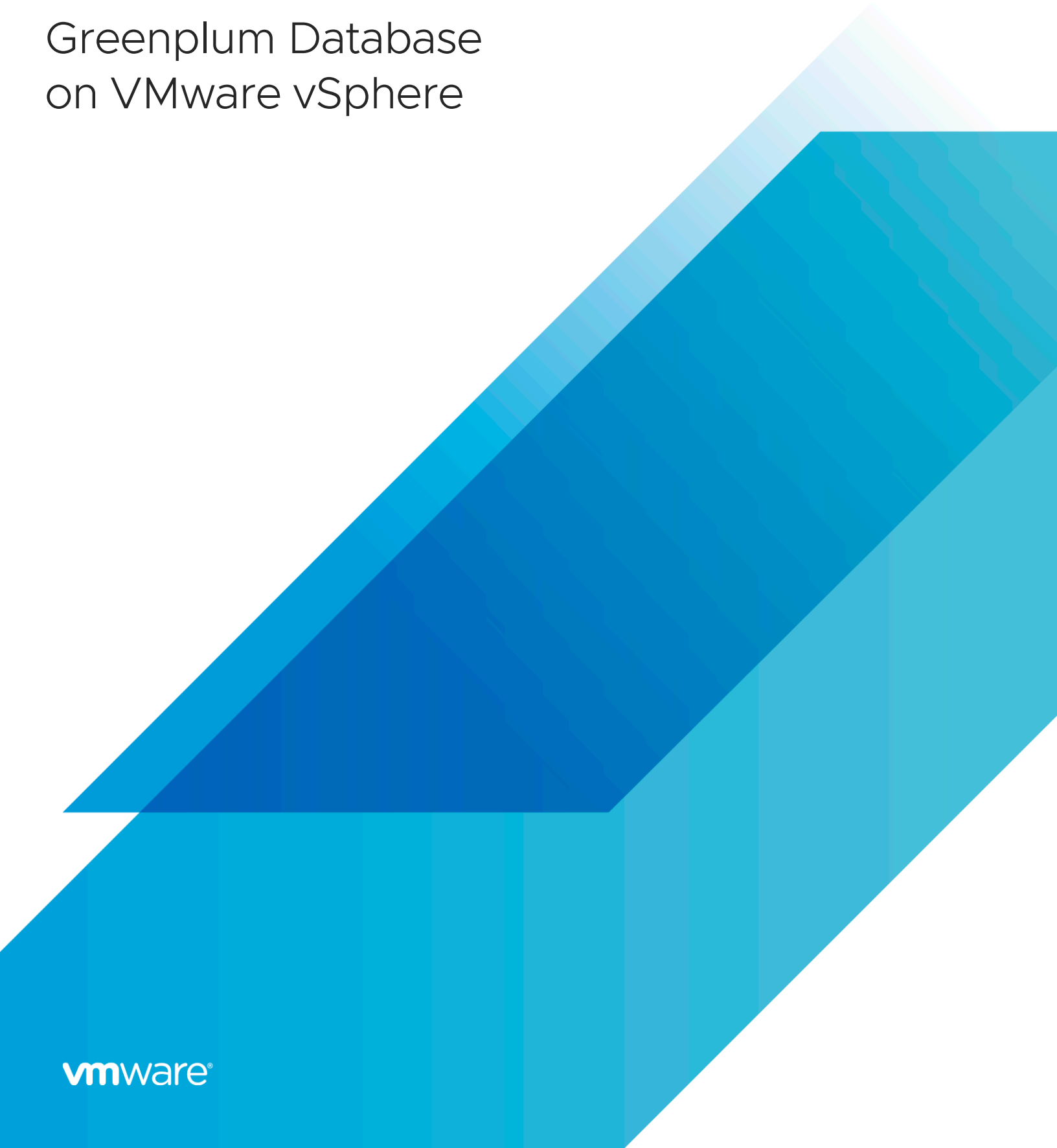
Greenplum Database on VMware vSphere



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DATACENTER NEEDS

- Repeatable deployment practices
- Consistent infrastructure and operations
- Ability to transition applications to new hardware
- Faster deployment
- Cloud-like growth

