IRONIC

A CLOUDY APPROACH TO HARDWARE

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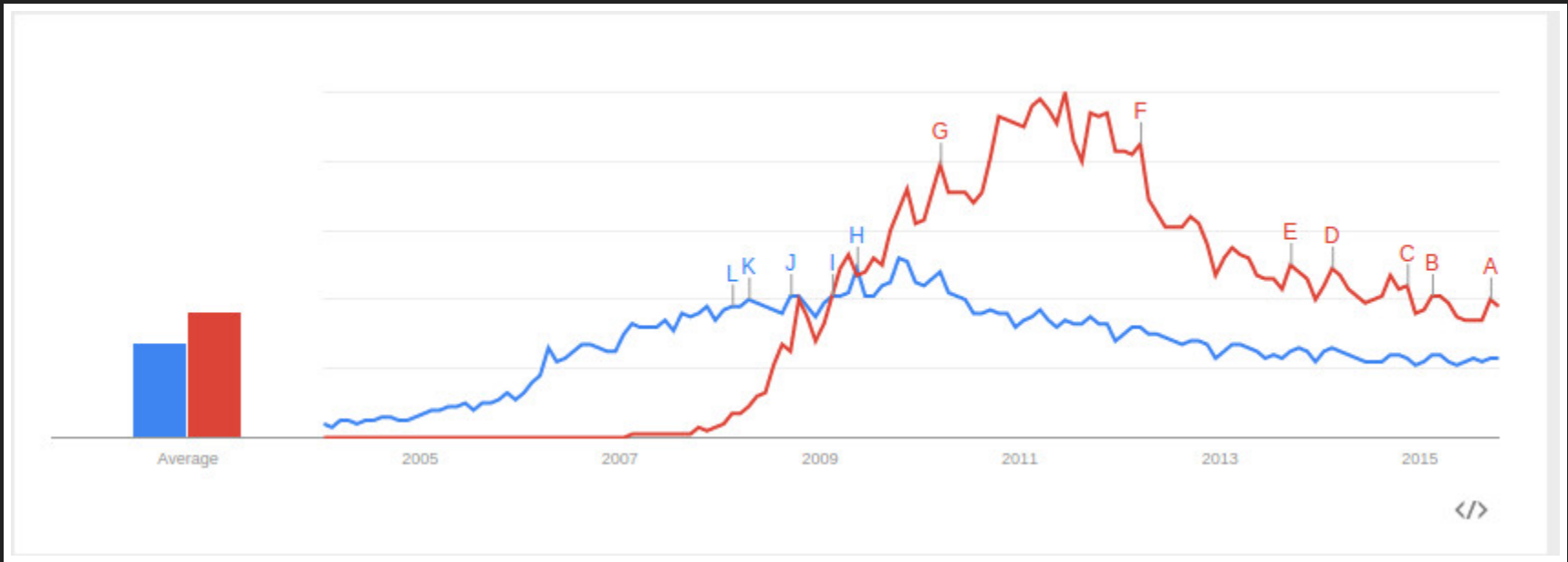
GITHUB.COM/DEVANANDA/TALKS

