



# New IBM i Technologies and Wine Make Backup and Recovery Better

Debbie Saugen  
Director, Business Continuity Services  
[debbie.saugen@helpsystems.com](mailto:debbie.saugen@helpsystems.com)



## About the Speaker

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Debbie Saugen is recognized worldwide as an expert on IBM i Backup/Recovery, Disaster Recovery and High Availability solutions. Prior to joining Helpsystems, Debbie's IBM career spanned 37 years serving as the Technical Owner of IBM i Backup/Recovery and the IBM i National Lead for IBM Resiliency Services.

Debbie is the Director of Business Continuity Services. She is also the Product Manager for Backup, Recovery and Media Services (BRMS) and Power HA for IBM i at Helpsystems.

As a Common Gold Medal Speaker she enjoys sharing her knowledge speaking at conferences, user groups, along with publishing articles. Debbie is passionate about solving business continuity issues and providing the best solution for customers.

You can reach Debbie at [debbie.saugen@helpsystems.com](mailto:debbie.saugen@helpsystems.com).



# IBM, HelpSystems Further Partnership

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- Joining forces to deliver better solutions for high availability, backup and recovery, and developer tools
- Accelerating development on great IBM technologies:
  - IBM Backup Recovery and Media Services for i (BRMS)
  - IBM Power HA for i
  - IBM Rational Developer for i, AIX, Linux
- HelpSystems and IBM excited about this opportunity
- Shows ongoing dedication and expertise on critical platform



# Agenda

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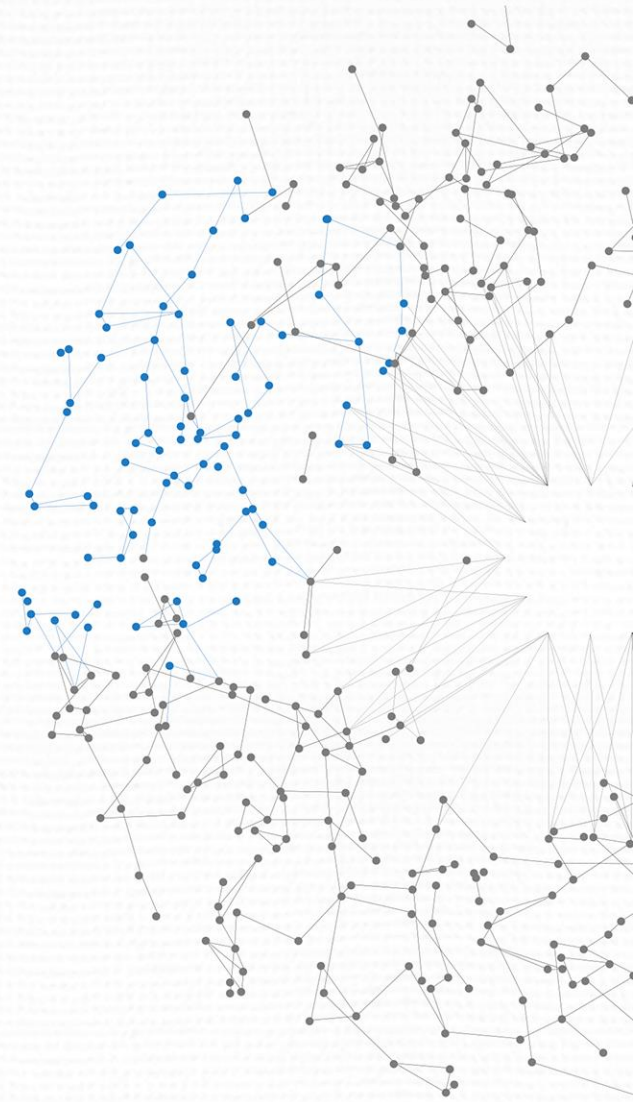
- **IBM i Business Continuity 101**
- **IBM i Tape Technology**
- **IBM i Integrated Virtual Tape**
- **IBM i Flashcopy Toolkit for Backups**
- **IBM i Cloud Backup**
  - **Evault Backup**
  - **BRMS Cloud Storage**
  - **Virtual Tape Libraries (VTLs)**
- **IBM i Cloud Replication**
  - **Logical Replication**
  - **Hardware Replication**
- **Disaster Recovery as a Service (DRaaS)**



# Business Continuity 101



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# IBM i Business Continuity 101

- Most valuable component of any computer system
  - NOT your hardware
  - NOT your software
  - DATA that resides on your system
- Hardware and software can be replaced
- Data can be LOST forever if disaster strikes
- Backup/Recovery strategy is critical



# IBM i Business Continuity 101



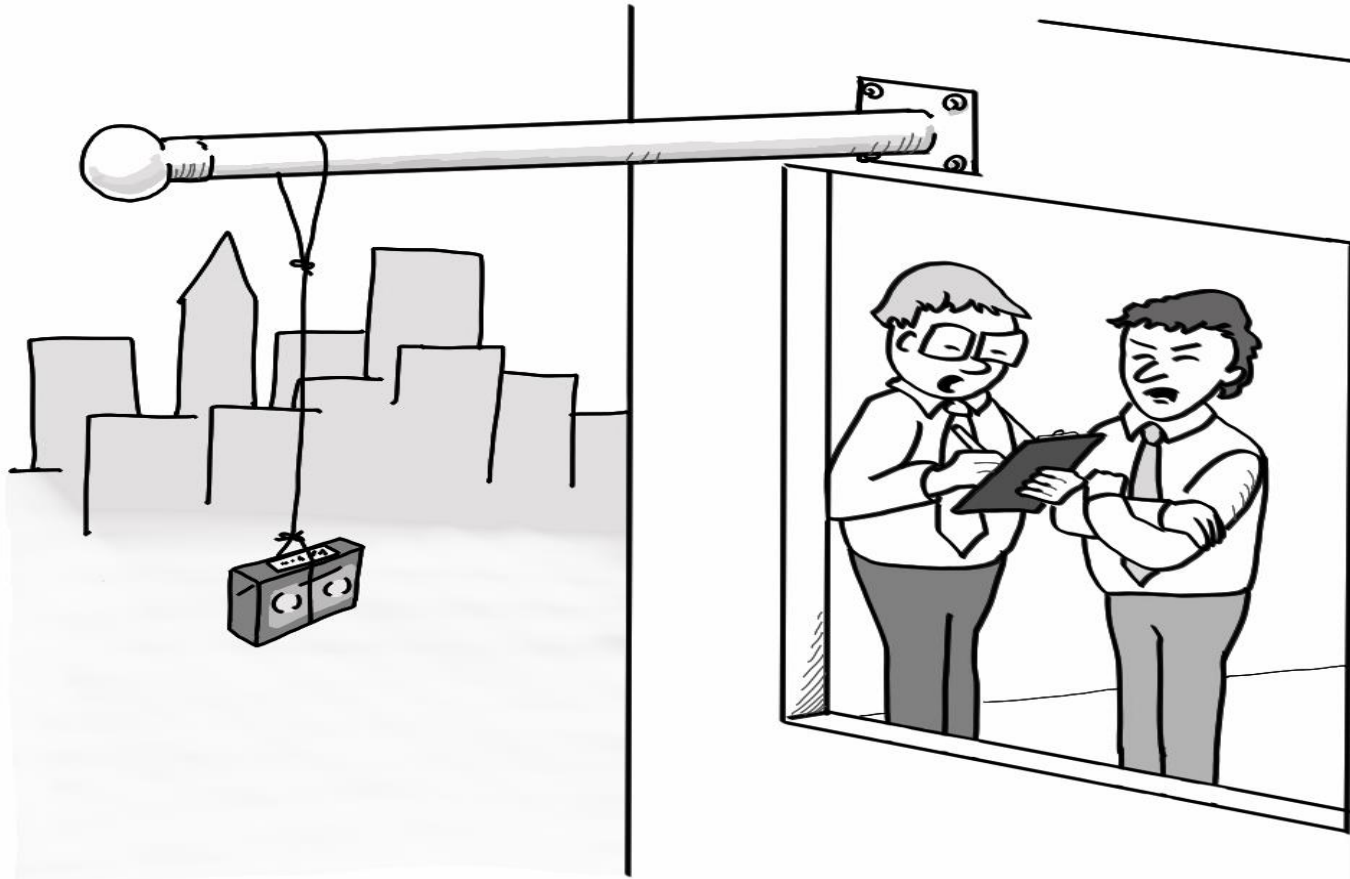
# IBM i Business Continuity 101

- Backup and Recovery
  - Saving the System to Tape or Virtual Tape Library (VTL)
  - Disaster Recovery Requires
    - Tapes or VTL Offsite
    - Recovering Entire System from Tape
    - RTO (Recovery Time Objective) - Typically 24 to 48 hours
    - RPO (Recovery Point Objective) - Data current since last backup





# IBM i Business Continuity 101



"This is not technically off-site storage"  
"What, do I need a longer pole?"

