

Terraforming is just the beginning

Virtual Design Master - Season 5 - Challenge 1

CHALLENGE 1

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DOCUMENT CONTROL SHEET

Change Control

Customer Name	Virtual Design Master Challenge, Season 5	
Document Title	Challenge 1	
Version	V1.0	
Document Reference	Challanage1.docx	
Project Reference	VDM Challenge 1	
Date of Creation	27 June 2017	
Date of Last issue	04 July 2017	
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Distribution

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Version Control

Version	Description of Change
0.1	Initial Creation
0.2	Logical Design
0.3	Physical Design
0.4	Formatting
0.5	Final Revisions
1.0	Release to the world

Associated Documents

Title	Date	Source	Version
Season 4 – Challenge 1 – Back to Earth	01/07/2016	GitHub	1

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Abbreviations

Abbreviations	Description
VPN	Virtual Private Network
VDM	Virtual Design Master
AI	Artificial Intelligence
DNS	Domain Name Services
DHCP	Dynamic Host Configuration Protocol
SMB	Server Message Block
DFS-R	Distributed File System Replication
AWS	Amazon Web Services
P2P	Point to Point

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SYNOPSIS

We now must get ready to continue to deploy the newest version of the HumanityLink application. We know we want to spread our efforts out across the world as we begin the terraforming effort. Because most of our time have been spent preparing the earth for recolonization, we are looking for your recommendations for building out the new version of the HumanityLink application. we have been so busy with this.

We are working on building an army of robots to carry out the terraforming efforts. These robots will be operated in shifts, to ensure there is a fleet running at all times. All robot maintenance is done while they are off shift. The new version of the HumanityLink application will add the features needed for the scheduling, operations, and maintenance of the robot fleet.

We need you to design and document a resilient 3-site architecture. We do not have limitations on hypervisor, hardware, networking stack, or applications. You will be working with many assumptions and will need to ensure your infrastructure design is able to handle the potential for unknown workloads (Hint: You should be able to scale your environment easily in any direction). Our primary concern is resiliency in as many layers as possible. The design and initial deployment will be on Earth and you can assume that Earth-like environmental conditions will be available wherever the design will be deployed.

Your design will need to clearly illustrate how you provide resiliency and be prepared to also defend how you made decisions on where your resiliency lies and what tradeoffs you have introduced when making those decisions.

The challenge submission will include your design and any supporting documentation that supports the design decisions. You have until Tuesday July 4th at midnight Eastern time to submit your designs and you will be defending those designs live on Thursday July 6th at 8 PM Eastern time right here from the Virtual Design Master live stream in front of our panel of judges.

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INTRODUCTION

Overview

All we know so far from the above is we have robots back on Earth and we are starting the terraforming effort to allow more humans back. The sky is the limit and we have no restrictions on what technologies we can use.

Intended Audience

This document is intended for the design board (our judges) to help make key decision on implementing our new infrastructure.

Project Summary

The brief appears to be somewhat vague as we don't have all the facts so we need to ensure not only our infrastructure is resilient it can also scale. We also have to be sure it can adapt to change as we are yet to find out how we are going to automate the environment. Due to the amount of AI and robots that are around we just have to hope none of these below characters decided to make an appearance or will there be an uprising if we provide all this flexibility and power and all our efforts are in vain.



Project Requirements

The requirements of this project are to provide the design board with the following.

- Must include a resilient 3-site architecture
- Scale the environment easily in any direction

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Project Assumptions

These are the assumptions we have made of this project is to provide the design board with the following.

- We do not have limitations on hypervisor, hardware, networking stack, or applications
- Earth-like environmental conditions will be available wherever the design will be deployed
- Robots will be operated in shifts, to ensure there is a fleet running at all times. All robot maintenance is done while they are off shift. The new version of the HumanityLink application will add the features needed for the scheduling, operations, and maintenance of the robot fleet.
- Some selections of software will have become GA during this event
- The Automation/DevOps procedures are still being selected by our developers so we will make our system as flexible as possible
- The systems should provide simple services such as authentication via Active Directory (or LDAP), along with DNS, DHCP and Email
- We can use locations from the previous series
- Budget.... What budget?

Project Constraints

The constraints of the project are outlined below.

- Real world data speeds
- Security is not yet fully established

Project Risks

The risks of this project are outlined below.