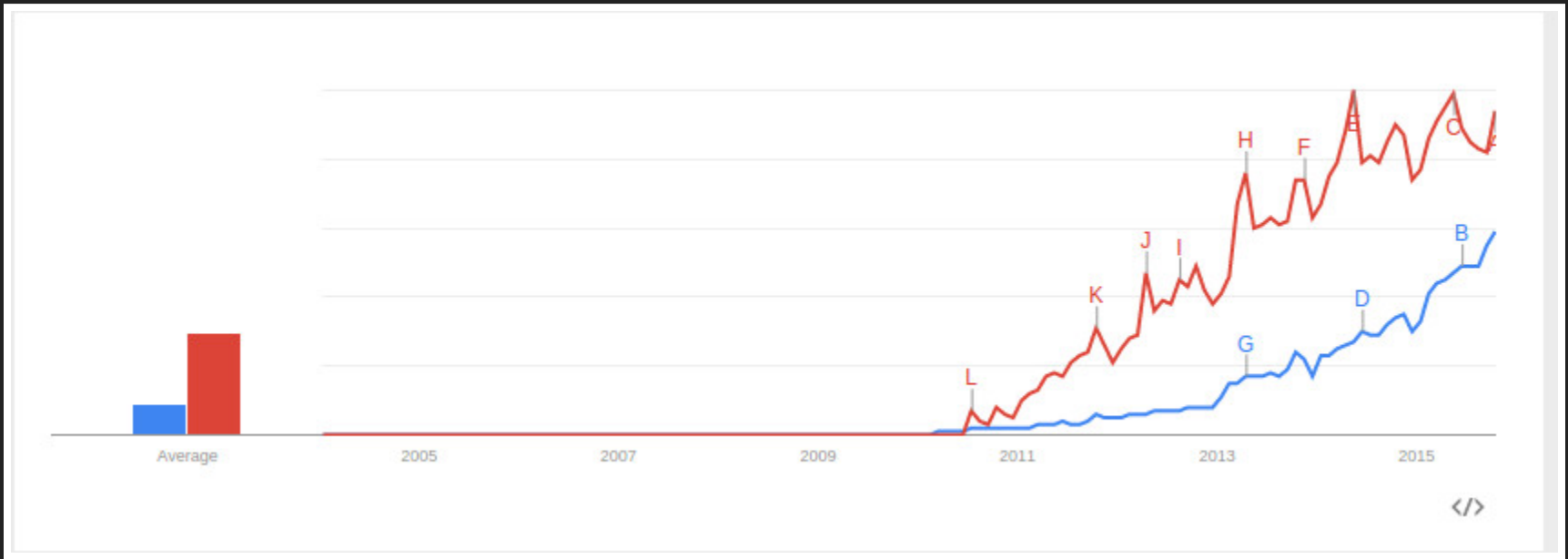
- Cloud Architect @ IBM / SoftLayer
- ~~HP Cloud~~
- OpenStack since 2012
- Yoichi single malt
- @devananda

Virtual Machines are **abstractions** of computers.

VIRTUALIZATION & CLOUD COMPUTING

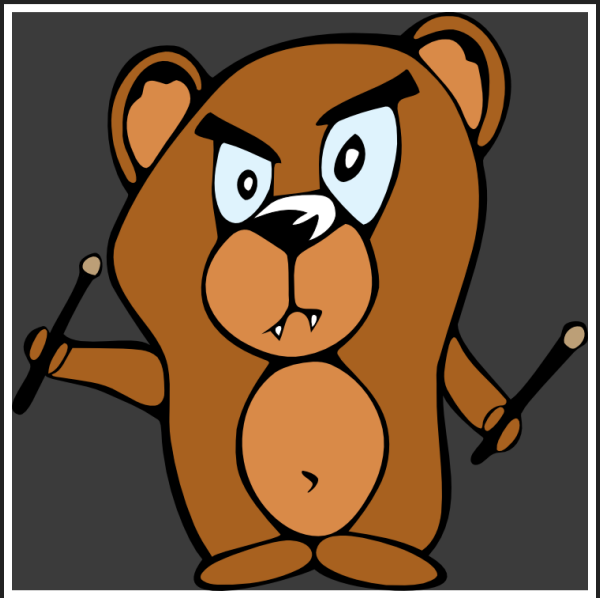


DEVOPS & OPENSTACK



If sufficiently abstracted,
a physical machine behaves like a virtual machine.

Consumption API + hardware abstraction?