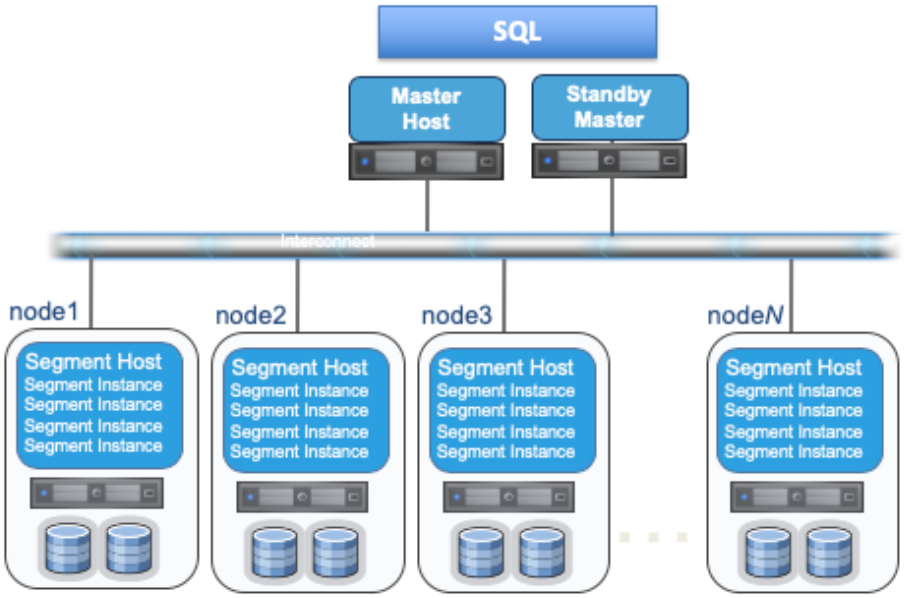
Key Message

Greenplum Database has been running in customer datacenters on vSphere. While there are many reasons to do this the keys factors come down to:

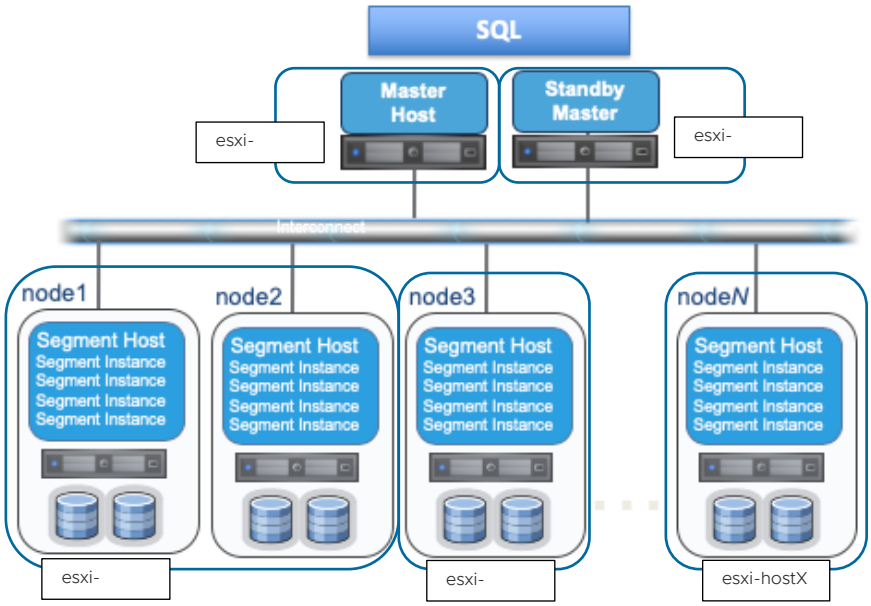
- Creating a homogeneous datacenter environment
- Ability to streamline re-platforming the database to newer hardware
- Extensibility of the platform as the size of the database grows

Solution Architecture

Greenplum is an MPP (Massively Parallel Processing) Database, in essence it is actually many databases that are tied together by a managing system that parcels out the work to the various nodes. An architecture diagram looks like this:



In a vSphere environment the key change is that a segment host is a VM and if there are sufficient resources, multiple can be ran on one physical system VM host. At which point architecture then changes to this:



In this architecture the master systems and segment hosts are encapsulated in a VM, of which multiple VMs can be placed on a single physical host. This is possible as long as the underlying host can provide the necessary resources and redundancy necessary to run the cluster.

