile option was used. Because they are officially part of C99, in 7.2, they were moved out of the condition of EXTENDED language level, and are always available in `<math.h>`.

## Assert macro diagnostic message change

The diagnostic message that the `assert` macro writes to `stderr` is now based on the language level that is used during the compilation. If the default language level is used, the diagnostic message includes the name of the function that contains the `assert` invocation in addition to the expression, file name, and line number.

## `_Ropen()` Function Changes

In releases before IBM i 7.2, the `_Ropen()` function did not check the length of the keyword parameter string. It allowed a string shorter than the correct keyword to be specified. In 7.2, the keyword parameter string must completely conform to the keywords documented for `_Ropen()`. If an incorrect keyword parameter string is specified, message C2M3015 - The type variable specified on the open function is not correct is issued at run time, the value of `errno` is set to `EBADMODE`, and the `_Ropen()` function returns `NULL`.

## C++ library function changes

Existing C++ library functions have been rewritten to better conform with C++ TR1 specifications.

In IBM i 7.2 changes were made to provide C++ library extensions in support of standards, which were submitted to the C++ standards committee with Draft Technical Report on C++ Library Extensions, ISO/IEC DTR 19768. To read more about the standards, also known as C++ Technical report 1 (TR1), follow the link to: [Draft Technical Report on C++ Library Extensions ISO/IEC DTR 19768](#).

With the introduction of this support in 7.2, it was necessary to rewrite some of the existing library functions to better conform with the C++ TR1 specification. Some of the changes added to the C++ STL header file require compiling with `OPTION(*RTTIALL)` to work properly on 7.2. Specifically, this includes functions within the header files `<locale>`, `<functional>`, and `<memory>`.

Any source code that uses non-standard facets in C++ locales might be affected and should be examined. The `has_facet` and `use_facet` functions were rewritten to take advantage of each facet's runtime type identification (RTTI) information. The generated C++ program might signal an MCH3601 (Pointer not set) exception within `"std::type_info::operator==(const std::type_info&) const"` if the source code is not compiled with the `OPTION(*RTTIALL)` C++ compiler option.

## IBM i command changes

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Release to release IBM i command changes

## Commands that have been changed by applying PTFs, might fail to compile with a CPD0043 when TGTRLS is not the current release

If a compile fails with CPD0043 - Keyword &2 not valid for this command message, and a previous release using the **TGTRLS** parameter was specified, it's probable that the command in the

current release has been changed by an applied PTF. Copy the command from the current release into the library for previous release specified, QSYSVxRxMx and retry the compile.

## CHGMOD command changes

Change Module (**CHGMOD**) command behavior changes.

When the Change Module (**CHGMOD**) command is used to remove Intermediate Language data observability (**CHGMOD RMVOBS(\*ILDTA)**) from module objects that are created for release IBM i 7.2 and later, if that module was digitally signed, the signature is removed. Intermediate Language data (IL data) can optionally be stored with modules created by some compilers. For releases before 7.2, if a digital signature was created for a module object that has IL data, that signature did not cover the IL data. However, starting in release 7.2, IL data is covered by the digital signature, so removing the IL data causes the digital signature to be removed as well.

## CRTCLS and CHGCLS command changes

Create Class (**CRTCLS**) and the Change Class (**CHGCLS**) **MAXTMPSTG** parameter changes.

The Create Class (**CRTCLS**) and the Change Class (**CHGCLS**) commands have changed so that the **MAXTMPSTG** parameter is specified in megabytes. Any class object (\*CLS) on the system already stores this value in megabytes (or has \*NOMAX), so the objects continue to work exactly like they did before. Stored CL command source, however, is affected. If you have a CL command that specifies the value in kilobytes, you need to change the source code to specify the value in megabytes.

## CRTUSRPRF, CHGUSRPRF, and RTVUSRPRF command changes

New **MAXSTGLRG** parameter allows a larger maximum storage value to be specified and retrieved.

The Create User Profile (**CRTUSRPRF**) and the Change User Profile (**CHGUSRPRF**) commands have a new **MAXSTGLRG** parameter that allows a larger maximum storage value to be specified than the **MAXSTG** parameter. You can specify a value for either the **MAXSTGLRG** parameter or the **MAXSTG** parameter but not for both.

If you are changing the command defaults for maximum allowed storage on the **CRTUSRPRF** or **CHGUSRPRF** commands, you must specify a value using the **MAXSTGLRG** parameter and not the **MAXSTG** parameter. The Copy option and Change option on the Work with User Profiles (**WRKUSRPRF**) panel use the **MAXSTGLRG** parameter when copying or changing a user profile. In order for these **WRKUSRPRF** options to work correctly, the maximum storage parameter default on the **CRTUSRPRF** and **CHGUSRPRF** commands, if changed, must be specified using the **MAXSTGLRG** parameter rather than changing the default value of the **MAXSTG** parameter. These commands do not allow both the **MAXSTGLRG** and **MAXSTG** parameters to be specified at the same time.

The Retrieve User Profile (**RTVUSRPRF**) command allows retrieval of the larger storage values using the new **MAXSTGLRG** and **STGUSEDLGR** parameters. The current **MAXSTG** and **STGUSED** parameters contain valid information until the value exceeds 2,147,483,647. When this value is exceeded, then the returned value is -2 and the new **MAXSTGLRG** or **STGUSEDLGR** parameters need to be used to get the actual value.

## CVTPFRDTA and CVTPFRCOL command changes

The **Convert Performance Data (CVTPFRDTA)** and **Convert Performance Collection (CVTPFRCOL)** commands no longer support in-place file conversions.

The **Convert Performance Data (CVTPFRDTA)** and **Convert Performance Collection (CVTPFRCOL)** commands no longer support in-place file conversions (where the from library and to library are the same). In-place conversions have always been discouraged and are not always possible. Due to the increasing complexity of collections, only conversion to a different library will be supported so that the result can be verified without losing the original data.

Messages CPF2365 (diagnostic) followed by CPF0001 (escape) are signaled when parameters **FROMLIB** and **TOLIB** specify the same library

## RSTOBJ and RSTLIB changes for saved objects with different primary groups

In releases previous to IBM i 7.2, if the primary group on a saved object was different from the primary group on the existing object, and the value that was specified on the ALWOBJDIF parameter allowed the object to be restored, the Restore object (**RSTOBJ**) and Restore library (**RSTLIB**) commands would restore the object and send informational message CPI3811. In 7.2, the object is restored but, in addition to the CPI3811 information message, diagnostic message CPF3848, and escape message CPF3773 are also sent indicating an authority change, and an RZ audit record is logged.

## STRPCCMD command changes

Start PC Command (**STRPCCMD**) behavior changes.

When **STRPCCMD** is used with the 5250 emulator in IBM i Access Client Solutions, the maximum command length that may be specified for the **PCCMD** parameter is now 1023 characters. Other 5250 emulators may truncate the command to their maximum supported length. For example, the 5250 emulator in IBM i Access for Windows and Personal Communications will truncate the command to the existing limit of 123 characters.

## WRKACTJOB command changes

Temporary storage has been added as a column to the Work with active job (**WRKACTJOB**) command output.

The printed output for the Work with active job (**WRKACTJOB**) command is now wider than 132 columns.

## CHGDEVTAP UNLOAD change now allowed while device is varied on

With IBM i 7.2 PTF MF70241, the **Change Device Desc (Tape)** command (**CHGDEVTAP**) will now allow the UNLOAD (Unload device at vary off) parameter to be modified while the device is varied on.

## Database changes

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Release to release Database changes that should be considered

### New SQL reserved words and schema names

As the SQL language support for DB2® for i is extended, the lists of reserved words and schema names in Appendix I of the SQL Reference is updated. The new reserved words and schema names are not mentioned in the MTU, but the lists should always be reviewed when moving to a new release.

The lists in Appendix I can be referenced here: [http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/db2/rbafzresword.htm](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/db2/rbafzresword.htm)

### Using reserved words as correlation names

With IBM i 7.2 PTF SI67939, the use of reserved words as a table correlation name became more restrictive. The table correlation name is the identifier that follows a table name, table function, nested table expression, among others that can be used to qualify columns returned from the table.

To identify static SQL statements that might contain this problem, run a query like the following. This example is looking for the reserved word INNER when it is not used as join syntax.

```
SELECT b.statement_text, a.system_program_name, a.program_type
FROM qsys2.sysprogramstat a INNER JOIN
     qsys2.sysprogramstmtstat b ON a.program_schema = b.program_schema AND
     a.program_name = b.program_name AND
     a.module_name = b.module_name
```

```
WHERE a.program_schema = 'MYLIB' AND  
      b.statement_text LIKE '%INNER%' and b.statement_text NOT LIKE '%INNER JOIN%'
```

## Native database access behavior changes

SQL Query Engine (SQE) versus Classic Query Engine (CQE) behavior differences for native database access

As in previous releases, IBM i 7.2 extends SQE handle more queries, in this case native queries processed outside of the SQL interfaces.

In IBM i 7.2, there is a new **QAQQINI** control called **SQE\_NATIVE\_ACCESS** with a default value of \*YES. When \*YES is used, the SQL Query Engine (SQE) attempts to run the query. If SQE is unable to process the query, the query is run using the Classic Query Engine (CQE). When **SQE\_NATIVE\_ACCESS** is changed to \*NO, CQE is used first and SQE is only used when CQE is unable to run the query.

The **SQE\_NATIVE\_ACCESS** control value \*NO should only be used temporarily by clients to give clients a means to easily and temporarily revert behavior back to CQE, if a behavior change or functional problem related to the Native Query support in SQE is encountered.

IBM i intends to remove the **SQE\_NATIVE\_ACCESS** control in the release after IBM i 7.3.

## QDBRTVFD API changes

Retrieve Database File Description (QDBRTVFD) API might return 0 offsets and lengths for a CREATE TRIGGER statement.

IBM i 7.2 provides support for obfuscated SQL statements, where the details of the CREATE TRIGGER statement that defines an SQL Trigger are not available. The Retrieve Database File Description (QDBRTVFD) API provides offsets into a CREATE TRIGGER statement. If the trigger was created with obfuscation, then field Qdb\_Qdbftrg\_Stmt\_Crt\_Trg is unreadable and these offsets and lengths within Qdb\_Qdbftrg\_Stmt\_Area contain a value of 0:

- Qdb\_Qdbftrg\_Stmt\_Onfile\_Off
- Qdb\_Qdbftrg\_Stmt\_Onfile\_Len
- Qdb\_Qdbftrg\_Stmt\_When\_Len
- Qdb\_Qdbftrg\_Stmt\_When\_Off
- Qdb\_Qdbftrg\_Stmt\_Body\_Len
- Qdb\_Qdbftrg\_Stmt\_Body\_Off

## Print SQL Information (PRTSQLINF) will not display obfuscated SQL statements

This release provides support for obfuscated SQL statements, where the SQL text used to create a SQL Procedure, SQL Function, or SQL Trigger is obscured from view. Because of this, the **PRTSQLINF** command will no longer display the SQL statements that are used by obfuscated SQL procedures, functions, and triggers.

## Copy file (CPYF) command change

When the Copy File command is used with the Create file parameter **CPYF CRTFILE(\*YES)**, if the FROMFILE is an SQL Table, SQL Index, or SQL View, the newly created file is an SQL Table. Before 7.2, if **CRTFILE(\*YES)** was specified and the FROMFILE was an SQL Table the created table would be an SQL table only if the attributes of the file required it to be an SQL table.

**Note:** If the FROMFILE is an SQL Partitioned Table or SQL Partitioned Index, the TOFILE continues to be a multiple member file.

## CURRENT\_USER special register

The addition of the CURRENT\_USER special register on IBM i 7.2 results in changed behavior if CURRENT\_USER was used as the column name and SQL statements reference that column name without delimiters. This affects dynamic SQL statements and any programs that are precompiled after moving to 7.2.

To determine whether you have this exposure, query the QSYS2/SYSCOLUMNS table.

Example:

```
SELECT * FROM QSYS2.SYSCOLUMNS
WHERE
  COLUMN_NAME = 'CURRENT_USER' AND TABLE_OWNER <> 'QSYS'
```

To avoid any change in behavior, use the delimited form of this column name within SQL statements (for example: "CURRENT\_USER").

## CURRENT\_SCHEMA special register changes

The CURRENT\_SCHEMA special register now returns a name with the delimiters removed. In previous releases, if CURRENT\_SCHEMA was set to a schema name that required delimiters for usage in an SQL statement, the value that was returned with the CURRENT\_SCHEMA special register would retain the delimiters. In IBM i 7.2, the delimiters are removed. The statement SET SCHEMA = "Long\_Schema\_Name"; is a statement that would set the current schema to a name with delimiters. In 7.2, the value that is returned in the CURRENT\_SCHEMA SQL special register is Long\_Schema\_Name whereas in previous releases it was "Long\_Schema\_Name".

