

# Ganeti "what we do with it"

A cluster virtualization manager.

Guido Trotter <[ultrotter@google.com](mailto:ultrotter@google.com)>

- Google, Ganeti, Debian

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Some images borrowed/modified from Lance Albertson and Justin Pop

## Ganeti at FOSDEM 2012

Saturday, 14:00 Janson, Internals (yesterday afternoon)

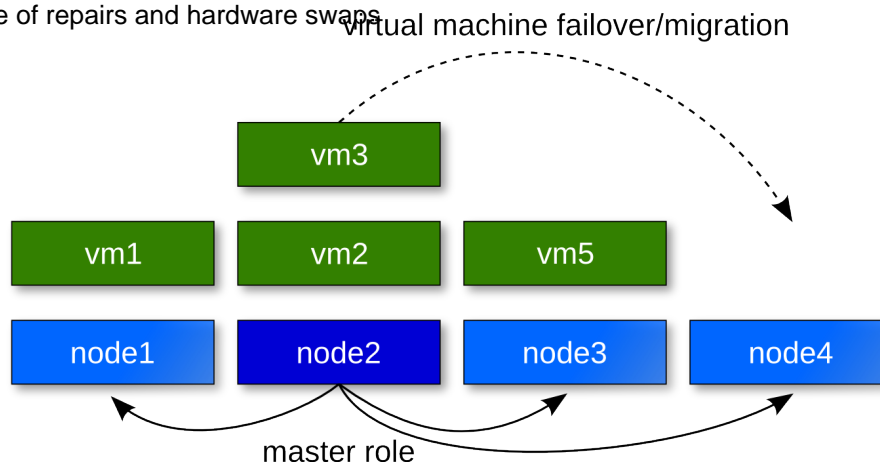
Sunday, 10:00 Chavanne, Getting Started (here and now)

## Outline

- Introduction to Ganeti
- Latest features
- Using Ganeti in practice
- How Ganeti is deployed at Google

## What can it do?

- Manage clusters of physical machines
- Deploy Xen/KVM/lxc virtual machines on them
  - Live migration
  - Resiliency to failure (data redundancy over DRBD)
  - Cluster balancing
  - Ease of repairs and hardware swaps

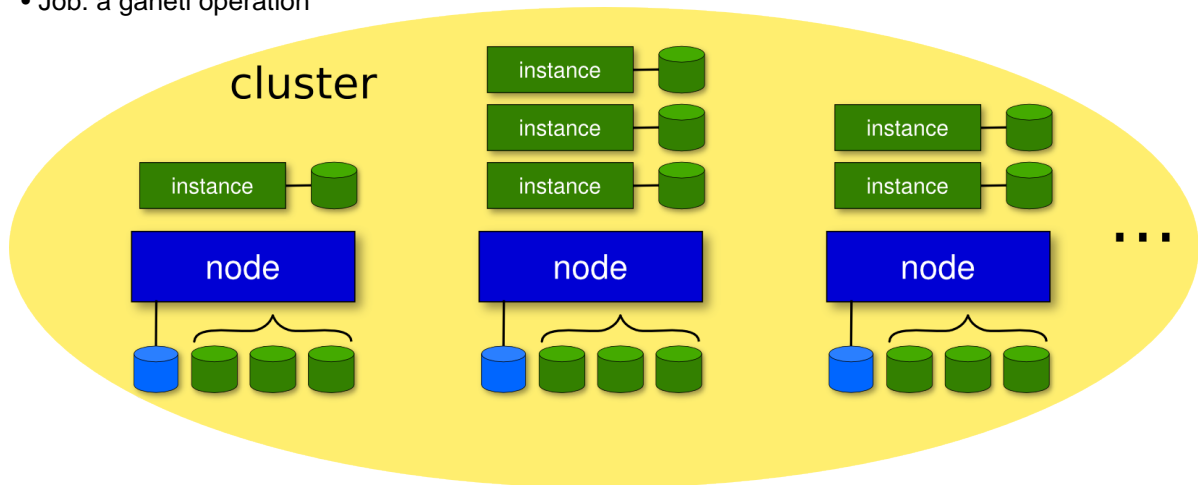


## Ideas

- Making the virtualization entry level as low as possible
  - Easy to install/manage
  - No specialized hardware needed (eg. SANs)
  - Lightweight (no "expensive" dependencies)
- Scale to enterprise ecosystems
  - Manage simultaneously from 1 to ~200 host machines
  - Access to advanced features (drbd, live migration)
- Be a good open source citizen
  - Design and code discussions are open
  - External contributions are welcome
  - Cooperate with other "big scale" Ganeti users

