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Overview of architecture for IBM Lotus Domino

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This education series consists of three modules that cover backup and recovery strategies for a Lotus® Domino® implementation on i5/OS™. This first module provides an overview of Domino architecture, backup methods and Command Language (CL) SAVE and Restore commands.

Most Domino i5/OS implementations run multiple Domino servers on the same system. Each Domino partition runs its own subsystem. The data for all of the Domino servers is in the integrated file system, also known as the IFS. Various libraries store Domino code and the QNOTES user profile owns all Domino data.
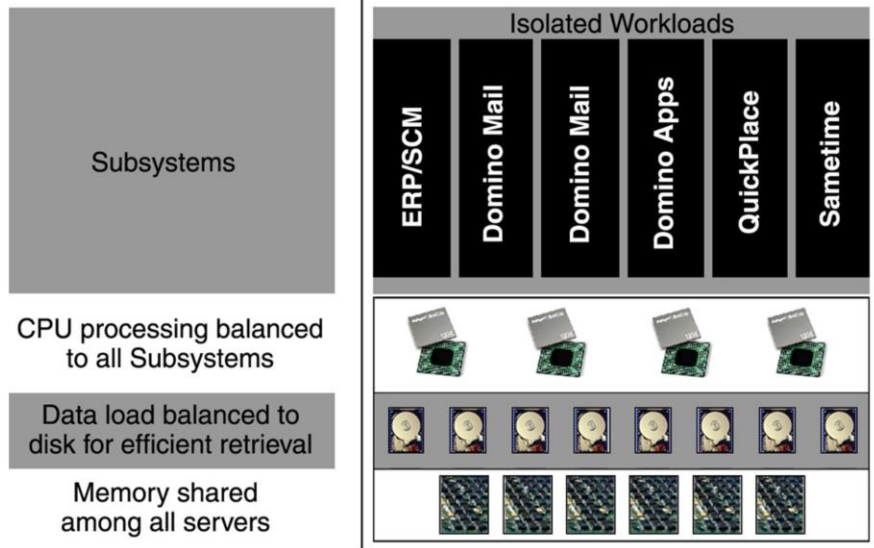
When running Domino on i5/OS, you can configure many Domino partitions. This allows you to isolate various Domino workloads, such as Mail, Domino applications or Lotus Sametime®. By default, data is automatically load balanced across all drives.

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Domino product libraries

▪ QDOMINOXXX	Domino code version 6.0.3 and above
▪ QNOTESAPI	C APIs
▪ QNOTESCPP	C++ APIs (Download from IBM developerWorks®)
▪ QNOTESLSKT	LotusScript Extension Toolkit: Downloadable
▪ QUSRNOTES	Server instance information
▪ QNOTES	Additional Domino product files
▪ QSAMETIME	Lotus Sametime® product
▪ QQPLACE	Lotus QuickPlace® and Lotus Quickr™ product

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Various libraries store Domino and its add-in products. Depending on which products you have installed on your system you will have one or more of the libraries listed. At a minimum, you will have the QUSRNOTES and QDOMINOXXX library. Note that XXX refers the version of Domino you have installed. For example, if you are running Domino version 8.0.1, you will have a QDOMINO801 library that will contain all of the Domino 8.0.1 product executables.

Domino files in IFS

- /QIBM/ProdData/Lotus/* and /QIBM/UserData/Lotus/*
  - various files for
    - Domino options (APIs, Directory Sync)
    - Domino.Doc
    - QuickPlace or Quickr
    - Sametime

- /QIBM/ProdData/Lotus/Notes or /QIBM/ProdData/Lotus/Dominoxxx
  - various shared files, LotusScript® files, symbolic links, database templates

- Data directory specified when you set up the server (for example: /notes/data)
  - Directory for databases on the server

The IFS contains all of the Domino user data and part of the Domino product.   The QIBM, ProdData, Lotus directory is where you will find Domino product data. The QIBM, UserData, Lotus directory is where you will find user data that is shared among multiple Domino servers. Finally, the server's data directory is stored in the IFS. The actual path to the data directory is unique to your environment as this value is chosen by the user who configures the server.

Domino files

server.id	Domino Server's ID file
cert.id	Domain Certifier ID file
dolcert.id	DOLS Certifier ID file
names.nsf	Domain Directory (Address Book)
notes.ini	Domino configuration file
mail.box or mailnn.box	Mail router "outbox"
catalog.nsf	Domain database catalog (built by Catalog task)
log.nsf	Domino Log database
statrep.nsf	Domino Statistics Collection database
events4.nsf	Domino Events database (used to configure event and stats reporting)
httpd.cnf	HTTP configuration file (similar to that of other HTTP servers)
domino.cnf	HTTP configuration file (created by HTTP task when started)
admin4.nsf	Administration Request database
browser.cnf	Configuration file (lists capabilities of browser clients)
*.dic	Dictionary files
*.id	Other ID files
*.nsf	Other Domino databases
*.ntf	Domino templates

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Here is a list of some Domino files and their descriptions. At a minimum, you should be aware of the server.id, notes.ini and all of the .nsf files.

