ALWAYS ON AVALABILITY GROUPS

Level 1 (Basic Level)

6th May 2020

Servers Recommendations (Virtualization)

1.Vshpere (ESXI hosts)
2.VM's hosting (V centers)
3.Disk Partition in Windows Level (RAID Levels)
4.Resouces Requirements

Storage Level

1.CPG
2.Logical Units (LUN)
3.Mount Points
4.Data stores
5.DE-DUP , Throughput rations , SAN replications

Storage Protocols

1. ISCSI & FC

Licensing (MS SQL Server)

1. Walk through of MS SQL Server Licensing

HA/DR Technologies we know

1. Always ON (HA+DR)
2. Always ON solution Options
    1. Windows Clusters Configurations
    2. DNS entry**
    3. Quorum Selections **
3. Always ON Configurations setup
4. How AG works ?
5. Understanding AG backups

Level 2 (Intermediate Level)

13th May 2020

1. AG Work Threads
    i. 1.Log Capture
    ii. 2.Log send queue/Redo Queue
    iii. 3.Message Handler
2. Log Transport Performance
3. Geographical Locations (Load Balancing & Rerouting replicas
4. DC/DR setups --> DC(Sync), DR(Async)

Level 3 (Advance Level)

1. Data Synchronization in SQL Server AG
2. Read Only Routing
3. Multi Subnet Cluster (Different data centers)
4. Always ON dashboard (Latency Check - 2017)
5. Automatic seeding

Level 4 (Real Scenarios DBA)

1. Real case studies
2. Q/A

DATACENTERS

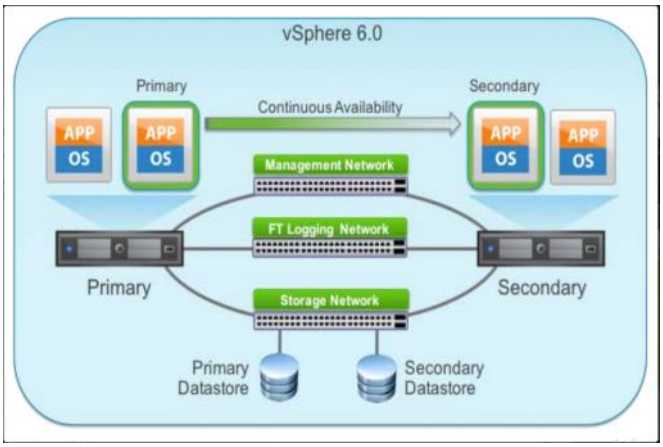
Figure : Blade Servers

1. Blade Servers are hosted at Data Centers
2. Each blade will have racks where physicals servers are hosted
3. Each physical Servers are connected with network adapters for communications.

Network Adapters

a. **ISCSI**, which **stands for** Internet Small Computer System Interface, works on top of the Transport Control Protocol (TCP) and allows the SCSI command to be sent end-to-end over local-area networks (LANs), wide-area networks (WANs) or the internet.

b. Fibre Channel is a high-speed networking technology primarily used for transmitting data among data centers, computer servers, switches and storage at data rates of up to 128 Gbps.



