

VMware ESX with CLARiiON Best Practices



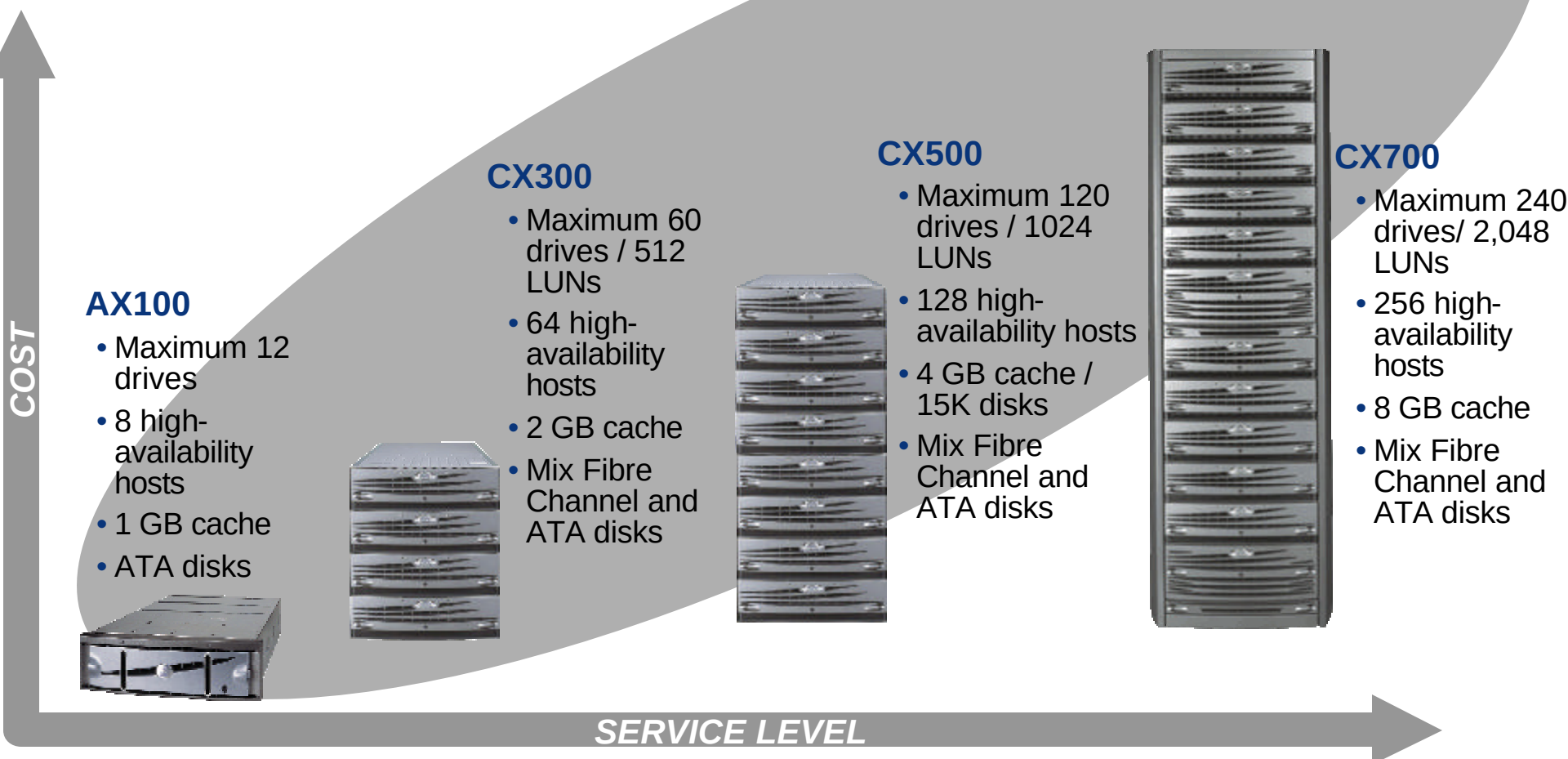
Sheetal Kochavara

Agenda

- Quick Level-set on CLARiiON and VMware
- Best practices for implementing CLARiiON and VMware ESX 2.5.x
 - Migration
 - Connectivity
 - Performance
 - Replication
- ESX 3.0 update with CLARiiON
- Case Study: Customer consolidation

EMC CLARiiON Hardware Series

Affordable, Easy-to-Use Networked Storage

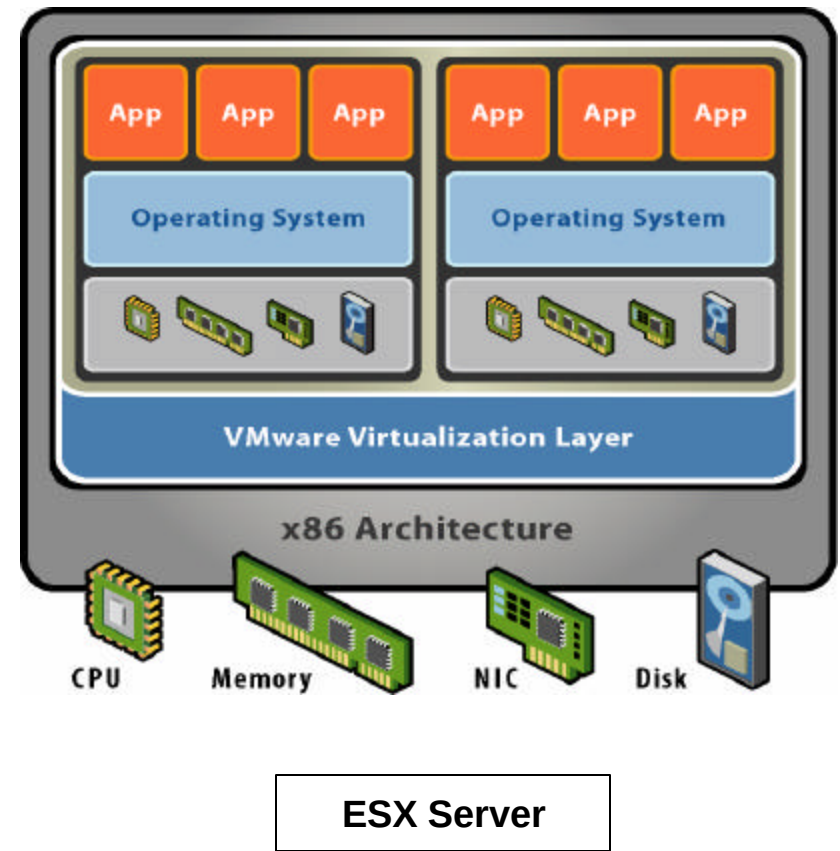


CLARiiON Software

- CLARiiON Virtual LUN Technology
 - CLARiiON metaLUNs
 - CLARiiON LUN Migration
- CLARiiON Replication Products
 - SnapView – Local replicas
 - MirrorView – Remote replicas
 - SAN Copy – Data mobility

