oVirt

oVirt Hosted Engine

The Egg That Hosts its Parent Chicken

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FOSDEM
February 2014

Agenda

oVirt

- Fundamental question
- Reason
- Architecture
- Setup
- Simulations
- Summary

Fundamental question

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Why did the chicken cross the road?

What is it?

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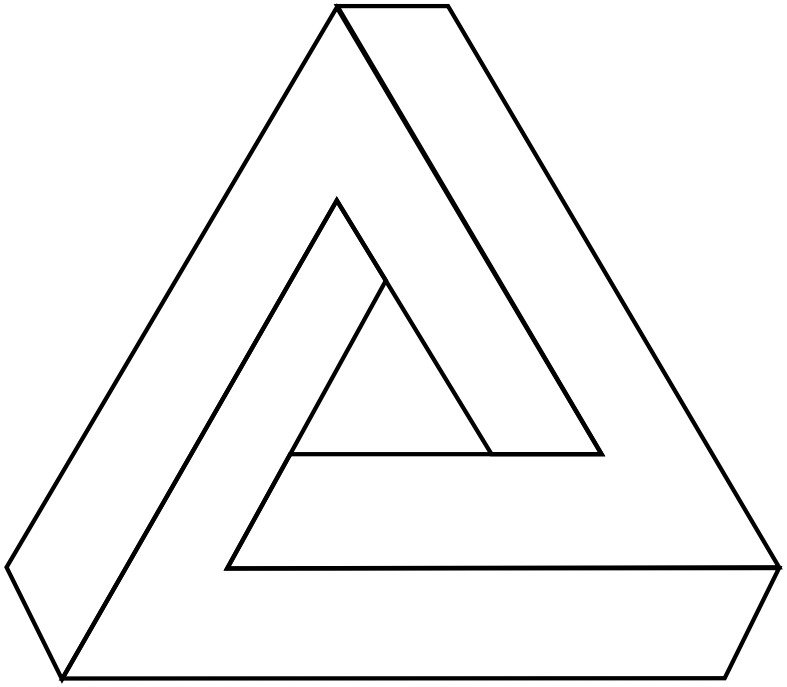
- Standard oVirt installation
- Running in a highly available VM
- The VM is managed... by the engine it's hosting

- Sound challenging?...



Why do we need it?

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- Saves $ / £ / € / ₪ /...
  - No need for dedicated box
- Actually, saves $$$ / £££ / €€€ / ₪₪₪ /...
  - If you have a failover solution

Challenges

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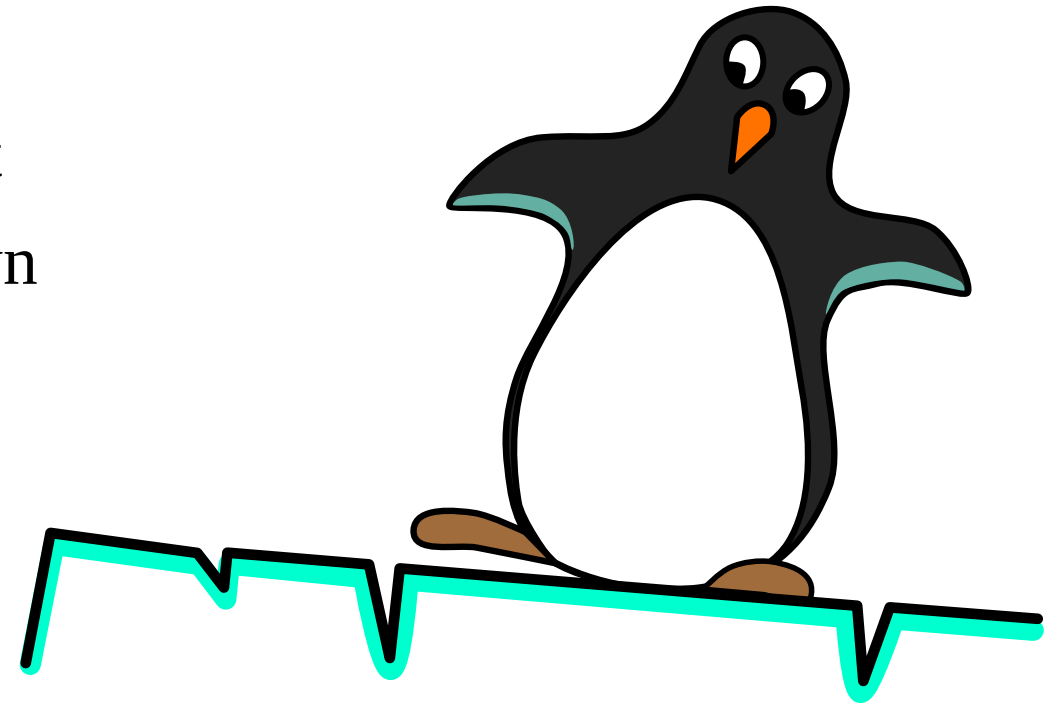
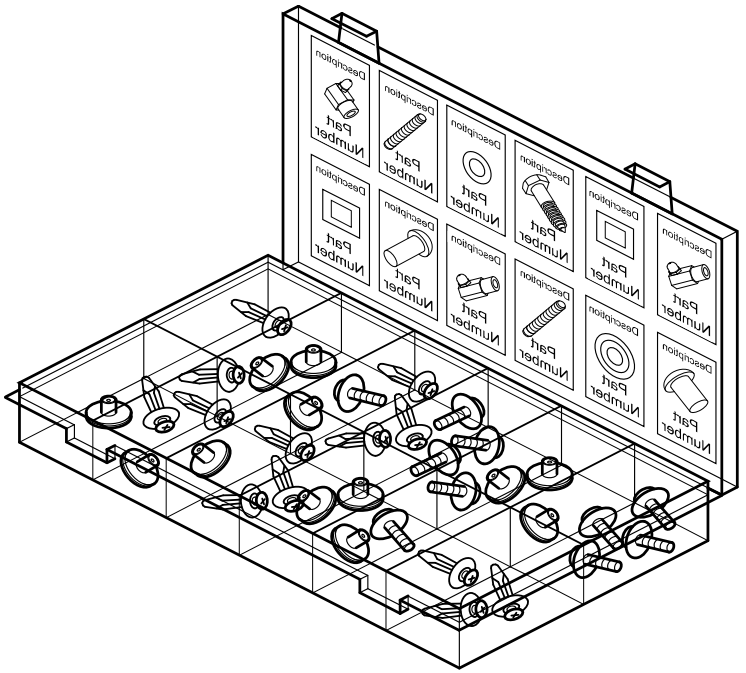
- Setup...
  - **How do we set up an egg (VM) that hosts its parent chicken (oVirt engine)**?

