

# VIRTUAL MACHINE BACKUP TOI

## - PART 1

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# Agenda

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- Backup concepts
- Traditional Backup Pain Points
- VM Backup Use Cases
- Market Analysis

# Backup Window

- The period of time when backups are permitted to run
  - ▣ Ensure backup has no interferences with normal operations
- Backup window is limited by backup performance
  - ▣ Simultaneously backup jobs from backup source
    - SDDC caused high application/VM density than physical
  - ▣ Backup server workload
  - ▣ Data protection performance

# RPO and RTO

- RPO - recovery point objective
  - ▣ Key data protection requirements per backup window
    - CDP(Continuous Data Protection)
      - RPO is zero
    - Near CDP or CRR(Continuous Remote Replication)
      - RPO is close to zero
    - Regular backup
      - Could be minutes, hourly, daily, weekly, monthly
- RTO - recovery time objective
  - ▣ Maximum allowable or maximum tolerable outage
    - RTO is close to zero
      - Stretched clusters: Active-active data center (Not real DR: see notes)
      - CDP + VMware vCenter Site Recovery Manager
  - ▣ Key requirements for recover performance SLA
  - ▣ Associate with availability of backup infrastructure

# Backup Methods

- Available methods
  - ▣ Full
  - ▣ Incremental
  - ▣ Differential
  - ▣ Synthetic
- Factors for choosing the backup methods
  - ▣ RPO
  - ▣ RTO
  - ▣ Backup windows
  - ▣ Retention timeframes
  - ▣ Infrastructure
  - ▣ Budgets

# Backup Consistent State

- ❑ Crash consistent
  - ▣ Snapshot without any quiescing
- ❑ File system consistent
  - ▣ Snapshot with OS quiescing but without app quiescing
- ❑ Application consistent
  - ▣ Snapshot with both OS and app quiescing

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# Physical vs. Virtual

## Physical Data Center

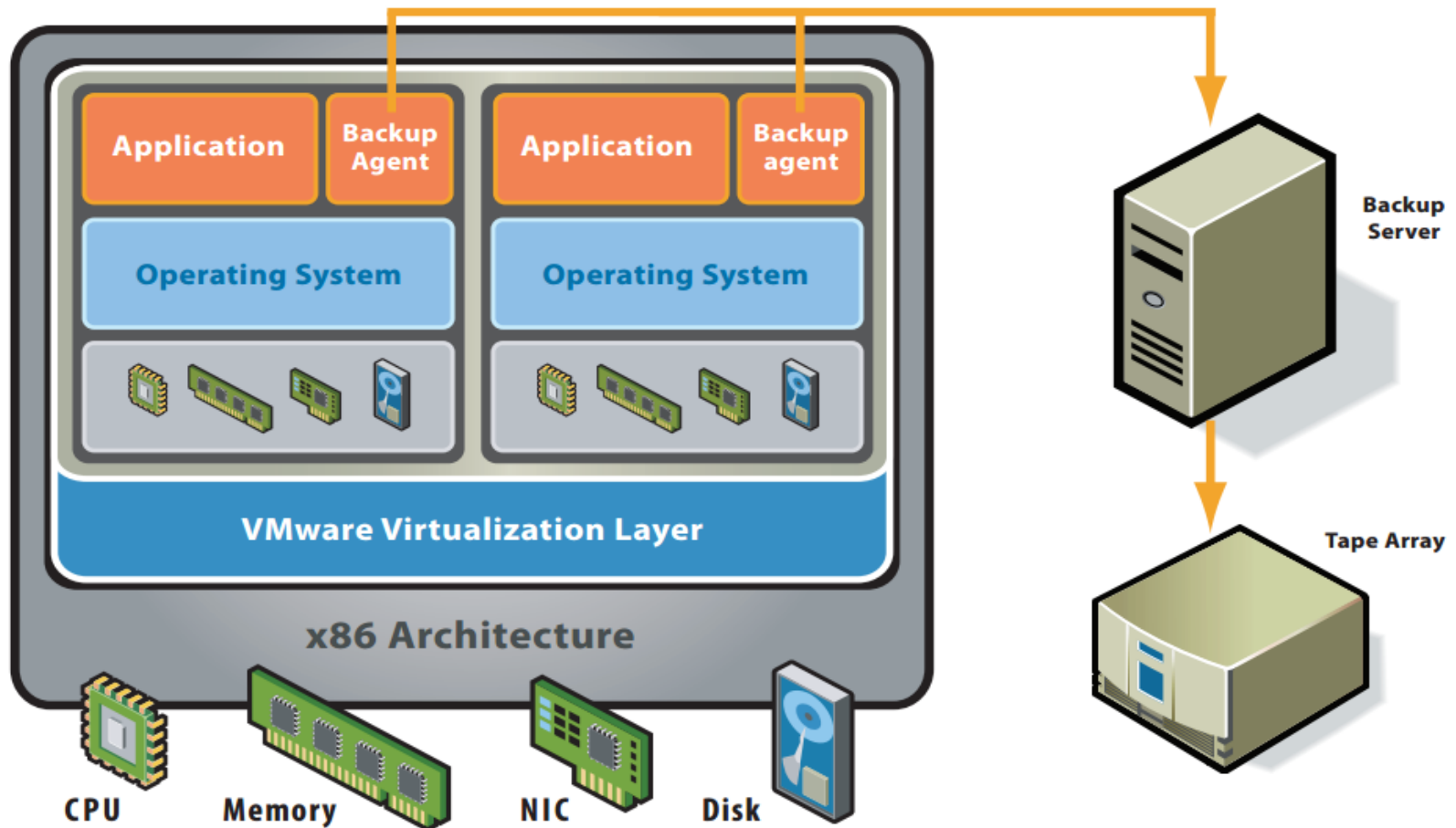
- Static, difficult to move
- Disruptive maintenance
- Slow provision due to manual work
- Hardware failure has bigger impacts if no HA solution
- Network and storage configuration and connection are static needs multiple teams cooperation