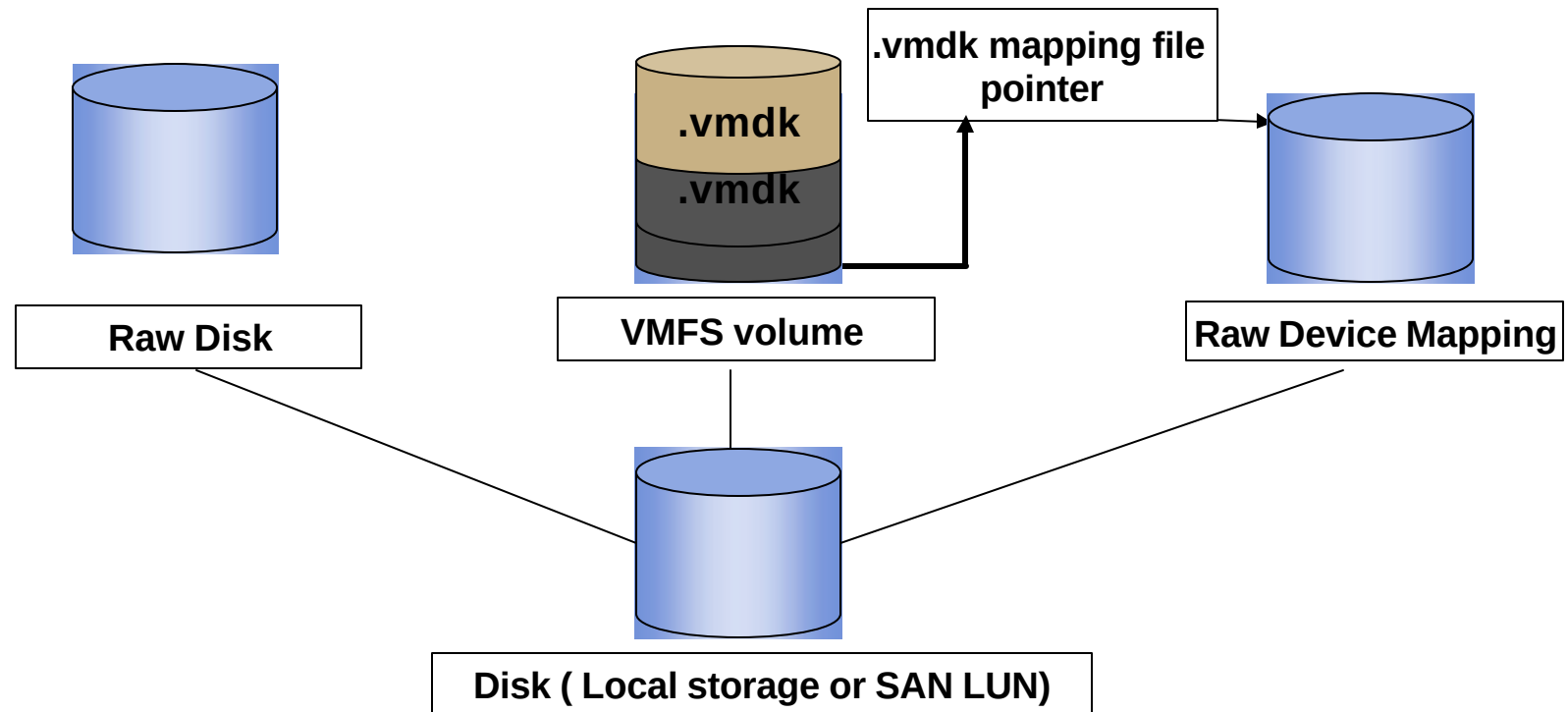
VMware ESX Overview

- ESX Server
 - Runs directly on hardware
 - VMware Server (GSX) application-based
 - Service console
 - VMkernel
- Configuration of ESX Server
 - Management User Interface (MUI)
- Management of VMware servers
 - VirtualCenter
 - VMotion
- P2V Assistant
 - Migration tool
 - Windows only



Storage Visualization in VMware ESX Server

- Raw Disks
- VMFS
- Raw Device Mappings (RDMs)
 - Introduced in ESX 2.5



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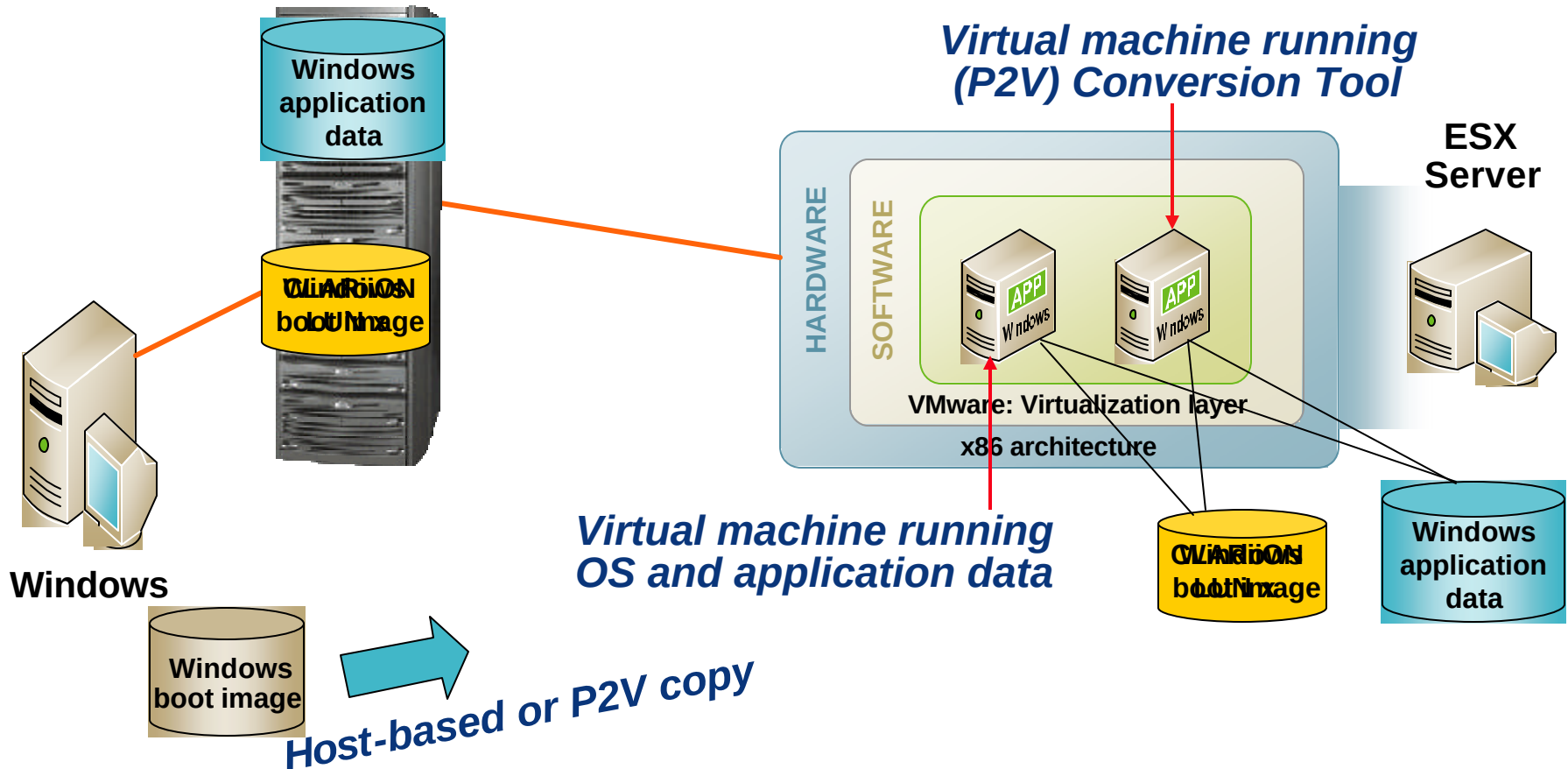
Migration

- Migrating from a physical server to an ESX server
 - Source
 - OS /application data images from physical server
 - Destination
 - Virtual Machine on a ESX server
 - Conversion Utility
 - VMware P2V
- Migrating a component of an ESX server to the same or different ESX server
 - Virtual disk file
 - Virtual Machine
 - Storage LUN

