

APACHECON  
NORTH AMERICA

# Operating CloudStack: sharing my

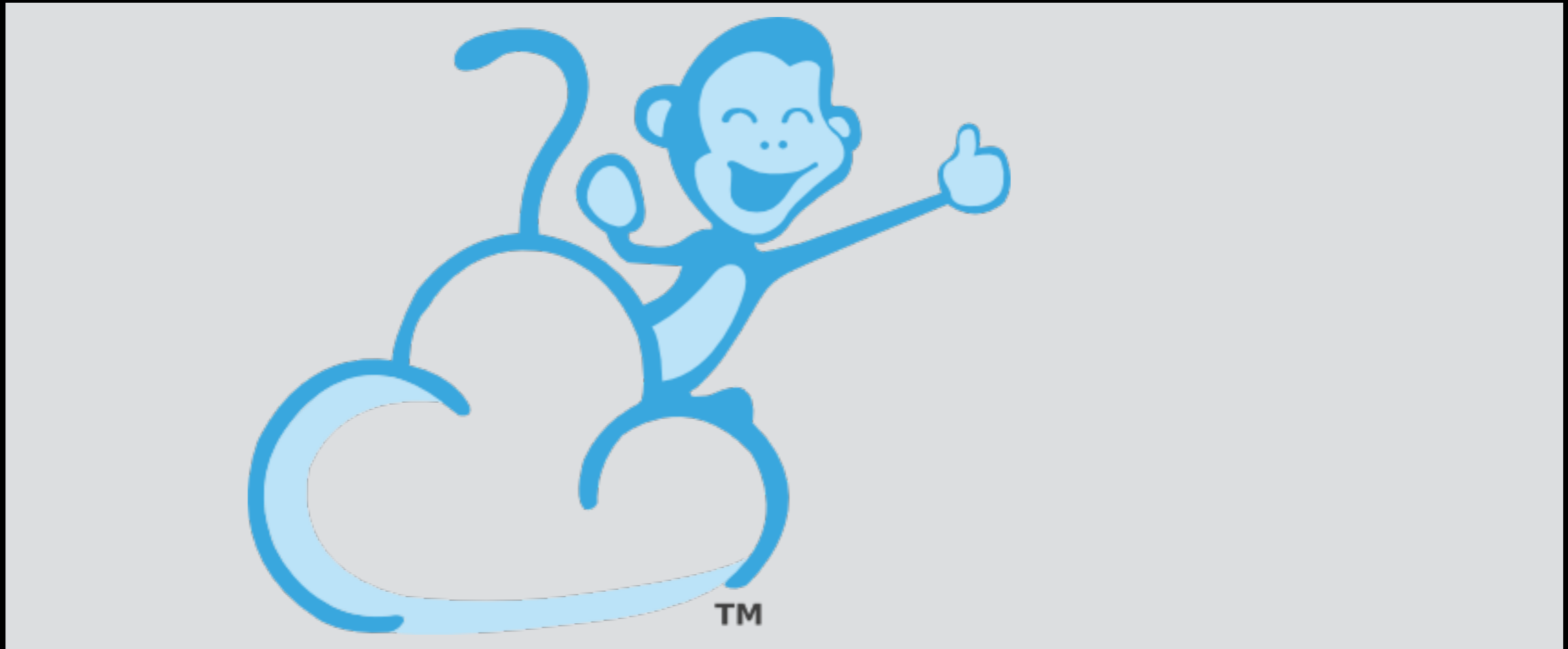
ApacheCon North America  
April 13th, 2015  
Austin, TX

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# What is Apache CloudStack?



Infrastructure-as-a-Service (IaaS).



I am  
**Remi** Bergsma

Engineer with a **passion** for **automation**.

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100%

Functional uptime. Since 2001. By default.

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# THE SUMMIT



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# THE SUMMIT

Build an **environment** that:  
can be steered with an **API**  
can **grow organically**  
is **more secure**  
and can be **integrated** with  
our existing platforms.

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# THE SUMMIT

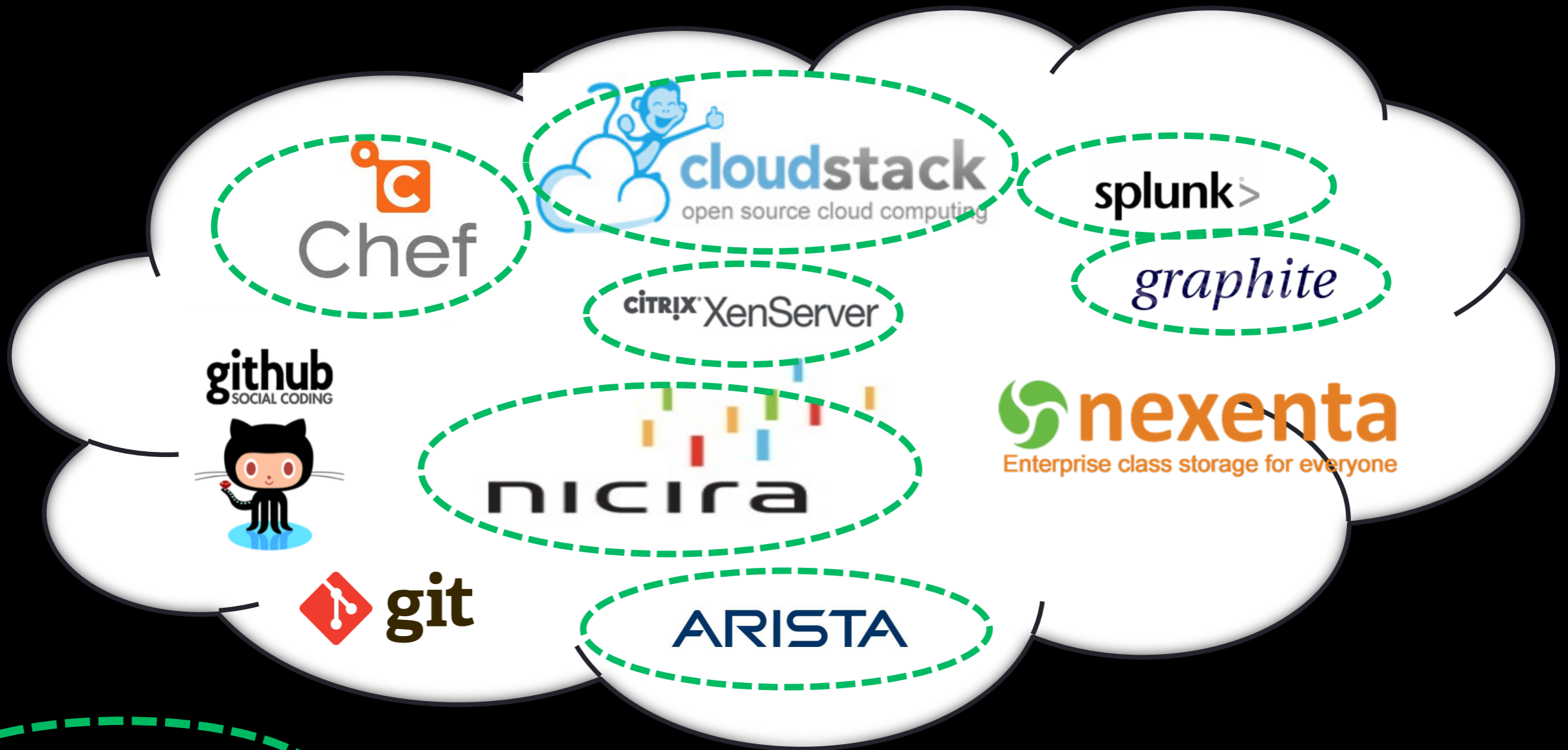
Build an **environment** that:  
can be steered with an **API**  
can **grow organically**  
is **more secure**  
and can be **integrated** with  
our existing platforms.

