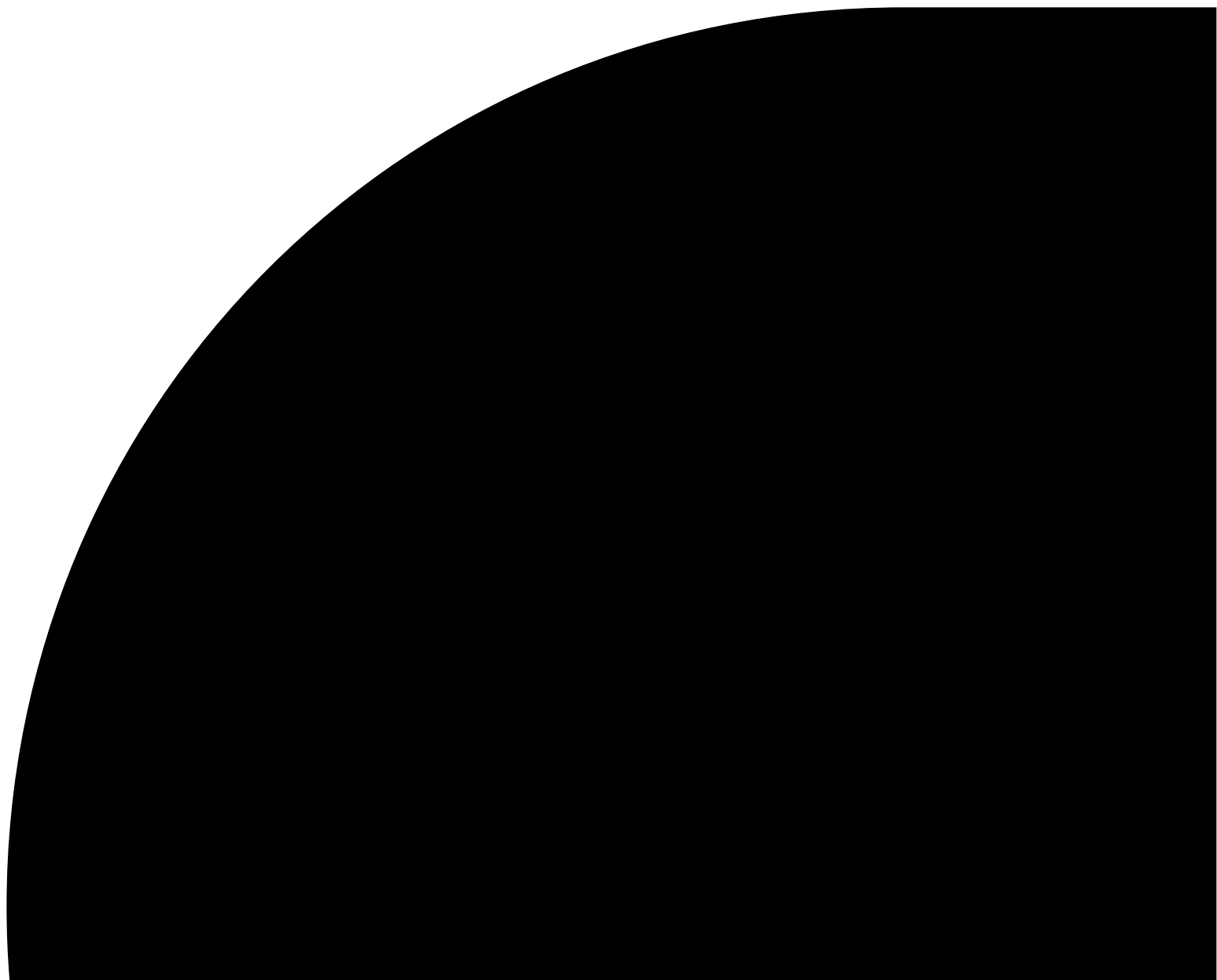


Oracle Segregation

Date: 03-07-2020



Informational document

Introduction

The purpose of this document is to describe the network and storage segregation for the Oracle estate which DXC designed and implemented for UWV.