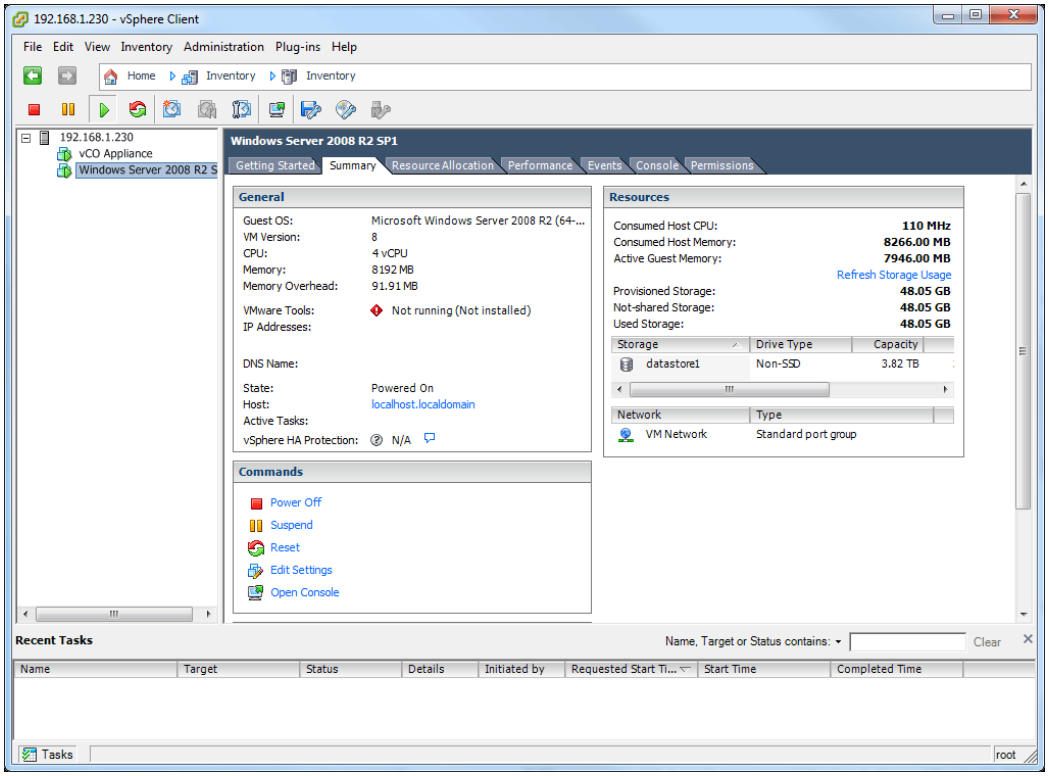
Important Terminologies

1. Blade Servers
2. Data Centers
3. Network Adapters

Physical Hard Disks

1. NON SSDS
2. SSD

VIRTUALIZATION



Virtualization

1. Vmware
2. HYPERV
3. Oracle Virtual Box

ESXI Servers & Clients

1.Vsphere Center
2.Vmotion
3.Host
4.Data stores
5.Physical RAM

VM Resources Allocation

CPU (Cores & processors)
Memory

RAID Levels

1. RAID 0 Stripped
2. RAID 10 Mirror
3. RAID 50 (Multi Mirrored)
4. RAID Multiparty (MP)

