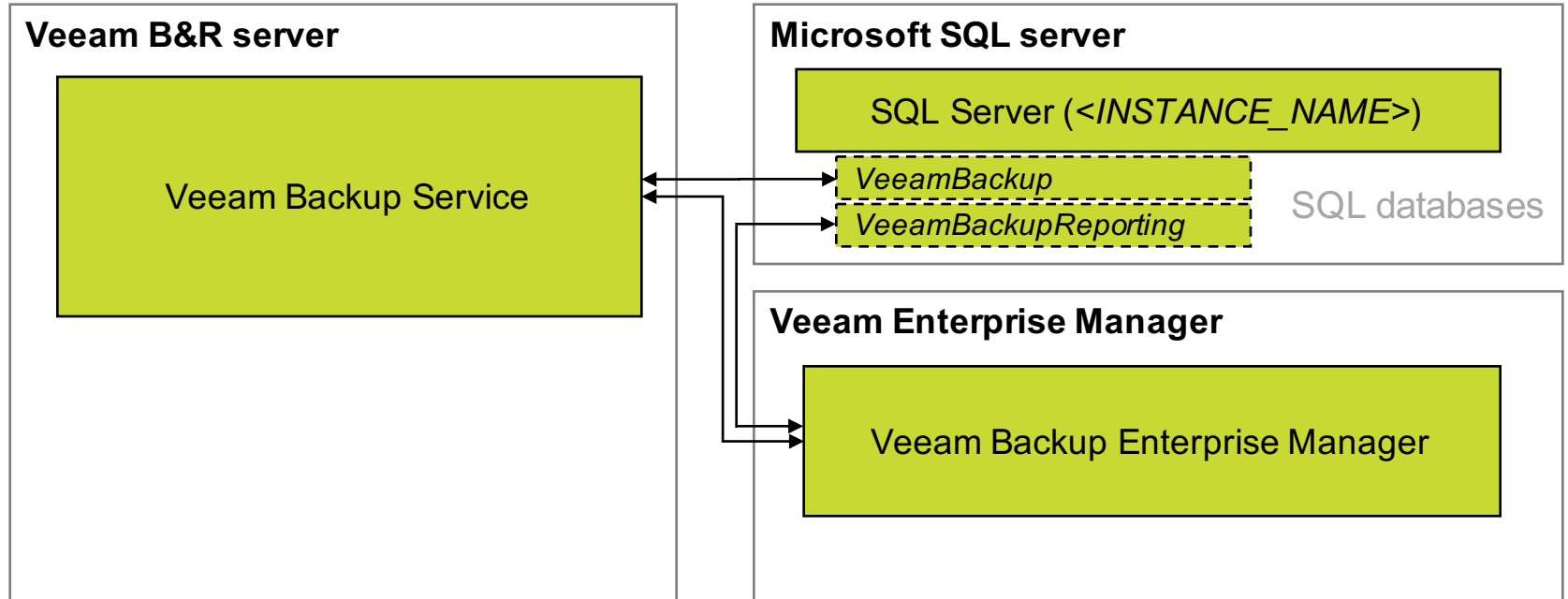# Veeam Backup & Replication Components Deep Dive (v9)

Vsevolod Zubarev, Veeam Tier 2 Support Engineer

Contents

- Veeam® Backup & Replication™

- Windows services

- Linux server interaction

- Microsoft Hyper-V host integration

- Veeam B&R guest interaction: Windows and Linux

- Enterprise Manager

Veeam Backup & Replication and Enterprise Manager

Veeam B&R server

Veeam Backup Service

Microsoft SQL server

SQL Server (<*INSTANCE_NAME*>)

VeeamBackup

VeeamBackupReporting

SQL databases

Veeam Enterprise Manager

Veeam Backup Enterprise Manager

Service Process Driver

Veeam Backup & Replication

Veeam B&R server
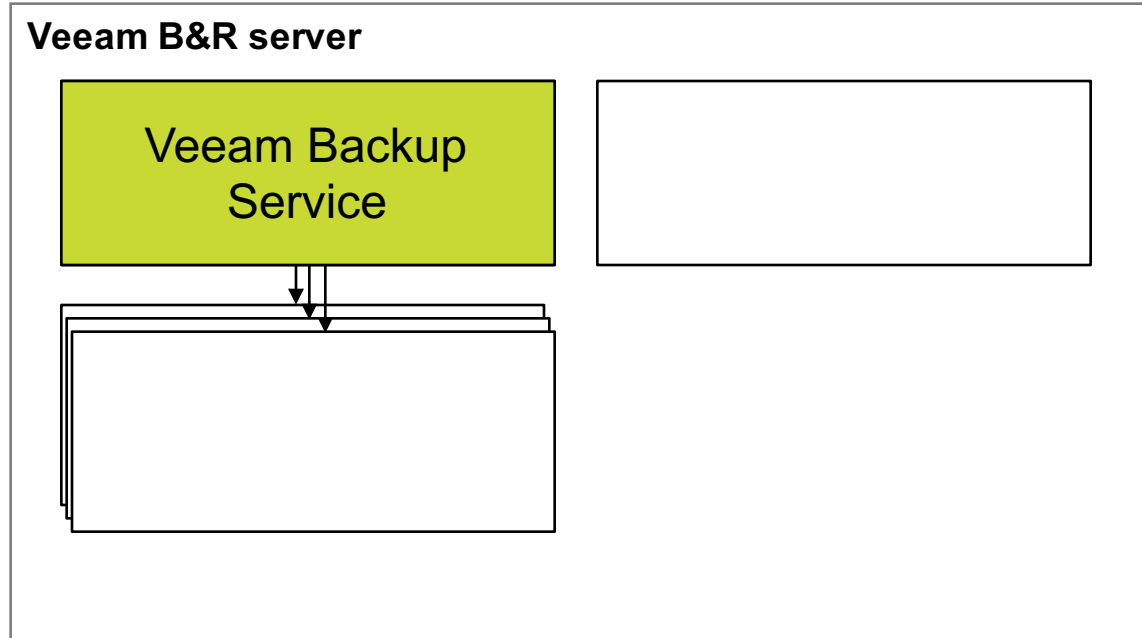
Veeam Backup Service

Veeam Backup & Replication Service

Veeam.Backup.Service.exe

- Manages the database

- Initiates every job start

- Runs resource task scheduler (RTS):

  Tracking of "resource" usage (concurrent tasks on proxy, repository, concurrent CSV snapshots)

- Accepts incoming connections from Veeam Console, Enterprise Manager, Veeam Endpoint Backup™ and others

Veeam Backup and Replication Service	Veeam Backup Service	Running
Veeam Backup Catalog Data Service	Veeam Backup Catalog Data Ser...	Running
VeeamCloudSvc	Veeam Cloud Connect Service	Running
VeeamDeploymentService	Veeam Installer Service	Running
VeeamGateSvc	Veeam Cloud Gateway Service	Running
VeeamNFSSvc	Veeam vPower NFS Service	Running
VeeamTransportSvc	Veeam Data Mover Service	Running

Veeam Backup & Replication

Veeam B&R server

Veeam Backup Service

Veeam Backup Manager
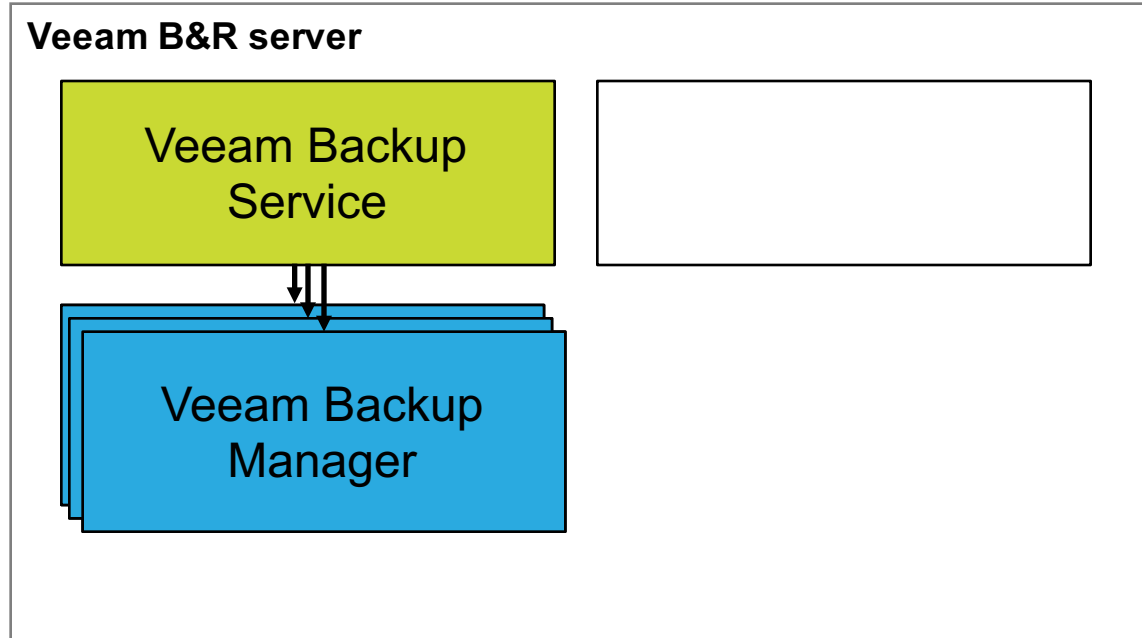
Service   Process   Driver

Veeam Backup Manager

Started by Veeam Backup Service
and is able to access the database

Runs a job from start to finish and understands
the actions it's supposed to take, such as:

- Connecting to vCenter over HTTPS or Hyper-V host over WMI

- Snapshot creation/removal

- Retention calculation and any other kind of job logic

- Direct communication with data movers (aka VeeamAgents).

Veeam Backup Manager

A **job** is almost any kind of *activity* that Veeam Backup & Replication can perform:

- Backup, replication, backup copy, etc.
- Any restore is a single-run job
- Any system jobs such as configuration backup, rescan, SAN rescan, tape infrastructure rescan

Veeam Backup & Replication

Veeam B&R server

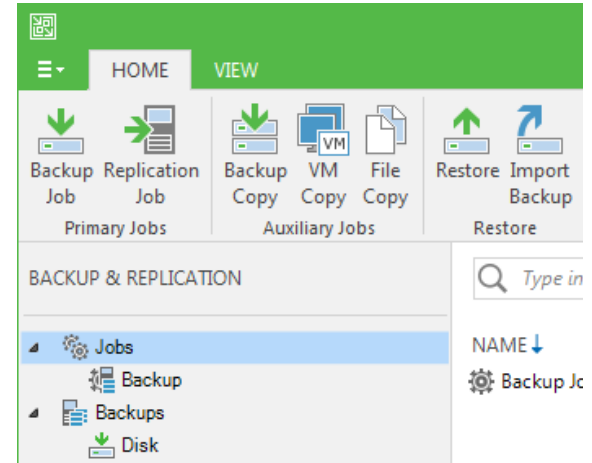| Veeam Backup Service	Veeam Backup Console

Veeam Backup Manager
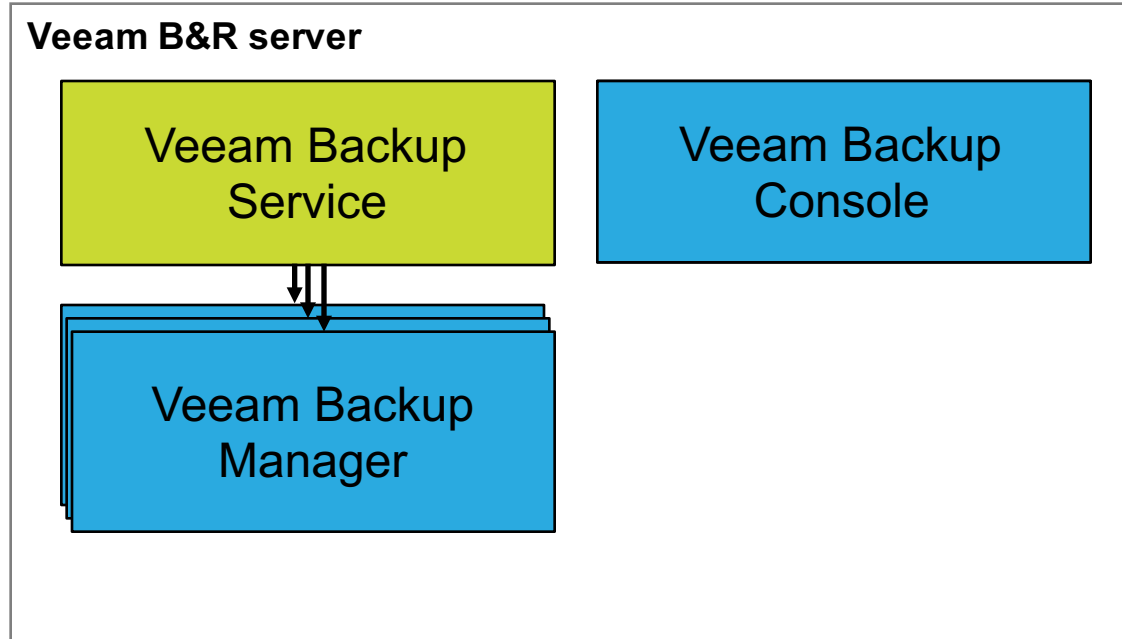
🟩 Service 🟦 Process 🟩 Driver

Veeam Backup Console

Veeam.Backup.Shell.exe

- Essentially a graphical user interface, started by end users

- Obtains data from the database to display jobs, backups and so on.

