Ganeti

A cluster virtualization manager.

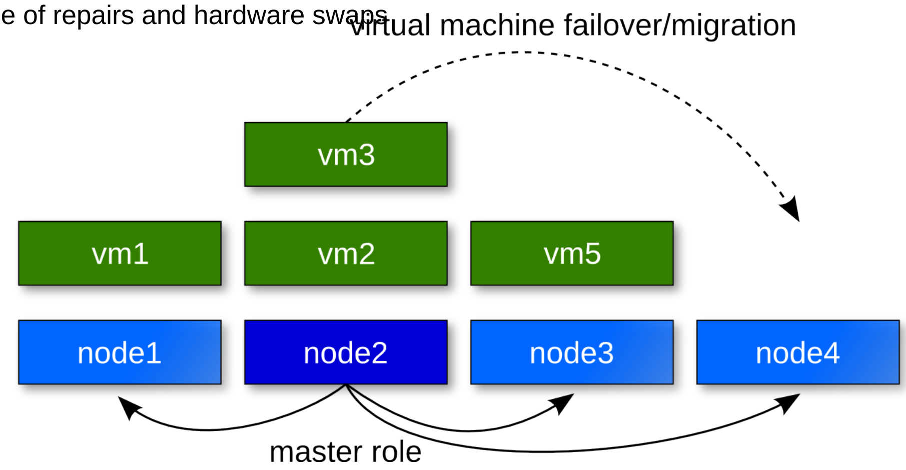
Guido Trotter <ultrotter@google.com>

- Google, Ganeti, Debian

Some images borrowed/modified from Lance Albertson

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

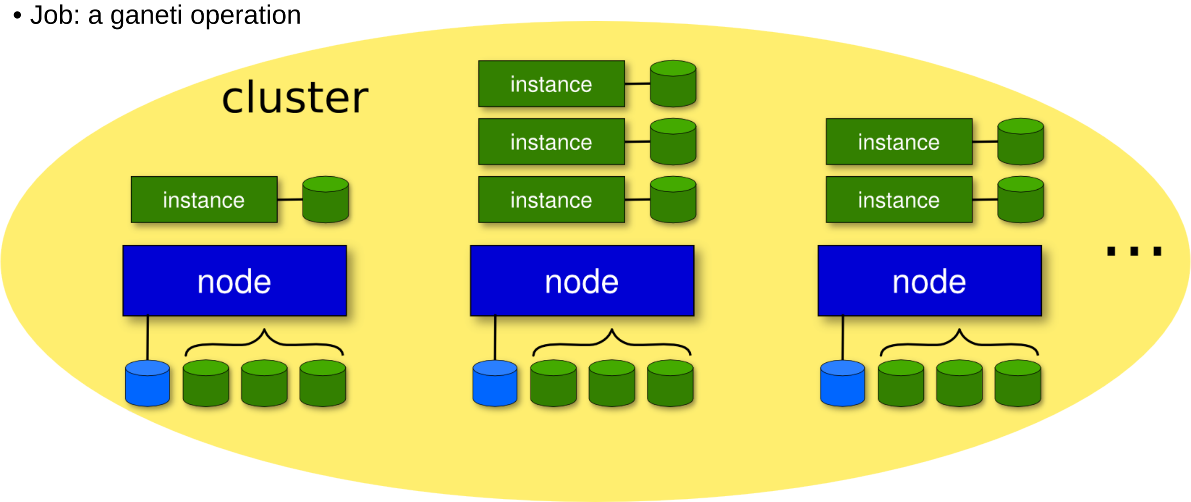


Ideas

- 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 symultaneously 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

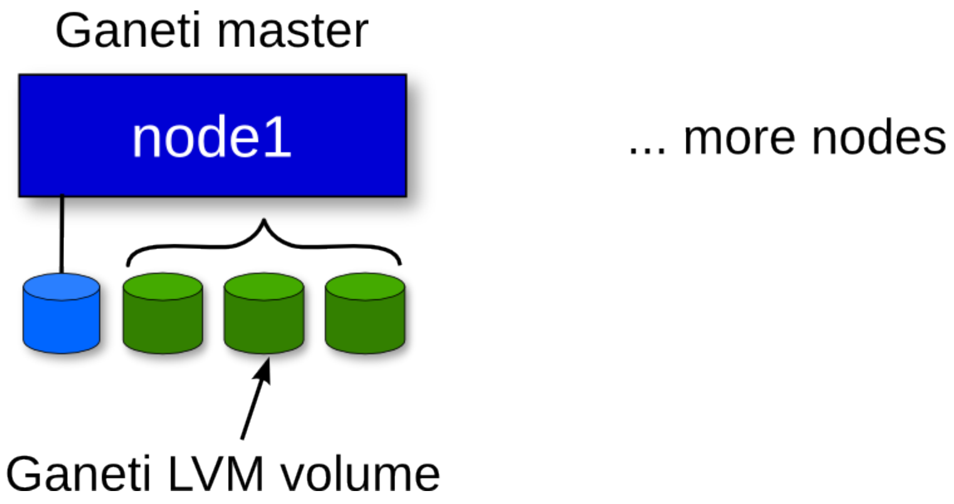
Node roles (instance hosting level)

