Ganeti

The Cluster-based Virtualization Mangement Software

Helga Velroyen (helgav@google.com)
Klaus Aehlig (aehlig@google.com)

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Google

Virtualization

To build your VMs ("instances"), you would take ...

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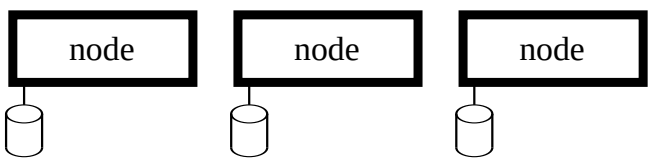
- a bunch of physical machines ("nodes")



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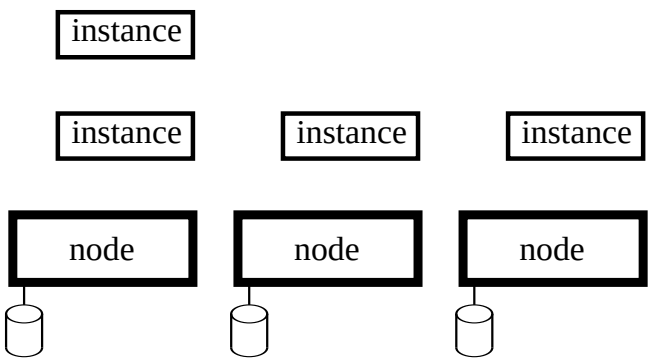
To build your VMs ("instances"), you would take ...

- a bunch of physical machines ("nodes")
- some hypervisor, say Xen



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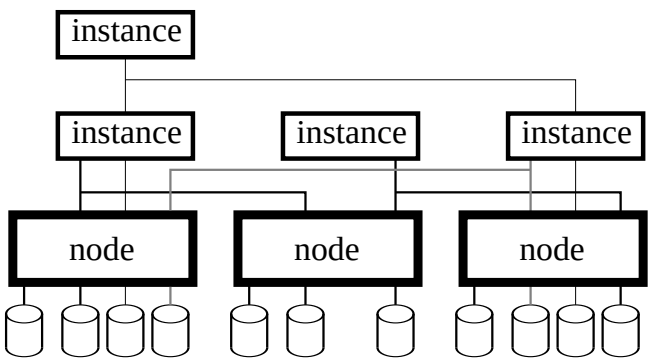
Virtualization

To build your VMs ("instances"), you would take ...

- a bunch of physical machines ("nodes")
- some hypervisor, say Xen
- some way to replicate storage, say DRBD



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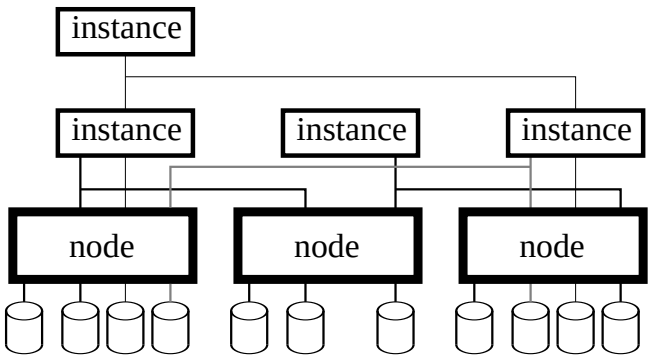
Enter Ganeti

While all this works on its own, Ganeti helps



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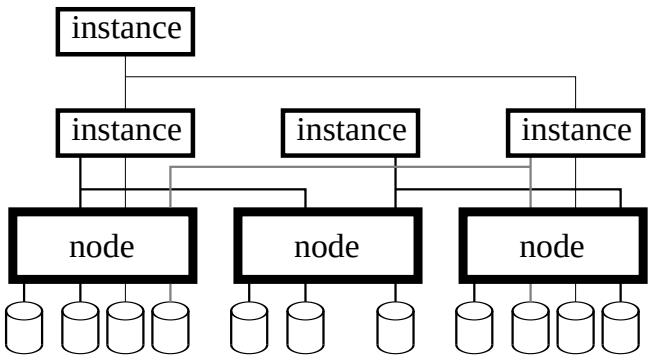
While all this works on its own, Ganeti helps

- to get there
  - uniform interface



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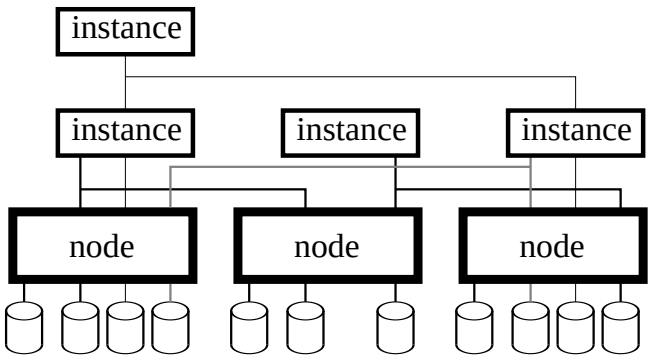

- Hypervisors: Xen, kvm, ...
- Storage: drbd, lvm, file, ...
- Network

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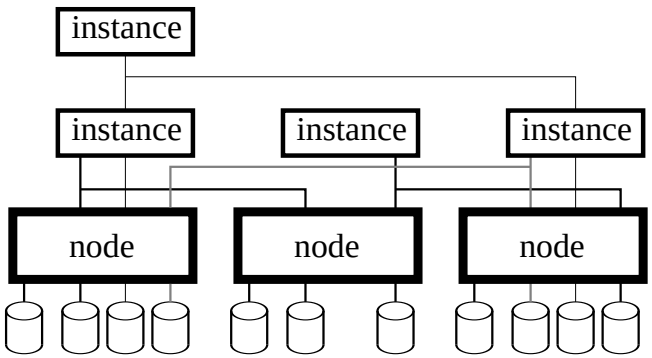
  - uniform interface *hypervisors/storage/...*
  - policies, balanced allocation



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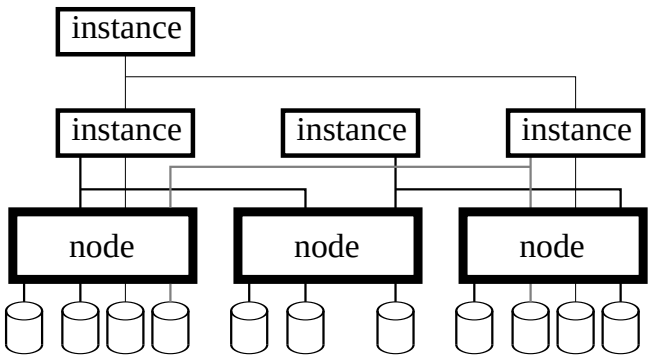
- to get there
  - uniform interface *hypervisors/storage/...*
  - policies, balanced allocation
    - *Instance memory/disk size*
    - *CPU oversubscription*
    - *tag-exclusion* *"Don't put both name servers on the same node!"*