## QSYS2.SYSROUTINEDEP column content changes

The values in the OBJECT\_SCHEMA and OBJECT\_NAME columns in QSYS2.SYSROUTINEDEP are now stored without delimiters. Before IBM i 7.2, when a routine was created, these names were stored in the same format in which they were originally used in the CREATE FUNCTION or CREATE PROCEDURE statement. For example, in the following statement, the column OBJECT\_NAME in SYSROUTINEDEP has a value of TABLE1 in 7.2, but the value would be "TABLE1" in previous releases.

```
CREATE PROCEDURE PROC1()
  BEGIN;
    UPDATE LIBRARY."TABLE1" SET COL1=10;
  END;
```

## Changes to the QSYS2.OBJECT\_STATISTICS table function

Several changes have been made to this function:

- The **OBJLONGNAME** column returns the object's SQL name. For programs and service programs that have been defined by SQL as external functions or procedures, the column will contain the function or procedure name. If a single program or service program contains more than one external function or procedure definition, the null value will be returned. Previously, this column contained the program or service program name (the same value as the **OBJNAME** column).
- A new input parameter has been added to this table function and several additional columns are being returned. Any views that use this function must be rebuilt. In release 7.2, a **CREATE** or **REPLACE VIEW** using the original view text will correctly update it.

## UPDATE using OVERRIDING USER VALUE

Before IBM i 7.2, an UPDATE statement that set a GENERATED ALWAYS or GENERATED BY DEFAULT identity or rowid column and specified the OVERRIDING USER VALUE clause would not update the column value. In 7.2, specifying the OVERRIDING USER VALUE clause on an UPDATE statement assigns a new system generated value for a GENERATED ALWAYS or GENERATED BY DEFAULT identity or rowid column if the identity or rowid column is included in the UPDATE assignment clause.

## Position function argument changes

The form of the POSITION function that uses a comma between the arguments has been changed to interpret the arguments in the opposite order to conform to DB2 SQL family standards.

- In releases before IBM i 7.2, the comma style was interpreted as: POSITION(*source-string*, ***search-string***)
- In release IBM i 7.2 and later, the comma style is interpreted as: POSITION(***search-string***, *source-string*)

This behavior change applies to any dynamically executed SQL and to any embedded SQL within a program, view, trigger, or other object that uses the POSITION function that is rebuilt after moving to IBM i 7.2. The result of the POSITION function with the arguments unintentionally reversed returns a value of 0, indicating that the search string was not found in source string. If an object (program, view, trigger) with the POSITION function is unchanged between releases, it works as before and continues to use the form of POSITION in effect when the view or program object was created.

There is a new environment variable, QIBM\_SQL\_POSITION\_LIKE\_DB2, that can be used to provide the prior behavior. For example, to use the non-standard, previous behavior across the entire system, execute this CL command: **ADDENVVAR ENVVAR(QIBM\_SQL\_POSITION\_LIKE\_DB2) VALUE('N') LEVEL(\*SYS)**.

## SQL Array assignment rules

Before IBM i 7.2, array assignments were allowed with any compatible array types. In 7.2, the documented assignment rules are enforced. If the right side of the assignment is an array variable, the TRIM\_ARRAY function, or a CAST expression, it must be the same array type as the array variable on the left side of the assignment. If they are not the same array type, an SQL0408 diagnostic message is signalled.

## Timestamp built-in functions in a view

Certain built-in functions in a view might prevent a restore to a previous release.

On IBM i 7.2, the database includes support for timestamp precision between 0 and 12, where previous releases always used timestamps with a precision of 6. Timestamp built-in functions were also enhanced to handle any level of timestamp precision. This improvement to the timestamp built-in functions has an impact on views. When some timestamp built-in functions are used within a view, those views are not eligible to be saved to a previous IBM i release.

When using IBM i 7.2, if a view uses any of the following SQL built-in functions, an attempt to save the object to a save file using a release prior to 7.2 on the Target Release (**TGTRLS**) parameter will fail with CPI3215 informational and CPF3741 diagnostic messages.

- VARCHAR\_FORMAT
- TRUNC\_TIMESTAMP
- ROUND\_TIMESTAMP

## Create Table Like and format level IDs

CREATE TABLE LIKE might generate a different format level ID as compared to previous releases.

Before IBM i 7.2, a CREATE TABLE LIKE of a table with a variable length field would generate a format level ID that was different from the based on table even when the INCLUDING clauses such as INCLUDING COLUMN DEFAULTS and the RCDFMT clause were specified. When the CREATE TABLE LIKE statement is written properly, the expectation is that the format level ID of the new table and the based on table will be the same.

In IBM i 7.2 this problem is fixed. This means that the CREATE TABLE LIKE now generates a format level ID that might be different that what the same CREATE TABLE LIKE statement generated in earlier releases.

## ICU sort table changes

A change in IBM i 7.2 requires newly created indexes to use ICU sort tables that are version 3.4 or greater. This requirement affects indexes that are created on 7.2 only. Indexes that were created before 7.2 do not need to be re-created.

An attempt to try to create an index with an unsupported ICU sort table on 7.2 results in a CPD3264 diagnostic message with a reason code of 2 being signaled. SQL created indexes also see an SQ20268 diagnostic message with a reason code of 5.

## GET DIAGNOSTICS modifies SQLSTATE and SQLCODE variables

Starting in release IBM i 7.2, the SQLSTATE, and SQLCODE variables are modified by GET DIAGNOSTICS statements in SQL routines. If a non-zero SQLSTATE is returned from the GET DIAGNOSTICS statement, the appropriate handler in the routine is invoked.

## RRN, PARTITION, and NODENUMBER functions with Common Table Expression (CTE) argument changes

**RRN**, **PARTITION**, and **NODENUMBER** functions with Common table expressions might trigger a CPD43AD.

Before IBM i 7.2, a stated restriction that an **RRN**, **PARTITION**, or **NODENUMBER** function could not have as an argument a common table expression whose outer fullselect includes an aggregate function, a **GROUP BY** clause, a **HAVING** clause, a **UNION**, **INTERSECT**, or **EXCEPT** clause, a **DISTINCT** clause, a **VALUES** clause, or a *table-function* was not fully enforced. Starting in IBM i 7.2, the restriction is enforced via SQLCODE = -5001. The joblog will show that the SQL5001 error is preceded by a CPD43AD diagnostic message with reason code 3.

## Fixes to the SQL ILE RPG precompiler might cause SQL5011 messages

Before IBM i 7.2, the SQL ILE RPG precompiler sometimes did not handle mismatches between the RPG compiler date/time format for host variables and the SQL date/time format. In some cases, a mismatch was not detected at compile time, which might result in an RPG runtime error for date, time or timestamp like an RNX0112, RNX0113, or RNX0114. In 7.2, the SQL ILE RPG precompiler properly matches the date/time formats and generates an error message when necessary. This might mean that an SQL5011 message is generated on 7.2 for code that compiled without error messages on previous releases.

## RPG application and OPNQRYF key mismatches might produce different results

Existing RPG applications that position a file using **SETLL** or **SETGT** with \*LOVAL or \*HIVAL, where the file corresponds to an OPNQRYF native query, might produce different results in v7r2 than in prior releases. This difference will only occur in cases where the RPG application was compiled with a file having a

different key definition than what was specified on the **OPNQRKFKEYFLD** parameter. This mismatch was typically caught at application coding time, and corrected. However, certain mismatches can appear to produce the results expected by the programmer, and so it was not previously discovered. In v7r2, depending on the nature of the mismatch, the behavior may be different. If this mismatch is discovered, the application should be recompiled to ensure the key definitions match. Also, if **SETLL** or **SETGT** with **\*LOVAL** or **\*HIVAL** is used only to position to the top or bottom of a collated result set, then consider using **SETLL \*START** or **\*END**, which does not require keys generated by the compiler.

## SQL Call Level Interface Changes

### SQLConnect CLI API changes

The SQLConnect API now provides better consistency between server mode and local mode.

In IBM i 7.2, the following changes are enforced when the CLI SQLConnect API is used to connect to the database:

- If a non-NULL userid or password is specified when SQLConnect is used to connect to the database with SQL server mode, both the userid and password must be valid.
- If a non-NULL userid is specified when the SQLConnect API is used to connect to the database in local mode, the userid must be the same as the current user or an SQL7022 error is returned.
- If a NULL userid is specified when the SQLConnect API is used to connect as the current user, then the password must also be NULL.

For example, the following code sample can be used to connect to the database with the current user profile:

```
rc = SQLConnect(hdbc, "*LOCAL", SQL_NTS,  
NULL, SQL_NTS,  
NULL, SQL_NTS);
```

### CLI API Timestamp changes

Before IBM i 7.2, timestamp types were treated as fixed-length types, with a length of 26 and a precision of 6 fractional seconds. In 7.2 timestamps can now range between 16 and 32 bytes with a corresponding precision of between 0 and 12 digits. Several SQL Call Level Interface (CLI) APIs have been updated to reflect these changes. In previous releases, CLI APIs, which took a buffer length or scale would ignore these values and use 26 and 6 instead. Many existing applications pass values for buffer lengths or scale, which might now be invalid, such as 0. This might result in Db2<sup>®</sup> for i disregarding any fractional seconds. To maintain compatibility with existing behavior, applications can use a new connection attribute:

**SQL\_ATTR\_TIMESTAMP\_PREC**. By setting **SQL\_ATTR\_TIMESTAMP\_PREC** to **SQL\_TRUE**, CLI reverts to 7.1 behavior and treats timestamps as fixed-length types. This connection attribute is meant to be used as a transition mechanism until applications can be updated.

These APIs now require a valid buffer length and scale:

- SQLBindParam
- SQLBindParameter

These APIs now require a valid buffer length:

- SQLBindCol
- SQLPutData

These APIs now return more length/precision information:

- SQLColAttributes
- SQLColAttribute
- SQLDescribeCol



- SQLDescribeParam
- SQLGetDescRec

## Restore of logical files over existing files with different file/member level ids

Before IBM i 7.2, a restore of a logical file over an existing file with a different file or member level id with the Restore object (**RSTOBJ**) or Restore library (**RSTLIB**) commands, would fail and messages CPF3283 and CPF3756 would be signaled. In 7.2, if **ALWOBJDIF (\*COMPATIBLE)** is specified on the restore, the messages are not signaled and the restore of the logical file is successful.

## DISPLAY\_JOURNAL() table function changes

The QSYS2/DISPLAY\_JOURNAL() table function and related System i® Navigator Journal Viewer support has been changed to recognize the use of ROW ACCESS CONTROL and COLUMN ACCESS CONTROL. Database file record changes (journal entries of journal code R) are logged in a data journal. When DISPLAY\_JOURNAL() or View Entries is used to access the database file record detail in those journal entries, DB2 for i will detect whether ROW ACCESS CONTROL or COLUMN ACCESS CONTROL exists and is activated for the target file. If Row and Column Access Control (RCAC) is active, the rule text logic within the Row Permission and/or Column Mask will be applied before returning the data to the user.

## SYSTOOLS.GROUP\_PTF\_CURRENCY/SYSTOOLS.GROUP\_PTF\_DETAIL changes

The IBM Preventative Service Planning (PSP) team has relocated the XML feeds that provide details about IBM i PTF Groups. Due to that transition, two popular IBM i Services (SYSTOOLS.GROUP\_PTF\_CURRENCY and SYSTOOLS.GROUP\_PTF\_DETAILS) have been rebuilt to use the new XML feeds. Once the previous XML feeds are disabled, queries to these services will fail with SQLCODE -4302 and SQLSTATE '38000'.

To avoid having a disruption in the use of these services, the following HIPER PTFs have been created to deliver the necessary changes to SYSTOOLS.GROUP\_PTF\_CURRENCY and SYSTOOLS.GROUP\_PTF\_DETAILS.

- PTF '5770SS1 V7R1M0 SI62612'
- PTF '5770SS1 V7R2M0 SI62620'

If TCP/IP was configured to enable access to the previous XML feed (129.42.160.32), the IP address corresponding to the new XML feed should be enabled. The new XML feed varies by geography.

1. ping www.ibm.com - to determine the IP address servicing your geography
2. Configure TCP/IP access to the IP address returned in step 1. See this technote for details on how to configure TCP/IP. <http://www-01.ibm.com/support/docview.wss?uid=nas8N1018980>

## TIMESTAMP\_FORMAT scalar function can return SQLSTATE '22007' and SQLCODE -20448

In IBM i 7.2, the TIMESTAMP\_FORMAT scalar function has been changed to enforce a failure when the string-expression contains numbers that do not have a corresponding element in the format-string. Prior to this change, the usage was permitted. After this change, the query will fail with SQ20448 and will be preceded by a CPF426B message with reason code: 13 -- The timestamp string can not be interpreted by the format string specified.

Note that TO\_DATE and TO\_TIMESTAMP are synonyms for TIMESTAMP\_FORMAT. To overcome the failure, change the TIMESTAMP\_FORMAT usage to have a compatible string-expression and format-string.

## FULL OUTER JOIN change

In IBM i 7.2 with SI63874, the implementation of a query containing a FULL OUTER JOIN has changed. When a FROM clause contains a table followed by a comma prior to the FULL OUTER JOIN, the query will now be executed according to the SQL standard.

Prior to this PTF a query like this:

```
Select * from T1, T2 FULL OUTER JOIN T3 on t2.col1 = t3. col2
```

was incorrectly implemented like this:

```
Select * from (T1 CROSS JOIN T2) FULL OUTER JOIN T3 on t2.col1 = t3. col2
```

With this PTF, it will now be implemented correctly, like this:

```
Select * from T1 CROSS JOIN (T2 FULL OUTER JOIN T3 on t2.col1 = t3. col2)
```

References to T1 were correctly disallowed in the join condition prior to this PTF, so no errors will be issued due to this change.

