

IBM MQ Disaster Recovery

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Introduction

- Availability is a very large subject
- You can have the best technology in the world, but you have to manage it correctly
- Technology is not a substitute for good planning and testing!

What is DR – Wikipedia Version

- Disaster recovery is the process, policies and procedures related to preparing for recovery or continuation of technology infrastructure critical to an organization after a natural or human-induced disaster. Disaster recovery is a subset of business continuity. While business continuity involves planning for keeping all aspects of a business functioning in the midst of disruptive events, disaster recovery focuses on the IT or technology systems that support business functions.

What is DR

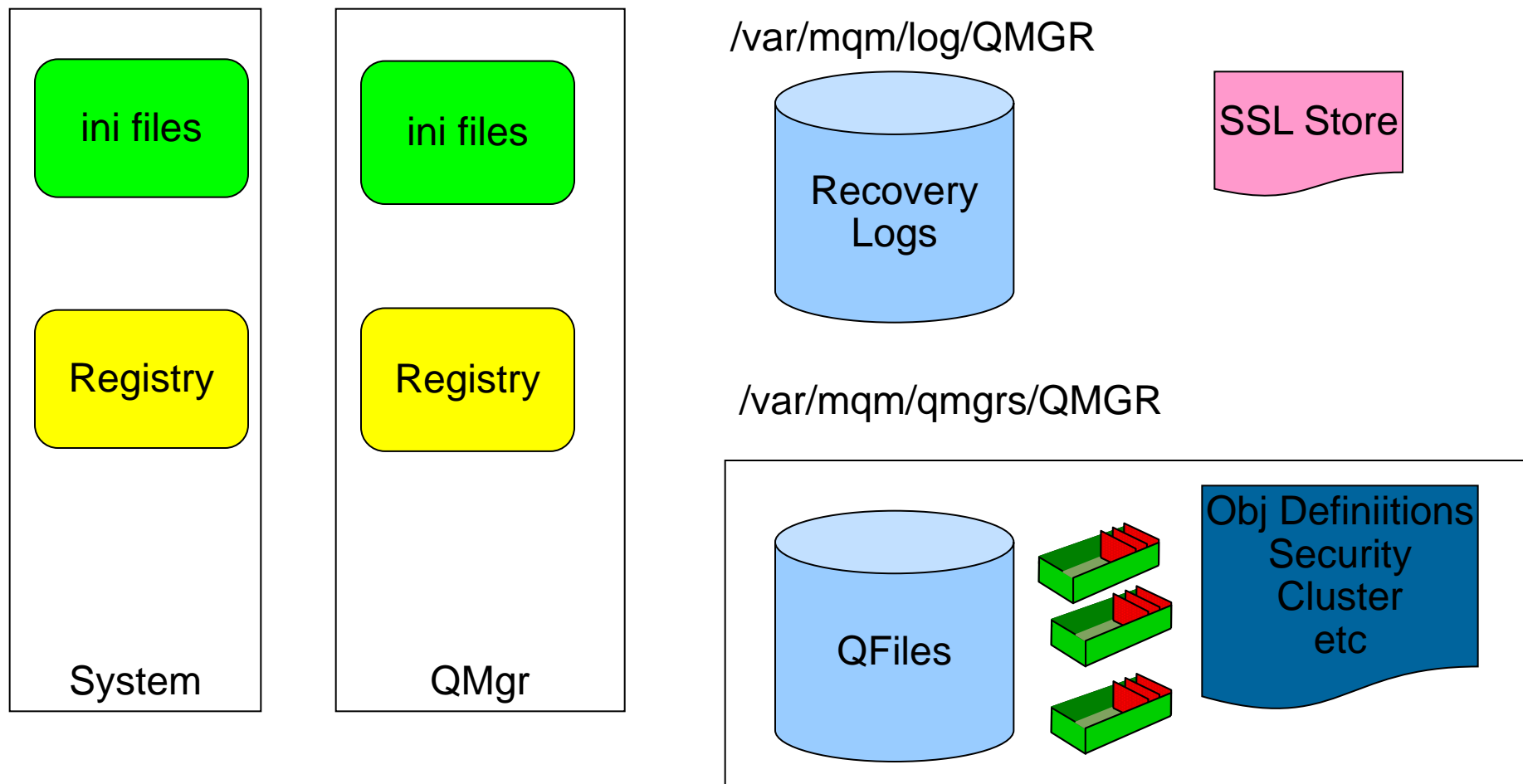
- Getting applications running after a major (often whole-site) failure or loss
- It is not about High Availability although often the two are related and share design and implementation choices
 - “HA is having 2, DR is having them a long way apart”
 - More seriously, HA is about keeping things running, while DR is about recovering when HA has failed.
- Requirements driven by business, and often by regulators
 - Data integrity, timescales, geography ...
- One major decision point: cost
 - How much does DR cost you, even if it's never used?
 - How much are you prepared to lose