- Almost all user interaction and possible errors during interaction are logged.

Veeam Backup & Replication

Veeam B&R server

Veeam Backup
Service

Veeam Backup
Console

Veeam Backup
Manager

Windows server/desktop

Veeam Backup
Console

Service   Process   Driver

Veeam Backup & Replication

Veeam B&R server

Windows server/desktop

Veeam Backup Service

Satellite

Veeam Backup Console

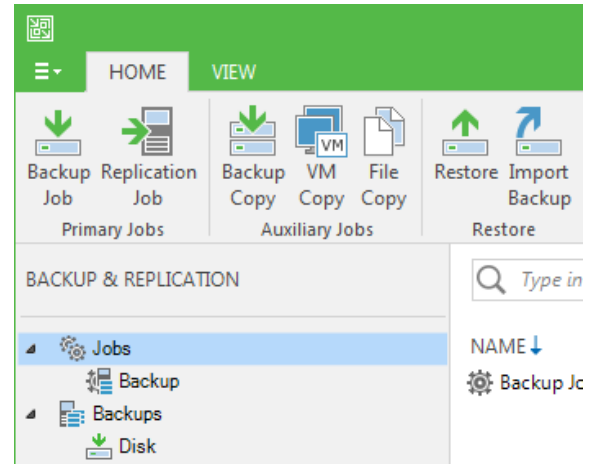Veeam Backup Manager
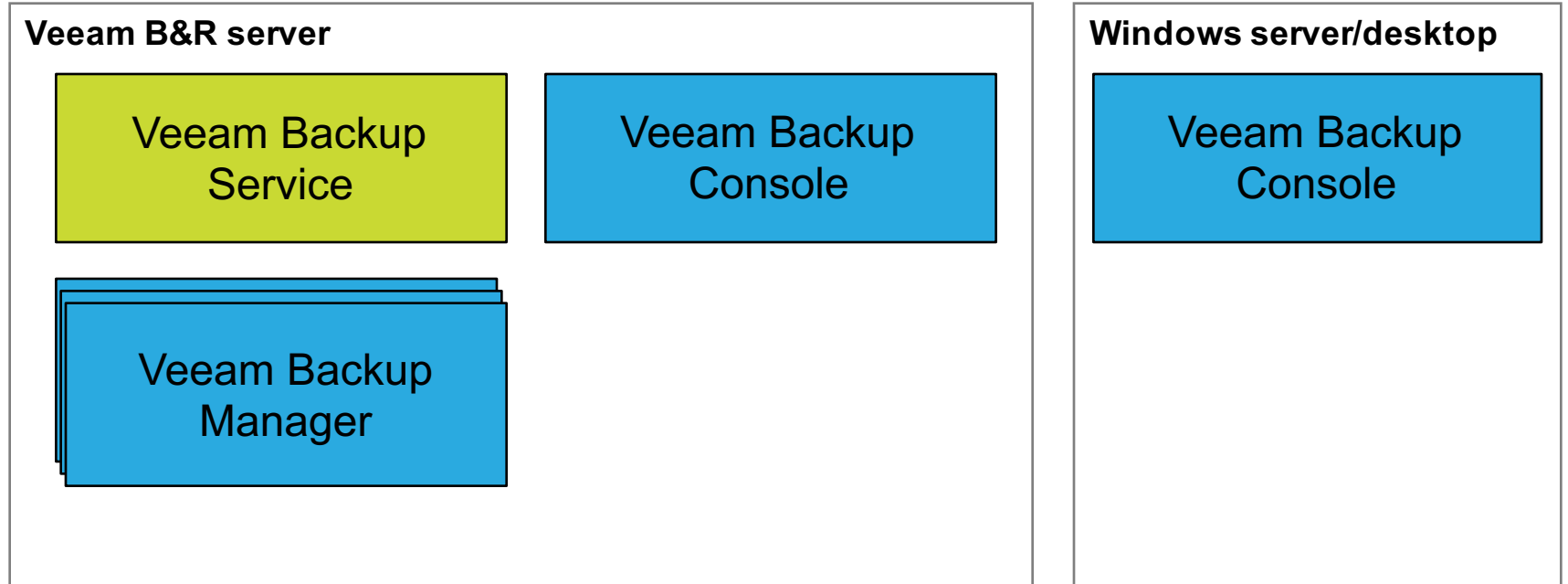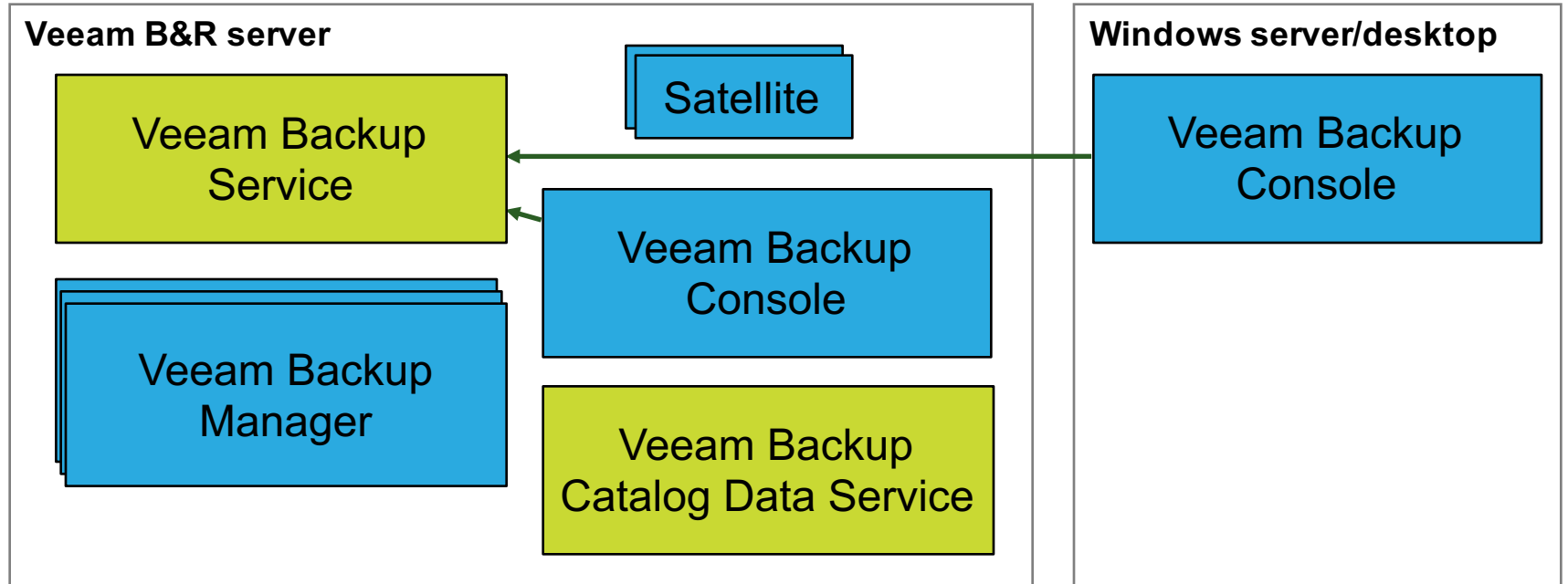
Veeam Backup Console
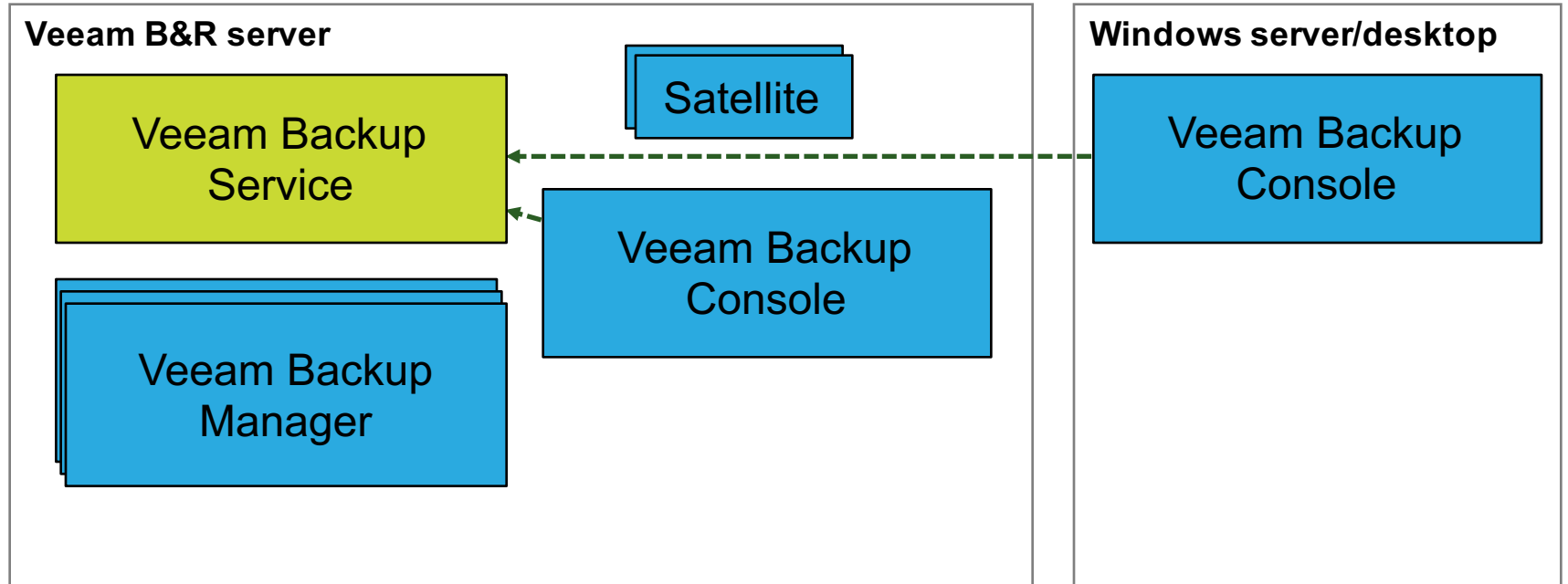
Service   Process   Driver

Remote Console

Control Veeam B&R from any Windows machine

- Veeam Console runs on your desktop and connects to a remote B&R

- Windows FLR is mounted locally, to the machine with Veeam Console

- Veeam Explorers also run locally

- Satellite process for each Console – used for offloading certain operations

Veeam Backup & Replication

Veeam B&R server

Veeam Backup Service

Satellite

Veeam Backup Console

Veeam Backup Manager

Veeam Backup Catalog Data Service

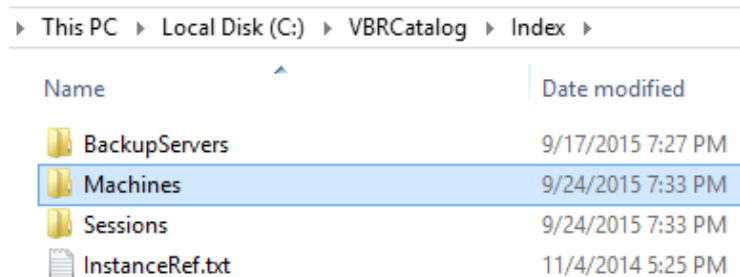Windows server/desktop

Veeam Backup Console

Service   Process   Driver

Veeam Backup Catalog Data Service

Veeam.Backup.CatalogDataService.exe

- Handles VM file system indexing data (the VBRCatalog folder)

- Handles catalog retention

- Only used when the indexing option is enabled in the backup jobs

Name	Date modified
BackupServers	9/17/2015 7:27 PM
Machines	9/24/2015 7:33 PM
Sessions	9/24/2015 7:33 PM
InstanceRef.txt	11/4/2014 5:25 PM