Logical Disks

1. Mount points

Domain Controls

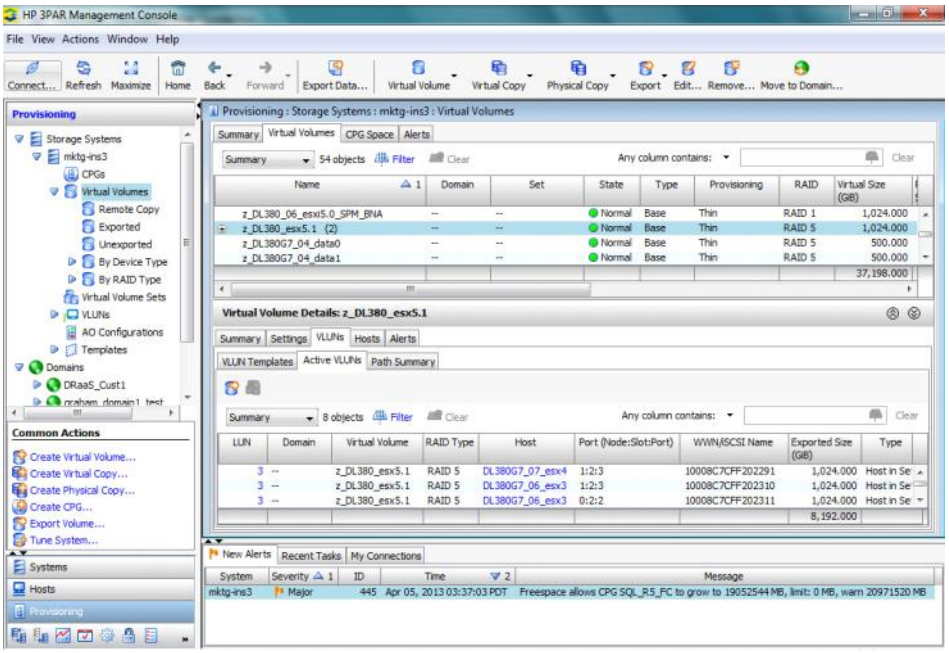
1. DNS

Services Accounts

1. Local Service Accounts
2. gMSA (Managed service accounts

   Managed Service Accounts (MSA) allow you to eliminate those never-expire-**service-accounts**. An MSA is a special domain **account** that **can** be **managed** by the computer that **uses** it. That computer **will** change its password periodically without the need of an administrator.