## SDDC

- Flexible, easy to move
- Non-disruptive maintenance
- Quick provision due to VM features
- Hardware failure has smaller impacts even without HA solution
- VM move from network or storage from one to another quickly and easily



# Backup VM As Physical



# Pain Points Of Traditional Backup

- Bigger VM backup overhead
  - ▣ SDDC caused high application/VM density than physical
    - One VM backup agent could cause the perf/QOS problems to other VMs
      - CPU, memory, storage, network overheads
- High OPEX by OS none-transparent backup
  - ▣ Various backup agents
    - OS level agent with coarse granularity
    - App level agent with fine granularity
  - ▣ Shadow copy depends on OS implementation
- Machine backup is complex
  - ▣ OS and file need different backup methods

# Pain Points Of Traditional Restore

- Machine recovery is complex
- Very difficult to test and verify of backups regularly
  - ▣ Need a separate test environment
- Restoring multi-tier applications is a challenge

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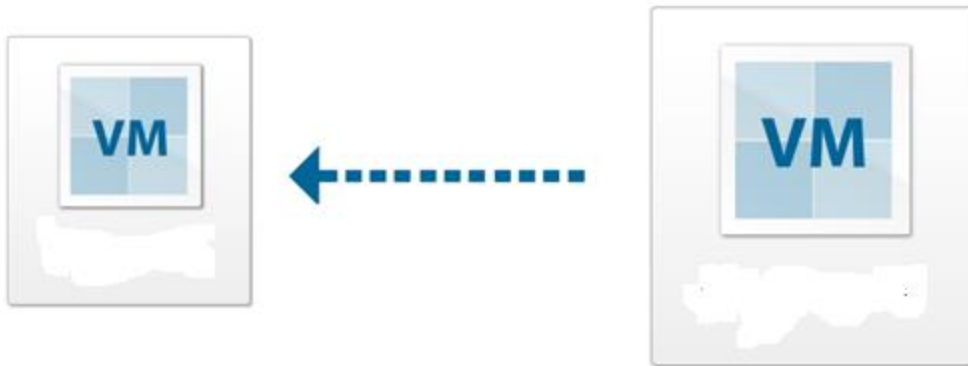
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# VM Data Protection Use Cases

RPO	RTO	Solution	Comments
Zero	Minutes	Stretched clusters	Site level Active-Active HA & load balance
		CDP + SRM	Site level sync replication Disaster Recovery orchestration & automation
Minutes	Minutes	Near CDP or CRR	VM Replication & Backup
Hours	Minutes	Backup or Replication	VM Replication & Backup Traditional backup & restore
Hours	Hours	Backup or Replication	VM Replication & Backup Traditional backup & restore Cloud backup & restore