This PC ▸ Local Disk (C:) ▸ VBRCatalog ▸ Index ▸

Windows Server: Mandatory services

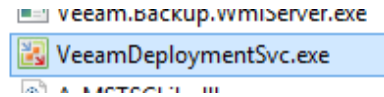Windows Server

Veeam Backup Installer Service
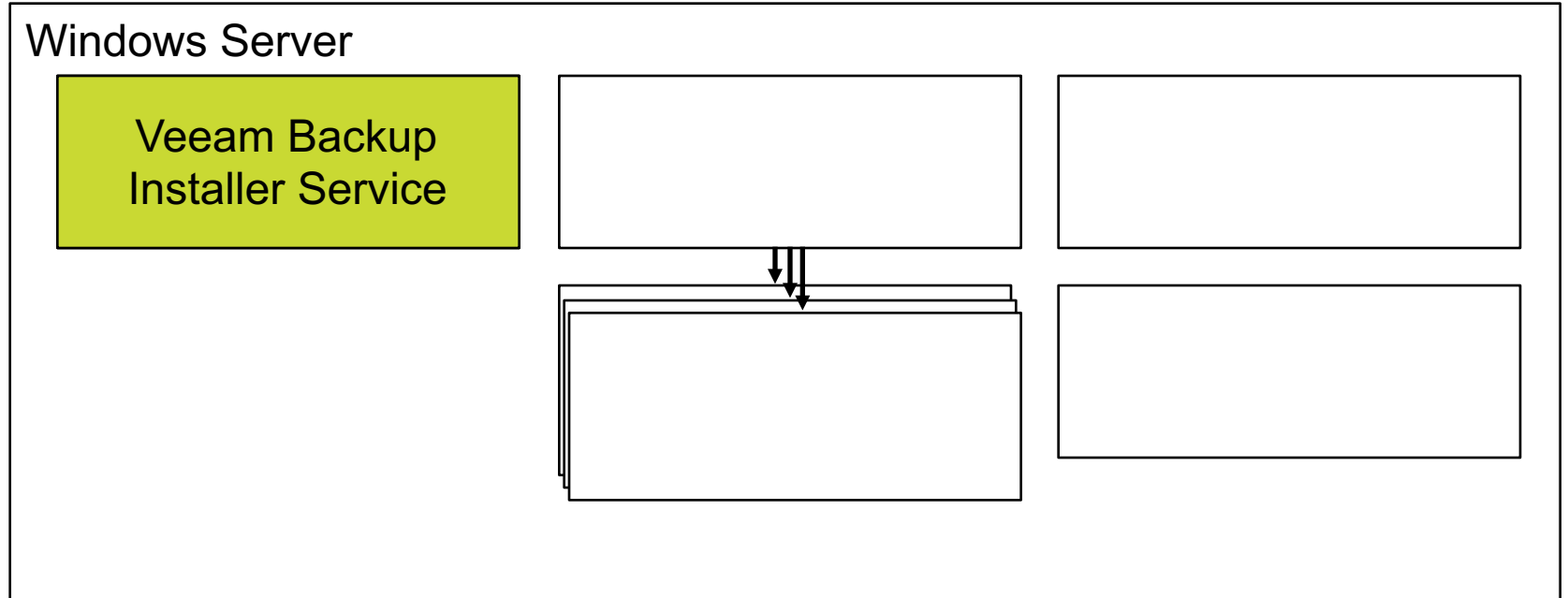
Service Process Driver

Veeam Installer Service (1/2)

VeeamDeploymentSvc.exe:

- The first service installed on any Windows Server added to Veeam B&R

- Performs installation of other services

- On every "rescan," gathers and reports back to Veeam:
  - OS version, number of CPU cores, attached storage, available volumes and amount of free space

Veeam Installer Service (2/2)

VeeamDeploymentSvc.exe:
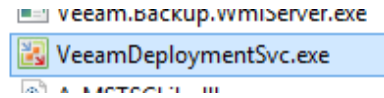
- If the service isn't running, Windows server is considered "offline."

- Performs simple tasks such as:
  - directory enumeration
  - .vbm file read/write
  - file rename, remove

Windows Server: Mandatory services

Windows Server

Veeam Backup Installer Service	Veeam Data Mover Service	

Service Process Driver
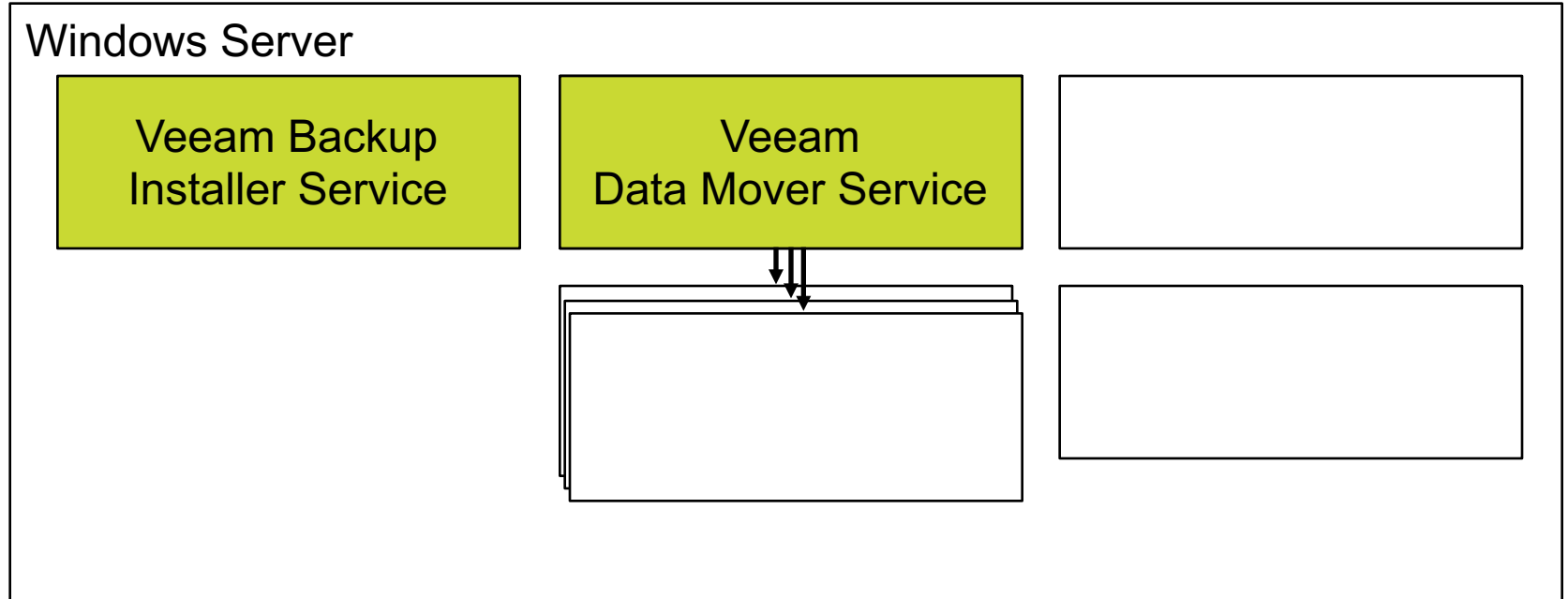
Veeam Data Mover Service

VeeamTransportSvc.exe

- Starts data movers (VeeamAgents) by the requests from Veeam Backup Manager.

- Manages the VeeamFSR driver

Windows Server: Mandatory services

Windows server

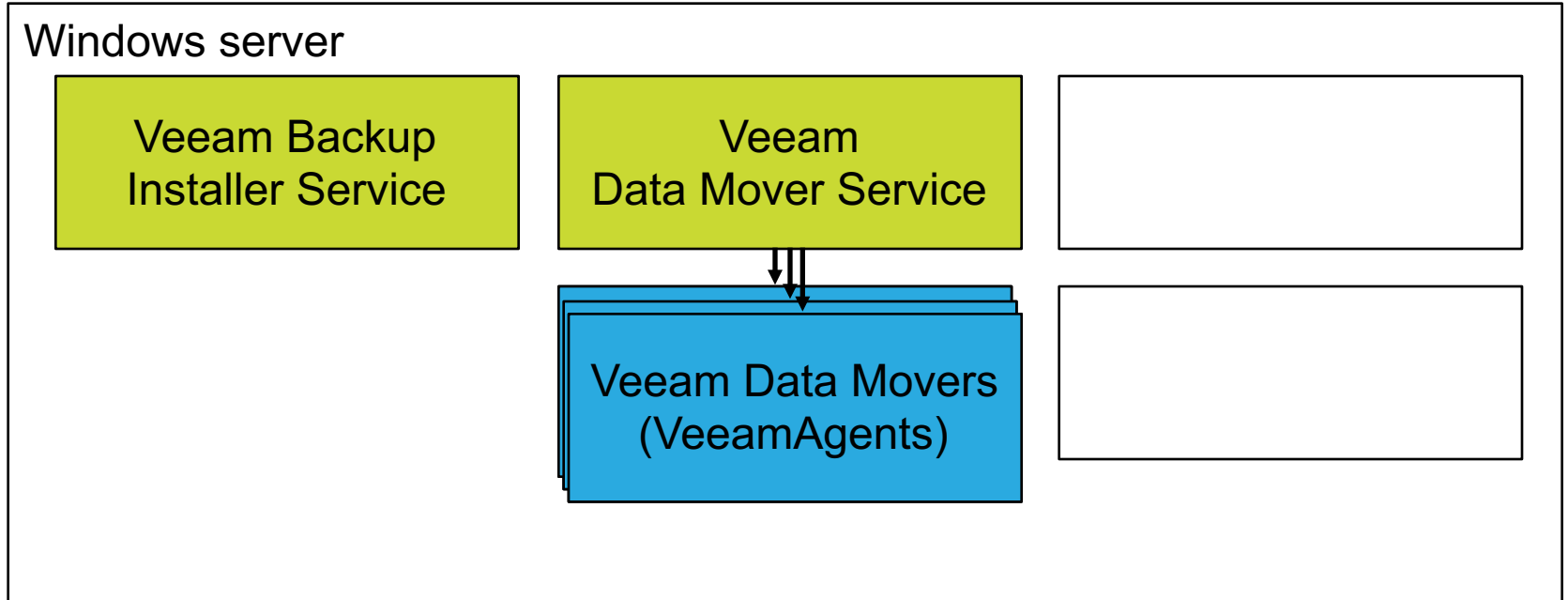| Veeam Backup Installer Service	Veeam Data Mover Service	
	Veeam Data Movers (VeeamAgents)	

Service Process Driver

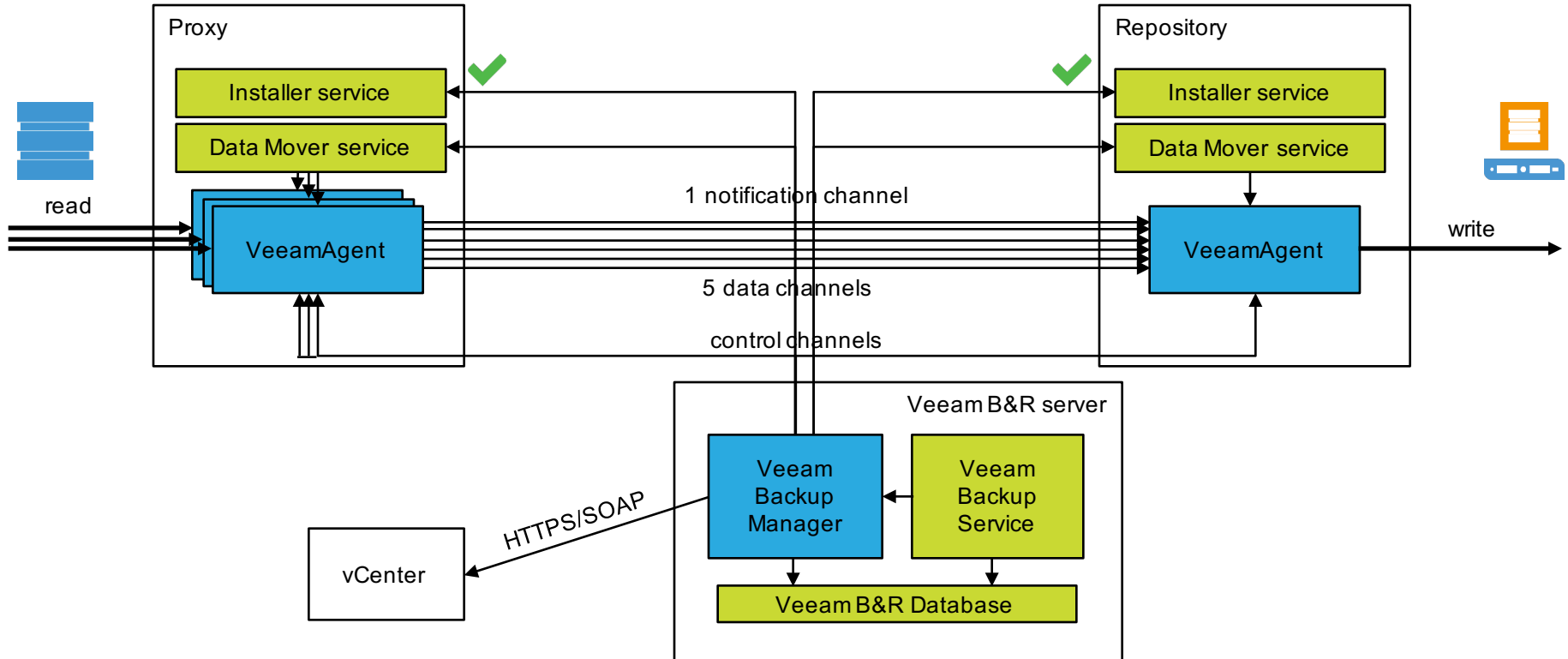# Data Movers (1/2)