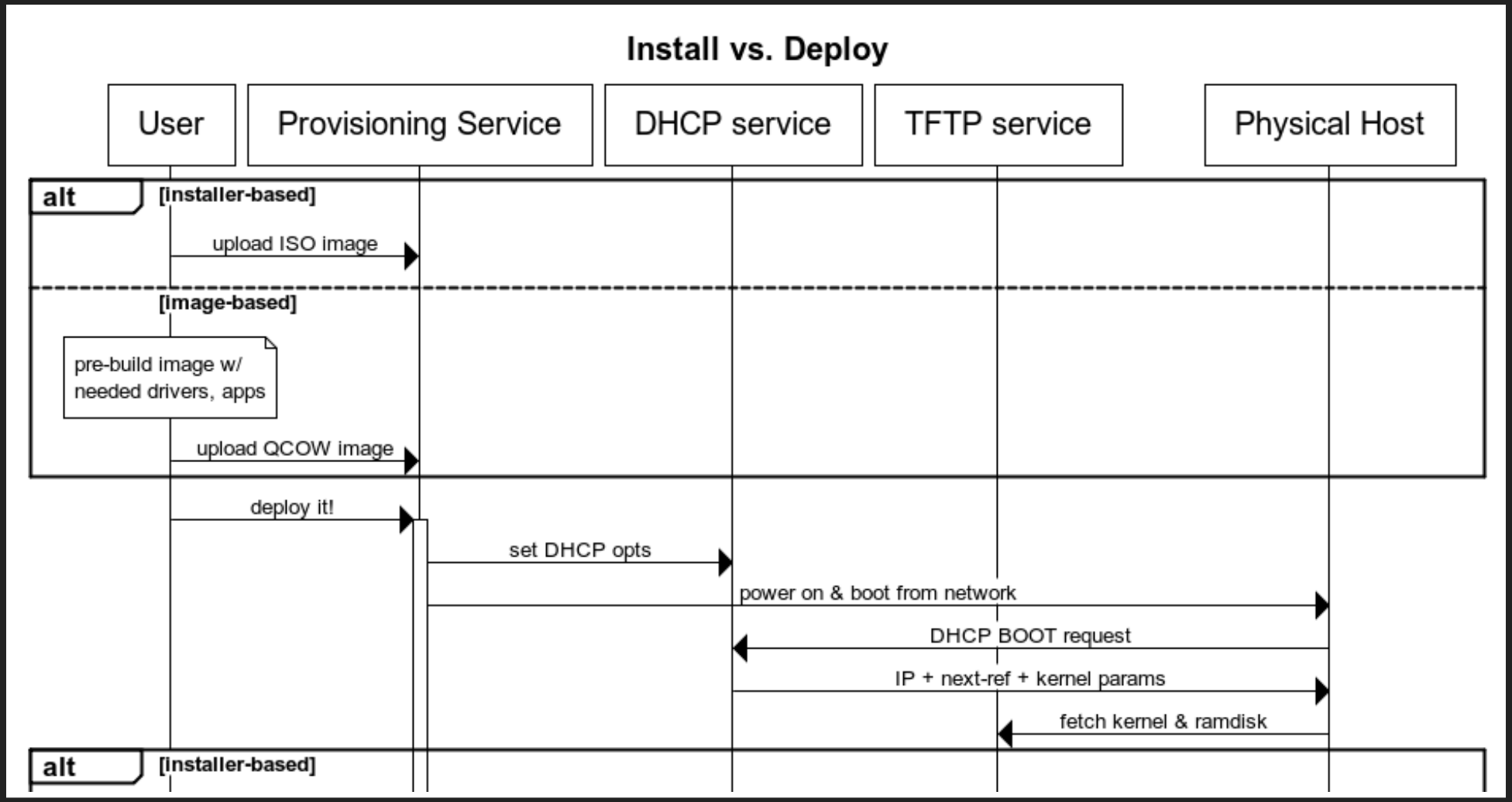


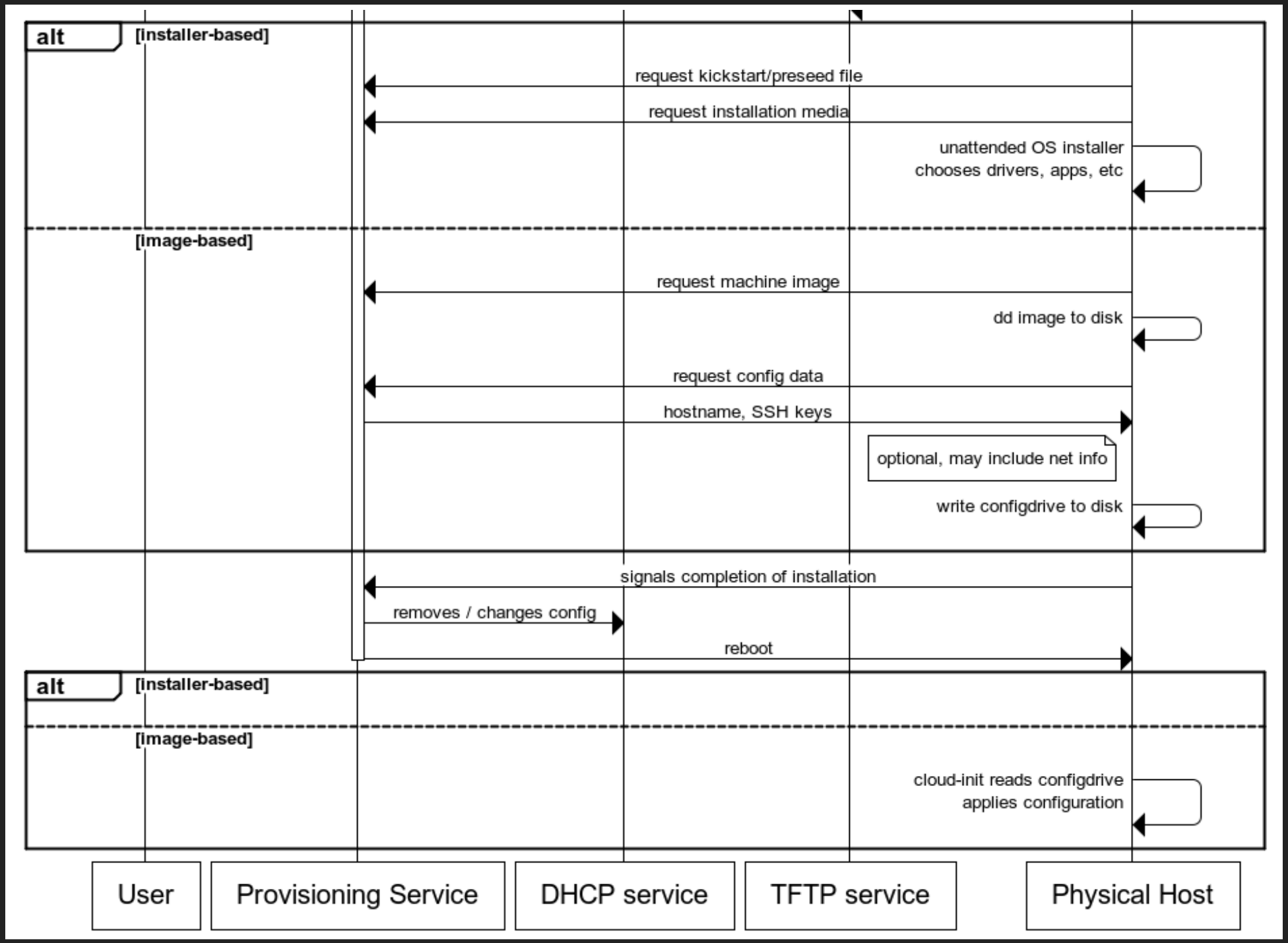
```
nova boot \
    --flavor baremetal.high_mem \
    --image Ubuntu_Trusty \
    --key-name my_keypair \
    my_high_mem_server
```