# Use Case: VM Replication & Backup

## Replication



## Backup



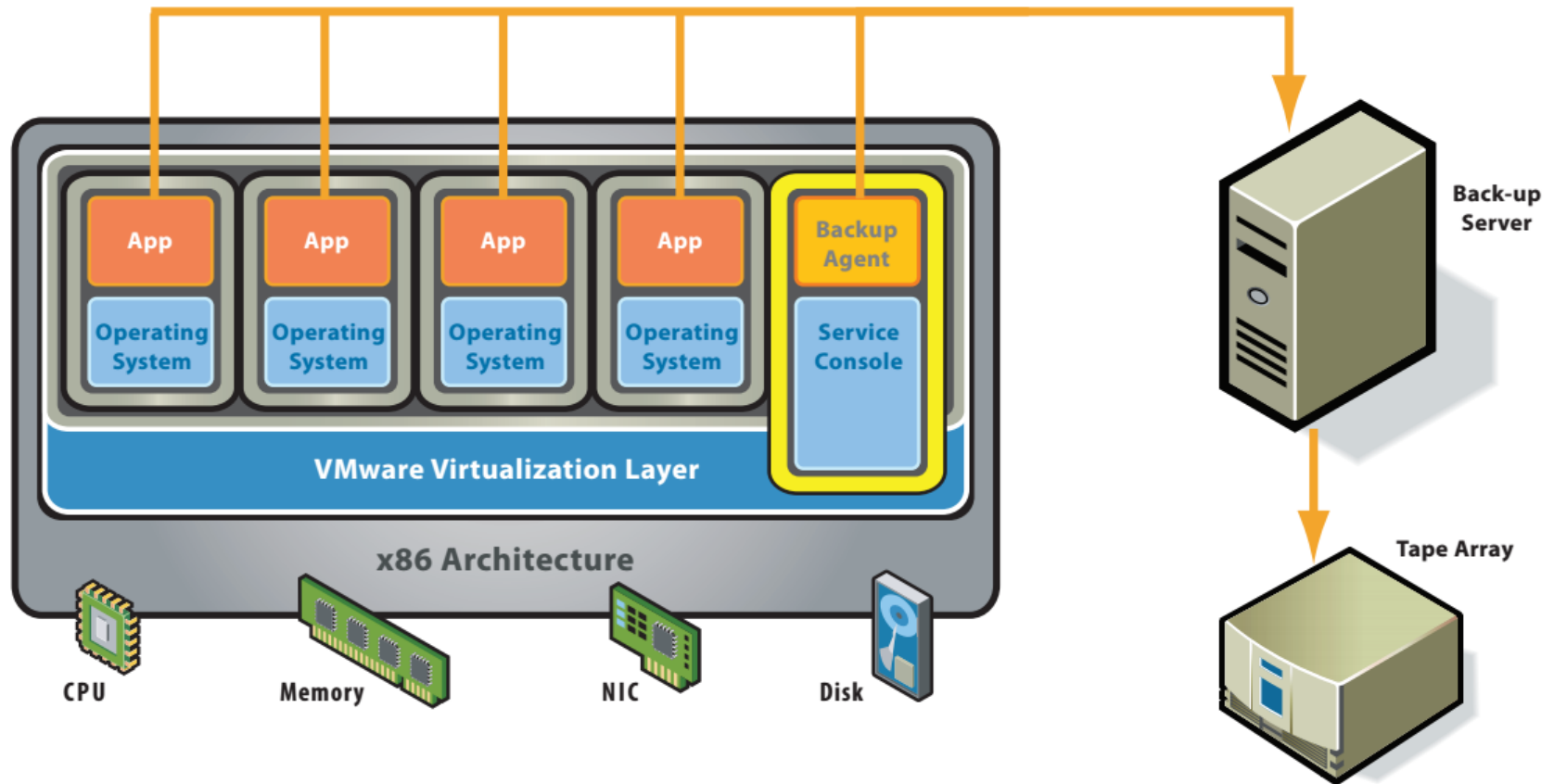
- Tier 1 applications
- Best RTO
- High storage costs