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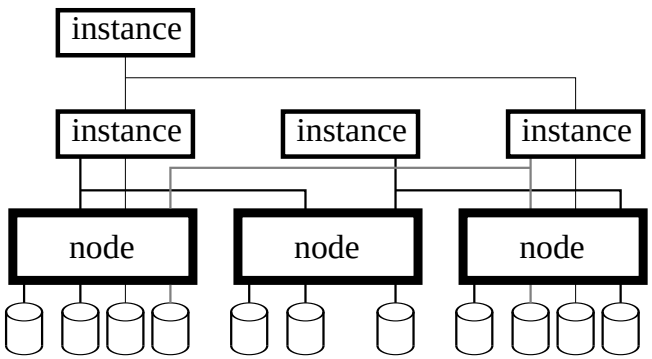
- and to stay there



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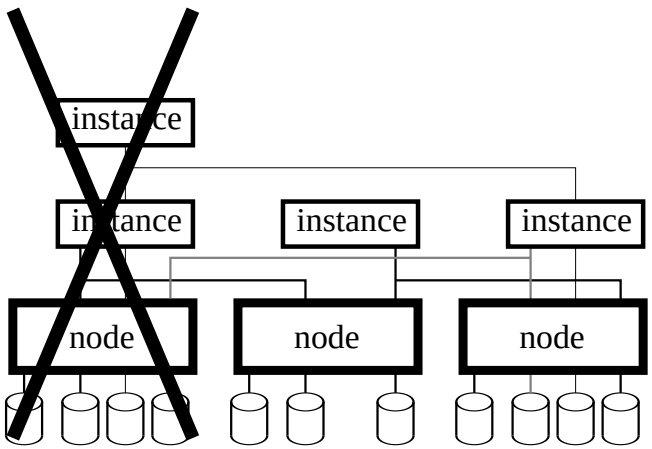

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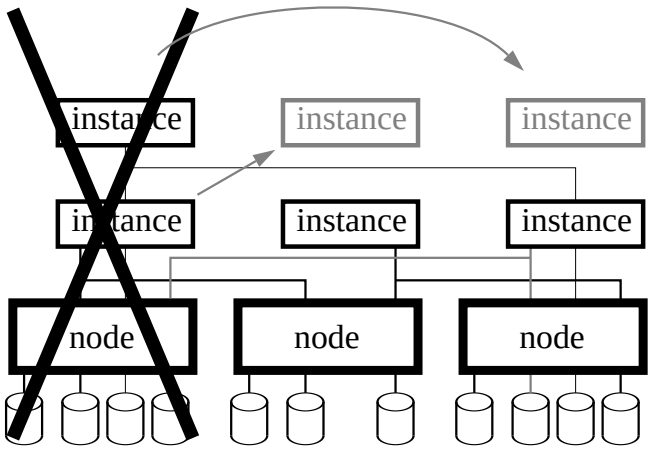

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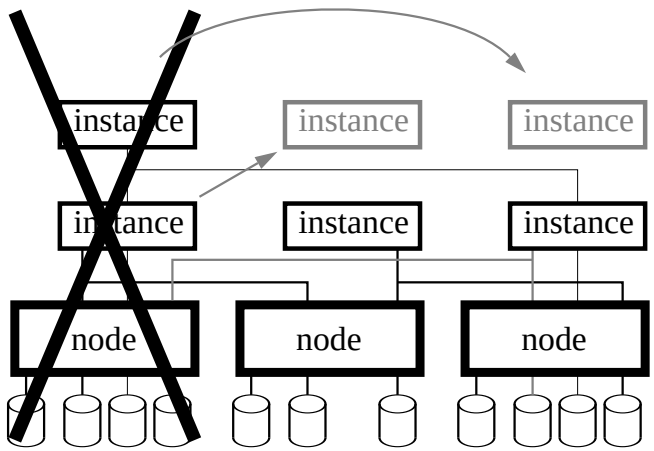

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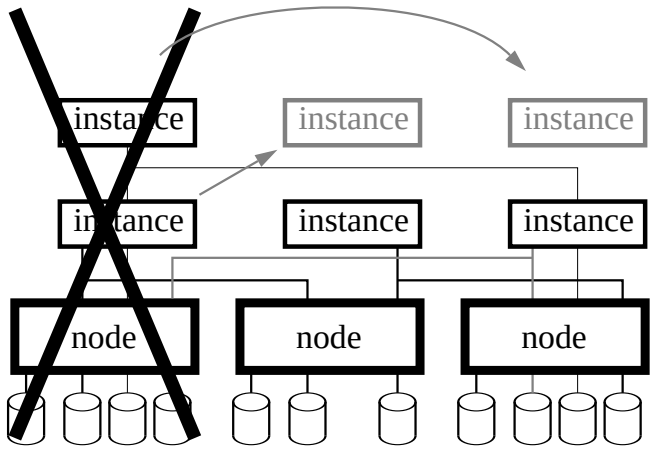

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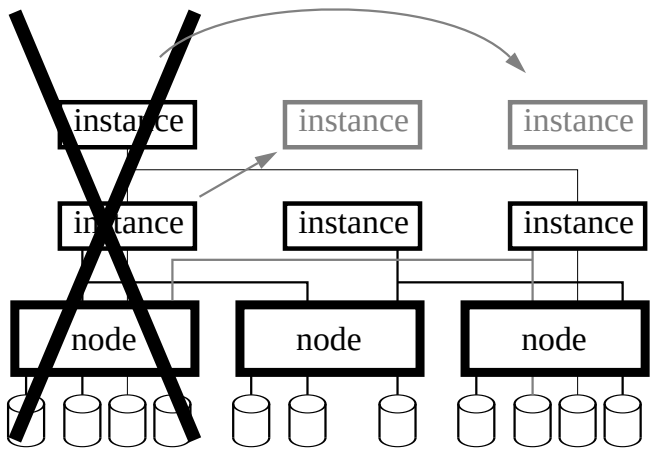

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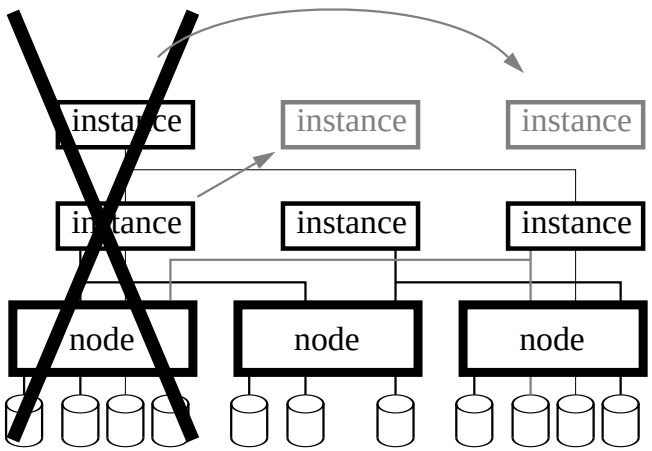
  - Restart instances after power outage



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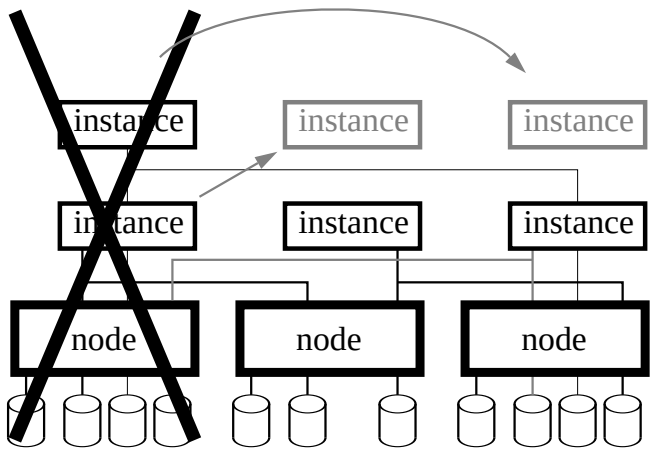

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  - ...

