



IBM System i™

# Disaster Recovery - Be Prepared!

Debbie Saugen

***i want stress-free IT.***

***i want control.***

***i want an **i**.***

© Copyright IBM Corporation, 2006. All Rights Reserved.

This publication may refer to products that are not currently available in your country. IBM makes no commitment to make available any products referred to herein.

## About the Speaker

Debbie Saugen is the Technical Owner of System i Backup and Recovery in the Rochester, MN Development Lab. She is also a Senior Business Recovery Architect/Consultant with IBM Business Continuity and Resiliency Services.

Debbie ensures the Backup and Recovery Solution meets the customer's requirements in capability and usability. She does actual Backup/Recovery testing using the new functions, products and publications.

As a recognized expert on Backup and Recovery worldwide, Debbie enjoys sharing her knowledge by speaking at Common, Technical Conferences, Business Continuity and Resiliency Conferences, User Group conferences and writing for various magazines, books and websites.

You can reach Debbie at [dsaugen@us.ibm.com](mailto:dsaugen@us.ibm.com).

# Agenda

- Top Ten Mistakes
- Prevent Disasters Before or During Recovery Test or Disaster
- Save/Restore of Spooled Files *(New for V5R4)*
- SAVSYSINF/RSTSYSINF Commands *(New for V5R4)*
- Recovery Ease of Use and Enhancements
- Recovering the System
- Rapid Recovery

# Golden Rules for Backup/Recovery

- That Which Has Not Been Backed up Cannot be Recovered
- That Which Has Not Been Backed up Offsite Will Not Survive a Disaster
- Any Backup That Has Not Been Tested With a Recovery is Not a Backup
- Back It Up or Give It Up

# Mistake Number 10

- Only One Set of Tape Media
  - Possible Media Errors
  - Possible Incomplete Saves
  - Recommend at Least Two Sets

# Mistake Number 9

- Extra Tape Media Labels
  - Labels Misplaced on Tape Media
  - Non Standard Labels
  - Labels Stick to Inside of Tape Device or Auto Cartridge Loader

# Mistake Number 8

- No Tape Management
  - Not Knowing What Data on What Tape Media
  - Especially Important for SAVCHGOBJ Command
  - May Require Extra Recovery Time Using DSPTAP Command
  - Recommend Backup, Recovery and Media Services (BRMS)

# Mistake Number 7

- Improper Tape Media Shipping
  - Improper Tape Media Packaging
  - Tape Media “Tossed” in Box
  - Recommend Standard Tape Media Shipping Containers



# Mistake Number 6

- Offsite Storage of Tape Media
  - Recovery Begins When Tape Media Arrives at Recovery Site
  - Remote Offsite Storage Critical
  - Hurricane Lessons Learned
    - Offsite Storage Flooded
    - Delivery Vendors Refuse Entry into Evacuation Areas
    - Speedy Arrival of Tape Media by Private Lear Jet
  - Recommend Close Proximity to Recovery Site

# Mistake Number 5

- Recovery Procedures Not Followed
  - Doing Before Reading Recovery Steps
  - Going to Fast – Don't RUSH!
  - Steps Skipped
  - Thinking "I Know How to Do This!"
  - Assumptions Made Without Technical Guidance

# Mistake Number 4

- Complete Recovery Test Not Performed
  - Only Recovery of iSeries Performed
  - No Users Testing Applications
  - No Network Connectivity

# Mistake Number 3

- Incomplete Saves
  - SAVSYS Command Does Not Save the Entire System
  - Objects Never Saved in Backup Strategy
  - Objects Locked During Save
    - Save of QUSRSYS Incomplete
    - Critical Objects In Use
  - IFS Not Saved
    - SAV Command or \*LINK in BRMS

# Mistake Number 2

- “Special” Backup Performed to Test Recovery
  - Option 21 or BRMS \*SYSTEM Save
  - Outside Normal Backup Strategy
  - Not a Recovery Test
  - Need to Test Monthly, Weekly and Daily Backup Strategy

# Mistake Number 1

- Recovery Strategy is Never Tested
  - Testing Your Recovery Strategy Ensures You Have a Good Backup Strategy!!
    - Your Backups are only as Good as Your Recovery
    - Only True Backup Verification is Done by Testing Your Recovery
    - Recovery Strategy only as Good as Backup Strategy
    - Design Recovery Strategy Before Backup Strategy