Disaster Recovery vs High Availability

- Designs for HA typically involve a single site for each component of the overall architecture
- Designs for DR typically involve separate sites
- Designs for HA (and CA) typically require no data loss
- Designs for DR typically can have limited data loss
- Designs for HA typically involve high-speed takeover
- Designs for DR typically can permit several hours down-time

Local Recovery

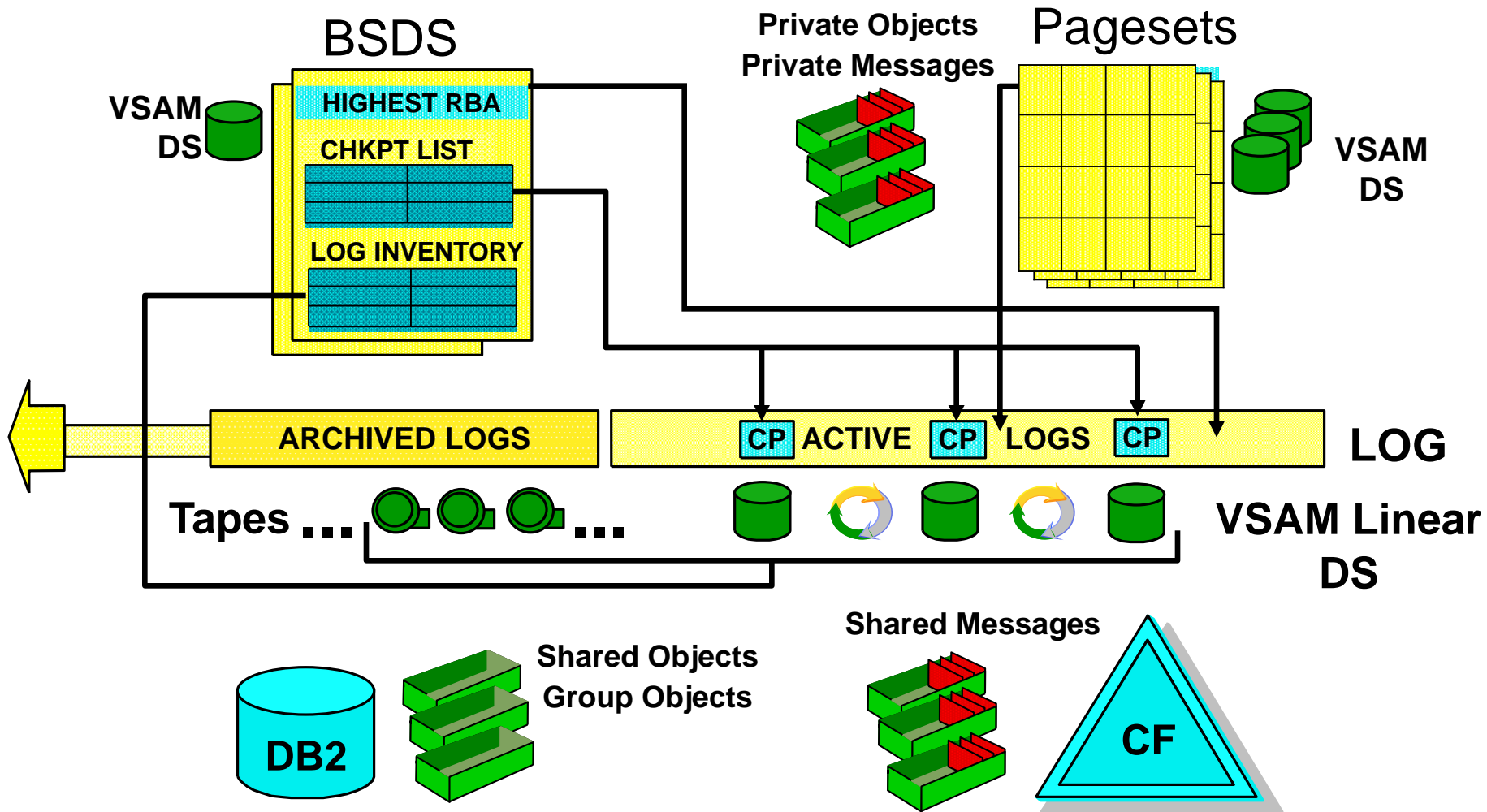
What makes a Queue Manager on Dist?