Google

Basic Interaction—Cluster creation

- `gnt-cluster init -s 192.0.2.1 clusterA.example.com`

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- `gnt-cluster init -s 192.0.2.1 clusterA.example.com`
- `gnt-node add -s 192.0.2.2 node2.example.com`

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- `gnt-node add -s 192.0.2.2 node2.example.com`
- `...`
- `gnt-instance add -t drbd -o debootstrap -s 2G --tags=foo,bar instance1.example.com`

Basic Interaction—Node maintenance

Evacutating a node

- `gnt-node modify --drained=yes node2.example.com`

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- `gnt-node modify --drained=yes node2.example.com`
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Using the node again

- `gnt-node modify --online=yes node2.example.com`

Basic Interaction—Node maintenance

Evacutating a node

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- `gnt-node evacuate -f -s node2.example.com`
- `gnt-node modify --offline=yes node2.example.com`

Using the node again

- `gnt-node modify --online=yes node2.example.com`
- `hbal -L -X`

Jobs

cli

Jobs

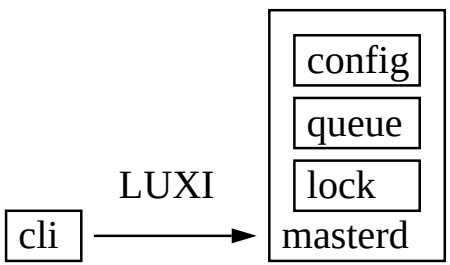
cli

gnt-cluster
gnt-node
gnt-instance
...

Jobs

cli

Jobs



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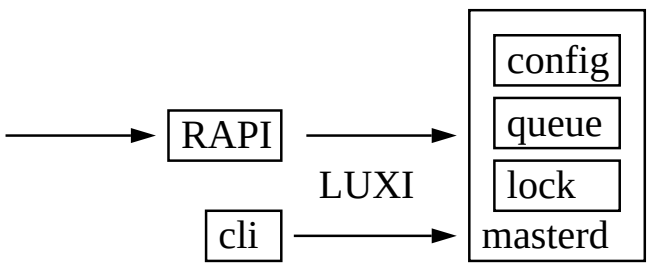

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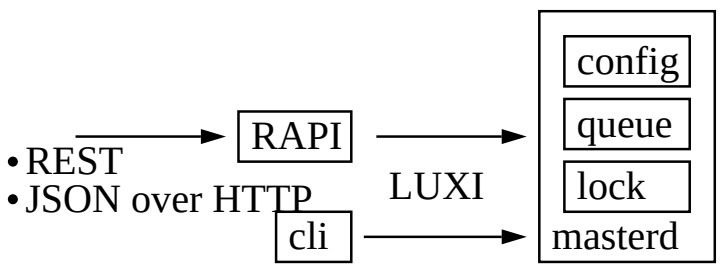

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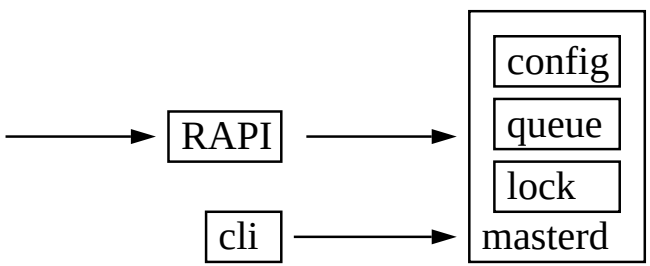
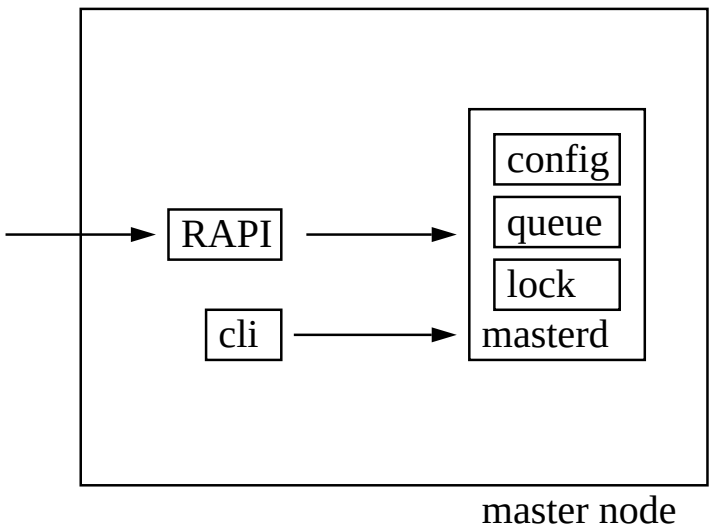


RPC



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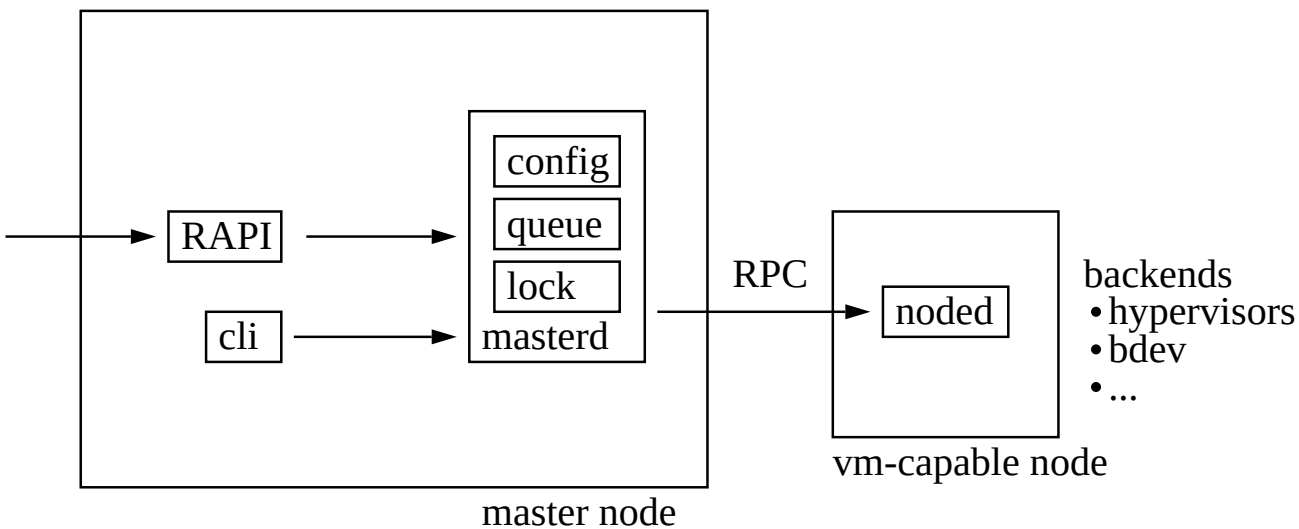
RAPI
cli
config
queue
lock
masterd
master node
RPC
noded
vm-capable node
backends
• hypervisors
• bdev
• ...