“Oh and do **not** use **anything**  
that we **ever used before**”

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# Our new darlings:



co-creation

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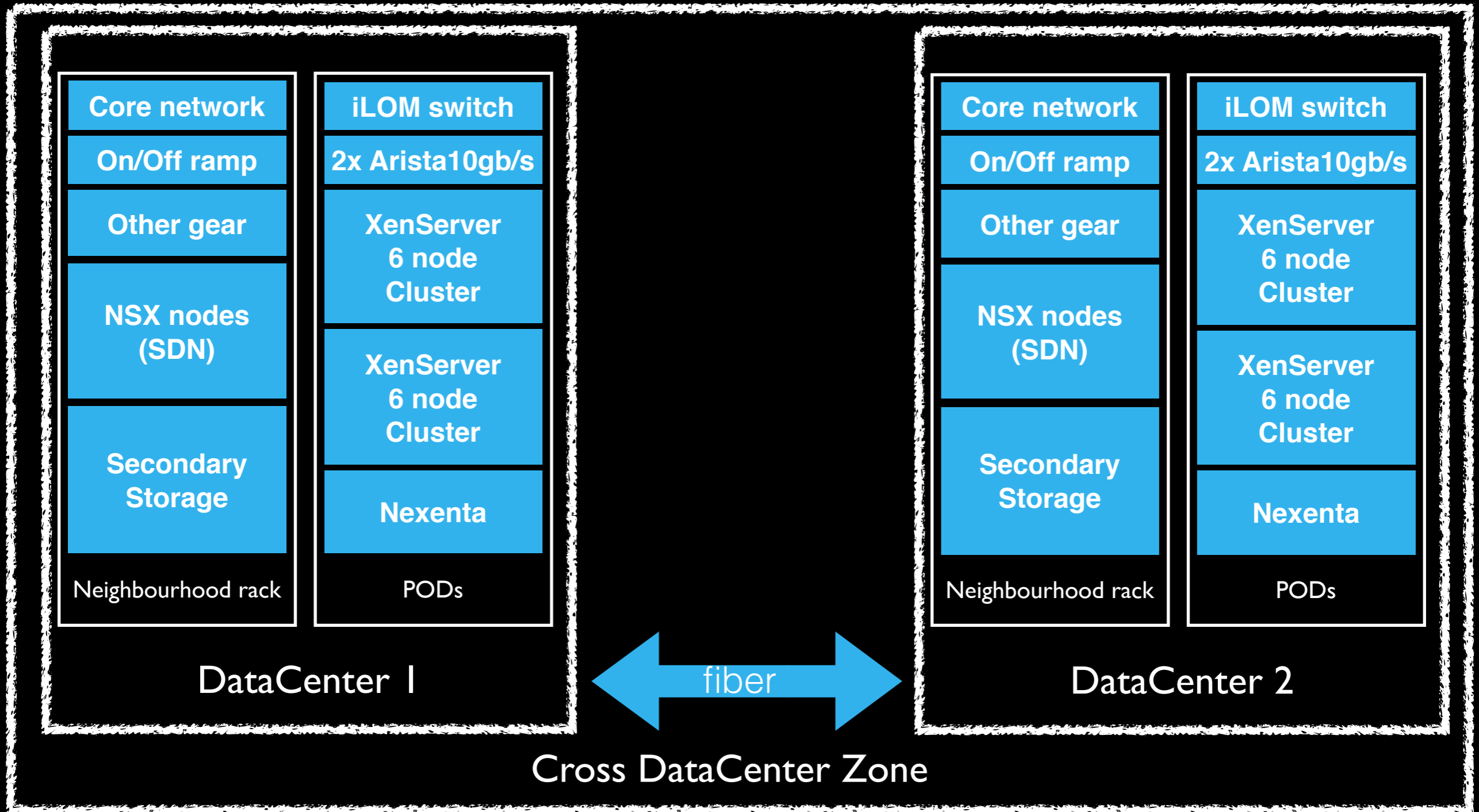
# 100%

Functional uptime. Still our solid base.

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# High level design







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# TROUBLE IN *Paradise*



When The Action Gets This Hot...  
It's Hard To Play It Cool.

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NexentaStor HA cluster shared storage

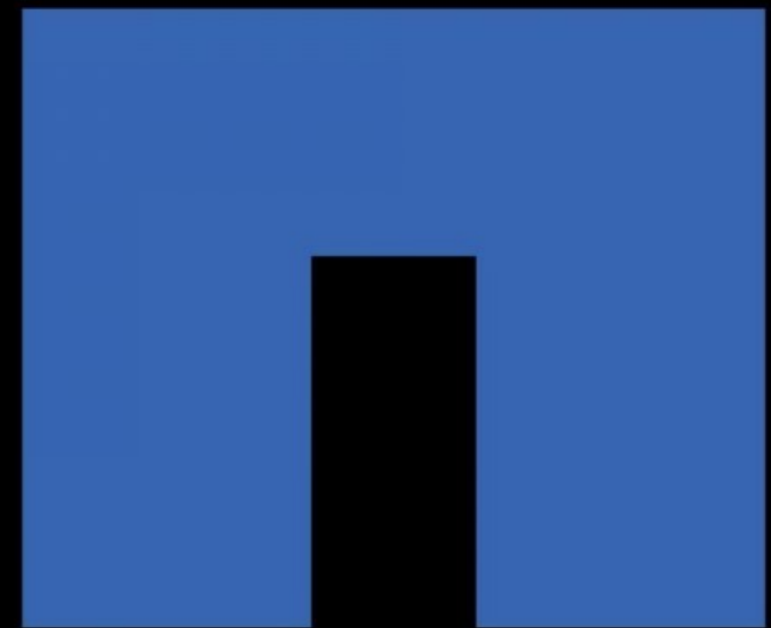


Delivered < 100%.

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# Change of plans!