- All applications
- Good RTO
- Low storage costs

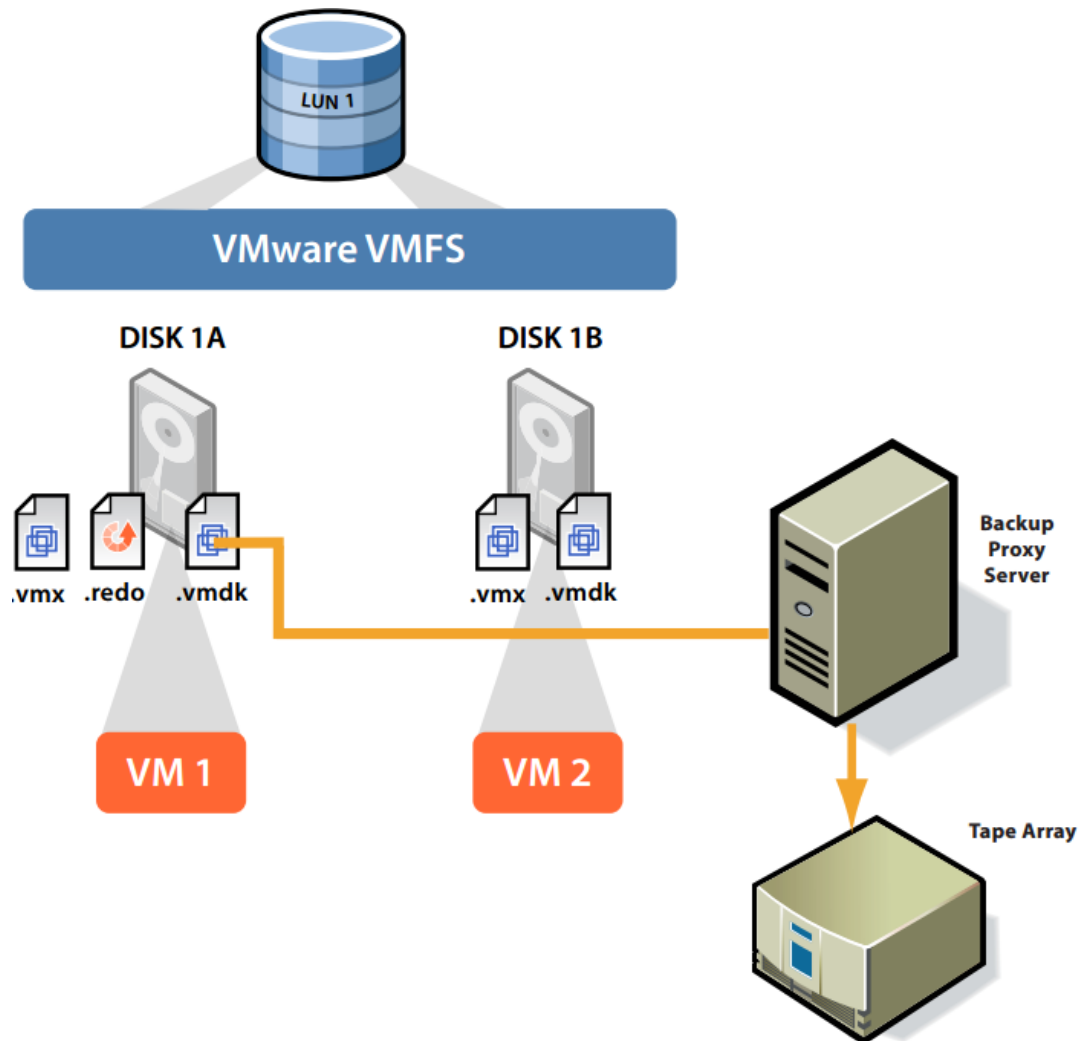


# Gen1: Backup VM By Virtual Disk Files

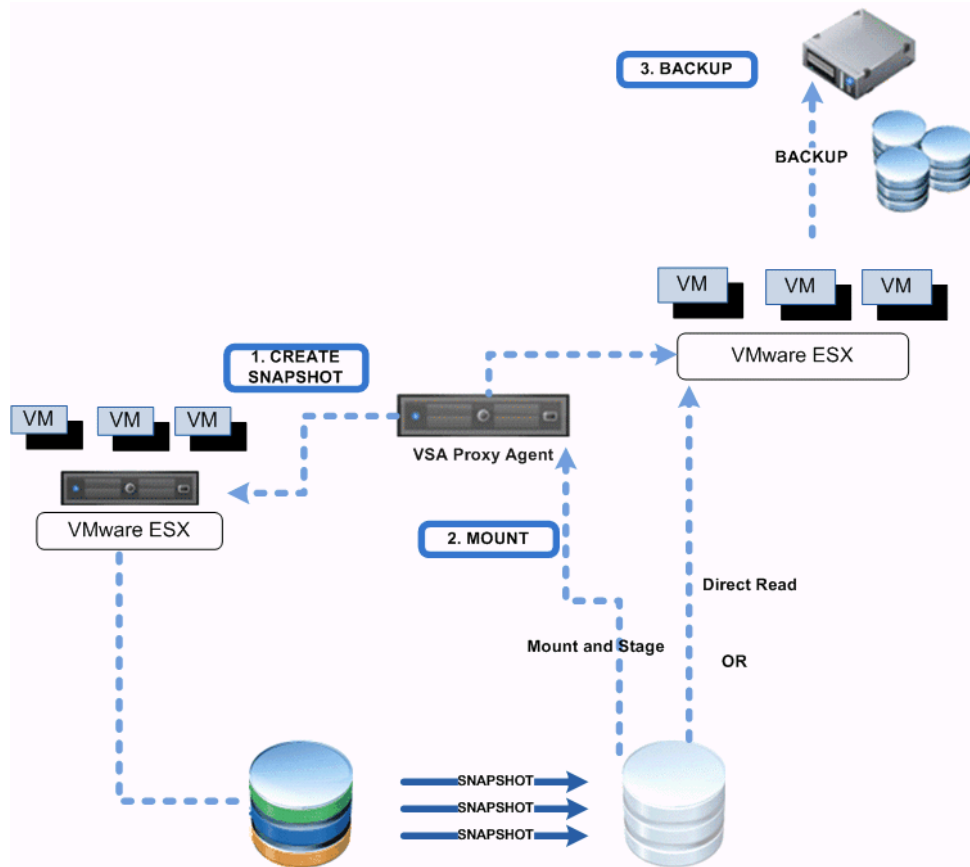




# Gen2: VCB(Virtual Consolidated Backup)



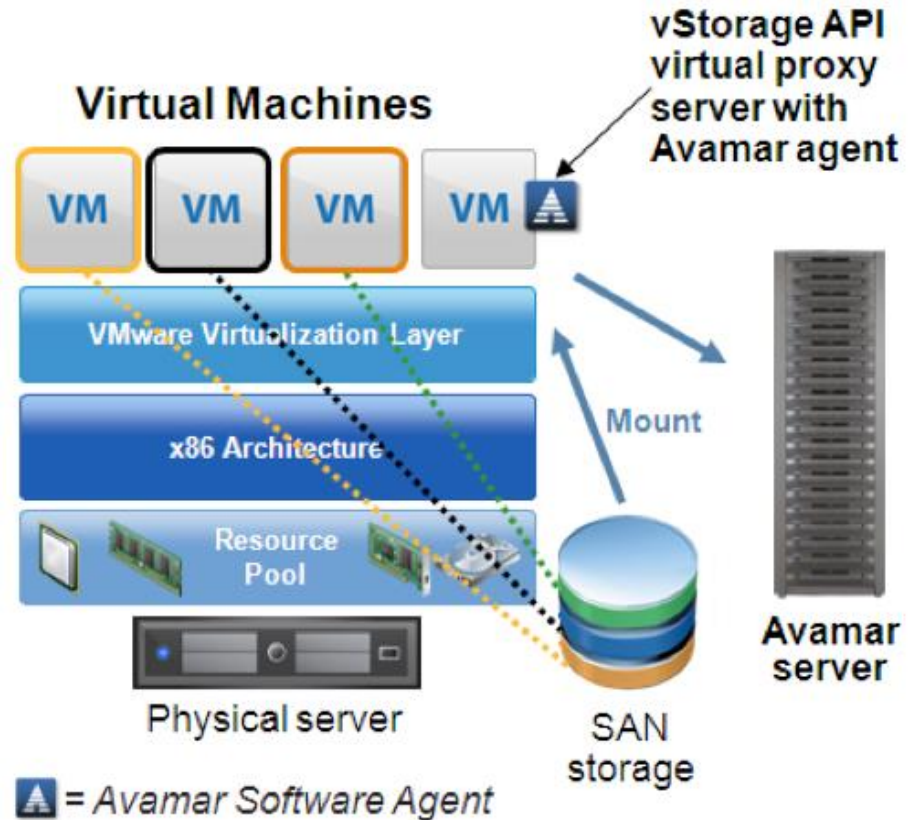
# Gen3A: VADP Physical Proxy



- Physical proxy appliance
  - Can be merge with backup server