This document provides the level of detail needed in order to proof the necessary segregation DXC has implemented to be compliant with running Oracle Software in a virtualized environment.

Datacenter setup

The environment which DXC has implemented for UWV is based on a 3 data center setup (AM2, AM3 and AM8).

Both AM2 and AM3 are active/active primary datacenters where active workloads will be running during normal operations. For Gold and Silver workloads, AM2 and AM3 also server as DR site for each other. Datacenter AM8 is a Disaster Recovery datacenter for bronze workloads which will **only** become active when either AM2 or AM3 is down.

The setup in all 3 datacenters is based on various solution building blocks which consist of **separate** vSphere Clusters for respectively the DXC Private Cloud, Oracle Databases and Oracle Middleware.

Network Layer

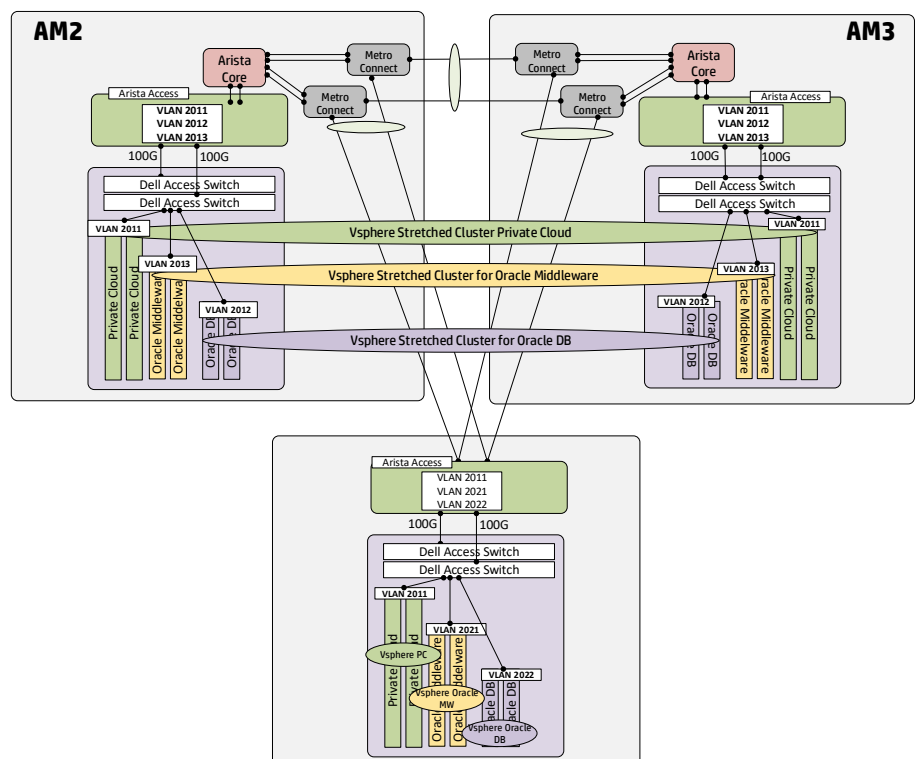
Each of the vSphere clusters have different VMotion VLANs configured in order to enforce that Virtual Machine migration is limited to the cluster the Virtual Machines are running on!

Definition of the VLAN's is outside the NSX virtualization technology on the Arista and Dell network switches.

In the below picture you see 5 different VMotion VLANs defined. Each VMotion VLAN is defined on the Arista switches and configured on the 100Gigabit trunk towards the Dell Chassis Switches.

Each Blade receives a "Blade Profile" which includes a set of VLANs it needs to use. For each vSphere Cluster a different set of VMotion VLANs are defined in order to prevent Virtual Machine mobility towards other clusters.

