



Advanced Virtualization Technologies

OpenVMS in the Cloud

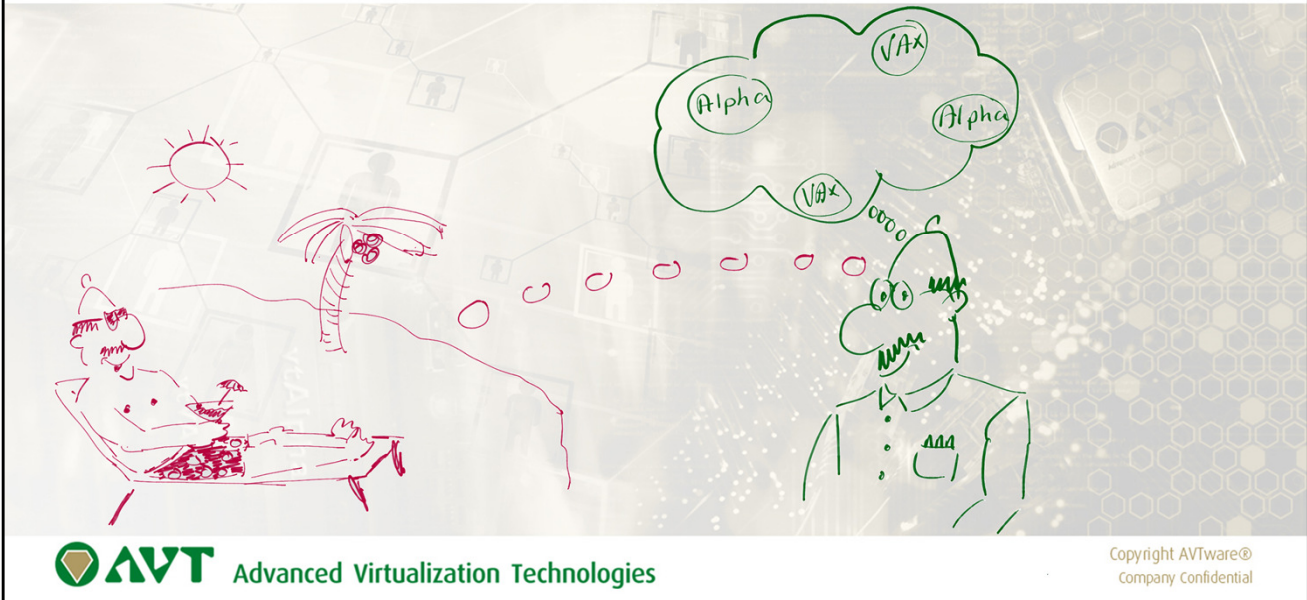
Arie de Groot
AVTware

avtware.com

Recently the OpenVMS/Tru64 community has expressed interest in Cloud computing. A lot of discussion - pro and con - is going on about the possibility of OpenVMS in the Cloud. AVT doesn't participate in that debate, we just continue to do what we are good at: providing a solution for an emerging demand. If a customer decides they want to run their OpenVMS or Tru64 applications in the Cloud, AVTware provides support for that.

This presentation will talk about how we have implemented it in a way it is easy-to-use for the customer, while providing a transparent and secure solution.

Cloud Expectations ?



Running OpenVMS in the Cloud is a thing that more and more people start considering. Given the current State Of The (IT) Art this question isn't that strange. Or is it?

What do YOU think about the combination OpenVMS and Cloud Environment??

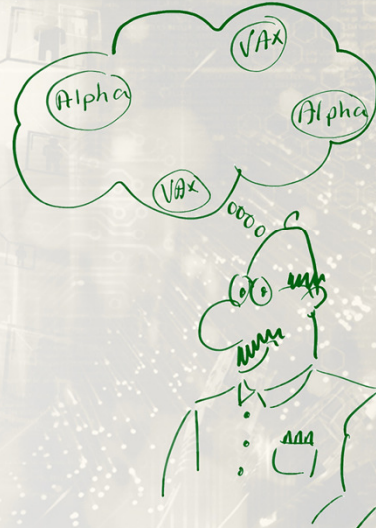
Will it bring you ultimate happiness? Or worries instead?

How would it play out in your situation?

The following slide sums up the desires/expectations from the audience, which will be revisited again at the end of the presentation, see if what we have to offer meets your demand.

Expectations ?