  - Requests a snapshot of the virtual machine hosted on the VMFS datastore.
  - Enables LAN-free data transfer
  - Use CBT for incremental backup
- Deduplication & compress by
  - Backup proxy
  - Backup server
  - Backup target storage

# Gen3B: VADP VM Appliance

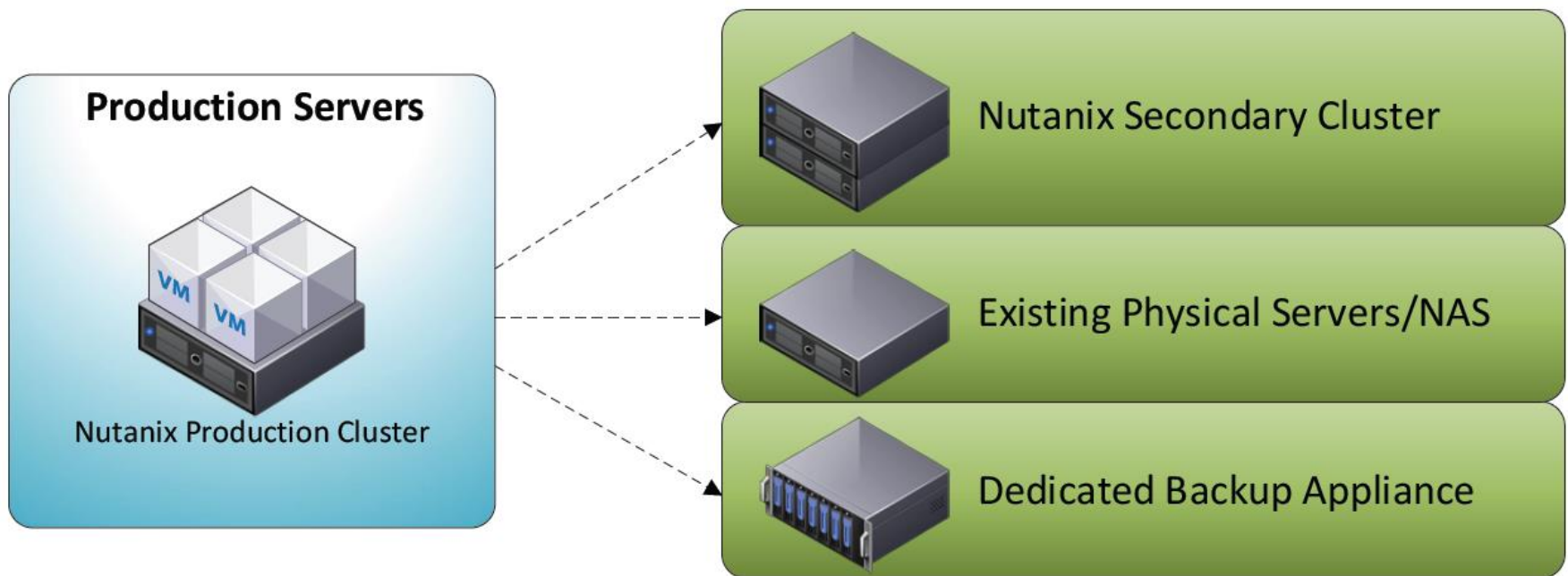
- VM proxy appliance
  - ▣ A VM with HotAdd access to VM disks on the datastore.
  - ▣ Enables LAN-free data transfer
- Deduplication & compress
  - ▣ By backup proxy
  - ▣ By backup server
  - ▣ By target storage



**Avamar client software runs  
on the proxy server**

# Veeam SDDC Solution (Nutanix)

- Nutanix could be secondary cluster as data protection storage
- Nutanix defined **capacity-rich** nodes for data protection use cases