Google

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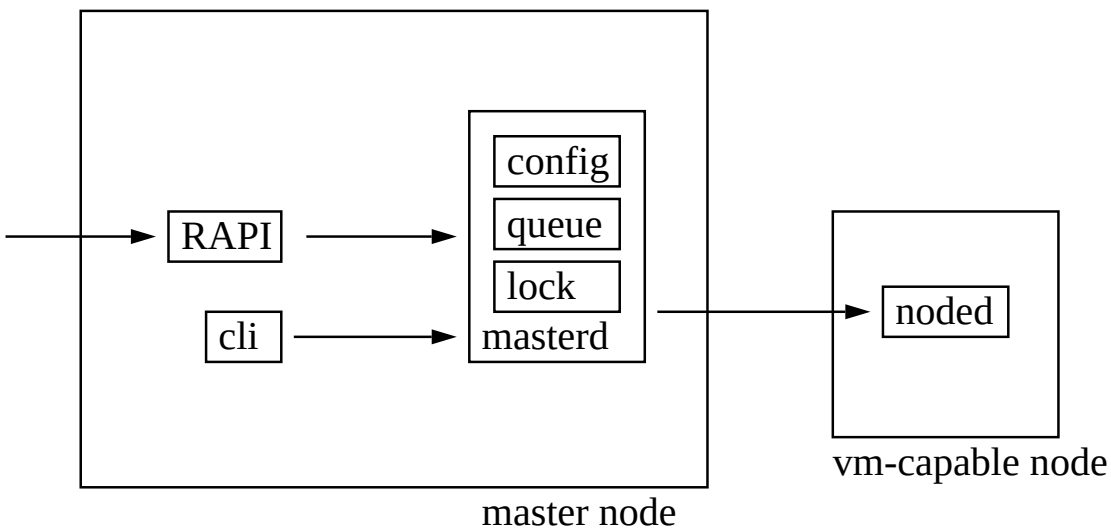
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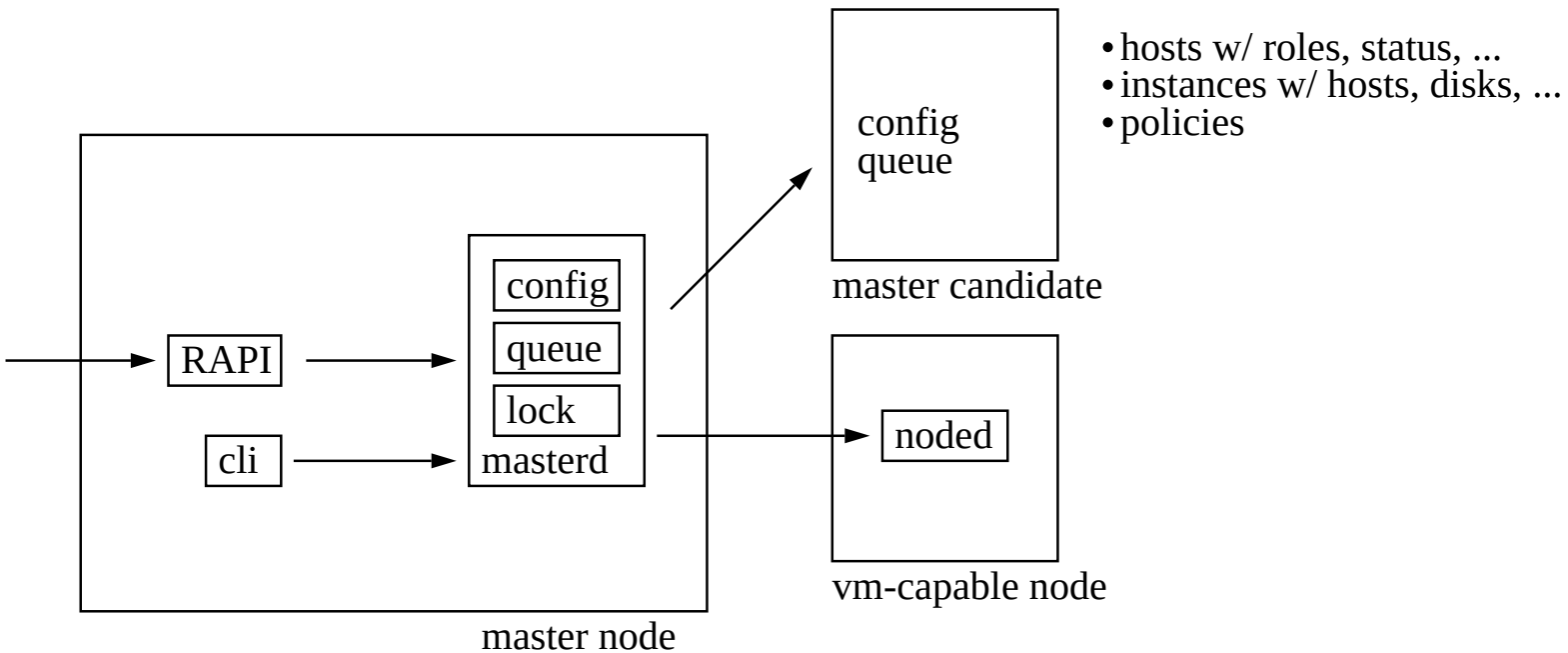

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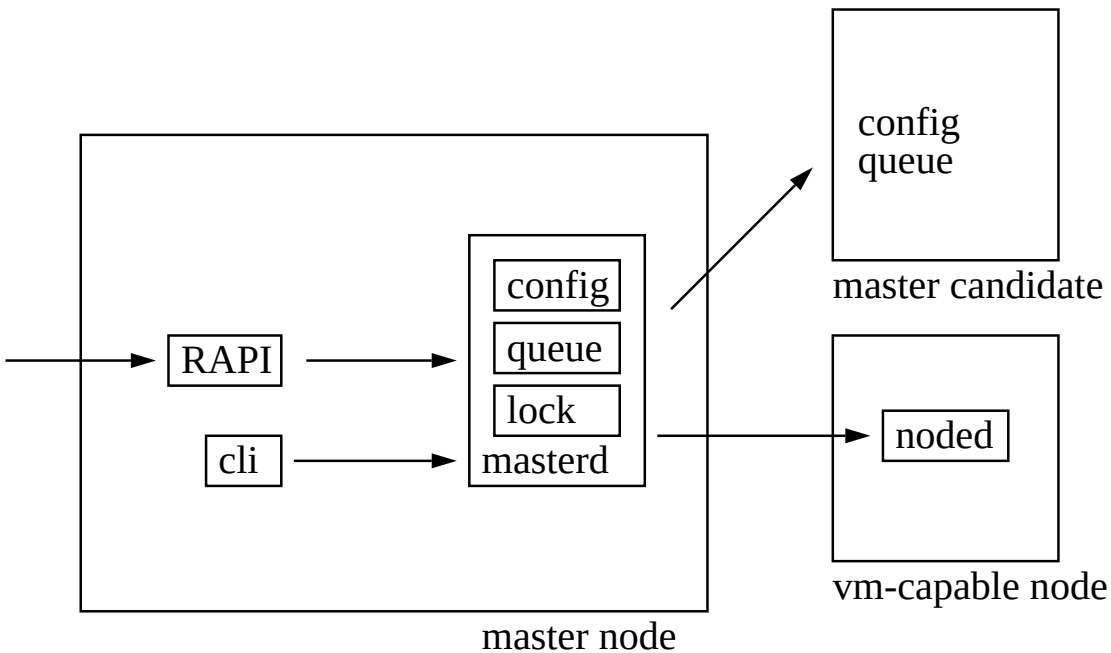