- Lack of knowledge on how the app is architected
- A single vendor may fail
- The zombies may still be out there
- Robots may take over
- A hacker may still be in our network

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LOGICAL DESIGN SUMMARY

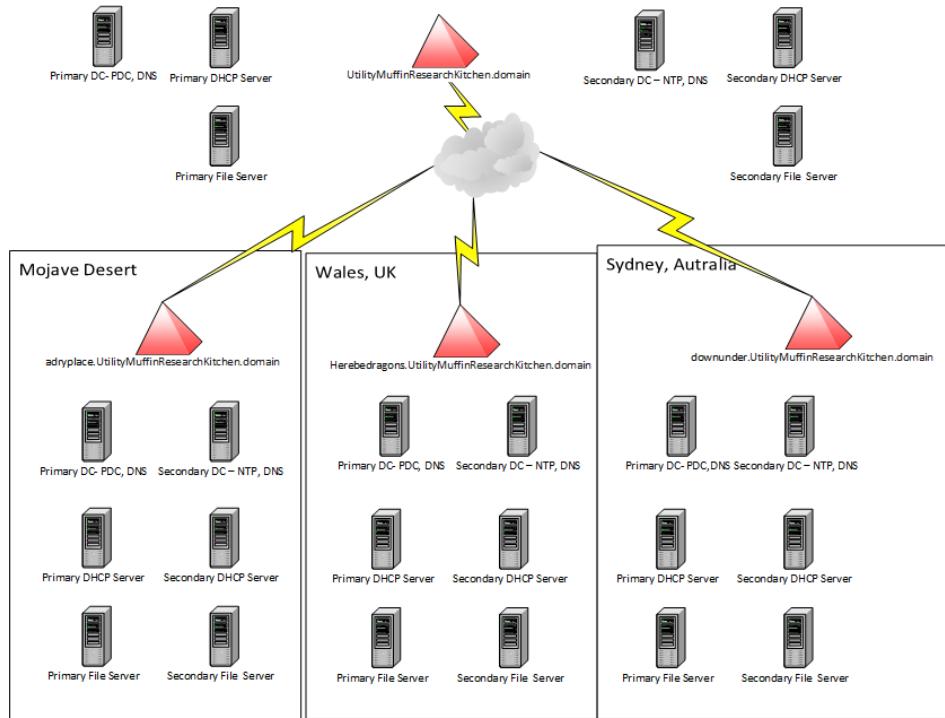
Sites

The design brief states that we need a 3 site architecture. We have chosen to take advantage of one of our sites from our previous season, place one in Europe for a distinct time zone difference to allow downtime/patching windows and include one site in AWS. This is also to try and allow sites to follow the sun as close as possible.

- Primary Site:- Mojave Desert (Back to Earth, 2016)
- Secondary Site:- NGD, Wales, United Kingdom
- Tertiary Site:- VMware on AWS, Sydney

Domain

The domain will have the following at each site. Two domain controllers at each site, each hosting DNS, Two further servers hosting a DHCP failover cluster. Two SQL servers running always on availability and replicating to each other and another partner site. There will also be two Exchange servers in a database availability group at each site to ensure Email services can be provided. To ensure code and user files can be saved we will take advantage of (SMB Transparent Failover, 2016) along with DFS-R to replicate to the other sites. The only difference to the layout will be on the AWS site in Sydney where 50% will be hosted in VMware and the other 50% on the AWS hypervisor.



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Virtual Infrastructure

We have chosen to primarily use VMWare in our environment as we feel it is stable and robust enough along with security patches to ensure there is enough uptime. We have at least one copy of the live services running in AWS on the Sydney site to allow for another vendor of hypervisor and also allow flexibility for any automation tools in either test or production. This will also allow the infrastructure to continue to run if VMware's code was compromised and started to fail. The auto scale of VMware on AWS also ensure we can match the ability to scale easily if needed with only a few clicks. It also takes out many of the maintenance tasks as this is provided to us by VMware and Amazon.

Cloud Infrastructure

As mentioned above we will be utilising VMware on AWS and in the same datacentre we will also place 50% of the work load directly on the AWS hypervisor.

Storage

The storage solution will consist of 3 tiers two of which will be active in production to ensure as much up time as possible. The final one is due to the ability of the backup devices we have chosen.