# Prevent Disasters Before Test!

- Don't Forget Keys to Vital Records Boxes
- Know Your Password
  - Keep passwords current
- Arrange for serial number dependent software
- Use PRTSYSINF Command or option on Save Menus 21, 22 and 23 (V4R2 or later) to print important system information
- Ensure RSTLIB and CHGPWD commands NOT changed to use different programs



# Prevent Disasters Before Test!

- Tape Management
  - Ensure Tapes are Labeled or Cataloged with Unique Volume IDs (Tape Management Product such as BRMS)
  - Prevent Overwriting Tapes with Active Data (Tape Management Product such as BRMS)
  - Have at least two sets
  - Use error reports to remove bad tapes from inventory
  - Audit tapes for data integrity
  - Do **NOT IGNORE** tape drive problems!





# Prevent Disasters Before Test!

- Ensure Critical Data is Completely Backed Up!!
  - Completely Back Up Library QUSRSYS
  - #1 Recovery Problem Today!!
  - Objects starting with Q in QUSRSYS contain Critical Recovery Data
- To Save Everything in QUSRSYS:
  - End all subsystems (with ENDSBS SBS(\*ALL))
  - Ensure subsystems QSNADS, QSYSWRK, QSERVER ended & ENDTCPSPVR (\*MGTC \*DIRSRV)
  - Use Save menu option 21 or 23
  - Use the save-while-active feature



# Prevent Disasters Before Test!

- ALWAYS Save Access Paths!
  - Default on Save Menu Options (21, 22, 23) is YES to Save Access Paths
  - Default on BRMS is YES to Save Access Paths
- BEWARE!!
  - Prior to V5R3 Default for Saving Access Paths on Save Commands is NO



# Saving Access Paths - *New Default for V5R3*

- New Save Access Paths Default for Save Commands
  - \*SYSVAL
  - New System Value QSAVACCPATH
    - '1' Save Access Paths (Default)
    - '2' Do Not Save Access Paths
  - Supported on SAVLIB, SAVOBJ, SAVCHGOBJ, SAVRSTLIB, SAVRSTOBJ, SAVRSTCHG
- \*YES or \*NO Still Valid Options

# Prevent Disasters Before Test!

- Install Latest Backup/Recovery Group PTF
  - V5R2M0 - SF99085
  - V5R3M0 - SF99185
  - V5R4M0 - SF99186
- WRKPTFGRP SFxxxxx for Date of Group PTF (V5R2 or Higher)



# Prevent Disasters During Test!

- Recovering to a Different System (Different Serial Number)
  - Must specify ALWOBJDIF(\*ALL) on all RSTxxx Commands - MBROPT(\*ALL) on RSTLIB Command

Note: ALWOBJDIF(\*ALL) during System Recovery to a Different System Links Authorization Lists to the Objects

- Must specify SRM(\*NONE) on RSTCFG command

# Prevent Disasters During Test!

- Security Issues During Recovery
  - After Restore, Unsure of QSECOFR Password? Not sure if password has Expired?
    - Change Password (CHGUSRPRF command) before signing off
  - Know Other User IDs needed for Test

# Prevent Disasters During Test!

- Security Issues During Recovery
- Authorization lists securing objects in QSYS:
  - Association between object and authorization list lost during restore because QSYS restored prior to user profiles
  - Use EDTOBJAUT or GRTOBJAUT
  - Create program to produce a file of these objects and include file in the save

# Prevent Disasters During Test!

- Need only Critical Application Data restored?
    - You **MUST** restore libraries QSYS2, QGPL and QUSRSYS
  - NOTE:** Starting with V5R2 QSYS2 is part of \*ALLUSR  
Saved with \*IBM Save Previously
  - SAVLIB/RSTLIB of \*NONSYS or \*ALLUSR in V5R3  
Saves and Restores QSYS2, QGPL and QUSRSYS First
- If you use journaling, the libraries containing the journals must be restored before restoring the journaled files



# Prevent Disasters During Test!

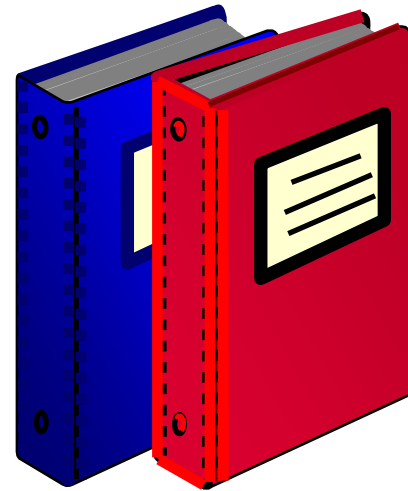
- If you have logical files whose based-on files are in a different library, you must restore all based-on files before you can restore the logical file
- Message CPF3204 "Cannot find object needed for file xxxx in xxx" During Recovery
  - If RSTLIB(\*NONSYS) Performed, Run the Following Command to Restore Logical Files

```
RSTLIB SAVLIB(*NONSYS) DEV(media-device-name) OPTION(*NEW) MBROPT(*ALL)  
ALWOBJDIF(*ALL)
```