- 1.
- 2.
- 3.
- 4.
- 5.
-



OpenVMS
In the cloud



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First let's start with YOUR expectation for OpenVMS in a Cloud environment.

What do you deem most important, which conditions need to be met first as far as you are concerned, what are your concerns about the subject?

By the end of this presentation we will revisit this list and see if AVT has answered your questions.

Considerations

OpenVMS

- Hardware Control
- Dedicated Host
- Always on
- DECnet/Cluster traffic



Cloud

- SAAS / PAAS / IAAS
- Many Vendors
- Pay per use
- TCP/IP



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Let's compare the OpenVMS and Cloud worlds and see where they differ of opinion.

First of all both have a totally different starting point and goal. OpenVMS is a complete (or in this Boot Camp venue: THE complete Operating System), designed to fully control the hardware it runs on.

OpenVMS runs at the heart of your IT-operation and as such is "always on", whereas Cloud is more of a service to be accessed and paid per use.

Sometimes applications only, sometimes it provides a default operating environment, to be utilized for your purpose.

So there are philosophical conflicts, but also technical ones.

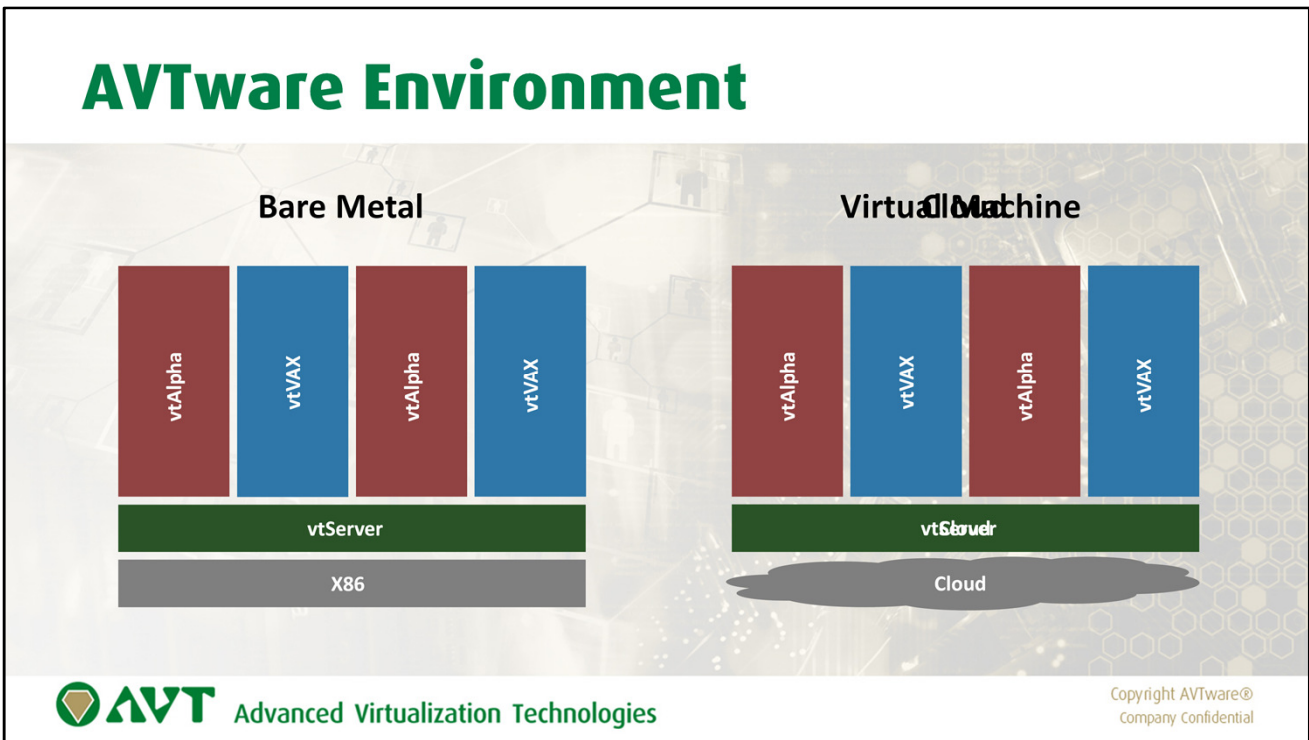
Think about DECnet and SCS Cluster Traffic. These protocols will not survive in the TCP-IP oriented Cloud environment.

These are all issues that need consideration when merging the two worlds.

And it must be simple to implement and maintain, of course.