VeeamAgent.exe

- Processes that do the "heavy lifting," data transfer work associated with a proxy or repository

- For example, during a VMware backup job:
  - **Source** agents read .vmx, .vmxf, .nvram and .vmdk files
  - **Target** agents write backup files to the repository folder/share

Data Movers (2/2)

VeeamAgent.exe
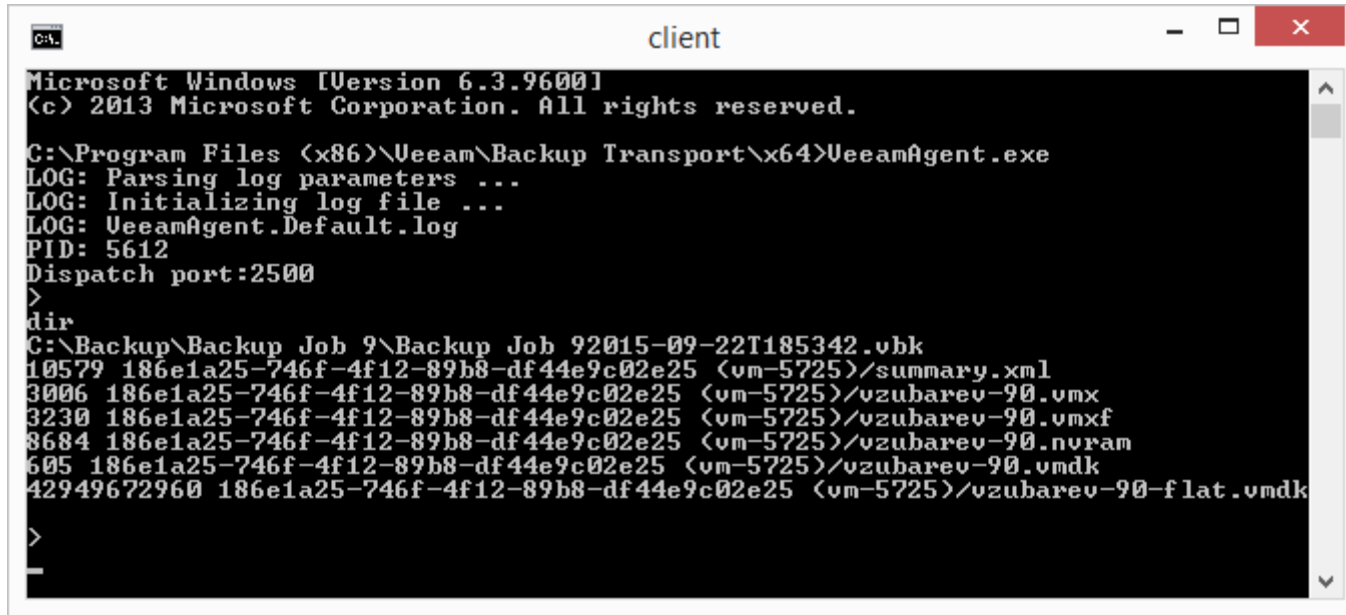
- VeeamAgents simply follow commands from the manager, they don't have a concept of a "job"
  - Manager knows which agent is performing which role
  - There are more than 200 commands for all the different scenarios
- 32 and 64-bit versions for both Windows and Linux

VMware backup job workflow

VeeamAgent demonstration

Windows Server: Mandatory services

Windows Server

Veeam Backup Installer Service	Veeam Data Mover Service	VeeamFSR driver

Veeam Data Movers (VeeamAgents)

■ Service ■ Process ■ Driver

Veeam FSR driver

veeamfsr.sys

- Restores Veeam backup contents, presenting files on the file system, without requiring any disk space

- Key component in many restore scenarios:
  - Instant VM Recovery, Windows FLR, Multi-OS FLR, SureBackup

Name	Description	File	Type	Started
veeamfsr	VeeamFSR	\??\c:\program f...	Kernel Driver	Yes

Windows Server: Mandatory services

Windows Server

Veeam Backup Installer Service	Veeam Data Mover Service	VeeamFSR driver
	Veeam Data Movers (VeeamAgents)	Virtual Disk Kernel-mode driver
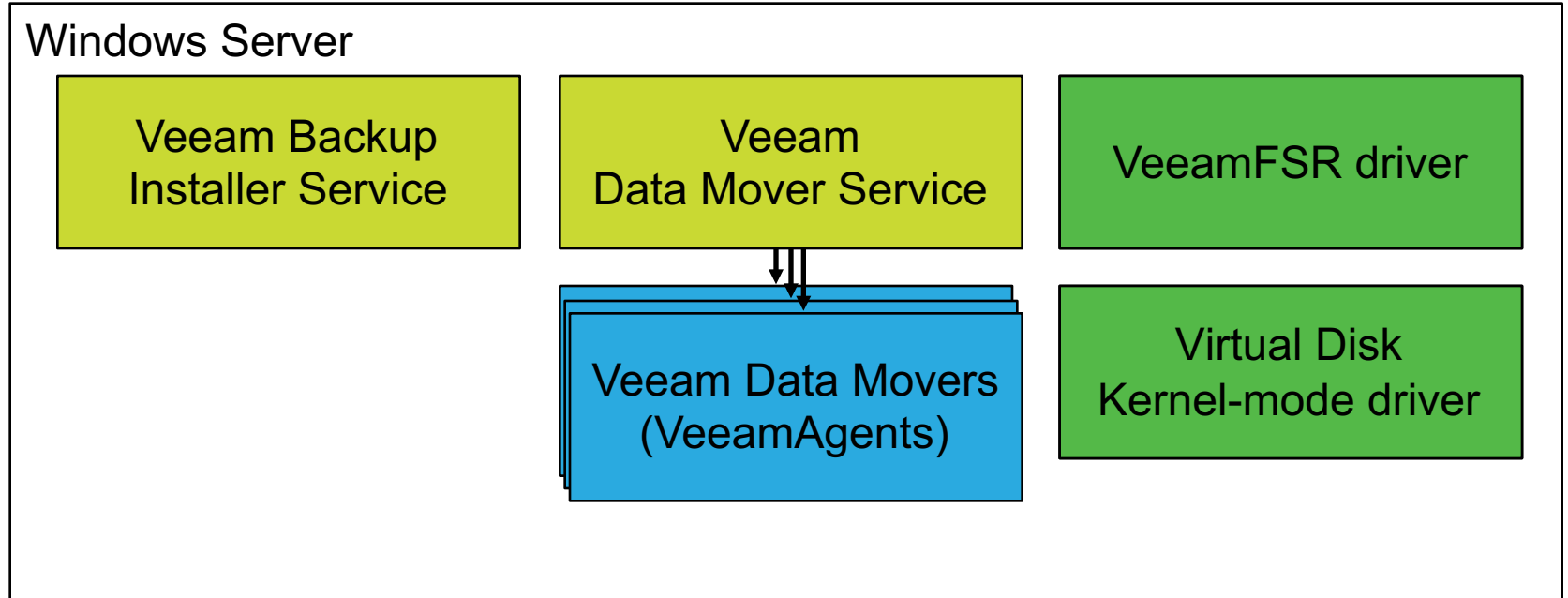
Legend:
- Service
- Process
- Driver

Virtual disk kernel-mode driver (1/2)

vdk.sys / vdk.exe

- A driver that is able to mount vSphere (.vmdk) and Hyper-V (.vhd(x)) disks to a Windows machine as if they were attached directly

- Driver is controlled via vdk.exe

```
Virtual Disk Driver for Windows version 4.0.0.3
Usage:
  VDK.EXE command [options...]

Commands:
  INSTALL    Install the Virtual Disk Driver.
  REMOVE     Uninstall the Virtual Disk Driver.
  START      Start the Virtual Disk Driver.
  STOP       Stop the Virtual Disk Driver.
  DRIVER     Print Virtual Disk Driver status.
  DISK       Set the initial number of virtual disk devices.
  CREATE     Create a new virtual disk device.
  DELETE     Delete a virtual disk device.
  VIEW       Print disk image information.
  DETAILS    Print disk image detailed information.
  OPEN       Open a disk image as a virtual drive.
  CLOSE      Close a disk image.
  LINK       Assign a drive letter to a partition.
  ULINK      Remove a drive letter from a partition.
  IMAGE      Print opened image file information.
  HELP       Print command help.
```

Virtual disk kernel-mode driver (2/2)

vdk.sys / vdk.exe

A key component in the following scenarios:

- Windows FLR, Veeam Explorers™
- Applying replica Re-IP rules during failover
- SureBackup Domain Controller recovery

```
Virtual Disk Driver for Windows version 4.0.0.3
Usage:
  VDK.EXE command [options...]

Commands:
  INSTALL    Install the Virtual Disk Driver.
  REMOVE     Uninstall the Virtual Disk Driver.
  START      Start the Virtual Disk Driver.
  STOP       Stop the Virtual Disk Driver.
  DRIVER     Print Virtual Disk Driver status.
  DISK       Set the initial number of virtual disk devices.
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  DELETE     Delete a virtual disk device.
  VIEW       Print disk image information.
  DETAILS    Print disk image detailed information.
  OPEN       Open a disk image as a virtual drive.
  CLOSE      Close a disk image.
  LINK       Assign a drive letter to a partition.
  ULINK      Remove a drive letter from a partition.
  IMAGE      Print opened image file information.
  HELP       Print command help.
```