- VM availability
  - Network connectivity lost
  - Engine unexpectedly down
  - Load balancing
  - Maintenance
  - ...



Solutions

- Existing solutions
  - Clustering File system + file locking
    - Proprietary
  - RHCS / Pacemaker
    - Standard file system
    - Uses Corosync
    - Limits number of nodes
    - No oVirt node support



Solutions

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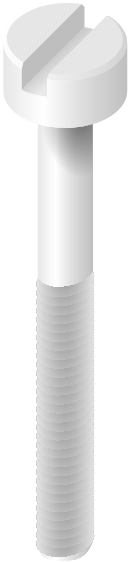
- Here's a thought
  - Standard file system
  - Sanlock leases

- Simpler
- Focused on Virtual Machines
- Less logic



Architecture

Architecture

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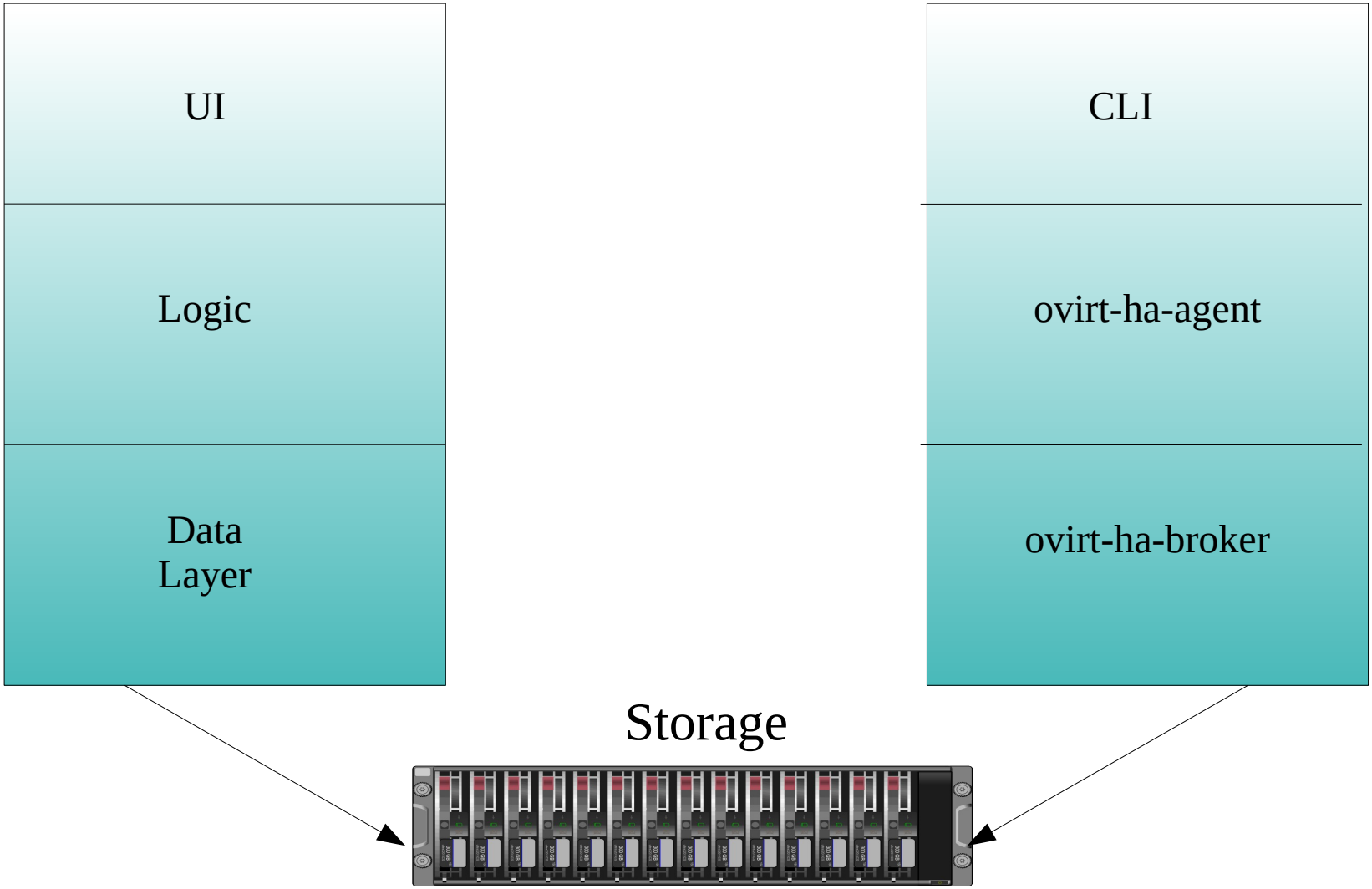
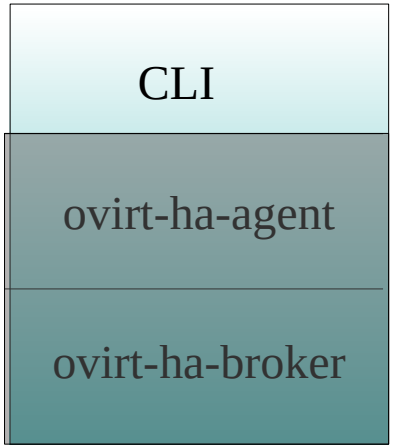
Classic 3-layers architecture



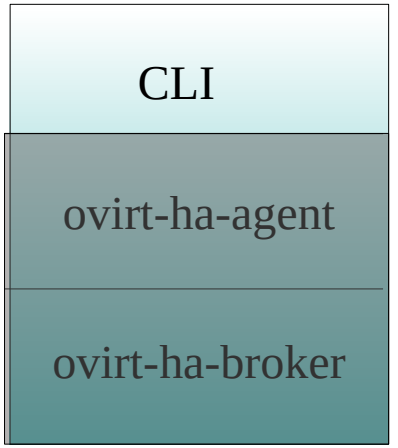
Architecture

- CLI: /usr/sbin/hosted-engine
  - --help
    - show this help.
  - --deploy
    - run ovirt-hosted-engine deployment
  - --vm-start
    - start VM on this host
  - --vm-shutdown
    - gracefully shut down the VM on this host
  - --vm-poweroff
    - forcefully power off the VM on this host
  - --vm-status
    - VM status according to HA agent



Architecture

- CLI: /usr/sbin/hosted-engine
  - --add-console-password=<password>
    - Create a temporary password for vnc/spice connection
  - --check-liveliness
    - Checks liveliness page of engine
  - --connect-storage
    - Connect the storage domain
  - --start-pool
    - Start the storage pool manually
  - --console
    - Open the configured console using remote-viewer on localhost
  - --set-maintenance=<local|global|none>