So we took care of all that.

Let's look at some of the details



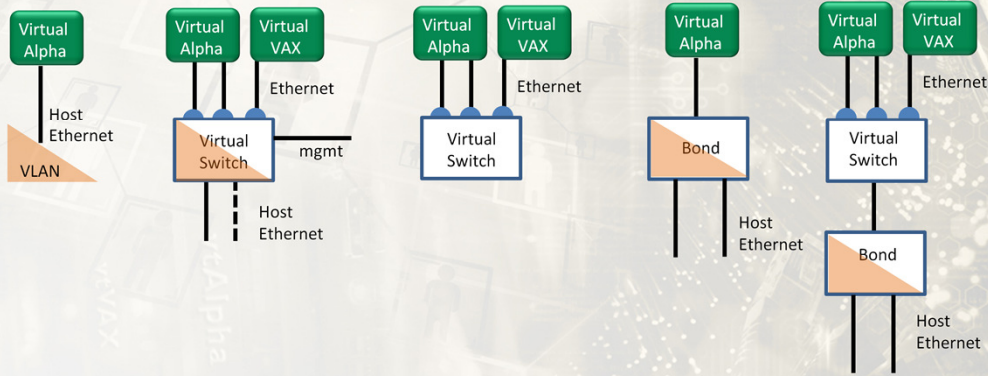
AVTware is a solution that let's you run your Alpha and VAX software in a regular X86 hardware environment, without making changes to your software. The Alpha and VAX hardware architecture is quite different from the X86, so a lot of work needs to be done to make that work.

The AVTware solutions runs directly on X86, without the need of a pre-installed Operating System like Windows or Linux. We refer to this as the Bare Metal installation. It translates in real-time between the Alpha/VAX and X86 worlds, such that the user /owner of the Alpha/VAX software won't know it runs on very different hardware.

Because AVTware talks to X86 it is a (relatively) small step to running on Virtual Machine Products (like VMware) and Cloud(s). The hurdles will be in how these environments operate, are managed and apply rules/demands.

With a lot of fancy footwork from our side it isn't that different to install and operate our solution in either of these three environments (Bare Metal, Virtual Machine and Cloud).

AVTware Network Options



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The way Clouds have organized their networking greatly differs from Cloud provider to Cloud Provider. Fortunately AVTware includes a lot of virtualized network components that make it easy to embed OpenVMS (on AVTware) in the Cloud.

What options do we have?

1. One-on-one mapping of a virtual network adapter to a host network link. Given the possibility to run multiple virtual VAXes and Alphas on a single host and the high speeds modern network links offer, this is a bit of a waste.
2. To fix that AVTware offers Virtual Network Switches that connect multiple virtual network adapters to a single host link. And of course supporting VLAN. And all the DEC protocols. It is also possible to connect a management link to a switch in order to avoid using up a valuable hardware link to manage your virtual Alpha and VAX environment.
3. A switch can also be used to interconnect virtual Alpha and VAX instances without using up a hardware link at all, for an in-host network setup.
4. Later on we introduced a link aggregation device (aka Bond) that can distribute a virtual network links across multiple host links in 7 different states from fail-over to load balancing.
5. Combine that with the Virtual network switch and you can route virtual links in anyway you want.

These network and hypervisor function will help us to run a Alpha/VAX environment in the Cloud

AVTware Storage Options

- Local
- NAS
- NFS
- iSCSI
- SAN
- ☺ + OpenVMS unsupported storage



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The AVTware offers many options regarding storage that will allow OpenVMS to simply take benefit of new technologies without making changes to the original environment.

AVTware support all of the storage options summarized in this slide, and even allows you to run on technology that your OpenVMS version is not aware of.