Every company* had built framework
for PXE boot & install OS

* every company that owns hardware

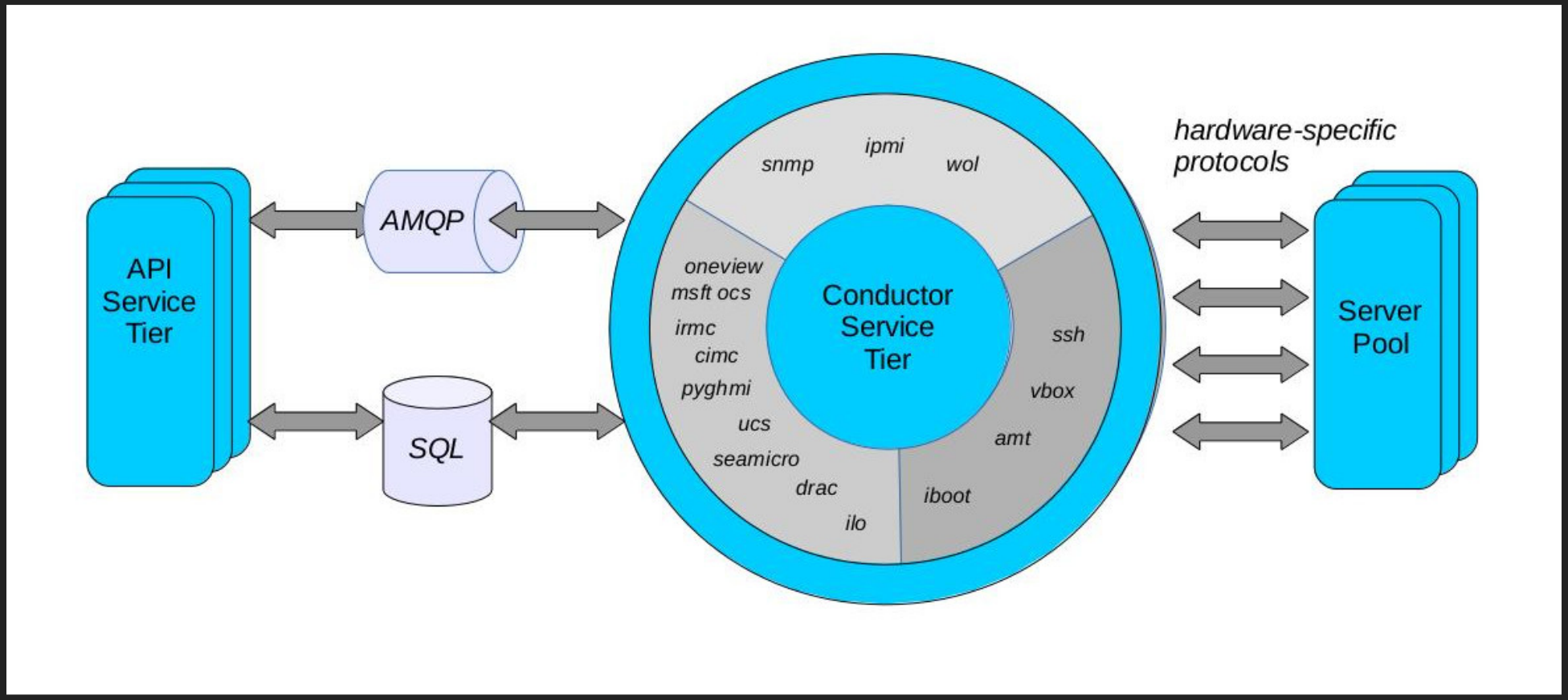
However, binary image copy
improves repeatability, reduces entropy