Windows Server:
On-demand services

Windows Server
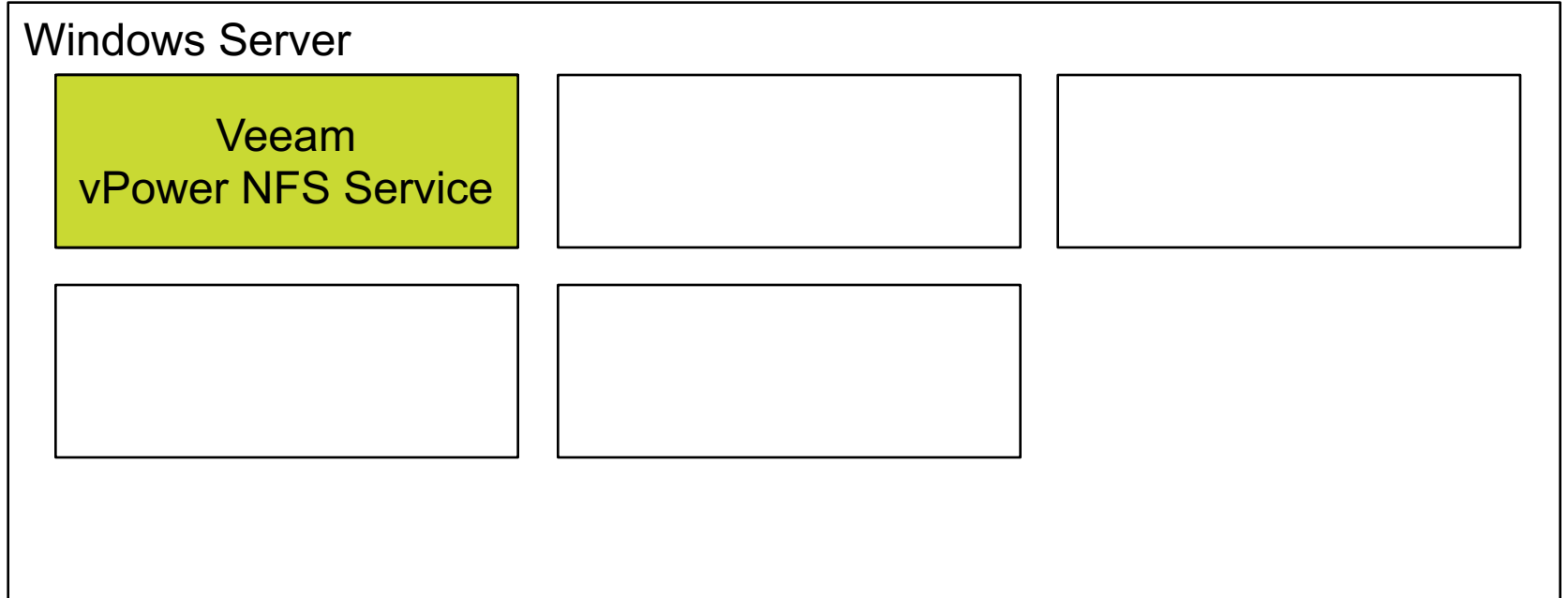
Veeam
vPower NFS Service
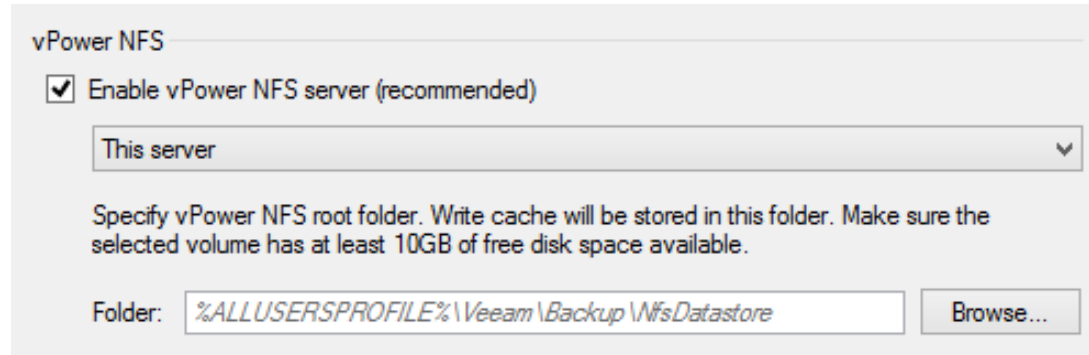
Veeam vPower NFS Service

VeeamNFSSvc.exe

- Acts as an NFSv3 server, mountable from ESXi hosts in particular

- Key component in Instant Recovery, Multi-OS FLR, SureBackup

Windows Server: On-demand services

Windows Server

Veeam vPower NFS Service	Veeam Mount Service	
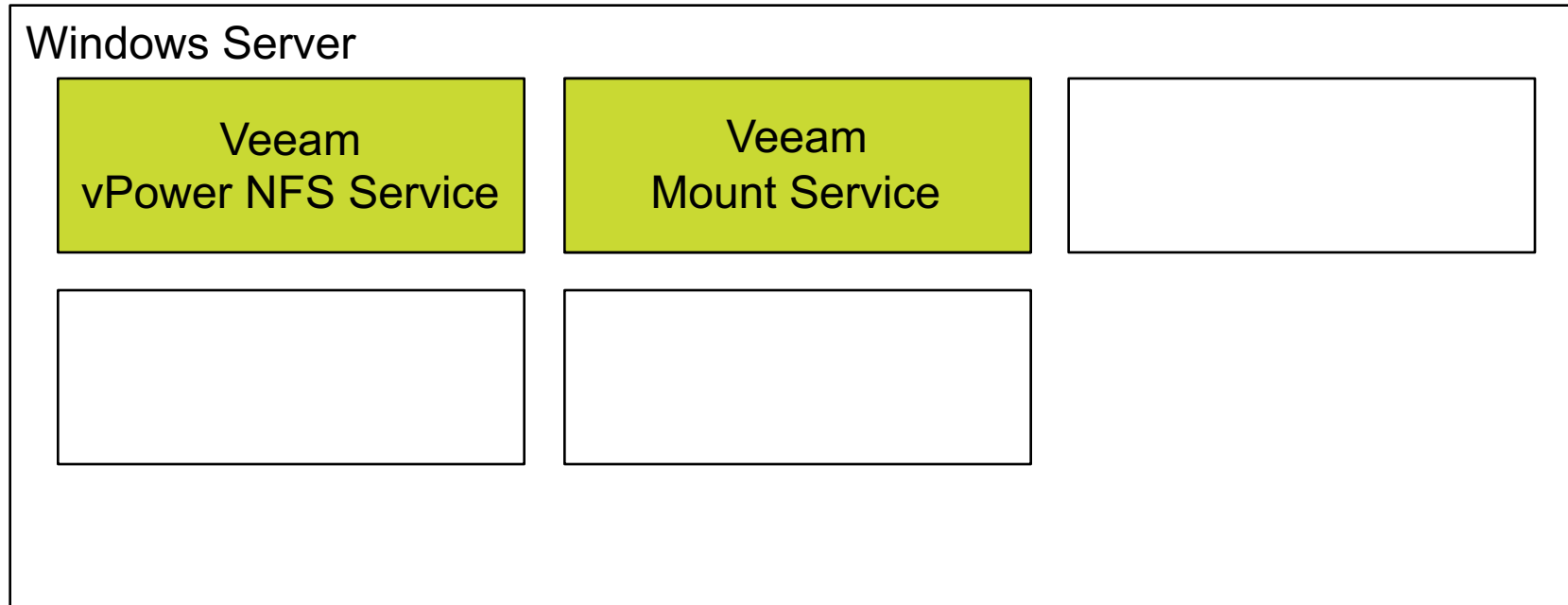
🟩 Service 🟦 Process 🟩 Driver

Veeam Mount Service/Server

Veeam.Backup.MountService.exe

- Used to contain File-Level Restore traffic on the remote site

- Defaults to Backup Repository or Backup Console
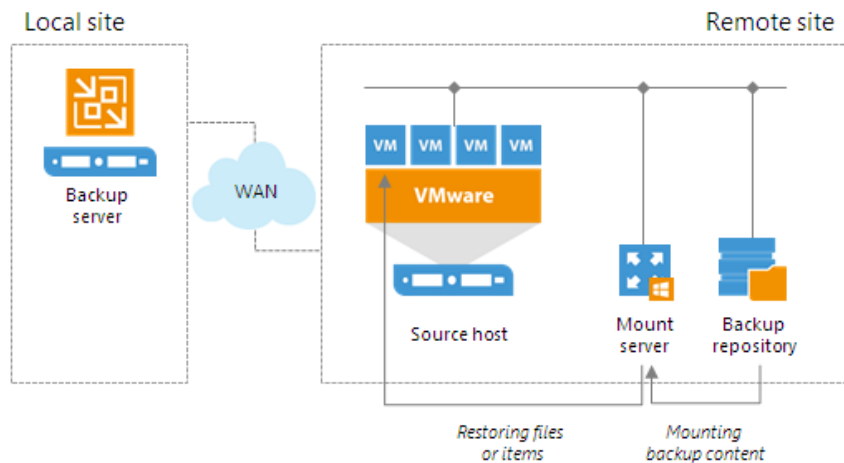
Veeam Mount Service/Server

v8 limitation: Windows FLR mount always happens on Veeam Server

v9: Now when restoring on a remote site, all Windows FLR traffic is kept on the remote site

Windows Server: On-demand services

Windows Server

Veeam vPower NFS Service	Veeam Mount Service	Veeam WAN Accelerator Service
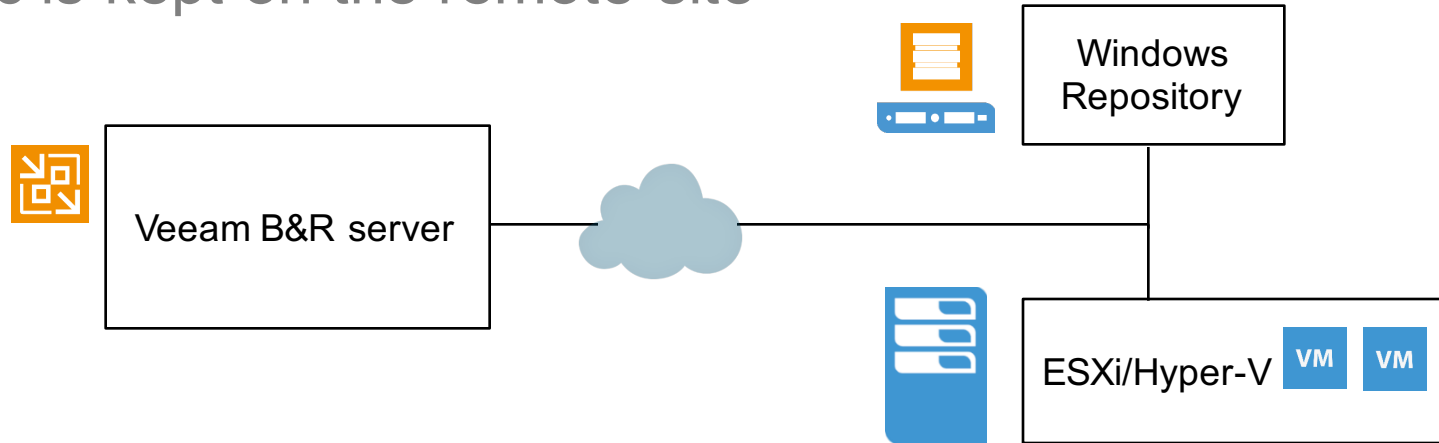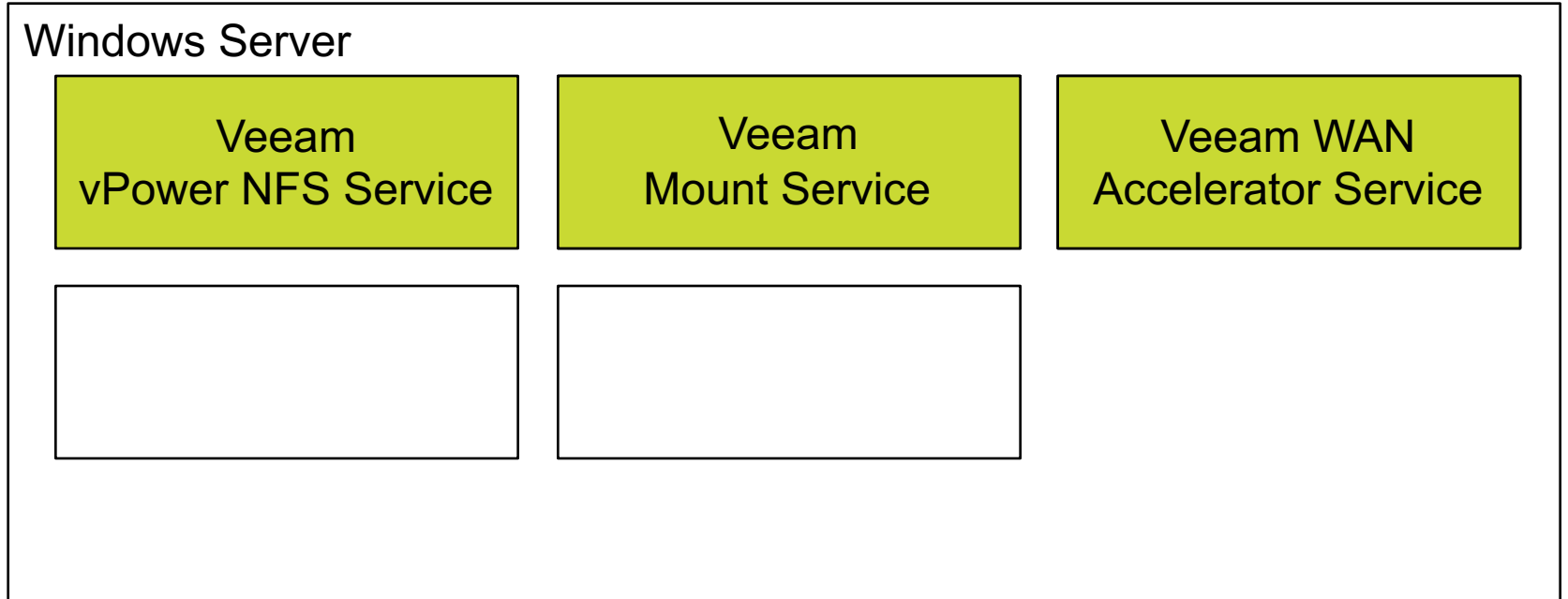
🟩 Service 🟦 Process 🟩 Driver