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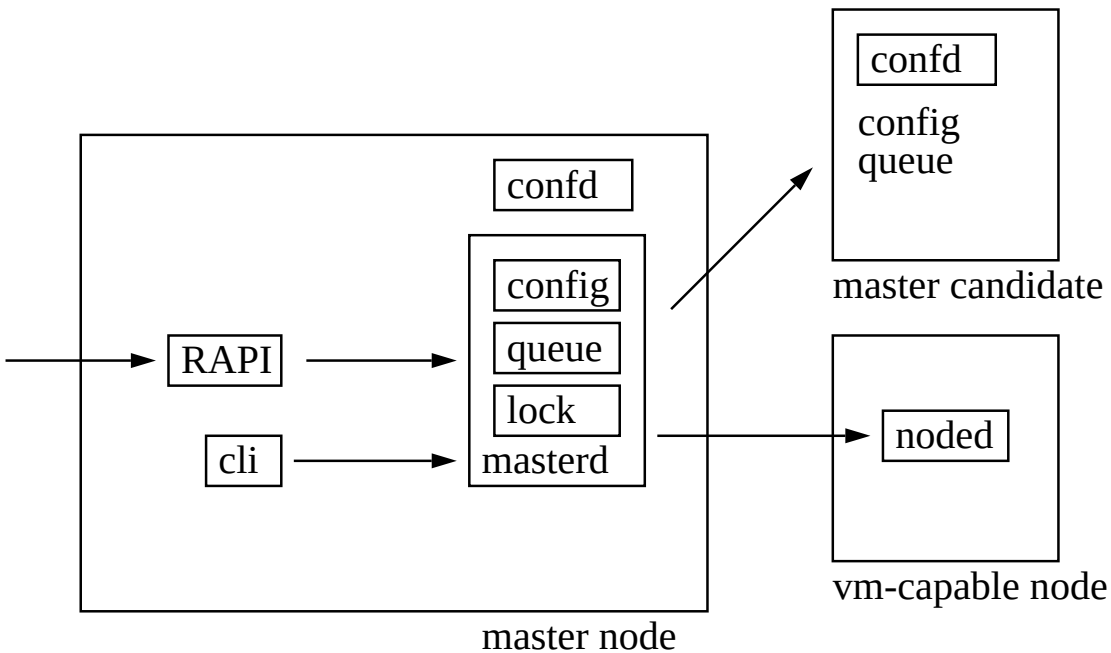

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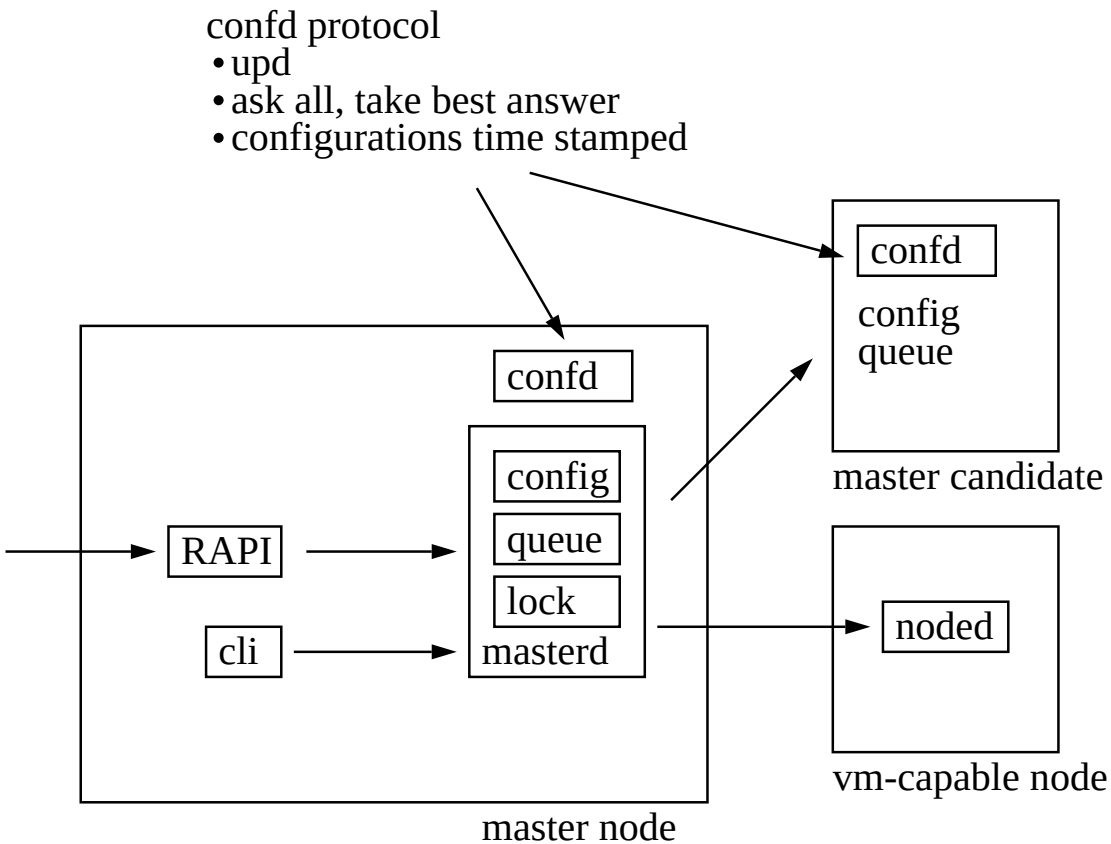