Install vs. Deploy
User
Provisioning Service
DHCP service
TFTP service
Physical Host
alt
[installer-based]
upload ISO image
[image-based]
pre-build image w/
needed drivers, apps
upload QCOW image
deploy it!
set DHCP opts
power on & boot from network
DHCP BOOT request
IP + next-ref + kernel params
fetch kernel & ramdisk
alt
[installer-based]


alt
[installer-based]
request kickstart/preseed file
request installation media
unattended OS installer
chooses drivers, apps, etc
[image-based]
request machine image
dd image to disk
request config data
hostname, SSH keys
optional, may include net info
write configdrive to disk
signals completion of installation
removes / changes config
reboot
alt
[installer-based]
[image-based]
cloud-init reads configdrive
applies configuration
User
Provisioning Service
DHCP service
TFTP service
Physical Host

ARCHITECTURE

SERVICE COMPONENTS



STANDARD PROTOCOLS

Power

- **IPMI:** intelligent platform management interface, for remote control of machine power state, boot device, serial console, etc.
- **SNMP:** simple network management protocol, often used with Power Distribution Units for remote control of power status.

STANDARD PROTOCOLS

<u>Boot</u>

- **DHCP:** dynamic host configuration protocol, used to locate the NBP on the network, and provide the host OS with IP address during init
- **TFTP:** trivial file transfer protocol, copies the NBP over the network
- **PXE:** pre-boot execution environment, allows host to boot from network
- **[g,i]PXE:** recent enhancements make PXE more flexible, supported on most hardware

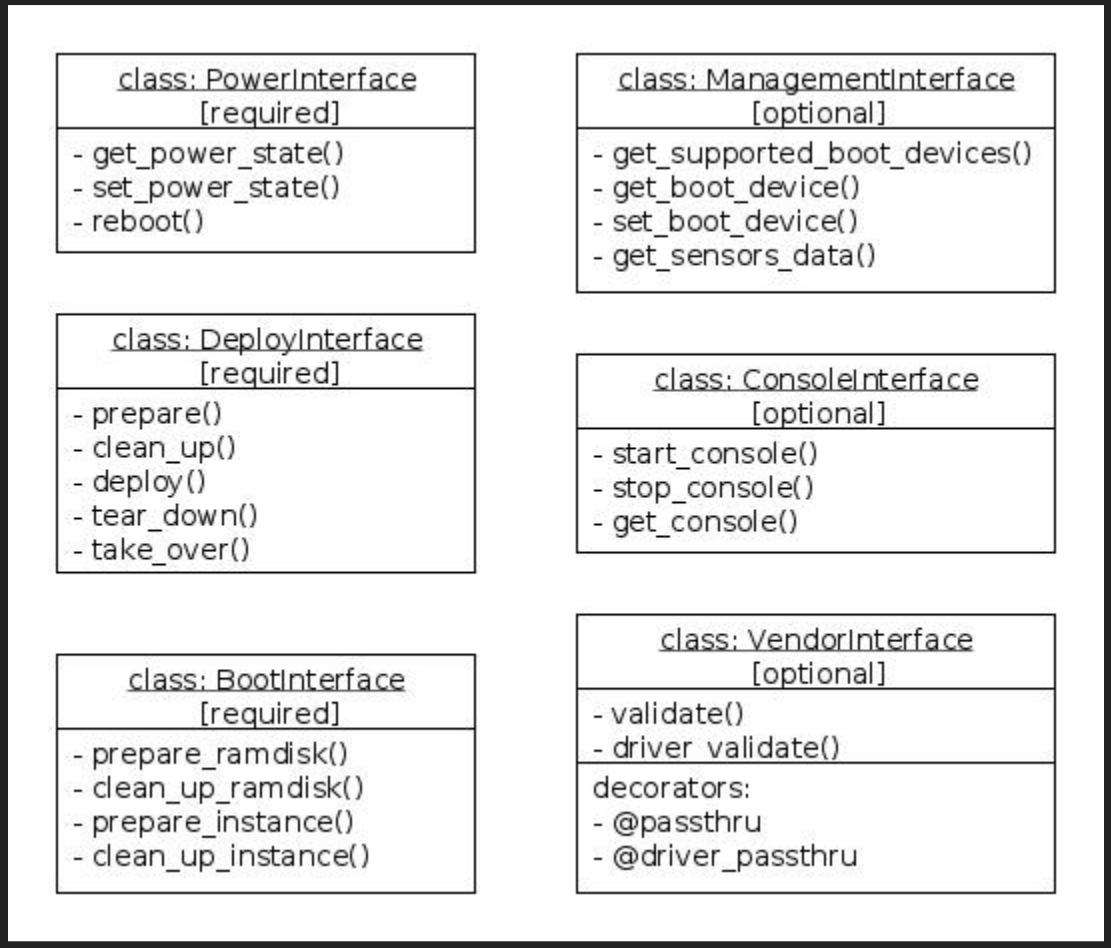
IPMI has not changed in the last 10 years

