



@server

iSeries

OS/400 maximum capacities

Version 5 Release 3





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OS/400 maximum capacities

Version 5 Release 3

Note

Before using this information and the product it supports, be sure to read the information in "Notices," on page 25.

First Edition (April 2004)

| This edition applies to version 5, release 3, modification 0 of IBM Operating System/400[®] (product number
| 5722-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 CICS[®] models.

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Chapter 1. OS/400 maximum capacities

If you exceed system limitations you can experience an application outage or a system outage. These limitations can be difficult to predict. However, you can avoid these types of outages by being aware of the system limitations and maximum capacities in advance.

The tables in this topic itemize some of the capacity limitations and restrictions that can affect the availability of large systems and their applications. For example, an online application halts when the size of a file or the number of its members reaches the size limitation. These tables list the limits or maximum values for V5R3. Some of these maximum values are different (lower) on prior releases. Also, there are environments or configurations where the actual limit may be less than the stated maximum. For example, certain high-level languages can have more restrictive limits.

Note: The values listed in this topic represent theoretical limits, not thresholds or recommendations. Approaching some of these limits may be unreasonable and can degrade performance. Therefore, practical limits may be lower, depending on system size, configuration, and application environment.

The categories of limits described in this topic are as follows:

Chapter 2, “Cluster limits,” on page 3 This section contains the values for the system limits that are related to clusters. They include cluster software limits, OptiConnect for OS/400® limits, HSL OptiConnect loop limits, and SPD OptiConnect limits.

Chapter 3, “Communications limits,” on page 5 This section contains the values for the system limits that are related to communications. They include general communications configuration limits, SNA limits, TCP/IP limits, and communications trace service tool limits.

Chapter 4, “Database and SQL Limits,” on page 9 This section contains the values for the system limits that are related to database and SQL. They include database manager limits, SQL identifier limits, numeric limits, string limits, date and time limits, and datalink limits.

Chapter 5, “File system limits,” on page 11 This section contains the values for the system limits that are related to file systems. They include limits on the number of documents in a folder, the size of a document, and the size of a stream file, among others.

Chapter 6, “Journal limits,” on page 13 This section contains the values for the system limits that are related to journals. They include the size of a journal receiver, the length of a single journal entry, and the maximum sequence number for journal entries.

Chapter 7, “Save and restore limits,” on page 15 This section contains the values for the system limits that are related to save and restore. They include limits for the size of a save file and the size of an object that can be saved.

Chapter 8, "Security limits," on page 17 This section contains the values for the system limits that are related to security. They include limits on the length of passwords and the number of user profiles on a system.

Chapter 9, "Work management limits," on page 19 This section contains the values for the system limits that are related to work management. They include limits on the number of jobs on a system, the number of active subsystems, and the number of jobs in a subsystem.

Chapter 10, "Miscellaneous limits," on page 21 This section contains the values for other system limits such as the number of basic disk pools, the size of a user space, and the size of a message queue.

Chapter 11, "System limits for previous releases," on page 23 This section contains the values for system limits for previous releases.

Chapter 2. Cluster limits

This section contains the values for the system limits that are related to clusters. They include cluster software limits, OptiConnect for OS/400 limits, HSL OptiConnect loop limits, and SPD OptiConnect limits.

Cluster software limits	Value
Maximum number of nodes in a recovery domain in a cluster resource group	128
Maximum number of clusters that a node may be a member of	1
Maximum number of IP addresses per cluster node	2
Maximum number of data port IP addresses per recovery domain node	4
Maximum number of configuration objects per cluster resource group	256
Maximum number of application restarts	3
Maximum number of nodes which can be configured in a cluster via the iSeries Navigator Simple Cluster Management interface	4

OptiConnect for OS/400 limits	Value
Maximum number of systems that can be connected using OptiConnect for OS/400	64
Maximum number of logical connection paths that can be established between two systems using OptiConnect for OS/400 ¹	6
Maximum number of active jobs that can communicate with any one system using OptiConnect for OS/400 ²	16,382
Maximum total number of active jobs on one system that can use OptiConnect for OS/400 ²	262,135
Maximum number of TCP/IP subnets per system that can be configured to use OptiConnect ³	8