Migrating from a Physical Server to an ESX Server

Case I: Booting Physical servers from Internal Storage

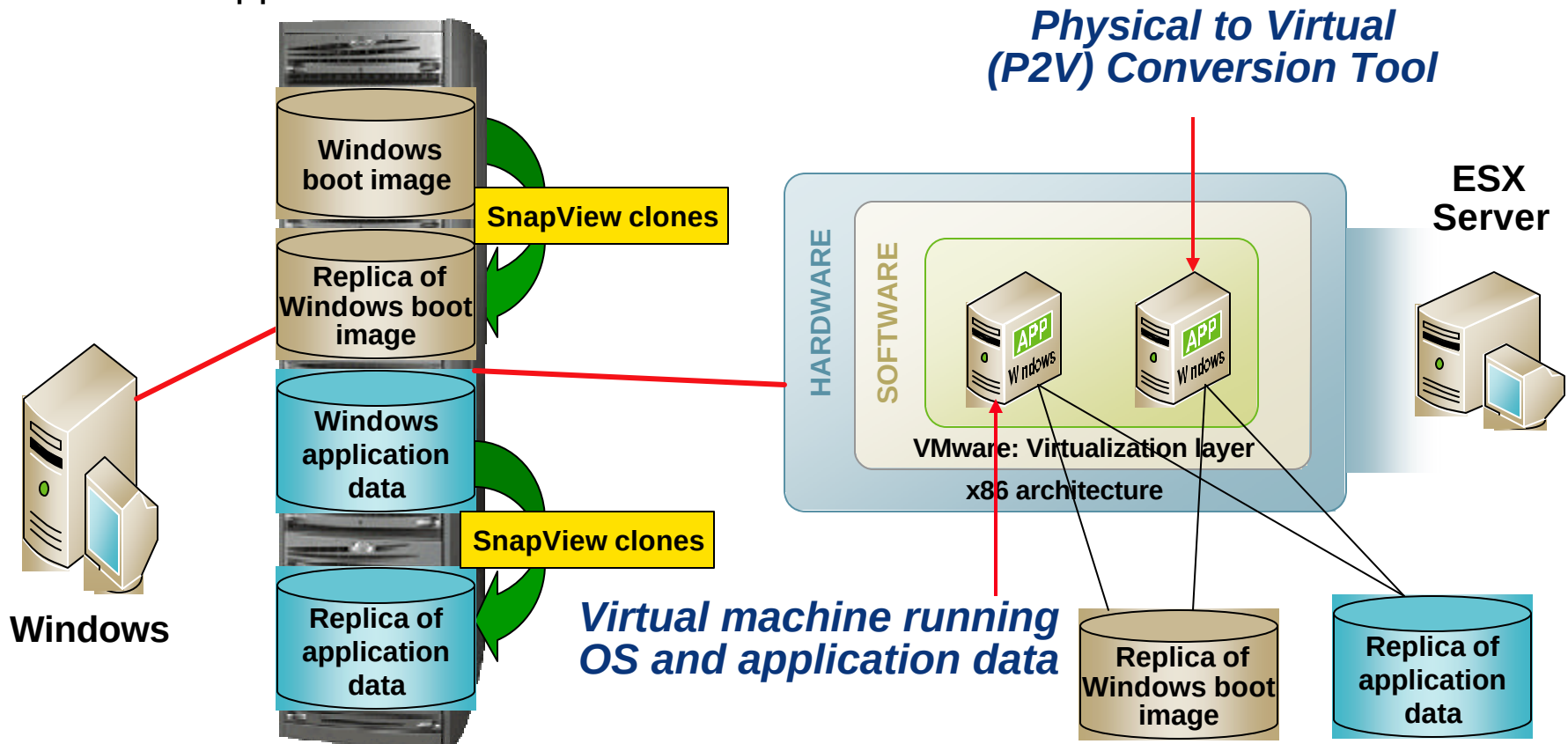
- Application data on CLARiiON



Migrating from a Physical Server to an ESX Server

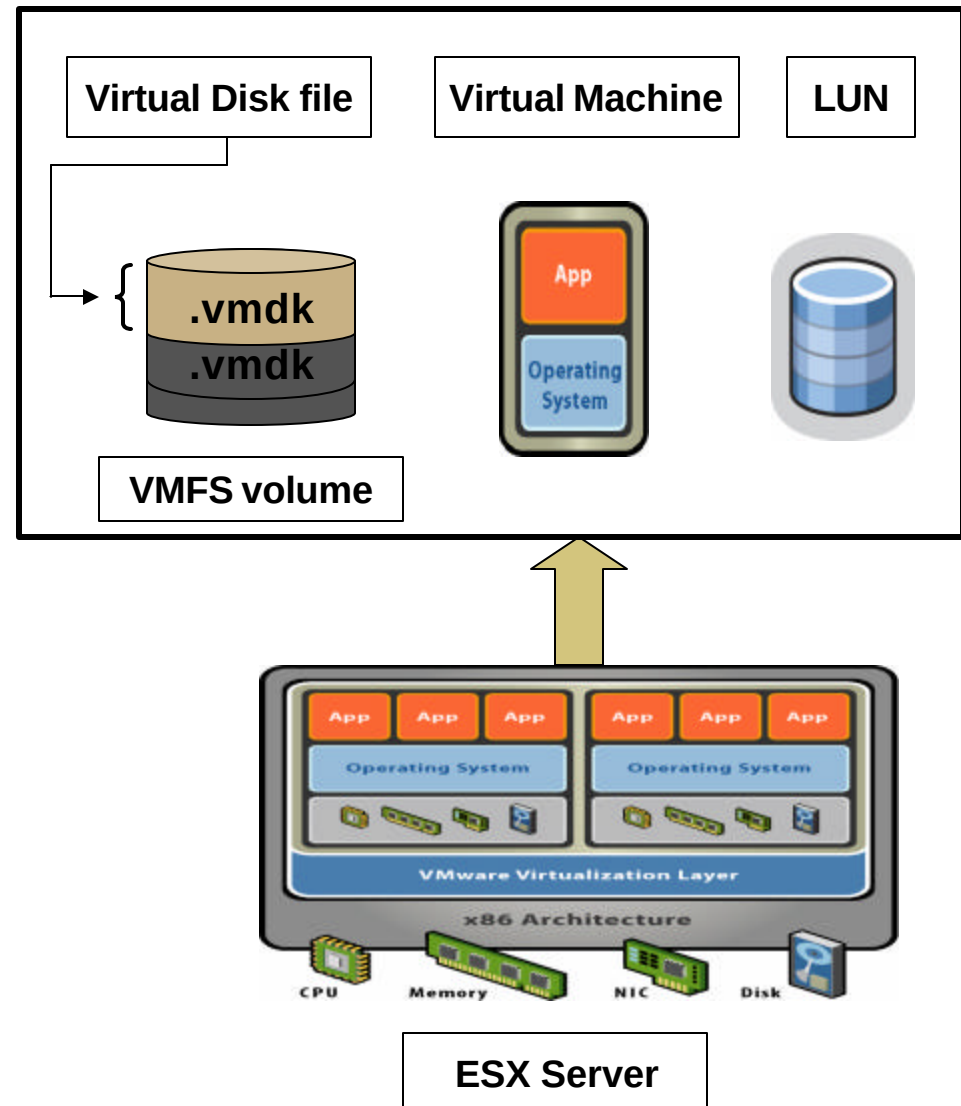
Case II: Booting Physical servers from CLARiiON

- Application data on CLARiiON



ESX Component Migration

- Virtual Disk Level (.vmdk)
 - Host-based migration
 - MUI or vmkfstools
- Virtual Machine Level
 - VirtualCenter Migration
- LUN Level
 - Array-based migration