DMTF just published "Redfish" spec ...
but ...

Vendor value is derived from quality of
hardware, services, support, and integration

not from proprietary solutions to common problems

DRIVER API


class: PowerInterface
[required]
- get_power_state()
- set_power_state()
- reboot()
class: DeployInterface
[required]
- prepare()
- clean_up()
- deploy()
- tear_down()
- take_over()
class: BootInterface
[required]
- prepare_ramdisk()
- clean_up_ramdisk()
- prepare_instance()
- clean_up_instance()
class: ManagementInterface
[optional]
- get_supported_boot_devices()
- get_boot_device()
- set_boot_device()
- get_sensors_data()
class: ConsoleInterface
[optional]
- start_console()
- stop_console()
- get_console()
class: VendorInterface
[optional]
- validate()
- driver_validate()
decorators:
- @passthru
- @driver_passthru

simplicity → *flexibility*

consistency → *repeatability*

GET /v1/nodes/

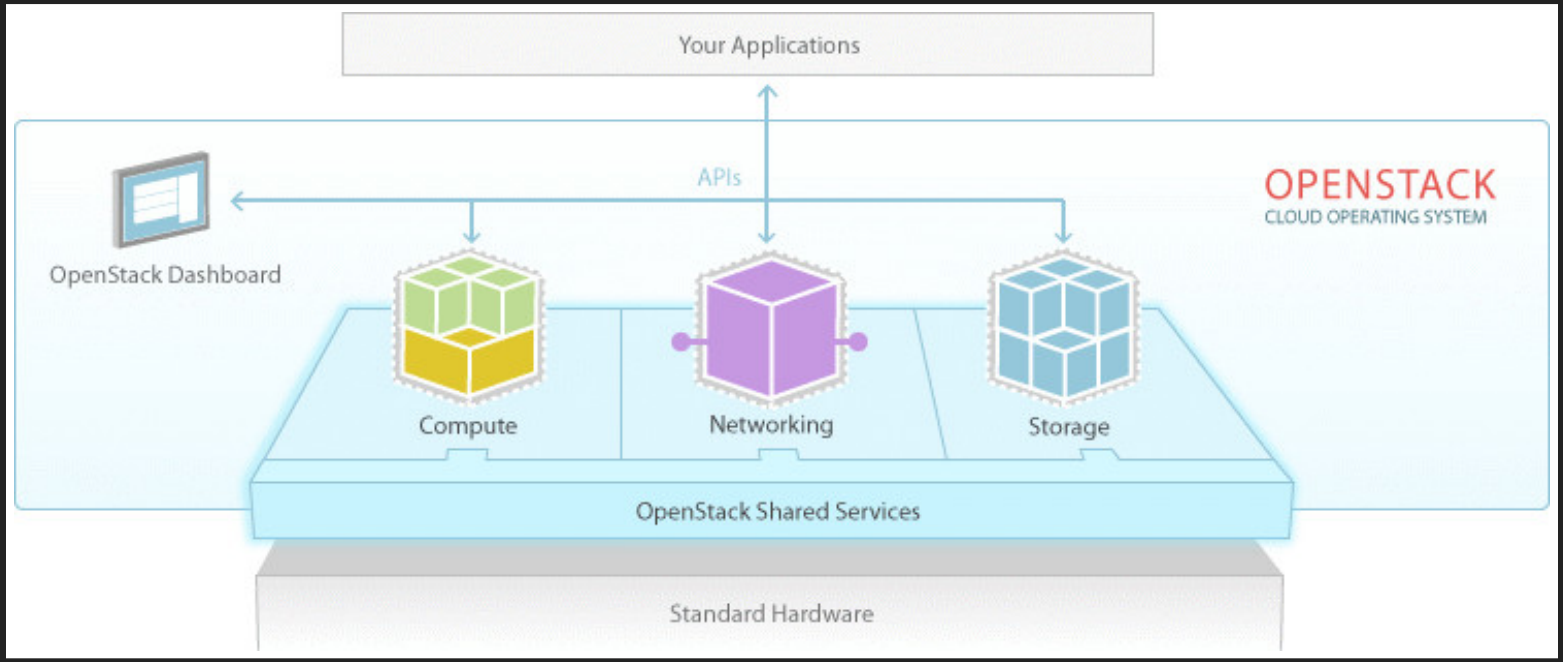
```
{
   "nodes" : [
      {
         "name" : "nuc",
         "maintenance" : false,
         "instance_uuid" : null,
         "power_state" : "power off",
         "uuid" : "ba031dea-e7a8-4917-89f1-0f3ad31344ee",
         "provision_state" : "available"
         "links" : [
              .... snip ....
         ],
      },
   ]
}
```