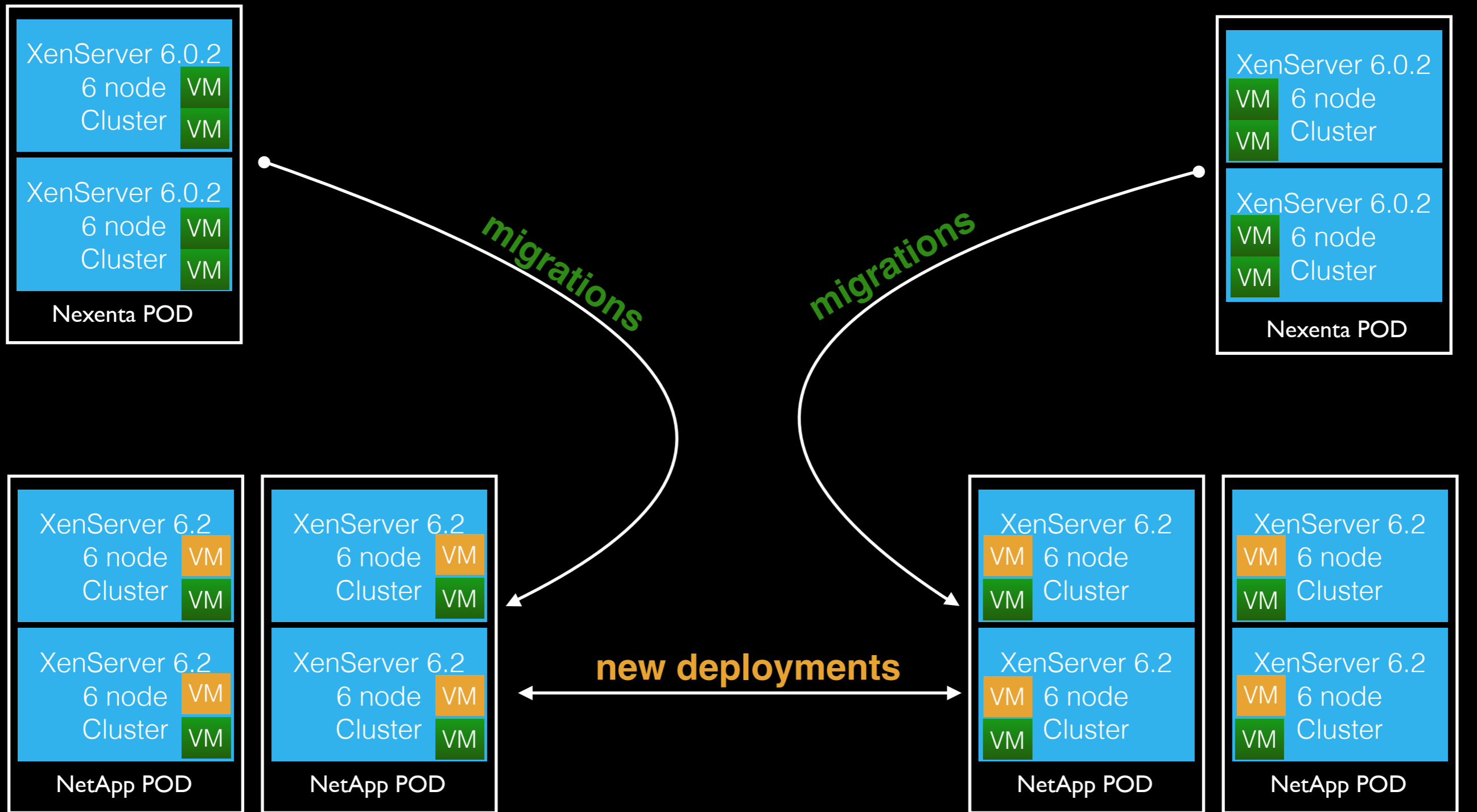


**NetApp**<sup>®</sup>

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# Reconfigure while flying:



DataCenter 1

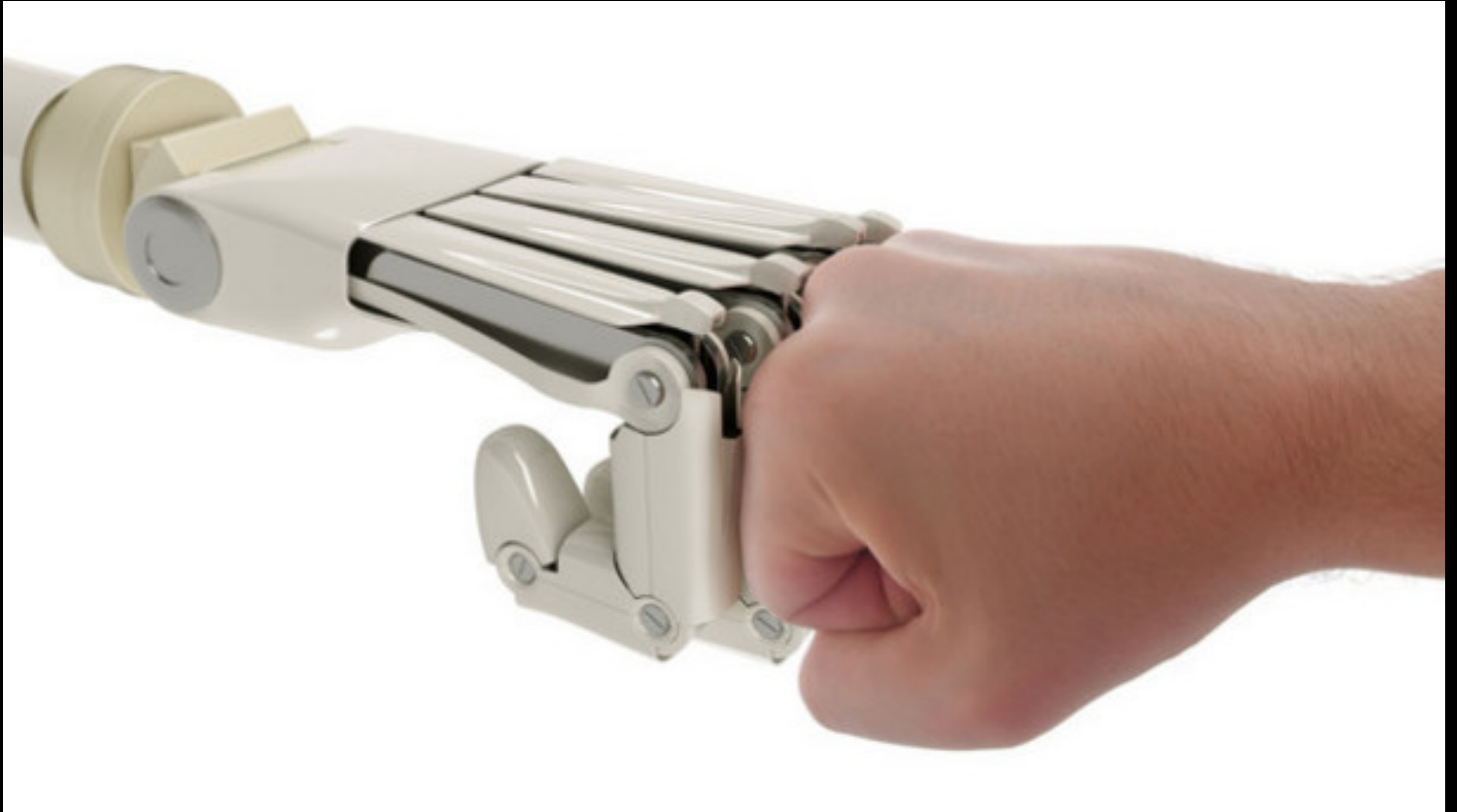
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DataCenter 2



# Automation!



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# First things first: Overview!



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# Overview of running VMs:

```
$ ./listVirtualMachines.py
```

```
--config-profile -c <name>  
--domainname -d <name>  
--oncluster -o <name>  
--pod <podname>  
--zone -z <zonename>  
--filter -f <keyword>  
--only-routers  
--only-routers-to-be-upgraded  
--no-routers  
--router-nic-count -n <number>  
--nic-count-is-minimum  
--nic-count-is-maximum  
--projectname -p  
--is-projectvm  
--ignore-domains <list>  
--non-admin-credentials  
--summary  
--no-summary  
--debug  
--exec
```

What is running on this cluster, POD, zone, etc..