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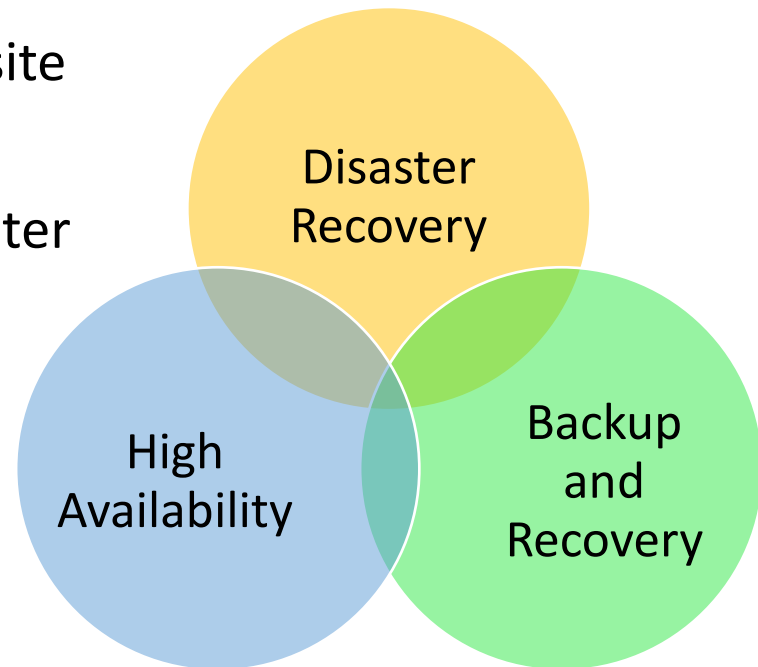
# IBM i Business Continuity 101

- High Availability
- System Replication
  - Separate System
  - Separate Partition
  - Provides 24 X 7 Production
    - System Maintenance
    - Upgrades
    - Backups
    - Some Hardware Issues



# IBM i Business Continuity 101

- Disaster Recovery
  - System or Hosted Partition Offsite
    - Out of Region
    - Preferably 500 miles or greater
- Recovery
  - Tape or VTL
  - Replication



# Business Continuity Messages

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- A backup is not a backup without testing
- You want business continuity
- You want predictability and confidence in the process
- You can't afford to be the next business in the news



# Questions to Always Be Asking

- Are we confident in our backups?
- Do we need to reduce our backup and recovery times?
- What is the Business Impact if data is lost?
- Have we tested a recovery lately?
- Do we need expert skills in testing disaster recovery?



# Wet and Wild Bookstores

- Two-tape strategy
- No offsite storage
- How wet (and wild) can it get?





# The Insurance Company

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- No offsite storage
- Onsite vault



# DR Deb's Casino

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- Tape library
  - Holds 7 tapes
- Using offsite storage
- Are you willing to bet on this casino in a disaster?



# The Bank

- Offsite tape storage
- Hurricane coming
- Full system backup
- What could go wrong here?

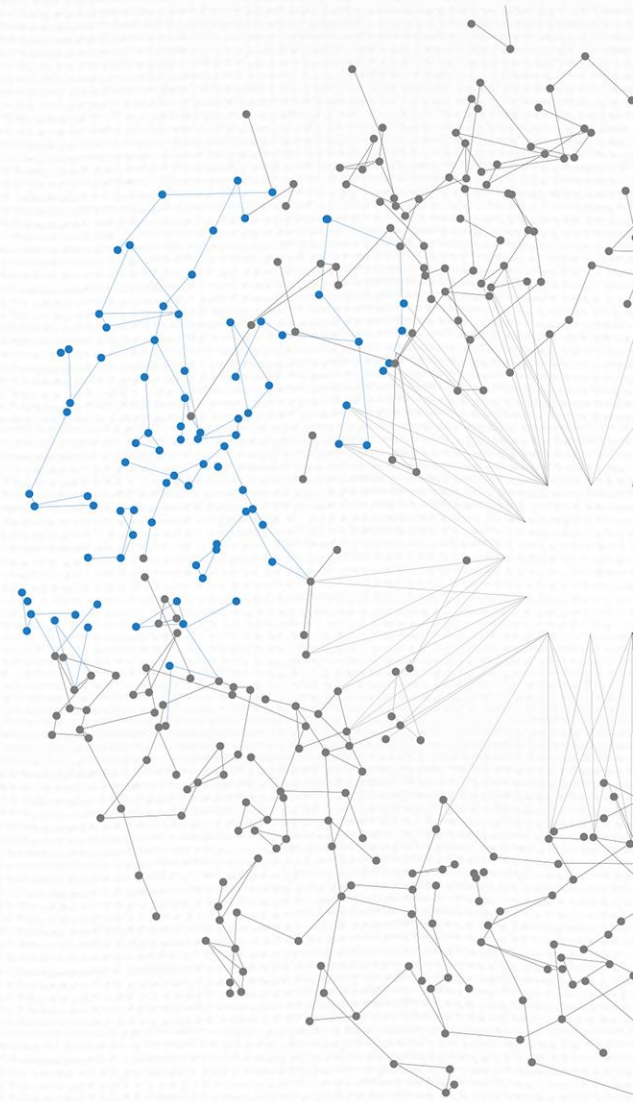




# IBM i Tape Technology



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# LTO 7 Tape Drive Highlights

- Seventh Generation LTO Tape Drive
  - 6 TB capacity (up to 15 TB at 2.5:1 compression)
  - 300 MB/sec native data transfer rate (750 MB/sec with compression)
  - Full height and half height form factors
    - Full height: Fibre Channel at 8 Gbit/sec
    - Half height: SAS at 6 Gbit/sec and Fibre Channel at 8 Gbit/sec
  - Capability to Read/Write Ultrium 6 and read Ultrium 5 cartridges



# LTO 7 Tape Drive – IBM i Requirements

- Supported on 7.1, 7.2 and 7.3
  - **Note:** With current IOA limitations, users will see very little, if any performance improvement compared to LTO 6 drives. Capacity will however be improved.
  
- OS PTFs required
  - 7.1 – MF60438
  - 7.2 – MF60437
- BRMS
  - 7.1 – SI57830 or superseding PTF
  - 7.2 – SI57831 or superseding PTF



# LTO 7 Tape Drive Highlights

- Features:
  - Encryption
  - WORM
  - Media partitioning
  - Supported in IBM Tape Automation Systems



# LTO 8 Tape Highlights

- Eighth Generation LTO Tape Drive
  - 12 TB capacity (up to 30 TB at 2.5:1 compression)
  - 300 MB/sec native data transfer rate (750 MB/sec with compression)
- Full height and half height form factors
  - Full height: Fibre Channel at 8 Gbit/sec
  - Half height: SAS at 6 Gbit/sec and Fibre Channel at 8 Gbit/sec
- Capability to Read/Write Ultrium 7 and read Ultrium 6 cartridges



# LTO 8 Tape Drive – IBM i Requirements

- Supported on 7.1, 7.2 and 7.3
  - **Note:** With current IOA limitations, users will see very little, if any performance improvement compared to LTO 6 drives. Capacity will however be improved.
  