Array-based LUN Level Migration Options

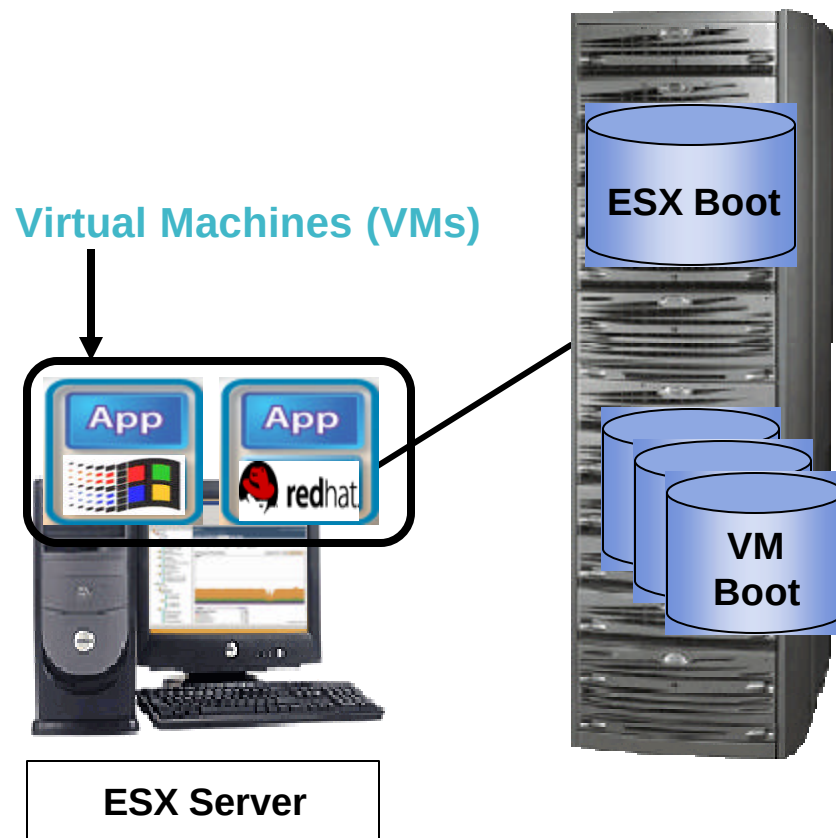
- CLARiiON LUN Migration
 - Local (internal) to a CLARiiON
- SAN Copy
 - CLARiiON to CLARiiON
 - CLARiiON ↔ Symmetrix
 - Third-party storage ↔ CLARiiON
- Open Replicator
 - Symmetrix ↔ CLARiiON

LUN Level Migration Considerations

- Data to be migrated
 - OS/app and/or application data
 - Separate OS/app and application data on separate LUNs
- LUN size
 - Impact Performance
 - Create small size LUNs rather than having one large LUN
 - Maximum of 128 LUNs per ESX server
- Virtual disk files (.vmdks) on a given LUN
 - Reduce number of virtual disk files assigned to different VMs on a given VMFS LUN
- Minimize downtime
 - Create SAN-based replicas
 - Replica used for test and/or VM configuration

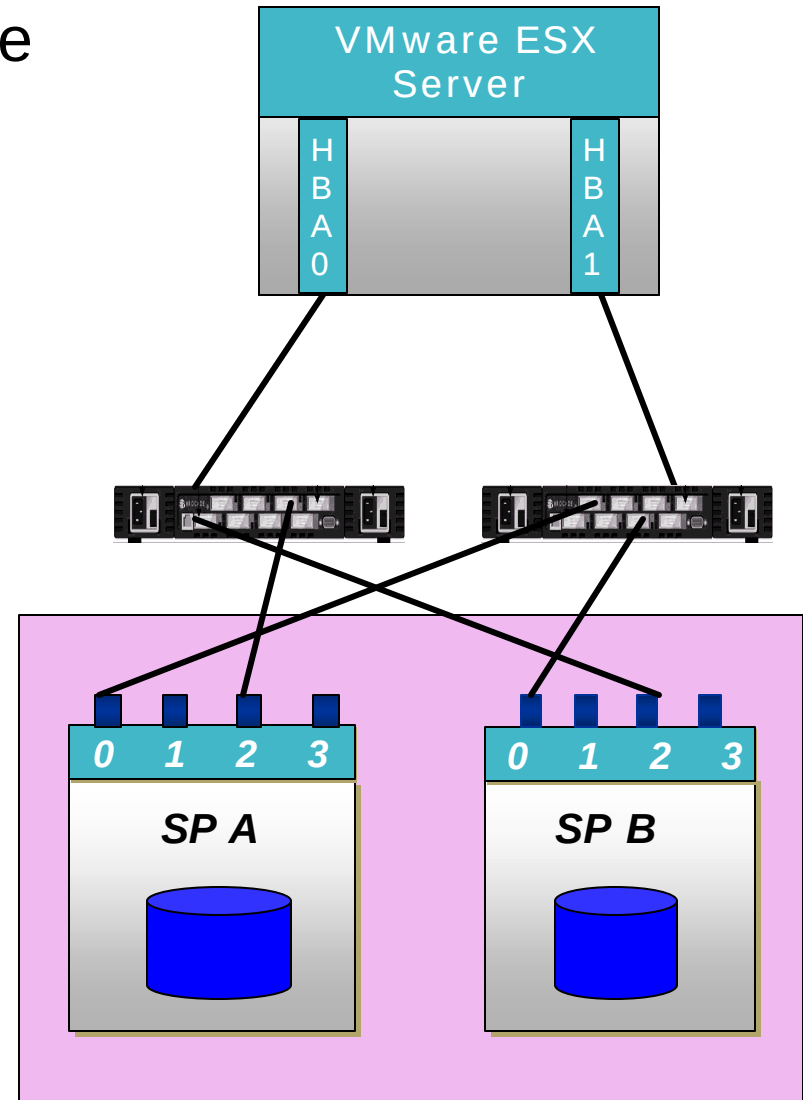
Connectivity - Boot from SAN Considerations

- ESX boot from SAN
 - RAID 1/0 for redundancy/reliability
 - RAID 5 otherwise
 - Boot LUN size
 - Swap space requirement
 - Separate LUN for templates
 - SHARED across all ESX servers
 - RDM not supported
- VM boot from SAN
 - Requirement for VMotion
 - VMFS and RDM supported
 - OS/application
 - RAID 1/0 for redundancy/reliability
 - RAID 5 otherwise
 - Application data
 - Specific to application characteristics



Connectivity - Multipathing

- VMware's native multipath software
 - Most recently used (MRU) policy
 - Set at LUN Level
- Zoning
 - Single initiator (HBA) zoning
- Enable persistent binding
- Static load balancing
 - Balance load across SPs and HBAs