Additional Domino files

pid.nbf	Job number and process ID number kept here while server is running
certlog.nsf	Certification log
cldbdir.nsf	Cluster database directory
certsrv.nsf	SSL Server Certificate application
cluster.ncf	Text file containting clustered server information (used by mail router)
cpa.nsf	Server.planner database
decsadm.nsf	DECS admin database (used for realtime DB2 connectivity)
doladmin.nsf	Domino Off-line Services Administration database
domlog.nsf	Domino HTTP log database (if enabled)
*.log	Text files used for Domino HTTP logging (if enabled)
statmail.nsf	Mail-in database used to consolidate mail statistics
*.DTF	This is a Domino Temp File and is temporary in nature. Sometimes in server crashes these are left behind. Files may be deleted when server is not in use.
*.nbf	Diagnostic Index files
~notes.lck	Temporary file
*.txn	Domino Transaction Log Extents
busytime.nsf	Database which stores all users busy times for group scheduler
homepage.nsf	Database containing the default HTTP home page

This list of Domino files continues. You do not need to save these temporary files: pid.nbf, ~notes.lck, and .dtf files. The server upon startup will re-create these.

The following files are difficult or impossible to replace: notes.ini, names.nsf, Lotus_Servers and cert.id.. The notes.ini file is your main configuration file and it resides in the server's data directory. Keep an extra copy of this file on the system. However, do not store it the root directory of the IFS or it may cause problems with some add-in products. The names.nsf file stores the configuration information for all users and servers in your Domino environment. You will also find this file in your server's data directory. Domino uses the Lotus_Servers file to define all of the Domino partitions on an i5/OS server or lpar. If this file is lost or damaged you cannot see, start or stop your server in the iSeries Navigator or with the Work with Domino Servers command. The cert.id file will be in your server's data directory only if it was the first server configured in your domain. Always keep this file secure and a backup available. If this file is lost or the password forgotten, you cannot recover it and you will need to reconfigure your entire Domino domain.

Backup methods for Domino

- i5/OS SAVE commands
  - ▶ Save Domino - typical Command Language (CL) commands
  - ▶ Restore Domino - typical CL commands

- Replication
  - ▶ Domino replication and clustering (more for high availability)

- Backup, Recovery and Media Services (BRMS)
  - ▶ Save Domino - online Domino backup
  - ▶ Save Domino - online incremental backup
  - ▶ Restore Domino from online Domino backup

You have many choices for backup and recovery. You can use the native i5/OS SAVE commands, replication, clustering, BRMS or a combination of those items. Note that this is not an all-inclusive list. Other options do exist such as using the i5/OS Operational Assistant and Tivoli products.

Here is an example of the native i5/OS SAVE menu. Use the "GO SAVE" command to access this menu.

SAVE commands

- Save entire system
  - Option 21 from SAVE menu
  - Backs up entire system
  - Ends all subsystems until finished
- Save System Data only
  - Option 22 from SAVE menu
  - Saves all libraries and /QIBM/ProdData
  - Ends all subsystems until finished
- Save User Data
  - Option 23 from SAVE menu
  - Saves user data
    - Everything **but** libraries and /QIBM/ProdData
  - Ends all subsystems until finished

There are three options that are of interest from the "GO SAVE" menu in a Domino environment. The first is option 21, which will end all subsystems, save the entire system and restart the system. Option 22 will save only system data, including the Domino product libraries and the QIBM, ProdData directory. Again, this option will end all subsystems, perform the save and then restart the system. The last option is option 23, which will save all user data. Typically, you should use this option in combination with option 22, as it will save everything on the system except what option 22 saves. Again, it will end all subsystems to perform the save. It is important to end your Domino servers in a controlled manner before starting any one of these saves. If you do not end your Domino servers before starting the save, Domino will crash when the end subsystem command is issued.

Command Language (CL) commands

- SAV
  - Command used to save IFS files
  - Does not support save while active when saving an active Domino server
  - Can be used in a CL program to automate the backup process
  - Example:

    SAV DEV('/qsys.lib/tap01.devd') OBJ(('/notes/data'))

- RST
  - Use to restore files saved with the SAV command
  - Example to restore one user's mail file:

    RST DEV('/qsys.lib/tap01.devd') OBJ(('/notes/data/mail/user.nsf'
       *INCLUDE '/restoredir/user.nsf'))