- Otherwise, Run the Following Command for each Logical File that Needs to be Restored

```
RSTOBJ OBJ(logical-file-name) SAVLIB(library-name) DEV(media-device-name)  
OBJTYPE(*FILE) MBROPT(*ALL) ALWOBJDIF (*ALL)
```

## Backup and Recovery Information



# Backup and Recovery Book

- Hardcopy Book NO LONGER shipped free
- Fee charged for book
- Hardcopy CRITICAL for DASD Configuration and System Recoveries
- Configurator Feature Code
  - Default may vary
  - Ensure **YES** for Hardcopy Book
- You **MUST** use the correct version of the book with each new release!
- Read the book **EVERY** time a new release comes out?

# Backup and Recovery Book

- Key Recovery Procedures to Remember
  - Step by Step Restore Instructions when Recovering Your Server to the **Same** Server - See Appendix C (**V5R3 and V5R4**)
  - Step by Step Restore Instructions when Recovering Your Server to a **Different** Server - See Appendix D (**V5R3 and V5R4**)
- System Migrations
  - Moving Previous Release User Data to a System at a Higher Release in Chapter 14, "Release to Release Support" (**V5R3 and V5R4**)

# Backing Up Spooled File Data *(New for V5R4)*

- Save /Restore of Spooled Files Now Supported in i5/OS
  - Preserves Spooled File Data, Spooled File Identity and Attributes
    - Spooled File Name
    - Spooled File Number
    - Creation Date/Time
    - Fully Qualified Job Name
    - Job System Name
  - Attributes May Not be Preserved
    - System 36 Identifier
    - Output Queue Name/Library (Restored to Different Output Queue/Library)
    - ASP (Output Queue on Different ASP)
    - New Expiration Date (Restore Occurs After Expiration Date)
    - New Save/Restore Attributes of Spooled File

# Backing Up Spooled File Data *(New for V5R4)*

- New SPLFDTA Parameter on Save/Restore Commands
  - SPLFDTA(\*NONE) is Default on Saves
  - SPLFDTA(\*ALL) Supported
  - SPLFDTA(\*NEW) is Default on Restores
    - Restore Spooled Files That Don't Exist
  - SPLFDTA(\*NONE) Supported on Restores

# Notes:

## New Spooled Files APIS

QSRSAVO & QSRRSTO APIs provide save/Restore support with full capability to select and subset spooled data.

- Include or omit by Output queue, Job name, Job number, User name, Spooled file name, Spooled file number, Job system name, User-specified data, Form type, or Create date/time ranges
- Set expiration date on spooled files

# Backing Up Spooled File Data *(New for V5R4)*

- Save and Restore Entire OUTQs
  - No support to Save/Restore Individual Spooled Files
- Save and Restore Menu Options
  - Optionally Save and Restore ALL Spooled Files
- Display Save/Restore Media to See List of Spooled Files
  - DSPTAP, DSPOPT, and DSPSAVF Commands
  - Similar to Displaying Members in a Database File
- Performance Improvement
  - Faster than Existing Methods to Save/Restore Spooled Files
  - No Requirement for
    - Copying Spooled File to Database File
    - Document Library Objects (DLOs)
  - Spooled Files Saved and Restored Directly
- BRMS Uses New Support
  - No User Interface Changes to BRMS
  - Performance Improvement



# SAVSYSINF and RSTSYSINF *(New for V5R4)*

- Save System Information (SAVSYSINF) Command Performs a Partial Save of Data Saved by Save System (SAVSYS) Command
- Cumulative Save Since Last SAVSYS
- Restricted State Not Required
  - SAVSYS Requires Restricted State
- Saves
  - System Reply List Entries
  - Certain System Values
    - Some System Values are Not Saved
    - Not Required for System Recovery
  - Service Attributes
  - Network Attributes
  - Environment Variables
  - PTFs for 5722SS1 and 5722999 Applied (TEMP or PERM) Since Last SAVSYS
  - All Group PTFs
  - All PTF Cover Letters and Loaded PTFs Copied into \*SERVICE