# Result for single domain:

optionally able to re-use existing CloudMonkey config profile

```
$ ./listVirtualMachines.py --config-profile mccx_admin --domain rbergsma
```

Welcome to CloudStackOps

VM	Storage	Router nic count	Memory	Cores	Instance	Host	Domain
tiny	60 GB	-	1 GB	1	i-625-30809-VM	mccxvm13	rbergsma
remi	60 GB	-	1 GB	1	i-625-30808-VM	mccxvm16	rbergsma
rb (vpc)	-	3 nics	128 MB	1	r-25490-VM	mccxvm14	rbergsma

Summary 'MCCX-XEN-21':

Total number of VMs:3

Total allocated RAM: 2.125 GB

Total allocated cores: 3

# Filtering on keyword:

```
$ ./listVirtualMachines.py --config-profile mccx_admin --domain rbergsma \  
  --filter tiny --no-routers
```

Welcome to CloudStackOps

VM	Storage	Router nic count	Memory	Cores	Instance	Host	Domain
tiny	60 GB	-	1 GB	1	i-625-30809-VM	mccxvm13	rbergsma

```
Summary 'MCCX-XEN-21':  
Total number of VMs: 1  
Total allocated RAM: 1 GB  
Total allocated cores: 1
```

# Getting routers only:

```
$ ./listVirtualMachines.py --config-profile mccx_admin --domain rbergsma \
  --only-routers
```

Welcome to CloudStackOps

VM	Storage	Router nic count	Memory	Cores	Instance	Host	Domain
rb (vpc)	-	2 nics	128 MB	1	r-25490-VM	mccxvm14	rbergsma

Summary 'MCCX-XEN-21':

Total number of VMs: 1

Total allocated RAM: 0.125 GB

Total allocated cores: 1

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# Getting a single field:

```
$ ./listVirtualMachines.py --config-profile mccx_admin \  
--oncluster MCCX-XEN-21 --no-summary | grep '\-VM' | cut -d\| -f7
```

```
i-555-192384-VM  
i-434-6228-VM  
i-225-17237-VM  
i-225-3722-VM  
i-722-24820-VM  
i-117-4543-VM  
i-527-20315-VM  
i-323-18225-VM  
i-514-11243-VM  
i-625-18698-VM  
i-267-5777-VM  
i-388-2071-VM  
i-688-1656-VM  
i-27-20784-VM  
i-441-31300-VM
```

Just Bash, nothing new here ;-)



Everything  
you need  
to make  
selections.

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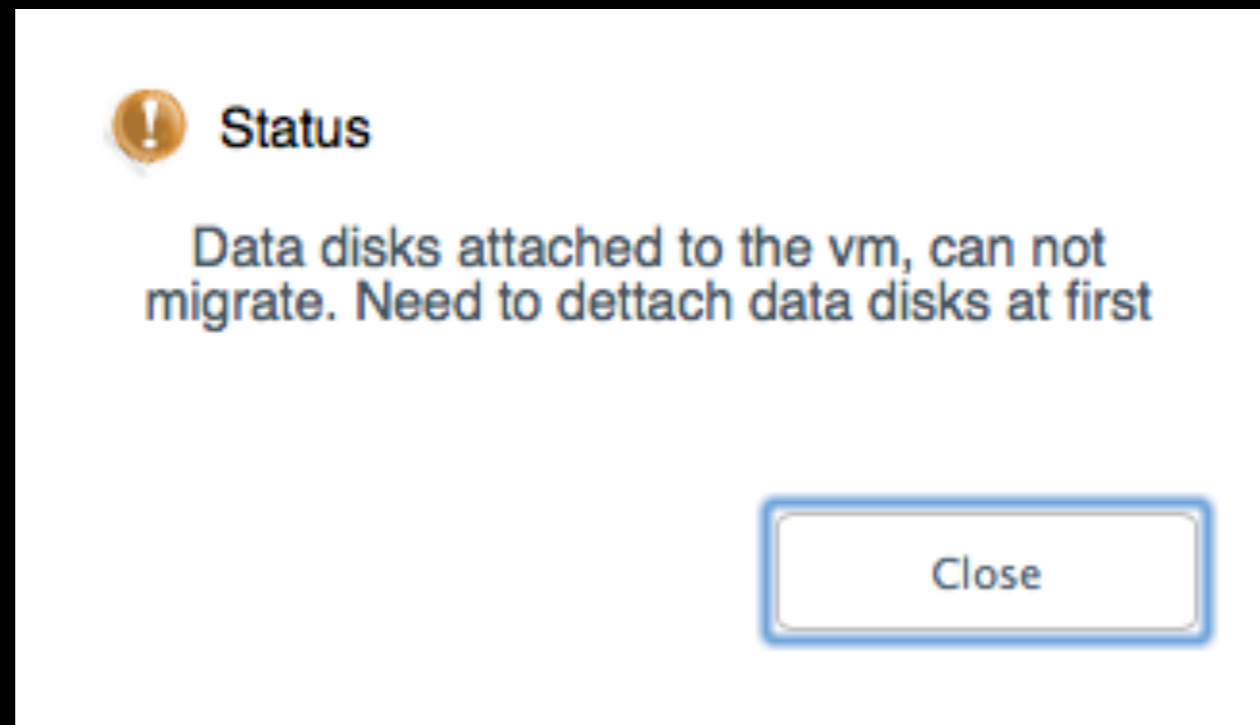
We now know **what**  
to migrate, but **how to?**

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# API cannot do it?



```
(mccx) 🐵 > migrate virtualmachine virtualmachineid=xxx storageid=xxx  
Async job 1d686882-2cba-4461-938f-4cdc51e838fd failed
```

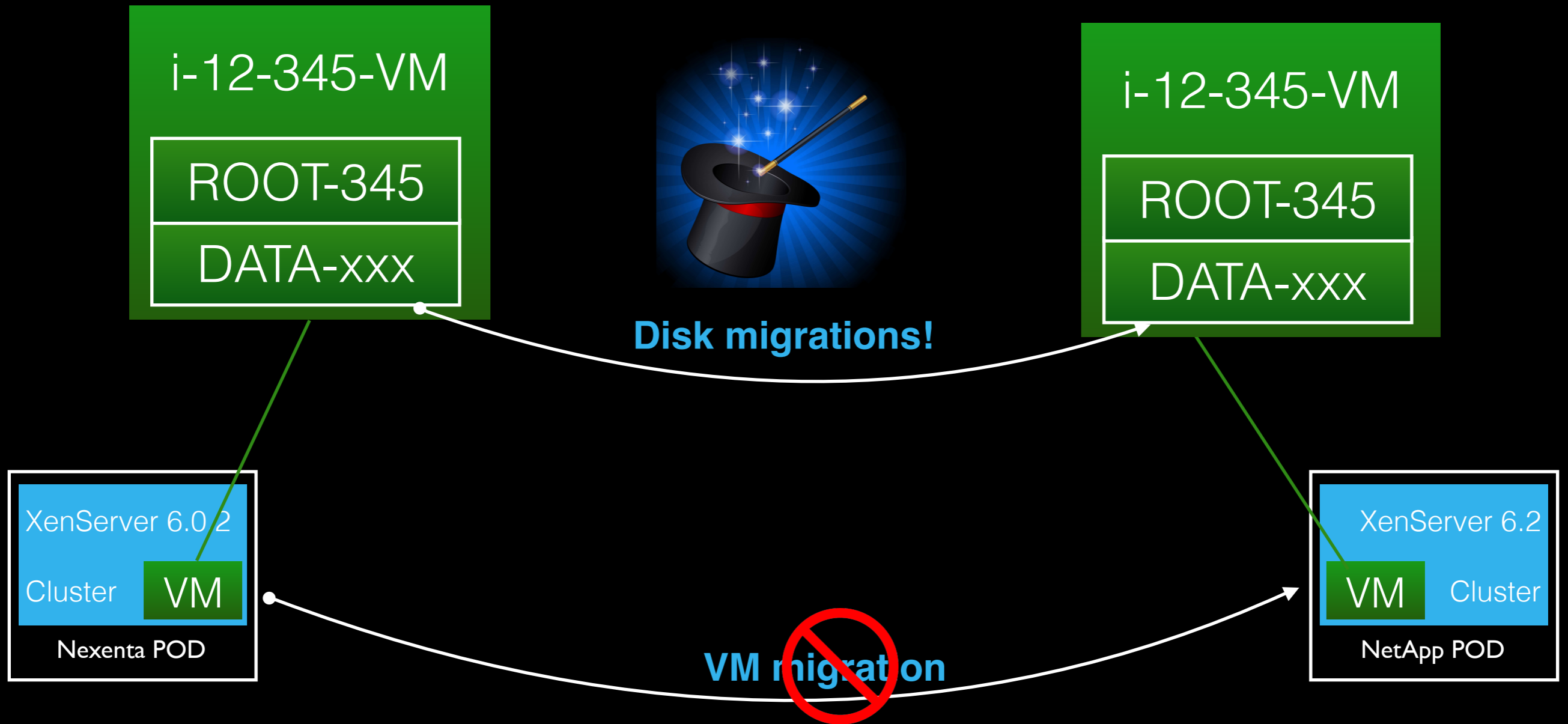
**Error 530, Data disks attached to the vm,**  
can not migrate. Need to dettach data disks at first  
cmd = org.apache.cloudstack.api.command.admin.vm.MigrateVMCmd



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# It can be done!