- OS PTFs required
  - 7.1 – MF64114
  - 7.2 – MF64115
  - 7.3 – MF64116
  
- BRMS
  - 7.1 – SI57830 or superseding PTF
  - 7.2 – SI57831 or superseding PTF

# TS1150 Tape Drive Highlights

- 5th generation of 3592 enterprise tape drive
  - Barium Ferrite media types with up to 10 TB native capacity
    - Re-Writable and Write Once Read Many (WORM) cartridge at 10 TB
    - Economy cartridge available at 2 TB
  - 360 MBps native drive data rate
  - Dual 8Gb fiber channel interfaces with 700 MB/s max compressed data rate



# TS1150 Tape Drive – IBM i Requirements

- Attaching to IBM i
  - IOPlless only
  - IBM i 6.1.1 and above
- Supported in tape libraries
  - IBM TS3500
  - IBM TS4500
- PTFs Required
  - IBM i 6.1.1 - MF58975
    - If using BRMS , SI53304 or superseding PTF
  - IBM i 7.1 - MF59046
    - If using BRMS, SI53305 or superseding PTF
  - IBM i 7.2 - MF59015
    - If using BRMS, SI53306 or superseding PTF

# TS1150 Tape Drive Highlights

- Features:
  - Encryption
  - WORM
  - Media partitioning
  - Supported in IBM Tape Libraries



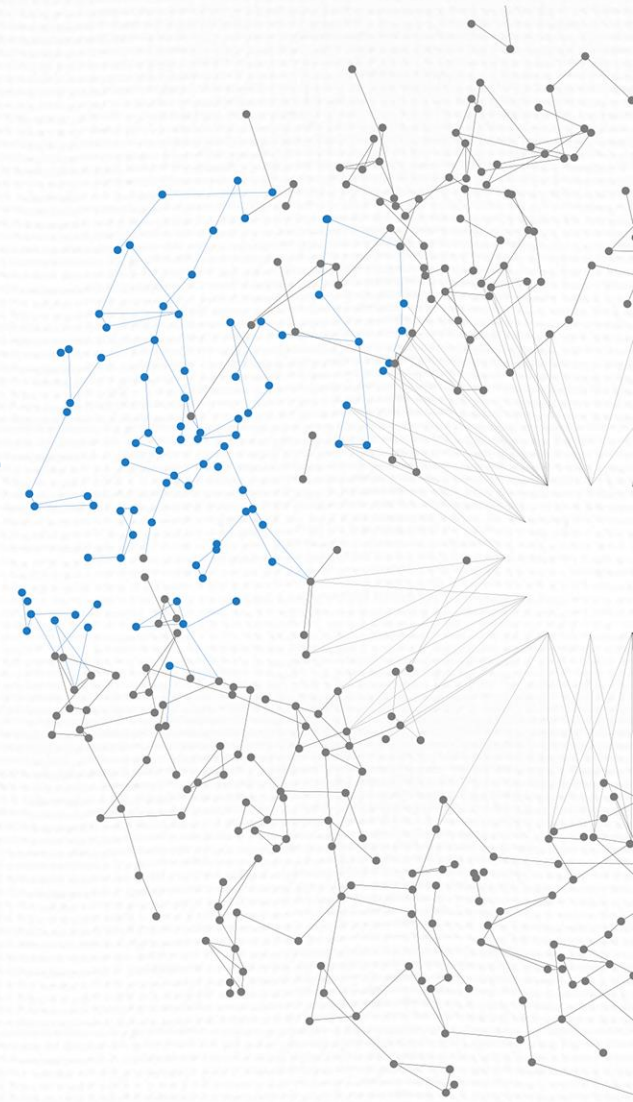




# IBM i Integrated Virtual Tape



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# IBM i Integrated Virtual Tape (Introduced V5R4)

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- Key Advantages
  - Supported on all Save/Restore Commands and APIs
  - Can Be Faster than Saving Directly to Old Tape Technology
    - Similar Performance as Save Files
    - Best Performance in Separate ASP
  - Eliminates Save File Limitations
    - One Library Per Save File
    - SAVSYS Not Supported on Save File
    - Parallel Saves Not Supported on Save File
    - 1 TB Size Limitation on Save File



# IBM i Integrated Virtual Tape

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- Key Advantages
  - Duplicate Saves to Media (DUPTAP or DUPMEDBRM)
    - When Tape Devices Available
    - At Your Convenience
  - Onsite and Offsite Storage
    - Keep Virtual Volumes on Systems as Needed
    - Keep Duplicated Volumes Offsite



# IBM i Integrated Virtual Tape

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- Key Considerations
  - Additional DASD Requirements
  - No Install from SAVSYS Virtual Volume
    - D-IPL Only from Media
  - May Not Be Faster
    - Tape Technology
    - System Configuration and Environment
  - Data Compaction Not Supported
  - Data Compression Support
    - DTACPR(\*YES) Parameter on Save Commands (Default is \*NO)
    - SNA Low Data Compression
    - Significant Performance Impact



# IBM i Integrated Virtual Tape

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- Implementation of Virtual Tape
  - Included in Base i5 Operating System
  - Configures as RA-CL (Random Access Cartridge Loader) Tape Device
    - I/O to Disk instead of Tape Media
    - Behaves as Tape Library Mounting Specified Volumes
    - Up to 35 Virtual Tape Devices
    - Virtual Tape Volumes Support Multiple Optimum Block Sizes (Compatibility with Tape Devices)
  - Tape Volume Management Interface with GUI
  - User Interface is Green Screen or GUI
  - Complete End User Interface and Tape Management with BRMS



# IBM i Integrated Virtual Tape

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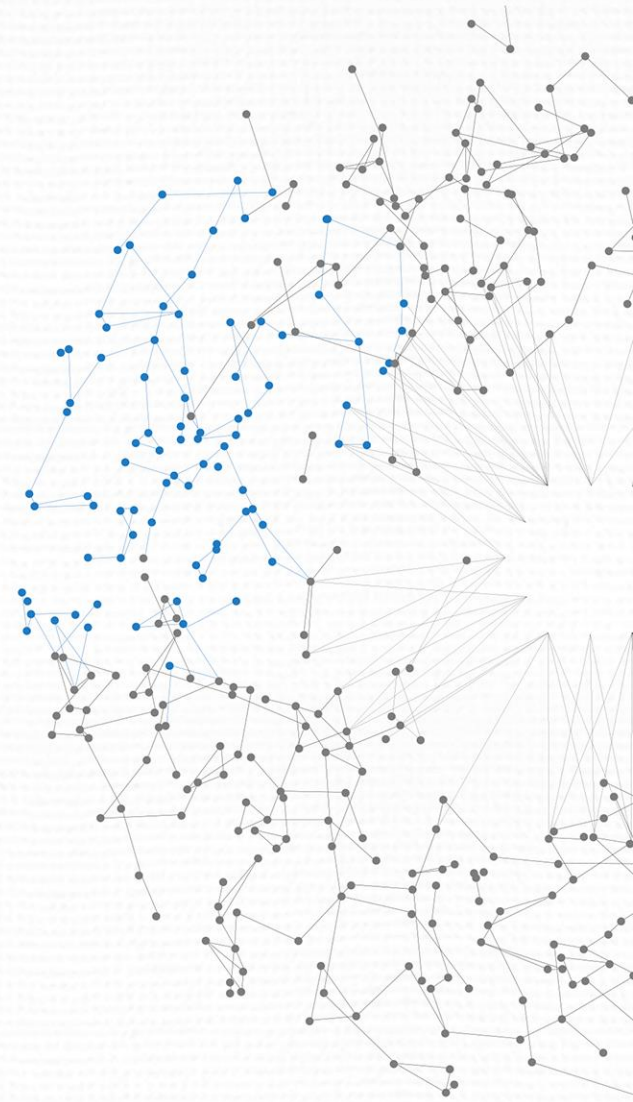
- Implementation of Virtual Tape
  - Virtual Volumes Stored as IFS Stream Files
  - FTP to Other Servers or Partitions Considerations
    - Bandwidth
    - Management of Transmitted Files
    - Disaster Recovery



# IBM i Flashcopy Toolkit for Backups



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# IBM i Flashcopy Toolkit for Backups

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- SAN Storage Required
- Provides a Point in Time Copy
  - Applications Quiesced
  - Transactions on Hold
  - Short Amount of Time (Few Minutes)
- Option for Online Backups
  - BRMS Supports Flashcopy Environment
  - Robot Save Supports Flashcopy Environment
- Full System Restricted State Backups