AVTware Cloud Environment

- CPUs
- Memory
- Storage

→ **IAAS**

- Ease of use
- Prefab install

 **AVT** Advanced Virtualization Technologies

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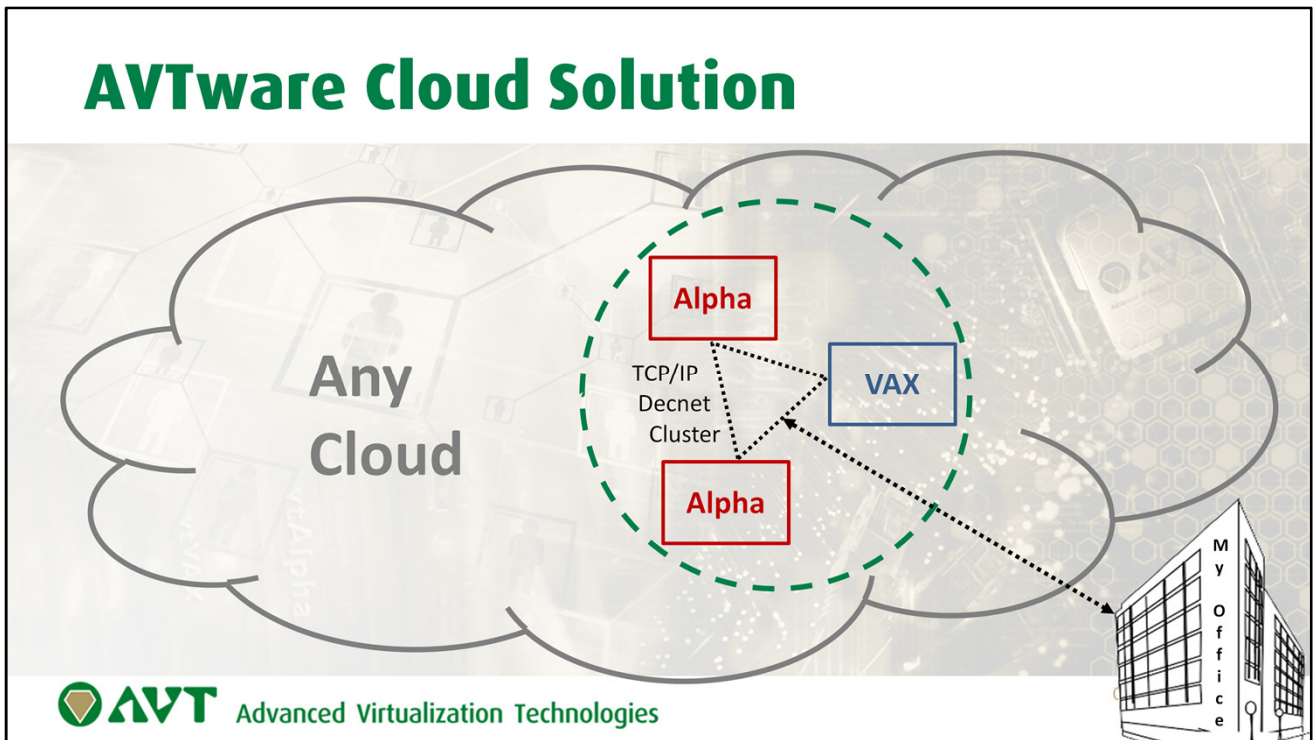
There are many flavors in Cloud provisioning, but for AVTware we can do with the simplest occurrence, one that gives us the number of CPUs we need. The memory and storage space.

Usually this is referred to as Infrastructure As A Service (IAAS). Everything else just adds unnecessary functionality and with that costs.

As usual AVT strives to makes things as easy as possible and offers two setup variants:

1. Clean install, same as with a Bare Metal installation
2. Prefab install, which is a preinstalled image that can be uploaded, ready to go. It can be inflated after installation to the size needed (CPUs, memory, storage)

Prefab is easier, but bigger (includes installed disks) and therefor takes longer to upload to the Cloud provider