## Terminology

- Node: a virtualization host
- Nodegroup: an omogeneous set of nodes
- Instance: a virtualization guest
- Cluster: a set of nodes, managed as a collective
- Job: a ganeti operation



## Technologies

- Linux and standard utils (iproute2, bridge-utils, ssh)
- KVM/Xen/LXC
- DRBD, LVM, or SAN
- Python (plus a few modules)
- socat
- Haskell (optional)



## Node roles (management level)

- Master Node
  - runs ganeti-masterd, rapi, noded and confd
- Master candidates
  - have a full copy of the config, can become master
  - run ganeti-confd and noded
- Regular nodes
  - cannot become master
  - get only part of the config
- Offline nodes, are in repair

## Node roles (instance hosting level)

- VM capable nodes
  - can run virtual machines
- Drained nodes
  - are being evacuated
- Offlined nodes, are in repair

## New features in 2.4

The very stable version (since Mar 2011):

- Out of Band management
- vhost net support (KVM)
- hugepages support (KVM)
- initial nodegroups

## New features in 2.5

At rc level, due for release soon:

- shared storage (SAN) support
- improved nodegroups (scalability, evacuate, commands)
- master IP turnup customization
- full SPICE support (KVM)

- Node health/power/epo commands (OOB)

## New features in 2.6

Soon to be frozen:

- RBD support (ceph)
- initial memory ballooning (KVM, Xen)
- cpu pinning
- OVF export/import support
- support for customizing drbd parameters
- policies for better resource modeling

## What to expect

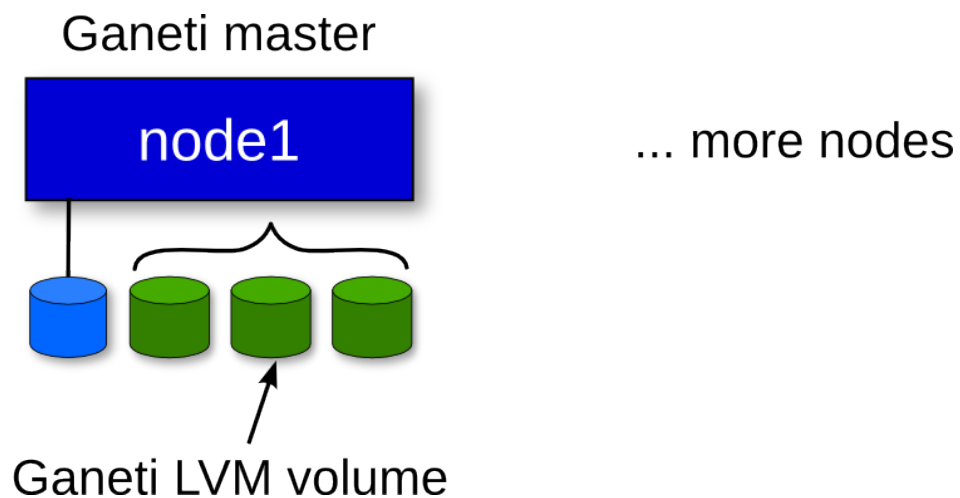
Just ideas, not promises:

- Full dynamic memory support
- Better instance networking customization
- Rolling reboot
- Better automation, self-healing, availability
- Higher scalability
- KVM block device migration
- Better OS installation
- New hypervisors (eg: native KVM)

## Initializing your cluster

The node needs to be set up following our installation guide.

```
gnt-cluster init [-s ip] ... \  
  --enabled-hypervisors=kvm cluster
```