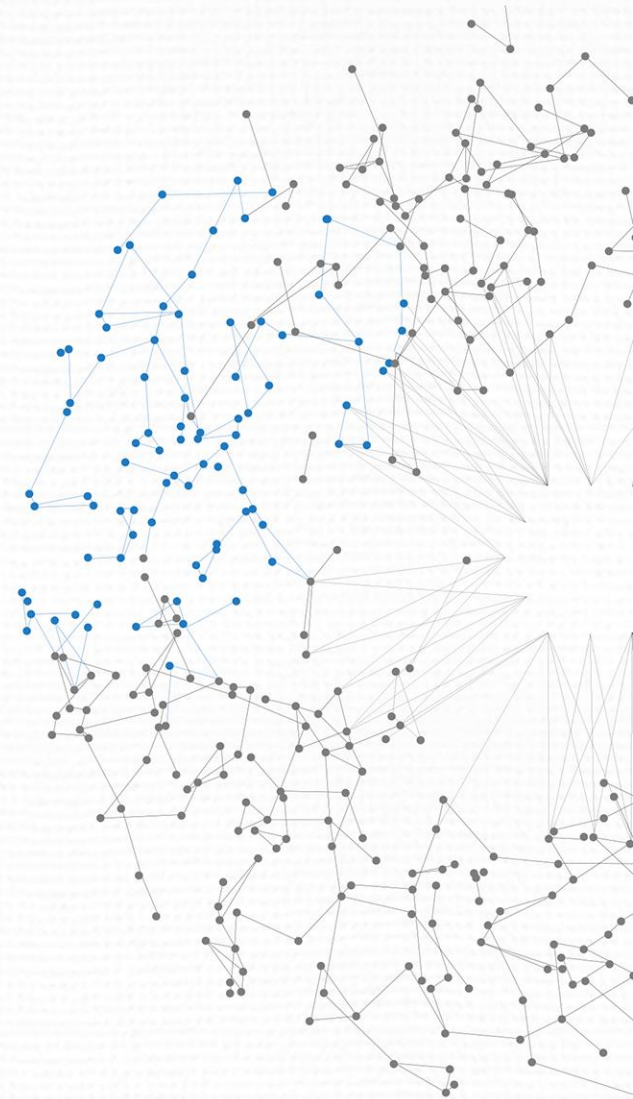




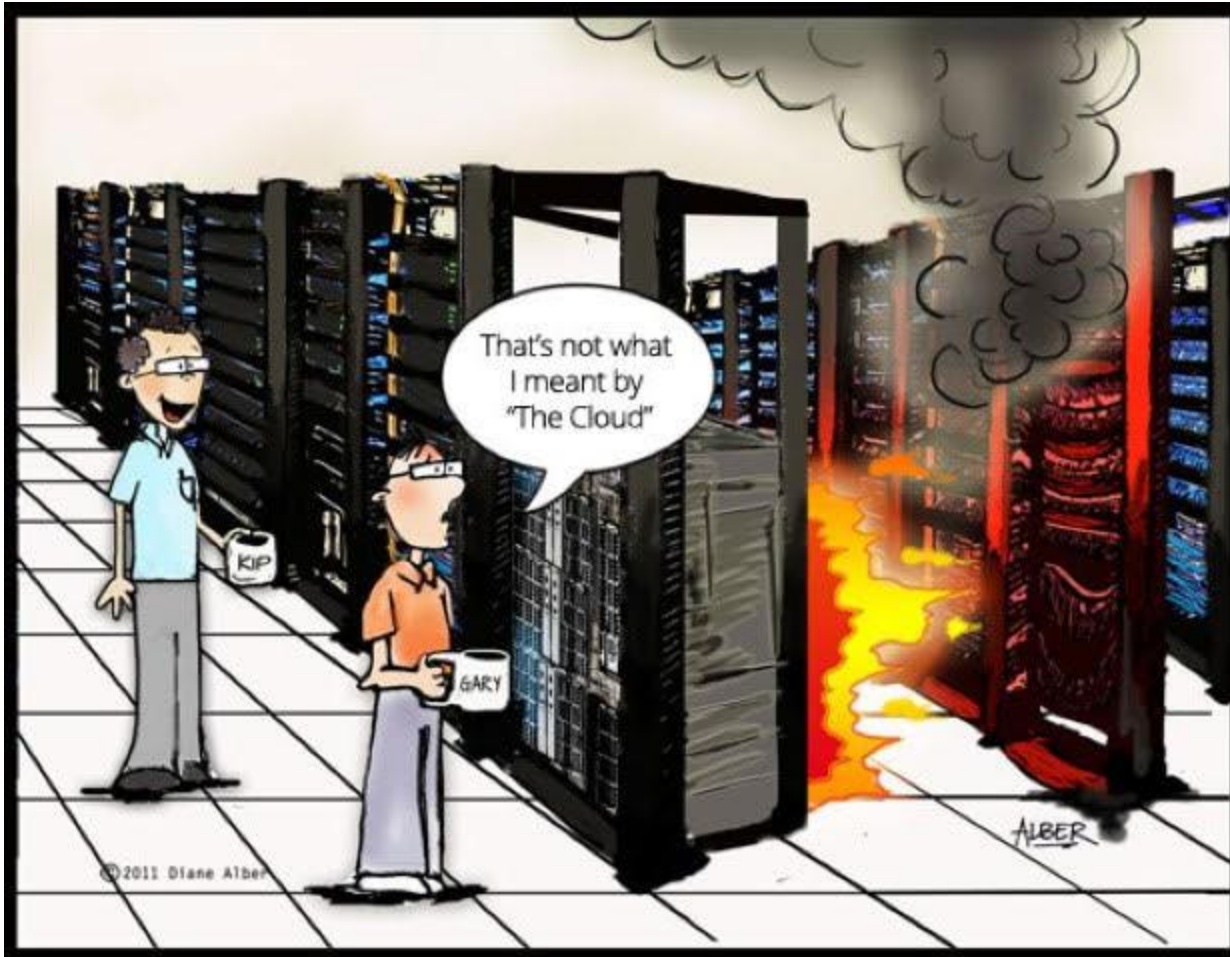
# IBM i Cloud Backup



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# IBM i Cloud Backup





# IBM i Cloud Backup

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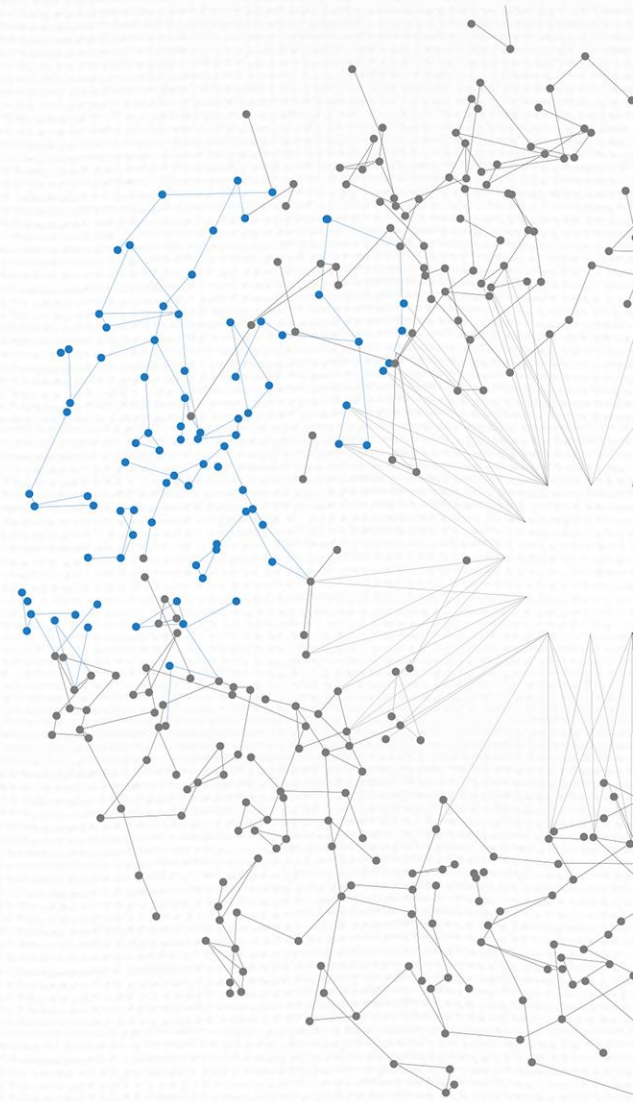
- Evault Backup
- BRMS Cloud Storage
- Virtual Tape Libraries (VTLs)



# Evault Backup



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# Evault Agent on IBM i

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- Carbonite Evault Backup Software
  - Evault Agent Installed on IBM i
  - Runs on All Supported i5/OS Versions
  - Backs Up User Data (No SAVSYS)
    - Local Vault (xSeries Server)
    - Replicate to Remote Vault (xSeries Server)
  - Encryption in Transit and on Vault Storage
  - DB2 Compression
  - Parallel and Concurrent Saves