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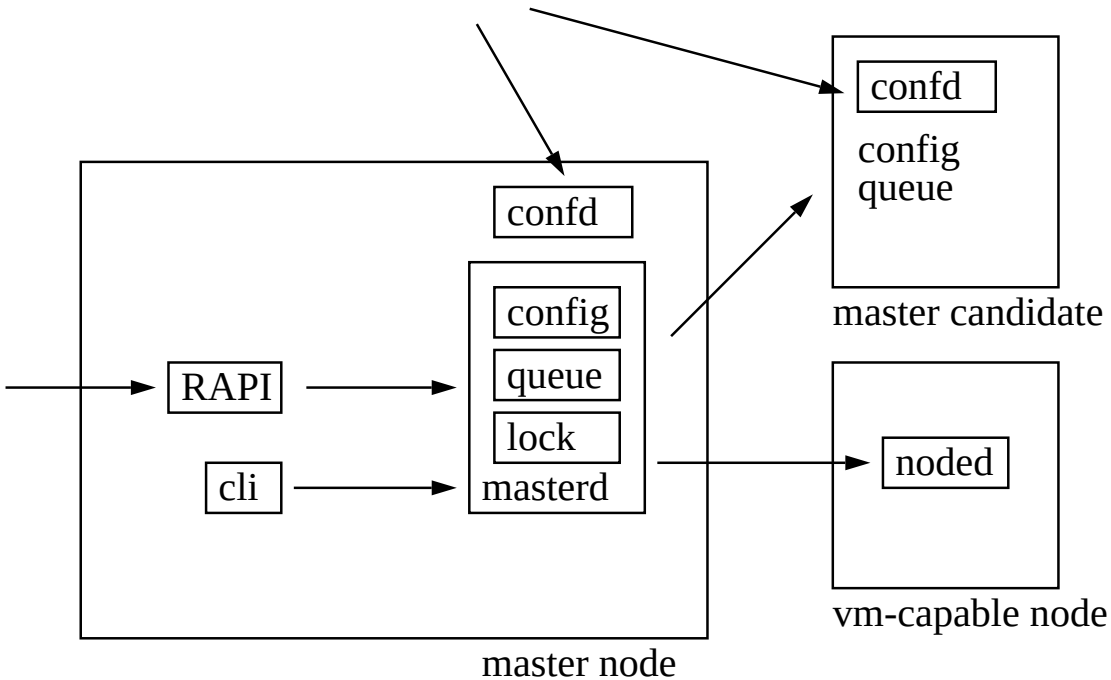

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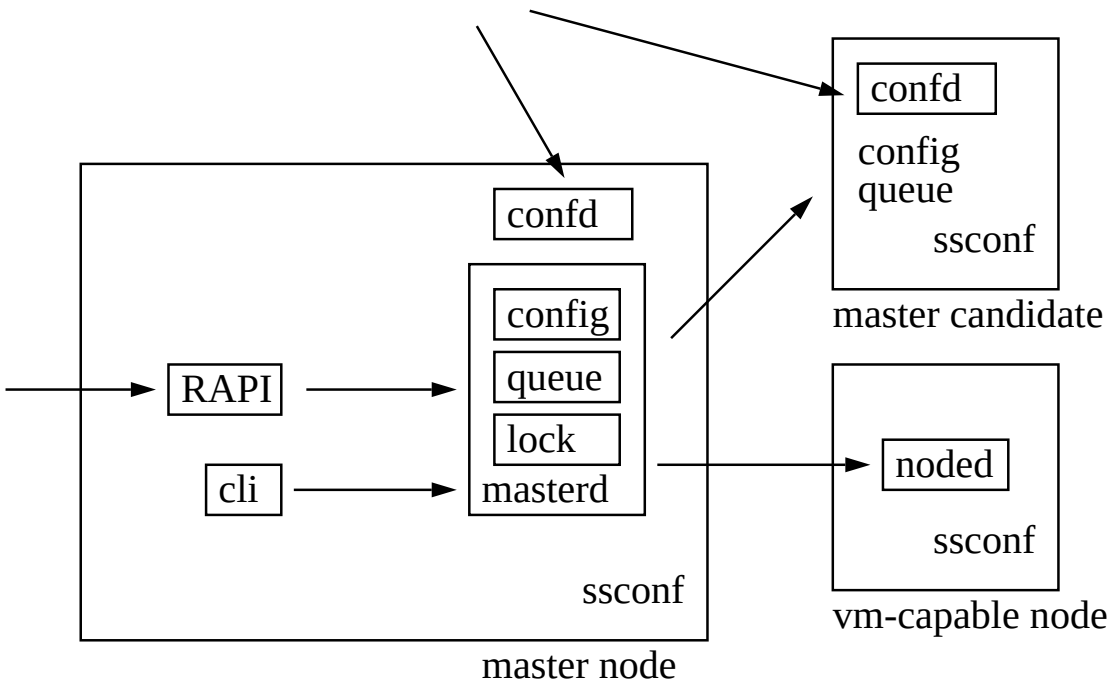

ssconf
- flat file
- "static" information
- nodes
- instance, w/o location
- ...

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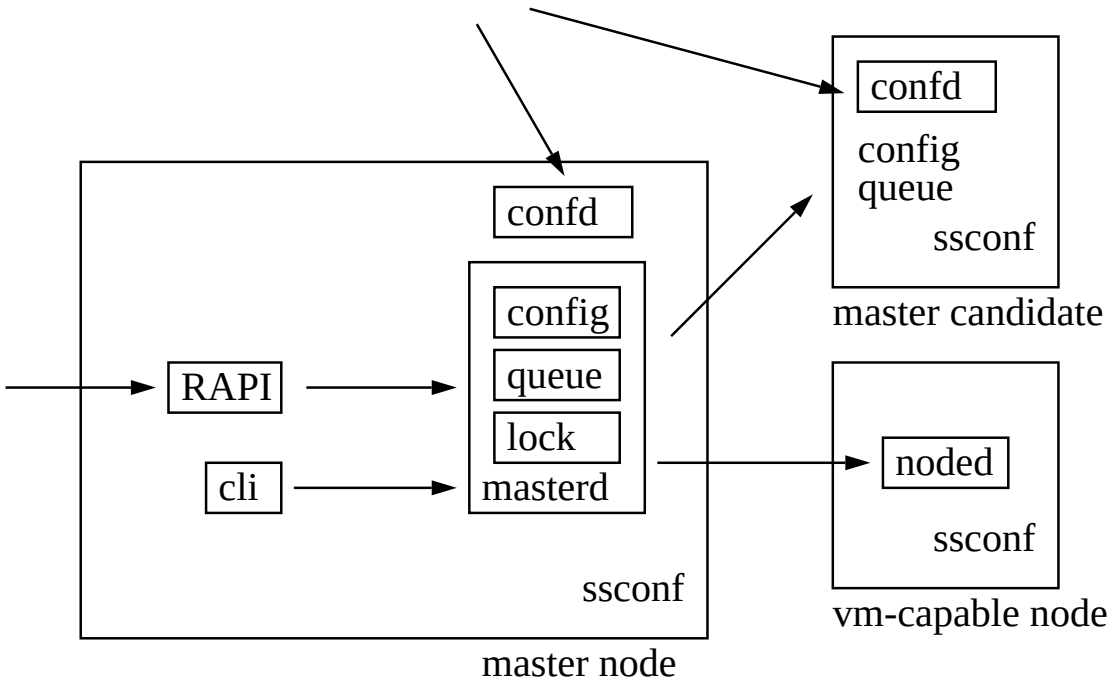
Configuration



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Independently of its role, nodes can be in a different statuses:
online, drained, offline

Guest OS Interface

Ganeti is agnostic about the guest OSes;
it just expects information to be provided.
(on directory per guest OS)

- executables: `create`, `import`, `export`, `rename`, `verify`
- text files: `ganeti_api_version`, `variants.list`

Executables are provided with information via the environment.

- `OS_VARIANT`
- `HYPERVISOR`
- `DISK_COUNT`, `DISK_0_PATH`, `DISK_1_PATH`, ...
- ...

Available OS Definitions

There exist quite a few implementations of the guest OS interface.

