HAL
open science

Efficient and Scalable OS Provisioning with Kadeploy 3

Emmanuel Jeanvoine, Luc Sarzyniec, Lucas Nussbaum

To cite this version:

Emmanuel Jeanvoine, Luc Sarzyniec, Lucas Nussbaum. Efficient and Scalable OS Provisioning with Kadeploy 3. JRES - Journées Réseaux - 2013, Dec 2013, Montpellier, France. 2013. hal-00920358

HAL Id: hal-00920358

https://inria.hal.science/hal-00920358v1

Submitted on 18 Dec 2013

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Efficient and Scalable OS Provisioning with Kadeploy3

Emmanuel Jeanvoine, Luc Sarzyniec and Lucas Nussbaum

Key features

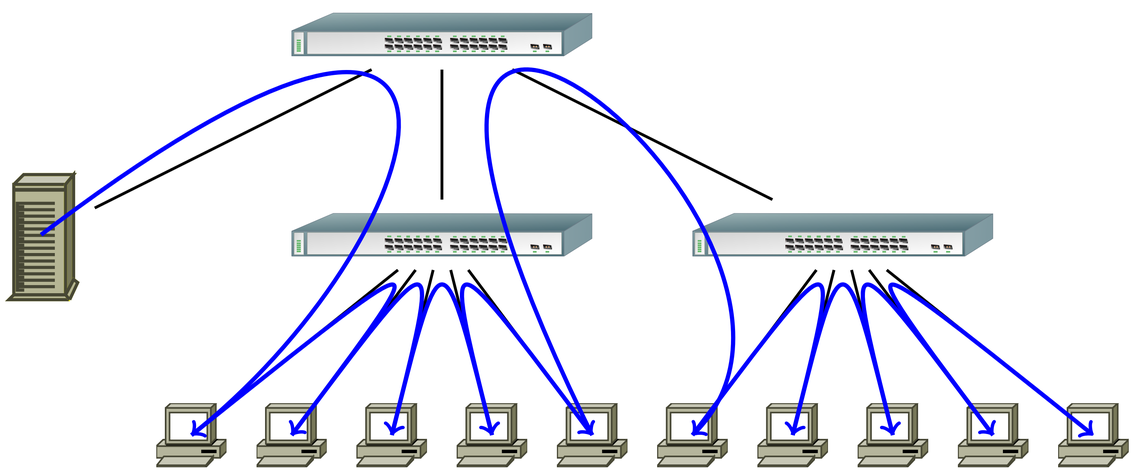
- **Install and configure a large number of nodes**
  - Install several cluster in one shot
  - Support for concurrent deployments
  - Control several clusters from a single client
- **Manage a library of pre-configured system images**
  - User-provided images
  - Visibility of images (shared, private)
- **Reliability of the installation process**
  - Customizable workflow engine
  - Windowed operations
  - Escalation of low-level remote commands
- **Hardware compatibility**
  - Built on top of PXE, DHCP, TFTP/HTTP
  - Remote operations based on SSH
  - Customizable remote low-level operations (IPMI, ...)
- **Software compatibility**
  - Support any operating system (Linux, *BSD, Windows, ...)
  - Integration with batch scheduler and network isolation tools
  - Remote control API

Scalability

System image broadcast

Goal: Send a big file on thousands of nodes
Challenge: Avoid network bottlenecks, saturation of links

- **Several alternatives available**
  - Chain, Tree, Bittorrent, ...



- Default alternative: **Topology-aware chain broadcast**
  - Parallel tree-based initialization of the chain
  - **Saturation of full-duplex** network in both directions
  - Efficient on networks composed of **hierarchy of switches**

Parallel operations

Goal: Executing commands on thousands of nodes
Challenge: Avoid client overloading, gather commands outputs

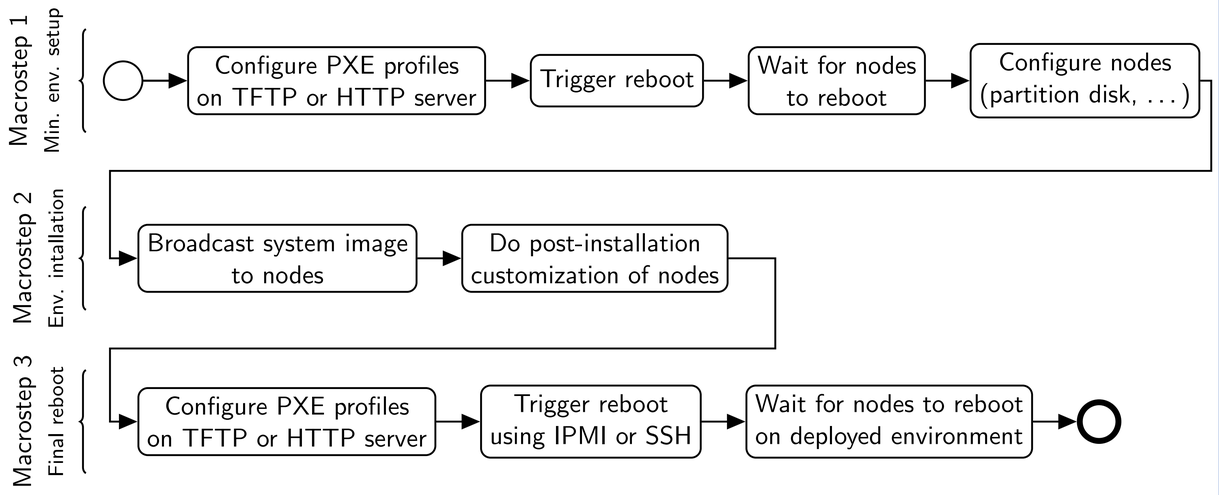
- Based on **TakTuk** (`http://taktuk.gforge.inria.fr`)
- **Hierarchical connections** between nodes
- Adaptative work-stealing algorithm
- **Auto-propagation** mechanism

Reliability

Reliable workflow engine

Goal: Manage the installation process
Challenge: Handle hardware & network failures, customization

- Engine based on **event automata**
- **Fallback methods** in case of failure
- Timeouts and retries at every step
- A typical workflow example:



Reliable reboot and power operations

Goal: Trigger remote reboot and power on/off on nodes
Challenge: Reliability, compatibility

- **Compatibility** with remote hardware managements protocols
- **Escalation** of several level of administrator defined commands
- Managing groups of nodes (e.g. PDU reboots)
- **Windowed operations** (DHCP flood, electrical hazards, ...)

Evaluation

- Key software on Grid'5000 **since 2009**
  - **25 clusters on 10 sites**
  - 620 users, **170 000 deployments**
  - about **10 mins** to deploy 130 nodes
- Virtualized infrastructure
  - **4000 VMs** dispatched on **635 physical nodes**
  - **3838 nodes** successful in a single shot in **less than 1 hour**

Software suite

- **Management of images**
  - User custom images
- **Rights management**
  - Compatibility with batch scheduler
- **Statistics collection**
  - Identify hardware issues, ...
- **Frontends to low-level tools**
  - Reboot and power on/off operations, serial consoles
- **DEB** and **RPM** packages
- Actively developed since 2009

http://kadeploy3.gforge.inria.fr/

Grid'5000 · Inria informatics mathematics · Université de Lorraine · Loria Laboratoire lorrain de recherche en informatique et ses applications · jres Montpellier 2013