OptiConnect for OS/400 limits	Value
<p>Notes:</p> <ol style="list-style-type: none"> Only 2 of the 6 logical connection paths can be using SPD Bus adapters (others must be HSL). The following count as jobs toward OptiConnect job limits: <ul style="list-style-type: none"> DDM/DRDA source jobs (user jobs) DDM/DRDA target jobs on server DB2[®] multisystem jobs APPC controllers and TCP/IP interfaces using OptiConnect (type *OPC, count as 2 jobs for each controller or interface) Jobs using ObjectConnect over OptiConnect Jobs using the OptiMover API Active remote journals <p>Some of these uses are transient for the duration of a function (for example, ObjectConnect SAVRSTxxx) and some are more long term (for example, DDM conversations until reclaimed by RCLDDMCNV or ending the job).</p> The following count as TCP/IP subnets: <ul style="list-style-type: none"> Each OptiConnect TCP/IP interface with no associated local interface (ADDTCPIFC keyword LCLIFC(*NONE)) Each unique interface associated with an OptiConnect TCP/IP interface 	

HSL OptiConnect loop limits	Value
Maximum number of HSL OptiConnect Loops on a system	See iSeries [™] Handbook  .
Maximum number of systems that can be connected on a single HSL OptiConnect Loop ¹	3
Maximum number of I/O towers and IXA cards on a single HSL OptiConnect Loop ¹	4
Maximum HSL cable length	250 meters (optical), 15 meters (copper)
<p>Notes:</p> <ol style="list-style-type: none"> If more than two systems are on an HSL OptiConnect Loop, then no I/O towers or IXA cards are allowed on the same loop. 	

SPD OptiConnect limits	Value
Maximum number of systems per hub	14
Maximum SPD cable length	500 meters (1063 Mbps) or 2 kilometers (266 Mbps)

Chapter 3. Communications limits

This section contains the values for the system limits that are related to communications. They include general communications configuration limits, SNA limits, TCP/IP limits, and communications trace service tool limits.

General communications configuration limits	Value
Maximum number of communications configuration objects that can be in a varied on state ¹	Approximately 100,000
Recommended maximum number of devices allocated to an interactive or communications subsystem	250 to 300
Maximum number of device descriptions for display devices per subsystem ²	Approximately 25,000
Maximum number of virtual devices that can be specified as automatically configured (QAUTOVRT system value)	32,500 or *NOMAX
Maximum communications/LAN hardware capabilities	See iSeries Handbook  .
Notes: <ol style="list-style-type: none"> 1. A maximum of 32,767 communications configuration objects can be varied online at IPL per communications arbiter system job (see QCMNARB system value). 2. Removing generic workstation types in work station entries can help avoid this limit. For example, the *ALL workstation type allows the subsystem to allocate all of the valid workstations on the system. Note that WRKSTNTYP(*ALL) is the default for some IBM-supplied subsystem descriptions. 	

SNA communication limits	Value
Maximum number of SNA controllers per LAN line plus the Network controller	256
Maximum number of SNA CDs across a frame relay network's NWI lines	256
Maximum number of lines per frame relay NWI	256
Maximum number of logical channels per X.25 line	256
Maximum number of controllers on SDLC multidrop lines	254
Maximum number of communication arbiters (maximum value of QCMNARB system value)	99
Maximum number of active sessions per APPC node	512
Maximum number of modes per APPC device (or APPN location) ¹	14

SNA communication limits	Value
Maximum combined number of APPC devices (in any state) and APPN devices (in varied on state)	25,300
Maximum number of APPN intermediate sessions	9,999
Maximum number of devices per APPC controller	254
Maximum number of switched lines per APPC controller	64
Maximum size of APPN local location list	476
Maximum size of APPN remote location list	1,898
Maximum size of asynchronous network address list	294
Maximum size of asynchronous remote location list	32,000
Maximum size of retail pass-through list	450
Maximum size of SNA pass-through group	254
Notes:	
1. An APPN location refers to all devices that have the same values for RMTLOCNAME, RMTNETID, and LCLLOCNAME.	