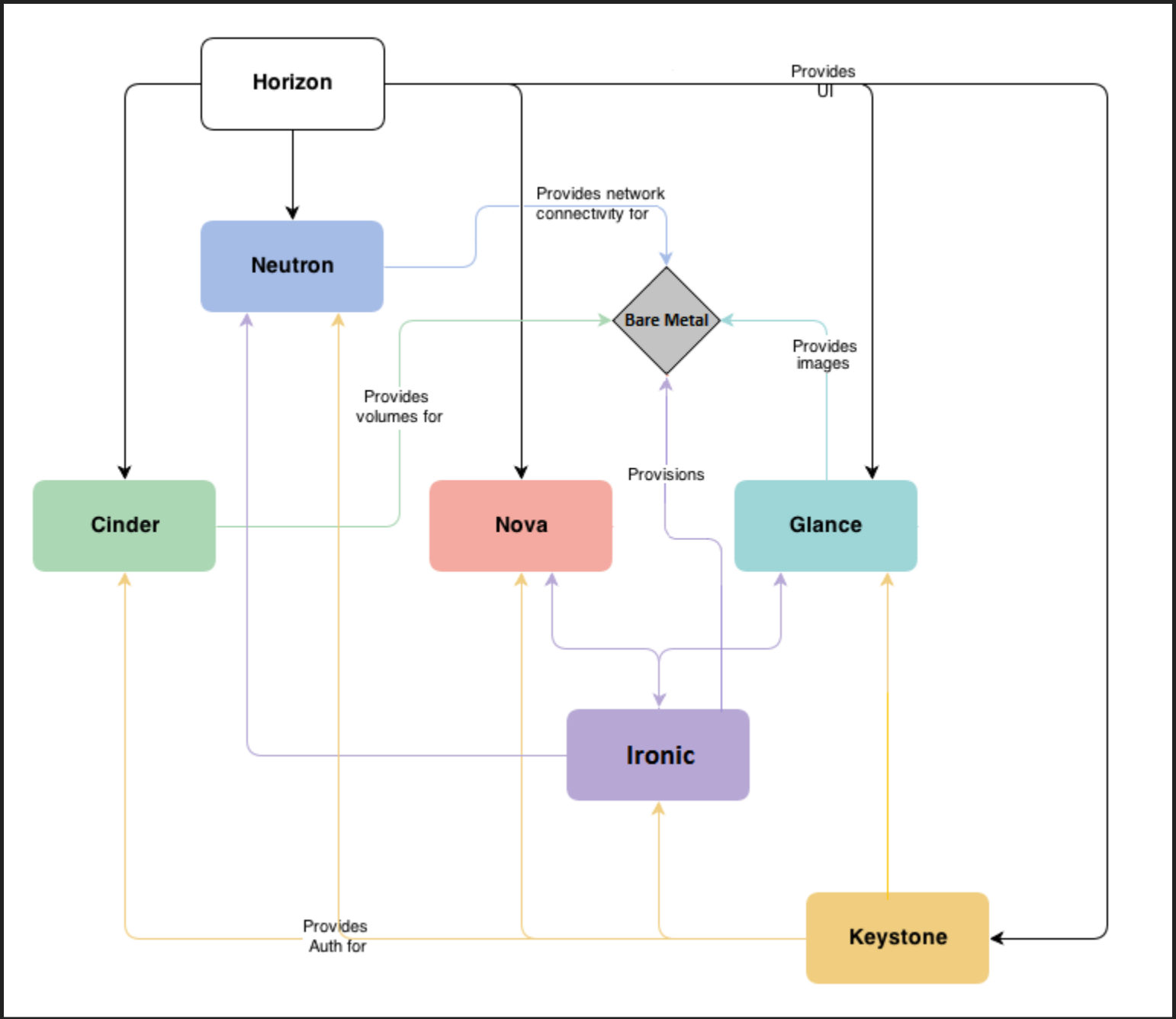
GET /v1/nodes/ba031dea-e7a8-4917-89f1-0f3ad31344ee

```
{
   "name" : "nuc",                                          # human reada
   "uuid" : "ba031dea-e7a8-4917-89f1-0f3ad31344ee",         # canonical r
   "driver" : "pxe_amt",                                    # hardware dr
   "properties" : {                                         # hardware ch
      "ram" : 8096,
      "cpu_arch" : "x86_64",
      "cpus" : 2,
      "disk_size" : 500
   },
   "driver_info" : {                                        # driver mana
      "amt_password" : "******",
      "amt_address" : "192.168.2.3",
      "amt_username" : "admin"
   },
   "power_state" : "power off",                             # last known
```