# Evault Agent on IBM i - Advantages

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- Local Backup Copy of Data
  - Quicker Restores
  - No need to Recall Tape Media
- Reduces Need to Send Tapes Offsite
  - Eliminates 3<sup>rd</sup> Party Handling of Tape Media
  - Good for Regulations and Security
- May Improve Recovery Time Objective (RTO)
  - Backup Data Resides at Remote Site
  - No Need to Wait for Tapes to Arrive
- May Improve Recovery Point Objective (RPO)
  - Backup Data Replicated to Remote Site
  - No Need to Get Tapes to Remote Site



# Evault Agent on IBM i - Considerations

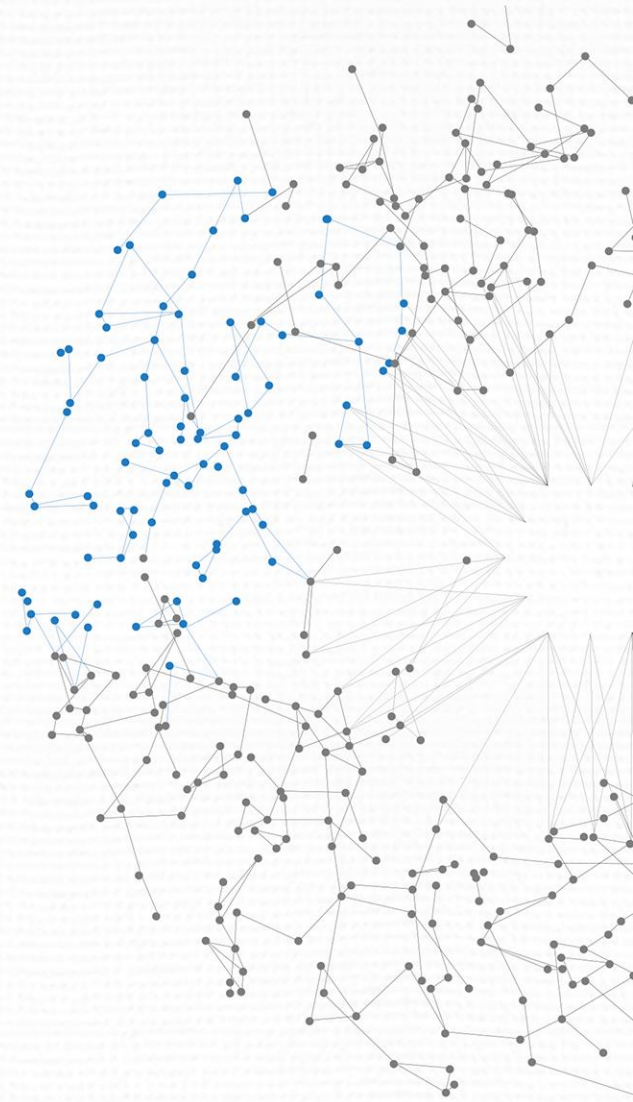
- Disaster Recovery
  - Base System Needs to be Built from Tape/DVD System Backup or a Pre-loaded System
  - Evault Agent Needs to be Installed
  - IP Connection Setup to Vault
  - Backup User Data Needs to be Restored
  - Best for Customers with 3TB or Less of Data
  - Restore Takes Longer than from Tape
    - Concurrent Restores Required
    - Access Path Rebuild Time - Due to How Data is Laid Down on Vault
- May Cost More than DRaaS with Logical Replication



# BRMS Cloud Storage



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# BRMS Cloud Storage

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- BRMS Integrated Virtual Tape Saves – Transmitted to Cloud
  - IBM Softlayer
  - AWS S3
  - IBM Cloud Object Storage Cloud Server (Cleversafe)
  - FTP to Private Server
- Software Requirements
  - Minimum i5/OS Level is 7.1
  - BRMS Base License
  - MSE SS1 Option 18
  - IBM Cloud Storage Solutions for i (Rocket Software)
    - Option 1 (\$2400 per LPAR)
    - Option 2 Compression/Encryption (\$1000 per LPAR)



# BRMS Cloud Storage - Advantages

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- Quicker File Level Restores
  - If Local Save Resides on System (Additional Disk Requirement)
  - No Need to Recall Tape Media
- Reduces Need to Send Tapes Offsite
- May Improve Recovery Time Objective (RTO)
  - Backup Data Resides at Remote Site
  - No Need to Wait for Tapes to Arrive
- May Improve Recovery Point Objective (RPO)
  - Backup Data Resides at Remote Site
  - Multiple Daily Saves of Changed Data Possible
  - No Need to Get Tapes to Remote Site

# BRMS Cloud Storage - Considerations

- Object Restore from Cloud
  - Need to Restore Entire Virtual Tape Volume
  - BRMS Virtual Volume Default is 30 GB
  - BRMS Restore to Same System Only
- Future Enhancements
  - Restore to Different System
  - Archive Support



# BRMS Cloud Storage - Considerations

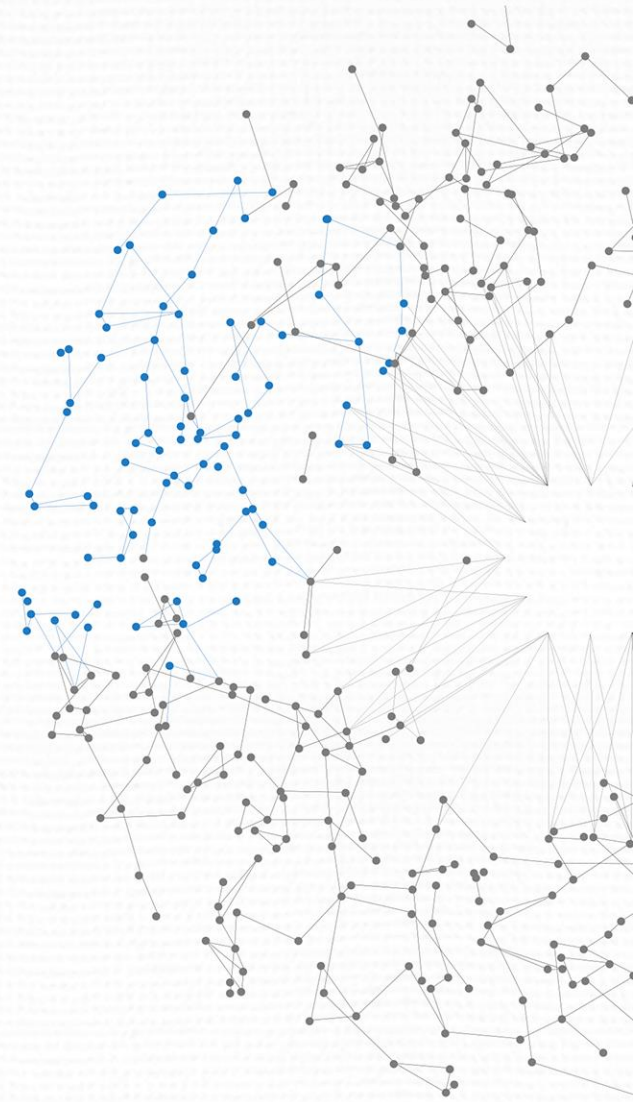
- Disaster Recovery
  - Implementation with Integrated Virtual Tape on IBM i
    - Requires Additional Disk on System for Save and Restore
    - Slower Restore Performance than Tape
  - Recovery Server Required (Co-Location or Service Provider)
  - Base System and BRMS Information Needs to be Burned to DVD from Cloud Backup or
    - Pre-loaded System in addition to
    - BRMS Information Burned to DVD from Cloud
  - Backup User Data Needs to be Restored from the Cloud
    - Download or FTP Virtual Tape Volumes to System
    - Restore from Virtual Tape Volumes on the System
- May Cost More than DRaaS with Logical Replication



# Virtual Tape Libraries (VTLs)



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# Virtual Tape Libraries (VTLs)

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- Virtual tape library (VTL)
- Emulates IBM i tape devices
- Disk-to-disk backups
- Create tape volumes for backup
- VTL-to-VTL replication with encryption
- Create physical tapes with encryption