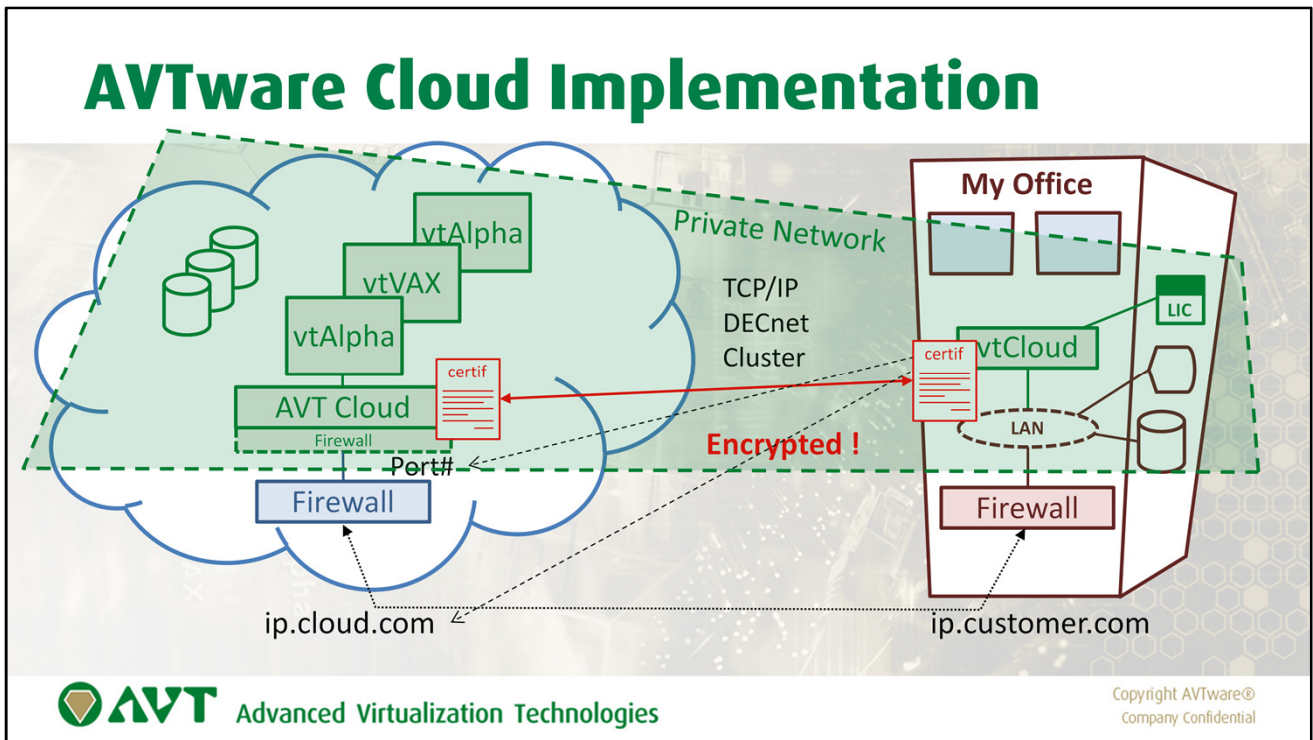
AVTware runs in any Cloud. We have run it with various providers with little difficulty. However, some Cloud providers applied limitations that made it difficult to adhere to.

Therefore, run a trial before selecting a Cloud provider!

With AVTware you can create a virtual Alpha and VAX environment in the Cloud, but we still need to look after the non-routable DEC network protocols (DECnet, SCS Cluster and LAT).

For this reason and for reasons of security the AVTware instance should be isolated from the rest of the Cloud traffic.

And we want to connect our office equipment to the virtual Alphas and VAXes that we run in that Cloud.