For additional control over what you are saving and how to save it, you can create your own backup procedure using the native S-A-V and R-S-T commands. You can use these commands to save and restore data within the IFS. When using the S-A-V command, the Domino server must be ended as Domino does not support save while active backups using this command. Shown here is an example of a S-A-V save and a restore of an individual mail file from the resulting save. Notice that the first parameter is the device. The format of the device will always start with the forward slash qsys.lib entry. You will then specify another forward slash and the name of the tape device followed with dot devd. The second parameter is the name of the file or directory you want to save or restore. In this example, the R-S-T command will also restore the file in an alternate directory. This is not necessary if you want to restore the file into the same location from where you saved it.
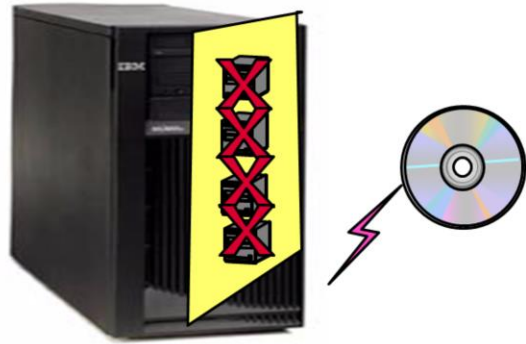
Here is the process for saving a Domino server with the S-A-V command. The first step is to end the server in a controlled manner.

After the Domino server has ended, you can then perform the backup.

Ending Domino server for backups

Step 1: End the Domino server (ENDDOMSVR)

Step 2: Perform backup

Step 3: Start the Domino server (STRDOMSVR)

Once the backup has completed, you can then restart the server.

Ending Domino server for backups

Use a CL program to automate saves of Domino data

```
0001.00              PGM
0002.00              MONMSG     MSGID(CPF0000)
0003.00              ENDDOMSVR  SERVER(DOMINO1) /* End the Domino Server +
0004.00                          normally */
0005.00              DLYJOB     DLY(180) /* Wait 3 minutes for the Domino +
0006.00                     Server to End (Increase if needed - normal time to end * 2)*/
0007.00              ENDDOMSVR  SERVER(DOMINO1) OPTION(*IMMED) /* This will +
0008.00                          end the subsystem monitor job */
0009.00              ALCOBJ     OBJ((QUSRNOTES/DOMINO1 *SBSD *EXCL)) WAIT(120)
0010.00              MONMSG     MSGID(CPF1002) EXEC(GOTO CMDLBL(NOSAVE)) /* +
0011.00                          CPF1002=Server did not end normally */
0012.00              SAV        DEV('/QSYS.LIB/TAP01.DEVD') +
0013.00                          OBJ((('/DOMINO1/NOTES/DATA/*')) ENDOPT(*LEAVE) +
0014.00                          CLEAR(*ALL) /* Backup data for given +
0015.00                          Domino Server. */
0016.00  NOSAVE:     DLCOBJ     OBJ((DOMINO1 *SBSD *EXCL))
0017.00              STRDOMSVR  SERVER(DOMINO1) /* Start the Domino Server */
0018.00  ENDPGM:     ENDPGM
```

Here is an example of using a CL program to automate the backup process. The first step is to end the Domino server controlled. Then, perform a delay job (D-L-Y-JOB command) to give the server ample time to end. Then issue another end command against the Domino server. This time, an immediate request is **issued** to ensure the server has ended and to end the subsystem associated with the server. The program then tries to obtain a lock on the subsystem description for the server. This lock can be obtained only if all Domino jobs and the subsystem have ended. This will guarantee that the Domino files are not locked and the S-A-V command is able to access the files. You can see the S-A-V command is the next command performed in this example. Finally, the lock on the subsystem description is released and the server is restarted. One common question that is asked when reviewing this program is, how do you know how long to delay the program before the immediate server end request. A general guideline is to wait two times the normal amount of time needed for the server to end.

Here you can see the advantages and disadvantages of using the i5/OS SAVE commands. The primary advantages are that it is free, you can treat it like any other i5/OS application and is highly flexible. The primary disadvantage is that you must end the Domino server.

Restoring using CL commands

- Refer to the Backup and Recovery Guide for a checklist for performing an entire system recovery
  - ▸ If you recover the entire system, no specific Domino steps are required

- Partial system restore
  - ▸ Install Domino software
    - Do not restore the Domino product libraries and IFS directories yourself or you will be missing objects!
    - Use RSTLICPGM to restore Domino from a system backup or install fresh from Media or downloaded image!
  - ▸ Configure the Domino server (CFGDOMSVR or iSeries Navigator)
  - ▸ Delete data in the newly created data directory
  - ▸ Restore the data directory
  - ▸ See technote 1086879 for additional help
    - http://www.ibm.com/support/docview.wss?rs=899&uid=swg21086879

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Here are the steps required to restore your entire Domino server when using i5/OS save CL commands.

Example of restoring the Domino data directory

Here is an example of restoring the entire data directory. Note that you must create the directory before you can restore data to it.

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