Backups

- At minimum, backup definitions at regular intervals
 - Include ini files and security settings
- One view is there is no point to backing up messages
 - They will be obsolete if they ever need to be restored
 - Distributed platforms – data backup only possible when qmgr stopped
- Use rcdmqimg on Distributed platforms to take images
 - Channel sync information is recovered even for circular logs
- Backup everything before upgrading code levels
 - On Distributed, you cannot go back
- Exclude queue manager data from normal system backups
 - Some backup products interfere with MQ processing

What makes a Queue Manager on z/OS?



What makes up a Queue Manager?

- Queue manager started task procedure
 - Specifies MQ libraries to use, location of BSDS and pagesets and INP1, INP2 members start up processing
- System Parameter Module – zParm
 - Configuration settings for logging, trace and connection environments for MQ
- BSDS: Vital for Queue Manager start up
 - Contains info about log RBAs, checkpoint information and log dataset names
- Active and Archive Logs: Vital for Queue Manager start up
 - Contain records of all recoverable activity performed by the Queue Manager
- Pagesets
 - Updates made “lazily” and brought “up to date” from logs during restart
 - Start up with an old pageset (restored backup) is not really any different from start up after queue manager failure
 - Backup needs to copy page 0 of pageset first (don’t do volume backup!)
- DB2 Configuration information & Group Object Definitions
- Coupling Facility Structures
 - Hold QSG control information and MQ messages

Backing Up a z/OS Queue Manager

- Keep copies of ZPARM, MSTR procedure, product datasets and INP1/INP2 members
- Use dual BSDS, dual active and dual archive logs
- Take backups of your pagesets
 - This can be done while the queue manager is running (fuzzy backups)
 - Make sure you backup Page 0 first, REPRO or ADRDSSU logical copy
- DB2 data should be backed up as part of the DB2 backup procedures
- CF application structures should be backed up on a regular basis
 - These are made in the logs of the queue manager where the backup was issued

Rebuilding a Queue Manager

- Make sure you have a backup of the definitions
 - Either through a tool such as Omegamon Configuration Manager
 - Or by manually creating the backup – MAKEDEF, dmpmqcfg or MS03
- Make sure you know which version of MQ is installed
 - And you have the install images for the code
- Make sure you've got the security configuration
 - Windows SIDs?
- Also any customisation in the qm.ini file (or registry)
- And sometimes exits might have external configuration
 - Don't forget to have the binaries available - often separately installed

Rebuilding a Queue Manager

- A rebuild creates a replacement queue manager
 - Same object definitions
 - But loss of message data and channel sequence numbers
- Replacement queue manager has a new QMID
 - MQ Explorer saves QMID in its list of known queue managers
 - Will allow you to connect, but requires confirmation that the new qmid is expected
- Recommend issuing RESET CLUSTER at full repository to remove the old QMID before bringing the replacement online

Remote Recovery

Topologies

- Sometimes a data centre is kept PURELY as the DR site
- Sometimes 2 data centres are in daily use; back each other up for disasters
 - Normal workload distributed to the 2 sites
 - These sites are probably geographically distant
- Another variation has 2 data centres “near” each other
 - Often synchronous replication
 - With a 3rd site providing a long-distance backup
 - "Tornados never hit two sites 10 miles apart so we only use nearby backup site"
- And of course further variations and combinations of these