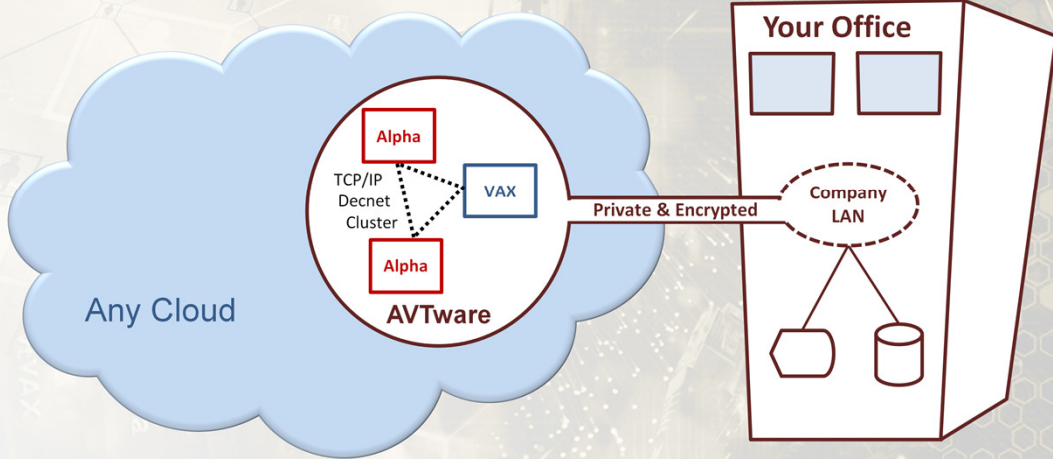


10 Steps to VMS in the Cloud

1. We start with a Cloud provider that gives us an IP-address to connect to
2. And we have our Office(s), with its own external address
3. Both have their own firewall and in the Office there is likely an internal network with its own address space
4. Next we install AVTware in the Cloud space we obtained, which has its own firewall protecting the company network we want to extend to the Cloud
5. AT the office we install a vtCloud box, which controls and protects the Office-Cloud network segment.
6. The vtCloud box connects to the AVTware Cloud instance using the Cloud IP and a dedicated portnumber
7. This creates a dedicated networksegment for this specific situation and connects the virtual Alpha/VAX environment to the office network, using local addresses
8. This allows to run the old DEC protocols as well, these are tunneled across the TCP/IP connection between the Cloud and the office
9. It is your own virtual and private network. Encrypted communication protected by your own certificates.
10. Your virtual Alphas and VAXes will run in this network. Working from the office it will be like the computers are still in the basement.

Since everything is in a local LAN as far as you are concerned you can control the Alpha/VAX licenses from there and you can even decide to have some local storage to copy backups to, away from the Cloud. Your choice!

OpenVMS in The Cloud



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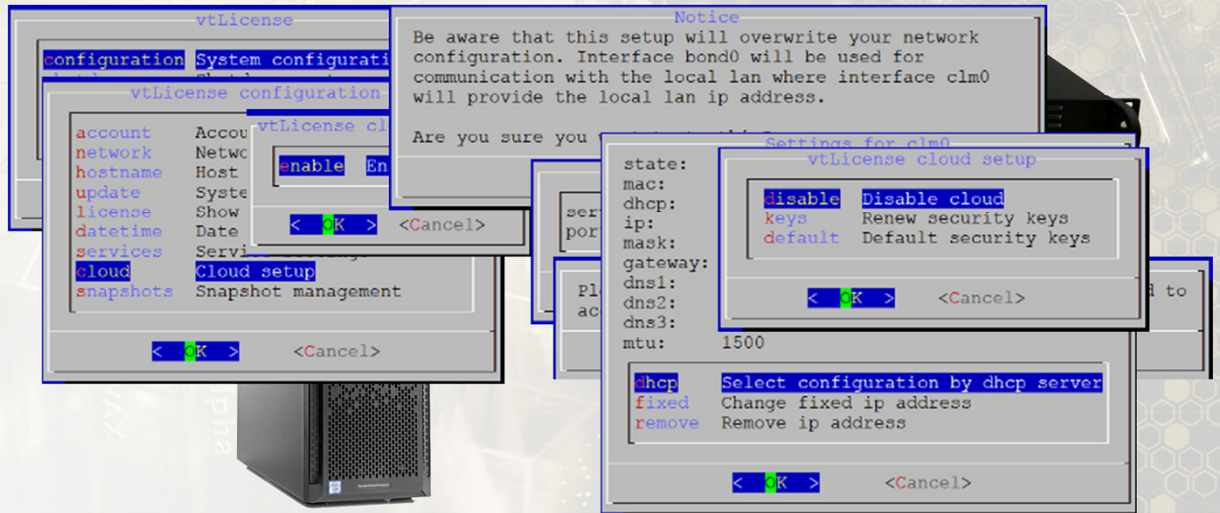
How does it look like from the outside?

Your virtual Alphas and VAXes run inside a protected environment in the Cloud of your choice, impenetrable from other users of that same cloud.

It is a private network in that Cloud, which has a tunnel to your office(s) connecting to your own local LAN to the users there.

Your own Alpha and VAX computer center, but now outsourced to somebody else, without concerns about safety or security.

vtCloud Install



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vtCloud Setup

1. Use the AVT provided vtCloud box in your office or create one yourself
2. Attach keyboard and monitor since it needs to be connected the Cloud setup
3. Upload an ISO or USB image to your Cloud instance and do a standard install
4. Use the Cloud console to get access to your AVTware installation
5. Login and select Configuration from the menu
6. Select Cloud and Enable Cloud
7. Since this activity will alter your network settings it requires acknowledge
8. Enter the IP-address of your Cloud provider and the Port number you want to use for Cloud connection. This will be the only open port in the AVTware firewall!
9. Define in your Cloud instance which port to listen to
10. Define the desired IP-settings for your internal network

The Cloud-Office network is now set up and can be protected by new certificates, that can be generated by the vtCloud box. Highly recommended!! Otherwise you will use the standard certificates.