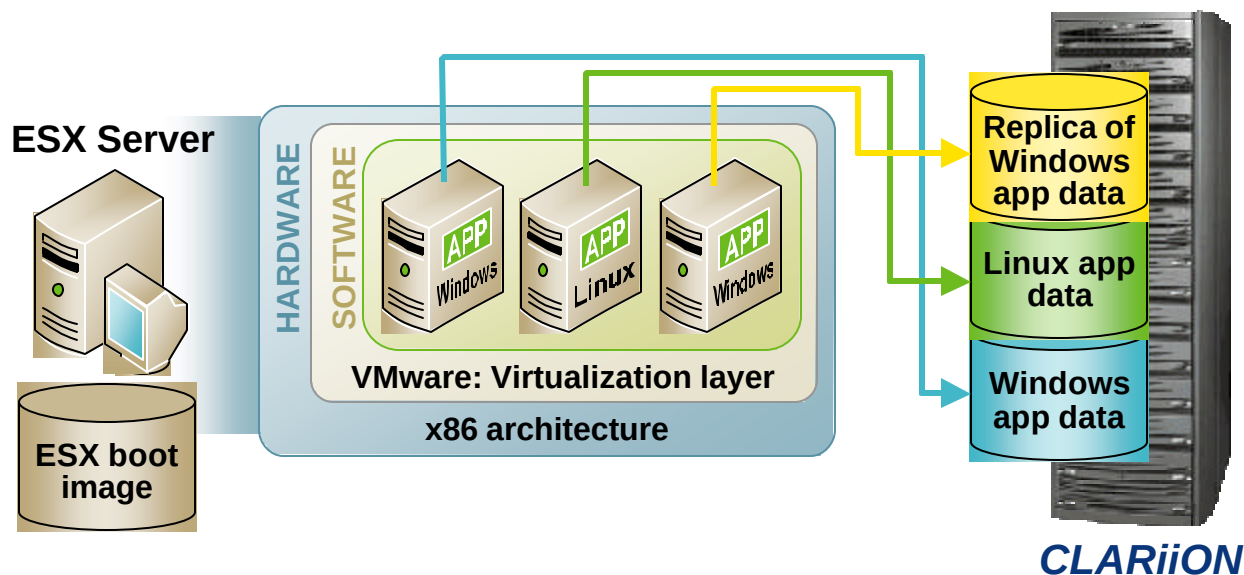


Performance Considerations

- Configuration for LUN Layout
 - Maximum LUN size should not be much larger than 250 GB
 - Maximum LUNs per VirtualCenter farm
 - Depend on number of ESX servers and VM workload
- Configuration for VM OS/application
 - Use VMFS volumes to avoid increase in LUN count
 - Striped metaLUNs across different RAID groups is recommended
 - Also see rules on replication best practices for VMFS volumes
- Configuration for I/O intensive application data
 - Separate OS/app from application data
 - Align application data disks
 - RDM recommended
 - LUN dedicated to a single VM
 - Online expansion using CLARiiON metaLUNs
 - Follow Fibre Channel best practices for a physical server

CLARiiON Replication Products and ESX Server Interoperability

- CLARiiON replication products are supported with RDMs and VMFS volumes
 - Guest operating system images, as well as the application data, can be replicated
 - Using RDM volumes the replica can be presented to the same ESX Server, but must be presented to a different Virtual Machine
 - Allows one VM to use the production LUN, and another VM on the same ESX Server to access the replica



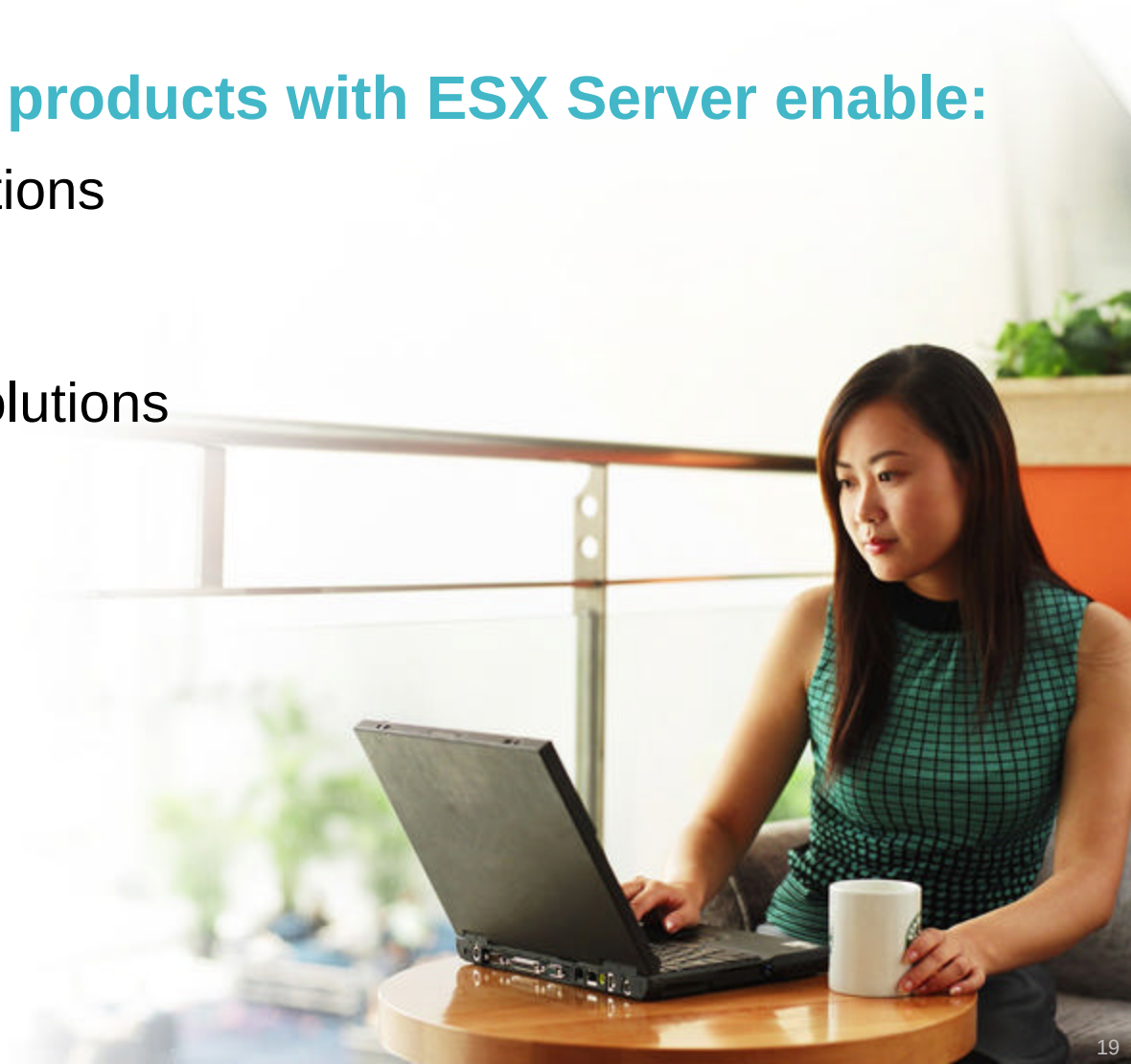
Array-based Replication Considerations

- VMFS or RDM ?
 - Use VMFS if:
 - Booting ESX server from SAN
 - Less LUNs to administer, easy provisioning of new VM and their disks
 - Replication of an individual .vmdk file is not required on a VMFS volume containing number of .vmdk files
 - Do not need direct access to the LUN
 - Use RDM if:
 - Easier backup management for consistent recovery of applications that have quiesce capability (similar to backup with physical server)
 - Replicating application data to and from a physical to virtual infrastructure
 - Replica needs to be presented back to the same ESX server
 - SAN Replication software to run inside virtual machines
 - e.g., admsnap, admhost etc.
- Use array-based consistency technology
 - Applications distributed across many LUNs
 - e.g., databases, volume managers
 - VMFS spanning

Use Cases for CLARiiON Replication Products with VMware

CLARiiON replication products with ESX Server enable:

- Local-replication solutions
 - Physical-to-virtual
 - Virtual-to-virtual
- Remote-replication solutions
 - Physical-to-virtual
 - Virtual-to-virtual