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# Migrating a VM to a new cluster:

```
$ ./migrateVirtualMachine.py
```

```
--config-profile -c <profilename>  
--vmname -n <name>  
--instance-name -i <instancename>  
--tocluster -t <clustername>  
--is-projectvm  
--debug  
--exec
```



# Migrating a VM to a new cluster:

add --exec flag when DRYRUN was OK.

```
$ ./migrateVirtualMachine.py --config-profile mccx_admin \  
--vmname tiny --tocluster MGCX-XEN-21
```

## Welcome to CloudStackOps

Warning: **dry-run mode** is enabled, not running any commands!

Note: Found vm **tiny** running on **mccxvm13**

Warning: router service offering has empty storage tags.

Note: Not sending notification e-mails due to DRYRUN setting. **Would have e-mailed RBergsma@schubergphilis.com**

**Would have stopped vm tiny** with id **6ad71aa2-d2c4-4a7a-a503-2baba8b36fe0**

Note: No snapshots found for this volume.

Note: No snapshot schedules found for this volume.

Note: **Would have migrated volume** **d6da7c31-e36e-4c58-b9af-8a08db1fde86** to storage **da22bd47-702c-3575-be99-9380b814001e**

Note: **Would have started vm tiny** with id **6ad71aa2-d2c4-4a7a-a503-2baba8b36fe0** on host **b95af21a-7f26-4826-9cac-4cc8eaa61538**

Note: We're done!

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# Migrating a VM to a new cluster:

```
$ ./migrateVirtualMachine.py --config-profile mccx_admin \  
--vmname tiny -t MCCX-XEN-21 --exec
```

## Welcome to CloudStackOps

Note: Found vm tiny running on mccxvm13

Executing: stop virtualmachine tiny

Note: tiny is stopped successfully

Note: No snapshots found for this volume.

Note: No snapshot schedules found for this volume.

Executing: migrate volume d6da7c31-e36e-4c58-b9af-8a08db1fde86 to storage da22bd47-702c-3575-be99-9380b814001e

Note: ROOT-30809 is migrated successfully

Note: No snapshot policies to restore.

Executing: start virtualmachine tiny with id 6ad71aa2-d2c4-4a7a-a503-2baba8b36fe0 on host c45c2e0b-0de2-4931-9c2c-4af0d7a0a8cc

Note: tiny is started successfully

Note: We're done!

snapshot schedules are recreated after migration

Dear Remi Bergsma,

We are about to migrate the VM 'tiny' that belongs to your domain 'rbergsma' to cluster 'MCCX-XEN-21'.

The instance id of this VM is 'i-625-30809-VM' and before maintenance the state was 'Running'.

You will receive another e-mail when migration is complete. If the VM was in 'Running' state, we will start it on the new cluster. Please contact us in case of any problems.

Kind Regards,

The Iaas Team

Dear Remi Bergsma,

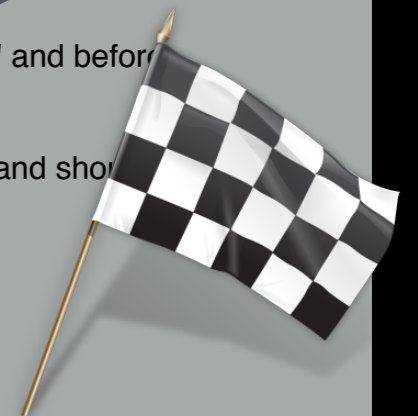
We completed migrating the VM 'tiny' that belongs to your domain 'rbergsma' to cluster 'MCCX-XEN-21'.

The instance id of this VM is 'i-625-30809-VM' and before maintenance the state was 'Running'.

Your VM has been started on the new cluster and should be available again soon.

Please contact us in case of any problems.  
Kind Regards,

The Iaas Team



# Automating migrations.

First make a selection..

```
$ ./listVirtualMachines.py --config-profile mccx_admin \  
--oncluster MGCX-XEN-16 --no-summary | grep '\-VM' | cut -d\| -f7 |\   
awk {'print " ./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i " $1'}
```

Send results to other script for processing..

```
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-555-192384-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-434-6228-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-225-17237-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-225-3722-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-722-24820-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-117-4543-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-527-20315-VM  
./migrateVirtualMachine.py -c mccx_admin -t MGCX-XEN-21 -i i-323-18225-VM
```

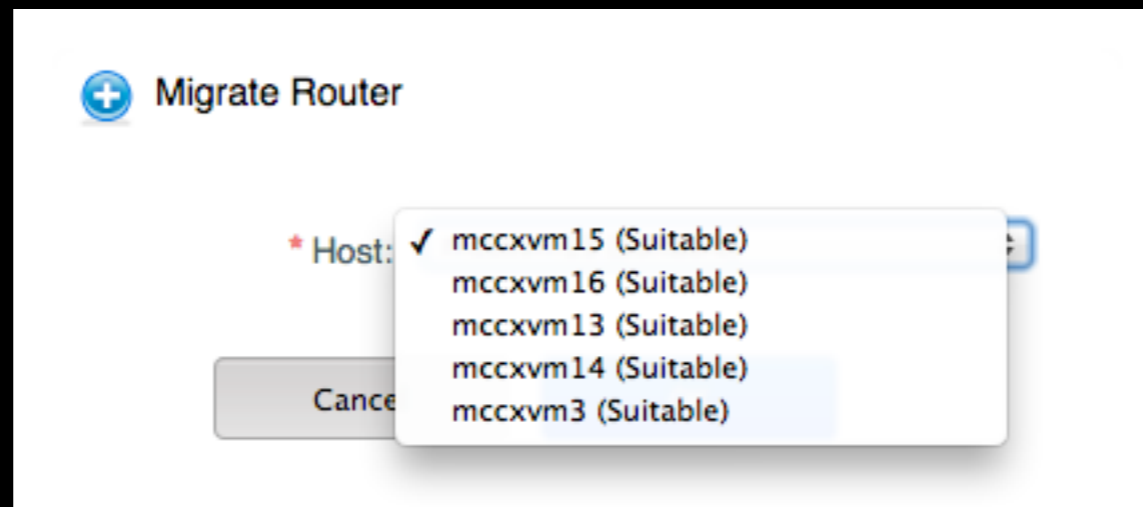
Both long and short argument names are supported





Tried  
migrating a  
**routerVM**  
to another  
**cluster?**

# Only between hosts from the same cluster!



```
(mccx) 🐵 > migrate systemvm virtualmachineid=xx hostid=xxx
```

```
Async job 8bd5b108-5fc2-426e-88f1-92fb53a72a63 failed
```