AVTware in the Cloud

The screenshot shows the vtMonitor interface for a host named 'bootcamp2017.vtserver.avtware'. The interface includes a navigation menu with tabs for Configuration, Storage, Toolbox, Logging, and Online Manual. Below the menu, there are buttons for Reboot Host, Shutdown Host, Support Info, Product Update, and Refresh. The main content area displays system information, including boot time, uptime, load average, vtserver version, vtalpha version, and vtVM version. A red arrow points to the 'System vendor: OpenStack Foundation' line in the hardware log section. The hardware log also shows system vendor, product, memory size, CPU type, cache size, number of CPU sockets, number of CPU cores, number of logical CPUs, hyperthreading enabled, and clock speed. The network devices section shows the eth0 interface with its MAC address, link state, speed, duplex, and auto negotiate settings.

After installation it will show the Cloud Computing Device in the hardware log

AVTware Cloud Network

vtMonitor bootcamp2017.vtserver.avtware root
V3.1.0 build 11723 ■ Disable 30 minute time-out period Logout

DS10 Rotterdam
New AlphaServer ES47
PLUTO Cluster (Bavaria)

Configuration Storage Toolbox Logging Online Manual
Host Network User Accounts License Backup Support

Selected: eth0 (Red Hat, Inc Virtio network device)
IP-address: 83.96.200.142 (dhcp) Change to: 83 96 200 142 DHCP
Subnet mask: 255.255.252.0 Change to: 255 255 252 0
Gateway: Change to: = Default Gateway
State eth0 up MTU-Size: 1500
Auto Negotiate: On Off

DNS server (1): 192.168.5.254 Change to: 192 168 5 254
DNS server (2): 0.0.0.0 Change to: 0 0 0 0
DNS server (3): 0.0.0.0 Change to: 0 0 0 0

Virtual Network Configuration Add Switch Add Bond

| | | | |
|---------|------|----|------------------------------------|
| Adapter | eth0 | up | Red Hat, Inc Virtio network device |
| Adapter | xcw0 | up | Virtual X-windows port |
| Switch | cls0 | up | Cloud network switch |
| Port | dln0 | up | Cloud management port |

certif ← Protected → certif

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The designated network adapter that connects to the Cloud, everything running under the AVT provided detection. Your certificate, updatable whenever you deem necessary.

AVTware Customer Network

The screenshot displays the AVTware vtMonitor interface. At the top, it shows the user 'bootcamp2017.vtserver.avtware' as 'root' with a 'Logout' button. Below this is a navigation bar with tabs for Configuration, Storage, Toolbox, Logging, and Online Manual. The main configuration area is divided into sections: Host, Network, User Accounts, License, Backup, and Support. The 'Network' section is active, showing configuration for the 'Selected: clm0 (Cloud management port)'. The IP address is 192.168.5.186 (dhcp), Subnet mask is 255.255.255.0, and Gateway is 192.168.5.254. A red circle highlights the IP address field. Below this, there are DNS server settings and a 'Virtual Network Configuration' table. The AVTware logo and 'Advanced Virtualization Technologies' are at the bottom left, and 'Copyright AVTware© Company Confidential' is at the bottom right.