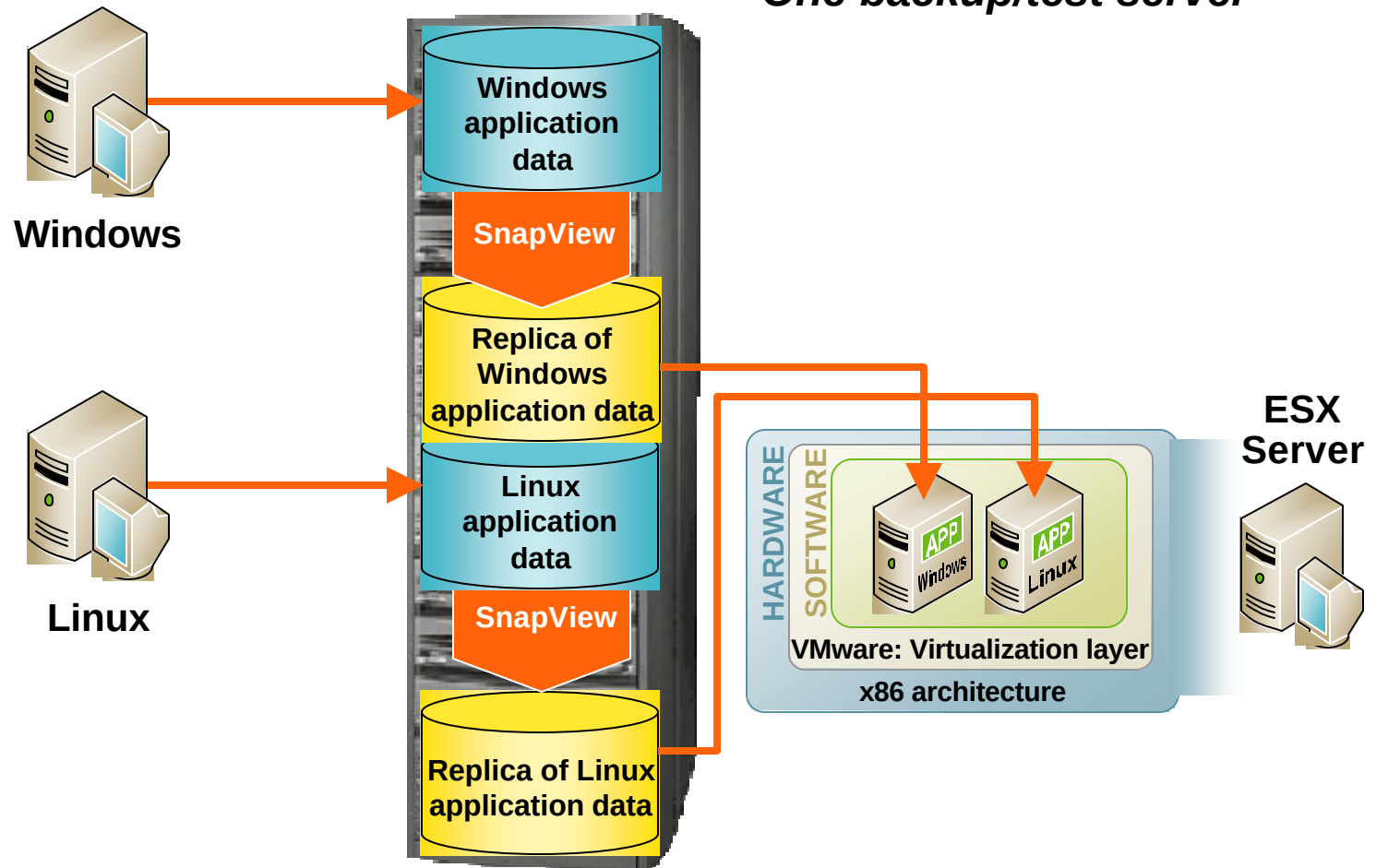
Local-Replication Solution (Application Data and RDM only)