In appendix, 2 screenshots of Blade Profiles. One for a vSphere host which is running Oracle Databases. One for a vSphere host which is used as Private Cloud Cluster.

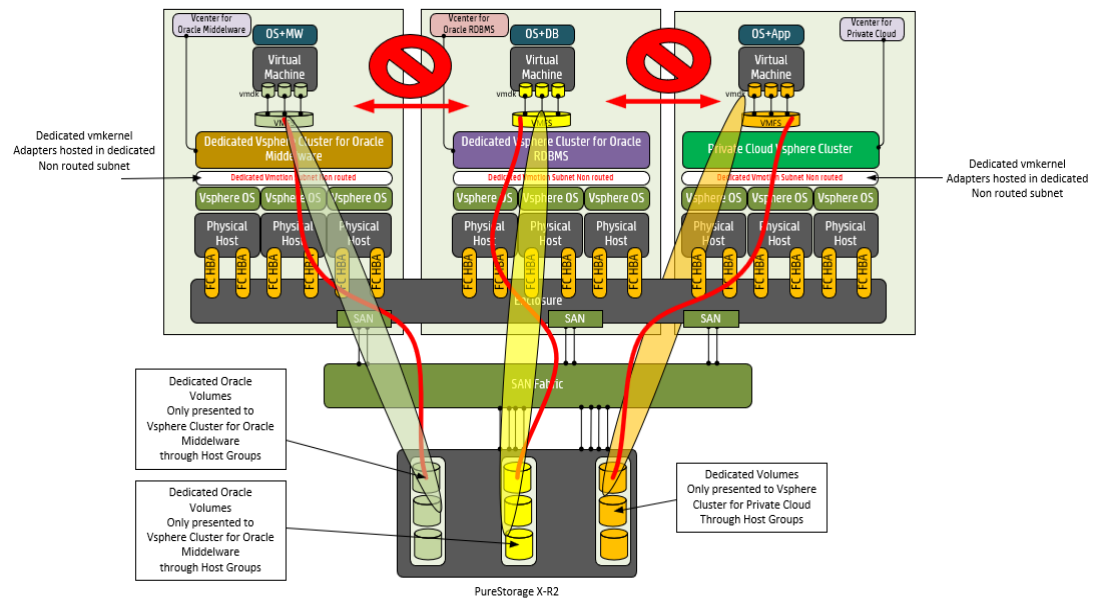


Storage Layer

DXC uses Purestorage X90-R2 arrays to foresee the Oracle Database and Oracle Middleware Clusters from block storage.

DXC implemented a combination of Hard Zoning on the SAN together with dedicated Host Groups on PureStorage so that volumes on the PureStorage are dedicated to their respective vSphere Cluster.

This configuration is implemented in all 3 datacenters



Disaster Recovery – AM8

The AM8 disaster recovery site is configured as follows:

- DR-site configuration: The disaster recovery site (DR-site) contains a storage layer and a VMware layer (as described above)
- Storage replication: The storage units on the primary sites (AM2 and AM3) are replicated in near real time to the backup storage units at the AM8-site. As such, the AM8-site functions solely as a data backup for the primary site until the moment a recovery is required.
- During normal operations the AM8 datacenter is not running any workloads nor active Virtual Machines. Also, the storage in AM8 is set to read-only.
- In addition to above, the Fiber Channel cards of the physical ESXi nodes for Oracle workloads, providing access to the storage units, will be disconnected during normal operations. This guarantees that the compute layer and storage layer are fully segregated.
- Due to this configuration, Oracle software is never installed and/or running at AM2/3 and AM8 simultaneously

DR-mechanics:

In case a disaster (an event causing one of the primary sites to stop functioning, e.g. fire, explosion, power failure that cannot be compensated by the backup facilities, etc.) occurs at one of the primary sites, the following actions are set in motion – in the order as below:

1. The (remainder of the) primary site is deactivated (insofar as this has not yet fully happened as a consequence of the disaster), so that no Oracle cluster hardware is active anymore and no software is running anymore;
2. The Fiber Channel cards in the physical ESXi nodes for Oracle workloads will be connected to the Storage device in order to establish connectivity.
3. The LUN permissions of the back-up storage unit at the DR-site are reconfigured to read/write;
4. The backup storage unit is connected to the VMware layer at the disaster recovery site, at which moment the backup data can be used for processing activities via (virtual) processors;
5. VM's equivalent to the production VM's that were running at the primary site prior to the disaster, are reconstructed on the basis of the latest backup data on the ESX cluster at the DR-site;
6. The DR-site is made available to end users, and now functions as the primary production environment for the bronze workloads of the impacted site

Recovery of the primary site:

After the primary site has been recovered, the storage LUNs on the DR-site are replicated in real time to the storage LUNs at the primary-site. After this replication is completed, the above steps 1 – 6 are followed to bring down the DR-site and bring up the primary site as the primary production environment.

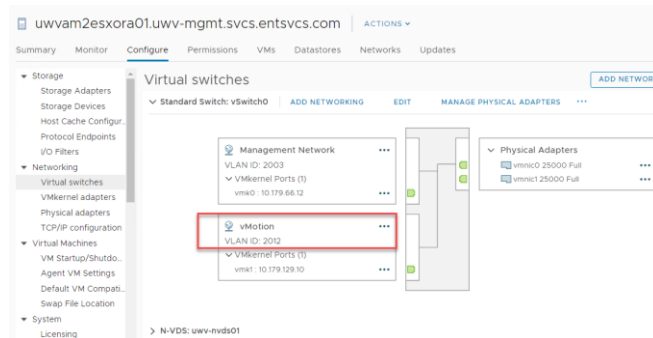
Testing of the AM8 DR-mechanics:

The functioning of these DR-mechanics is being tested for a maximum of 4 times each calendar year. These tests take place under controlled circumstances, where no environment is available to end users. The test is performed in a weekend and requires two days or less to complete. As in the situation of a real DR, no Oracle program will run in the entire primary site.

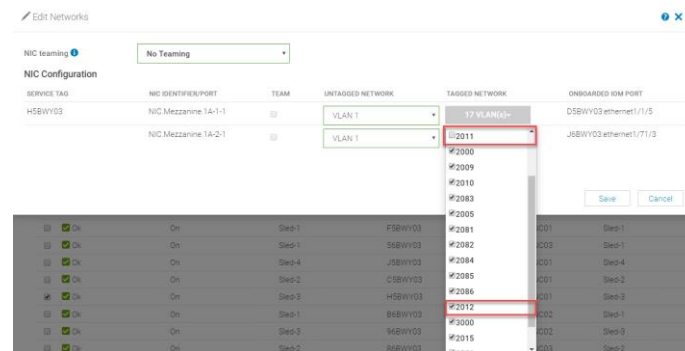
Appendix

Screen-shots with ‘proof’ of what we have described above (as in Oracle example document)

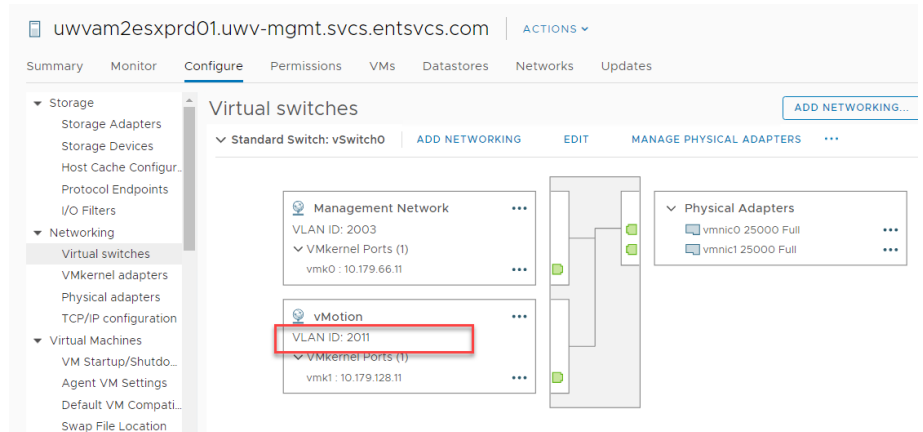
Screenshot configuration of the Vmotion VLAN ID for Oracle vSphere Cluster. As you can see in the drawing below the VMotion VLAN ID for the Oracle vSphere Cluster is VLAN ID 1212.