- Primary Solution – Nimble All Flash Array
- Secondary Solution – VSAN
- Tertiary Solution – Backup Appliances

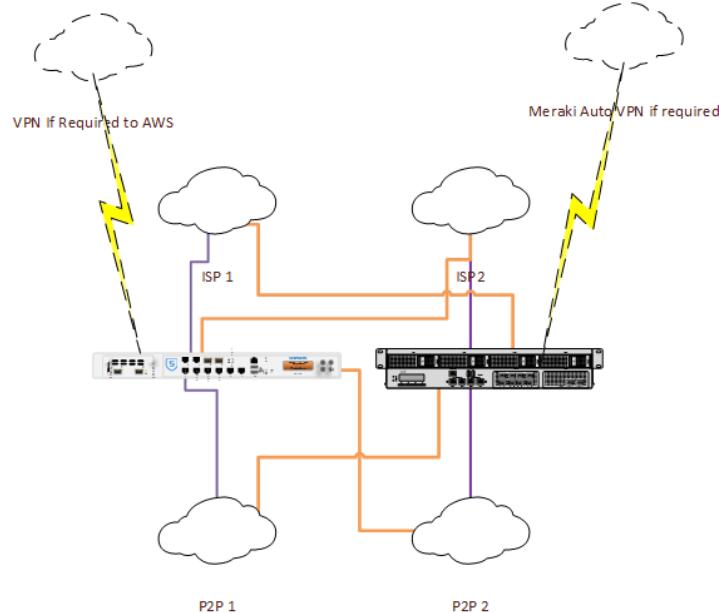
Networking / WAN

At each of the physical datacentre sites we will try to utilise at least two independent ISPs along with diverse point to point connections. These will all be diversely routed where possible such as the internet being east and west and point to point north and south. As a complete fail back on the point to points we will also have site to site VPNs available on the Meraki and Sophos. We will not only be using physical networking but we will also overlay NSX where possible to allow VMs to migrate easily between datacentres and also up to VMware running on AWS.

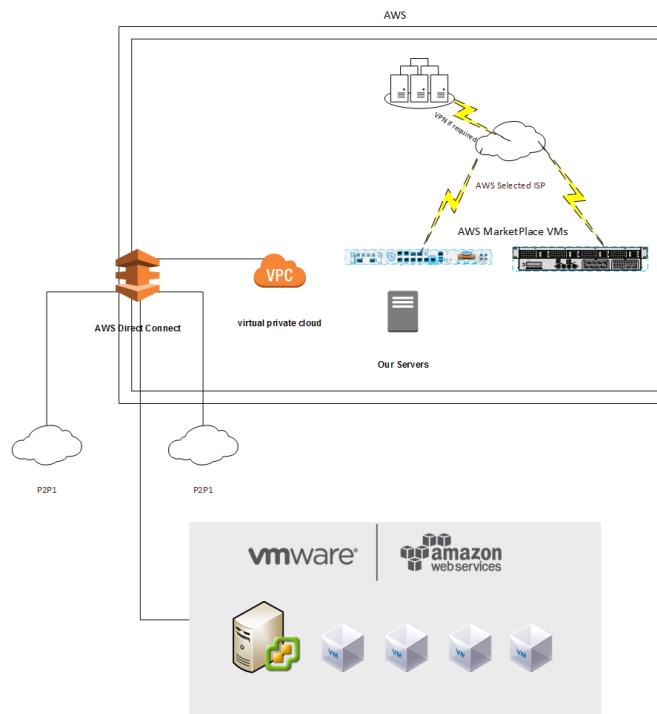
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- Primary and Secondary Physical Sites – The purple links are primary and orange for the secondary set with auto failover or the relevant weightings to achieve this.



- AWS Site – This site has two distinct zones but can all be connected with the direct connects or VPCs. Both Sophos and Meraki offer an AWS appliance



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Backup

The backup solution will consist of 3 tiers to ensure that there would be very minimal data loss if one backup solution fails and that systems and files can still be recovered

- Primary Solution – Rubrik
- Secondary Solution – Veeam & Cohesity
- Tertiary Solution – Veeam and Tape Copy Job

The reason we have chosen these solutions are as follows. The primary solution Rubrik offers an air gapped backup solution of which integrates seamlessly with VMware. We can also provide a set and forget backup policy to our cluster in case our infrastructure team get lazy. We can also enhance the backups and scale out builds by calling upon the available APIs with Rubrik to apply new policies to any orchestrated VMs or hardware that has been added. It also allows us the ability to run VMs directly from the appliance for rapid recovery of files or the environment. It could also support running live VMs to move back to the primary or secondary storage should they fail. We can also replicate this to the other Rubrik Brik's and into a cloud storage platform such as AWS for recovery.