## CREATE FUNCTION (SQL scalar) or CREATE FUNCTION (SQL table) with a data access classification of CONTAINS SQL may fail with SQLSTATE '2F004' and SQLCODE -579

In IBM i 7.2 with PTF SI63618, in some cases, a CREATE FUNCTION (SQL scalar) or CREATE FUNCTION (SQL table) with a data access classification of CONTAINS SQL will return an error where unqualified success used to be returned. Instead of SQLSTATE of '00000' and SQLCODE = 0, CREATE FUNCTION (SQL scalar) or CREATE FUNCTION (SQL table) may return an SQLSTATE of '2F004' and SQLCODE -579. The SQLSTATE '2F004' error indicates that reading SQL data is not permitted within the scalar function or table function. If the scalar function or table function returns a query, the function must have a data access classification of READS SQL DATA or MODIFIES SQL DATA. It cannot have a data access classification of CONTAINS SQL.

To determine whether you have this exposure, query the QSYS2/SYSROUTINES table:

Example:

```
SELECT *
FROM QSYS2.SYSROUTINES
WHERE (SQL_DATA_ACCESS = 'CONTAINS' AND
ROUTINE_TYPE = 'FUNCTION' AND
ROUTINE_BODY = 'SQL') AND
(FUNCTION_TYPE = 'T' OR
FUNCTION_TYPE = 'S') AND
(UPPER(ROUTINE_DEFINITION) LIKE '%SELECT%' OR
UPPER(ROUTINE_DEFINITION) LIKE '%UNION%')
```

To execute this query, you will need to make sure the job CCSID is set to a value other than 65535. Examine the contents of the ROUTINE\_DEFINITION column for all returned routines. If the routine returns a query, the function should have its data access changed from CONTAINS SQL to either READS SQL DATA or MODIFIES SQL DATA to create successfully.

## Workload Capping and SMP degree \*OPTIMIZE change

When DB2 Symmetric Multiprocessing (SMP) is used with a value of \*OPTIMIZE, the query optimizer calculates the maximum degree that can be used based on the number of processing units that are assigned to the partition. The conversion formula is that 100 units is equivalent to 1 whole processor. When workload capping was in effect, the optimizer was incorrectly multiplying the workload capping value by the number of SMT threads supported for the processor and then using the smaller of the number of whole processors and the calculated workload capping threads. To be consistent with how

the degree is calculated for \*OPTIMIZE, the optimizer will now use the smaller of the specified workload capping value and the number of whole processors. The number of SMT threads is no longer considered for \*OPTIMIZE. The workload capping calculations for SMP of \*MAX and \*NBRTASKS are unchanged and include the number of SMT threads per processor.

## **SQE changed to hold jobs when query related temporary storage exceeds MAXTMPSTG**

SQE queries allocate temporary storage charged to a shared bucket (Bucket number: 8; Global Bucket Name: \*DATABASE Segment Cache), because the created objects may be shared across jobs when other users or jobs execute a query.

By attributing the temporary storage to a shared bucket, it is difficult to identify jobs that are causing an over-consumption of temporary storage.

Traditionally, administrators would protect against over-consumption by utilizing the Maximum temporary storage (MAXTMPSTG) limit set in the job or class.

PTFs MF64627, MF64448, MF64628, MF64629, SI66859, and SI66860 contain new support that will enforce a MAXTMPSTG parameter value other than \*NOMAX during the execution of SQE queries. SQE storage charging will continue to be assigned to the \*DATABASE Segment Cache bucket. However, if the amount of free space in SYSBASE falls below the Auxiliary storage lower limit (QSTGLOWLMT) system value, SQE will enforce the MAXTMPSTG value. When the amount of temporary storage charged to the job plus the storage allocated by the query exceeds the MAXTMPSTG value, the job will be held and a CPI112E message sent will be sent to the QSYSOPR message queue.

This enforcement will not occur when MAXTMPSTG is set to \*NOMAX.

## **SQL JSON functions duplicate key handling change**

In IBM i 7.2 with PTFs SI67881 and SI67815, the handling of duplicate keys in JSON functions has changed.

The JSON\_TABLE, JSON\_QUERY, JSON\_VALUE, and JSON\_TO\_BSON functions will now tolerate documents containing duplicate key values and will process one of the values.

The default behavior of the JSON\_OBJECT and JSON\_OBJECTAGG functions has changed to allow generation of duplicate keys. A new clause has been added to the syntax, WITH UNIQUE KEYS or WITHOUT UNIQUE KEYS, to control whether keys generated by the function are enforced as unique. The default is WITHOUT UNIQUE KEYS.

Refer to the updated SQL Reference in the IBM Knowledge Center for more detail.

## **OBJECT\_STATISTICS() table function changes for \*USRPRF objects**

In IBM i 7.2 with PTF SI74488, the QSYS2/OBJECT\_STATISTICS() table function has been modified to only return result rows for user profiles to which the user has some authority (authority other than \*EXCLUDE).

With this change, any views which use the QSYS2/OBJECT\_STATISTICS() table function to list user profiles may have different results than it would have had before this change. This includes the following views:

- QSYS2.AUTHORIZATIONS
- QSYS2.GROUP\_PROFILE\_ENTRIES
- QSYS2.OBJECT\_LOCK\_INFO
- QSYS2.OBJECT\_PRIVILEGES
- SYSIBM.AUTHORIZATIONS

This is not a complete list, but is representative of the types of views that may change behavior.

If it is desired for result rows to be returned for all user profiles, the `QSYS2/OBJECT_STATISTICS()` table function should be called by a user with `*ALLOBJ` special authority or a user which is authorized to the Database Security Administrator function of IBM i (`QIBM_DB_SECADM`).

## DSPOBJD outfile changes

---

The version values for fields `ODCVRM` (Compiler version) and `ODPVRM` (Licensed program version) in the Display Object Description (**DSPOBJD**) outfile (`QADSPOBJ`) are changed in i 7.2.

The version values for fields `ODCVRM` (Compiler version) and `ODPVRM` (Licensed program version) in the Display Object Description (**DSPOBJD**) CL command outfile (`QADSPOBJ`) is returned in either `VxRyMz` form (as currently) or in `vrrmm` form if either the version or release has a value greater than 9 and the version will not fit into a `VxRyMz` form. Customers that are processing **DSPOBJD** outfiles must handle version field values that are in these two different forms.

## Display station pass-through changes

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Display station pass-through using communication jobs in the `QCMN` subsystem is disabled in IBM i 7.2.

The ability to run display station pass-through using communication jobs in the `QCMN` subsystem is disabled in 7.2. By system default, pass-through server jobs running in the `QSYSWRK` subsystem have been used since `V4R1` for display station pass-through. This is configured by the **QPASTHRSVR** system value. Pass-through server jobs are started either by issuing the Start Communications Server (**STRCMNSVR**) command or running the Autostart Job Entry that is configured for the `QSYSWRK` Subsystem description. On previous releases, display station pass-through could be initiated by using communications jobs when **QPASTHRSVR** was configured as 0 or when pass-through server jobs were ended. This old method invoked the display station pass-through target `APPC` transaction program to run as a user job in the `QCMN` (or `QBASE` if it is active) subsystem. This will no longer work in 7.2. It fails with a `CPF1269` sent to `QSYSOPR` with reason codes 715, 0.

To use display station pass-through, you need to set the **QPASTHRSVR** system value to the recommended/shipped value of `*CALC` and make sure that the pass-through server jobs are started with the Autostart Job Entry in the `QSYSWRK` subsystem description. If you have CL programs that end the pass-through servers using the End Communications Server (**ENDCMNSVR**) CL command, you need to use the **STRCMNSVR** CL command to restart the pass-through servers.

### CHGSYSVAL SYSVAL(QPASTHRSVR) VALUE(\*CALC)

Note this also gives you a method to disallow display station pass-through from running on your system by setting the **QPASTHRSVR** system value to 0.

## Change to the event file EVFEVENT

---

With PTF `SI58109`, when an event file is created by **FNDSTRPDM**, **CRTRPGMOD**, **CRTBNDRPG**, or **CRTSQLRPGI**, numeric values which usually have three digits in the event file, such as the position of an error message, may sometimes have values larger than 999. In this case the numbers will appear as 10-digit numbers in the event file. Note that the event file does not have a fixed layout, so you should not assume that any numeric value will have a fixed number of digits, or that any value will be at a fixed position in the record.

## Floating point changes

---

System support for floating point (both binary floating point and decimal floating point) in IBM i 7.2 is changed to correct defects and improve performance. Some floating point operations produce different results and some raise different exceptions than prior releases. Here are a few examples:

- Conversions between binary floating point and decimal forms (including decimal floating point) are changed to improve accuracy and correctly handle all rounding modes. Floating point results might differ from prior releases by as much as eight units in the last place.

- The modulus operation (used for the SQL MOD function) now produces correct results for all binary floating point input values.
- Several decimal floating point operations now produce an MCH1209 - floating point invalid operation exception instead of the (incorrect) MCH1212 - floating point conversion exception produced in prior releases (for example, a request to compute the logarithm of a negative number).

## IBM Navigator for i requires 64-bit Java SE 8

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The Admin2 HTTP server now requires 64-bit Java™ SE 8. IBM® Navigator for i web application depends on the Admin2 server. In order for the Admin2 server and IBM Navigator for i to function properly, 64-bit Java SE 8 needs to be installed. This is product 5770JV1 option 17.

## IBM i Navigator communication trace analyzer no longer supported

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The Communications Trace Analyzer plug-in to IBM i Navigator has been dropped from the IBM i 7.2 release.

An enhancement in the IBM V6R1 release allows a communications trace to be dumped into the Packet Capture (PCAP) format used by other trace analysis tools. It is recommended that you use a tool that can analyze the communications trace data in PCAP format rather than the communications trace analyzer.

## IBM Navigator for i primary access methodology

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The IBM Navigator for i web based system management interface is changing the primary access methodology. For the past many years, this interface has been shipped with SSL enabled by default. This was done leveraging a self-signed certificate created by IBM. This practice over the past few years has become no longer accepted by the general community. It causes a many issues with browsers as they no longer accept this type of certificate. This has caused a great deal of difficulty for users and with the continued focus on Security in the industry, this will continue to get worse. To help customers be able to access IBM Navigator and give them easy control of their security practices, we are making the following changes:

- IBM Navigator will no longer be secured by SSL by default
- When using the URL 'http://hostname:2001' ; The routing by default will change from HTTPS port 2005, to HTTP and port 2004.
- A wizard in the Web Admin GUI interface gives users an easy interface to configure Navigator to use HTTPS and can reactivate port 2005. Details on how to configure can be found on the IBM i DeveloperWorks - <https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/IBM%20Navigator%20for%20i>

## System i Navigator performance tools plug-in no longer supported

---

The System i Navigator performance tools (GewyPerfTools) plug-in is not supported in release 7.2

The performance tools plug-in to System i Navigator has been dropped from the IBM i 7.2 release. It is recommended that you use IBM Navigator for i to display the performance data. If you use performance tools installed from a 7.1 system or earlier to connect to a 7.2 system, unexpected errors may occur.

## System i Navigator Advanced Job Scheduler plug-in is no longer supported

---

The System i Navigator Advanced Job Scheduler plug-in is not supported in release 7.2

The Advanced Job Scheduler plug-in to System i Navigator has been dropped from the IBM i 7.2 release. Advanced Job Scheduler can be accessed through IBM Navigator for i.

## Heritage IBM Navigator for i permanently removed from the system

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The code required for running heritage IBM Navigator for i is permanently removed from the system with the following 5770SS1 PTFs:

### **IBM i 7.4**

SI82995 and SI82996

### **IBM i 7.3**

SI82997 and SI82998

### **IBM i 7.2**

SI83098 and SI83099

It is recommended to use the new **IBM Navigator for i** user interface accessible via URL <http://systemname:2002/Navigator>. Documentation on IBM Navigator for i can be found here: <https://www.ibm.com/support/pages/node/6483299>.

## Integrated web application server changes

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Support has been withdrawn for the integrated web application server (IAS) version 7.1. During the install of the IBM i 7.2 operating system, all IAS version 7.1 server instances are automatically upgraded to IAS version 8.1. For most IAS instances this upgrade is transparent. However, if your IAS server instance no longer works correctly after the upgrade to version 8.1, please contact IBM support for assistance.

Newly created integrated web application servers will be based on IAS version 8.5, the technology used for the server is the WebSphere Application Server V8.5.5 Liberty Profile. Already deployed servers running IAS 8.1 will continue to function, although it is highly encouraged that customers transition to the new server as soon as they are able to since the old runtime will be removed in a future release. Note that there is no automatic upgrade from IAS version 8.1 to 8.5 since the runtimes are based on totally different technologies.

## Integrated web services server changes

---

Newly created integrated web services servers are based on IAS version 8.5 and include a new web services engine. Existing web services servers will continue to run if the version of the web services server engine is 1.5. Web services servers that are running with version 1.3 of the web services engine must be upgraded to version 1.5 by using the upgrade wizard that is part of the IBM Web Administration for i GUI. The wizard is shown in the navigation bar if the server is eligible to be upgraded.

It is highly encouraged that customers transition to the new server as soon as they are able to since the old server runtime and web services engine will be removed in a future release.

## Job limit changes

---

The limit on the number of jobs has increased.

The limit for number of jobs has been increased to 970000. If you change the **QMAXJOB** system value to use the new larger limit, it will cause additional storage use and decreased performance for functions that work with all jobs on the system.