STORAGE BASICS

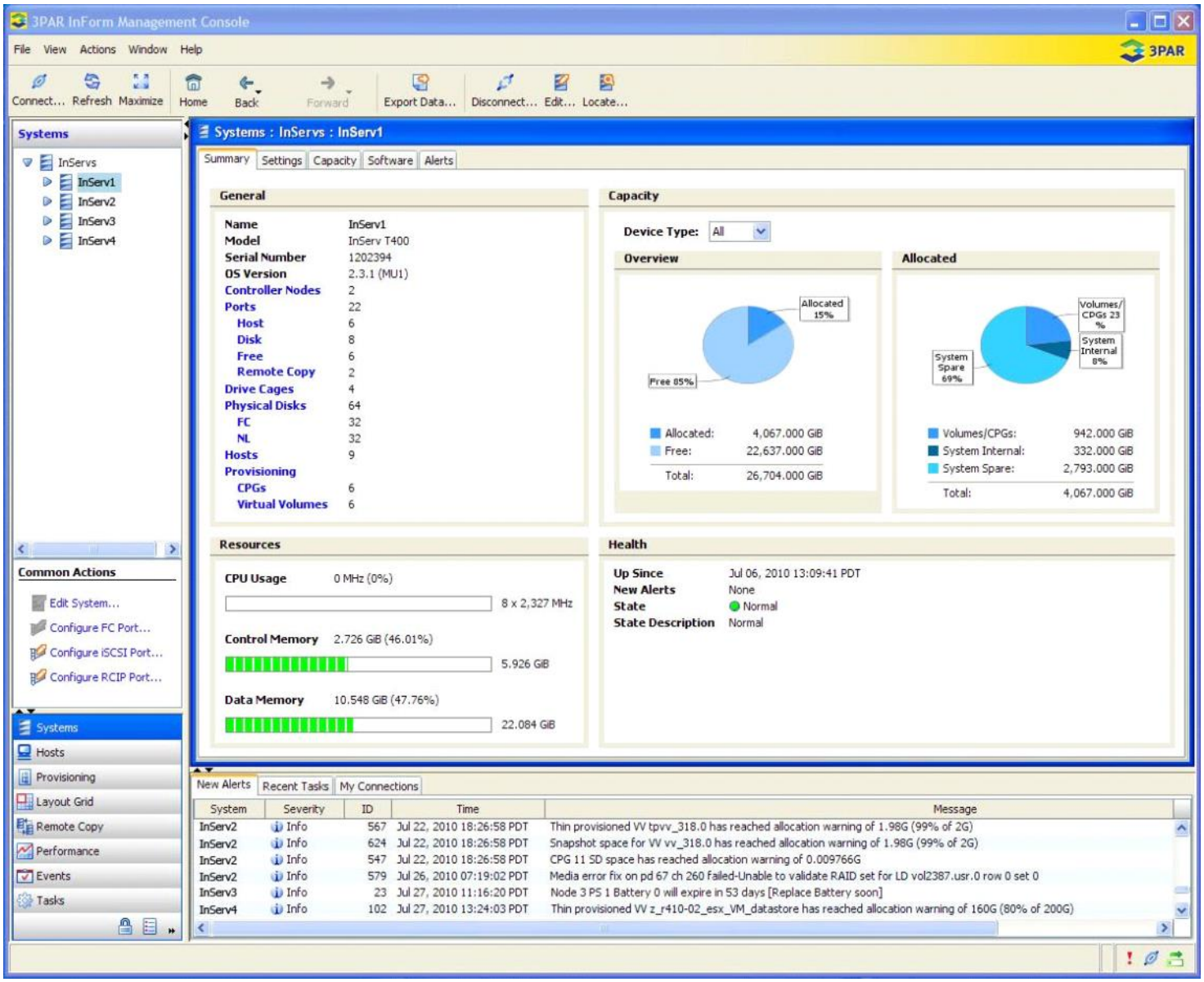


Storage Console

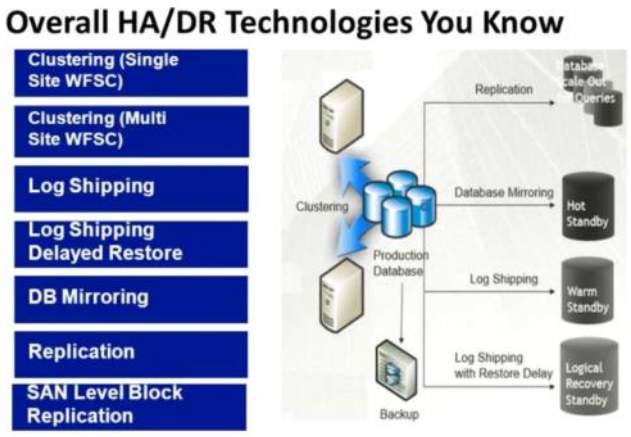
Storage

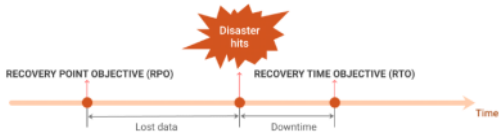
Important Terminologies

1. CPG
2. LUN
3. Data Stores
4. RAID levels
5. Backup Protocols
    a. ISCSI targets (PCSI cards)
    b. FC (WWN - MAC Address)
6. Exports states
    a. Read
    b. Read/Write
    c. VM Snapshots (Read/write)
    d. Disk availability
    e. DEDUP ratio (SAN REPLICATION)
    f. Through put value
7. Stores
    a. Catalyst Stores
        i. Data Stores
        ii. FTP
            1. CIFS (Common Internet File System - Windows)
            2. NFS "Network File System" - Linux