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

Initializing your cluster

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

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



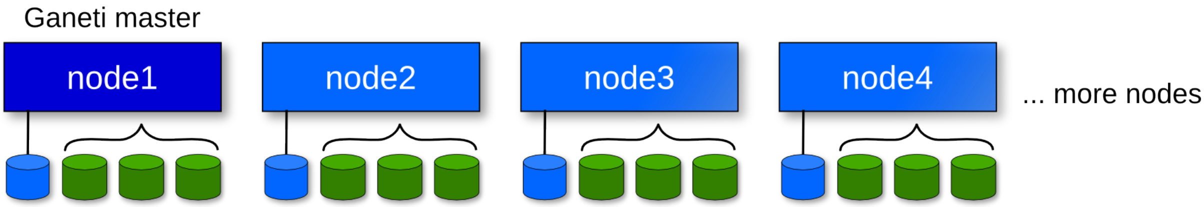
gnt-cluster

Cluster wide operations:

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

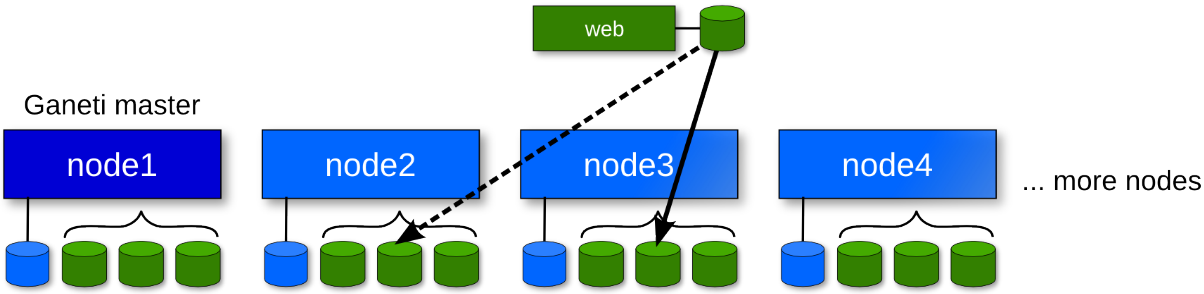
Adding nodes

```
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

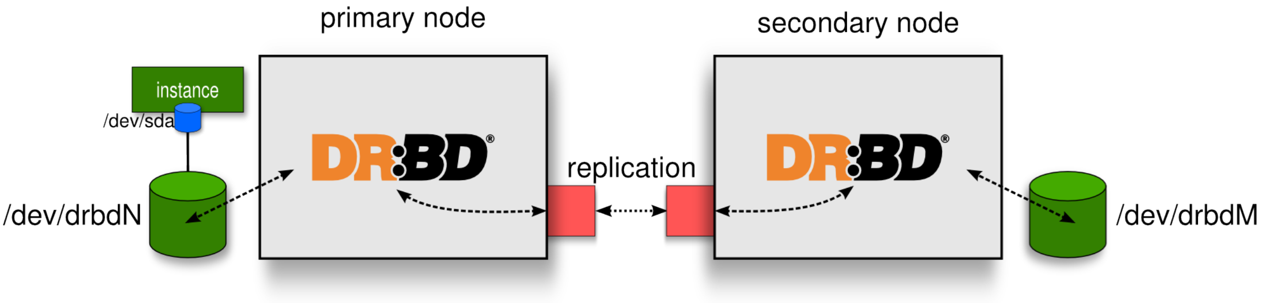
Instance operations:

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