## Job message limit behavior changes

---

Each job on the system has a limited number of program messages (4,294,967,293) it can create for the lifetime of the job. If the job has multiple threads, then the limit is the number of messages from all threads combined. When this limit is reached, the intent was for the operating system to terminate the entire job. In prior releases, this intent was not satisfied when the limit was reached in a secondary thread. Instead, the operating system ended only the secondary thread that noticed the limit was reached and the rest of the threads in the job continued to run. In IBM i 7.2 the operating system was updated to

end the entire job, as was originally intended, when any thread in the job reaches the maximum number of messages allowed.

## Journal changes

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Release to release changes for Journal

### Journaling behavior when a DFRID is specified on a restore

Journal behavior changes when **DFRID** is specified on the Restore Library (**RSTLIB**), Restore Object (**RSTOBJ**), Restore Deferred Object (**RSTDFROBJ**) commands or **GO RESTORE** Option 21.

If the same **DFRID** parameter is used to both defer the restore of logical files and defer start journaling requests, when the Restore deferred object (**RSTDFROBJ**) command is run for that **DFRID**, an attempt will be made to both restore the deferred logical files and start journaling objects which deferred journaling. In previous releases, only an attempt to restore the logical files was made.

When a deferred start journal request is processed, a journal entry is recorded for the start journal operation, but no journal entries are recorded for the restore object or create object operations. This behavior change would be most noted in the case of a restore of all system and user data with option 21.

If a Defer ID is specified when restoring an object into a journaled library that has a \*RESTORE inherit rule defined, the Defer ID takes precedence. That is, if the journal that the object was journaled to when it was saved does not exist, the start journal request will be deferred, and the \*RESTORE inherit rule will not be used.

### Remote journal honors "secure connection"

Remote Journaling now honors the 'secure connection' field in a Relational Database (RDB) Directory Entry.

With release IBM i 7.2, remote journaling now honors the 'secure connection' field in a Relational Database (RDB) Directory Entry. If the RDB directory entry indicates that a secure connection is to be used, then a request to activate remote journaling will fail with CPF694F (communications failed with reason code 4) if a Global secure certificate for remote journaling (application ID QIBM\_QJO\_RMT\_JRN\_TGT) had not been defined on that target system and imported to the source system. For more information on how to establish secure connections for remote journal, see the Supported communications protocols for remote journals topic in the IBM Knowledge Center: [Supported communications protocols for remote journals](#).

### Change Journal (CHGJRN) on all journals after IBM i 7.2 installed

A one-time **CHGJRN** for journal conversion on installation of i 7.2

When IBM i 7.2 is installed, a Change Journal (**CHGJRN**) command is issued once for all journals on the system. This action supports a conversion, which is required for internal information of the journal and journal receiver objects. Additionally, no Next Receiver (Journal code J, Entry Type NR) journal entries or IPL-related journal entries are deposited for the initial installation IPL.

## Maximum CPU and temporary storage changes

---

Behavior changes may be seen when limiting maximum CPU or temporary storage usage for jobs.

Any customers that are currently setting a maximum for CPU time or for temporary storage use will see a change in system behavior. Jobs that exceed the maximum CPU time or exceed the maximum temporary storage used will now be held by the system. Previously, these jobs would have been ended by the system. To obtain the old behavior you can set up a message watch and run a program that issues an End Job (ENDJOB) command. For maximum CPU time, set up a message watch for message CPI112D. For maximum temporary storage set up a watch for message CPI112E.



## MI Queue timestamp changes affecting data queues and user queues

MI queue timestamps might no longer be unique.

To avoid potential performance scaling issues, the time an entry is sent to a queue is changing to no longer use the uniqueness bits and the time a queue was last modified is changing to only use uniqueness bits some of the time. The granularity of timestamps are not changing but bits 52-63 of the timestamps might no longer provide uniqueness, in which case they are set to zero. Since the granularity of the timestamps is not changing, users of functions such as the Retrieve Object Description (QUSROBJD) API, the Display Object Description (**DSPOBJD**) command, and the Retrieve Object Description (**RTVOBJD**) command will see no noticeable change. The change is noticeable in the following places where the timestamp is returned in Standard Time Format:

- Timestamp of enqueue of message field that is returned by the Dequeue (DEQ) MI instruction
- Message enqueue time field that is returned by the Materialize Queue Messages (MATQMSG) MI instruction
- Timestamp of last modification field that is returned by the Materialize System Object (MATSOBJ) MI instruction when a queue is materialized
- Message enqueue date and time field that is returned by the Retrieve Data Queue Message (QMHRDQM) API
- Change date and time field that is returned by the List Objects (QUSLOBJ) API when a data queue or user queue is listed
- Change date and time field that is returned by the Open List of Objects (QGYOLOBJ) API when a data queue or user queue is listed

The above 8-byte timestamps might no longer have the uniqueness bits set. For example, in the Dequeue (DEQ) MI instruction, the Standard Time Format is defined as a 64-bit (8-byte) unsigned binary value as follows:

Offset	Dec	Hex	Field Name	Data Type and Length
	0	0	Standard Time Format	UBin(8)
	0	0	Time	Bits 0-51
	0	0	Uniqueness bits	Bits 52-63
	8	8	--- End ---	

The time field is a binary number, which can be interpreted as a time value in units of 1 microsecond. A binary 1 in bit 51 is equal to 1 microsecond.

The uniqueness bits field might contain any combination of binary 1s and 0s. These bits do not provide extra granularity for a time value; they merely allow unique 64-bit values to be returned, such as when the value of the time-of-day (TOD) clock is materialized. When the uniqueness bits all contain binary 0s, then the 64-bit value that is returned is not unique.

The create and last reclaim timestamps that are returned by functions such as the Retrieve Data Queue Description (QMHRDQD) API and the **MATSOBJ** MI instruction remain unchanged.

## Message timestamps changing

Message timestamps may no longer be unique.

In previous releases, time for messages would be shown in HHMMSS and microsecond fields. If multiple messages were sent within the same microsecond in the past, times would have been non-unique. This is not changing, microsecond granularity will continue to be available. The change will affect the 8-byte time stamp fields returned by various message operations, because bits 52-63 of the time stamp will no longer provide uniqueness (they will be 0). This change will apply to messages sent to a program message queue which make up a job log (queue space). It also applies to messages sent to non-program message queues like QSYSOPR, QHST, user profile message queues, etc. For example, the changed timestamps could be seen by serviceability tools such as trace output, the advanced analysis macro queuespace and watch for



event programs called when the watch option setting is \*MSGID. This change was made as a performance improvement to avoid potential scaling issues.

## NLV changes for the Croatian and Romanian languages

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In IBM i 7.2 5770-SS1, the IBM i operating system and products are no longer translated into the Croatian and Romanian languages.

Starting in IBM i 7.2, the 5770-SS1 IBM i operating system and related products are no longer translated into the Croatia and Romanian languages. The globalization feature codes and settings for Croatia (2912) and Romanian (2992) remain. However, the text is now delivered in English. The system multicultural support for these languages are not affected.

## Operations Console LAN adapter IPv6 support

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Operations Console LAN adapter IPv6 support in IBM i 7.2 might cause address conflicts.

Beginning in IBM i 7.2, Internet Protocol version 6 (IPv6) is supported by the Operations Console LAN adapter. If a console adapter is configured, IPv6 support is automatically enabled along with the existing IPv4 support. If both the console adapter and a system line description use the same communication resource (for example CMN01) and an \*IP6SAC (IPv6 stateless address auto-configuration) TCP/IP interface is configured on that line description, an address conflict can occur that might prevent IPv6 from being activated on that adapter. Before IBM i 7.2 is installed, the conflict can be prevented by ensuring the \*IP6SAC interface is configured with an interface ID other than \*LIND. (For example, the command **CHGTCPIFC INTNETADR(\*IP6SAC) LIND(ETHLINE) IFCID(1234)** changes the interface ID to 0x1234.) The interface ID is used by an \*IP6SAC interface to automatically configure IPv6 addresses for the interface. Changing the interface ID changes the IPv6 addresses that are auto-configured. Alternatively, following the installation, IPv6 can be disabled or a unique interface ID can be configured on the Operations Console LAN adapter through dedicated service tools (DST) or system service tools (SST) to eliminate any conflict.

## Problem reporting/PTF orders over VPN no longer supported

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Customers who use VPN for problem reporting or PTF orders need to change to use HTTP or HTTPS.

One or more of the following changes might be needed:

- If the /QIBM/UserData/OS400/UniversalConnection/eccConnect.properties was modified to disable the HTTP/HTTPS paths for Electronic Customer Support, the changes need to be removed or the service configuration will need to be deleted and re-created to allow HTTP/HTTPS to work.
- If there is a firewall between the IBM i system and the internet, the firewall configuration might need to be modified to allow the IBM Service IP addresses and ports to make it through.

## PTF process changes

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PTF processing has changed so that permanently applied objects will no longer be moved into library QRPLOBJ. Library QRPLOBJ will only contain user data rather than a mixture of user data and IBM data. PTF management will use new IBM libraries QPTFOBJ1 and QPTFOBJ2 for deleting unused permanently applied PTF objects. These libraries will only contain IBM data and cannot be cleared or deleted by the user.

## QFileSvr.400 connection changes

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A change was introduced in the APPC support before IBM i 7.2 that prevents QFileSvr.400 to connect with SNA with Enterprise Extender. A CPFA0E2 - System unable to establish a communications connection to a file server is signalled instead. The circumvention is to use a TCP/IP interface for QFileSvr.400.

## Save Storage (SAVSTG) command and restore storage process are no longer provided

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The Save Storage (**SAVSTG**) command and restore storage process are no longer provided. To backup and recover your system, it is recommended that you use other save and restore functions or a backup/recovery application. For example, use option 21 on the SAVE and RESTORE menus, or the Backup Recovery and Media Services (BRMS) application.

## SCPF joblog changes

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In releases prior to IBM i 7.2, the **SCPF** joblog contained messages from parts of two IPLs. In 7.2 the **SCPF** joblog will be similar to other system joblogs and contain messages for only one IPL.

## Simple Network Management Protocol (SNMP) changes

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In 7.2, the Simple Network Management Protocol (SNMP) server is enforcing stricter compliance to the SNMP version 3 (SNMPv3) protocol. The SNMP server will not start if the SNMP attributes have been configured to allow SNMPv3 and a non-RFC compliant SNMP Engine ID is specified by the SNMP attributes. The QTMSNMP job will log message TCP403B (Local SNMP engine ID not valid. Reason code &1.) and then end. If SNMPv3 is not enabled the message TCP403B will still be logged, however, the QTMSNMP job will not end. To set a valid SNMPv3 Engine ID, run the following command: **CHGSNMPA SNMPENGID(\*SYSGEN)**

## Simple Network Management Protocol (SNMP) Install Actions

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The SNMP attributes file (QUSRSYS/QATOSCFG) gets cleared at first touch after installing release 7.2 over a pre-7.1 release (there is no problem installing 7.2 over 7.1). PTF SI57890 has been created to address the problem, however, one of following actions must still be taken:

- Make sure that the SNMP server is not going to be auto-started by either TCP/IP, startup-program, or an SNMP-based application. After the upgrade, load and apply PTF SI57890. Then the SNMP server can be started and/or changed to auto-start in the future using the **Change SNMP Attributes (CHGSNMPA)** command.
- Backup the QUSRSYS/QATOSCFG file prior to the install, perform the install to 7.2, end the SNMP server, load and apply PTF SI57890, restore the file from backup, and then start the SNMP server.

## Secure sockets layer (SSL) changes

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### Secure sockets layer (SSL) default cipher specification list changes

SSL default cipher specification list has changed for System SSL

The System SSL default cipher specification list no longer contains any ciphers that use the MD5 hashing algorithm. The new Elliptic Curve Diffie-Hellman Ephemeral (ECDHE) Elliptic Curve Digital Signature Algorithm (ECDSA) set of Advanced Encryption Standard (AES) ciphers are first in the list. In the subsection of previously existing RSA ciphers, the AES 256-bit cipher is now second in the ordered default cipher specification list, previously it was fourth. All Rivest Cipher 4 (RC4) 128-bit ciphers and all Triple DES (3DES) ciphers have been removed from the list. The new ECDHE RSA AES subset of ciphers appears at the end of the list. The ciphers no longer in the default cipher specification list are still supported by System SSL for applications that code to specifically use those ciphers.

Administrators can control the ciphers supported by System SSL using the system values QSSLCSL and QSSLCSLCTL. The order of ciphers in the default cipher specification list can be altered indirectly by changing the order of the ciphers contained in the QSSLCSL system value. See the SSL topic in the IBM Knowledge Center for additional information. The shipped default cipher specification list values but not

order can also be changed by using System Service Tools (SST) Advanced Analysis Command SSLCONFIG. For additional information see the help text for SSLCONFIG. The System SSL default cipher specification list is now as follows:

- ECDHE\_ECDSA\_AES\_128\_CBC\_SHA256
- ECDHE\_ECDSA\_AES\_256\_CBC\_SHA384
- ECDHE\_ECDSA\_AES\_128\_GCM\_SHA256
- ECDHE\_ECDSA\_AES\_256\_GCM\_SHA384
- RSA\_AES\_128\_CBC\_SHA256
- RSA\_AES\_128\_CBC\_SHA
- RSA\_AES\_256\_CBC\_SHA256
- RSA\_AES\_256\_CBC\_SHA
- RSA\_AES\_128\_GCM\_SHA256
- RSA\_AES\_256\_GCM\_SHA384
- ECDHE\_RSA\_AES\_128\_CBC\_SHA256
- ECDHE\_RSA\_AES\_256\_CBC\_SHA384
- ECDHE\_RSA\_AES\_128\_GCM\_SHA256
- ECDHE\_RSA\_AES\_256\_GCM\_SHA384

## SSLv3 protocol has been disabled for System SSL

The Secure Sockets Layer version 3.0 protocol (SSLv3) is now disabled by default for System SSL. System SSL is the IBM i Licensed Internal Code (LIC) implementation of SSL functionality. It is tightly coupled with the operating system and the sockets code specifically providing extra performance and security. System SSL is available to application developers via two different programming interfaces and one JSSE implementation:

- Global Secure Toolkit (GSKit) APIs
  - ILE C APIs accessible from other ILE languages
- Native i5/OS SSL\_ APIs
  - ILE C APIs accessible from other ILE languages
  - This API set is not recommended, use GSKit
- Integrated IBM i JSSE implementation
  - The IBM i JSSE implementation is available for JDK 1.6, JDK 7, and JDK 8.