Every driver is different
and requires different `driver_info`

OPERATIONS


Your Applications
APIs
OPENSTACK
CLOUD OPERATING SYSTEM
OpenStack Dashboard
Compute
Networking
Storage
OpenStack Shared Services
Standard Hardware


Horizon
Provides UI
Neutron
Provides network connectivity for
Bare Metal
Provides images
Provides volumes for
Provisions
Cinder
Nova
Glance
Ironic
Keystone
Provides Auth for

"Thousands" of servers managed today per region.

However...

- Parallel deploys can saturate network
- Periodic health checking can be delayed by bad BMCs
- Nova scheduler does resource selection in Python
- Neutron DHCP config reload is slow

"But OpenStack is too complex!
Is there a simple alternative?"

Yes
Run Ironic straight from Ansible.


Bifrost?!?

First

input environment vars

```
$ cat bifrost/playbooks/inventory
---
node_default_network_interface: eth0
network_interface: eth2
ipv4_subnet_mask: 255.255.255.0
ipv4_gateway: 192.168.1.1
ipv4_nameserver: 8.8.8.8
dhcp_pool_start: 192.168.2.200
dhcp_pool_end: 192.168.2.250
deploy_kernel: "{{http_boot_folder}}/coreos_production_pxe.vmlinuz"
deploy_ramdisk: "{{http_boot_folder}}/coreos_production_pxe_image-oem
deploy_image_filename: "deployment_image.qcow2"
deploy_image: "{{http_boot_folder}}/{{deploy_image_filename}}"
```

Then **Install**
external dependencies & environment prep

```
$ bash ./scripts/env-setup.sh
$ source /opt/stack/ansible/hacking/env-setup
$ cd playbooks

$ ansible-playbook -K -vvvv -i inventory/localhost install.yaml
```

Then **Enroll** with an inventory file

```
$ ansible-playbook -vvvv -i inventory/localhost enroll.yaml \
    -e baremetal_csv_file=baremetal.csv
```

or by using CLI to create Nodes, Ports

```
$ ironic node-create -d agent_amttool -n nuc \
    -i amt_password='Pa$$w0rd' -i amt_address='192.168.2.3' -i amt_us
    -p cpu_arch=x86_64 -p local_gb=64 -p memory_mb=8192 -p cpus=2 \
    -i deploy_ramdisk='http://192.168.2.2:8080/coreos_production_pxe_
    -i deploy_kernel='http://192.168.2.2:8080/coreos_production_pxe.v

$ ironic port-create -n $UUID -a ec:a8:6b:fe:e1:b0
```

Finally, **Deploy**
from the inventory file
or hit all inventory in Ironic

```
$ ansible-playbook -vvvv -i inventory/bifrost_inventory.py \
    deploy-dynamic.yaml
```

DEMO?

Q & A?

THANKS!

@devananda

devananda.github.io/talks

github.com/openstack/ironic
github.com/openstack/bifrost