Physical-to-Virtual Backup Environment

Production servers

CLARiiON

One backup/test server



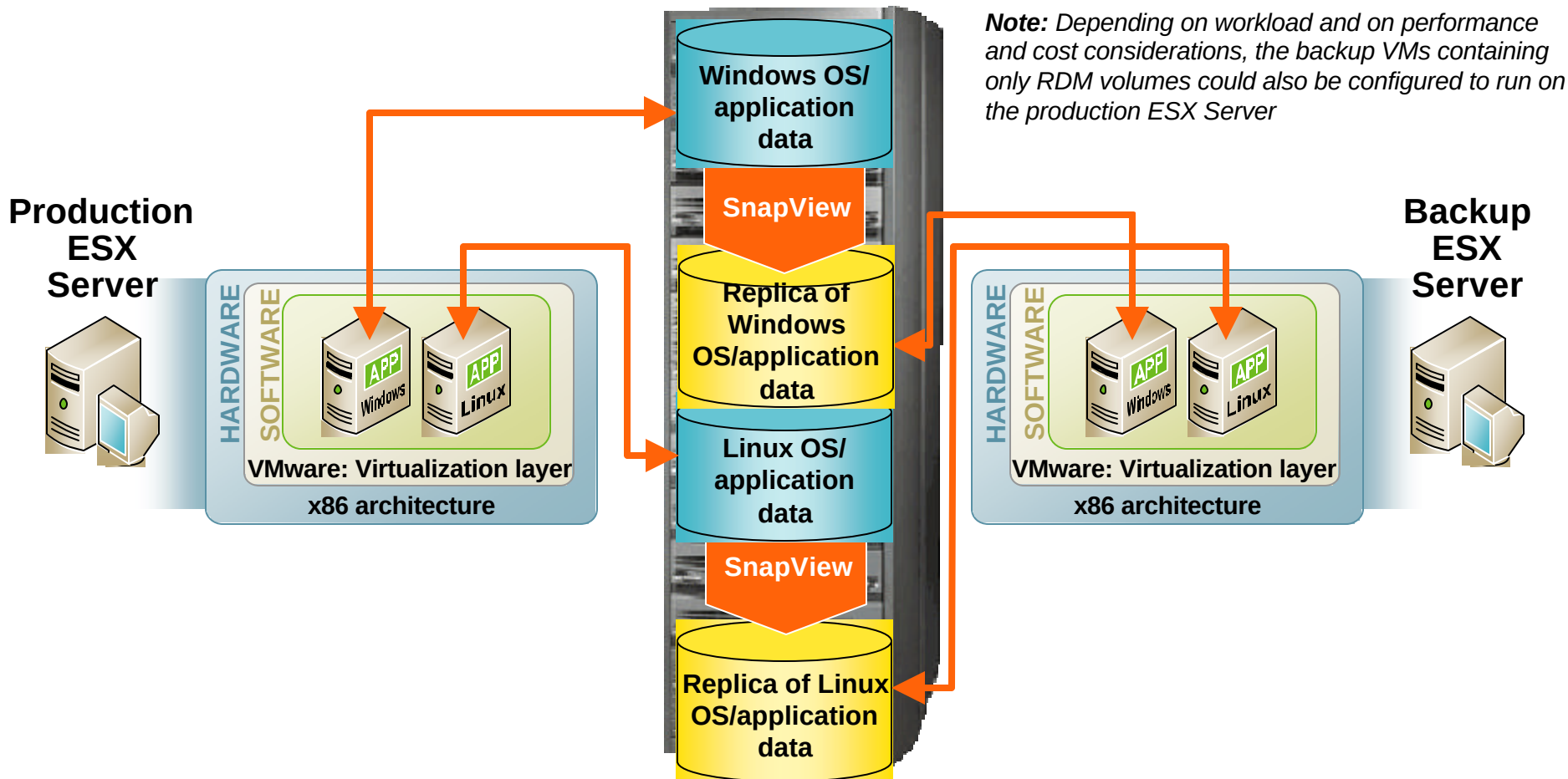
Local-Replication Solution

Virtual-to-Virtual Backup Environment

Production virtual machines

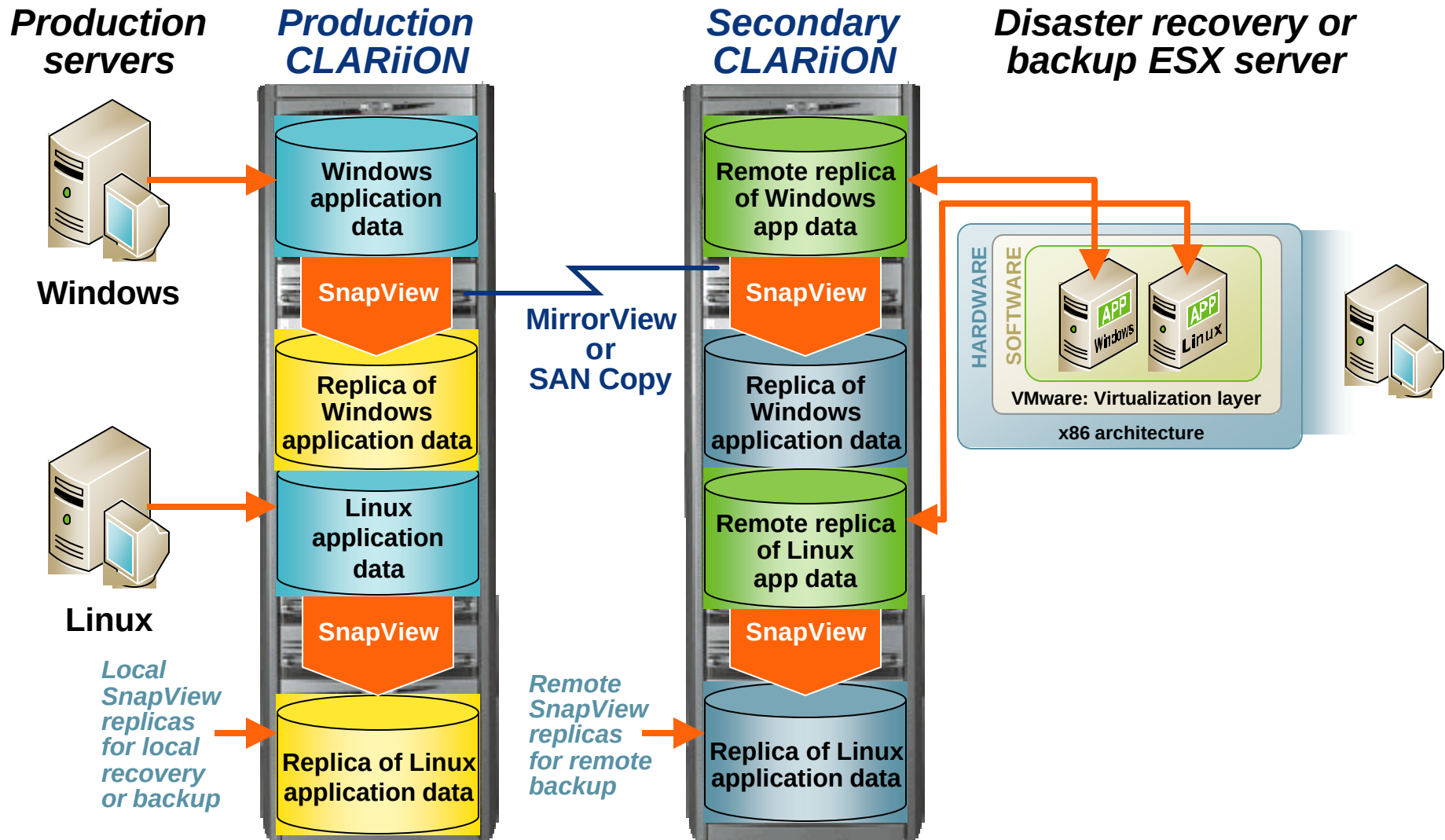
CLARiiON

Backup virtual machines



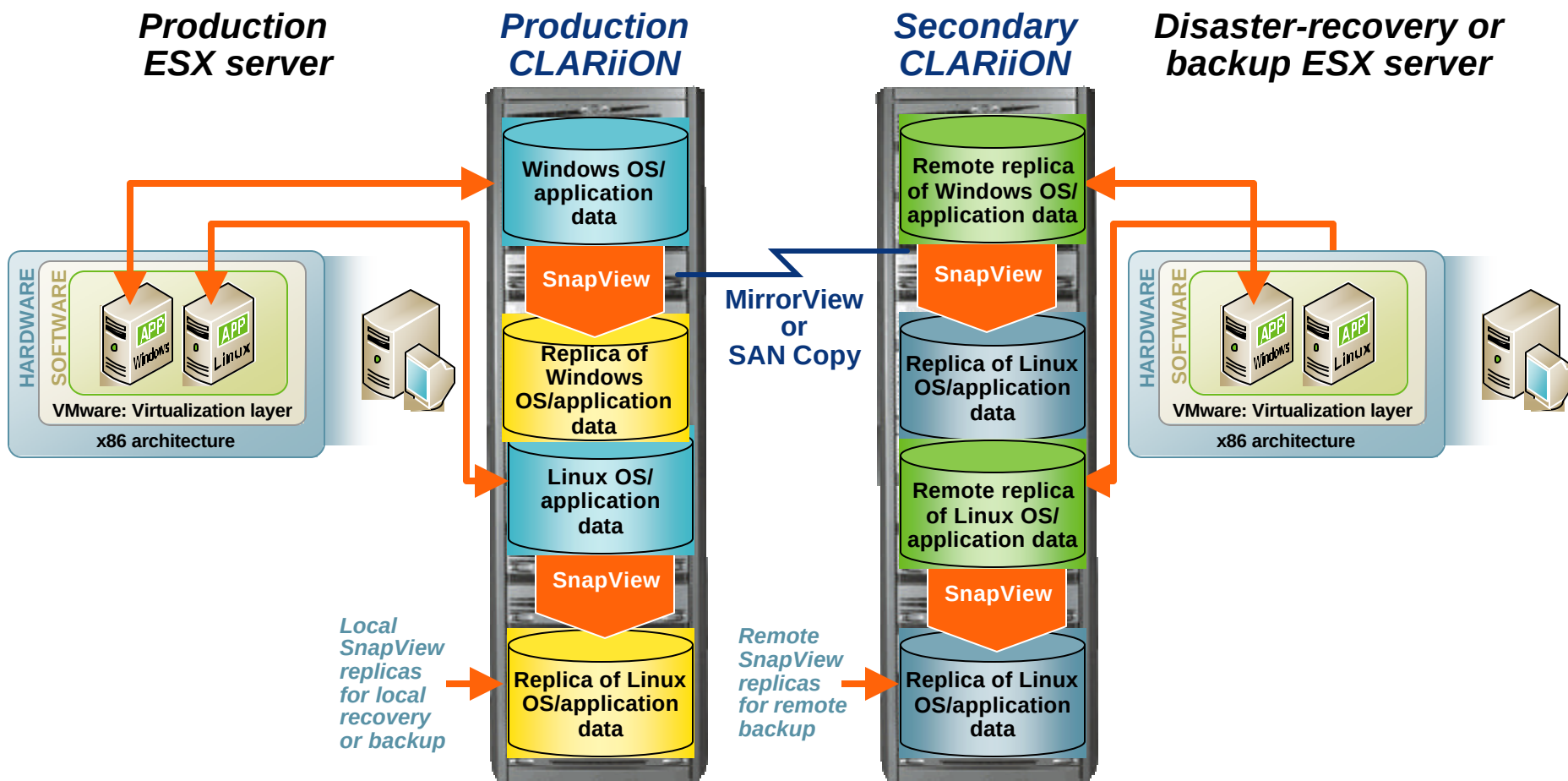
Remote-Replication Solution (Application Data and RDM only)