SSL applications created by IBM, IBM business partners, independent software vendors (ISV), or customers that use one of these three interfaces to System SSL will be affected. FTP and Telnet are examples of IBM applications that use System SSL.

SSLv3 can be re-enabled by changing the QSSLPLCL system value. See the SSL topic in the IBM Knowledge Center for additional information. After re-enabling SSLv3, you can make SSLv3 a default protocol again using System Service Tools (SST) Advanced Analysis Command SSLCONFIG. For additional information see the help text for SSLCONFIG.

## TELNET changes

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### CHGTELNA command changes

Change TELNET Attributes (**CHGTELNA**) command is changing the Session keep alive timeout (**TIMMRKTIMO**) range.

The Change TELNET Attributes (**CHGTELNA**) command is changing the Session keep alive timeout (**TIMMRKTIMO**) range. It is changed from 0-2147483647 to 1-2419200 to match the limits allowed on the TCP keep alive (**TCPKEEPALV**) parameter of the Change TCP/IP Attributes (**CHGTCPA**) command and the system implemented limits for socket attributes.

Any value outside the new range is set to the maximum value 2419200, which is equivalent to 28 days. Message TCP1F11 - 'Config file member successfully converted' is sent to the joblog and to the QSYSOPR message queue if this value was changed to conform with the allowed range.

### Data area QTVNO32785 no longer supported for wide-screen suppression

New **ENBWIDE** parameter on the Change TELNET attributes (**CHGTELNA**) command must be used to configure wide-screen preferences.

Beginning with V5R1, customers who used 3278-5 wide-screen devices used for IBM z systems and then wanted to Telnet to an IBM i system had an option to NOT use the wide-screen support and instead use a 24x80 display. This was documented and configured by creating a QTVNO32785 data area anywhere in the system library list.

Customers were instructed:

To get a 24x80 display, run the command **CRTDTAARA DTAARA(libname/QTVNO32785) TYPE(\*CHAR) VALUE('1')**.

This is no longer supported. The change is to use the Enable 3270 wide-screen (**ENBWIDE**) parameter added to the Change TELNET Attributes (**CHGTELNA**) command. Customers who previously used the QTVNO32785 data area must manually configure the Enable 3270 wide-screen (**ENBWIDE**) parameter. The system does not automatically migrate any pre-existing use of the QTVNO32785 data area and the default value of **ENBWIDE(\*YES)** is used. The value for the **ENBWIDE** parameter must be set to **\*NO** to disable wide-screen emulation.

### Planning for removal of support of adapters and configurations for releases following V7R3 of IBM i

Removal of commands supporting native SNA adapters:

Software support for these adapters will be removed. Hardware support for these adapters was withdrawn in prior releases. Software alternatives, such as Enterprise Extender for SNA, do not support these configurations. Affected configurations include SNA FAX, Finance, Retail and Remote workstation configurations.

Removal of support for DDI, Token-Ring, Wireless, Frame Relay, SDLC, TDLC, and X.25 protocols:

Software support for these protocols is being removed. Hardware support for these protocols was withdrawn in prior releases.

Removal of Network Interfaces configurations:

Software support for these adapters is being removed. Hardware support for these adapters was withdrawn in prior releases.

Removal of AnyNet<sup>®</sup> configurations:

Software support for AnyNet will formally be removed.

AnyNet was no longer supported in V7R1. Users should start to move to Enterprise Extender before upgrading to the new release.

For information on moving from AnyNet to Enterprise Extenders view the topic in the Knowledge Center: [http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_73/rzajt/rzajtanytoee.htm](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_73/rzajt/rzajtanytoee.htm)

## Updated EBCDIC Unicode maps for CCSIDs 1377 and 1388

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The IBM i CCSID conversion support to and from Unicode has been updated for data stored in EBCDIC **CCSIDs 1377 and 1388** (normally used for Chinese data). This new support reflects some new Unicode assignments for existing CCSID 1377 or 1388 characters.

The conversion to the new Unicode mapping will occur automatically with no intervention. If your CCSID 1377 or 1388 data is converted from Unicode, the old codepoints will convert to the same 1388 or 1377 codepoint. But when converted back to Unicode, the new Unicode codepoint will be used.

If you need to preserve the current mapping, two new CCSIDs have been provided to allow the old conversions. The new CCSIDs to use are:

- **CCSID 13676** instead of 1388
- **CCSID 5473** instead of 1377

These new CCSIDs provide the old codepoint mappings for 1377 and 1388 without the new characters.

See KnowledgeCenter for the list of changed characters.

IBM i 7.2 PTFs for changes to CCSIDs 1377 and 1388 are:

- SI71953
- SI71952
- MF67072
- SI72104
- MF67121
- MF66946

IBM i 7.2 PTFs for new CCSIDs 13676 and 5473 are (these supersede the PTFs for changes to CCSIDs 1377 and 1388):

- MF67845
- SI74351
- SI74354
- SI74358
- SI74416

**Note:** These PTFs are being withheld from CUM packages and resaves. Unless the PTFs are specifically ordered, the CCSID maps will not be updated.



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## Options

This sections describes changes to options of the IBM i operating system.

### System Openness Includes (Option 13)

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The ILE RPG header files contained in file QSYSINC/QRPGLESRC have been updated.

Two and four byte binary fields have been converted to two and four byte integer fields, respectively. For example:

Old Header:

DQUSM0200	DS			
D*				Qdb Mbrd0200
D QUSBRTN03		1	4B 0	Bytes Returned
D*				
D QUSBAVL04		5	8B 0	Bytes Available
D*				
D QUSDFILN00		9	18	Db File Name
D*				

New Header:

DQUSM0200	DS			
D*				Qdb Mbrd0200
D QUSBRTN03		1	4I 0	Bytes Returned
D*				
D QUSBAVL04		5	8I 0	Bytes Available
D*				
D QUSDFILN00		9	18	Db File Name
D*				

These changes might cause an incompatibility to existing code that use the affected headers.

1. An RPG program might fail to compile in cases where RPG requires an exact type match.
  - A parameter that is passed by reference on a prototyped call.
  - A single key field in a fixed form search operation.
2. A recompiled RPG program might behave differently.
  - If the program is using the number of digits in the subfield for some other calculation (the prior binary subfields would have 4 or 9 digits; the new integer fields would have 5 or 10).
  - The edited form of the subfields would have one more byte so it might overflow a character work field.
  - If the program is expecting numeric calculations to truncate the high-order digits (RPG has fixed form arithmetic operations ADD, SUB, MULT, DIV which default to truncating without error).

### Integrated Server Support (Option 29)

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Some Microsoft Windows server versions are no longer supported over iSCSI connections.

The following Microsoft Windows server versions are no longer supported on servers that are integrated with IBM i using internet SCSI (iSCSI):

- Microsoft Windows Server 2003 R2
- Microsoft Windows Server 2003

See the Support Matrices chapter of the IBM i iSCSI Solution Guide [IBM i iSCSI Solution Guide](#) for the current list of server operating system versions and IBM System x and BladeCenter blade server models that can be attached to IBM i systems using internet SCSI (iSCSI) technology.

**If a partition is scratch installed to 7.2 and a Microsoft Windows Server 2003 NWSD is restored to the partition, it is essential that PTF SI56829 be loaded and applied either before the restore of the NWSD or before varying on any Windows Server 2003.** If the PTF is not loaded on a partition that has been scratch installed and a Microsoft Windows Server 2003 NWSD is restored on to the partition, when the server is started the synchronization can cause the Windows Server to become unusable by deleting needed binary files.

## Domain name system (Option 31)

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In 7.2, Domain Name System (Option 31) uses utilities OpenSSH, OpenSSL, and zlib, which require that IBM Portable Utilities for i (5733-SC1) option 1 be installed.

## Additional Fonts (Option 43)

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The names of the fonts and their corresponding file names have changed.

For compatibility with earlier versions, and to eliminate the need to update existing applications, the operating system maps the old font names to the new font names for DDS applications that use the FONTNAME keyword to reference fonts by their full font name. Likewise, the operating system has created symbolic links with both the old and new file names in the `/usr/lib/fonts` directory for PASE applications that reference fonts by their file names.

If you have applications that access these fonts directly in the product directory `/QIBM/ProdData/OS400/Fonts/TTFonts`, you need to change the application to use the new names or create symbolic links that map the old file names to the new ones.



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## Licensed programs

This section contains information about individual licensed programs that have been modified or changed for IBM i 7.2.

### Collaboration and Social Products (Formerly Lotus)

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#### Collaboration and Social Products supported on IBM i 7.2

Refer to the Lotus® Software for IBM i Compatibility Guide on the IBM systems Web site at [http://www.ibm.com/systems/resources/systems\\_power\\_ibmi\\_lotus\\_releasesupport.pdf](http://www.ibm.com/systems/resources/systems_power_ibmi_lotus_releasesupport.pdf) for information about the minimum releases of Lotus products required to run on IBM i 7.2.

#### Lotus Quickr for Domino

Lotus Quickr® for Domino® is not supported on IBM i 7.2. The suggested replacement for your Lotus Quickr environments is IBM Connections Content Manager.

### IBM WebSphere Application Server Versions 8.0 (5733-W80) and 8.5 (5733-W85)

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#### Product Support Information:

IBM WebSphere® Application Server Version 8.0 (5733-W80)

Full support of this product will be discontinued on December 31st, 2017. After this date, the WAS v8.0 Express® edition on the IBM i platform will only be supported on a best effort basis under the IBM Web Enablement (5722-WE2) product license. The Base and Network Deployment (ND) editions will no longer be supported.

For more information on the support of the WAS v8.0 product, please refer to the URL: [http://www-01.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep\\_ca/3/897/ENUS916-143/index.html&lang=en&request\\_locale=en](http://www-01.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_ca/3/897/ENUS916-143/index.html&lang=en&request_locale=en)

If you are currently running on WAS v8.0; IBM strongly recommends you migrate to WAS v8.5 or v9.0.

WAS product migration information for the IBM i platform can be found in the following URLs:

- WAS v8.5.5 - <http://www.ibm.com/support/docview.wss?uid=nas8N1020832>
- WAS v9.0 - <http://www.ibm.com/support/docview.wss?uid=nas8N1021398>

#### Support for IBM Java SE 6.0/6.2.6 (5770JV1 Option 11 and 12) will be discontinued on December 31st, 2017

**WARNING** After this date, no additional fixes or PTFs will be produced for the 5770JV1 Option 11 and 12 LPPs. Support for the 5770JV1 Option 11 and 12 LPPs will be provided on best effort basis only. This will affect WAS v8.5.5 environments and require a migration of WAS v8.5.5 to Java™ SE 7.0, 7.1, or 8.0.

Existing v8.5.5 WebSphere Application Servers may fail to start when the WAS Fix Pack released after December 2017 is applied. Only WebSphere Application Servers configured to use Java SE 6.0 will be affected. If the application server is configured to use JDK 7.0, 7.1, or 8.0; it will not be affected. Please note that the default Java SE for v8.5.5 WebSphere Application Servers is Java SE 6.0 unless they are configured otherwise.

## How to identify the Java SE version used by my WAS v8.5 profile and environment?

- **STRQSH**

- `cd /QIBM/ProdData/WebSphere/AppServer/V85/<edition>/bin`
- `./managesdk -listEnabledProfileAll`

The output should look something like the following for each:

CWSDK1004I: Profile WAS85SVR :

CWSDK1006I: PROFILE\_COMMAND\_SDK = 1.6\_32

CWSDK1008I: Node AS400\_WAS85SVR SDK name: 1.6\_32

CWSDK1009I: Server WAS85SVR SDK name: 1.6\_32

CWSDK1009I: Server IHS\_WEBSERVER SDK name: 1.6\_32

CWSDK1001I: Successfully performed the requested managesdk task.

\$

In the above example, you can see that 1.6\_32 (Java SE 6.0 32bit) is currently configured to be used.

If you are currently are using Java SE 6.0, 7.0, or 7.1 in your WAS v8.5.5 environment, IBM strongly recommends you migrate your WAS environment to use Java SE 8.0 using the managesdk comamnd.

In order to use Java SE 8.0 with WAS v8.5.5, the following steps will need to be taken:

1. Install the Java SE 8.0 32 bit (5770-JV1 option 16) and Java SE 8.0 64 bit (5770-JV1 option 17) LPPs.

Refer to the following URL on how to download and install Java SE 8.0 on the IBM i OS. <http://www-01.ibm.com/support/docview.wss?uid=nas8N1020692>

2. Use the WAS-supplied managesdk command to update existing WebSphere Application Server profile(s) SDK, command default SDK, and new profile SDK to Java SE 8.0.