## VTL

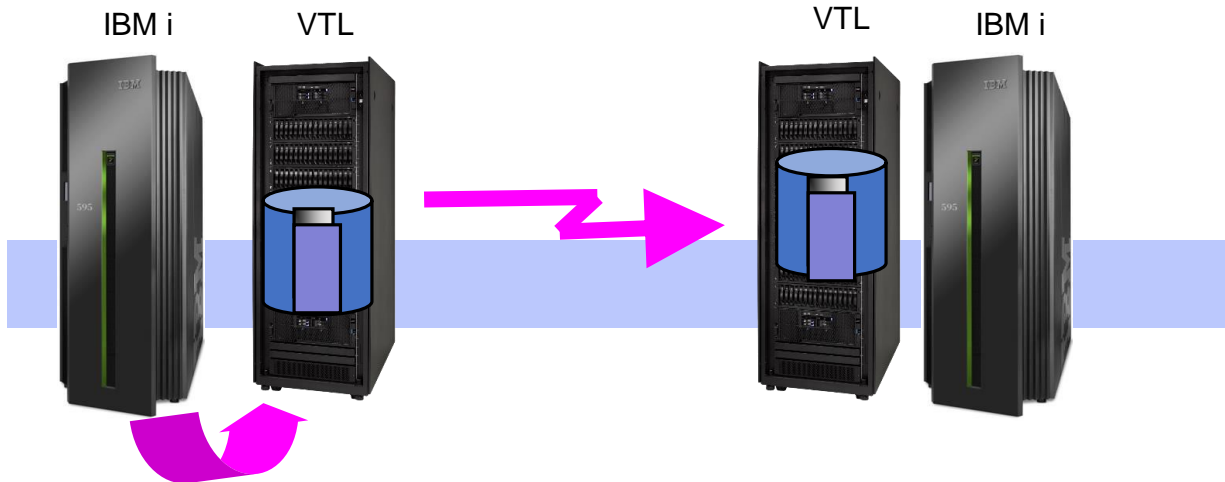
n. (Virtual Tape Library) a data storage virtualization technology used typically for backup and recovery purposes. A VTL presents a storage component (usually hard disk storage) as tape libraries or tape drives for use with existing backup software.

source: Wikipedia

# Virtual Tape Libraries on IBM i – Where Do They Fit?

## Virtual Tape Library – IP Replication

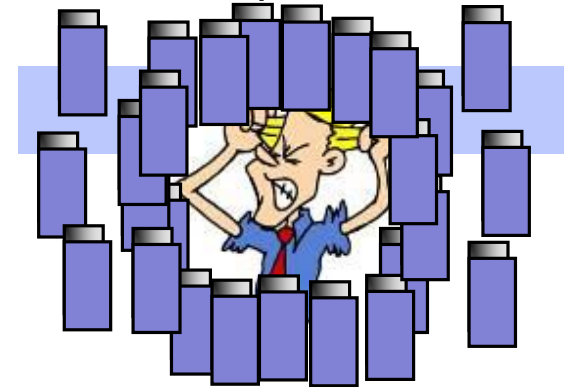
For customers who are moving their tapes offsite via truck today and would like a safer, more automated solution



Note: If the customer already has an HA/DR solution that replicates his data to his remote site, then that will likely provide a more economical solution for remote tape:

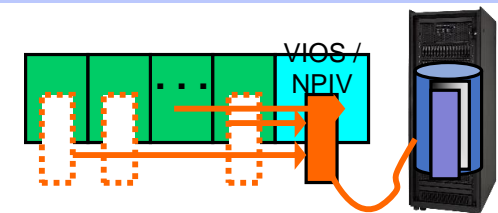
- IBM i Software-based Logical Replication (eg ROBOT HA, MIMIX, iTera, QuickEDD, etc)
- External Disk Copy Services
- IBM i Geographic Mirroring

## Tired of Handling Tapes?



## Tiny LPARs

For customers where a tape cartridge is much bigger than needed






# Virtual Tape Libraries (VTLs) - Advantages

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- Quicker File Level Restores
  - Local Save Resides on Local VTL
  - No Need to Recall Tape Media
- Eliminates Need to Send Tapes Offsite
  - Entire System Save is Replicated to Remote VTL
- May Improve Recovery Time Objective (RTO)
  - Backup Data Resides at Remote Site
  - No Need to Wait for Tapes to Arrive
- May Improve Recovery Point Objective (RPO)
  - Backup Data Resides at Remote Site
  - No Need to Get Tapes to Remote Site





# Virtual Tape Libraries (VTLs) - Considerations

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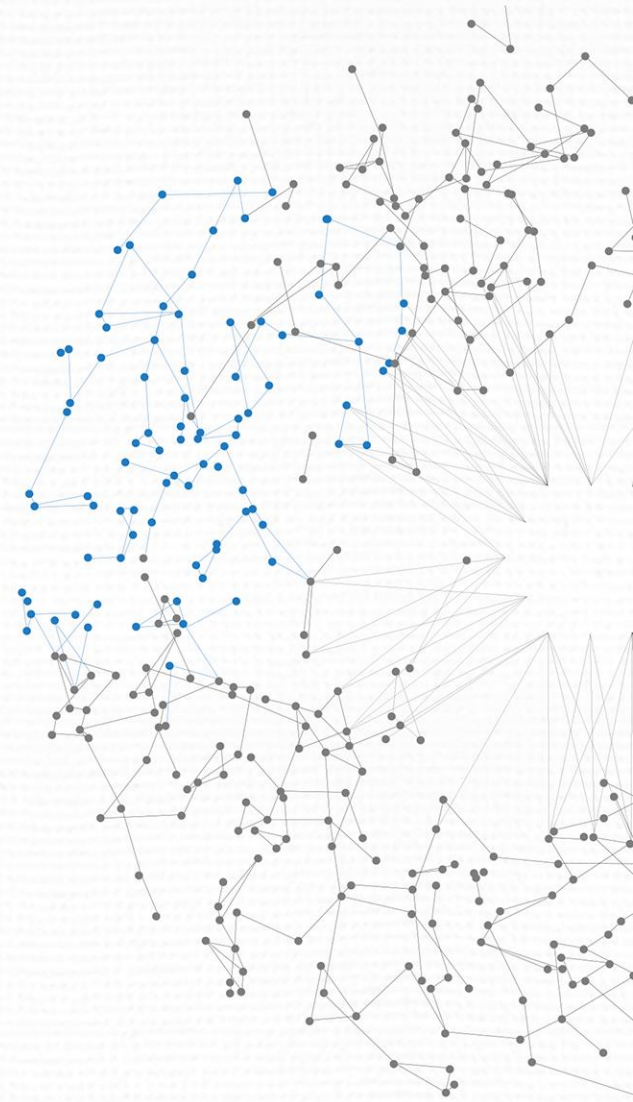
- Performance
  - Parallel Saves with BRMS to Achieve Physical Tape Speeds
  - No Cost for Additional Virtual Tape Drives
- Bandwidth for Replicating Saves
- Disaster Recovery
  - Local and Remote VTL Required for Disaster Recovery
  - Entire System Recovered from VTL at Remote Site
- May Cost More than DRaaS Logical Replication



# IBM i Cloud Replication



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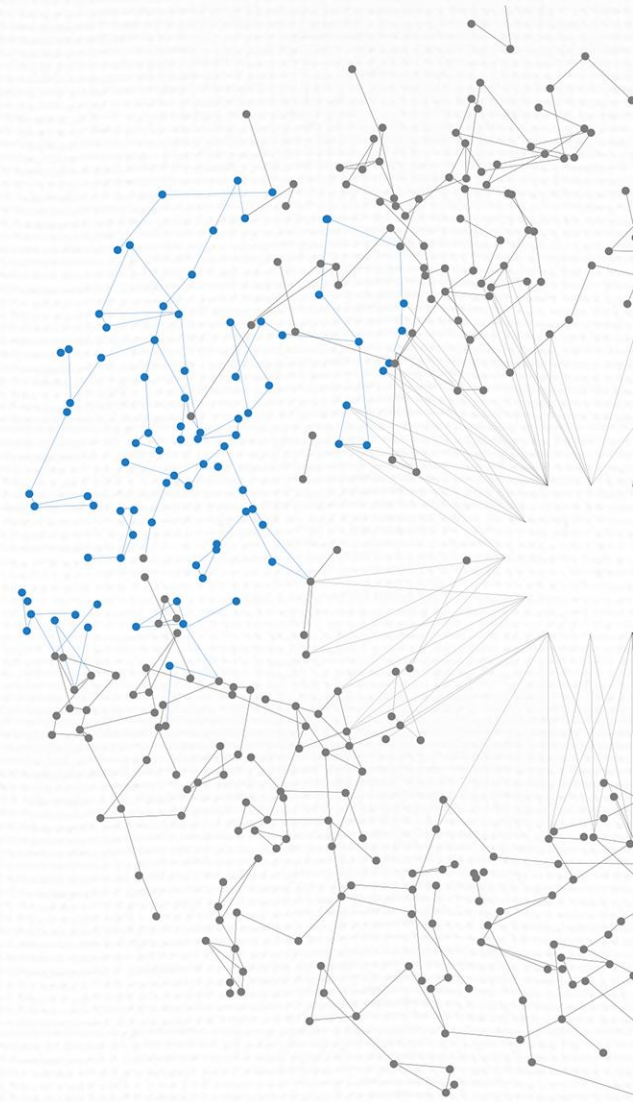




