Dynamic Provisioning with sNow! Cluster Manager

Jordi Blasco
Co-founder & CTO
Business Model
GNU + Professional Support

sNow! is available under the GNU General Public License.
Why sNow!?

Main Features

**Painless Deployment**

sNow! domains are unattended deployed by pre-defined roles. Those roles, are shell scripts which make them easy to develop and to understand.

**Easy to Integrate**

sNow! domains allow integrating site-specific needs without overhead. The hook rich architecture allows integrating uncommon needs easily.

**Fault Tolerant**

The sNow! architecture has been designed to leverage fault tolerant services for HPC environments, where downtime is not an option.

**DevOps Friendly**

sNoW! domains are key to develop a real DevOps friendly solution, easy to interact, develop, rebuild and also accommodate Continuous Integration needs.

**Community Driven**

Your feedback, suggestions, and requirements have an impact on the development and in the roadmap of the project.
sNow! as Convergence Solution
HPC Cluster, Singularity, Docker Swarm, OpenNebula

HPC users need more than just compute solution

- **Workflow**: Pre-processing and post-processing, workflow frameworks,
- **Web services**: RStudio, Galaxy, Jupyter notebook, JMS,
- **Software managers**: Anaconda, EasyBuild, Spack,
- **Prebuilt software**: Docker, Singularity, VM image (NeuroDebian,..),
sNow! has setup the fundamental technology to deliver complete HPC solutions and extended to cover other critical needs.
sNow! as Convergence Solution
HPC Cluster, Singularity, Docker Swarm, OpenNebula

sNow! provides response to the long tail of research and engineering needs and also allows to dynamically re-architect/re-purpose the HPC solution to accommodate them.
sNow! as Convergence Solution
cluster provisioning improvements

1. Faster Cluster Provisioning
   Reduced network load from ~1GB/node to ~28MB/node. If TFTP broadcast is used, then the load is reduced to ~28MB/cluster.

2. Smaller Memory Footprint
   Stateless image and SSI provisioning memory footprint has been reduced from several Gigabytes to just 35MB.

3. Easier Administration
   Single System Image (SSI) allows applying changes online atomically. One change in the shared rootfs is applied everywhere at the same time.

4. Cost Reduction
   License cost is mitigated thanks to the SSI architecture. Also, there is no longer need for local disks for provisioning the OS.

5. Improved Resilience
   Moving the rootfs from unreliable local disks to cluster file system improve the resilience significantly.
sNow! as Convergence Solution
HPC Cluster, Singularity, Docker Swarm, OpenNebula

Dynamic Provisioning with sNow! Cluster Manager - Jordi Blasco
sNow! as Convergence Solution
Hybrid Solution: HPC Cluster, Docker Swarm & OpenNebula*

* Manual intervention required
sNow! as Convergence Solution
Current Challenges

**elasticity**
Docker Swarm and OpenNebula do not support auto-scaling services based on metrics out of the box.

**scaling**
Docker Swarm and OpenNebula do not support auto-scaling machines out of the box.

**power**
Docker Swarm and OpenNebula do not support scale down by draining and removing nodes.

* Manual intervention required

Dynamic Provisioning with sNow! Cluster Manager - Jordi Blasco
sNow! as Convergence Solution
Dynamic Provisioning of HPC Cluster, Docker Swarm & OpenNebula*

* Dynamic and Unattended - Under development
sNow! as Convergence Solution
claim and release resources

1. **Claim Resource**
   - `snow set node X --state=slurm`
   - `snow set node X --state=one`
   - `snow set node X --state=swarm`

2. **Use Resource**
   - `scontrol update node=X state=RESUME`
   - `onehost enable X`
   - `docker node update --availability active X`

3. **Release Resource**
   - `snow set node X --state=idle`

4. **Release Resource**
   - `scontrol update node=X state=DOWN`
   - `onehost offline X`
   - `docker node update --availability drain X`

* Dynamic provisioning is under development. Expected to be available in the new major release 2.0
sNow! as Convergence Solution

next step: sensors and business rules

* Dynamic provisioning is under development. Expected to be available in the new major release 2.0
“The best way to predict the future is to invent it.”

-- Alan Kay