For detailed managesdk command usage, refer to the URL: <http://www-01.ibm.com/support/docview.wss?uid=nas8N1019730>

IBM recommends the following commands be executed to change the product and all profile defaults to use JDK 8.0 64 bit (5770JV1 Option 17).

- **STRQSH**

- `cd /QIBM/ProdData/WebSphere/AppServer/V85/<edition>/bin`
- `./managesdk -setNewProfileDefault -sdkname 1.8_64`
- `./managesdk -setCommandDefault -sdkname 1.8_64`
- `./managesdk -enableProfileAll -sdkname 1.8_64 -enableServers`

NOTE: IBM strongly recommends that all WebSphere Application Server profiles and product defaults be updated to use Java SE 8.0 prior to December 2017 to avoid any issues.

Java SE 8.0 is the recommended Java SDK because it provides the latest features and security updates and will eliminate another Java SE upgrade when Java SE 7.0/7.1 goes out of support in the future.

## Installation of WebSphere Application Server

In IBM i 7.1, IBM Web Enablement for i included IBM WebSphere Application Server - Express V7.0, IBM WebSphere Application Server - Express V8.0, and IBM WebSphere Application Server - Express V8.5. In IBM i 7.2, IBM Web Enablement for i includes IBM WebSphere Application Server - Express V8.0 and IBM WebSphere Application Server - Express V8.5. Additionally, Application Servers V6.1 and V7.0 are not supported on IBM i 7.2.

The minimum required level of WebSphere Application Server V8.0 on 7.2 is 8.0.0.8. The minimum required level of WebSphere Application Server V8.5 on 7.2 is 8.5.5.2. However, for the WebSphere Application Server Liberty profile, which was introduced with Application Server V8.5 the minimum required level for archive type installations is 8.5.0.0 while the minimum required level for IBM Installation Manager type installations is 8.5.5.0.

## Upgrading to IBM i 7.2:

If you are currently using Application Server V7.0 and upgrading to 7.2, you need to migrate to the WebSphere Application Server V8.0.0.8 or V8.5.5.2 products. Because migration does not require Application Server V7.0 to be operational, migration can occur before or you upgrade to 7.2.

1. After you upgrade to 7.2, ensure that all Application Server installations meet the minimum required fix levels. The version identifier is contained in file `<app_server_root>/properties/version/WAS.product`, where `<app_server_root>` is the root directory of the WebSphere Application Server installation. For the Liberty profile, the version identifier is contained in `<wlp_root>/lib/versions/WebSphereApplicationServer.properties`, where `<wlp_root>` is the root directory of the Liberty profile.
2. For WebSphere Application Server V8.0, apply fix pack 8 (8.0.0.8) or later if needed. For WebSphere Application Server V8.5, apply fix pack 2 of version 8.5.5 (8.5.5.2) or later if needed. For Installation Manager type installs of the Liberty profile, update the Liberty profile to version 8.5.5.0 or later.  
**Note:** In WebSphere Application Server Version 8.5.5.0, the Liberty profile was promoted from a feature to an independently installable offering. You cannot make an in-place update of the Version 8.5.0.x Liberty profile feature. For more information, see article "Updating the Liberty profile from Version 8.5.0 to Version 8.5.5" in WebSphere Application Server information center.
3. **IMPORTANT:** if the Application Server installation was already at the required fix level before the IBM i Operating System upgrade, then update the Application Server service programs for IBM i 7.2. This step does not apply to the WebSphere Application Server Liberty profile.

Prior to updating the service programs, ensure the following conditions are met:

- WebSphere Application Servers are ended
- System value QALWOBJRST is set to \*ALL
- The IBM i User Profile running the command has the following special authority set: \*ALLOBJ and \*SECADM

To update the programs:

- Start the Qshell interpreter.
- cd to `<app_server_root>/bin`
- Start the `_postfpexit` script as follows: `_postfpexit <app_server_root>`

```
Example:  
STRQSH  
cd /QIBM/ProdData/WebSphere/AppServer/V85/Express/bin  
_postfpexit /QIBM/ProdData/WebSphere/AppServer/V85/Express
```

## Documentation:

For more information, see the WebSphere Application Server Library documentation at this website: <http://www.ibm.com/software/webservers/appserv/was/library>

## IBM Developer Kit for Java (5770-JV1)

### Documentation

For more information of J9 on i, see the IBM i Technology Updates website: <http://www.ibm.com/developerworks/ibmi/techupdates/java>.

## JV1 options support on IBM i 7.2

The JV1 options for IBM Technology for Java(IT4J) 1.4.2 (option 13) and 5.0 (option 8 and 9) are no longer supported on IBM i 7.2. The default JVM on i 7.2 is IBM Technology for Java 7.1 32 bit (option 14).

Support for IBM Java SE 6.0/6.2.6 (5770JV1 Option 11 and 12) will be discontinued on December 31st, 2017. After this date, no additional fixes or PTFs will be produced for the 5770JV1 Option 11 and 12 LPPs.

Support for the 5770JV1 Option 11 and 12 LPPs will be provided on best effort basis only.

## Classic Java commands and API removed

The Classic Java commands **ANZJVAPGM**, **ANZJVM**, **CHGJVAPGM**, **CRTJVAPGM**, **DMPJVM**, **DSPJVAPGM**, and the Classic Java API **QJVARJPI** have been removed in IBM i 7.2.

Any programs that reference these commands might need to be updated.

## Backup Recovery and Media Services (5770-BR1)

Backup recovery and media services (5770-BR1) changes

### Read before upgrading BRMS

It is important to ensure no user created dependencies exist on BRMS files in QUSRBRM before upgrading BRMS. Use DSPDBR on all physical and logical files in QUSRBRM to ensure only IBM BRMS files are listed. If any other non-IBM dependencies exists, they need to be removed before starting an upgrade.

If using OUTPUT(\*OUTFILE) on any BRMS commands, it is recommended that the current outfiles be deleted prior to upgrading or after upgrading to a new release. Changes to files may have occurred and new fields added or changed.

### BRMS recovery report changes

The "Deleted library" attention block in the BRMS recovery report is now ignored.

In releases before IBM i 7.2, if data area QUSRBRM/Q1ANODLTAT existed, the "Deleted library" attention block would not show in the recovery report. In 7.2, parameter **SHWDLTLIB** was added to the Start Recovery using BRMS (**STRRCYBRM**) command. The **SHWDLTLIB** parameter controls including or omitting the attention block and replaces the data area function. The data area QUSRBRM/Q1ANODLTAT is ignored.

### Set time function removed

The set time function has been removed.

The "Set time" option 8 function from the Network Panel (**WRKPCYBRM \*SYS** option 4) has been removed. Time management is critical to system operation and since there are other time management products available on the IBM i that work more efficiently, this function has been removed from BRMS in 7.2.

### New parameter UPDHST on some BRM commands

A new parameter **UPDHST** has been added to the Save Library using BRMs (**SAVLIBRM**), Save Object using BRMs (**SAVOBJBRM**), Save Object List using BRMs (**SAVOBJLBRM**), Save Object using BRMs (**SAVBRM**) commands and control group attributes. This parameter exists on the operating system save commands Save Library (**SAVLIB**), Save Object (**SAVOBJ**), Save Object (**SAV**), and Save Changed Objects (**SAVCHGOBJ**), and if set up with defaults, BRMS would automatically have used the specified defaults. Since we are adding this parameter on BRMS commands, any default that was set before this release on these operating system commands, will no longer be used. You need to specify the value on the new **UPDHST** parameter available through the BRMS commands to get the same behavior.

When specifying **UPDHST (\*NO)**, the object save time and date will not get updated. This might cause longer save times when doing an incremental save with BRMS. With **UPDHST (\*NO)**, the system's optimization of using **\*SAVLIB** on the reference date cannot be used.

## WRKPCYBRM TYPE(\*MOV) OUTPUT(\*PRINT) changes

The spooled output that is generated by running command **WRKPCYBRM TYPE(\*MOV) OUTPUT(\*PRINT)** (Work with Policies using BRMs) has changed. If you have a program the parses this spooled file, then you will need to evaluate the changes to this report and make the corresponding changes to your parsing program.

## SAVLIBBRM command changes

The Save Library using BRM (**SAVLIBBRM**) command default for the Journalized objects (**OBJJRN**) parameter has changed to \*YES.

## IBM HTTP Server for i (5770-DG1)

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IBM HTTP Server for i is now based on Apache HTTP server version 2.4

### Configuration-related changes

Changes in server behavior that might require you to change your configuration or how you use the server so that you can continue to use HTTP Server on IBM i 7.2 as you currently use HTTP Server on IBM i 7.1 and V6R1.

- All load balancing implementations have moved to individual, self-contained mod\_proxy sub modules, for example mod\_lbmethod\_bybusyness. You might need to load any of the load balancing implementations that your configuration uses.
- The DefaultType directive no longer has an effect, other than to emit a warning if it is used with any value other than none. For unknown file extensions, which are not declared in /QIBM/UserData/HTTPPA/conf/mime.types(for example, the .mbr files in QSYS file system), HTTP server does not add a default type(text/plain) in the response anymore. To display these files correctly, you are now responsible to assign media types in IBM i 7.2. For example, "AddType text/html .mbr".
- The default value of directive Options was changed from "All" to "FollowSymlinks".
- Module "mod\_disk\_cache" is renamed to "mod\_cache\_disk". You need to replace "LoadModule disk\_cache\_module /QSYS.LIB/QHTTPSVR.LIB/QZSRCORE.SRVPGM" with "LoadModule cache\_disk\_module /QSYS.LIB/QHTTPSVR.LIB/QZSRCORE.SRVPGM".
- mod\_cache: The second parameter to CacheEnable matches forward proxy content only if it begins with the correct protocol. In IBM i 7.1 and earlier, a parameter of '/' matched all content. Specifying "<protocol>://" for the second parameter caches forward proxy content only from the default port of that protocol. In IBM i 7.1 and earlier, it caches content from all ports. For example, "CacheEnable disk http://" now caches HTTP forward proxy content only from 80 port. Use "CacheEnable disk **http://\*:**" to cache http forward proxy content from all ports.
- FileETag now defaults to "MTime Size" (without INode).
- mod\_log\_config: \${cookie}C matches whole cookie names. Previously any substring would match.
- mod\_dav\_fs: The format of the DavLockDB file is changed for systems with inodes. The old DavLockDB file must be deleted on upgrade.
- KeepAlive accepts only values of On or Off. Previously, any value other than "Off" or "0" was treated as "On".
- mod\_filter: FilterProvider syntax is changed and now uses a Boolean expression to determine whether a filter is applied.
- mod\_include:

- The `#if` expr element now uses the new expression parser. The old syntax can be restored with the new directive `SSILegacyExprParser`.
- An SSI\* configuration directive in directory scope no longer causes all other per-directory SSI\* directives to be reset to their default values.
- `mod_autoindex`: now extracts titles and display descriptions for `.html` files, which were previously ignored.
- The `NameVirtualHost` directive no longer has an effect, other than to emit a warning. Any address/port combination which appear in multiple virtual hosts is implicitly treated as a name-based virtual host.
- `mod_deflate`: now skips compression if it knows that the size increase added by the compression is larger than the data to be compressed.
- Multi-language error documents from previous releases might not work unless they are adjusted to the new syntax of `mod_include`: `#if expr=` element or the directive `SSILegacyExprParser` is enabled for the directory that contains the error documents.
- Directive "Rewritelog" and "Rewriteloglevel" are replaced by the new per-module logging configuration.

## Access control changes

Access control changes on IBM i 7.2

Before IBM i 7.2, access control that is based on client host name, IP address, and other characteristics of client requests was done with the directives `Order`, `Allow`, `Deny`, and `Satisfy`.

In 7.2, such access control is done in the same way as other authorization checks, by using the new module `mod_authz_host`. The old access control idioms should be replaced by the new authentication mechanisms, although for compatibility with old configurations, the new module `mod_access_compat` is provided. Here are some examples of old and new ways to do the same access control:

1. In this example, all requests are denied.

### Pre 7.2 configuration:

```
Order deny,allow
Deny from all
```

### 7.2 configuration:

```
Require all denied
```

2. In this example, all requests are allowed:

### Pre 7.2 configuration:

```
Order allow,deny
Allow from all
```

### 7.2 configuration:

```
Require all granted
```

3. In the following example, all hosts in the `example.org` domain are allowed access; all other hosts are denied access.

### Pre 7.2 configuration:

```
Order deny,allow
Deny from all
Allow from example.org
```

### 7.2 configuration:

```
Require host example.org
```

Beginning in IBM i 7.2, customers are encouraged to start to use the new access control directives. New directives are used by default when a new HTTP Server from IBM Web Administration for i is created.

## Third party modules consideration

API changes require third party modules be recompiled.