# IBM i Logical Replication

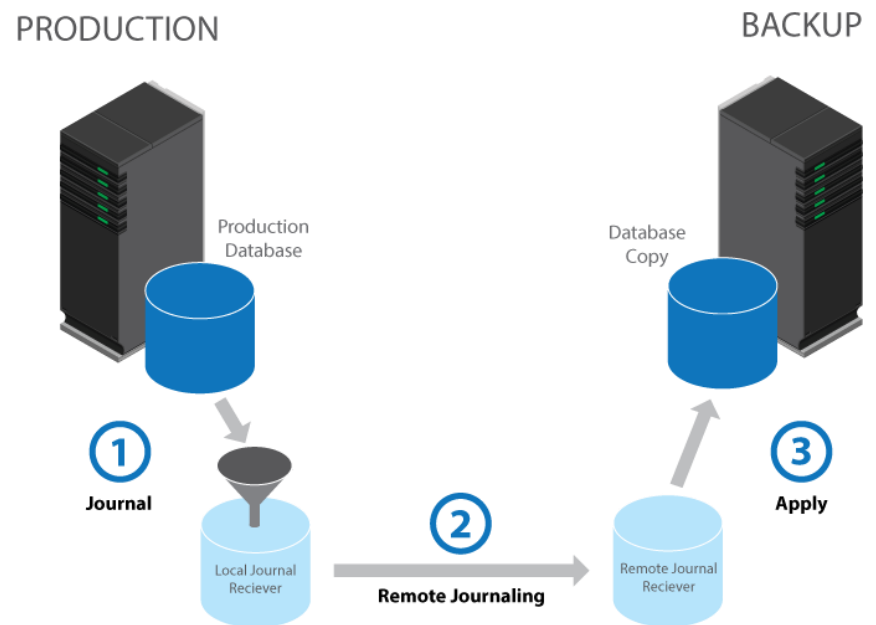


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# IBM i Logical Replication

- Software based logical replication
- Remote journaling
  - PFs, data queues, data areas, IFS
  - Real-time
- Save API
  - All other object types
  - Interval-oriented
- User defines the rules
- IFS and library objects
- Can use CBU, second box or DRaaS



*Image credit: Glenn Robinson, RSI Consulting*

# IBM i Logical Replication - Advantages

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- Faster activation of target system
  - No IPL or IASP vary-on required to switch
- Works with any disks
- Works across different levels of IBM hardware and software installations
- Replicated data can be used for other reasons like business intelligence (BI)
- Requires less bandwidth than hardware replication
- Provides granular control of data/objects/settings to be replicated
- Offers flexible configuration for multi-site and multi-partition replication
- Backups on secondary system

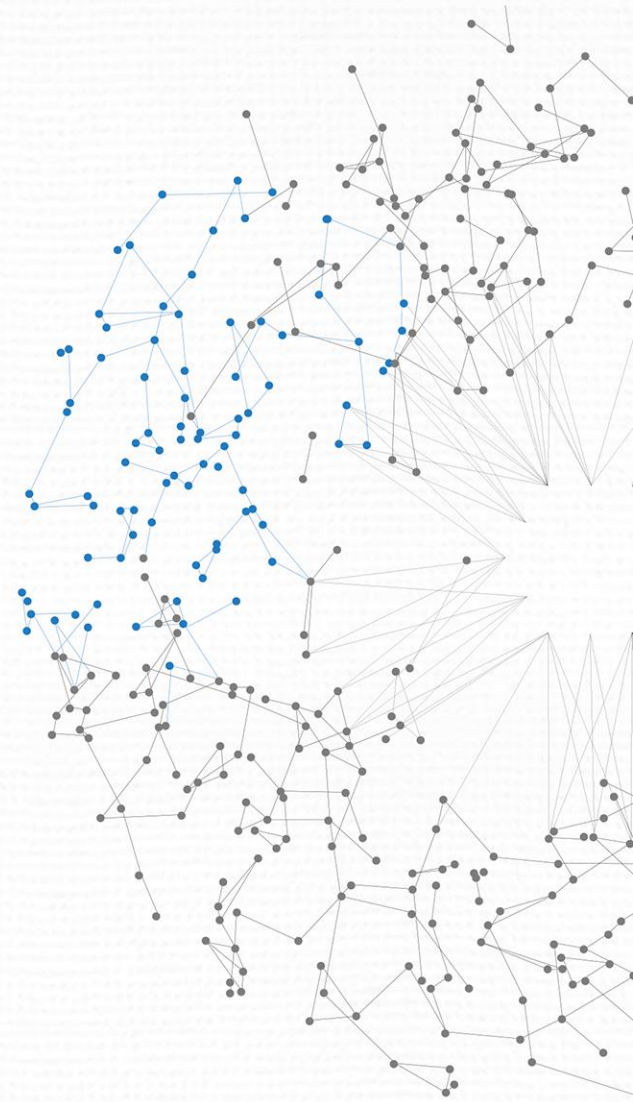




# IBM i Hardware Replication



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# IBM i Hardware Replication - PowerHA Diagram

- Hardware-based
- Objects in IASP
- Requires IASP
- Target IASP is not live
- Admin Domain is software for user profiles

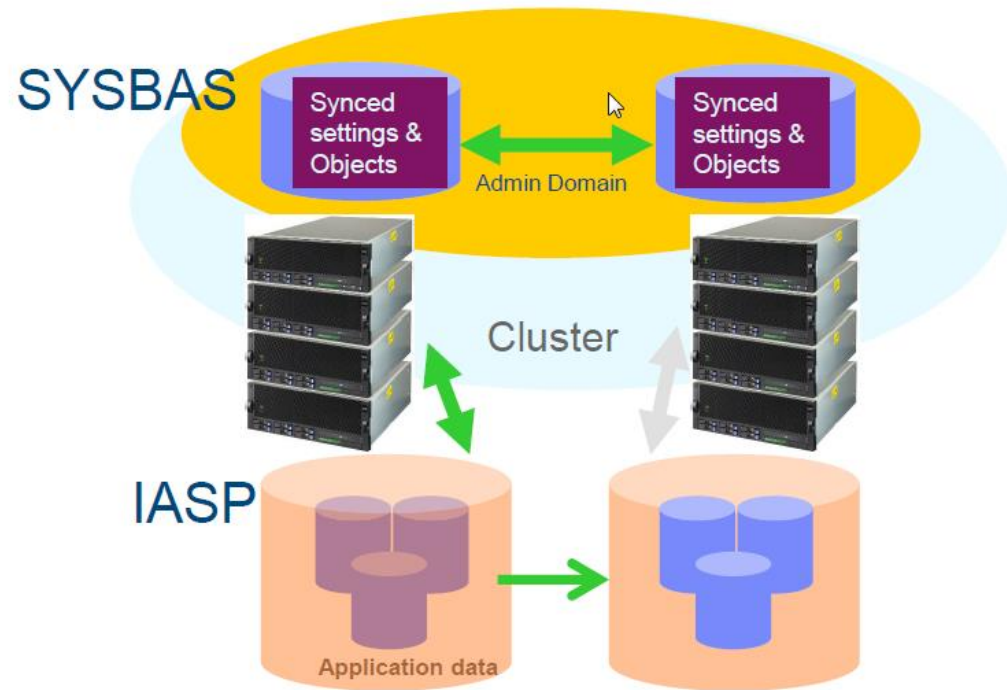


Image credit: Laural Bauer, IBM

# IBM i Hardware Replication - PowerHA Flavors

- Geographic Mirroring
  - Internal Disk and IASP
  - Synchronous or Asynchronous
- Global Mirror
  - SAN with IASP Asynchronous
- Metro Mirror
  - SAN with IASP Synchronous
  - 30 Kilometer or less distance
- LUN Level Switch
  - 1 SAN shared by 2 IBM i Servers in same data center
  - IASP
- Hyper Swap LUN Level Switch
  - 2 SAN and 2 IBM i Servers
  - Same Data Center or Less than 30 KM
  - IASP
- LUN Level Switch plus Global Mirror
  - Combines LUN Level with Global Mirror
  - SAN and IASP