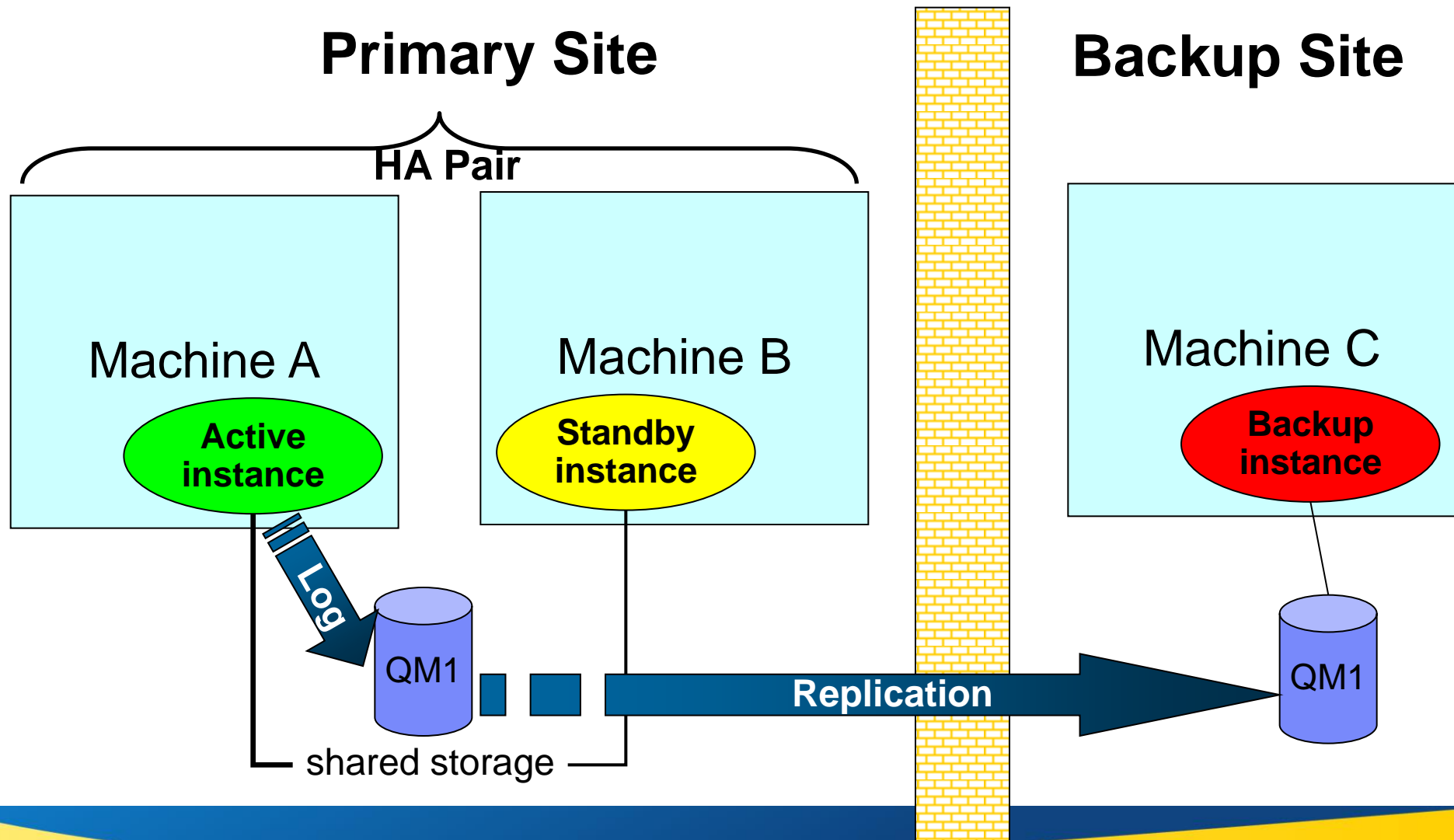
Queue Manager Connections

- DR topologies have little difference for individual queue managers
- But they do affect overall design
 - Where do applications connect to
 - How are messages routed
- Clients need CIntConn definitions that reach any machine
- Will be affected by how you manage network
 - Do DNS names move with the site?
 - Do IP addresses move with the site?
- Some sites always put IP addresses in CONNAME; others use hostname
 - No rule on which is better