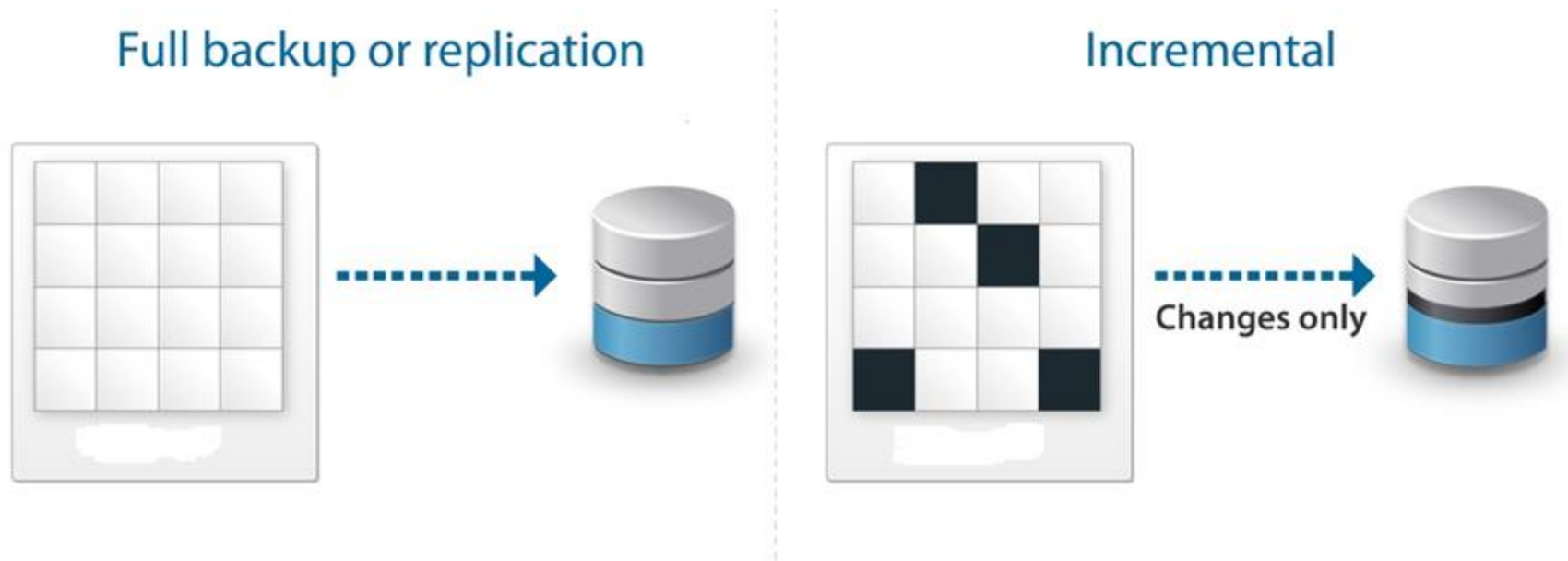


# Veeam Features For VM Backup

- Off-host LAN free backup
  - ▣ Less overhead by VADP
  - ▣ Using storage network instead of VM network
- Uniform backup method: Image-level backup
  - ▣ Near CDP (<15min RPO & RTO)
  - ▣ **Empty block, deleted data ignorance**
  - ▣ Inline deduplication and compression
  - ▣ App level data consistence with fine granularity
    - Quiesce the VM by VM tools/drivers
      - Windows: Microsoft VSS service
    - One time full backup and incremental forever
      - Block level incremental backup
      - VM snapshot -> VADP(CBT) -> snapshot merge back
        - VMware: VADP(vStorage APIs for Data Protection)
    - Easy and portable restore for whole VM

Note: **Red color** indicates Veeam strengths over other VM backup products

# CBT – Change Block Tracking



- 10x faster
- Small backup window
- Near-CDP replication

# Veeam Features For VM Restore

- Easier and quick restore
  - ▣ 1 click restore with a single or group VMs
- Easier test and verify backup
  - ▣ Automatic verification
  - ▣ On demand sandbox vs. dedicate virtual lab
- High backup usability
  - ▣ Instant recover + Storage vMotion
- Fine granularity restore based on one method
  - ▣ Image level restore
    - Full or incremental VM recovery with efficient VM search
  - ▣ File level restore
    - File instant index and search
    - Explorer for any type of file systems per VM images
  - ▣ Application level restore
    - RDB table & records, Exchange mail items, Active Directory etc...