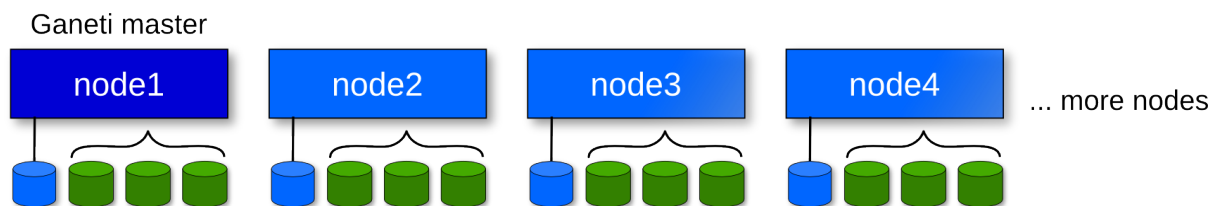
# gnt-cluster

Cluster wide operations:

```
gnt-cluster info
gnt-cluster modify [-B/H/N ...]
gnt-cluster verify
gnt-cluster master-failover
gnt-cluster command/copyfile ...
```

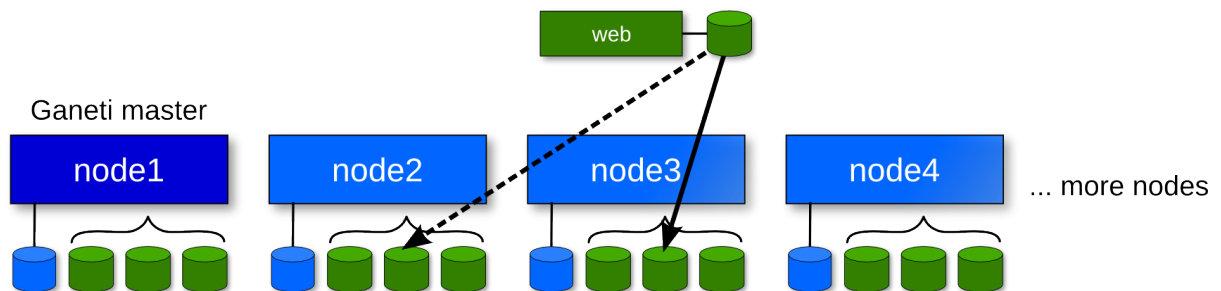
## Adding nodes

```
gnt-node add [-s ip] node2
gnt-node add [-s ip] node3
```



## Adding instances

```
# install instance-{debootstrap, image}
gnt-os list
gnt-instance add -t drbd \
  {-n node3:node2 | -I hail } \
  -o debootstrap+default web
ping i0
ssh i0 # easy with OS hooks
```



# gnt-node

Per node operations:

```
gnt-node remove node4
gnt-node modify \
  [ --master-candidate yes|no ] \
  [ --drained yes|no ] \
  [ --offline yes|no ] node2
gnt-node evacuate/failover/migrate
```

```
gnt-node powercycle
```

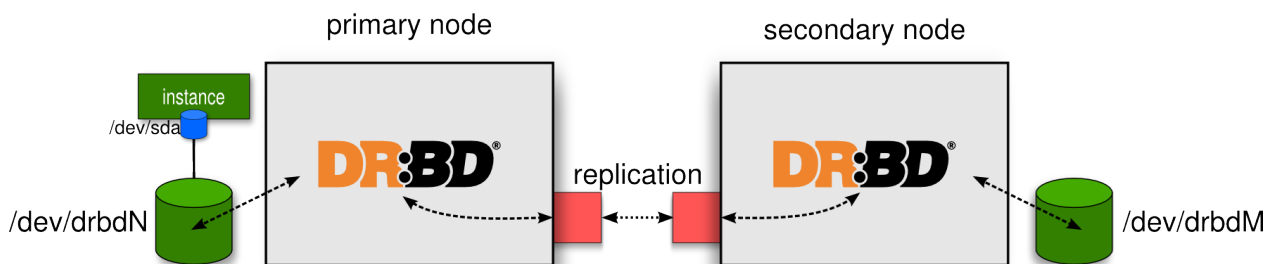
## gnt-instance

Instance operations:

```
gnt-instance start/stop i0
gnt-instance modify ... i0
gnt-instance info i0
gnt-instance migrate i0
gnt-instance console i0
```