Key Benefits

- Scaling systems

  If the demand on a single VM increases in this architecture, there are many options to addresses this. The size of the VM (CPU, RAM, storage space or throughput) can be grown without rebuilding the segment host. The VM host itself could be expanded or the set of Greenplum VMs running on a VM host could be reduced so the VMs can be allocated with more resources.

- Consistent infrastructure in the datacenter

  While hardware can be selected to engineer a very fast purpose built Greenplum Database, the access to expertise and resources to maintain that type of system can be challenging. It is often the case where datacenters work to homogenize the systems to reduce the operational overhead. Running Greenplum on vSphere can replace the need for these special built systems.

- Deployment agility

  Having segment hosts as VMs enable expanding or migration of the system to new hardware. Additional underlying hosts can be added to the system while the VM specifications for a host remain the same. Thus, allowing for the Greenplum cluster to grow over time without the need to for reconfiguration. Additionally, as hardware

ages out the VMs can be migrated to new systems, usually with some physical consolidation as compute power in systems increase over time.

Running Greenplum on vSphere

- Greenplum Database is a resource greedy application

  The segment hosts in a Greenplum system can be expected to use all of the CPU, network, memory and IO allocated to them. In fact, what Greenplum is engineered to do is use as many resources in parallel as possible to answer the questions being given. This means that over allocation of any Greenplum resource is not recommended and any resources given to the Greenplum VMs should be reserved.

- Need large network and IO throughput pipes

  Two major activities performed by the Greenplum Database is reading data off disk and sharing it with other segments in the system. This means that there needs to be the capacity for a large amount of IO throughput in parallel as well network capacity for the segment hosts to talk across an interconnect network. Often the best way to meet this requirement is to create a dedicated network resource for the interconnect and to either ensure the disk IO is local or there is sufficient bandwidth to handle both the interconnect and IO traffic the systems require.

- Disable automated motions of systems due to load

  Greenplum will normally be pushing the limits of the VM systems. Having a migration of a system in the middle of these operations can add additional load to the infrastructure that will affect the speed and stability of the database. It is therefore recommended that any non-disaster auto-migration of resources be turned off.

- VM sizes

  A good starting point for sizing a Greenplum VM to run in vSphere is

  - 24 cores
  - 256G RAM
  - 200GB root drive (/)
  - 4 x 1TB – 4TB data devices (/data1 /data2 /data3 /data4)
  - Separate networks for the network intensive operations:
    - general access
    - vMotion
    - interconnect (node to node) throughput 10Gb/sec
    - IO (if using external disk) throughput 10Gb/sec

  Each VM segment host should be able to run 8 primary instance and 8 mirror instances if these conditions are met. Thus, a system running two segment hosts would need 20Gb/sec interconnect and 20Gb/sec IO throughput.

Takeaway

- vSphere is a valid infrastructure choice for Greenplum and there are customer currently running large production clusters on it
- Many operational efficiencies can be gained by running Greenplum on vSphere

- Greenplum on vSphere should be run in a dedicated mode where resource can be specifically allocated to it and are not expected to be shared with other applications.

For more details, stay tuned for various solution reference architectures. There are many configuration possibilities (such using vSAN versus vxFlex) and future papers will explore their use cases along with the efficiencies and potential limitations of different technologies.

Resources

- Check out the VMware Tanzu Greenplum *documentation*.
- Learn more about VMware Tanzu Greenplum on *the website*.
- Check out Greenplum *Blog*, *Twitter*, and *YouTube* for the latest updates on Greenplum.

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