## Notes:

The SAVSYSINF command saves the following object types in QSYS:

- \*DTAARA
- \*JOB
- \*JRN
- \*CLS
- \*IGCTBL
- \*MSGF
- \*JOBQ
- \*JRNRCV
- \*MSGQ (1)
- \*EDTD
- \*SBSD
- \*TBL
- \*CMD (1)

(1) objects changed since last SAVSYS

The SAVSYSINF Command does not save the following:

- Licensed Internal Code
- QSYS Library
- System values which cannot be changed, saved or are related to date/time or password level
- Configuration objects (use SAVCFG)
- Security Data (use SAVSECDTA)

Loaded PTFs are only saved if copied into \*SERVICE area. This enables SAVSYSINF to find the save files of the PTFs. The Copy PTFs (CPYPTF) service attribute specifies whether to copy PTF save files into \*SERVICE when PTFs are loaded from a tape or optical device. Use the CHGSRVA CPYPTF(\*YES) command to change the service attribute on your system to copy PTF save files when loading PTFs from media.

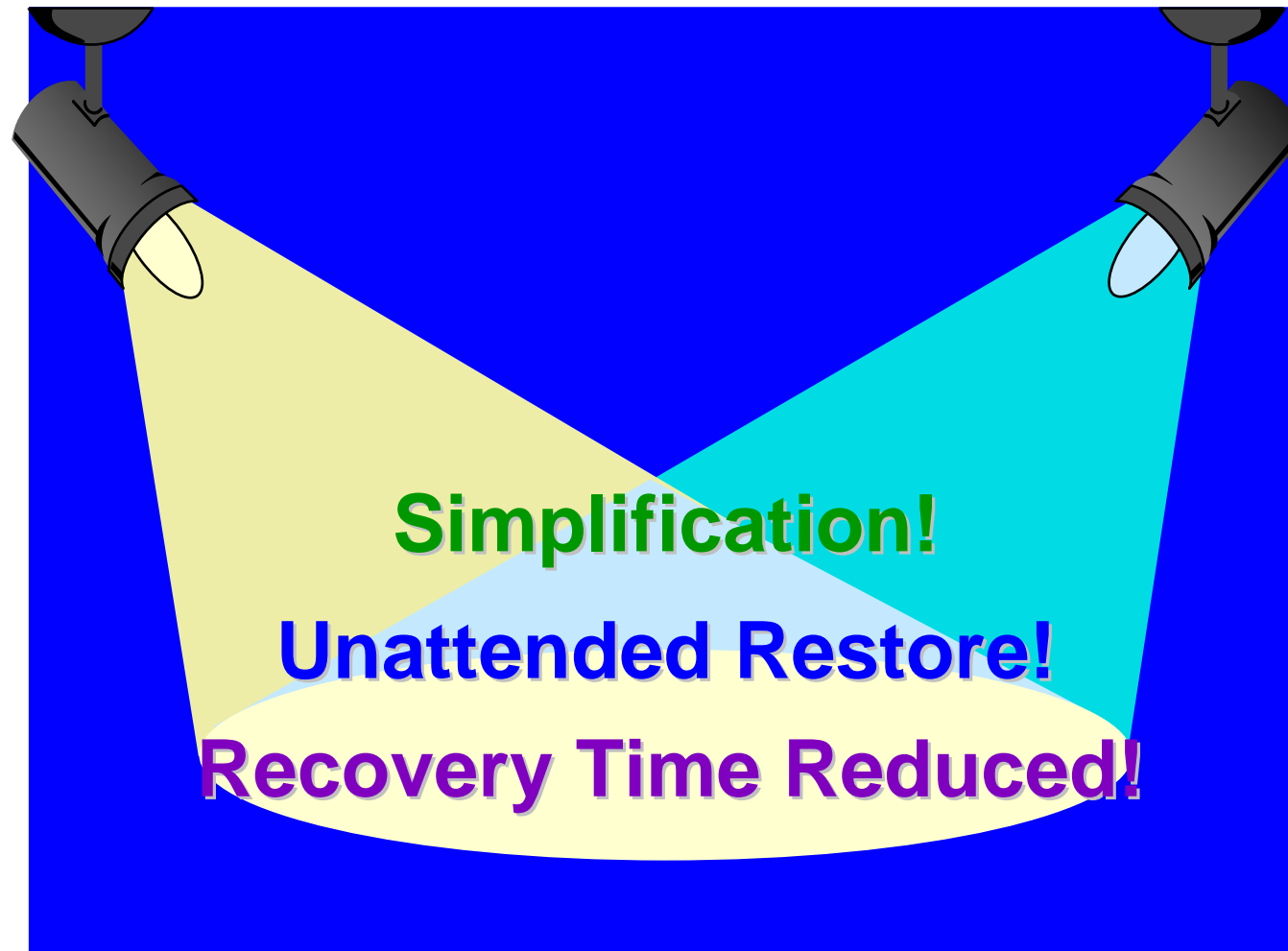
# SAVSYSINF and RSTSYSINF Considerations