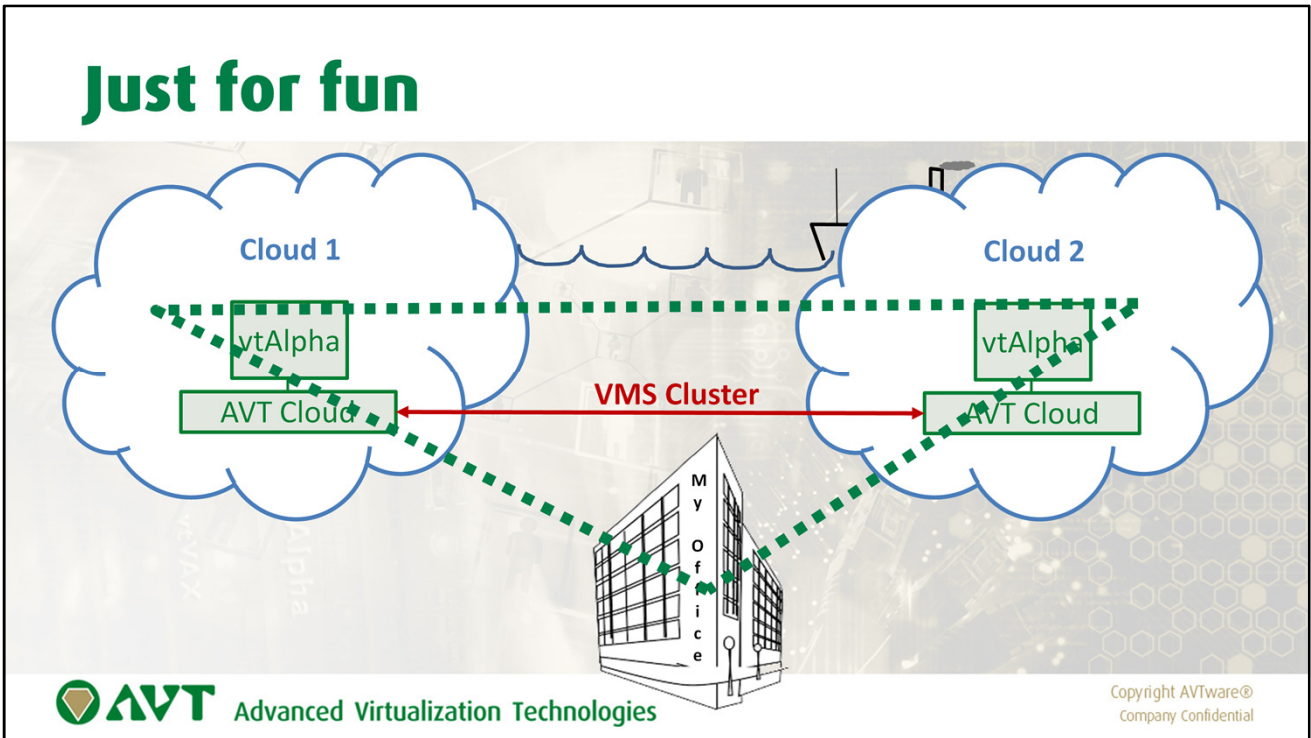
On the inside the AVT implementation uses your own network address range, in other words it simply embeds into your internal company network and is accessible from your LAN under your own security rules.

In this example it takes the addresses from your DHCP server, but you can assign your own addresses if you want to.

vtCloud Customer Site

The screenshot displays the vtCloud Customer Site interface. At the top, there is a navigation menu with tabs for Host, Network, User Accounts, License, Backup, Support, Firewall, and Online Manual. The 'Network' tab is selected. The main content area shows the configuration for the 'Selected: clm0 (Cloud management port)'. The IP address is 192.168.5.180, which is circled in red. Other configuration details include Subnet mask (255.255.255.0), Gateway (192.168.5.254), and MTU-Size (1500). Below the network configuration, there is a 'Virtual Network Configuration' section with buttons for 'Add Switch' and 'Add Bond'. The footer contains the AVT logo and the text 'Advanced Virtualization Technologies'.

A quick peek in your vtCloud system (set-top, license server , VM or other assigned entity) shows an IP in the same address space. This system controls the Virtual private Network that protect your virtual Alpha/VAX environment from other Cloud users.



We too like to experiment from time to time so we did setup a (redundant) OpenVMS cluster on two different continents, an ocean apart and ran it like an in-house cluster. Everything worked fine, but you could notice the distance put a strain on the network performance.

VSI Cloud

- AVT & VMSsoftware Inc cooperation
- Move your aging VAX and Alpha OpenVMS systems to the Cloud under VSI support
- The Virtual Private Cloud (VPC) implementation is secure and cost-effective
- Allow OpenVMS users to transparently migrate to x86 technology using VSI virtualization expertise



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Recently VMSsoftware Inc (VSI) announced their VSI Cloud solution.

This cooperation between VSI and AVT provides Alpha and VAX owners an easy migration path, away from their old Alpha and VAX equipment, safely embedded in a VSI supported environment.

AVT and VSI have also joined forces to support the current Alpha and VAX OpenVMS installed base.

A graphic with a background of a 3D grid and floating windows. The text is centered and reads: avtware.com, avtware.com/vlog, @avtware, info@avtware.com. At the bottom left is the AVT logo and 'Advanced Virtualization Technologies'. At the bottom right is 'Copyright AVTware® Company Confidential'.

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More information can be found on our website.

We also maintain a virtual blog where we publish articles we think are helpful for our community.

The best way to stay abreast of what we are doing is to follow us on Twitter. Whenever we have something newsworthy to report we will use Twitter to announce it. This way you will always immediately know what is going on.

Email is always an option of course. We are available to answer any question you have regarding virtualization.