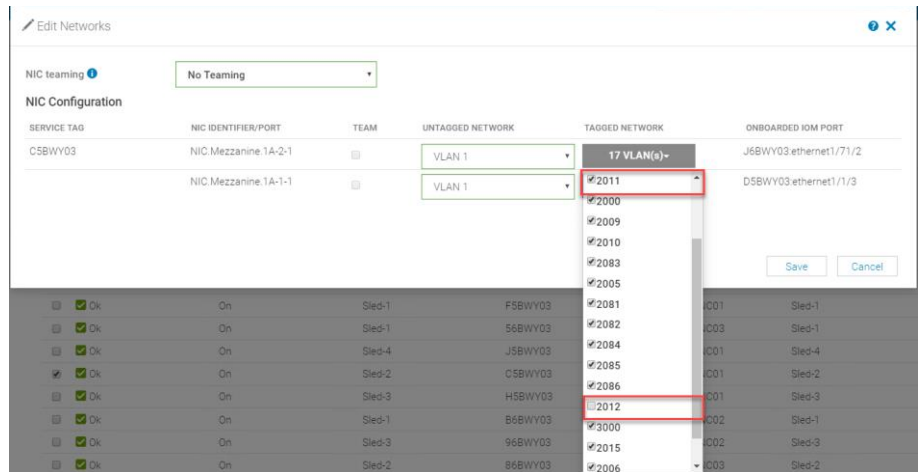
Below screenshot represents the configuration of a Blade Profile for an Oracle vSphere Host where we explicitly “deny” access to VLANID 2011 and explicitly “allow” access to VLAN ID 1212



Screenshot configuration of the Vmotion VLAN ID for Private Cloud Vsphere Cluster. As you can see in the drawing below the VMotion VLAN ID for the Private Cloud Vsphere Cluster is VLAN ID 2011



Below screenshot represents the configuration of a Blade Profile for a Private Cloud Vsphere Host where we explicitly “deny” access to VLAN ID 2012 and explicitly “allow” access to VLAN ID 2011



Screenshot storage configuration

PURE STORAGE Storage

Dashboard Hosts Volumes Protection Groups Pods

Dedicated Host Group for Oracle RDBMS

Name	Size Reduction	Volumes	Capacity	Shared	System	Total
UWVAMXESKORAD1-HG	32 T	9.9 to 1	874.43 M	0.00	-	874.43 M

Member Hosts

Name

- UWVAMXESKORAD1
- UWVAMXESKORAD2
- UWVAMXESKORAD3

Dedicated Vsphere Hosts in Oracle Host Group

Interface	Size	Volumes	Reduction
FC	32 T	874.43 M	9.9 to 1
FC	32 T	874.43 M	9.9 to 1
FC	32 T	874.43 M	9.9 to 1
FC	32 T	874.43 M	9.9 to 1

Connected Volumes

Name LUN

- UWVAMXESKORAD1-P00001-UWVAMXESKORAD1-P00-VOL001 254
- UWVAMXESKORAD1-P00001-UWVAMXESKORAD1-P00-VOL002 253

Protection Groups

Name

Dedicated Volumes in Oracle Host Group