- Base SAVSYS Required
  - SAVSYSINF Not Replacement for SAVSYS
- \*ALLOBJ or \*SAVSYS Special Authority Required
- Can't be Used For
  - Restoring to Another Existing System
  - System Upgrades or Migrations
- Intended for Customers Who
  - Can't Bring System to Restricted State for SAVSYS
  - Can't Take Down Time for SAVSYS
- PTF Save Files Must Remain on System Until Next SAVSYS
  - Do Not Run Delete Program Temporary FIX (DLTPTF) Command Unless
    - Right Before SAVSYS
    - Right After SAVSYS
  - Installing PTFs Default is NOT to Restore Save Files
    - Change System Default CPYPTF(\*YES) on CHGSRVA Command or
    - Use CPYPTF(\*YES) in INSPTF Command Consistently
- Increases System Recovery Time and Complexity
  - SAVSYS and SAVSYSINF Needs to be Recovered
  - RSTSYSINF Additional Step per Backup and Recovery Checklists

# SAVSYSINF Backup Strategy

- After Base SAVSYS, Perform these Commands to Save System Changes
  - SAVLIB LIB(\*IBM)
  - SAV OBJ('/QIBM/ProdData')('/QOpenSys/QIBM/ProdData') UPDHST(\*YES)
  - SAVSYSINF
- Commands to Save User Data
  - SAVSECDTA
  - SAVCFG
  - SAVLIB LIB(\*ALLUSR)
  - SAVDLO DLO(\*ALL) FLR(\*ANY)
  - SAV OBJ('//\*') ('/QSYS.LIB' \*OMIT) ('/QDLS' \*OMIT) UPHST(\*YES)

# Recovery Ease of Use



# Recovery Ease of Use

- System Recovery
  - Restore Menu Option 21
    - Simplifies Recoveries
    - Allows Unattended Restores
  - New Parameter
    - Restore to Different System
  - Specifies on Commands these Parameters
    - SRM(\*NONE)
    - ALWOBJDIF(\*ALL)
    - MBROPT(\*ALL)

# Recovery Enhancements

- System Recovery - Restore Menu Option 21

## Specify Command Defaults

Type choices, press Enter.

Tape devices . . . . .

TAP01\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Names

Prompt for commands . . . . .

N

Y=Yes, N=No

Message queue delivery . . . . .

\*NOTIFY

\*BREAK, \*NOTIFY

Restore to different system. . . .