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- debootstrap (`git://git.ganeti.org/instance-debootstrap.git`)
  glorified call of `debootstrap(8)`
  `sfdisk`, `mkswap`, `mke2fs`, `...`; `/etc/{hostname, ...}`

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- ganeti-instance-image (https://code.osuosl.org/projects/ganeti-image)
  image-based; images created with `tar(1)` or `dump(8)`
- ganeti-os-defs (http://sourceforge.net/p/ganeti-os-defs/home/Home/)
- ...

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Ways to customize Ganeti

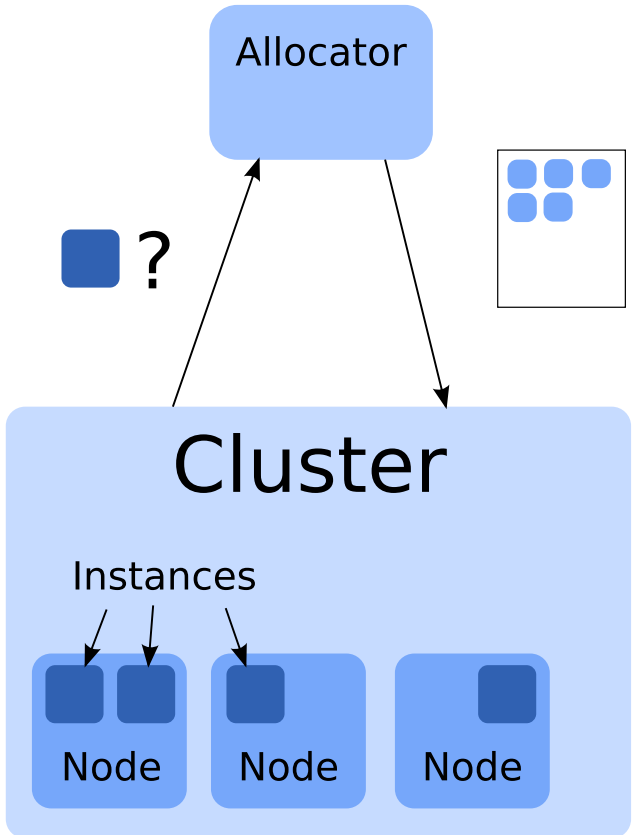
- Hooks
- Allocator
- ...

Hooks

- hook scripts to customize cluster operations
- useful for synching with external systems
- pre phase: e.g. for authorization
- post phase: e.g. for logging, billing, setting passwords
- examples: `cluster-verify-post.d`, `node-add-pre.d`

Allocation

- Where to put an instance?
- protocol:
  - JSON over pipes
  - input: cluster's state + request-specific info
  - output: suggestions where to place which instance
- supported requests: allocate, relocate, change-group, node-evacuate, multi-allocate



Google

Ganeti in Production

What should you add?

- Monitoring:
  - Check host disks, memory, load
- Automation:
  - Trigger events (evacuate, send to repairs, readd node, rebalance)
- Configuration Management:
  - Automated host installation / setup
- Self service use
  - Graphical interface (e.g. Ganeti Web Manager)

    (http://ganeti-webmgr.readthedocs.org/en/latest/)
  - Instance creation and resize
  - Instance console access

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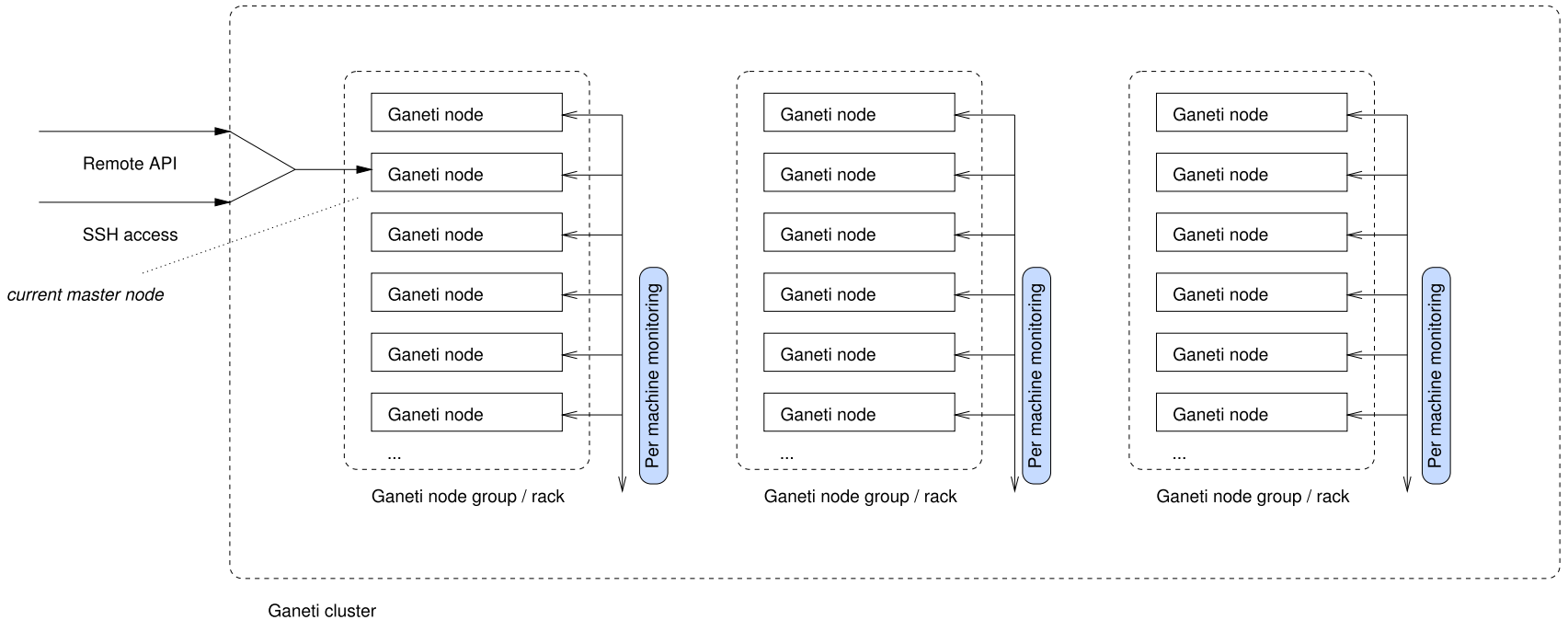
Production Cluster