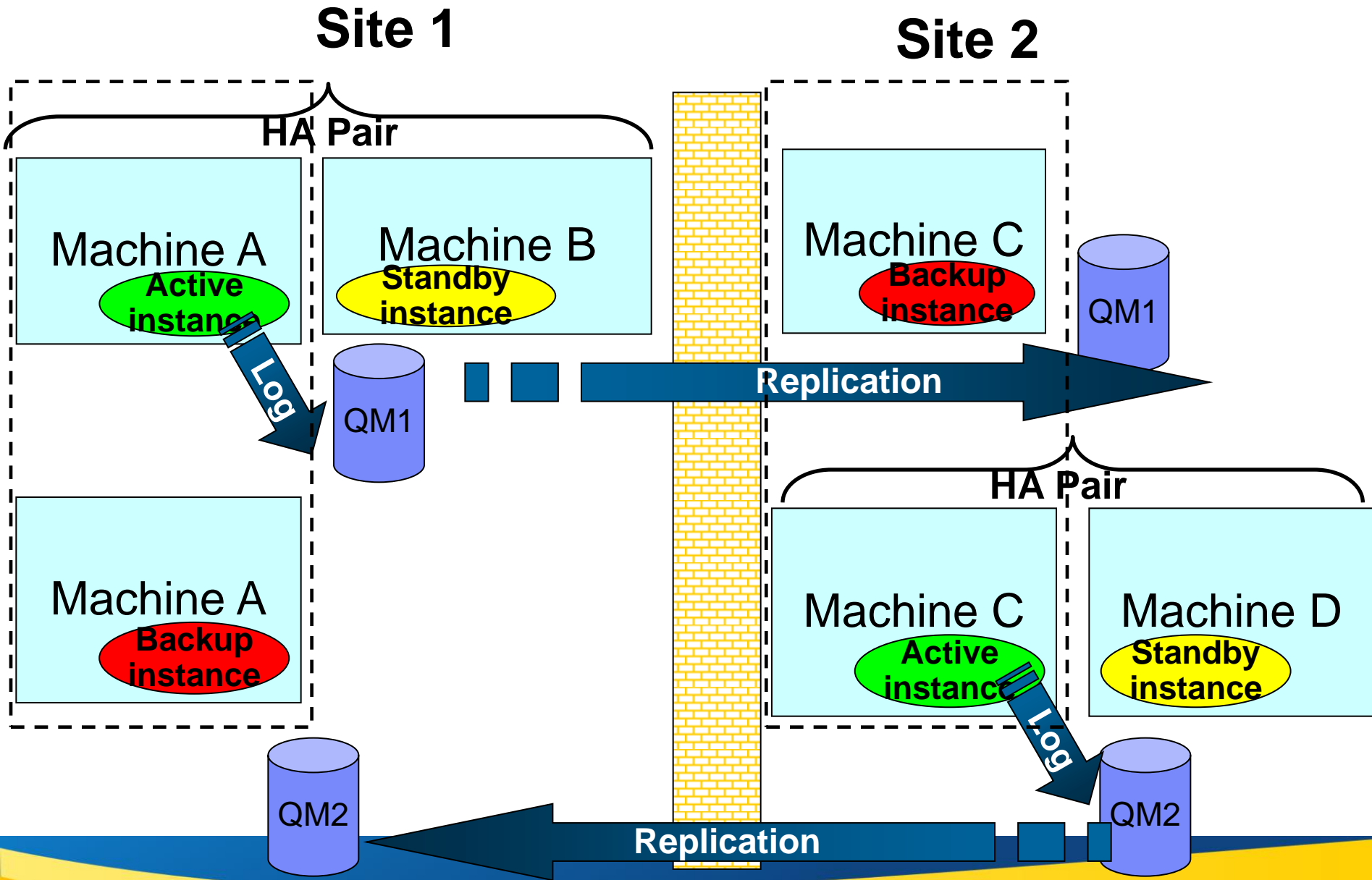
Disk replication

- Disk replication can be used for MQ disaster recovery
- Either synchronous or asynchronous disk replication is OK
 - Synchronous:
 - No data loss if disaster occurs
 - Performance is impacted by replication delay
 - Limited by distance (eg 100km)
 - Asynchronous:
 - Some limited data loss if disaster occurs
 - It is critical that queue manager data and logs are replicated in the same consistency group if replicating both
- Disk replication cannot be used between the active and standby instances of a multi-instance queue manager
 - Could be used to replicate to a DR site in addition though

Combining HA and DR



Combining HA and DR – “Active/Active”