TCP/IP communication limits	Value
Maximum number of interfaces per line	2,048
Maximum number of interfaces per system	16,384
Maximum number of routes per system	65,535
Maximum number of ports for TCP	65,535
Maximum number of ports for UDP	65,535
Maximum TCP receive buffer size	8MB
Maximum TCP send buffer size	8MB
Maximum size of a transmission unit on an interface	16,388 bytes
Maximum number of TELNET server jobs	200
Maximum number of TELNET server sessions	Maximum number of virtual devices
Default maximum number of socket and file descriptors per job ¹	200
Maximum number of socket and file descriptors per job	2,500,000
Maximum number of socket descriptors on the system	Approximately 46,420,000
Maximum size of database files for FTP	1TB
Maximum size of integrated file system files for FTP	Amount of storage
Maximum number of recipients for SMTP	14,000

TCP/IP communication limits	Value
Maximum number of simultaneous inbound connections for SMTP	Approximately 32,000 (1 connection per prestart job)
Maximum number of simultaneous outbound connections for SMTP	Approximately 32,000 (1 connection per prestart job plus 1 listening)
Maximum number of MX records handled by MX resolver (Client) for SMTP	80
Maximum document size for SMTP	2.1GB
Maximum number of active threads per HTTP server	9,999
Maximum number of connections that can be displayed using WRKTCPSTS or NETSTAT commands	32,767
Notes:	
1. Default can be changed with DosSetRelMaxFH() - Change the Maximum Number of File Descriptors (see UNIX-Type APIs in the Information Center).	

Communications trace service tool limits	Value
Maximum amount of storage allocated for a single communications trace buffer	1GB
Maximum total amount of storage allocated for all communications trace buffers	4GB
Maximum number of active traces per multiline IOP on pre-V4R1 IOP hardware (limit is removed with new V4R1 IOP hardware)	2
Maximum record size when using the TRCTCPAPP trace tool for Host Server and DDM/DRDA Server	6,000 bytes

Chapter 4. Database and SQL Limits

| This section includes the values for the system limits that are related to database
| and SQL.

| To view the limits for the Structured Query Language (SQL), see SQL Limits. These
| limits include identifier length limits, numeric limits, string limits, datetime limits,
| datalink limits, and database manager limits.

| To view the limits for database file sizes, see Database file sizes. These limits
| include the number of bytes in a record, number of key fields in a file, number of
| physical file members in a logical file member, among others.

Chapter 5. File system limits

This section contains the values for the system limits that are related to file systems. They include limits on the number of documents in a folder, the size of a document, and the size of a stream file, among others.

File system limits	Value
Maximum number of libraries in the system part of the library list	15
Maximum number of libraries in the user part of the library list ¹	250
Maximum number of objects in a library	Approximately 360,000
Maximum number of documents and folders (DLOs) in a user ASP	349,000
Maximum number of DLOs in a folder	65,510
Maximum size of a document	2GB - 1
Maximum cumulative number of objects across the "root" (/), QOpenSys, and user-defined file systems of ASPs 1 through 32	2,147,483,647
Maximum cumulative number of objects across the user-defined file system(s) for each Independent ASP	2,147,483,647
Maximum number of user-defined files systems in an Independent ASP	Approximately 4,000
Maximum number of directories in one *TYPE1 directory in the "root" (/), QOpenSys, or user-defined file systems	32,765
Maximum number of directories in one *TYPE2 directory in the "root" (/), QOpenSys, or user-defined file systems	999,998
Maximum number of *TYPE1 directory links for an object in the "root" (/), QOpenSys, or user-defined file systems	32,767
Maximum number of *TYPE2 directory links for an object in the "root" (/), QOpenSys, or user-defined file systems	1,000,000
Maximum size of a stream file	1TB
Maximum file size that can be read or written using the iSeries Access File Server or the QNTC file system	4GB
Default maximum number of file and socket descriptors per job ²	200
Maximum number of file and socket descriptors per job	2,500,000
Maximums for directory levels, path names, and object attributes and links	See the File System Comparison topic in the Information Center.

File system limits	Value
Maximum number of files that the iSeries Access File Server can have open at one time ³	16,776,960
Maximum number of scan descriptors per job ⁴	Approximately 524,000
<p>Notes[®]:</p> <ol style="list-style-type: none"> 1. There are compatibility considerations for application programs that retrieve library lists and are not prepared for the longer lists. For more details, see the V5R1 Memo to Users. 2. Default can be changed with DosSetRelMaxFH() - Change the Maximum Number of File Descriptors (see UNIX-Type APIs in the Information Center.) 3. This limit is cumulative across all File Server jobs (QPWFSxxxx and QZLSFILE jobs) on the system. Once a file is closed, it no longer counts toward the limit. Some applications that can be affected by this limit are iSeries Access, iSeries NetServer, Network Station[®] boot up (which keeps over 200 files open, unless using Compact Flash Memory which only requires about 25 files) and applications, and the QFileSvr.400 file system. 4. For more information on scan descriptors, see Integrated File System Scan on Close Exit Program in the APIs topic. 	