3PAR InForm Management Console
File View Actions Window Help
3PAR
Connect... Refresh Maximize Home Back Forward Export Data... Disconnect... Edit... Locate...
Systems
InServs
InServ1
InServ2
InServ3
InServ4
Systems : InServs : InServ1
Summary Settings Capacity Software Alerts
General
Name InServ1
Model InServ T400
Serial Number 1202394
OS Version 2.3.1 (MU1)
Controller Nodes 2
Ports 22
Host 6
Disk 8
Free 6
Remote Copy 2
Drive Cages 4
Physical Disks 64
FC 32
NL 32
Hosts 9
Provisioning
CPGs 6
Virtual Volumes 6
Capacity
Device Type: All
Overview
Allocated 15%
Free 85%
Allocated: 4,067.000 GiB
Free: 22,637.000 GiB
Total: 26,704.000 GiB
Allocated
Volumes/ CPGs 23 %
System Internal 8%
System Spare 69%
Volumes/CPGs: 942.000 GiB
System Internal: 332.000 GiB
System Spare: 2,793.000 GiB
Total: 4,067.000 GiB
Resources
CPU Usage 0 MHz (0%)
8 x 2,327 MHz
Control Memory 2.726 GiB (46.01%)
5.926 GiB
Data Memory 10.548 GiB (47.76%)
22.084 GiB
Health
Up Since Jul 06, 2010 13:09:41 PDT
New Alerts None
State Normal
State Description Normal
Common Actions
Edit System...
Configure FC Port...
Configure iSCSI Port...
Configure RCIP Port...
Systems
Hosts
Provisioning
Layout Grid
Remote Copy
Performance
Events
Tasks
New Alerts Recent Tasks My Connections
System Severity ID Time Message
InServ2 Info 567 Jul 22, 2010 18:26:58 PDT Thin provisioned VV tpvv_318.0 has reached allocation warning of 1.98G (99% of 2G)
InServ2 Info 624 Jul 22, 2010 18:26:58 PDT Snapshot space for VV vv_318.0 has reached allocation warning of 1.98G (99% of 2G)
InServ2 Info 547 Jul 22, 2010 18:26:58 PDT CPG 11 SD space has reached allocation warning of 0.009766G
InServ2 Info 579 Jul 26, 2010 07:19:02 PDT Media error fix on pd 67 ch 260 failed-Unable to validate RAID set for LD vol2387.usr.0 row 0 set 0
InServ3 Info 23 Jul 27, 2010 11:16:20 PDT Node 3 PS 1 Battery 0 will expire in 53 days [Replace Battery soon]
InServ4 Info 102 Jul 27, 2010 13:24:03 PDT Thin provisioned VV z_r410-02_esx_VM_datastore has reached allocation warning of 160G (80% of 200G)

HA /DR





High Availability (HA) is about providing service **availability** and 100% uptime through redundant and fault-tolerant components at the same location. **Disaster Recovery** (DR) is about providing service continuity and minimizing downtime through redundant & independent site in a distinct location.

HA

1. SQL Server Clustering
2. SQL Server Always ON FCI

HA+DR

1. Database Mirroring (Mirror Copies & Automatic failover)
2. Log Shipping (Shipping of Transactional logs to DR site - Manual Failover
3. Always ON AG (Readable Secondary copies , Automatic failovers , HA+DR)

Replication

1. Scale out queries (can be configured at DC and DR)

SAN Replication (Redundant storage copies of different datacenters)

1. REPDB (I will explain the REPDB architecture)
2. Different zones

DR

1. **Hot standby** (Redundant copies , DB Mirror copies & supports automatic failover)
2. **Warm standby** (**Log shipping** **Warm standby** is a server that will not automatically failover
3. **Cold standby** is just a spare machine that needs to be turned on, backup restored (or even full staging of the machine).

RPO is about how much data you afford to lose before it impacts business operations. For example, for a banking system, 1 hour of data loss can be catastrophic as they operate live transactions. ... On the other hand, **RTO** is the timeframe within which application and systems must be restored after an outage

Availability Zones

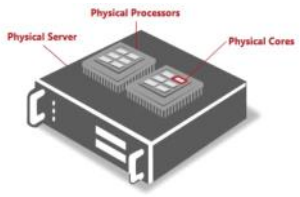
Data Protection Law

1.PHI and HIPPA

DC & DR

1. Data should be in our Available regions

SQL Server Licensing (CAL BASED LICENSING)



This figure depicts a physical server with two physical processors, each containing six physical cores

Physical Server – The Server (Which is not a Virtual Machine) on which you plan to install SQL Server
Physical Core: Processors can contain Dual, Quad, Hex, Octa or more cores in each processor. It depends on the processor model or vendor.
• Hardware Threads: Logical threads introduced first with Intel Hyper-Threading Technology(HTT). AMD also sells Modules instead of Cores which adds a bit to the confusion.