More about disk replication

- During failover, need to stop disk replication and make backup disks live
 - This is probably the most time-consuming piece
 - Both for HA and DR, managing disks is critical path
 - Will probably be replicating data for all resource managers, not just MQ
- Configuration variation:
 - A local disk-only synchronous replica
 - A remote full datacentre using async replication chained from primary
 - If primary fails, the local replica can still bring the backup site up-to-date



Backup Queue Manager - Objective

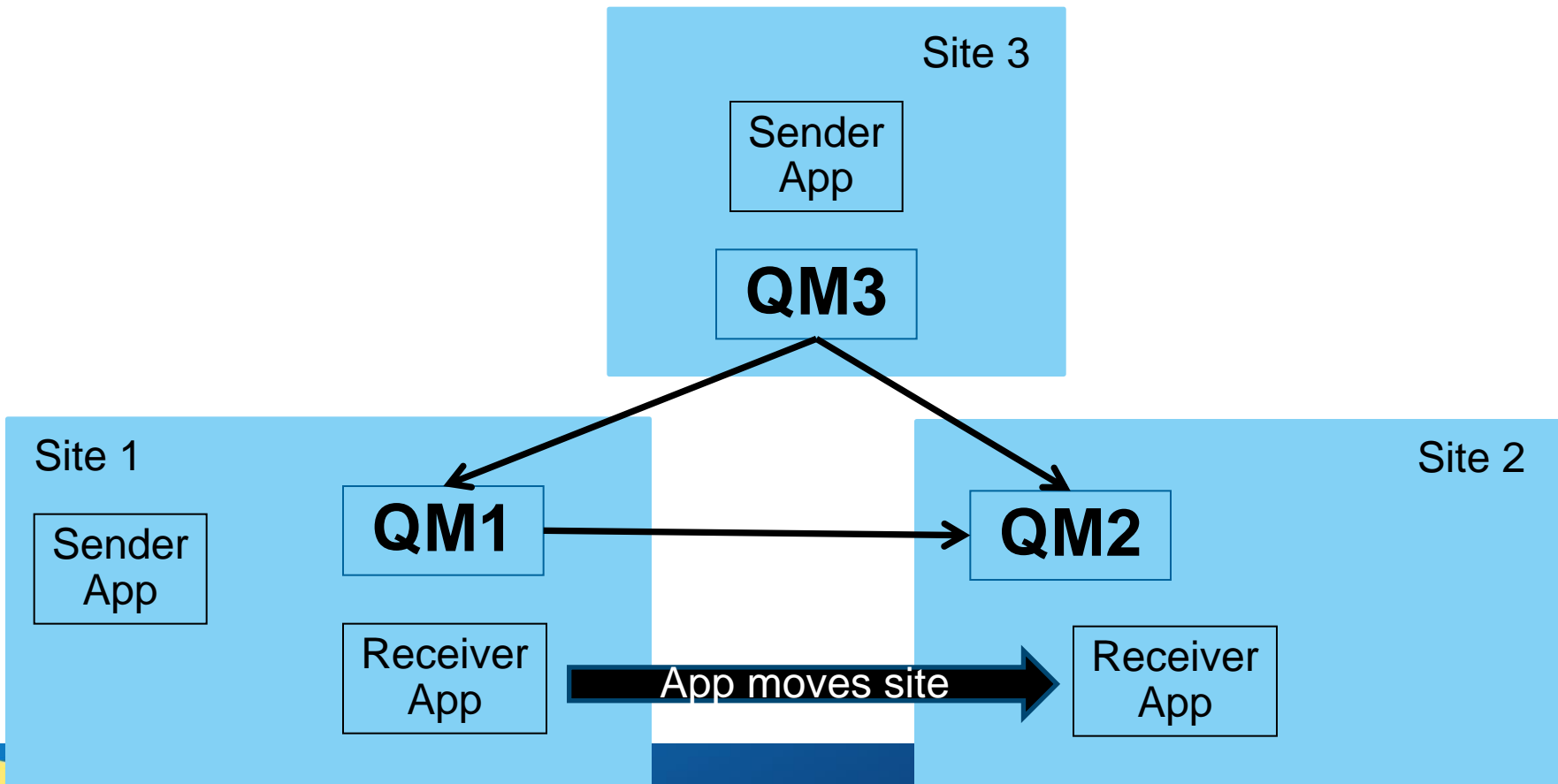
- Feature introduced in MQ V6
- Prepares a queue manager for restart/recovery
 - Without needing to replay all logs at a critical time
 - For Windows, Unix and System i
- “Backup” queue manager takes the place of original
 - New QMID but contains original definitions and messages