Chapter 6. Journal limits

This section contains the values for the system limits that are related to journals. They include the size of a journal receiver, the length of a single journal entry, and the maximum sequence number for journal entries.

Journal limits	Value
Maximum size of a single journal receiver	Approximately 1 terabyte
Maximum length of a single journal entry (bytes)	4,000,000,000 bytes
Maximum length of a single journal entry that can be written using the Send Journal Entry (QJOSJRNE) API	32,766 bytes
Maximum sequence number for journal entries	18,446,744,073,709,551,600
Maximum number of objects that can be associated with one journal ¹	250,000
Maximum number of objects allowed on a single APYJRNCHG or RMVJRNCHG command	300,000
Maximum number of journal receivers allowed in a range of receivers on a journal command	1,024
Maximum number of remote journal target systems for broadcast mode	255
Notes:	
1. This maximum includes objects whose changes are currently being journaled, and journal receivers that are associated with the journal. If the number of objects is larger than this maximum, journaling does not start.	

Chapter 7. Save and restore limits

This section contains the values for the system limits that are related to save and restore. They include limits on the length of passwords and the number of user profiles on a system.

Save and restore limits	Value
Maximum number of related objects that can be saved in a single save operation ¹	Approximately 111,000
Maximum number of names in a save or restore command specifying which objects or libraries to include or exclude in the save or restore operation ²	300
Maximum number of concurrent save or restore operations	Limited only by available machine resources
Maximum size of an object that can be saved	Approximately 1TB
Maximum size of a save file	Approximately 1TB
<p>Notes:</p> <p>1. All database file objects in a library that are related to each other by dependent logical files are considered to be related objects. Starting in V5R3, unless they are related to each other by dependent logical files, the following are not considered to be related objects:</p> <ul style="list-style-type: none"> • All database file objects in a library that are journaled to the same journal when using the save-while-active function. • All objects in a library when SAVACT(*LIB) is specified. <p>A database file object consists of one or more internal objects. A maximum of approximately 500,000 related internal objects can be saved in a single save operation. One internal object is saved for each database file object, along with the following additional internal objects:</p> <ul style="list-style-type: none"> • If the physical file is not keyed, add 1 internal object per member. • If the physical file is keyed, add 2 internal objects per member. • If the physical file has unique or referential constraints, add 1 internal object per constraint. • If the physical file has triggers, add 1 internal object for the file. • If the physical or logical file has column level authorities, add 1 internal object for the file. • If you use ACCPTH(*YES) on the save command, add 1 internal object for each logical file in the save request. <p>Note: This information is for estimation purposes only. The actual number of internal objects in your library may be higher or lower due to other variables.</p> <p>2. Using generic names to specify groups of objects or libraries can help avoid this limit.</p>	

Chapter 8. Security limits

This section contains the values for the system limits that are related to security. They include limits on the length of passwords and the number of user profiles on a system.

Security limits	Value
Maximum number of entries for a user profile ^{1, 2, 3}	10,000,000
Maximum number of objects that can be secured by an authorization list	2,097,070
Maximum number of private authorities to an authorization list ⁴	9,999,999
Maximum number of entries in a validation list	2,147,483
Maximum number of user profiles on a system	Approximately 340,000
Maximum length of a password	128
Maximum number of profile handles in a job	Approximately 20,000
Maximum number of profile tokens on the system	Approximately 2,000,000
Maximum amount of storage in the system and basic user ASPs, or in each Independent ASP, for permanent objects owned by a single user profile	8TB
<p>Notes:</p> <ol style="list-style-type: none"> 1. A user profile contains four categories of entries: 1) every object owned by the profile, 2) every private authority the profile has to other objects, 3) every private authority other profiles have to objects owned by this profile, and 4) every object for which this profile is the primary group. The sum of these categories equals the total number of entries for the profile. 2. OS/400 maintains internal user profiles that own objects that are shared or cannot be assigned to a single individual user (for example, QDBSHR owns shared database objects such as database formats, access paths, and so on). These internal user profiles are subject to the same limits as any other user profile on the system. 3. Using authorization lists or group profiles reduces the number of private authorities and helps avoid this limit (see the Security topic in the Information Center). 4. Limit is due to the maximum number of entries allowed for the user profile that owns the authorization list (one less because a category 01 entry is used for the ownership of the authorization list). 	