```
gnt-instance console i0
```

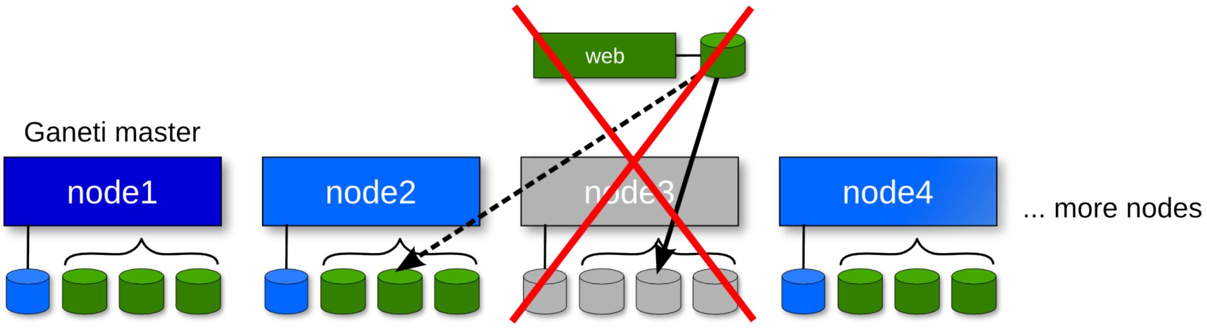
-t drbd

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



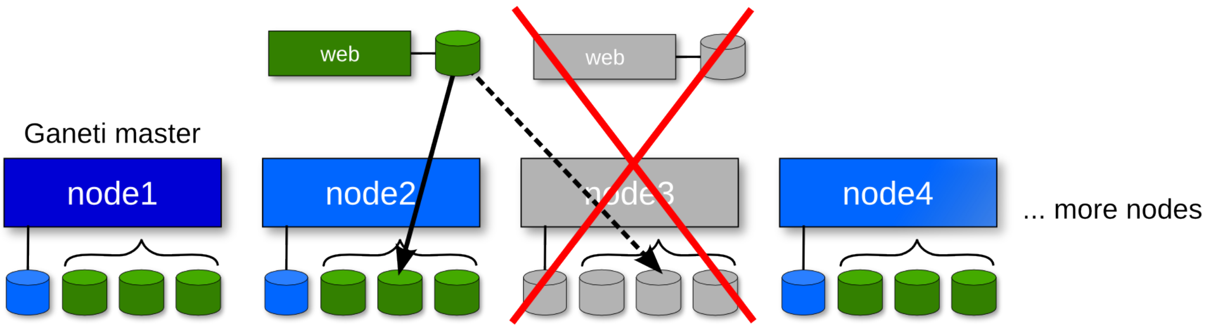
Recovering from failure

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



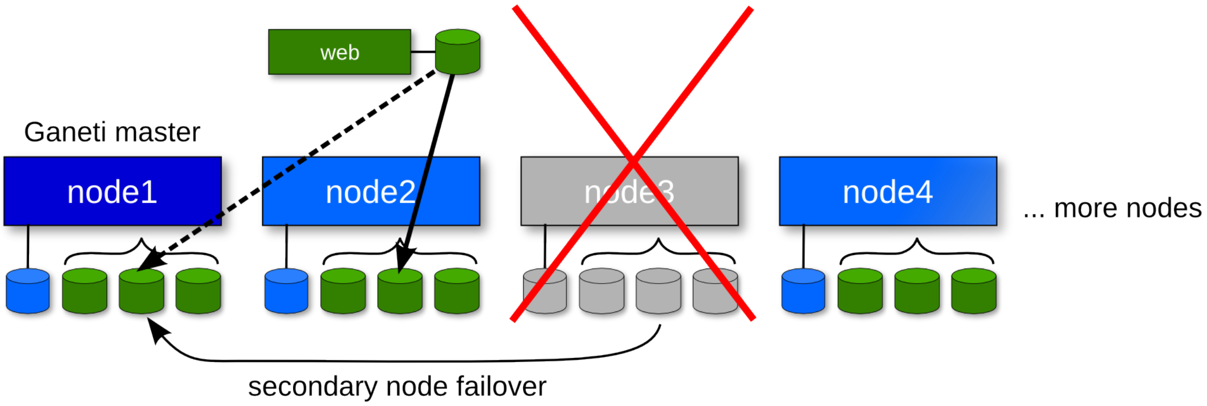
Recovering from failure

```
# 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 imoport -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 iallocator
- 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
```

'big-scale' features

- Nodegroups (2.4/2.5)
- Routed networking
- vm_capable and master_capable nodes (2.3)
- Job priorities (2.3)
- Out of Band management (2.5)
- Cluster merger

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
```

Other recent improvements

- New KVM features (vhost, hugepages) (2.4)
- IPv6 (2.3)
- Privilege separation (2.4)
- Inter-cluster instance move
- SPICE (2.5)
- Master network turnup hooks (2.5)

Future roadmap

- Distributed storage (ceph, sheepdog)
- Better OS installation
- Better self-healing
- KVM enhancements
    - block device migration
    - USB redirect
- Networking enhancements
    - Pool and subnet management
    - Better low-level deployment
- More hypervisors/hv-customizations

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

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 Google "Ganeti".
- Try it. Love it. Improve it. Contribute back (CLA required).

Questions? Feedback? Ideas? Flames?