Backup Queue Manager - Procedure

- Configure queue manager with linear logging
- Create a queue manager at the primary site
 - Create an identical one at the DR site – the backup queue manager
- Ship full, inactive log files from active QM to the DR site
 - Can use disk replication to do this, but disks have to be mounted
 - No need to replicate qfiles
 - Or modify SupportPac or sample programs for log management to copy files at the same time as deleting/archiving local logs
- Replay log files on the backup QM to bring it up to date
 - Do this at regular intervals
 - `strmqm -r`
- If disaster occurs, activate the backup queue manager
 - `strmqm -a`
- For more control, can force filling of current log file
 - `MQSC RESET QMGR TYPE(ADVANCELOG)`

A non-DR DR configuration

- Based on a real customer scenario: different qmgrs in different sites
- Regular deliberate partial failovers of apps and/or qmgrs
- Recommended MQ clusters: "marooned" messages allowed for this design



Integration with other products

- May want to have consistency with other data resources
 - For example, databases and app servers
- Only way for guaranteed consistency is disk replication where all logs are in same group
 - Otherwise transactional state might be out of sync
- DB2 can use MQ as part of its own replication strategy
 - InfoSphere Replication Server

Planning and Testing

Planning for Recovery

- Write a DR plan
 - Document everything – to tedious levels of detail
 - Include actual commands, not just a description of the operation
 - Not “Stop MQ”, but “as mqm, run /usr/local/bin/stopmq.sh US.PROD.01”
- And test it frequently
 - Recommend twice a year
 - Record time taken for each task
- Remember that the person executing the plan in a real emergency might be under-skilled and over-pressured
 - Plan for no access to phones, email, online docs ...
- Each test is likely to show something you’ve forgotten
 - Update the plan to match
 - You’re likely to have new applications, hardware, software ...
- May have different plans for different disaster scenarios

Example Exercises from MQ Development

- Different groups have different activities that must continue
 - Realistic scenarios can help show what might not be available
- From the MQ development lab ...
- Most of the change team were told there was a virulent disease and they had to work from home
 - Could they continue to support customers
- If Hursley machine room was taken out by a plane missing its landing at Southampton airport
 - Could we carry on developing the MQ product
 - Source code libraries, build machines, test machines ...
 - Could fixes be produced
- (A common one) Someone hit emergency power-off button
- Not just paper exercises