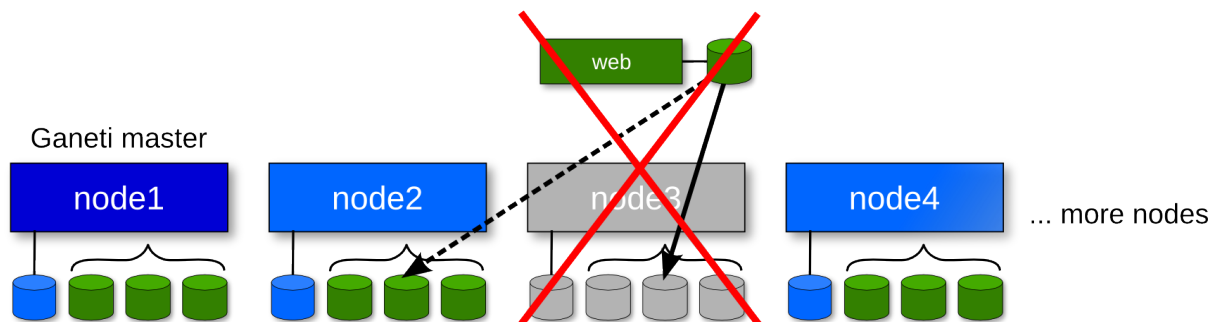
## -t drbd

DRBD provides redundancy to instance data, and makes it possible to perform live migration without having shared storage between the nodes.



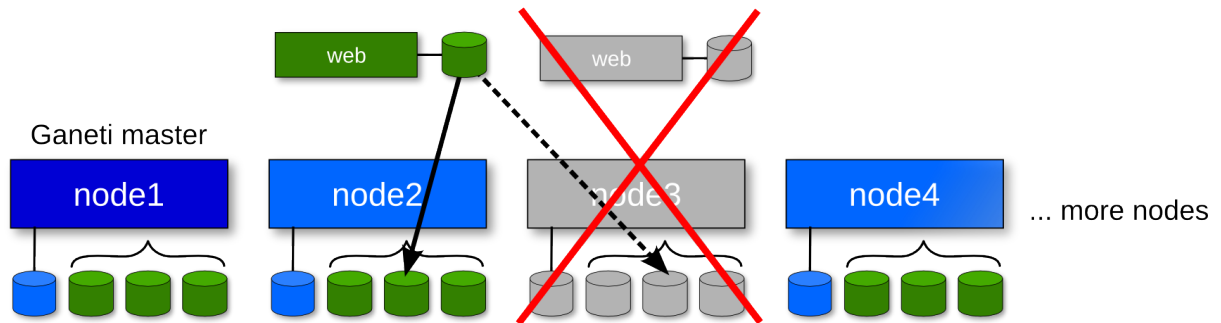
## Recovering from failure

```
# set the node offline
gnt-node modify -O yes node3
```



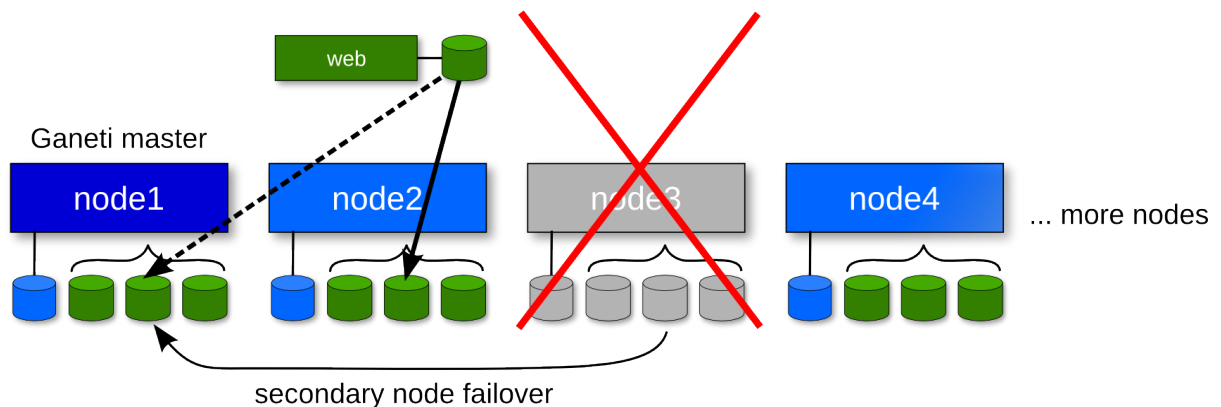
## Recovering from failure

```
# failover instances to their secondaries
gnt-node failover --ignore-consistency node3
# or, for each instance:
gnt-instance failover \
  --ignore-consistency web
```



## Recovering from failure

```
# restore redundancy
gnt-node evacuate -I hail node3
# or, for each instance:
gnt-instance replace-disks \
  {-n node1 | -I hail } web
```



## gnt-backup

Manage instance exports/backups:

```
gnt-backup export -n node1 web
gnt-backup import -t plain \
  {-n node3 | -I hail } --src-node node1 \
  --src-dir /tmp/myexport web
gnt-backup list
gnt-backup remove
```

# htools: cluster resource management

Written in Haskell.