The secondary solution Cohesity provides a similar solution but we would use Veeam in this solution to automate some of the failover should SRM fail and it can also use (SureBackup, 2017) so that we can ensure VMs would actually recover.

The final solution of tape is there as a just in case scenario. We can also utilise our robot task force to change these as we all know everyone else would otherwise forget! The main reason for this is it offers a true point in time backup that can not be compromised unless it occurred before the write.

Anti Virus

We will use Sophos Antivirus with Intercept X so that we can try to minimise any Cryptotlocker style attacks on our network. An example of Sophos stopping one of the latest variants can be seen [here](#) so this should help

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Security

Where possible we will utilise any logging services which will provide timestamps and feed these off to multiple sources. For example VMWare log insight and (SexiLog) so that we can cross reference during an event to ensure they match up and spot anomalies. On the Primary storage we can encrypt the data at rest and we can also do this with the primary backup solution. Where possible we will enhance any physical security due to last seasons intruders by having CCTV everywhere and any access to the racks will require fingers prints and a pin and access to the room will require a retinal scan.

Code Deployment

To ensure that we can track all the code we will use (GitHub HA). This also means once an orchestration or automation tools has been finalised we can also store any procedures such as XML in here to ensure nothing is tampered with and all changes can be tracked.

End User Access

As the HumanityLink app appears to be web based most people can access this via a web browser. Any other application will either be deployed via a VMware Horizon desktop or if it's a single application this will be published via Citrix.

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PHYSICAL DESIGN SUMMARY

Sites

Below shows a map of all the DC locations



A larger version can be seen here [\(Scribble Maps & Google\)](#)

I believe each of these sites offer a near by airstrip without compromising the datacentre, each of them are near water if a boat is required and multi-terrain vehicles can all access them if required. The data and power feeds in each location also will easily accomplish what we need.

Virtual Infrastructure

I have outlined what I would use for the infrastructure below

■ Primary Site:-

- 2 x C7000 Blade Enclosures
- 8 x HPE ProLiant BL460c Gen9
- 1 x Primary All Flash Nimble Array
- 4 Node Rubrik Cluster
- 4 Node Cohesity Cluster

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- 1 x Automated Tape Library
- 2 x VCenter Installation in Linked Mode
- 2 x Meraki MX 600
- 2 x Sophos XG 750
- 2 x HP 5406R
- 2 x Cisco Nexus Switches