**Error 530, Cannot migrate the VM,**

destination host is not in the same cluster as current host of the VM

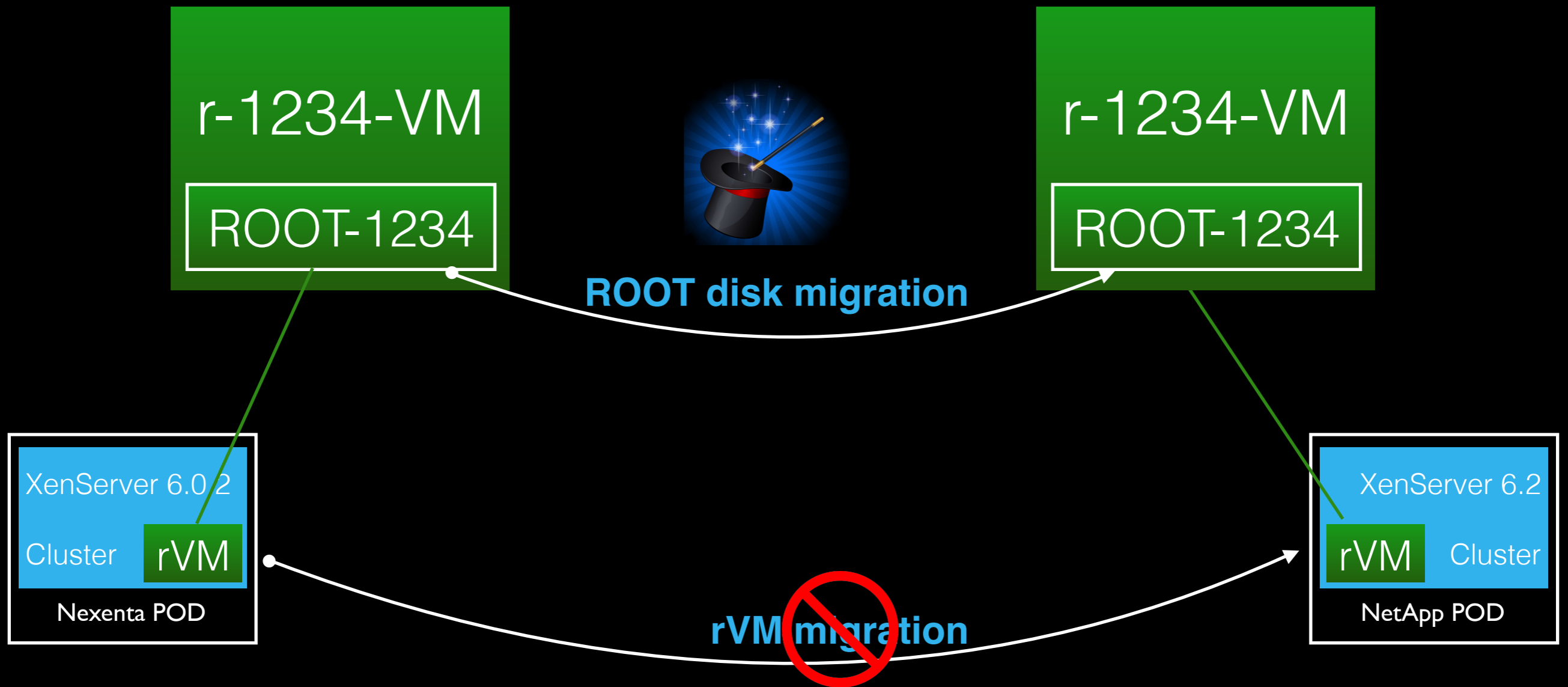
```
cmd = org.apache.cloudstack.api.command.admin.systemvm.MigrateSystemVMCmd
```



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# It can be done!





# Migrating a router:

```
$ ./migrateRouterVM.py
```

```
--config-profile -c <profilename>  
--routerinstance-name -r <instancename>  
--tocluster -t <clustername>  
--mysqlserver -s <mysql hostname>  
--mysqlpassword <passwd>  
--is-projectrouter  
--debug  
--exec
```



VMs and router VMs  
migrated away.  
One thing left to do..

# Emptying the storage pool:

```
$ ./migrateOfflineVolumes.py --config-profile mccx_admin \  
--oncluster MCCX-XEN-16 --to-cluster MCCX-XEN-21
```

Migrate offline volumes from one cluster to another.

## Welcome to CloudStackOps

Note: dry-run mode is enabled, not running any commands!

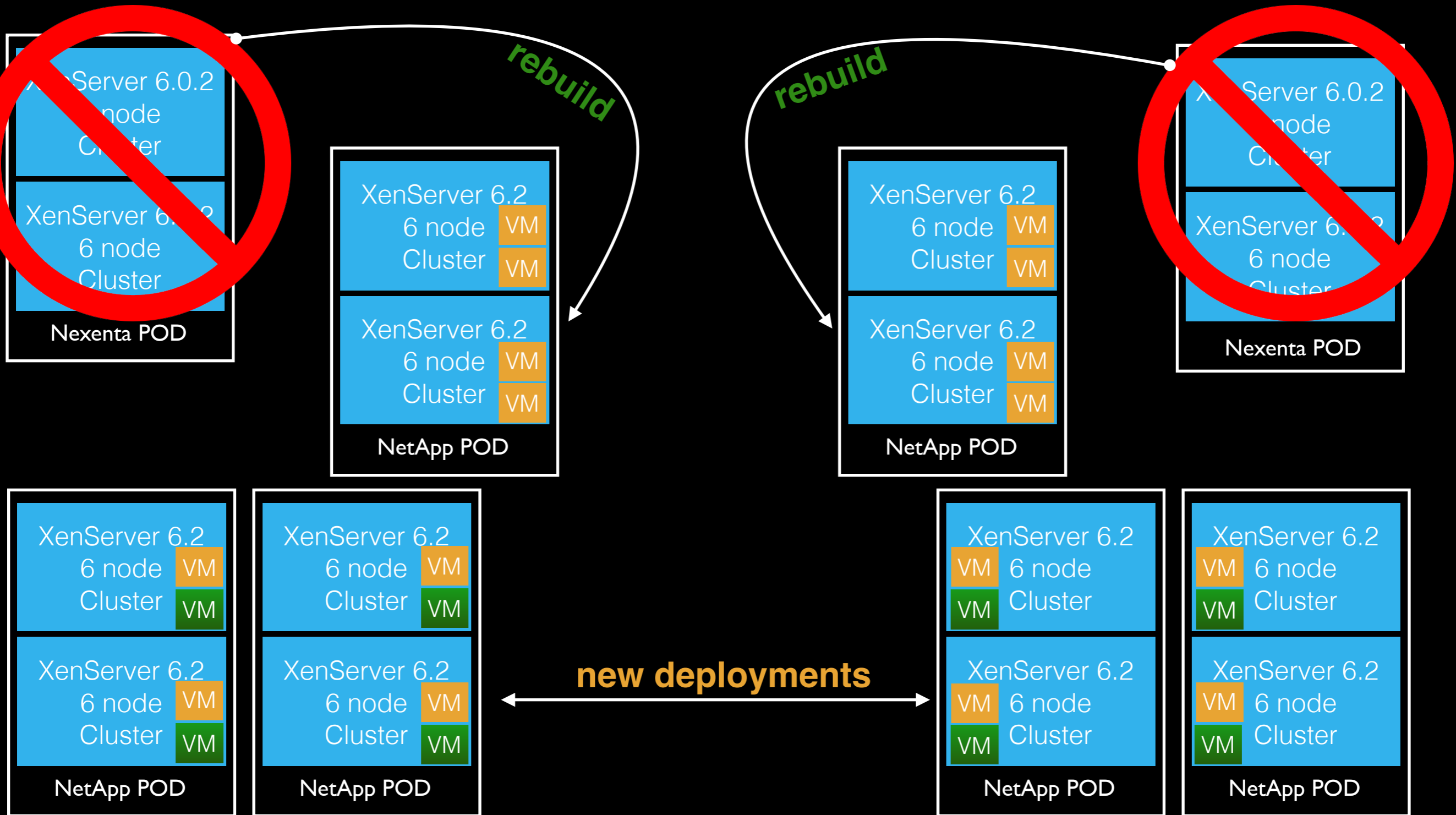
Note: Ignore file 'ignore\_volumes.txt' not found, so no volumes will be ignored.