Architecture

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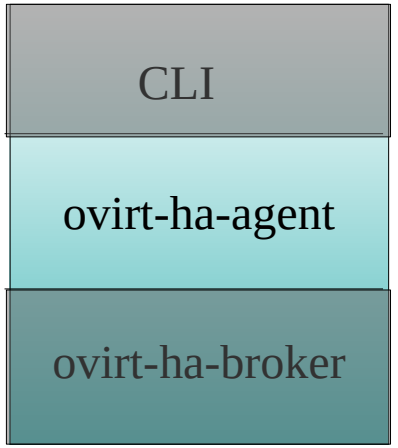
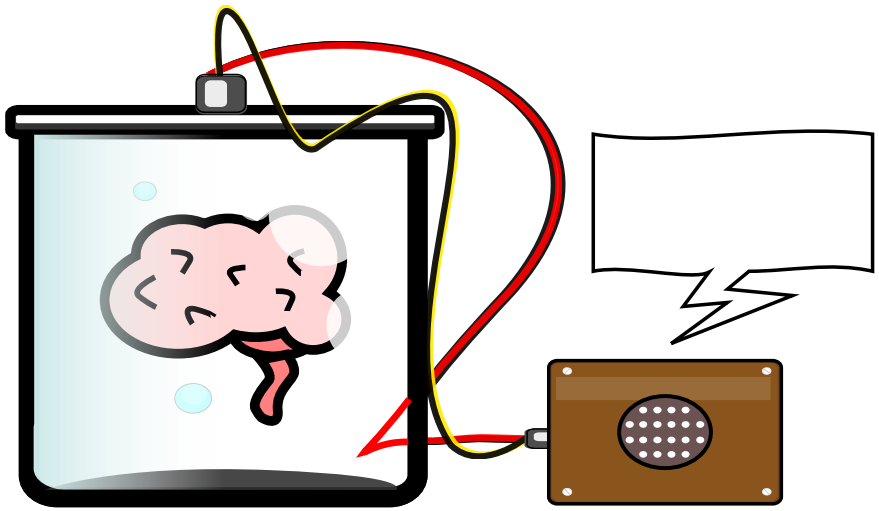
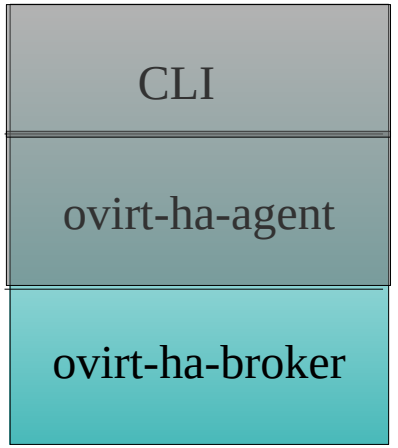
- ovirt-ha-agent
  - AKA 'The Brain'
  - Standalone system service
  - Contains the HA logic, state machine, etc
  - Takes action if needed to ensure high availability
  - Communicates locally with the broker to get data





Architecture



- ovirt-ha-broker
  - AKA 'The Middleman'
  - Standalone system service
  - Shared storage
    - Used by ovirt-ha-agent to read from/write to storage
  - Monitoring
    - Includes pluggable monitoring (…/submonitors/)
    - Ping
    - CPU load
    - Memory use
    - Management network bridge status
    - Engine VM status

Architecture

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- Host Score
  - Single number representing a host's suitability for running the engine VM
  - Range is 0 (unsuitable) to 2400 (all is well)
  - Calculated based on host status: each monitor (ping, cpu load, gateway status, ...) has a weight and contributes to the score

Score weights:
1000 - gateway address is pingable
800 - host's management network bridge is up
400 - host has 4GB of memory free to run the engine VM
100 - host's cpu load is less than 80% of capacity
100 - host's memory usage is less than 80% of capacity

Adjustments:
-50 - subtraction for each failed vm startup attempt
0 - score reset to 0 after 3 attempts, for 10 minutes

Hosted engine storage

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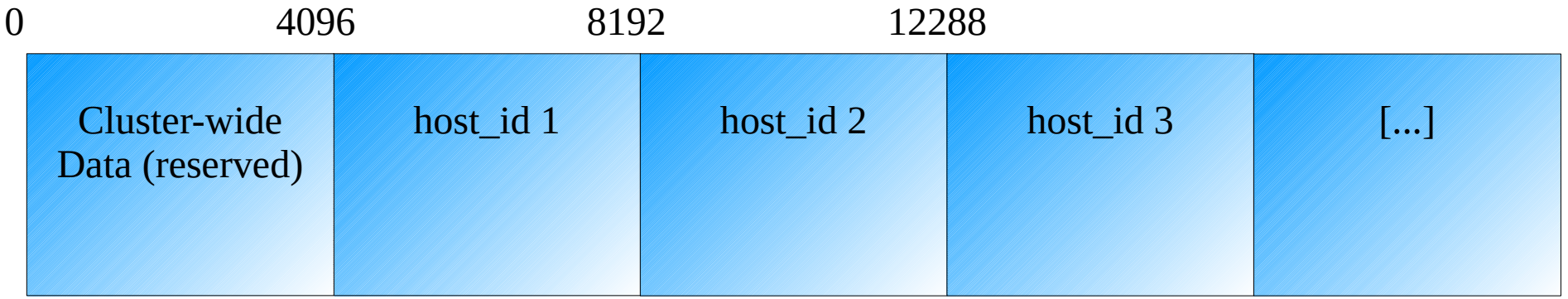
- Storage domain created during setup

  - First host only
  - Holds engine VM disks, sanlock metadata, agent metadata
  - NFS only (support for GlusterFS/iSCSI/FC coming later)

- Special files (created during setup):
  - /rhev/data-center/mnt/<host:domain>/<uuid>/ha_agent/
  - [...] hosted-engine.lockspace – for sanlock
  - [...] hosted-engine.metadata – for agent

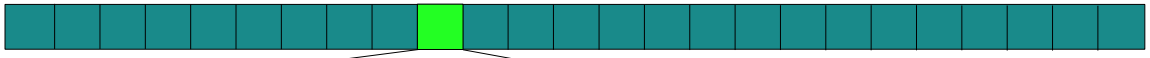
Hosted engine storage

- hosted-engine.metadata
  - 4KiB chunks, one per host
  - Chunk ownership defined by host_id (Sanlock)
  - host_id starts at 1... offset 0 reserved for cluster-wide settings such as maintenance bit



Hosted engine storage

- hosted-engine.metadata: each 4KiB
  - First 512 bytes of chunks store critical data, atomic
  - Remaining space to assist in debugging