As we use it in a Google Datacenter



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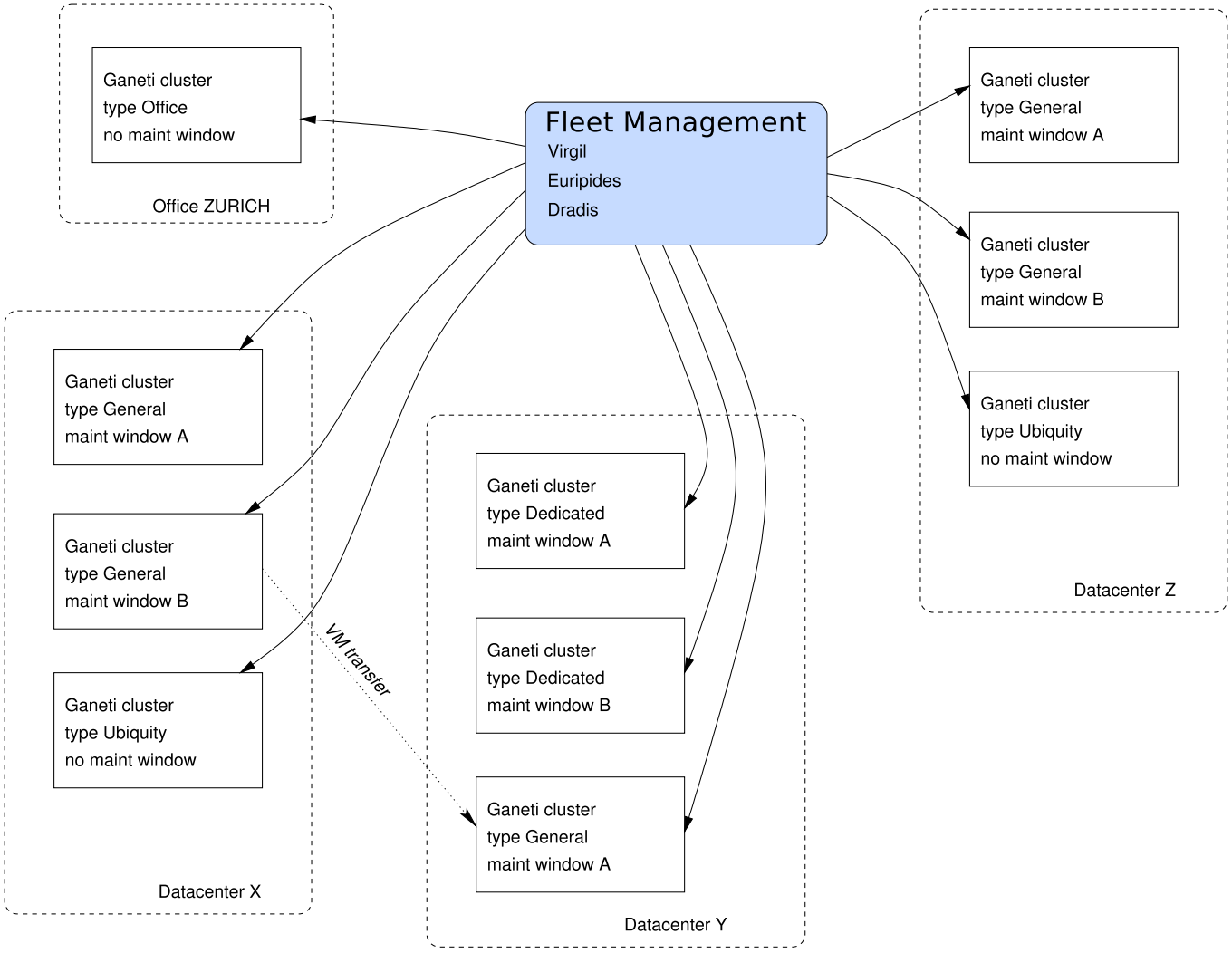
Fleet at Google



Google

2.7 (Current Release)

- Network management (contributed by grnet.gr)
- Exclusive storage
- Opportunistic locking
- Restricted commands
- Monitoring agent

Monitoring Agent

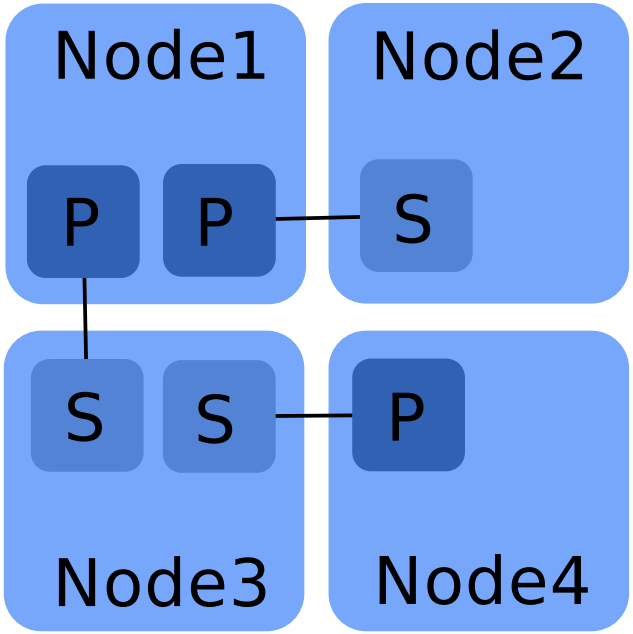
- integrated monitoring service
- implemented in 2.7, 2.8, 2.9
- new daemon, runs on all nodes, speaks http
- provides information about the cluster's status
- collectors for: drbd, disk status, LVM, instance status (xen)
- Google Summer of Code: CPU load monitoring

2.8 (Beta)

- Improved support of non-lvm storage
- Downgrading
- More work on monitoring daemon
- Autorepair tool
- Hroller

Hroller

- Scheduler for rolling reboots
- Partitiones cluster into groups of nodes that can be rebooted simultaneously
- various modes: default, full evacuation, offline-maintenace
- options for non-redundant instances



Google

2.9 (Alpha)

- DRBD 8.4 support
- Improved support of non-lvm storage handling
- Improvements of monitoring agent
- Improvements of hroller

Future

Just plans, no promises!

- Hot-plugging
- Automatic updates
- More fine-grained job-queue management
- Storage pools

Open Source Ganeti

- Ganeti has been open source since 2007
- Relatively big community of external users and contributers
- People running Ganeti:
  - Google (Corporate Computing Infrastructure)

    (https://www.youtube.com/watch?v=TELArK6SmyY)
  - grnet.gr (Greek Research & Technology Network)
  - osuosl.org (Oregon State University Open Source Lab)
  - fsffrance.org (Free Software Foundation France)

Ganeti Development Process

- Time-based release process, one freeze every 3 months
- Code reviews over the mailing list
- Discussion of design documents publicly on the mailing list
- Video-conferences with bigger contributors
- Public continuous build system[1]
- QA scripts public to be re-used

[1] machines provided by grnet.gr, run by Google

Recent Events 2013

- Fosdem 2013 (https://archive.fosdem.org/2013/)
- Xen Hackathon in Dublin, May 2013

  (http://www.xenproject.org/component/content/article/97-event-details/126-xen-hackathon-dublin-2013.html)
- Google Summer of Code, 2013
  - Better Openvswitch support
  - CPU load monitoring

Upcoming Events

- GanetiCon, Athens, Sep 2013

  (https://sites.google.com/site/ganeticon/)
- LinuxCon North America, New Orleans, Sep 2013, introductory talk

  (http://events.linuxfoundation.org/events/linuxcon-north-america/program/schedule)
- LinuxCon Europe, Edinburgh, UK, Oct 2013, introductory talk

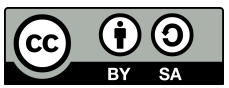
  (http://events.linuxfoundation.org/events/linuxcon-europe)
- LISA, Washington D. C., Nov 2013, workshop / class

  (https://www.usenix.org/conference/lisa13)

A list of publications from previous events (slides, recordings) can be found in our wiki. (https://code.google.com/p/ganeti/wiki/Publications)

Conclusion

- Check us out at `https://code.google.com/p/ganeti/`
- Or just search for "Ganeti"
- We are around on FrOSCon today and tomorrow!



Questions? Feedback? Ideas? Flames?