Veeam WAN Accelerator Service (1/2)

VeeamWANSvc.exe

- Two instances are required, one on site, another off site

- Can be used for backup copy and replication jobs

- 64-bit process with minimal RAM requirement of 8 GB
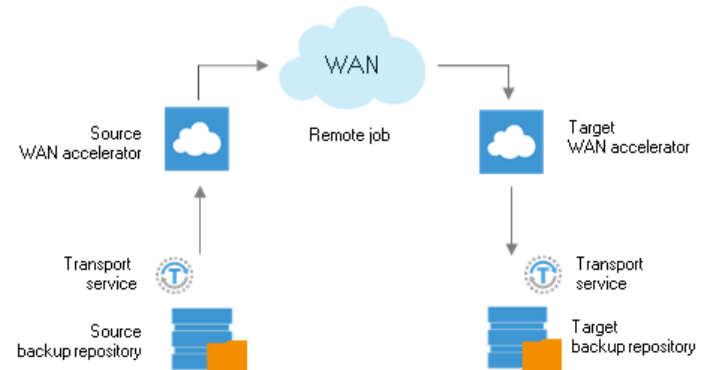
Veeam WAN Accelerator Service (2/2)

VeeamWANSvc.exe

- Requires disk space for caching:

  100 GB+ recommended on target

- Performance may not improve if the network link is fast (e.g., 1 Gbit) and disks with cache are not fast enough

Windows Server: On-demand services

Windows Server

Veeam vPower NFS Service	Veeam Mount Service	Veeam WAN Accelerator Service
Veeam Remote Tape Access Service		
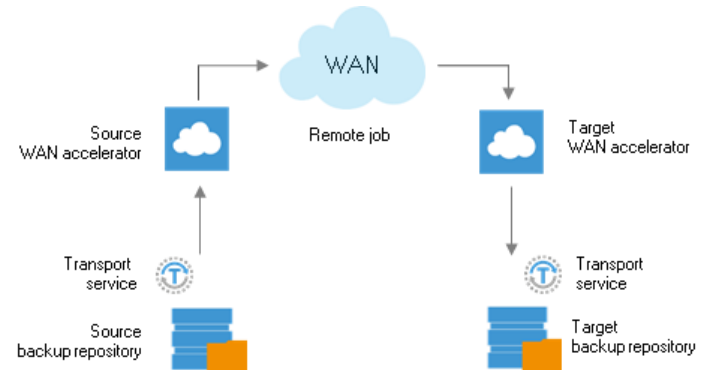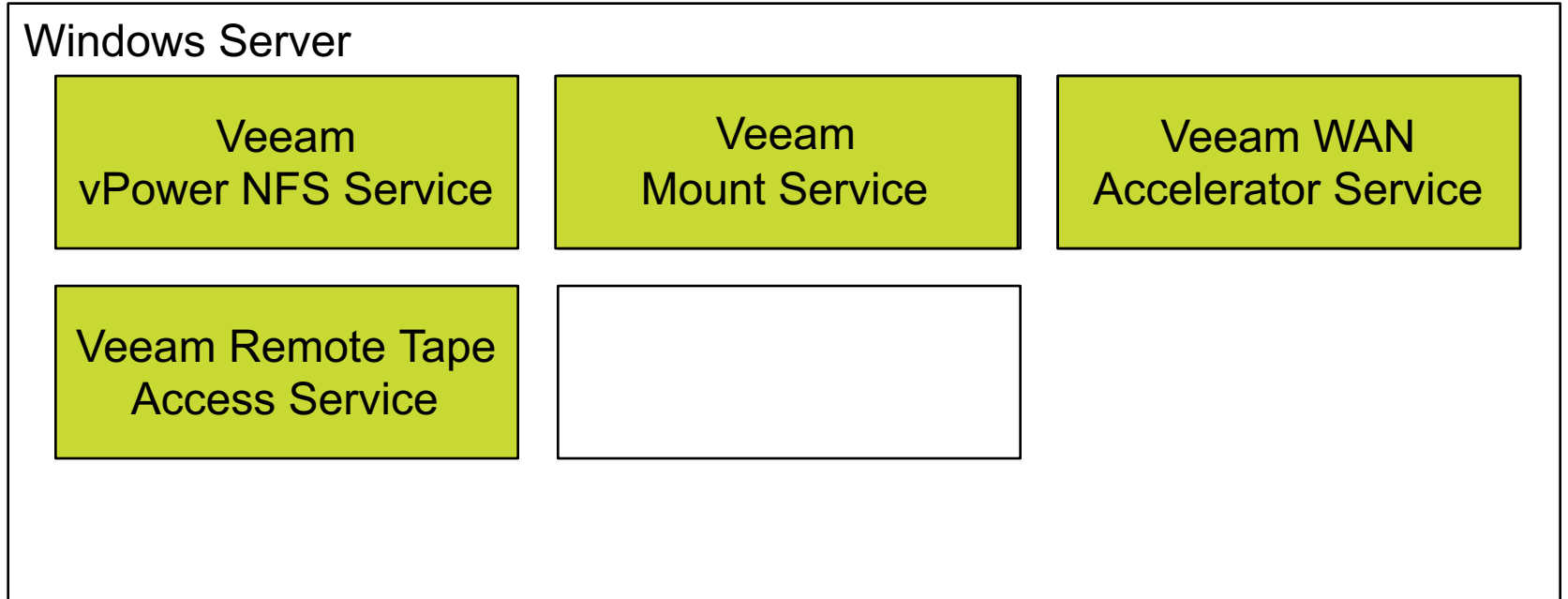
🟩 Service 🟦 Process 🟩 Driver

Veeam Remote Tape Access Service

VeeamTapeSvc.exe

- Gathers information about locally connected tape devices and sends it back to Veeam B&R

- Implemented to lift v7.0 limitation — previously only Veeam B&R could act as a tape server
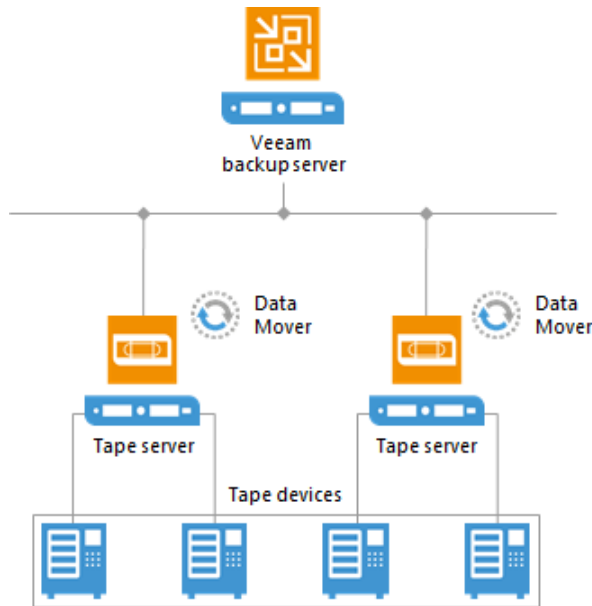
Windows Server:
On-demand services

Windows server

Veeam vPower NFS Service	Veeam Mount Service	Veeam WAN Accelerator Service
Veeam Remote Tape Access Service	Veeam Cloud Gateway Service	

■ Service   ■ Process   ■ Driver

Veeam Cloud Connect and gateway services

Veeam.Backup.CloudService.exe
VeeamGateSvc.exe

- Works in conjunction with the Cloud Connect service that is running on Veeam B&R on the cloud provider
- Accepts incoming connections from clients, directly or from behind NAT
- It is possible to deploy multiple gateways for increased Availability

User's Veeam backup server

Cloud gateway

SP Veeam backup server

Cloud repository

Linux server interaction

Veeam B&R server

- Veeam Backup Service
- Veeam Backup Manager

SSH

Linux server

- sshd
- perlsoap library
- Veeam Data Movers (VeeamAgents)

Service   Process   Driver
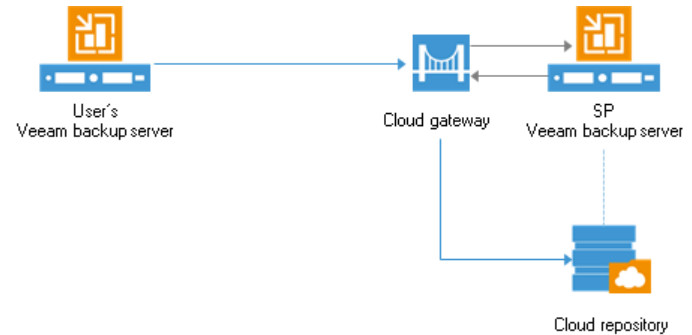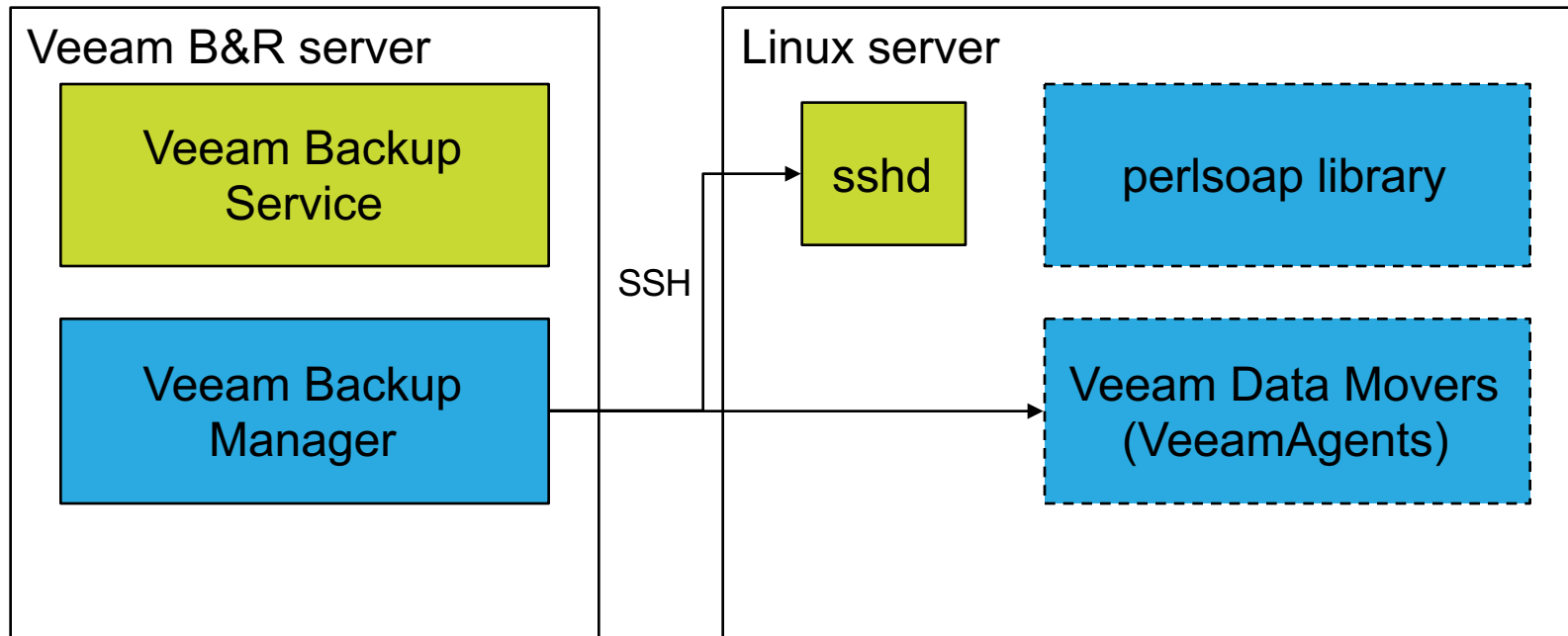
Linux server interaction

SSH connection required. Authentication via:

- Username, password. **root** account required or with elevation to root (sudoers file)
- Or using the **Identity/Pubkey** method

perlsoap library is uploaded and used for auxiliary tasks, such as renaming files and listing directories

- Requires Perl

Hyper-V host integration

Hyper-V host

Veeam Backup Installer Service	Veeam Data Mover Service	VeeamFSR driver	Veeam Backup Hyper-V Integration Service