N

Y=Yes, N=No

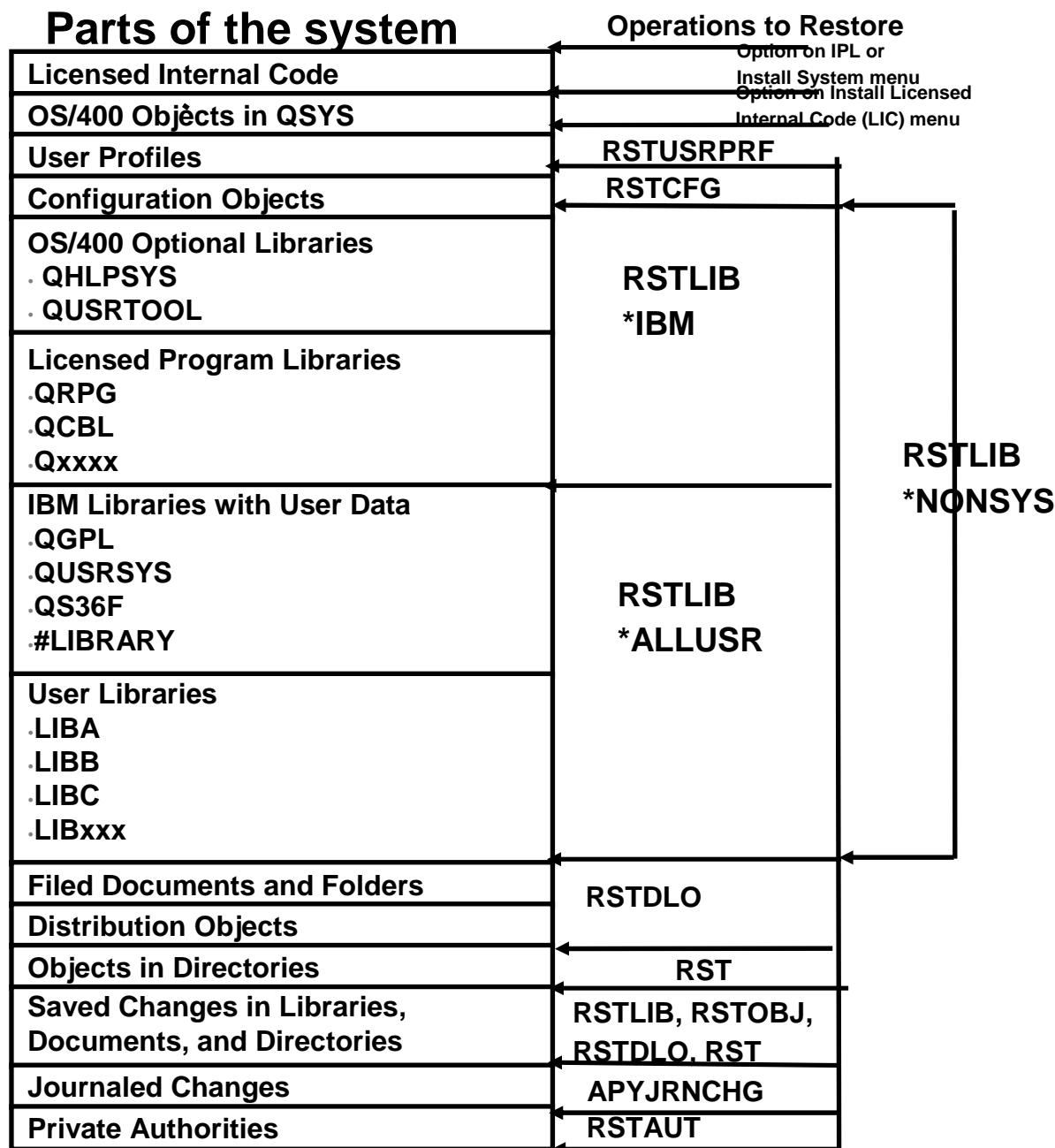
F3=Exit F12=Cancel



# Recovery Enhancements for V5R3

- RSTLIB and RSTOBJ New Values on SAVLIB Parameter
  - New \*ANY Value
    - Restore of SAVCHGOBJ Media
    - Restores First Version All Libraries on Tape Beginning with SEQNBR Specified
  - Up to 300 Generic or Specific Library Names  
(Previously only 1 Library Name Allowed)
- RSTLIB, RSTOBJ and RSTCFG Supports OMITOBJ
  - Up to 300 Generic or Specific Values
  - Previously only Libraries Omitted on RSTLIB Command
  - OMITLIB on RSTLIB Now Supports Generics





# Recovering with Alternate Installation Device

- Allows Setup of Alternate Installation Device for Alternate IPL
- ***REQUIRED for FIBRE CHANNEL TAPE DEVICES!***
- Define Via Dedicated Service Tools (DST)

NOTE: Alternate Installation Device **REQUIRES** PID Install CD or SAVSYS on DVD for Installs and System Recoveries from Tape Media

# Recovering After Complete System Loss

- Step by Step Recovery Procedures Recovering to **Same** System in Backup and Recovery Book
  - Appendix C (*V5R3 and V5R4*)
- Step by Step Recovery Procedures Recovering to *Different* System in Backup and Recovery Book
  - Appendix D (*V5R3 and V5R4*)
- The Recovery Process:
  - IPL from SAVSYS media to Install the Licensed Internal Code using option 2 (Install Licensed Internal Code and Initialize system)
  - Configure the disk units (assign to ASP and set up disk protection). If you saved any User-Defined File System (UDFSs), you must configure your user ASPs or the UDFSs will not restore.
  - If necessary, start mirroring