- Where do I put a new instance?
- Where do I move an existing one?
  - hail: the H allocator
- How much space do I have?
  - hspace: the H space calculator
- How do I fix an N+1 error?
  - hbal: the cluster balancer

## Controlling Ganeti

- Command line (\*)
- [Ganeti Web manager](#)
  - Developed by osuosl.org and grnet.gr
- RAPI (Rest-full http interface) (\*)
- On-cluster "luxi" interface (\*)
  - luxi is currently json over unix socket
  - there is code for python and haskell

(\*) Programmable interfaces

## Job Queue

- Ganeti operations generate jobs in the master (with the exception of queries)
- Jobs execute concurrently
- You can cancel non-started jobs, inspect the queue status, and inspect jobs

```
gnt-job list
gnt-job info
gnt-job watch
gnt-job cancel
```

## gnt-group

Managing node groups:

```
gnt-group add
gnt-group assign-nodes
gnt-group evacuate
gnt-group list
gnt-group modify
gnt-group remove
gnt-group rename
gnt-instance change-group
```



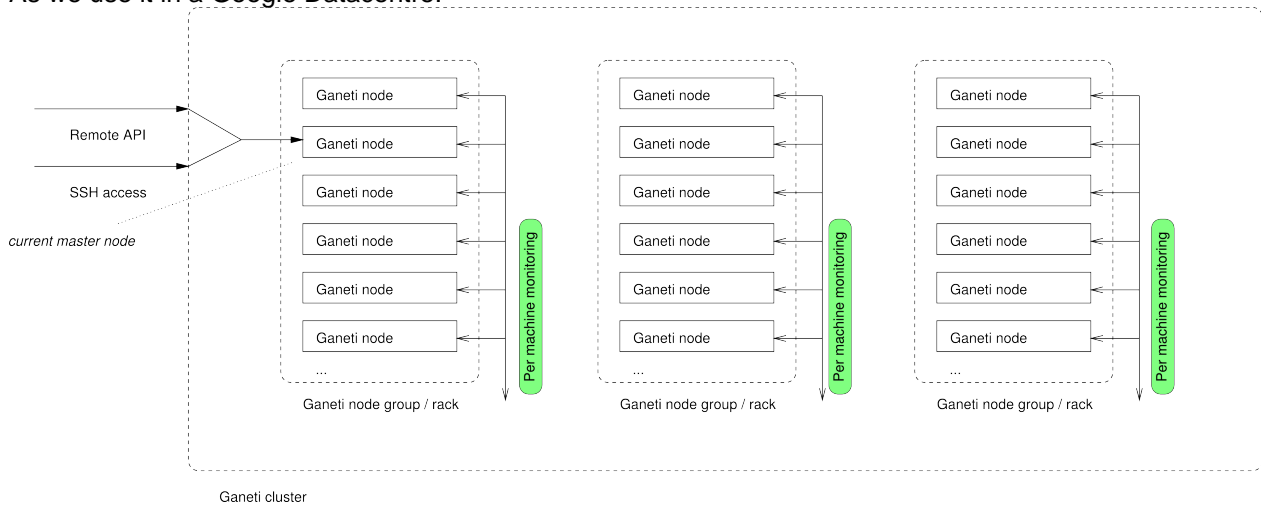
# Running Ganeti in production

What should you add?