Veeam Data Movers (VeeamAgents)
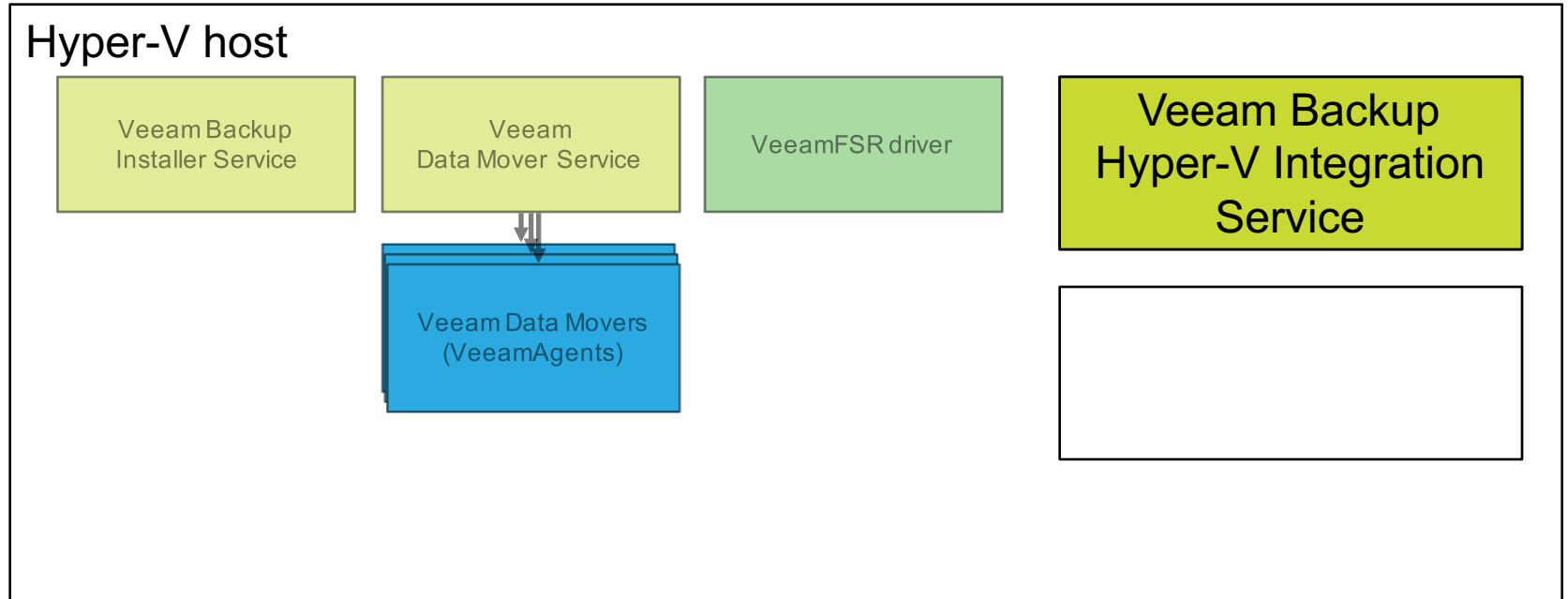
🟩 Service 🟦 Process 🟩 Driver

Veeam Backup Hyper-V Integration Service

VeeamHvIntegrationSvc.exe

- Performs auxiliary Hyper-V related tasks that are not possible via WMI

- Controls the VeeamFCT driver

Hyper-V host integration

Hyper-V host

Veeam Backup Installer Service	Veeam Data Mover Service	VeeamFSR driver

Veeam Data Movers (VeeamAgents)

Veeam Backup Hyper-V Integration Service

Veeam CT Mini-Filter Driver
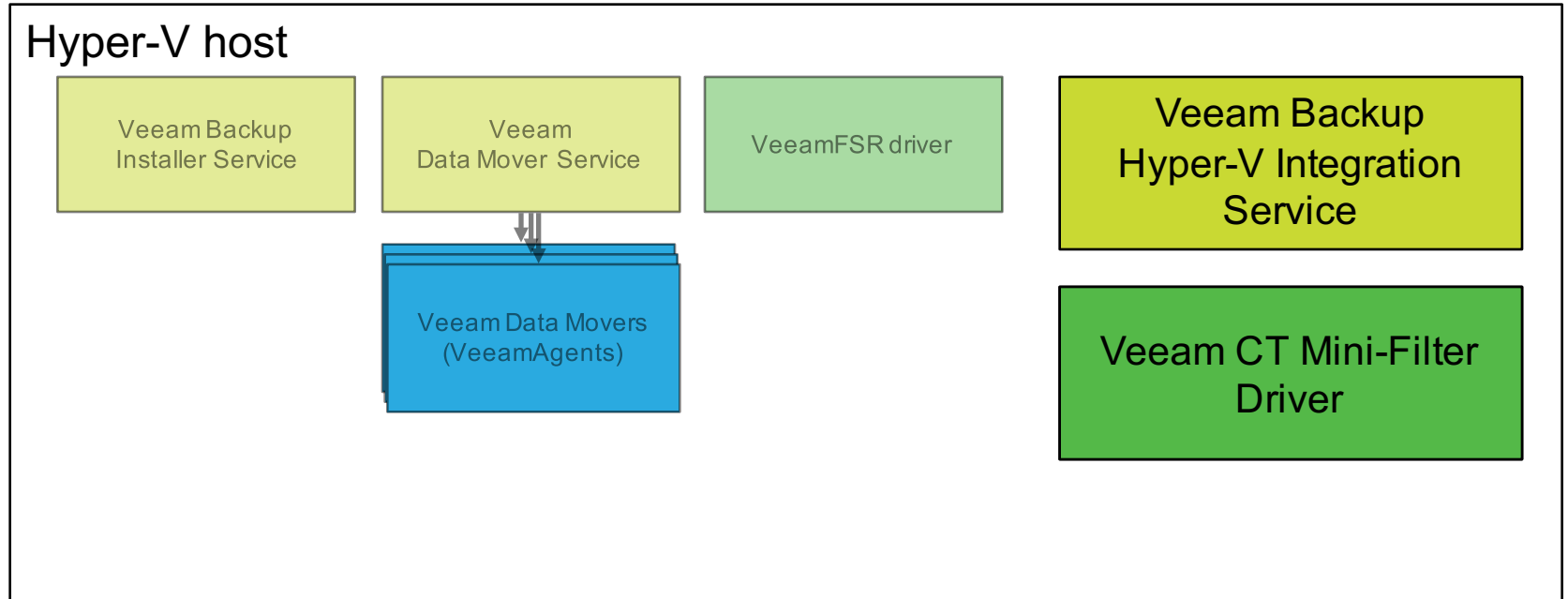
Service **Process** **Driver**

Veeam CT Mini-Filter Driver (1/2)

veeamfct.sys

- Allows for Changed Block Tracking (CBT) on a Hyper-V host where otherwise no such functionality is available

- This, in turn, allows for true incremental backups


```
C:\Users\vzubarev>fltmc

Filter Name
------------------------------------
VeeamFCT
CsvNSFlt
CsvFlt
TSFairShare
CCFFilter
ResumeKeyFilter
svhdxflt
npsvctrig
```
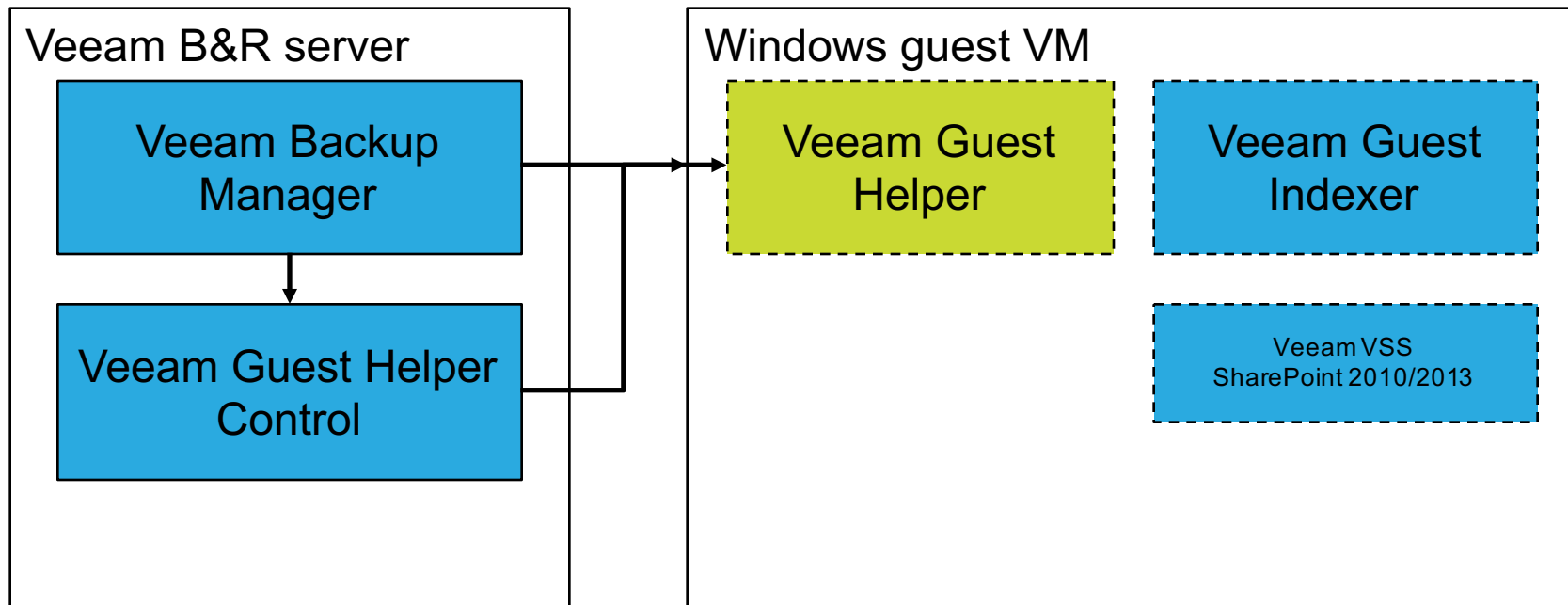
Veeam CT Mini-Filter Driver (2/2)

veeamfct.sys

- Acts as a file system mini-filter driver and records any changes made to any .vhd/.vhdx disks on any volumes

- Has to be running on each host in the Hyper-V cluster when using shared storage

```
C:\Users\vzubarev>fltmc

Filter Name
-----------
VeeamFCT
CsvNSFlt
CsvFlt
TSFairShare
CCFFilter
ResumeKeyFilter
svhdxflt
npsvctrig
```

Guest VM interaction: Windows

Veeam B&R server

Veeam Backup Manager

Veeam Guest Helper Control

Windows guest VM

Veeam Guest Helper

Veeam Guest Indexer

Veeam VSS
SharePoint 2010/2013

■ Service ■ Process ■ Driver

Veeam Guest Helper (1/2)

VeeamGuestHelper.exe

Performs almost all in-guest interaction:

- Pre- and post-freeze scripts execution
- Creates in-guest shadow copy with all VSS writers enabled (only VMware)
- Collects application metadata collection for Active Directory, Exchange, MSSQL, SharePoint and Oracle services.
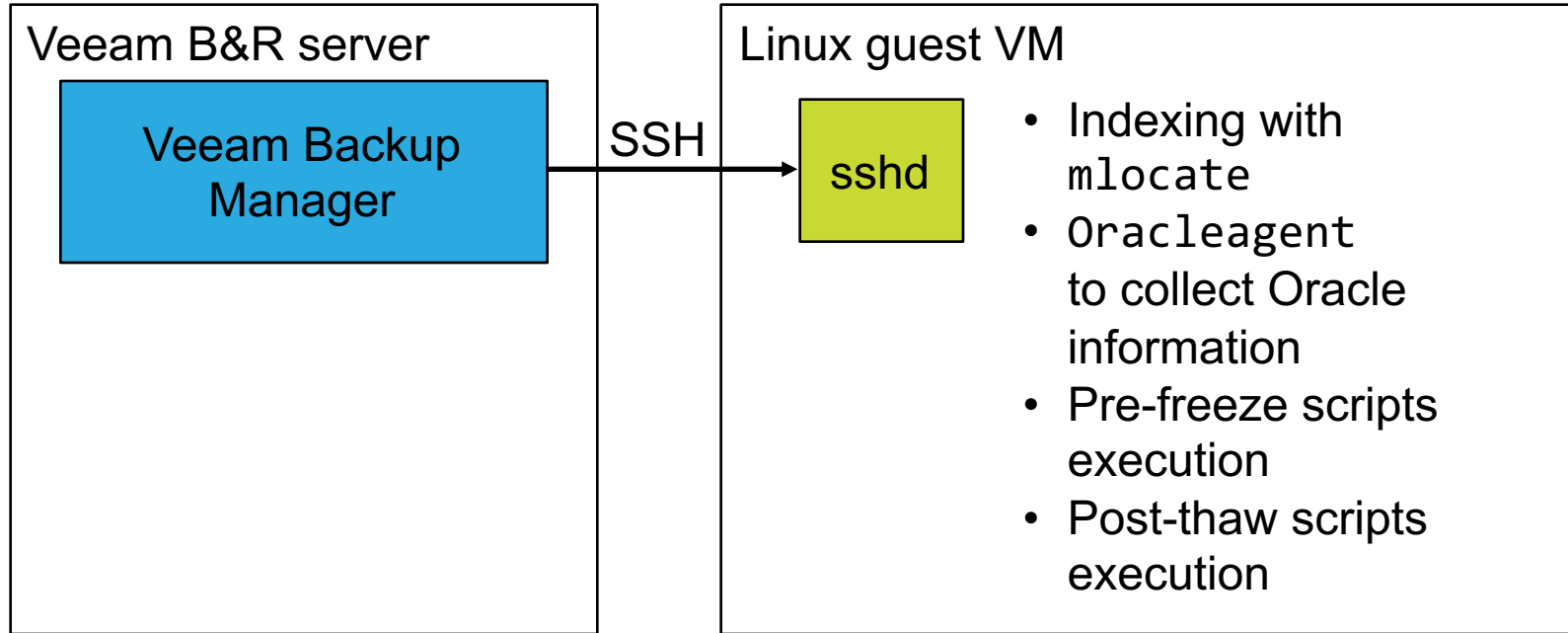 This information is then stored in the backup files and Veeam database