# IBM i Hardware Replication - Advantages

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- Any object added to IASP is replicated
- Faster role swaps
- Less monitoring
- Other advantages like FlashCopy for Backups with IBM storage area networks (SAN)

# Disaster Recovery as a Service (DRaaS)



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# Disaster Recovery as a Service (DRaaS)

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- Subscription based recovery service
- Disaster Recovery (DR) in the cloud
- Alternative to having your own targeted/hot site server

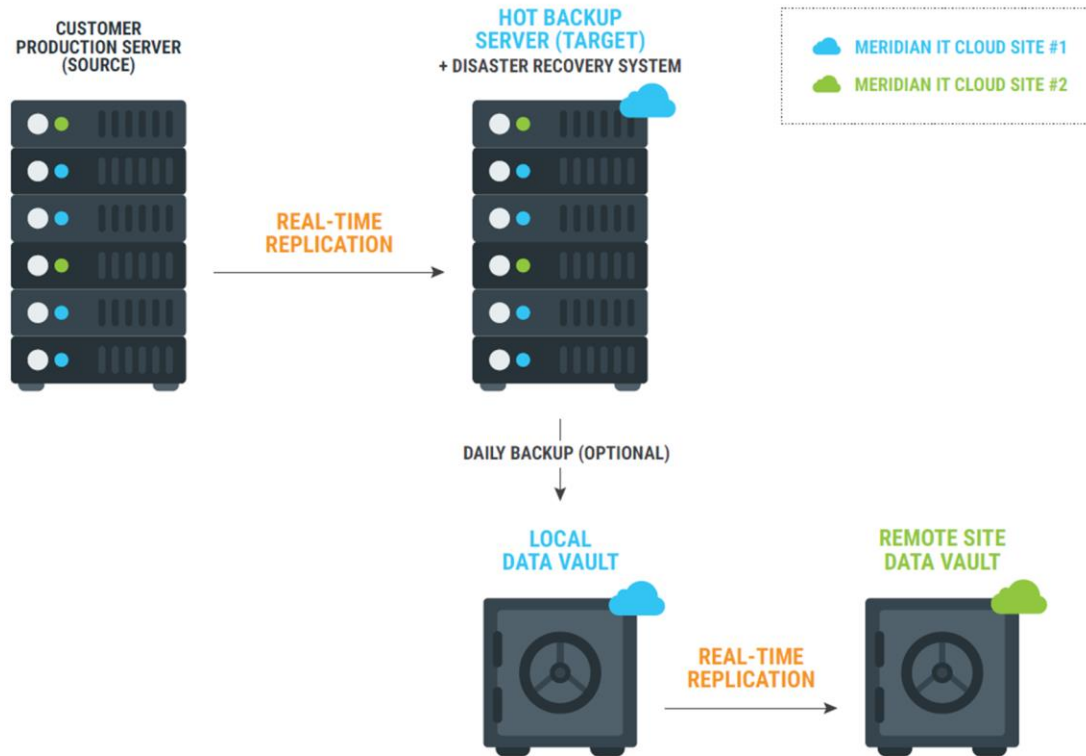
*Disaster recovery as a service (DRaaS) is the replication and hosting of physical or virtual servers by a third party to provide failover in the event of a man-made or natural catastrophe.*

# Disaster Recovery as a Services (DRaaS)

- What Does Draas Include?
  - HA to Cloud
  - Backups in the Cloud
  - Monitoring of the servers
  - Testing/role swaps



# Disaster Recovery as a Service (DRaaS)



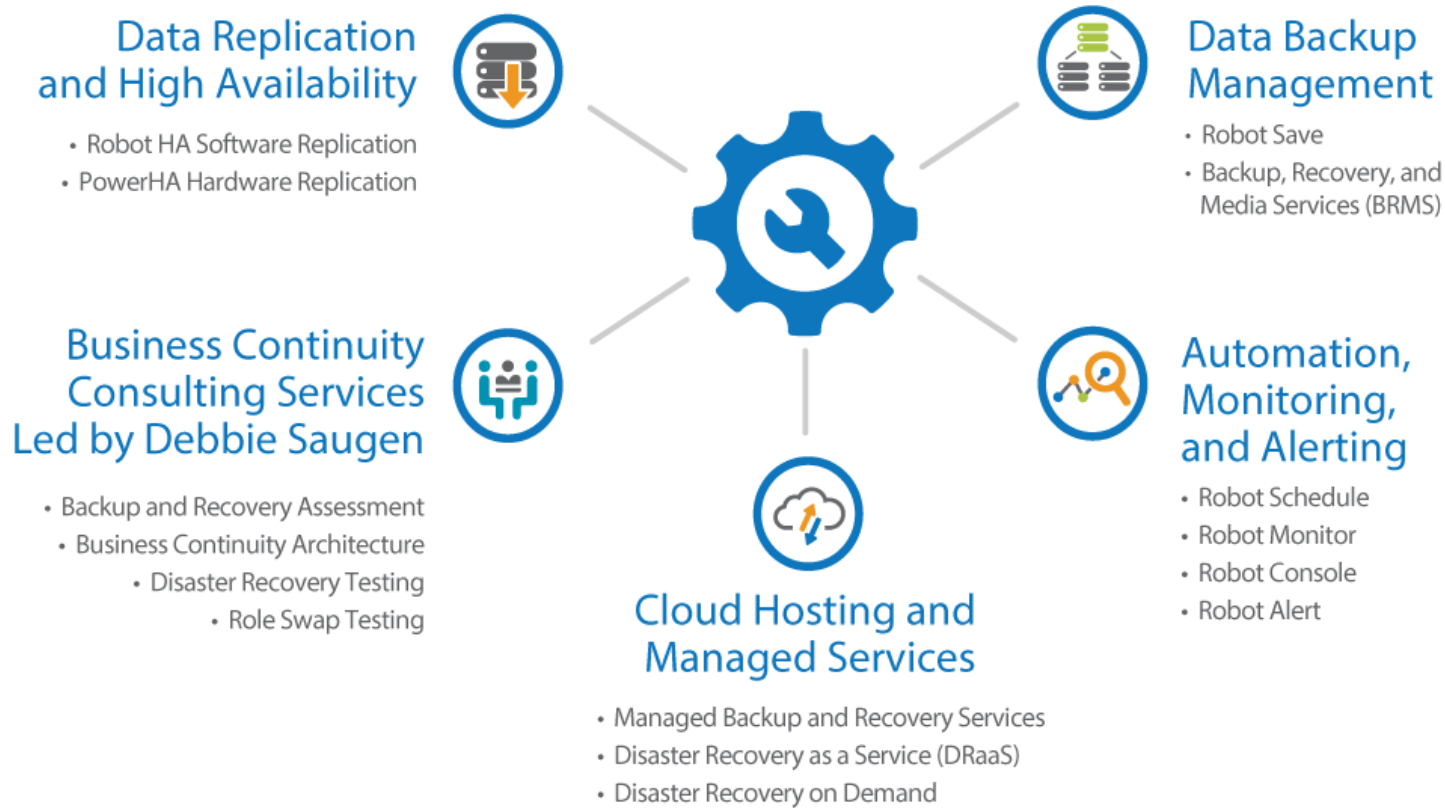


# Disaster Recovery as a Service - Advantages

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- They have done it before
- Experts on the IBM i platform
- Experts on remote journaling or hardware replication
- Experts on IBM i backup and recovery
- Enterprise level solution for all customers

# Business Continuity Solutions for IBM i



# IBM i Disaster Strikes

If disaster strikes and you still don't have a plan.....





# Disaster Recovery Story Time

Real life stories.....