# Recovering After Complete System Loss

- Install the Operating System
- Update Required System Values for Recovery
  - System Value QALWOBJRST to \*ALL
  - System Value QJOBMSGQFL to \*PRTWRAP
  - System Value QVFYOBJRST to '1' (V5R1 or Higher)
  - Security Sensitive System Value Changes Not Allowed
    - DST Option in V5R2 or Higher
    - Default is to Allow Changes
    - If Disallowed, Must Update in DST to Allow Changes During Recovery

# Recovering After Complete System Loss

- Restoring to Different system?
  - Specify ALWOBJDIF(\*ALL) on RSTxxx Commands
    - Restore Menu Option 21 or BRMS Handles
    - Select Option for Restoring to Different System
    - Relinks Authorization Lists to Objects
  - Specify SRM(\*NONE) on RSTCFG Command
    - Restore Menu Option 21 or BRMS Handles
    - Select Option for Restoring to Different System

# Recovering After Complete System Loss

- Prevent Messages Unrelated to Recovery from Interrupting (Can Setup Restore Menu Option 21 to Handle)
  - CHGMSGQ MSGQ(QSYSOPR) DLVRY(\*NOTIFY) SEV(99)
- Restore User Profiles (Restore Menu Option 21 or BRMS)
- Restore Device Configuration (Restore Menu Option 21 or BRMS)
- Restore IBM and User Libraries (Restore Menu Option 21 or BRMS)

Note: If Not Restoring All of User Libraries, Be Sure to Restore QSYS2, QGPL, and QUSRSYS

***V5R3: SAVLIB/RSTLIB of \*NONSYS or \*ALLUSR Saves and Restores QSYS2, QGPL and QUSRSYS First***

# Recovering After Complete System Loss

- Restore Document Library Objects (Restore Menu Option 21 or BRMS)
- Restore Directories (Restore Menu Option 21 or BRMS)
- If SAVSYSINF Part of Backup Strategy, Perform Following *(New in V5R4)*
  - UPDPTFINF
    - Updates all Program Temporary Fix Information for PTF Save Files in QGPL
  - RSTSYSINF
    - Restores System Data and Objects Saved with SAVSYSINF
- Restore Authority (Restore Menu Option 21)
- Reapply PTFs Applied Since Last SAVSYS
- Change Restore QSECOFR Profile Password
  - Password is Restored Value
  - May be Expired or Disabled on SAVSYS or SAVSECDTA Save

# Recovering After Complete System Loss

- SIGNOFF \*LIST or DSPJOBLOG \* \*PRINT
- Check Job Log
- Place Scheduled Jobs on Hold
  - WRKJOBSCDE
  - Select Option 3



# Recovering After Complete System Loss

- Perform IPL
- For Content Manager OnDemand for iSeries
  - Perform Additional Recovery Steps to Start Journaling
- For Windows Server for iSeries if You Saved with Netfinity Servers Varied On
  - Perform Additional Recovery Steps to Add Links for Server Descriptions
  - Additional Restore Step to Restore Windows Server
- For Windows Server for iSeries if You Saved with Netfinity Servers Varied Off
  - Perform Additional Recovery Steps to Add Links Server Descriptions
- For CCA Cryptographic Service Provider
  - Reinstall Product to Complete Recovery
  - Call QCAP3/QYAC3INAT

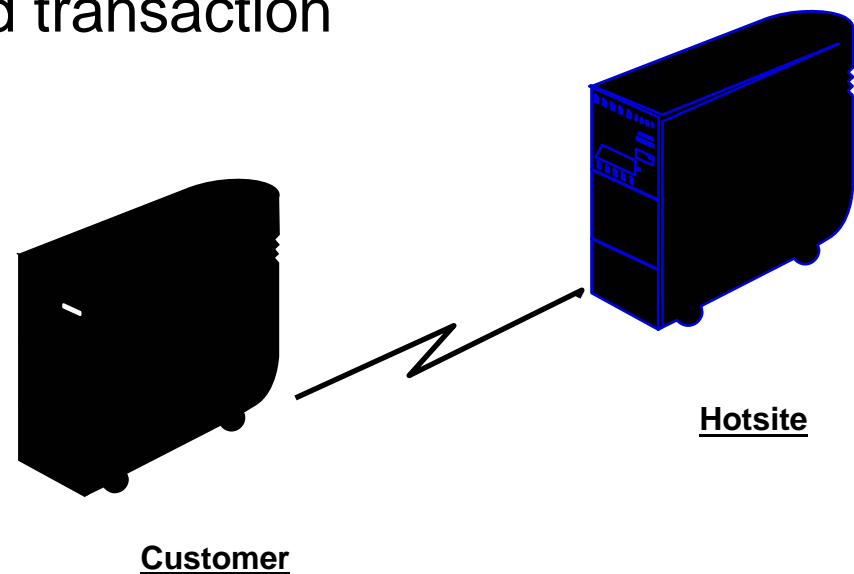
# Rapid Recovery for iSeries Replication



# iSeries Replication

..a Rapid Recovery feature that enables you to replicate your applications and data.