Note: Overview of volumes to migrate to storage pool BETA-MCCX-XEN-16:

Volume name	Attached to VM	Type	Volume state	Size	Account	Domain
DATA-23232	None	DATADISK	Ready	100	rbergsma	rbergsma
ROOT-19447	None	ROOT	Ready	250	rbergsma	rbergsma
ROOT-19350	None	ROOT	Ready	500	rbergsma	rbergsma
ROOT-20150	remitest	ROOT	Ready	500	rbergsma	rbergsma

Total size of volumes to migrate: 1350 GB

# Migration done!



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DataCenter 2



# There's more to automate..



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# Upgrading CloudStack



upgrading  
system VMs



user impact.



# Upgrading a router:

```
$ ./upgradeRouterVM.py
```

```
--config-profile -c <profilename>  
--routerinstance-name -r <instancename>  
--is-projectrouter  
--debug  
--exec
```



# Flexible automated upgrading:

Either Cluster, POD, Zone or custom selection.

```
$ ./listVirtualMachines.py -c mccx_admin --only-routers-to-be-upgraded \
--pod MGCX-POD-12 | grep r- | cut -d\| -f7 | \
awk {'print "./upgradeRouterVM.py -c mccx_admin -r " $1 " --exec \
>> " $1 ".log 2>&1 "'} | sh
```

```
./upgradeVirtualRouter.py -c mccx_admin -r r-192384-VM >> r-30656-VM.log 2>&1
./upgradeVirtualRouter.py -c mccx_admin -r r-6228-VM >> r-6228-VM.log 2>&1
./upgradeVirtualRouter.py -c mccx_admin -r r-17237-VM >> r-17237-VM.log 2>&1
./upgradeVirtualRouter.py -c mccx_admin -r r-3722-VM >> r-3722-VM.log 2>&1
```

Output of each upgrade is captured in its own log file.

Dear Remi Bergsma,

We will now upgrade the virtual router VM that belongs to your domain 'rbergsma' (r-1234-VM).

During this reboot your VMs will have no network connectivity. Expected downtime is 1~3 minutes.

Please contact us in case of any problems.

Kind Regards,

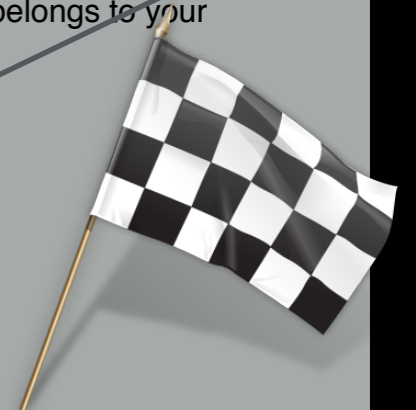
The Iaas Team

Dear Remi Bergsma,

We have upgraded the virtual router VM that belongs to your domain 'rbergsma' (r-1234-VM).

Please contact us in case of any problems.  
Kind Regards,

The Iaas Team





# Parallel upgrades:

```
$ ./listVirtualMachines.py -c mccp_admin --only-routers-to-be-upgraded \
  \ --router-nic-count=2 --ignore-domains REMI,TEST | grep r- | cut -d\| \
  -f7 | awk {'print "./upgradeRouterVM.py -c mccx_admin -r " $1 " \
  >> " $1 ".log 2>&1 & "'} | sh
```

automatic execution, use carefully (especially with --exec)!

```
./upgradeVirtualRouter.py -c mccx_admin -r r-192384-VM >> r-30656-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-6228-VM >> r-6228-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-17237-VM >> r-17237-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-3722-VM >> r-3722-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-24820-VM >> r-24820-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-4543-VM >> r-4543-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-20315-VM >> r-20315-VM.log 2>&1 &
./upgradeVirtualRouter.py -c mccx_admin -r r-18225-VM >> r-18225-VM.log 2>&1 &
```

Migrations are sent to background and run in parallel.

# Sequential vs Parallel



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# XenServer maintenance automation.

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# XenServer maintenance:

```
$ ./hypervisorMaintenance.py --config-profile mccx_admin --name mccxvm13
```

Welcome to CloudStack0ps

Warning: **dry-run mode** is enabled, not running any commands!

Note: Host 'mccxvm13' belongs to cluster 'MCCX-XEN-21'

Note: Looking for other hosts in this cluster and checking their health..

Hostname	Poolmaster	Resource state	State	# VMs	Bond Status	Heartbeat Status
mccxvm13		Enabled	Up	10	OK	OK
mccxvm14	<-----	Enabled	Up	20	OK	OK
mccxvm15		Enabled	Up	108	OK	OK
mccxvm16		Enabled	Up	98	OK	OK
mccxvm17		Enabled	Up	107	OK	OK
mccxvm18		Enabled	Up	75	OK	OK

Note: Would have enabled maintenance for host 'mccxvm13'.

Note: Would have **faked XenTools** for VMs on host 'mccxvm13'.

Note: **All resource states are 'Enabled'**, we can safely put one to maintenance

Note: Testing if we would be able to migrate the vm's on hypervisor 'mccxvm13':

oat-adm, oat-vm06, oat-vm07, oat-vm04, oat-vm08, oat-vm05, oat-vm03, oat-vm01, oat-vm02,  
r-30657-VM,

Note: Would have prepared host 'mccxvm13' for maintenance

Note: We're done!



# XenServer maintenance:

Before:

Hostname	Poolmaster	Resource state	State	# VMs	Bond Status	Heartbeat Status
mccxvm13		Enabled	Up	10	OK	OK
mccxvm14	<-----	Enabled	Up	20	OK	OK
mccxvm15		Enabled	Up	108	OK	OK
mccxvm16		Enabled	Up	98	OK	OK
mccxvm17		Enabled	Up	107	OK	OK
mccxvm18		Enabled	Up	75	OK	OK

After:

Hostname	Poolmaster	Resource state	State	# VMs	Bond Status	Heartbeat Status
mccxvm13		Maintenance	Up	0	OK	OK
mccxvm14	<-----	Enabled	Up	25	OK	OK
mccxvm15		Enabled	Up	108	OK	OK
mccxvm16		Enabled	Up	98	OK	OK
mccxvm17		Enabled	Up	107	OK	OK
mccxvm18		Enabled	Up	80	OK	OK



Help!

Who uses this ip-address?

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# Who uses this ip-address?

```
$ ./whoHasThisIp.py --mysqlserver dbserver1 --ip-address 31.32.81.18
```

```
Welcome to CloudStackOps
```

VM name	Network	Mac Address	Ipv4	Netmask	Mode	State
r-30657-VM	None	06:3a:95:00:05:4e	31.32.81.18	255.255.255.128	Static	Reserved

```
Note: Found 1 results.
```

```
$ ./whoHasThisIp.py --mysqlserver dbserver1 --ip-address 10.1.1.100
```

```
Welcome to CloudStackOps
```

VM name	Network Name	Mac Address	Ipv4	Netmask	Mode	State
www1	some-default	02:00:17:4b:00:3c	10.1.1.100	255.255.255.0	Dhcp	Reserved
oat-01	oat-network	02:00:2c:9f:00:05	10.1.1.100	255.255.255.0	Dhcp	Reserved

```
Note: Found 2 results.
```



Which VMs were running  
on that hypervisor that  
just crashed?





