Overview:
What is GSI/FAIR?
What is Infrastructure as Code?
How did we use it?
Summary
GSI: a German National Lab for Heavy Ion Research

FAIR: Facility for Ion and Antiproton Research ~2018

GSI computing 2011
- ALICE T2/T3
- HADES
- ~ 4000 cores,
- ~ 2 PB lustre
- Topical Center LQCD

FAIR computing 2018
- CBM
- PANDA
- NuSTAR
- APPA
- LQCD
- 300000 cores
- 40 PB disk
- 40 PB archive

open source and community software
budget commodity hardware
support different communities
scarce manpower
Goal:
Ease the deployment and operation of scientific applications and their infrastructure:

- on various IaaS clouds,
- by adopting the *Infrastructure as Code* concept.

"Enable the reconstruction of the business from nothing but a source code repository, an application data backup, and bare metal resources."

Deploying and operating infrastructure and applications not manual or ad-hoc but by code.

Via network accessible APIs.

No manual intervention in production systems.

Every change under version control.

John Allspaw, Jesse Robbins
*Web Operations, Keeping the Data On Time*
Chapter 5: *Infrastructure As Code*, by Adam Jacob
Our Testbeds:

SC Lab: IaaS cloud at GSI
  Debian Lenny as host OS with KVM as hypervisor
  OpenNebula using libvirt as virtualization API
  ~ 200 VMs

Frankfurt Cloud: http://www.frankfurt-cloud.com
  VMWare ESX
  CloudController from InContinuum Software

EC2: http://aws.amazon.com
Configuration Management with Chef
http://www.opscode.com/chef

each system you can configure is called a node

nodes have

- **attributes**: information specific to a node

- **roles** and/or **recipes**, combined in **run-lists** or **cookbooks**

**chef-client** runs on all nodes

talking to a **chef-server**

recipes, roles, run-lists, cookbooks are ruby code maintained in a git repository
Chef lets you:

Manage configurations as idempotent resources;

Put resources together as recipes and cookbooks;

Group recipes into roles;

Track it all like source code;

Configure your systems;

Using knife, chef-solo or Chef Server we can orchestrate VMs into whatever we need in a matter of minutes.

http://wiki.opscode.com/display/chef/Architecture
First Experiences: Virtual Cluster on Demand

CMS - Configuration Management System: Chef
DRMS - Distributed Resource Management: Torque
IaaS-cloud – Infrastructure as a Service: OpenNebula
First Experiences: Applications

next steps: 
MPI applications
nonstandard hardware
GPUs, Infiniband, ...
Summary:
Infrastructure as Code - Experience at GSI

Infrastructure as Code

describes infrastructure and applications including installation and maintenance in code.

Use of a centralized configuration management tool like chef and APIs for all components and version control is absolutely essential.

We developed cookbooks to assemble private batch clusters for different users on top of IaaS clouds.

Automation helps

going science done,
not babysitting the computing infrastructure.