Physical-to-Virtual Disaster-Recovery Environment



Remote-Replication Solution

Virtual-to-Virtual Disaster-Recovery Environment



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Planned Support for ESX 3.0

- iSCSI support
 - CX500i, CX300i and AX100i
 - ESX and VM Boot from SAN
 - VMFS and RDM replication support
 - Multipathing support
- Support for 256 LUNs
- Hot Virtual Disk Assignment to VM
- RDM support when ESX Server is booting from SAN
- Replicas of VMFS volumes can be brought back into the same ESX server
- VMFS can now hold all files for a VM, including config files

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Case Study - Customer consolidation

- About “ABC” Corporation
 - Company headquarters in France
 - Specialize in manufacturing chemicals
 - 12,000 employees
- IT service department
 - Applications
 - Oracle Database
 - Manage supply and quality of raw materials
 - Web servers
- Initial environment
 - Applications running on local storage
 - NO CLARiiON, VMware

Challenges

- 30 physical servers running Windows 2000
 - Maintenance issues
 - Some servers underutilized (1 to 5 % utilization)
- Backups/restores of Oracle to tape
 - IP-based backup
 - Running backup agents on more than 15 physical servers
- Needed a disaster recovery solution at a remote site
 - 300 metres apart from primary site

Implementation\Proposal

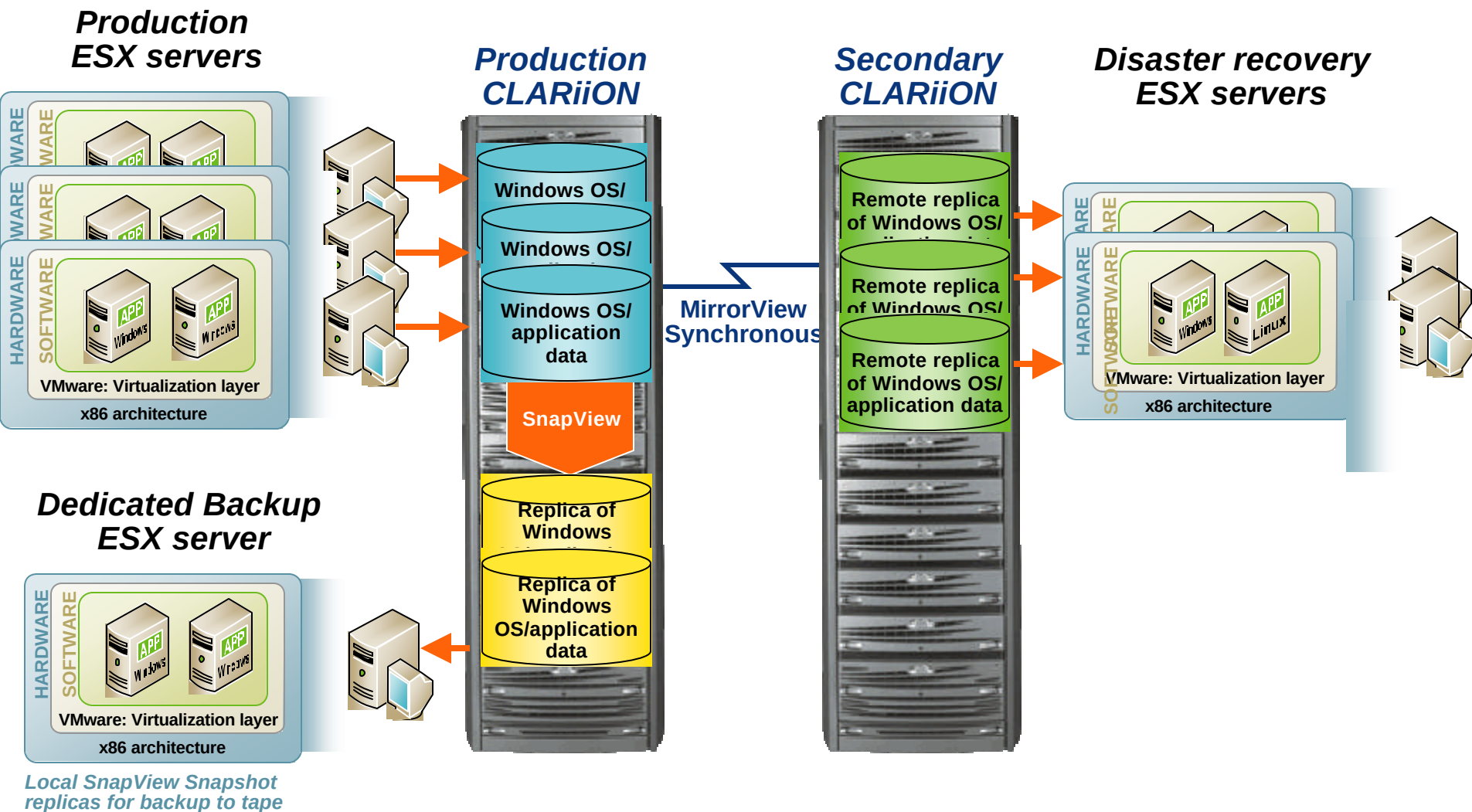
- Consolidated 30 physical servers at primary site
 - 3 ESX servers
 - 30 Windows virtual machines
 - Dell 6500 four processor systems

- Proposed CX500 at the primary site
 - Each ESX server and its VMs booting from CLARiiON
 - Each VM configured as VMFS volume
 - 146 FC drives running Oracle, RAID 1/0
 - Largest metaLUN size 260 GB

- Backups/restores of Oracle to Tape
 - One dedicated ESX server for backup
 - SnapView Snapshots (done off hours)
 - 146 GB FC Drives, RAID 1/0
 - One VMFS volume per VM

- CX500 -> CX500 (DR Site)
 - MirrorView/Synchronous
 - Critical LUNs mirrored (Oracle) using consistency groups
 - 2 ESX servers at DR site

Final Implementation Diagram



Results

- Simplified Management and Maintainability
 - 4 ESX servers only

- SAN-attached CX500 connected to ESX servers
 - High availability and performance
 - Customer comment: “If we had to do it all over again, we would boot ESX server from local storage than from SAN for easier manageability”

- Backup
 - Snapview Snapshots
 - Dedicated ESX backup server
 - Fewer backup agents
 - No consumption of network bandwidth on production servers

- DR solution in place
 - MirrorView/Synchronous between CX500 systems
 - RTO close to zero

Conclusion

- CLARiiON integration with VMware
 - Connectivity
 - Migration
 - Replication

- CLARiiON replication software support for VMFS and RDM
 - Differences between VMFS and RDM
 - Array-based consistency technology

- VMware ESX 3.0 and CLARiiON
 - Fibre Channel and iSCSI attach support

EMC World VMware and CLARiiON Sessions

- Break-out Sessions
 - Best practices for using EMC storage with VMware ESX server
 - VMware Remote Disaster Restart using CLARiiON replication software

- Hand on Lab
 - VMotion with CLARiiON storage

- VMware Birds-of-a-Feather
 - Discussion on EMC products with VMware ESX server
 - Discussion on CLARiiON replication with VMware ESX server

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