Due to the API changes in HTTP server for 7.2, in order to get your plug-in modules to work correctly with the new version HTTP server, all third-party (Non IBM) modules are required be recompiled against HTTP server for 7.2 runtime before being used. For detail about the API changes, please refer to API update overview: [http://httpd.apache.org/docs/2.4/developer/new\\_api\\_2\\_4.html](http://httpd.apache.org/docs/2.4/developer/new_api_2_4.html)

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

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IBM PowerHA SystemMirror for i (5770-HAS)

- Before you upgrade your system to IBM i 7.2, if you have 5770-HAS (IBM PowerHA SystemMirror for i) installed, make sure that your HA version is 2.2. The Change Cluster Version (**CHGCLUVER**) command can be used to adjust the current version of the PowerHA product.
- IBM PowerHA SystemMirror for i has been restructured. Standard edition is now option 2 and Express edition has been added which supports HyperSwap® and is option 3.
- The High Availability Solution Manager GUI and the Cluster Resource Services GUI have been removed from the IBM PowerHA SystemMirror for i product. You can continue to configure and manage your high availability environment using the PowerHA GUI.
- IBM i 7.2 will be the last release that supports the IOP switching technology (sometimes referred to as switched disk technology). Support will be dropped in the next release of IBM i. This technology is part of the IBM i operating system, with user interfaces in the IBM PowerHA SystemMirror for i product (5770-HAS). IOP switching was used primarily by customers with internal disk who wanted two IBM i partitions but only one copy of the independent auxiliary storage pool (IASP). Customers still on internal disk have the option of either synchronous or asynchronous geographic mirroring, which replicates the data from one IASP to a backup copy. Customers using external storage can use PowerHA's LUN switching technology which will remain fully supported, as well as the other replication technologies available on external storage. Once customers have upgraded to the next release of IBM i, it will no longer be possible to configure or manage an IOP switching environment.

### HMC dropping support of Common Information Model (CIM)

The Hardware Monitor Console (HMC) is being updated to replace the existing Common Information Model (CIM) server with a new representational state transfer (REST) server. HMC V8R8.5.0 is the last version of HMC to support the CIM server, and is the first version of HMC to support all REST server. IBM® PowerHA® for i enhanced advanced node failure detection to support a new REST server through a new function PowerHA PTFs. PTFs have been provided for 7.1 and 7.2 PowerHA LP. See High Availability in Knowledge Center for more information.

Link for High Availability: [http://www-03preprod.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/rzahg/rzahgha.htm](http://www-03preprod.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzahg/rzahgha.htm)

## IBM Content Manager OnDemand for i (5770-RD1)

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### IBM Content Manager OnDemand for i upgrade requirements

If you are upgrading from a previous version of IBM Content Manager OnDemand, you must be running Content Manager OnDemand server version 8.4.0.3 (or higher) before you upgrade to Content Manager OnDemand for i 7.2. For instructions on how to determine your current server version, see the Content Manager OnDemand for i: Common Server Planning and Installation Guide.

Content Manager OnDemand client software must be upgraded to version 8.4.1.x (or higher) before you upgrade to Content Manager OnDemand for i 7.2. This includes, but is not limited to, the OnDemand

Windows (end-user) client and the ODWEK CGI, Servlet, and Java APIs. If you use WEBi or IBM Content Navigator (ICN), see the appropriate documentation for those products to determine minimum software requirements.

The OnDemand Administrator client must be at the same version or higher as the Content Manager OnDemand server. For Content Manager OnDemand for i 7.2, the OnDemand Administrator client must be at version 9.0.0.3 or higher.

## New web-based administration tool

A new web-based Content Manager OnDemand component of IBM Navigator for i is now available. This new administration interface replaces the OnDemand Archive plug-in of System i Navigator. Customers running Content Manager OnDemand for i at 7.2 must use this new tool to administer storage management objects such as migration policies and various archive media definitions, as well as output queue and directory monitor definitions.

## Command changes

In Content Manager OnDemand for i 7.2, various commands have changed as described below. See the Content Manager OnDemand for i: Common Server Planning and Installation Guide, Common Server Administration Guide, and online help for more information.

- Both the Start Archived Storage Management (**STRASMOND**) command and the Start Disk Storage Management (**STRDSMOND**) command with **STRASMOND (\*YES)** now place a copy of the Archived Storage Management reports into the Content Manager OnDemand System Log folder after the ASM process completes. The Content Manager OnDemand server is started for you automatically if the server is not started so that the reports can be loaded.
- Both the Add Report to OnDemand (**ADDRPTOND**) and Start Monitor for OnDemand (**STRMONOND**) commands have a new Password stash file (**STASHFILE**) parameter that, if used, specifies the path and file name of a stream file that contains the user profile and password that is used to run the command. This parameter is optional.
- The Change Policy Level Date (**CHGPLDOND**) command has two new parameters. The new Processing option (**OPTION**) parameter allows you to specify a particular report ID (also known as load ID). This parameter enables you to change the next level date for one particular report ID, rather than the current default, which is to change the policy level date for a date range of documents. If you specify \*RPTID for the new **OPTION** parameter, a new Report ID (**RPTID**) parameter is enabled. These parameters are optional.
- Both the Remove Report from OnDemand (**RMVRPTOND**) command and the Start Disk Storage Management (**STRDSMOND**) command have a new Hold threshold (**HLDTHLD**) parameter. When you use the Enhanced Retention Management feature, the new **HLDTHLD** parameter specifies a threshold value that determines if and when you want Content Manager OnDemand to reload data during deletion or expiration processing. This parameter is optional.
- The Remove Report from OnDemand (**RMVRPTOND**) command no longer supports the Error option (**ERROPT**) parameter. Previously, the **ERROPT** parameter allowed you to specify whether you wanted to remove a report that is based on the existence of a record of the report ID in the Content Manager OnDemand System Log. Beginning in 7.2, the **RMVRPTOND** command always removes the report, regardless of whether the report ID is found in the System Log.

## First start of a Content Manager OnDemand instance or the Archive Storage Management (ASM) process takes longer

The first start of a Content Manager OnDemand instance or the Archive Storage Management (ASM) process after an upgrade to Content Manager OnDemand for i 7.2 might take longer because of a number of database changes. The most significant delay occurs if you are upgrading from a release before 7.1 due to the movement of instance-specific data and objects from the QUSRRDARS library into the instance libraries.



- Do not end the server job or the ASM job because you are concerned that it is not progressing.
- Status messages are signaled during the database changes and the data movement from QUSRRDARS to the instance library. You can check these messages to confirm that the job is progressing.

## Product restructuring

The product options for Content Manager OnDemand for i have been restructured to make installation and maintenance easier. The individual product options for 7.2 (which install separately) are as follows:

- \*BASE for the Base Support (required for all others)
  - \*BASE now includes Common Server (previously option 10) and Web Enablement Kit (ODWEK; previously option 11).
  - This option also includes the IBM Navigator for i - Content Manager OnDemand component (previously named: IBM Navigator for i - OnDemand Administration).
- 12 for PDF Indexer (optional)
- 13 for Advanced Function Presentation Transformations for IBM i (optional)
- 14 for Enhanced Retention Management (optional)

Product options 10 and 11 are now included in \*BASE and no longer require installation of a separate option. Important: If product options 10 or 11 exist on your system, they are deleted during the upgrade process.

The System i Navigator - OnDemand Archive plug-in is replaced by the web-based IBM Navigator for i - Content Manager OnDemand component that is included in the \*BASE product option. Important: The System i Navigator - OnDemand Archive plug-in is not supported at 7.2 and is deleted during the upgrade process.

Product options 1 through 5 have not been supported since Content Manager OnDemand for iSeries 5.4 (licensed program number 5722-RD1). Important: If options 1 through 5 of licensed program number 5722-RD1 exist on your system during the upgrade to Content Manager OnDemand for i 7.2, they are deleted during the upgrade process.

The options are:

1. Spool File Archive
2. Object Archive
3. Record Archive
4. AnyStore
5. Server (used with Spool File Archive)

## End of support for Tivoli Storage Manager (TSM) APIs

Previous versions of Content Manager OnDemand for i supported the use of IBM Tivoli® Storage Manager (TSM) in addition to ASM or in place of ASM, or simply as another media choice for use in ASM migration policies. The Tivoli Storage Manager APIs for IBM i were withdrawn from support on April 30, 2015. This end of support affects customers using Tivoli Storage Manager as their storage manager and customers using Tivoli Storage Manager as a level within an ASM migration policy. Tivoli Storage Manager can no longer be used as a media choice in ASM migration policies. For customers using TSM as their storage manager, Tivoli Storage Manager can only be used with Content Manager OnDemand for i if you add a Content Manager OnDemand for Multiplatforms object server between your IBM i partition and your Tivoli Storage Manager server.

If you are currently using Tivoli Storage Manager or System Storage® Archive Manager (SSAM) with Content Manager OnDemand for i, you need to make changes to continue to access your archived data. If you want to begin using Tivoli Storage Manager with a Content Manager OnDemand for Multiplatforms object server, you need to configure the object server. See the Content Manager OnDemand Read This First document for IBM i 7.2 for additional information.

## IBM TCP/IP Connectivity Utilities for i (5770-TC1)

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### SMTP support changes

#### Server modes

In IBM i 7.2, SMTP supports three different server modes **DIRTYPE (\*SDD)**, **DIRTYPE (\*SMTP)** and **DIRTYPE (\*SMTPMSF)**. **DIRTYPE (\*SDD)** is the server mode used in prior releases. **DIRTYPE (\*SMTP)** and **DIRTYPE (\*SMTPMSF)** use different delivery and email storage methods than in prior releases. If you slip install to 7.2 from an earlier release, your SMTP mode will be **DIRTYPE (\*SDD)** and you will not see any differences. If you receive a system that has 7.2 preloaded or you scratch install 7.2 on to your system, your SMTP server mode will be changed to \*SMTP and you will need to run **CHGSMTPA (DIRTYPE (\*SDD))** if you want SMTP to function as it did in prior releases.

#### Upgrading IBM i SMTP Server to IBM i 7.2

If you have upgraded your system from IBM i 7.1 or a previous release to IBM i 7.2, then use the Change SMTP Attributes (**CHGSMTPA**) command to check the values for the **OVRRJTNNL**, **ALWBARELF**, and **VFYID** parameters and make sure they are still consistent with what they were before the upgrade. The upgrade might have reset them to the default values of **OVRRJTNNL(\*YES)**, **ALWBARELF(\*NO)**, and **VFYID(\*YES)**. If the values have been changed, use the **CHGSMTPA** command to set them to the pre-install values.

For more information on new SMTP support visit the E-mail What's New topic here: [http://www.ibm.com/support/knowledgecenter/ssw\\_ibm\\_i\\_72/rzair/rzairwhatnew](http://www.ibm.com/support/knowledgecenter/ssw_ibm_i_72/rzair/rzairwhatnew)

For the latest SMTP fix recommendations select SMTP from the 7.2 release pull down on this website: [https://www-912.ibm.com/s\\_dir/slkbasesf/recommendedfixes](https://www-912.ibm.com/s_dir/slkbasesf/recommendedfixes)

## IBM Universal Manageability Enablement for i (5770-UME)

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CIM function updates from Licensed Program IBM Universal Manageability Enablement for i 5770-UME(V1R3M0) to Licensed Program 5770-UME(V1R4M0)

IBM i Common Information Model Object Manager (CIMOM) server and providers are updated from Licensed Program (LP) 5770-UME V1R3M0 to Licensed Program (LP) 5770-UME V1R4M0. 5770-UME V1R4M0 can be installed on IBM i 6.1, IBM i 7.1 and IBM i 7.2 and is installed by default on IBM i 7.2.

#### Dependency for CIM server startup:

Users must install these LPs and options before the CIM server can be started without error:

- 5770-SS1 option 33 PASE (Portable Application Solutions Environment).
- 5733-SC1 option 1 (OpenSSL)

#### Auto-start CIM Server :

5770-UME V1R4M0 CIM server is defined as an auto-start TCP/IP service. The CIM server will auto start after a scratch installation of the IBM i 7.2, while it will inherit the previous auto-start configuration after a slip installation.

#### CIM commands that are run in IBM i PASE:

CIM server and providers can run in Portable Application Solutions Environment (IBM i PASE). You need to run the call qp2term command before you run IBM i PASE commands. CIM commands (**cimconfig**, **cimmof**, **cimtrust**, **cimcrl**, **cimsub**, and **cimprovider**) are unchanged from 5770-UME V1R3M0. New commands (**cimcli**, **cimreparchive**) are added in 5770-UME V1R4M0.

#### IBM Systems Director compatibility:

5770-UME V1R4M0 CIM Server registers platform-agent for IBM Systems Director. The 5770-UME LP might not work with IBM Systems Director earlier than version 6.1.2.

#### Development interfaces:

The CIM server in 5770-UME V1R4M0 is based on OpenPegasus V2.11.0. Any external products that use the restricted IBM i 6.1, IBM i 7.1 or IBM i 7.2 CIM provider interfaces must adapt to the new OpenPegasus Software Development Kit (SDK) V2.11.0 and obtain updated IBM i-specific interface documentation from IBM. The development interfaces remain restricted with 5770-UME, and a limited availability agreement is required for their use. If external products have installed CIM providers in IBM i 6.1, IBM i 7.1 or IBM i 7.2, those CIM providers will not work with 5770-UME until they are updated to run in IBM i PASE and to use updated interfaces.

#### **CIM schema:**

5770-UME, V1R4M0, includes the Distributed Management Task Force (DMTF) CIM schema V2.29.

#### **CIMOM TCP/IP server entry in IBM Navigator for i:**

You can start and end the CIM server as a TCP/IP server. Using IBM Navigator for i, expand **IBM i Management > Network > Servers > User-Defined Servers** to find the “CIMOM” entry. Then, you can use the web page to start or stop **CIMOM**.

#### **Reliable Indications:**

To enhance the reliability of delivering CIM indication, 5770-UME V1R4M0 introduces two new properties (**maxIndicationDeliveryRetryAttempts**, **minIndicationDeliveryRetryInterval**) to configure the retry mechanism of delivering CIM indications.