Note: Red color indicates Veeam strengths over other VM backup products

# Other Veeam Features

- Unlimited Scale-out Backup Repository
  - ▣ Management overheads with massive VMs
  - ▣ Global Pool - break backup target storage silos
  - ▣ Storage Aware Placement
  - ▣ Self-service backup - a backup storage cloud
- Cloud backup & recovery



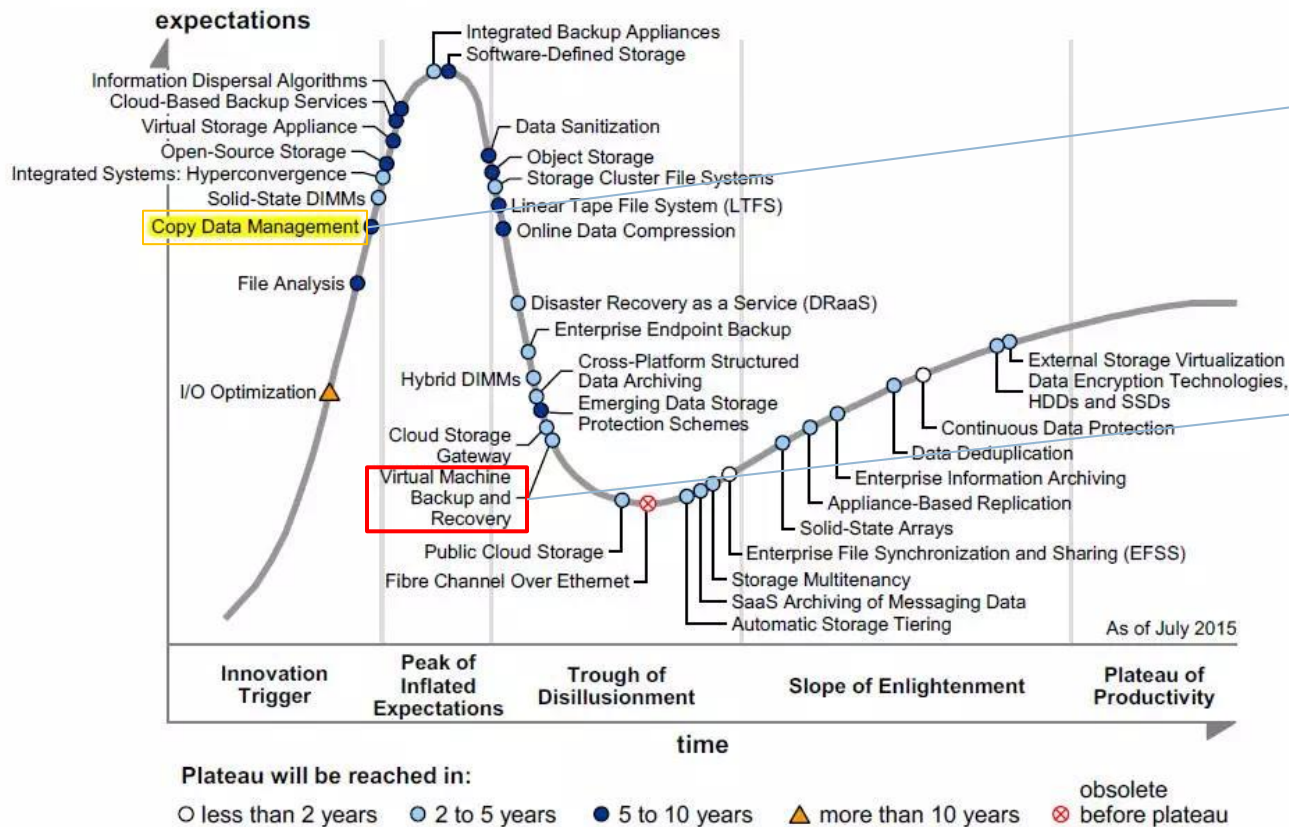
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# Gartner Hyper Cycle

Figure 1. Hype Cycle for Storage Technologies, 2015



Still has a long way to go

2 to 5 years to be a mature technology

# Gartner Market Survey