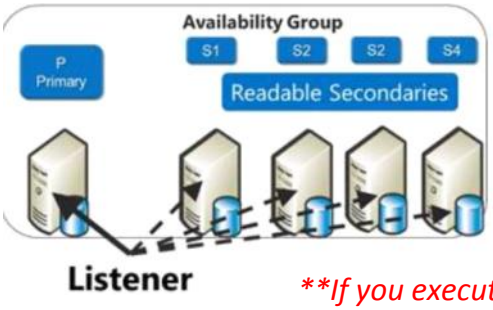
2 Intel Xeon 6-core processors

Number of core licenses required:

	12	(total cores on the server)
x	1	(core factor from the table below)
=	12	core licenses required

Purchase 6 "2-Pack" SKUs of core licenses
(cores sold in 2-core packs)

- All physical cores on the server must be licensed (Exceptions being a Virtual Machine)
- You need to buy a minimum number of licenses for each physical processor on the server, which is 4 cores.
- Core Licenses are sold in an even number of packs, i.e. 2 pack, 4 pack, 6 packs etc.



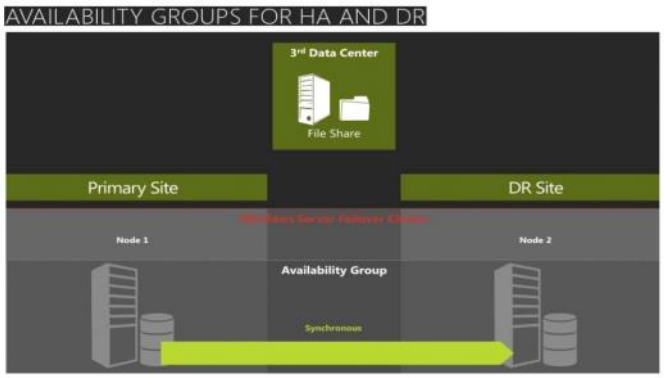
- SQL Server Standard Edition.
- SQL Server Business Intelligence Edition.
- SQL Server Developer Edition.
- SQL Server Enterprise Edition.

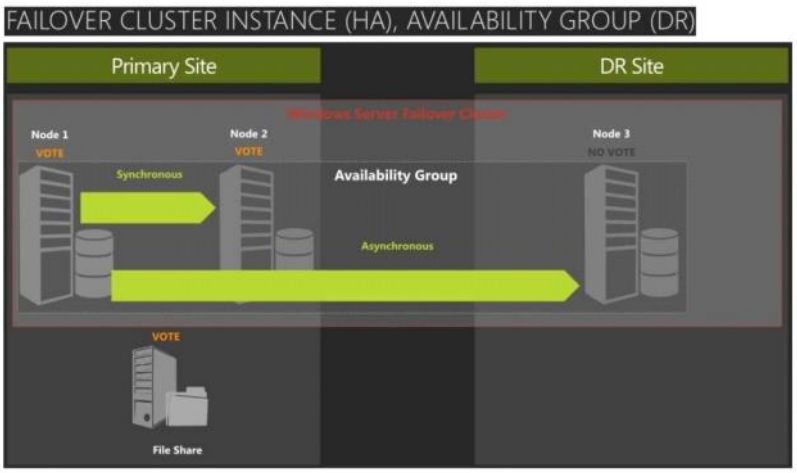
Enterprise Edition (EE) is available through all channels except for Retail, i.e. Volume Licensing (Open, Select+ EA/EAS/SCE) or Third Party (ISVR & SPLA).

This is the only edition which can be bought under Server/User or Server/Device CAL (Client Access License) based Licensing as well as CPU Core based Licenses.

If you execute a query on secondary replicas , You need licensing on DR servers as well

Requirements (Business/ DBA/WINTEL/NW)





- BCP project budget by Business.
- Resources Budget (Capacity planning)
- Readable secondary copies (Sync - waits for acknowledgement (Hot stand by) - DC, Async - DR - Warm standby)