0

1|1|1378496098|1|1400|vm-up bad-health-status|ovirt.localdomain

← For agent consumption

512

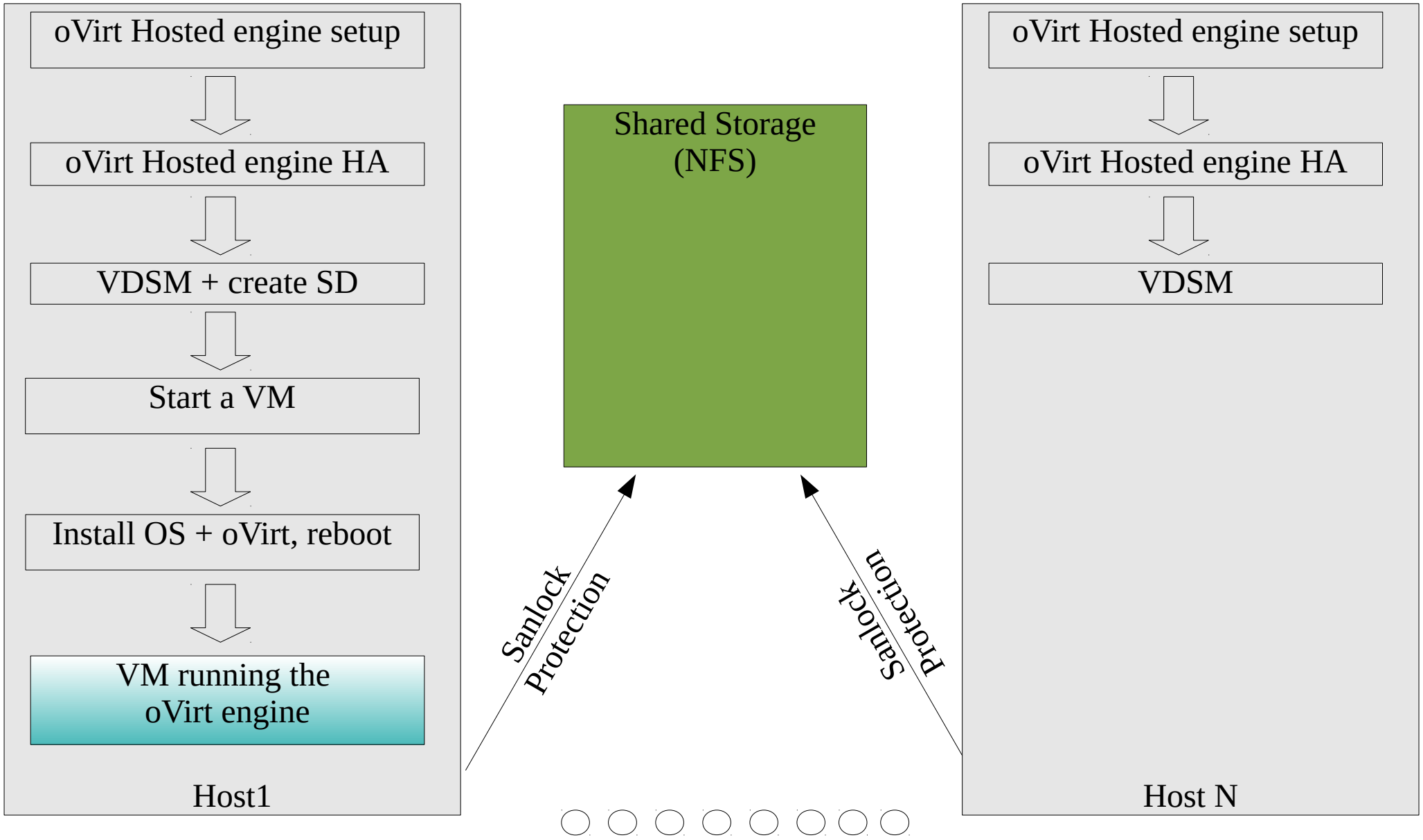
metadata_parse_version=1
metadata_feature_version=1
timestamp=1378496272 (Fri Sep 6 15:37:52
2013)
host-id=1
score=1400
bridge=True
cpu-load=0.055
engine-health=vm-up bad-health-status
gateway=False
mem-free=12367