Veeam Guest Helper (2/2)

VeeamGuestHelper.exe
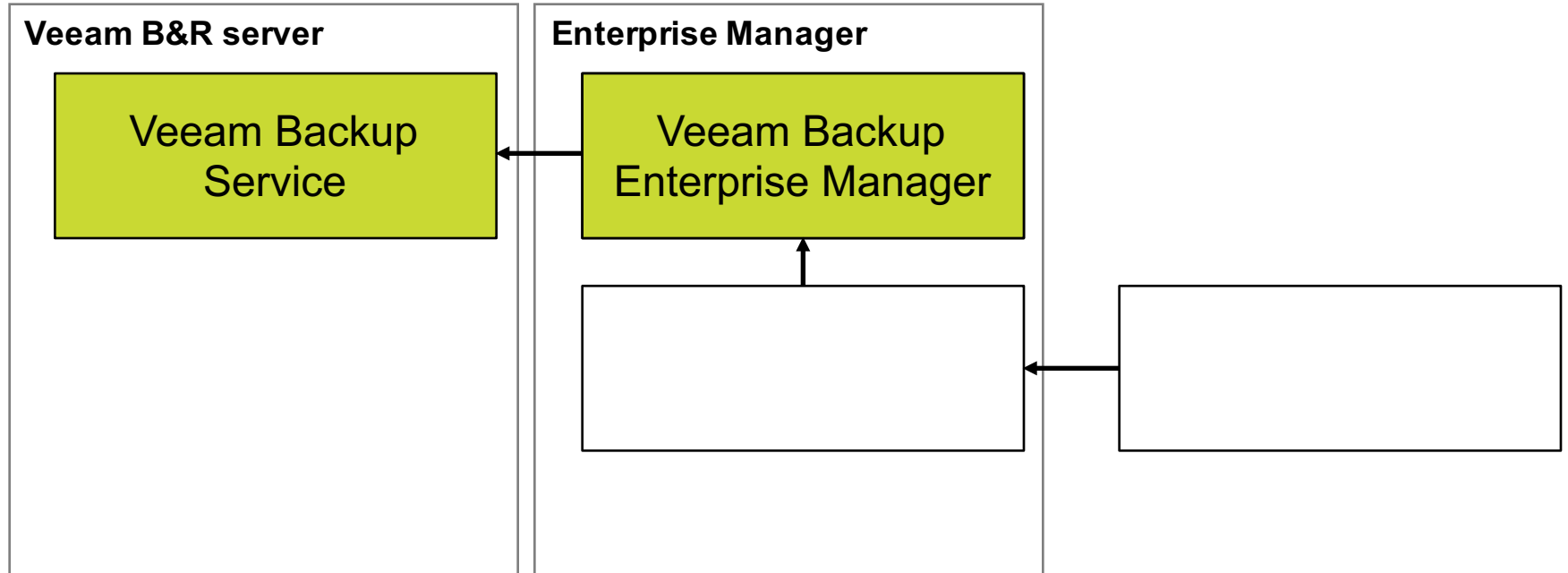
Performs almost all in-guest interaction:

- Truncates MSSQL and Exchange database transaction logs
- Starts **VeeamGuestIndexer** to index the file systems (if enabled in the job)
- If SharePoint is detected, starts **Veeam.VSS.SharePoint2010/13** to gather further information about the SharePoint infrastructure

Guest VM interaction: Linux

Veeam B&R server

Veeam Backup Manager

SSH →

Linux guest VM

sshd

- Indexing with `mlocate`
- `Oracleagent` to collect Oracle information
- Pre-freeze scripts execution
- Post-thaw scripts execution

■ Service   ■ Process   ■ Driver

Enterprise Manager

Veeam B&R server

Veeam Backup
Service

Enterprise Manager
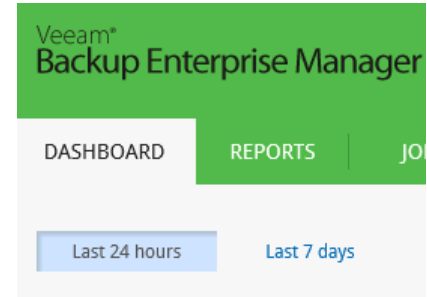
Veeam Backup
Enterprise Manager

Service Process Driver
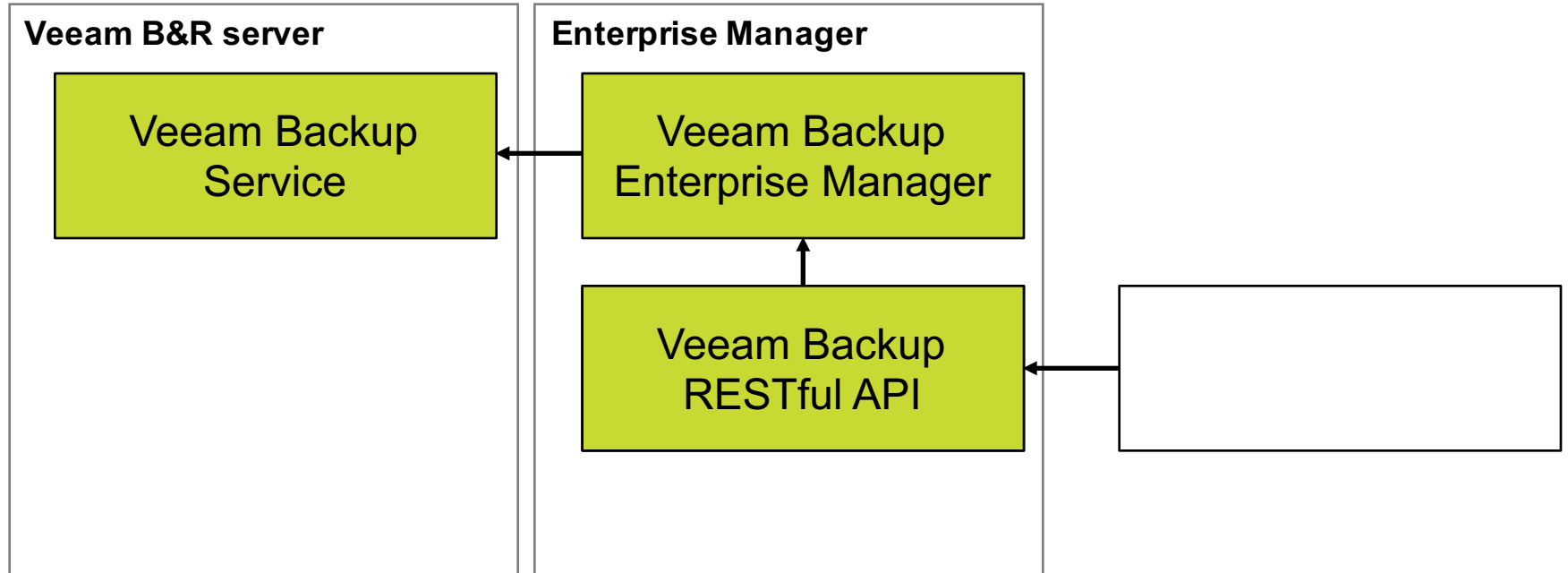
Enterprise Manager

Veeam.Backup.EnterpriseService.exe

- A web application using IIS as its web server

- Periodically collects information from the connected Veeam B&R installations, such as:

  Jobs, restore points, sessions, etc.

- Aggregate information is stored in a separate database

- Accepts incoming connections from Veeam Backup RESTful API service

Enterprise Manager

Veeam B&R server

Veeam Backup Service

Enterprise Manager

Veeam Backup Enterprise Manager

Veeam Backup RESTful API
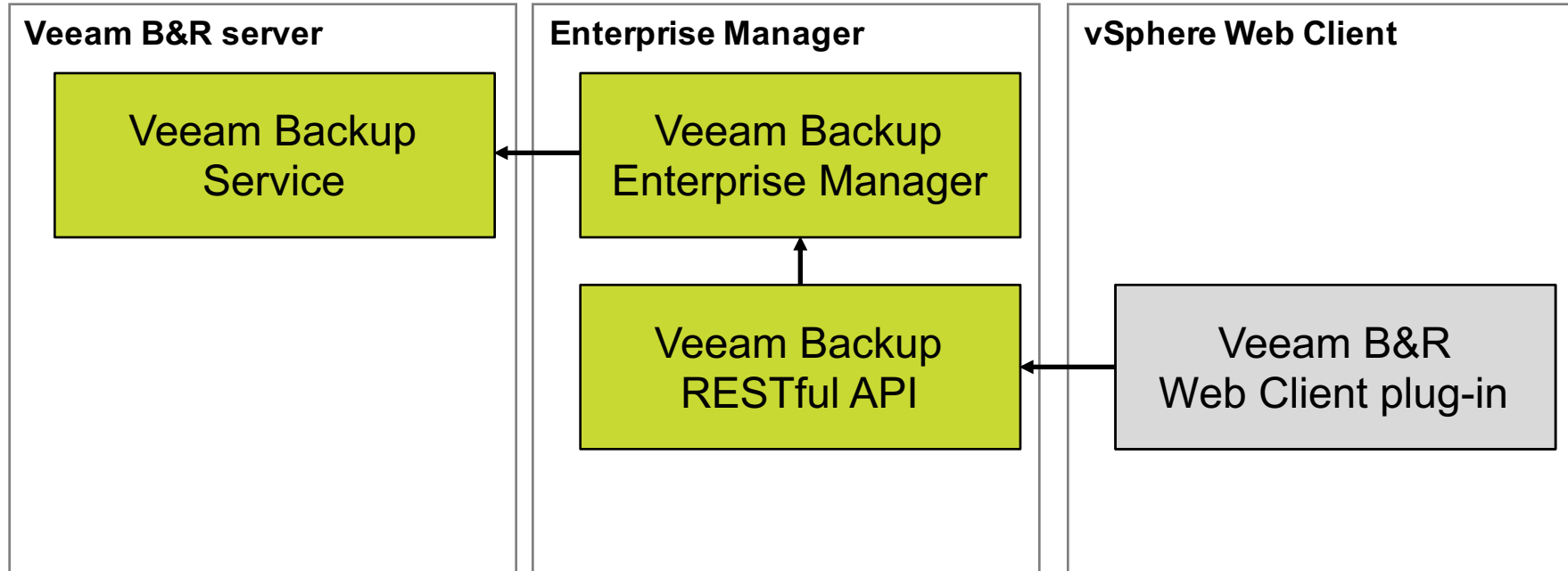
🟩 Service 🟦 Process 🟩 Driver

Veeam Backup RESTful API

Veeam.Backup.Enterprise.RestAPIService.exe

- Accepts incoming RESTful API client requests in XML form, over HTTPS

- Obtains data and performs actions via Enterprise Manager

- Returns response to the client

Enterprise Manager

Veeam plug-in for vSphere Web Client

- Displays information about backups from Enterprise Manager

- Allows to run Quick backup and VeeamZIP for VMs via the context menu.

- All requests go via RESTful API