Networking Considerations

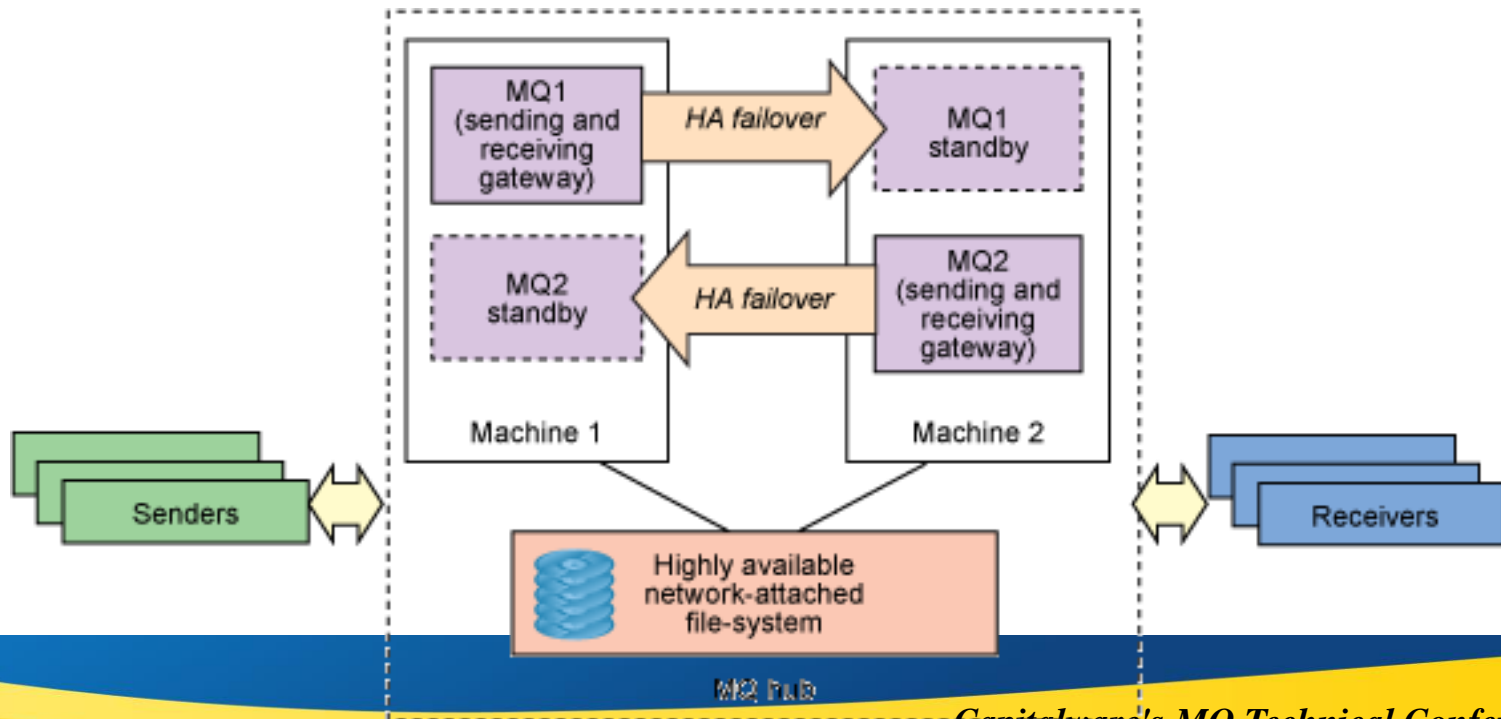
- DNS - You will probably redirect hostnames to a new site
 - But keep the same IP addresses? Consider NAT for routing to external partners?
 - Affects CONNAME
- Include external organisations in your testing
 - 3rd parties may have firewalls that do not recognize your DR servers
- LOCLADDR configuration
 - Not normally used by MQ, but firewalls, IPT and channel exits may inspect it
 - May need modification if a machine changes address
- Clustering needs special consideration
 - Easy to accidentally join the real cluster and start stealing messages
 - Ideally keep network separated, but can help by:
 - Not giving backup 'live' security certs
 - Not starting chinit address space (z/OS)
 - Not allowing channel initiators to start (distributed)
 - Use CHLAUTH rules
- Backup will be out of sync with the cluster
 - REFRESH CLUSTER() resolves updates

A Real MQ Network Story

- Customer did an IP move during a DR test
- Forgot to do the IP move back when they returned to prime systems
- Didn't have monitoring in place that picked this up until users complained about lack of response

Application Patterns for availability

- Article describing examples of how to build a hub topology supporting:
 - Continuous availability to send MQ messages, with no single point of failure
 - Linear horizontal scale of throughput, for both MQ and the attaching applications
 - Exactly once delivery, with high availability of individual persistent messages
 - Three messaging styles: Request/response, fire-and-forget, and pub/sub
- http://www.ibm.com/developerworks/websphere/library/techarticles/1303_broadhurst/1303_broadhurst.html



Other Resources

- Applications may need to deal with replay or loss of data.
 - Decide whether to clear queues down to a known state, or enough information elsewhere to manage replays
- Order of recovery may change with different product releases
 - Every time you install a new version of a product revisit your DR plan
- What do you really need to recover
 - DR site might be lower-power than primary site
 - Some apps might not be critical to the business
 - But some might be unrecognised prereqs

If a Real Disaster Hits

- Hopefully you never need it. But if the worst happens:
- Follow your tested plan
 - Don't try shortcuts
- But also, if possible:
 - Get someone to take notes and keep track of the time tasks took
 - Prepare to attend post mortem meetings on steps you took to recover
 - Accept all offers of assistance
- And afterwards:
 - Update your plan for the next time

Summary

- Various ways of recovering queue managers
- Plan what you need to recover for MQ
- Plan the relationship with other resources
- Test your plan

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