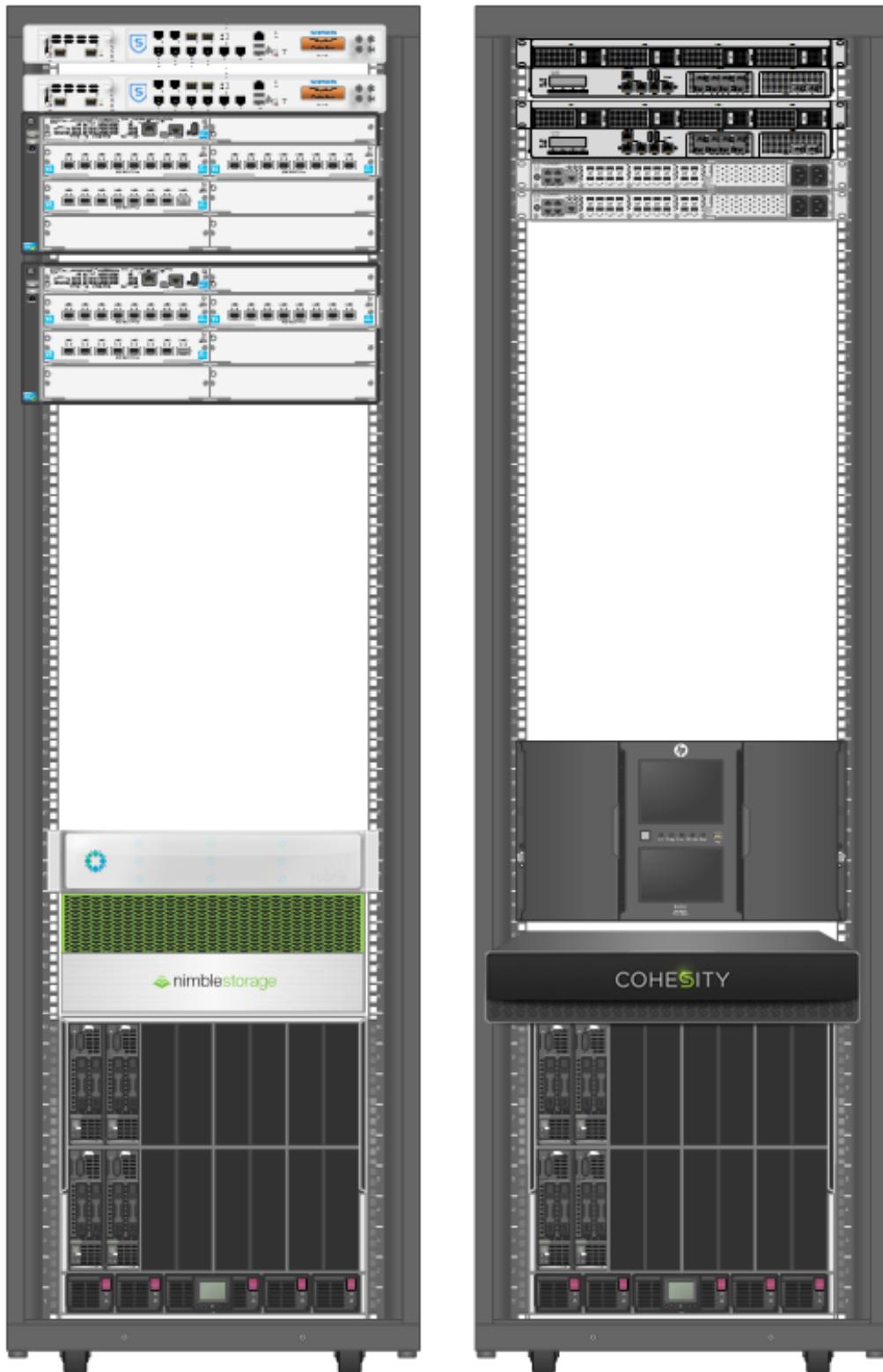
■ Secondary Site:-

- 2 x C7000 Blade Enclosures
- 8 x HPE ProLiant BL460c Gen9
- 1 x Primary All Flash Nimble Array
- 4 Node Rubrik Cluster
- 4 Node Cohesity Cluster
- 1 x Automated Tape Library
- 2 x VCenter Installation in Linked Mode
- 2 x Meraki MX 600
- 2 x Sophos XG 750
- 2 x HP 5406R
- 2 x Cisco Nexus Switches

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Example Rack Configurations

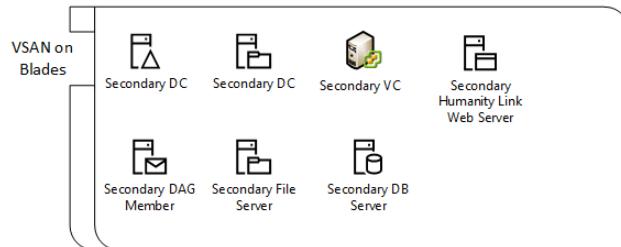
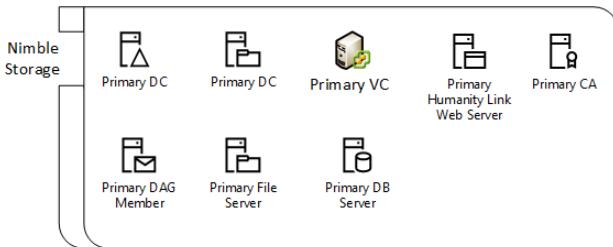


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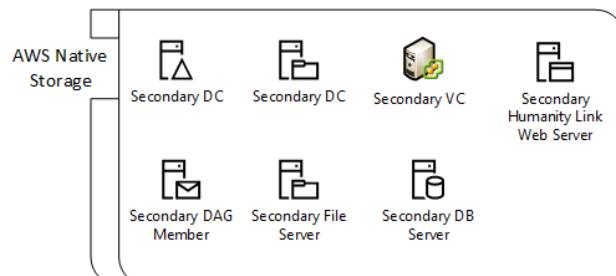
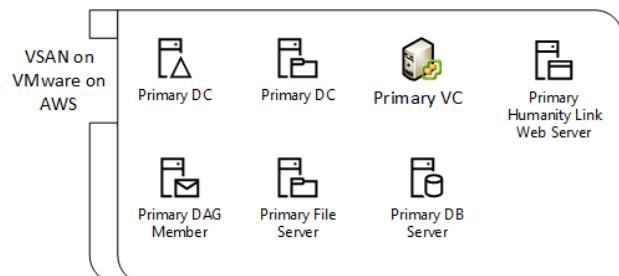
On-Premises Data store Configurations