**KEEP  
CALM  
AND  
USE THE  
TOOL KIT**

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# Hypervisor down?

Filtering on hostname is optional, but usually what you need.

```
$ ./listHAWorkers.py --mysqlserver dbserver1 --hostname mccxvm19
```

Welcome to CloudStackOps

VM	Type	VM state	Created (-2H)	Step	Mgt server
Desktop	User	Stopped	2015-03-14 18:57:29	Scheduled	None
vm123	User	Running	2015-03-14 18:57:30	Done	xapp2
vm001	User	Stopped	2015-03-14 18:57:29	Scheduled	None
host1	User	Running	2015-03-14 18:57:30	Investigating	None
testing101	User	Stopped	2015-03-14 18:57:30	Scheduled	None
mobile	User	Stopped	2015-03-14 18:57:28	Scheduled	None
mx	User	Running	2015-03-14 18:57:29	Done	xapp1
mobile222	User	Running	2015-03-14 18:57:29	Done	xapp2
r-17845-VM	DomainRouter	Starting	2015-03-14 18:57:29	Scheduled	xapp1
r-17847-VM	DomainRouter	Starting	2015-03-14 18:57:29	Scheduled	xapp1

Note: Found 10 HA workers.

Here you can monitor the recovery of your VMs.



What is **CloudStack**  
doing right **now?**

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# Running CloudStack jobs:

```
$ ./listRunningJobs.py --mysqlserver dbserver1
```

Welcome to CloudStackOps

username	account_name	job_cmd
system	rbergsma_admin	com.cloud.storage.VmWorkTakeVolumeSnapshot
system	rbergsma_admin	com.cloud.storage.VmWorkTakeVolumeSnapshot
system	rbergsma_admin	org.apache.cloudstack.api.command.user.snapshot.CreateSnapshotCmd
system	rbergsma_admin	org.apache.cloudstack.api.command.user.snapshot.CreateSnapshotCmd
system	system	com.cloud.vm.VmWorkStart
system	system	com.cloud.vm.VmWorkStop

Note: Found 6 running jobs.

Snapshots are being created...





Check. Double check..



@remibergsma

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# Reporting Admin Users:

```
$ ./reportAccounts.py --config-profile mccx_admin --display screen
```

Welcome to CloudStack0ps

Overview for rbergsma (ROOT/Employee/rbergsma):

User Account	Username	E-mail	Firstname	Lastname
rbergsma_admin	rbergsma	RBergsma@schubergphilis.com	Remi	Bergsma

E-mail address is taken from CloudStack account

```
$ ./reportAccounts.py --config-profile mccx_admin --display email
```

Dear Remi Bergsma,

This is an overview of the enabled admin users in your domain **Employee/rbergsma**:

User Account	Username	E-mail	Firstname	Lastname
rbergsma_admin	rbergsma	RBergsma@schubergphilis.com	Remi	Bergsma

The domain path in CloudStack is **Employee/rbergsma**.

Please review and adjust where applicable. In case of issues: please contact us via [email@example.org](mailto:email@example.org).

Kind Regards,

The Iaas Team

[@remibergsma](mailto:@remibergsma)

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# CloudStackOps:



Operating  
CloudStack  
made easy.

<https://github.com/schubergphilis/cloudstackOps>

[@remibergsma](https://twitter.com/remibergsma)

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# Getting started:

```
$ git clone https://github.com/schubergphilis/cloudstack0ps
```

```
$ cd cloudstack0ps
```

```
$ cp -pr config.sample config
```

```
$ vim config 
```

```
$ pip install -Iv marvin/Marvin-0.1.0.tar.gz
```

```
$ pip install -Iv clint
```

```
$ pip install -Iv prettytable
```

You can omit this section when using `--config-profile`

```
# Config file for CloudStack Operations scripts
```

```
[cloudstackOps]
```

```
organization = The Iaas Team
```

```
[mail]
```

```
smtpserver = localhost
```

```
mail_from = rbergsma@schubergphilis.com
```

```
errors_to = rbergsma@schubergphilis.com
```

```
[config]
```

```
apikey = whMTYFZ...gqIETPEile4_A
```

```
url = http://127.0.0.1:8080/client/api
```

```
expires = 600
```

```
secretkey = 9Z0S5-ry...Qj-tVhkn9tFv1Q
```

```
timeout = 3600
```

```
[dbserver1]
```

```
password = mypass
```



# Get in touch!

Follow me on Twitter  
I will post **the slides** soon.



[RBergsma@schubergphilis.com](mailto:RBergsma@schubergphilis.com)

[blog.remibergsma.com](http://blog.remibergsma.com)

[@remibergsma](https://twitter.com/remibergsma)

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Thank you!

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# Credits

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Automation [http://jewishcurrents.org/wp-content/uploads/2014/02/Firing-employees-and-hiring-robots-Minimum-wage-rise-to-spark-automation-age-says-All-Bake-Technologies\\_strict\\_xxl.jpg](http://jewishcurrents.org/wp-content/uploads/2014/02/Firing-employees-and-hiring-robots-Minimum-wage-rise-to-spark-automation-age-says-All-Bake-Technologies_strict_xxl.jpg)  
Knife [http://www.vanslobbe.nl/assets/cache/img/normal\\_a\\_a\\_ae8170826274ac75ec1c99cc01a74ded.jpg](http://www.vanslobbe.nl/assets/cache/img/normal_a_a_ae8170826274ac75ec1c99cc01a74ded.jpg)  
Flag [https://cdn4.iconfinder.com/data/icons/SUPERVISTA/business/png/400/checkered\\_flag.png](https://cdn4.iconfinder.com/data/icons/SUPERVISTA/business/png/400/checkered_flag.png)  
Parallel swimmers <http://wowpics.in/wp-content/uploads/2012/03/alicia.jpg>  
Keep calm <http://sd.keepcalm-o-matic.co.uk/i/keep-calm-and-use-the-tool-kit.png>  
Audit [http://www.philexmining.com.ph/images/articles/1396260177\\_Audit\\_Hero.jpg](http://www.philexmining.com.ph/images/articles/1396260177_Audit_Hero.jpg)  
Toolbox [http://tripleseo.com/wp-content/uploads/2013/08/wooden\\_tool\\_box.jpg](http://tripleseo.com/wp-content/uploads/2013/08/wooden_tool_box.jpg)  
Magic <http://globe-views.com/dcim/dreams/magic/magic-01.jpg>  
Summit <http://i.ytimg.com/vi/n3YSU06k4BA/maxresdefault.jpg>  
Stamp [http://www.eccho.org/uploads/Original%20Stamp%20\(transparent\).png](http://www.eccho.org/uploads/Original%20Stamp%20(transparent).png)  
Commodities [http://i.telegraph.co.uk/multimedia/archive/01870/basket\\_1870914b.jpg](http://i.telegraph.co.uk/multimedia/archive/01870/basket_1870914b.jpg)  
Bottles <http://images.wisegeek.com/bottles-on-assembly-line.jpg>  
Copycat <http://www.dailymobile.net/wp-content/uploads/2012/09/copycat.png>

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[@remibergsma](https://www.instagram.com/remibergsma)

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