← For human consumption

4096

Setup

Setup flow

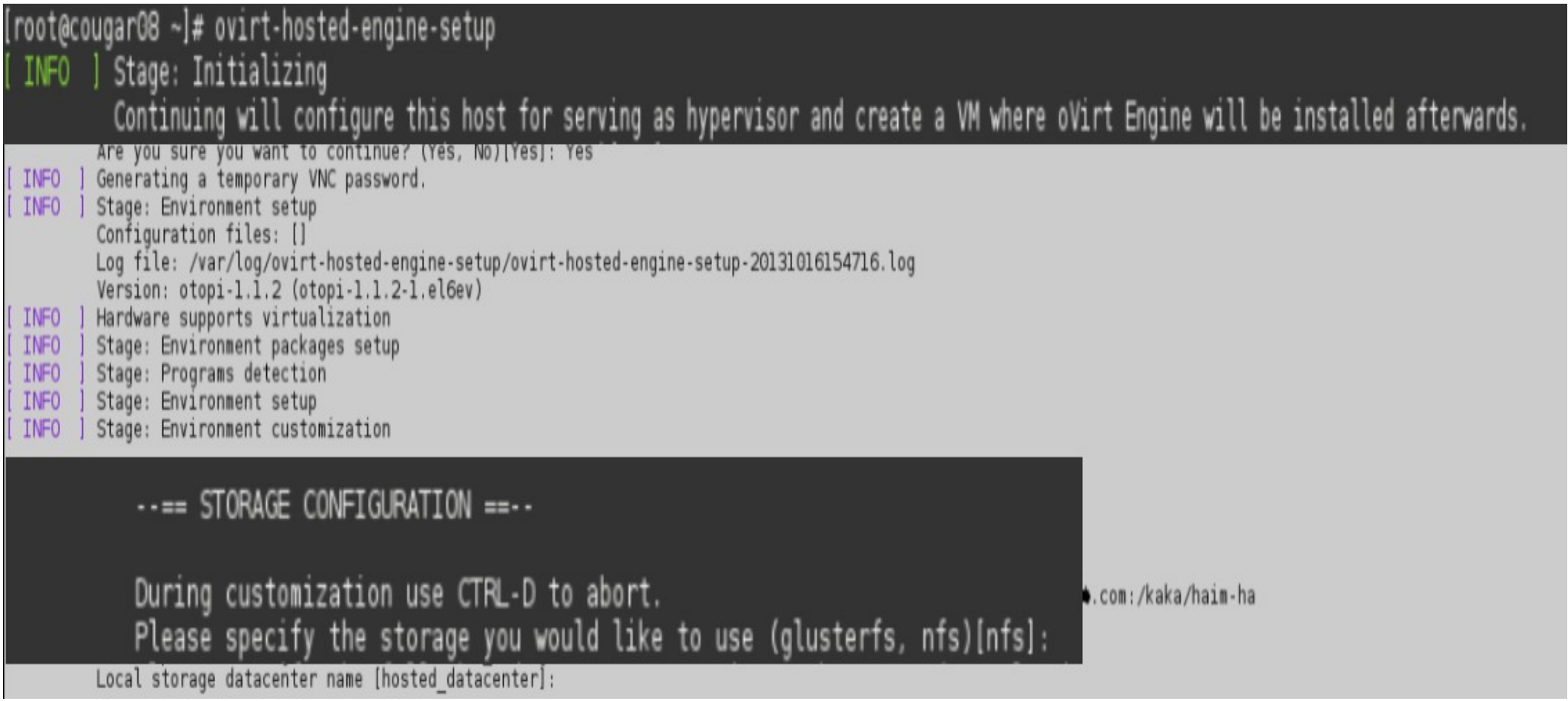

oVirt Hosted engine setup
oVirt Hosted engine HA
VDSM + create SD
Start a VM
Install OS + oVirt, reboot
VM running the oVirt engine
Host1
Shared Storage (NFS)
Sanlock Protection
Sanlock Protection
oVirt Hosted engine setup
oVirt Hosted engine HA
VDSM
Host N

Setting up the first node

oVirt

```
File  Edit  View  Search  Terminal  Help
[root@cougar08 ~]# ovirt-hosted-engine-setup
[ INFO  ] Stage: Initializing
          Continuing will configure this host for serving as hypervisor and create a VM where oVirt Engine will be installed afterwards.
          Are you sure you want to continue? (Yes, No)[Yes]: Yes
[ INFO  ] Generating a temporary VNC password.
[ INFO  ] Stage: Environment setup
          Configuration files: []
          Log file: /var/log/ovirt-hosted-engine-setup/ovirt-hosted-engine-setup-20131016154716.log
          Version: otopi-1.1.2 (otopi-1.1.2-1.el6ev)
[ INFO  ] Hardware supports virtualization
[ INFO  ] Stage: Environment packages setup
[ INFO  ] Stage: Programs detection
[ INFO  ] Stage: Environment setup
[ INFO  ] Stage: Environment customization

          --== STORAGE CONFIGURATION ==--

          During customization use CTRL-D to abort.
          Please specify the storage you would like to use (glusterfs, nfs)[nfs]:
          Please specify the full shared storage connection path to use (example: host:/path): orion.qa.[redacted].com:/kaka/haim-ha
[ INFO  ] Installing on first host
          Please provide storage domain name [hosted_storage]:
          Local storage datacenter name [hosted_datacenter]:
```

Setting up the first node



Setting up the first node

oVirt

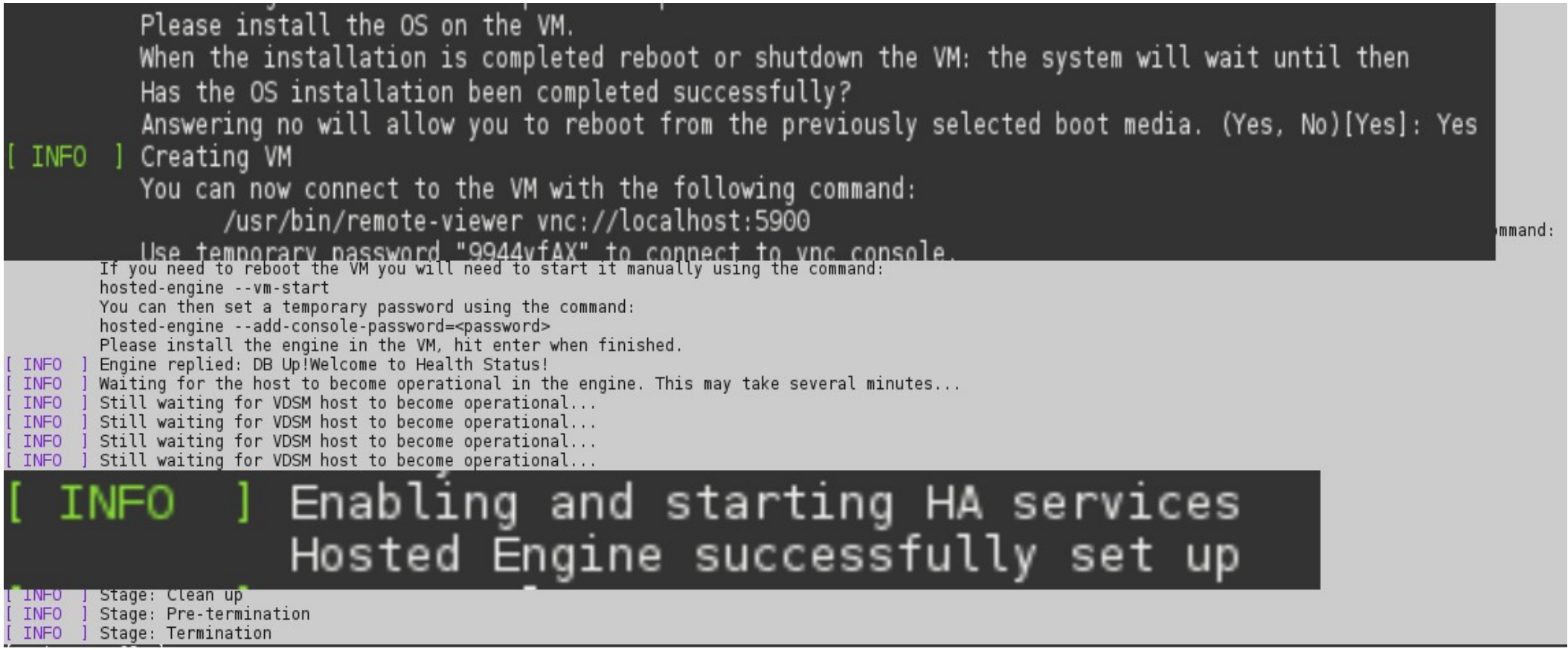
```
--== SYSTEM CONFIGURATION ==--


--== NETWORK CONFIGURATION ==--

Please indicate a nic to set rhevm bridge on: (eth3, eth2, eth1, eth0) [eth3]: eth2
iptables was detected on your computer, do you wish setup to configure it? (Yes, No)[Yes]: Yes
Please indicate a pingable gateway IP address: 10.35.160.254

--== VM CONFIGURATION ==--

Please specify the device to boot the VM from (cdrom, disk, pxe) [cdrom]: pxe
The following CPU types are supported by this host:
        - model_Opteron_G3: AMD Opteron G3
        - model_Opteron_G2: AMD Opteron G2
        - model_Opteron_G1: AMD Opteron G1
Please specify the CPU type to be used by the VM [model_Opteron_G3]:
Please specify the number of virtual CPUs for the VM [Defaults to minimum requirement: 2]:
Please specify the disk size of the VM in GB [Defaults to minimum requirement: 25]:
Please specify the memory size of the VM in MB [Defaults to minimum requirement: 4096]:
Please specify the console type you would like to use to connect to the VM (vnc, spice) [vnc]:

--== HOSTED ENGINE CONFIGURATION ==--

Enter the name which will be used to identify this host inside the Administrator Portal [hosted_engine_1]:
Enter 'admin@internal' user password that will be used for accessing the Administrator Portal:
Confirm 'admin@internal' user password:
Please provide the FQDN for the engine you would like to use. This needs to match the FQDN that you will use for the engine installation within the VM: haim-ha.qa[redacted]
[WARNING] Failed to resolve haim-ha.qa[redacted].com using DNS, it can be resolved only locally
[ INFO  ] Stage: Setup validation
```