Below I have outlined the data store layouts to try and provide resiliency locally on each data centre site. The volumes will also be replicated on the Nimble Storage to the alternative site. The reason for 2 vCenters in linked mode on each data store is for easy management and to allow each independent cluster to come online if key hardware does fail.



Cloud/AWS Data store Configurations

Below I have outlined the data store layouts to try and provide resiliency locally to that site

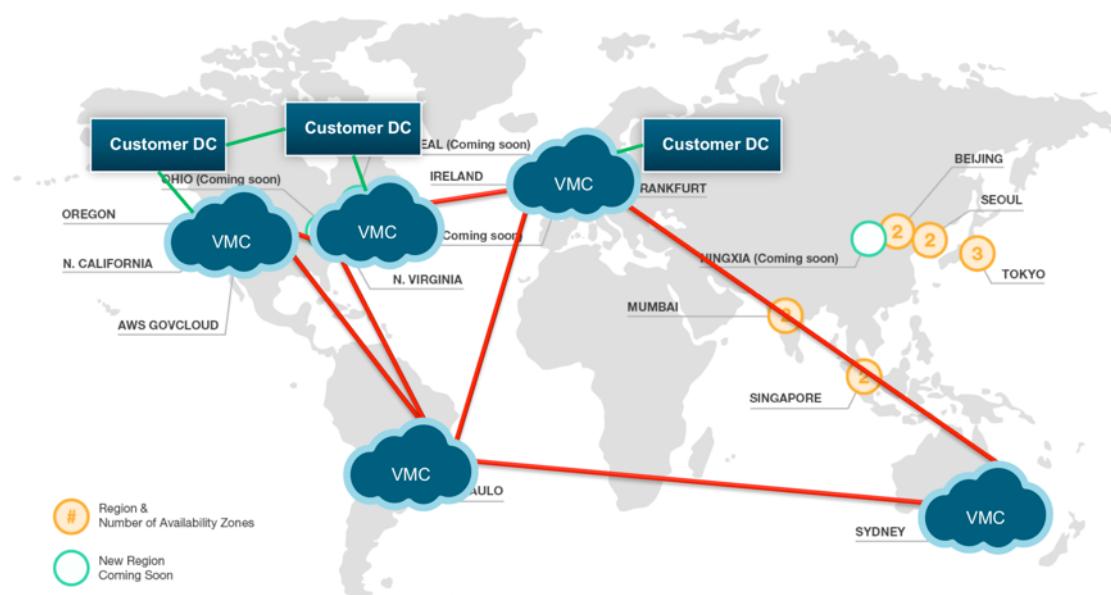


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WHAT WOULD I HAVE DONE DIFFERENT

I feel in this challenge I should have asked more questions so that I could have built out the orchestration/automation & DevOps to be able to scale the application. I also think that if Norway had a VMWare on AWS DC I may have moved from the UK. This is also down to the amount or renewable energy they produce meaning I should have no issues keeping my DCs online. I also feel I haven't put in enough security as per last season but I hope this can be built upon over further challenges once other key decisions come to light as we may need others system to talk to one another. I have also thought as cost is not as issue could I have done all this in the cloud, I think possibly but can I then still ensuring its all backed up with no on site infrastructure



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DISCLAIMER

The view expressed in this document are my own and do not necessarily reflect the views of my current, previous or future employer(s). This is a fictional design and some elements may not work correctly within your infrastructure. All data and information provided on this document is for informational purposes only. I make no representations as to accuracy, completeness, currentness, suitability, or validity of any information throughout the document & will not be liable for any errors, omissions, or delays in this information or any losses, injuries, or damages arising from its display or use. All information is provided on an as-is basis.

Covers were taken from the following places:-

<http://wasteland-3d.deviantart.com/art/Terraforming-1-1-146225459>

<https://pixabay.com/en/wooden-robot-grass-lawn-green-791421/>



Dont Allow the Robot Uprising

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