Chapter 9. Work management limits

This section contains the values for the system limits that are related to work management. They include limits on the number of jobs on a system, the number of active subsystems, and the number of jobs in a subsystem.

Work management limits	Value
Maximum number of jobs on the system	485,000
Maximum number of active subsystems	32,767
Maximum number of jobs in a subsystem	32,767
Maximum number of prestart jobs initially started when subsystem started	9,999
Maximum number of spooled files per job	999,999
Maximum number of spooled files in the system and basic user ASPs	Approximately 2,610,000
Maximum number of spooled files in each Independent ASP	Approximately 10,000,000
Maximum amount of temporary auxiliary storage that can be specified for a job	2TB or *NOMAX
Maximum number of active memory storage pools	64

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Chapter 10. Miscellaneous limits

This section contains the values for other system limits such as the number of basic disk pools, the size of a user space, and the size of a message queue.

Miscellaneous limits	Value
Maximum system and I/O hardware configurations and capacities	See iSeries Handbook  .
Maximum number of DASD arms	2,047
Minimum number of DASD arms required for acceptable performance.	See iSeries Disk Arm Considerations  in the Resource Library on the iSeries Performance Management web site.
Maximum number of connections to a disk unit in an Enterprise Storage Server [®]	8
Maximum combined number of DASD arms and redundant connections to disk units ¹	Approximately 2,800
Maximum number of basic user ASPs	31
Maximum number of independent ASPs	223
Maximum number of logical partitions	See the Logical Partitions topic in the Information Center.
Maximum database size for Domino [™]	256GB
Maximum size of a user space ²	16,773,120 bytes
Maximum size of a user index ³	1TB
Maximum size of a data queue or a user queue ⁴	2GB
Maximum size of a message queue ⁵	16MB (approximately 75,000 messages)
Maximum number of new messages of any one message type on a message queue	Limited only by size of message queue
Maximum number of program messages that can be created during any single job	4,294,967,293
Maximum number of records for each version of the history log	65,535

Miscellaneous limits	Value
Maximum number of unique Volume IDs displayed/printed in Product Activity Log's Removable Media Lifetime Statistics for each Media Option	5,000
Maximum number of input fields that can be specified for a display file	256
Maximum total size of concurrently used teraspace address ranges per job	Approximately 512 GB
Notes: <ol style="list-style-type: none"> The maximum number of DASD arms is limited to 2,047. Listed size is the maximum when the machine is allowed to choose the alignment. Absolute maximum size of a user space is 16,776,704 bytes. To create a 1TB capable user index when using the QUSCRTUI API, specify a value of "1" for the Index Size Option. Otherwise, the size limit will be 4GB. The maximum size of a data queue that can be created through the data queue host server is 16MB. Message queue QSYSOPR is shipped with a message queue full action of *WRAP. When the message queue is full, the oldest informational and answered messages are removed from the message queue to allow space for new messages to be added. If the removing of the informational and answered messages does not provide enough space, then unanswered inquiry messages are removed until there is space to add the new message. The default reply is sent before an unanswered inquiry message is removed. For more information, see the MSGQFULL parameter on the CHGMSGQ command. 	

Interprocess Communication (IPC) limits	Value
Maximum number of Single UNIX [®] Specification message queues on the system	2,147,483,646
Maximum size of a Single UNIX Specification message queue	16,773,120 bytes
Maximum size of a single message on a Single UNIX Specification message queue	65,535 bytes
Maximum number of semaphore sets on the system	2,147,483,646
Maximum number of semaphores per semaphore set	65,535
Maximum number of shared memory segments on the system	2,147,483,646
Maximum size of a teraspace shared memory segment	4,294,967,295 bytes
Maximum size of a resizeable teraspace shared memory segment	268,435,456 bytes
Maximum size of a nonteraspace shared memory segment	16,776,704 bytes
Maximum size of a resizeable nonteraspace shared memory segment	16,773,120 bytes

Chapter 11. System limits for previous releases

| The limits for V5R2 are published as a Redpaper titled IBM® @server iSeries
| Software Limits/Capability Statement  . You can find the limits for OS/400
| V5R1, V4R5, V4R4, and V4R2 at OS/400 Maximum Capacities  . The Redpaper
| includes links to limits documentation for previous releases.

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