Setting up the first node

oVirt

```
[ INFO  ] Stage: Package installation
[ INFO  ] Stage: Misc configuration
[ INFO  ] Configuring libvirt
[ INFO  ] Configuring the management bridge
[ INFO  ] Generating VDSM certificates
[ INFO  ] Generating libvirt-spice certificates
[ INFO  ] Configuring VDSM
[WARNING] VDSM configuration file not found: creating a new configuration file
[ INFO  ] Starting vdsmd
[ INFO  ] Waiting for VDSM hardware info
[ INFO  ] Waiting for VDSM hardware info
[ INFO  ] Creating Storage Domain
[ INFO  ] Creating Storage Pool
[ INFO  ] Connecting Storage Pool
[ INFO  ] Verifying sanlock lockspace initialization
[ INFO  ] Initializing sanlock lockspace
[ INFO  ] Initializing sanlock metadata
[ INFO  ] Creating VM Image
[ INFO  ] Disconnecting Storage Pool
[ INFO  ] Start monitoring domain
[ INFO  ] Creating VM
          You can now connect to the VM with the following command:
               /usr/bin/remote-viewer vnc://localhost:5900
          Use temporary password "9944vfAX" to connect to vnc console.
```

Setting up the first node



Hosted engine is alive!

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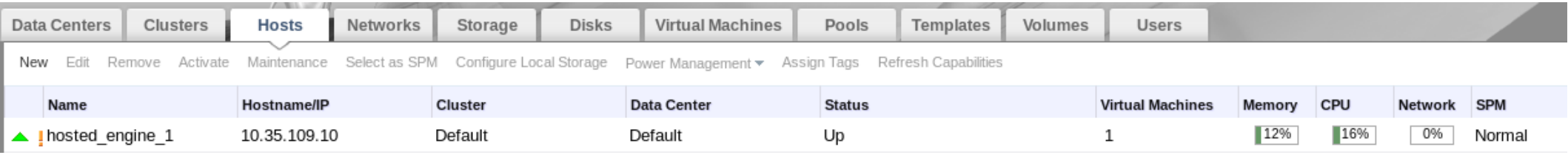

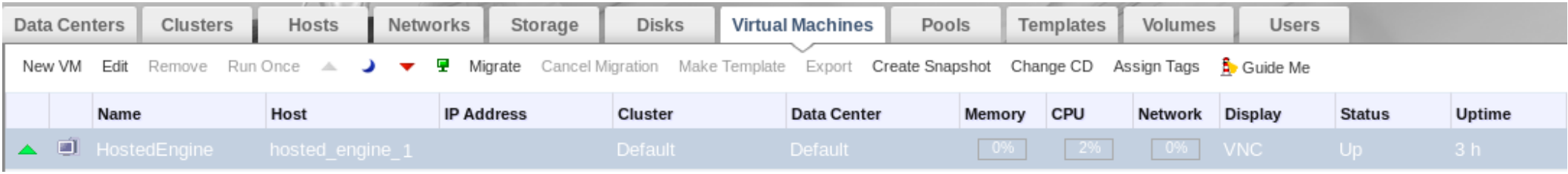

Setting up the 2nd+ node

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```
[root@thinkerbell ~]# hosted-engine --deploy --config-append=answers.conf
[ INFO  ] Stage: Initializing
          Continuing will configure this host for serving as hypervisor and create a VM where oVirt Engine will be installed afterwards.
          Are you sure you want to continue? (Yes, No)[Yes]:
[ INFO  ] Generating a temporary VNC password.
[ INFO  ] Stage: Environment setup
          Configuration files: ['/root/answers.conf']
          Log file: /var/log/ovirt-hosted-engine-setup/ovirt-hosted-engine-setup-20131018091350.log
          Version: otopi-1.2.0_master (otopi-1.2.0-0.0.master.20131007.git6f8ac6d.fc19)
[ INFO  ] Hardware supports virtualization
[ INFO  ] Bridge ovirtmgmt already created
[ INFO  ] Stage: Environment packages setup
[ INFO  ] Stage: Programs detection
[ INFO  ] Stage: Environment setup
[ INFO  ] Stage: Environment customization