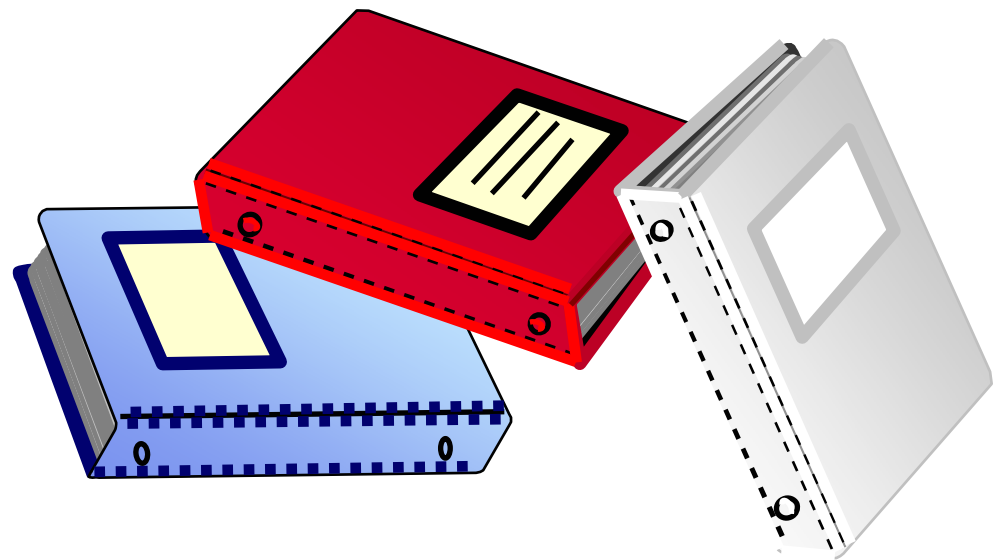
- Can achieve recovery time objectives of minutes
- Protects data to last replicated transaction



# Remember.....Test Your Recovery!!!

*The Only Way to Ensure you have a Good Backup Strategy  
is to Test your Recovery!!!!*

# Reference Material



# Reference Material

Backup and Recovery; SC41-5304-08 (V5R4)

Backup, Recovery and Media Services; SC41-5345-05 (V5R4)

Backup, Recovery and Media Service for OS/400: A Practical Approach Redbook; SG24-4840

**<http://www.redbooks.ibm.com/abstracts/sq244840.html>**

Virtual Tape Redbook; SQ24-7164

V5R4 iSeries Performance Capabilities Reference; SC41-0607-10

**<http://www-03.ibm.com/servers/eserver/iserries/perfmgmt/resource.html>**

BRMS Web Page:

**<http://www-03.ibm.com/servers/eserver/iserries/service/brms/>**

# Trademarks and Disclaimers

© IBM Corporation 1994-2006. All rights reserved.

References in this document to IBM products or services do not imply that IBM intends to make them available in every country.

Trademarks of International Business Machines Corporation in the United States, other countries, or both can be found on the World Wide Web at <http://www.ibm.com/legal/copytrade.shtml>.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.

Information is provided "AS IS" without warranty of any kind.

The customer examples described are presented as illustrations of how those customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics may vary by customer.

Information concerning non-IBM products was obtained from a supplier of these products, published announcement material, or other publicly available sources and does not constitute an endorsement of such products by IBM. Sources for non-IBM list prices and performance numbers are taken from publicly available information, including vendor announcements and vendor worldwide homepages. IBM has not tested these products and cannot confirm the accuracy of performance, capability, or any other claims related to non-IBM products. Questions on the capability of non-IBM products should be addressed to the supplier of those products.

All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Some information addresses anticipated future capabilities. Such information is not intended as a definitive statement of a commitment to specific levels of performance, function or delivery schedules with respect to any future products. Such commitments are only made in IBM product announcements. The information is presented here to communicate IBM's current investment and development activities as a good faith effort to help with our customers' future planning.

Performance is based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput or performance that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput or performance improvements equivalent to the ratios stated here.

Photographs shown may be engineering prototypes. Changes may be incorporated in production models.