#### **Configurable SSL cipher suite:**

During the period of responding to a CIM request, the CIM server maintains secure SSL-based communication with the client. The secure cipher suite level that CIM server supports is DEFAULT. To enable customers to adjust the security level, 5770-UME V1R4M0 provides a new property (**sslCipherSuite**) to configure CIM server supported cipher suites.

#### **ICU library changed:**

5770-UME V1R4M0 changes the ICU library from ICU 4.0 to ICU 3.6 due to OpenPegasus V2.11.0 compatibility issues with ICU4.0.

#### **Support customer provider directory:**

Based on a new feature in OpenPegasus V2.11.0, 5770-UME V1R4M0 defines an extra directory for 3rd-party providers. The directory is “/QOpenSys/QIBM/ProdData/UME/Pegasus/3rdprovider”, and customers can put their own providers in this directory. The customer’s provider agent is started when a user sends a CIM request to the provider. All of this can be done while the CIM Server is running. The user does not need to restart the CIM Server.

#### **New command for repository backup:**

New command “cimreparchive” is shipped in 5770-UME V1R4M0. A symbolic link for the command is added in directory “/QOpenSys/usr/bin”. It supports an additional mechanism to backup the CIM repository in addition to the IBM i specific SAVE and RESTORE mechanism. Users can run this new command in Portable Application Solutions Environment (IBM i PASE).

#### **Repository migration:**

If the IBM i 7.2 system is upgraded over V5R4, the CIM Server repository is migrated from DMTF CIM schema V2.9 to DMTF CIM schema V2.29 during the first startup of CIM server in 5770-UME LP. If IBM i 7.2 system is upgraded over IBM i 6.1 or IBM i 7.1, the CIM Server repository is migrated from DMTF CIM schema V2.14 to DMTF CIM schema V2.29 during the first startup of CIM server in 5770-UME LP. This migration takes a while, depending on the size of the repository, processor speed, and system utilization. The CIM server is unavailable to process CIM requests until the repository migration completes. Stopping the server job during migration might result in a loss of data.

The following objects in the repository are not migrated:

- CIM Provider Registration on IBM i 5.4 is not migrated.
- Static instances of metric definition on IBM i 5.4 in the repository (providers dynamically collect information and implement the same functions as these metric instances).

The CIM server log might have the following messages that are related to the repository migration:

- When migration starts, message PGS10080 is written in the CIM server log. The default location is /QOpenSys/QIBM/UserData/UME/Pegasus/Logs. PGS10080: The CIM server is starting to check/restore/migrate repository. This takes several minutes, during which the server will not be available. Stopping the server job might result in a loss of data.
- When migration ends without any error, message PGS10081 is written in the CIM server log. PGS10081: The Common Information Model (CIM) check/creation/migration process of repository has been completed successfully.

#### Configuration properties:

The CIM server in 5770-UME LP has some changed configuration properties.

These properties are obsolete: **httpBindAddress**, **httpsBindAddress**, **httpAuthType**, **httpExportPort**, **enableHttpLocalConnection**, **tempLocalAuthDir**, **exportSSLTrustStore**, **enableClientCertification**, **enableSSEExportClientVerification**, **enableHttpExportConnection**, and **passwordFilePath**.

These properties are set to fixed properties: **enableBinaryRepository**, **enableNamespaceAuthorization**, **enableRemotePrivilegedUserAccess**, **home**, **messageDir**, **providerDir**, **providerManagerDir**, **slp**, and **repositoryDir**.

#### These properties' default values are changed:

- The default value for **enableNamespaceAuthorization** is set to: *true*.
- The default value for **enableSubscriptionsForNonprivilegedUsers** is set to: *true*.
- The default value for **providerDir** is set to: /QOpenSys/QIBM/ProdData/UME/Pegasus/provider;/QOpenSys/usr/lib;/QOpenSys/QIBM/ProdData/UME/Pegasus/3rdprovider.
- The default value for **shutdownTimeout** is set to: *60*.

These properties are new properties in 5770-UME V1R4M0:

- **maxIndicationDeliveryRetryAttempts**: If set to a positive integer, this value defines the number of times that the indication service tries to deliver an indication to a particular listener destination. This does not affect the original delivery attempt, thus if set to 0, the CIM server tries to deliver the indication only once. The default value is set to *5*.
- **minIndicationDeliveryRetryInterval**: If set to a positive integer, this value defines the minimal time interval in seconds for the indication service to wait before attempting again to deliver an indication to a listener destination that previously failed. The CIM server might take longer due to QoS or other processing. The default value is *480* (seconds).
- **sslCipherSuite**: This property is a String containing the OpenSSL cipher specifications to configure the cipher suite the client is permitted to negotiate with the server during the SSL handshake phase. The default value is *DEFAULT*.

If IBM i 7.2 is upgraded over IBM i 7.1 or IBM i 6.1, the first time the CIMOM is started, the CIM server migrates CIM server configuration data from the previous releases to 5770-UME V1R4M0 PASE CIM server configuration. If IBM i 7.2 is upgraded over V5R4, the first time the CIMOM is started, the CIM server migrates data from base operating system CIM server configuration to 5770-UME V1R4M0 PASE CIM server configuration. Most of the configuration property values are migrated intact. The following are exceptions, and they are not migrated from base operating system CIM server in IBM i V5R4 or 5722-UME V1R2M0 to 5770-UME V1R4M0:

- Obsolete properties are not migrated.
- If the property **idleSessionTimeout** has a value set, then replace it by property **idleConnectionTimeout** with the same value.
- If **traceLevel** =4 then modify it to **traceLevel** =5.

The property values being migrated are not validated. If the CIM server configuration properties from the previous releases are not set to function correctly, this situation might prevent the 5770-UME LP CIM server from starting and working correctly.

## IBM Rational® Development Studio for i (5770-WDS)

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### ILE C compiler changes

Changes have been made in the ILE C compiler to more closely conform to the C99 language specification as defined in the International Standard for Information Systems-Programming Language C, ISO/IEC 9899:1999. The ILE C compiler now conforms to the integer constant type rules as defined in the C99 language specification, section 6.4.4.1, Integer Constants. By conforming to the new C99 specification, incompatibilities have been introduced.

- An unsuffixed decimal constant in range  $2^{31}$  to  $(2^{32})-1$  will have type long long int versus unsigned long int. For example, the constant 2147483700 will now have type long long int.
- A decimal constant suffixed with l or L in range  $2^{31}$  to  $(2^{32})-1$  will have type long long int versus unsigned long int. For example, the constant 2147483700L will now have type long long int.
- A decimal constant suffixed with ll or LL in range  $2^{63}$  to  $(2^{64})-1$  will be flagged as an error versus having a type of unsigned long long int. For example, the constant 9223372036854775900LL will now be flagged as an error.
- A mixed case LL suffix (lL or Ll) will be flagged as an error.

The C99 integer constant type rules are used when the **LANGLVL(\*EXTENDED)** and **TGTRLS(\*CURRENT | V7R2M0)** compiler options are in effect. Since **\*EXTENDED** is the default language level and **\*CURRENT** is the default target release, the new integer constant type rules are in effect by default.

The compiler services option, **CSOPT(' -qinfo=c99')**, can be specified on the Create C Module (**CRTCMOD**) or Create Bound C Program (**CRTBND**) commands. This option will cause the ILE C compiler to flag code that behaves differently between C89 and C99 language levels and can be used to detect the differences described above.

### ILE RPG changes

#### A non-qualified subfield or format cannot be qualified within a subprocedure

It is not valid to use qualified notation, A.B, for subfields and record formats that are not qualified. Before IBM i 7.2, the compiler did not always detect this error if the reference to the global subfield or record format was in a subprocedure. Starting in 7.2, the compiler detects this error and diagnostic: RNF7591 - An operand of a qualified name expression is not valid is issued at compile time.

#### Programs that contain subprocedures that are not prototyped will not compile if DFACTGRP(\*YES) is specified

In releases previous to 7.2, a program that contained a procedure without a prototype definition would successfully compile with DFACTGRP(\*YES) specified. The program object produced was an illegal program that might produce unpredictable results when run.

In release 7.2, the program no longer compiles and diagnostic message RNF1520 - The procedure cannot be defined with DFACTGRP(\*YES) is issued.

#### Hexadecimal literals cannot be converted to Graphic or UCS-2

Before release 7.2, the RPG compiler supported the use of **MOVE** and **MOVEL** to convert a hexadecimal literal to a graphic or UCS-2 variable, and it supported a hexadecimal literal as a parameter to the %GRAPH and %UCS2 built-in functions.

Starting in 7.2, the RPG compiler no longer supports converting a hexadecimal literal to graphic or UCS-2.

If you are affected by this change, you can concatenate an empty character literal to the hexadecimal literal for the %GRAPH and %UCS2 functions. In all cases, you can define a varying length character field and assign it the hexadecimal literal, then specify that character field in place of the hexadecimal literal.

### **%GRAPH(alphanumeric) now checks for a shift-out character at the beginning of the operand**

When the operand of the %GRAPH built-in function is alphanumeric with an EBCDIC CCSID, then the first character must be the shift-out character X'0E'.

Prior to 7.2, the first character was ignored. Starting in 7.2, if the first character is not the shift-out character, message RNX0450 is issued (EBCDIC character value not entirely enclosed by shift-out and shift-in).

### **RESET \*ALL is no longer allowed for an array of data structures in free-form calculations**

It is not valid to specify RESET \*ALL for an array, including an array of data structures. An error in the compiler previously allowed this, but the error has been corrected for the RESET operation in free-form calculations. No change has been made to fixed-form calculations.

A program with a free-form RESET \*ALL for an array of data structures will no longer compile for TGTRLS(\*CURRENT) with PTF SI66149 applied.

The compile will fail with message RNF5393 Factor 2 of a CLEAR or RESET operation is not valid.

To correct the error, remove \*ALL from the RESET statement.

### **Specifying an index of (\*) for RESET is no longer supported in free-form RPG**

It is not valid to specify an index of \* (for example, RESET myArray(\*)) for an array in a RESET operation. An error in the compiler previously allowed this, but the error has been corrected for the RESET operation in free-form calculations. No change has been made to fixed-form calculations.

Note that specifying an array name for a RESET operation automatically resets every element in the array.

A program with a RESET operation in the form RESET array(\*) will no longer compile for TGTRLS(\*CURRENT) with PTF SI66149. The compile will fail with message RNF5343 - Array has too many missing indexes. To correct the error, remove the indexing from the array name.

## **IBM i Access for Windows (5770-XE1)**

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The last release for IBM i Access for Windows (5770-XE1) was 7.1. Most features that are part of 7.1 IBM i Access for Windows are available in newer products. For example, 5250 display and print emulation, Data Transfer, 5250 Console, Virtual Control Panel, and the ability to download spool files to your desktop are available as part of IBM i Access Client Solutions (5733-XJ1). Database drivers and providers such as ODBC, .Net and OLE DB are available as part of IBM i Access Client Solutions - Windows Application Package (5733-XJ1). Most of the features of System i Navigator are available as part of its web based counterpart, IBM Navigator for i (SS1 option 3). For System i Navigator features that are not part of IBM Navigator for i, such as Run SQL Script, Visual Explain, and Management Central, the 7.1 version of System i Navigator is compatible with IBM i release 7.2.

## **IBM i Access for Web (5770-XH2)**

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IBM i Access for Web (5770-XH2) changes

### **Before you install IBM i Access for Web:**

If you currently have a configured, running version of IBM i Access for Web on your IBM i system, you must run the IBM i Access for Web configuration commands again when you install the new version

before you can use the product. Running the command enables the new function that is provided with the new release. When you run the Configure Access for Web (**CFGACCWEB**) command for the WebSphere Application Server environments, be aware that the value specified for the **WASPRF** parameter is case-sensitive and must be entered exactly as shown in the `/QIBM/UserData/Access/Web2/config/instances.properties` file. For detailed instructions on installing and upgrading the product and running the configuration commands, see the IBM i Access for Web topic in the IBM Knowledge Center: [IBM i Access for Web](#).

#### **Web application servers and WebSphere Portal environments:**

If you currently have a configured, running version of IBM i Access for Web on your IBM i system, that web application server environment might no longer be supported by IBM i Access for Web. You must migrate your IBM i Access for Web configuration to a supported web application server. For additional information, see the IBM i Access for Web topic in the IBM Knowledge Center: [IBM i Access for Web](#).

7.2 IBM i Access for Web can migrate user-generated data from an unsupported web application server environment to a supported web application server environment when new web application servers are configured. You can migrate user-generated data by using the **CFGACCWEB** command and specifying input for the **SRCSVRTYPE**, **SRCSVRINST**, **SRCAPPSVR**, **SRCINSDIR**, and **SHRUSRDTA** parameters.

7.2 IBM i Access for Web also allows you to remove the IBM i Access for Web configuration from the unsupported web application server environment using the Remove Access for Web (**RMVACCWEB**) command. Be sure that the latest 7.2 IBM i Access for Web PTFs are loaded and applied before attempting to migrate from or remove unsupported web application server environment configurations.

## **IBM i Access for Linux (5770-XL1)**

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The last release for IBM i Access for Linux® (5770-XL1) was 7.1. It has been replaced by IBM i Access Client Solutions (5733-XJ1) which offers an updated 5250 display and print emulator and additional features which were not previously available for Linux such as Data Transfer, 5250 Console, Virtual Control Panel, and the ability to download spool files to your desktop. The ODBC driver is available as part of IBM i Access Client Solutions - Linux Application Package (5733-XJ1).





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