          --== STORAGE CONFIGURATION ==--

          During customization use CTRL-D to abort.
          The specified storage location already contains a data domain. Is this an additional host setup (Yes, No)[Yes]?
[ INFO  ] Installing on additional host
          Please specify the Host ID [Must be integer, default: 2]:
```

Setting up the 2nd+ node

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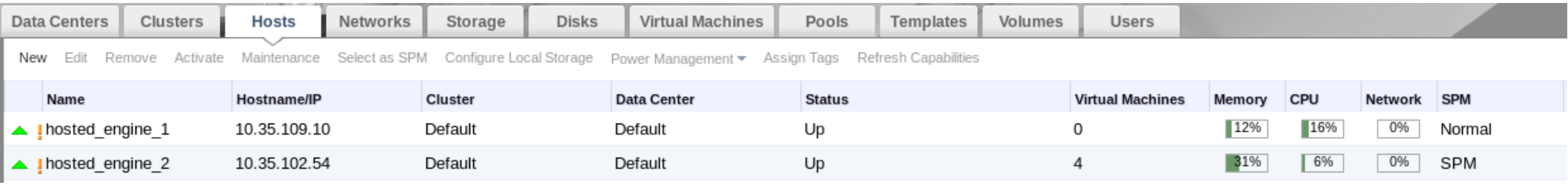
--== HOSTED ENGINE CONFIGURATION ==--

Enter the name which will be used to identify this host inside the Administrator Portal [hosted_engine_2]:
Enter 'admin@internal' user password that will be used for accessing the Administrator Portal:
Confirm 'admin@internal' user password:
[INFO] Stage: Setup validation

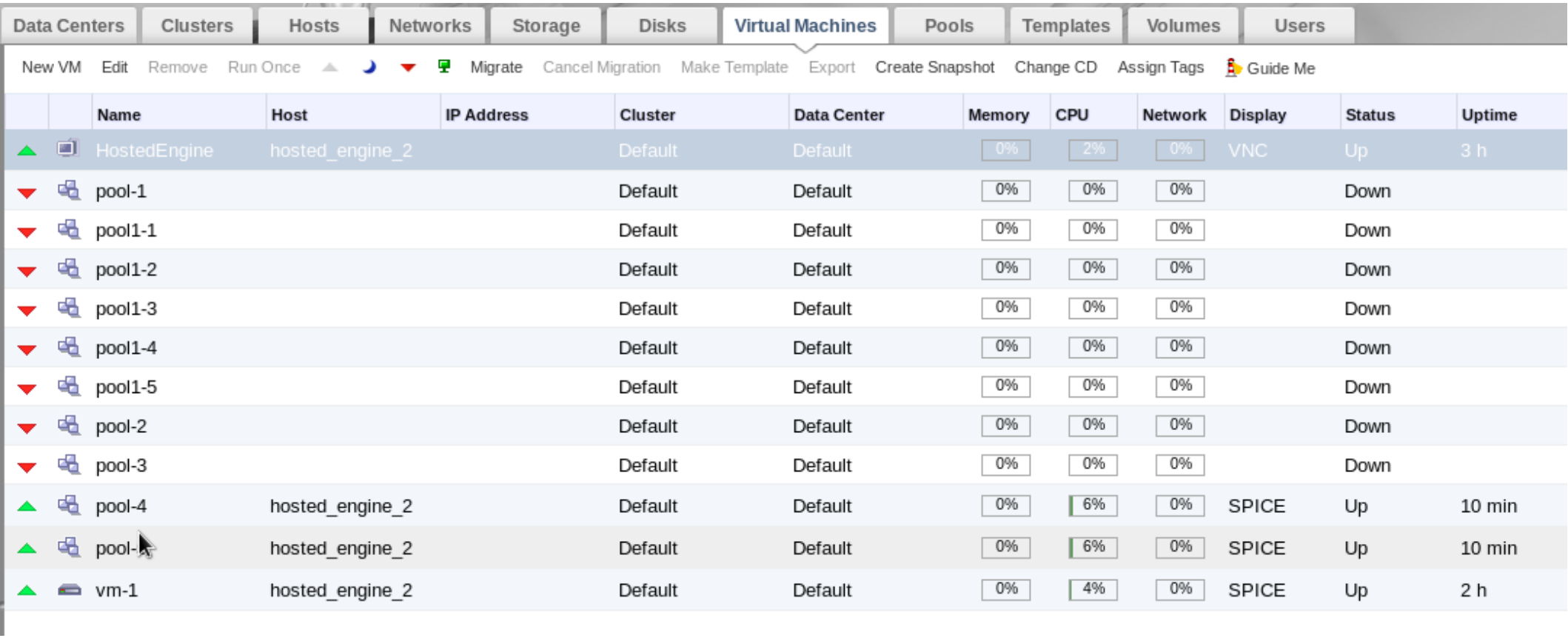
....

[INFO] The VDSM Host is now operational
[INFO] Enabling and starting HA services
Hosted Engine successfully set up
[INFO] Stage: Clean up
[INFO] Stage: Pre-termination
[INFO] Stage: Termination

Hosted engine is alive, 2 nodes running



Name	Hostname/IP	Cluster	Data Center	Status	Virtual Machines	Memory	CPU	Network	SPM
hosted_engine_1	10.35.109.10	Default	Default	Up	0	12%	16%	0%	Normal
hosted_engine_2	10.35.102.54	Default	Default	Up	4	31%	6%	0%	SPM



Name	Host	IP Address	Cluster	Data Center	Memory	CPU	Network	Display	Status	Uptime
HostedEngine	hosted_engine_2		Default	Default	0%	2%	0%	VNC	Up	3 h
pool-1			Default	Default	0%	0%	0%		Down	
pool1-1			Default	Default	0%	0%	0%		Down	
pool1-2			Default	Default	0%	0%	0%		Down	
pool1-3			Default	Default	0%	0%	0%		Down	
pool1-4			Default	Default	0%	0%	0%		Down	
pool1-5			Default	Default	0%	0%	0%		Down	
pool-2			Default	Default	0%	0%	0%		Down	
pool-3			Default	Default	0%	0%	0%		Down	
pool-4	hosted_engine_2		Default	Default	0%	6%	0%	SPICE	Up	10 min
pool-	hosted_engine_2		Default	Default	0%	6%	0%	SPICE	Up	10 min
vm-1	hosted_engine_2		Default	Default	0%	4%	0%	SPICE	Up	2 h

HA simulation

Hosted engine simulation

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- Initial state: VM up on host 2, both hosts healthy

```
--== Host 1 status ==--

Hostname                           : hosted_engine_2
Host ID                            : 1
Engine status                      : vm-up good-health-status
Score                              : 2400
Host timestamp                     : 1378510362
Extra metadata                     :
    timestamp=1378510362 (Sun Oct 20 19:32:42 2013)
    host-id=1
    score=2400
    engine-health=vm-up good-health-status
    gateway=True