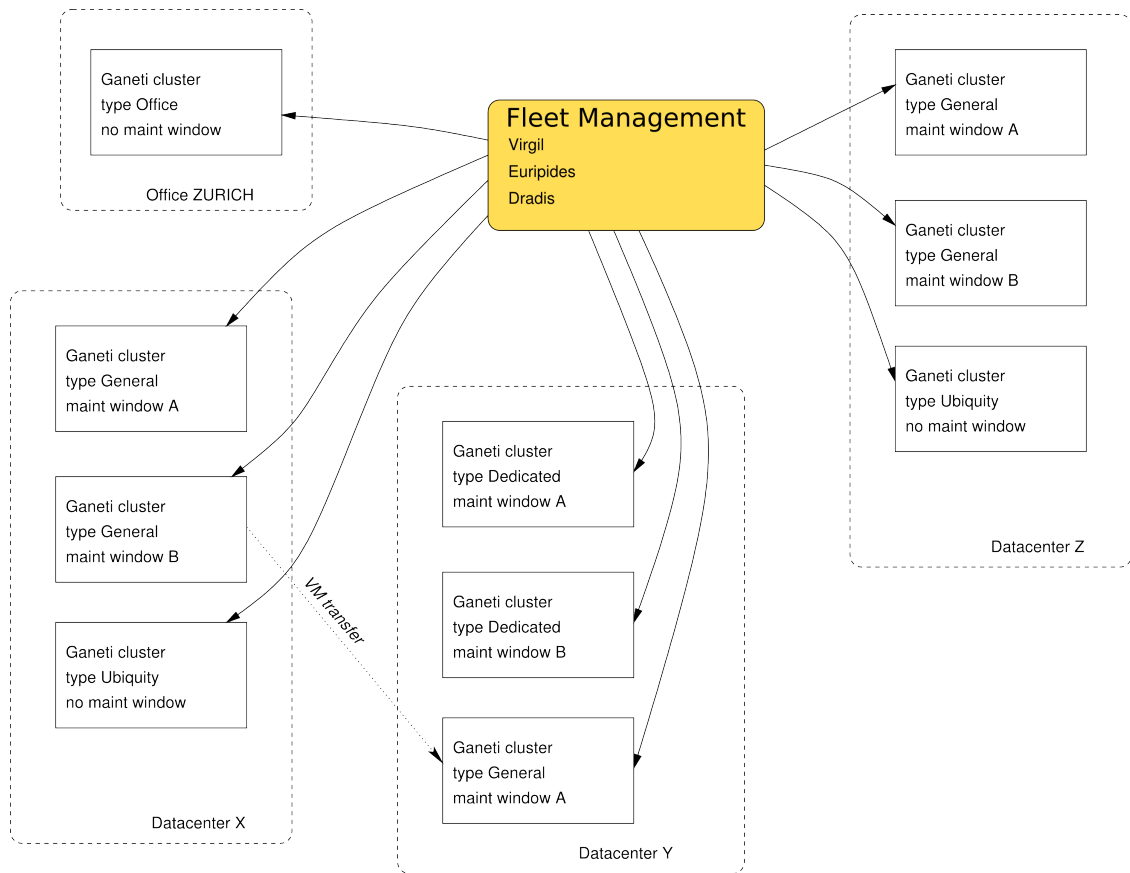
- Monitoring/Automation
  - Check host disks, memory, load
  - Trigger events (evacuate, send to repairs, readd node, rebalance)
  - Automated host installation/setup (config management)
- Self service use
  - Instance creation and resize
  - Instance console access

## Production cluster

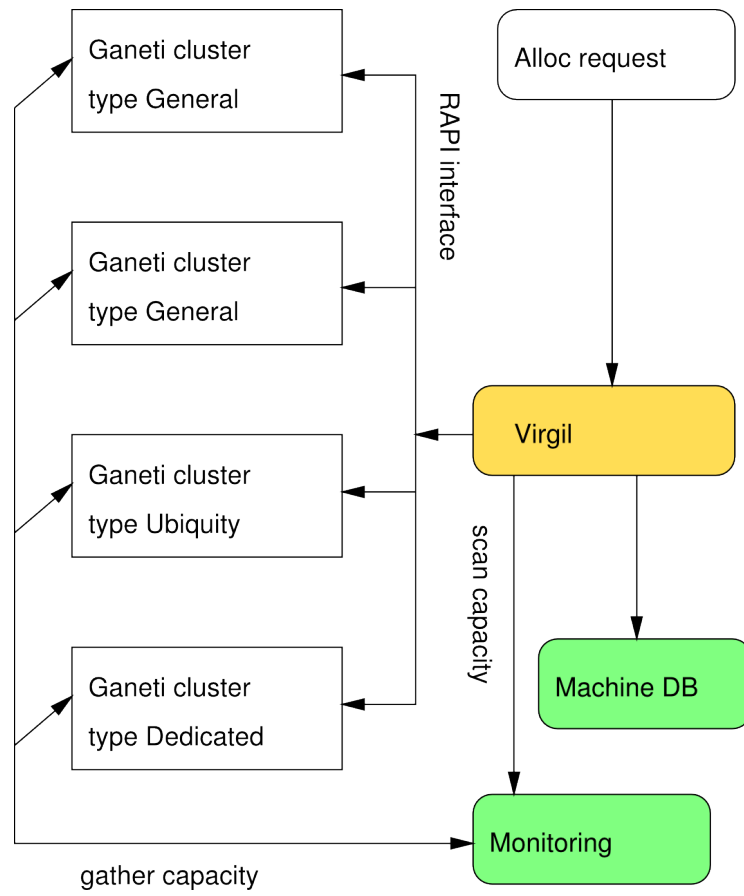
As we use it in a Google Datacentre:



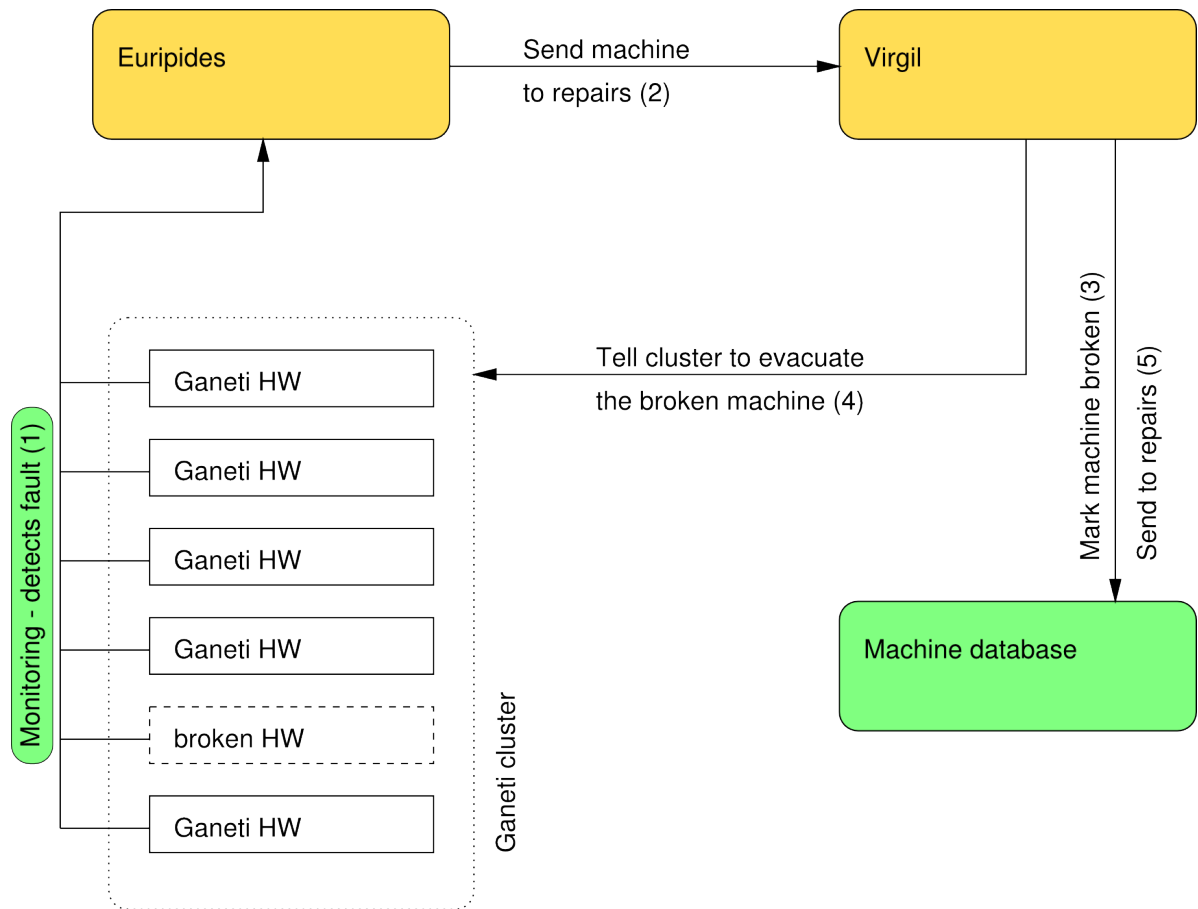
# Fleet at Google



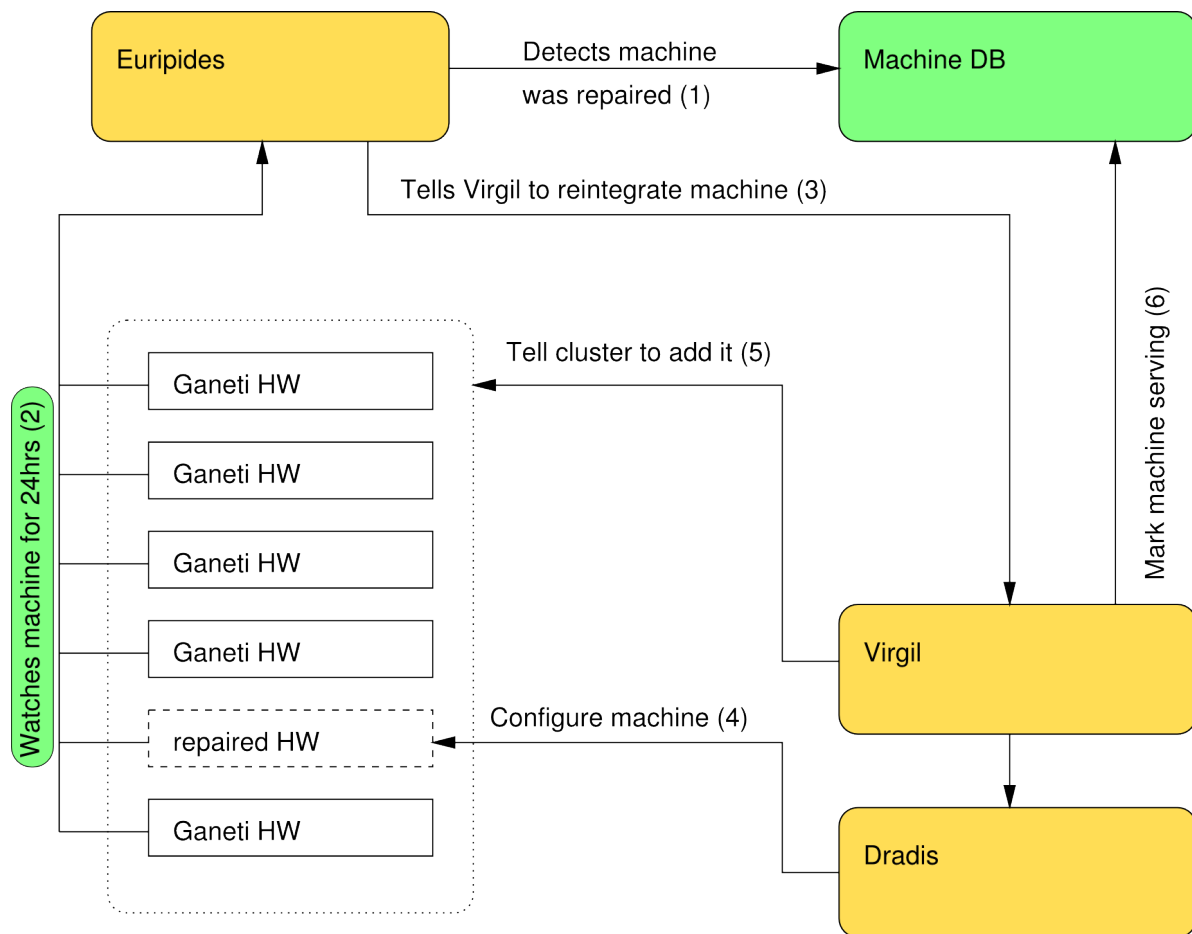
# Instance provisioning at Google



# Auto node repair at Google



## Auto node readd at Google



## People running Ganeti

- Google (Corporate Computing Infrastructure)
- grnet.gr (Greek Research & Technology Network)
- osuosl.org (Oregon State University Open Source Lab)
- fsffrance.org (according to docs on their website and trac)
- ...

## Conclusion

- Check us out at <http://code.google.com/p/ganeti>.
- Or just search for "Ganeti".
- Try it. Love it. Improve it. Contribute back (CLA required).

Questions? Feedback? Ideas? Flames?

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