--== Host 2 status ==--

Hostname                           : hosted_engine_3
Host ID                            : 2
Engine status                      : vm-down
Score                              : 2400
Host timestamp                     : 1378510365
Extra metadata                     :
    timestamp=1378510365 (Sun Oct 20 19:32:45 2013)
    host-id=2
    score=2400
    engine-health=vm-down
    gateway=True
```

Hosted engine simulation

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Now, let's block GW in hosted_engine_2....

Hosted engine simulation

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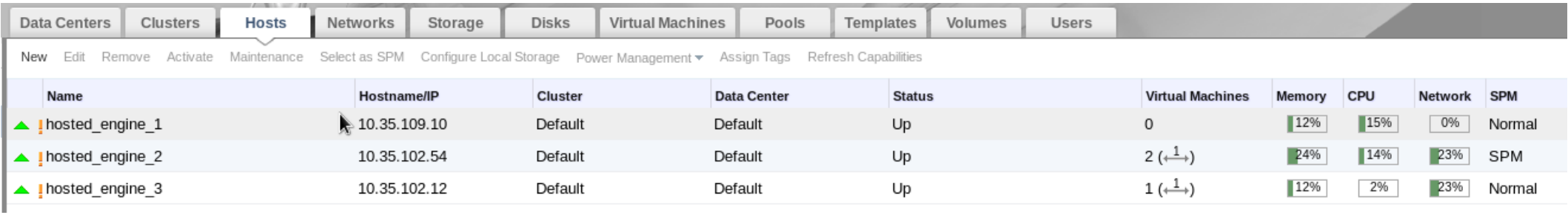

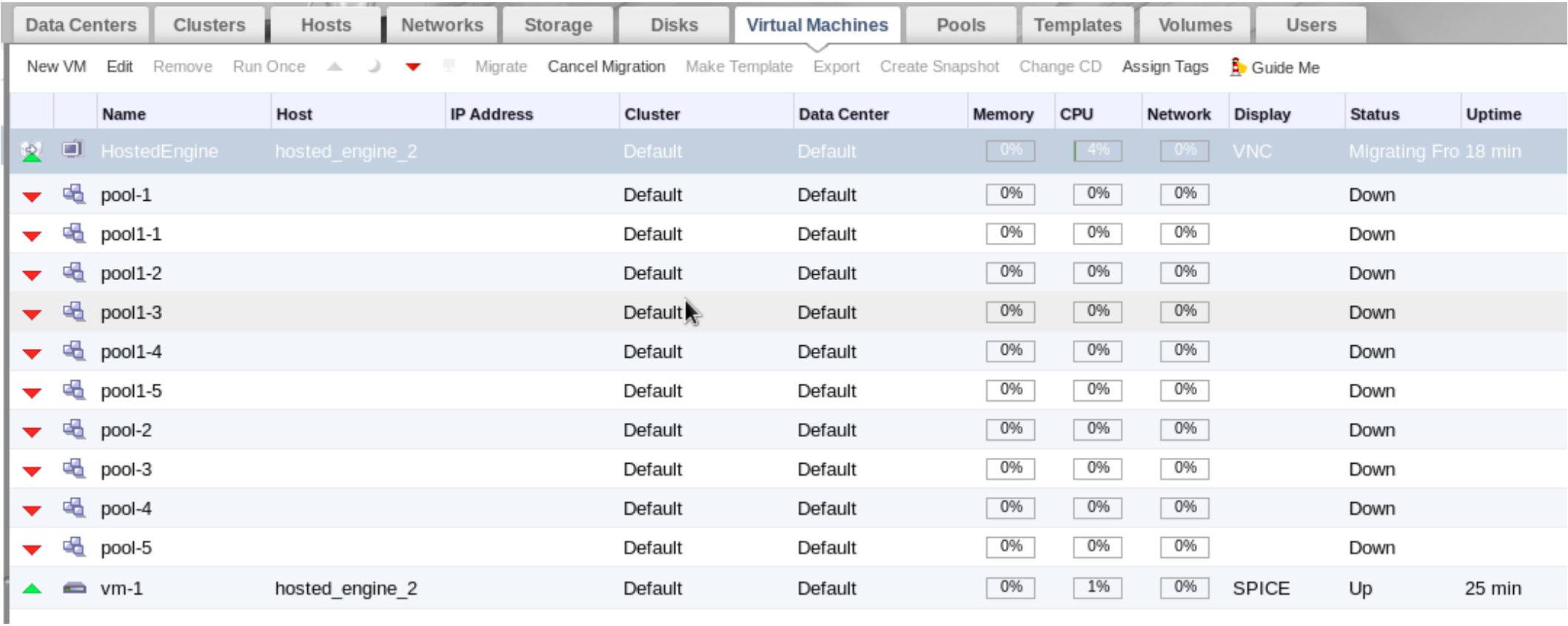

Hosted engine simulation

- Node 1's gateway down; VM migrated to node 2

```
--== Host 1 status ==--

Hostname                           : hosted_engine_2
Host ID                            : 1
Engine status                      : vm-down
Score                              : 1400
Host timestamp                     : 1378510422
Extra metadata                     :
    timestamp=1378510422 (Sun Oct 20 19:33:42 2013)
    host-id=1
    score=1400
    engine-health=vm-down
    gateway=False


--== Host 2 status ==--

Hostname                           : hosted_engine_3
Host ID                            : 2
Engine status                      : vm-up good-health-status
Score                              : 2400
Host timestamp                     : 1378510425
Extra metadata                     :
    timestamp=1378510425 (Sun Oct 20 19:33:45 2013)
    host-id=2
    score=2400
    engine-health=vm-up good-health-status
    gateway=True
```

Summary

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Back to the fundamental question...

Why did the chicken cross the road?

Summary

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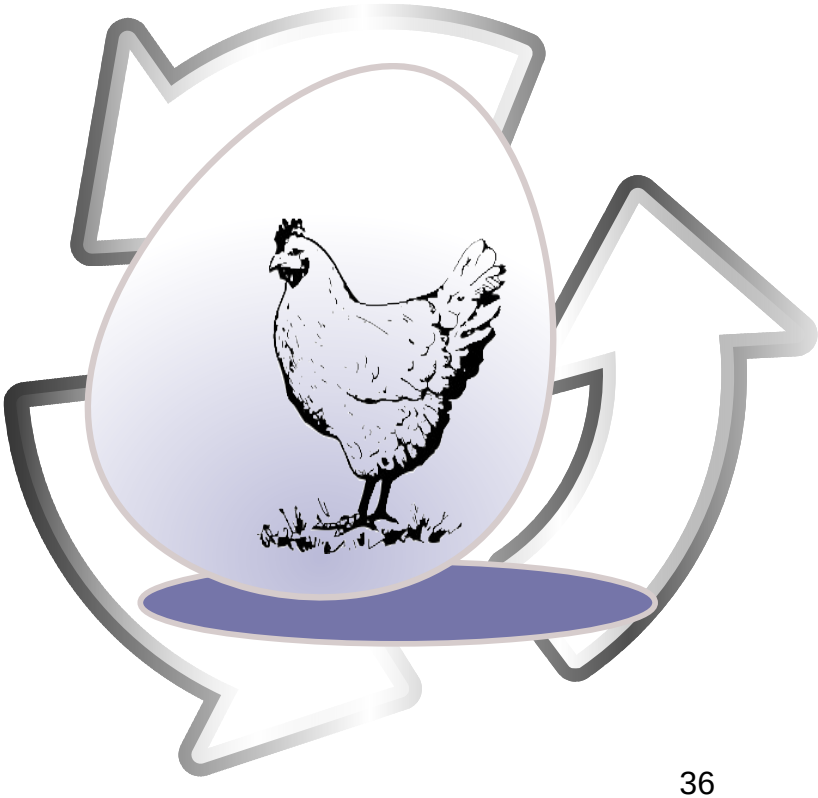
It did not,

It was migrated by the HA services.



Questions?

Note: no chickens or eggs were hurt during the making this presentation

THANK YOU!

http://www.ovirt.org
http://www.ovirt.org/Category:SLA

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