CERN and KEK Cloud Service Reports

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Cloud at CERN

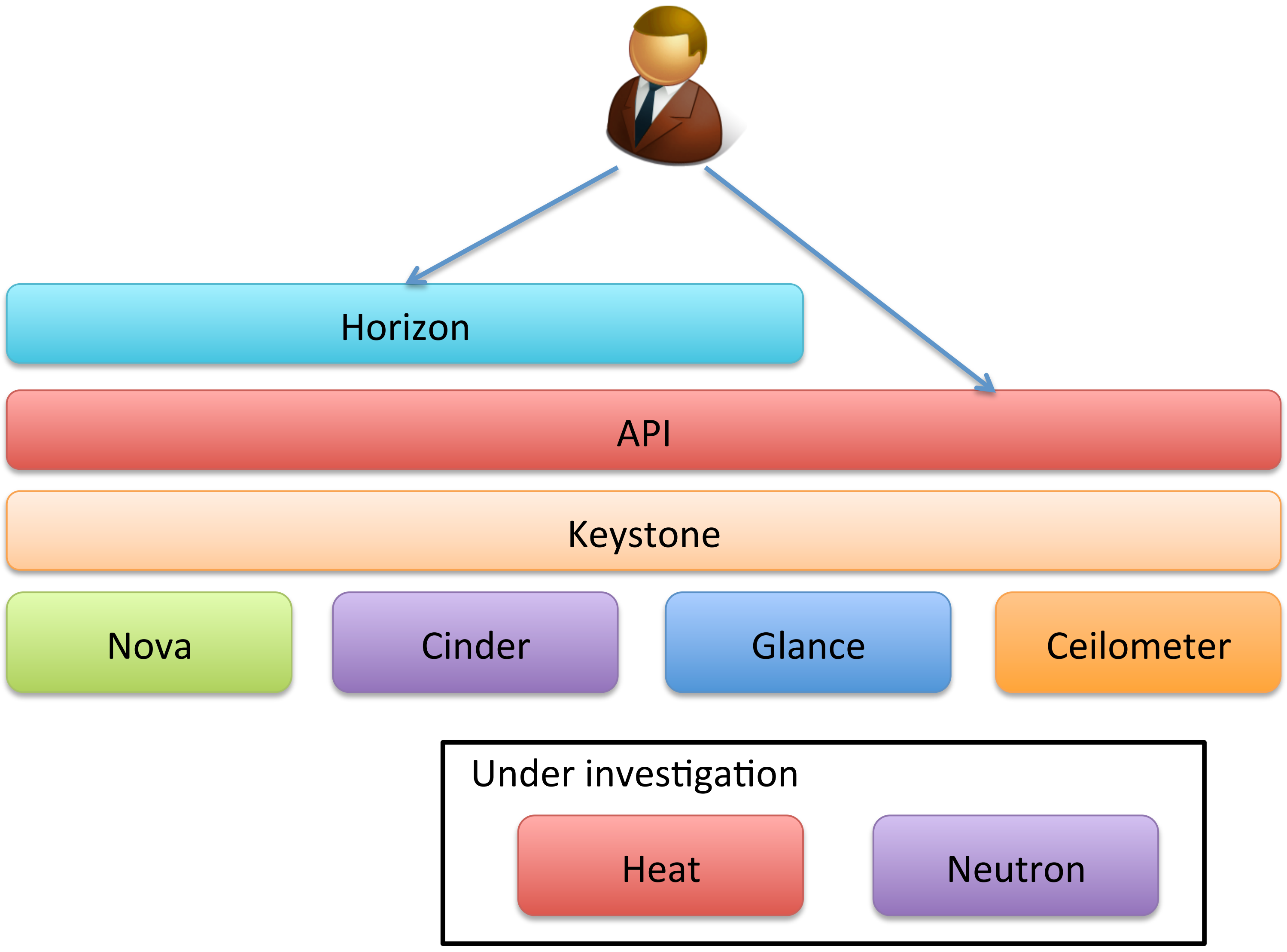
CERN Data Centers in Numbers

	Meyrin	Wigner
Servers	11,000	2,000
Cores	118,000	32,000
RAM (TB)	440	130
Disk (PB)	128	70

Cloud at CERN

- OpenStack Icehouse
  - Upgrading to Juno
- Production service started in July, 2013
- 3,000 hypervisors
  - Meyrin and Wigner
  - KVM
  - Hyper-V
- 1,500 users
- 1,700 tenants
- 9,500 Instances
  - # of instance creation reached 1,000,000!!

Components of CERN Cloud



CERN Cloud Service

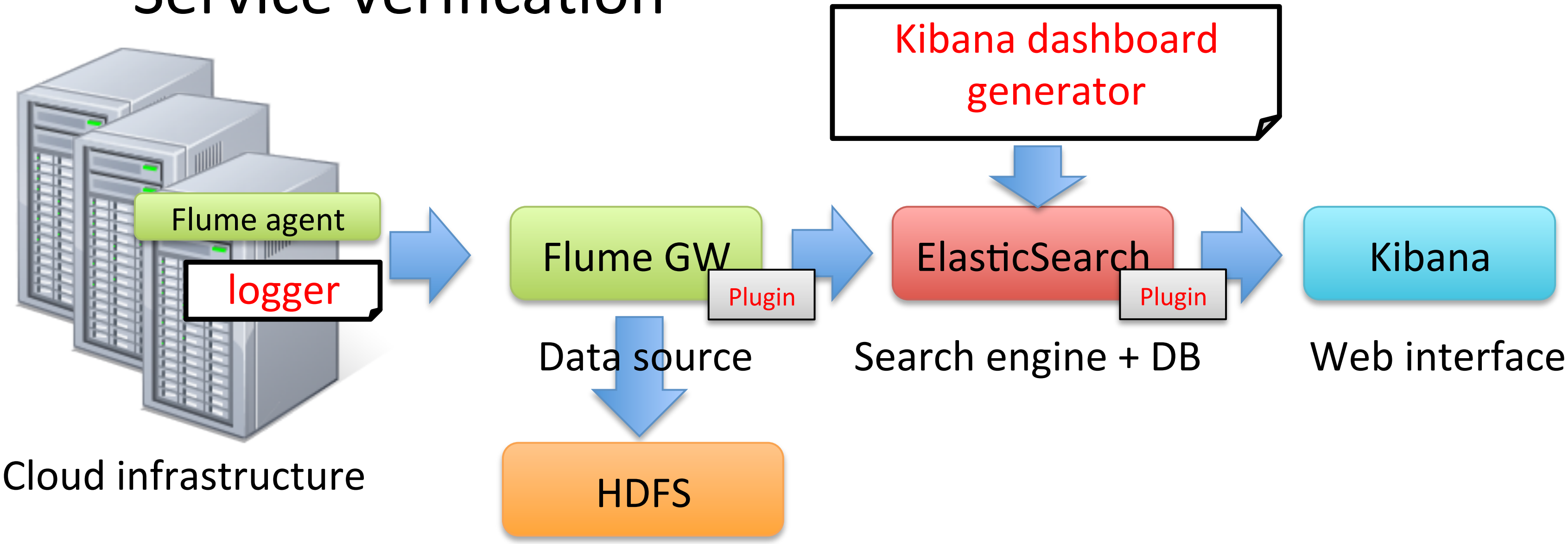
- Provides computing resources to:
  1. Batch service
  2. Experimental groups
  3. Personal users
  4. Departments
- IaaS
  – Just provides OpenStack Tenants
    - Ex. Batch group deploy batch servers to given tenants on their own

What do we do?

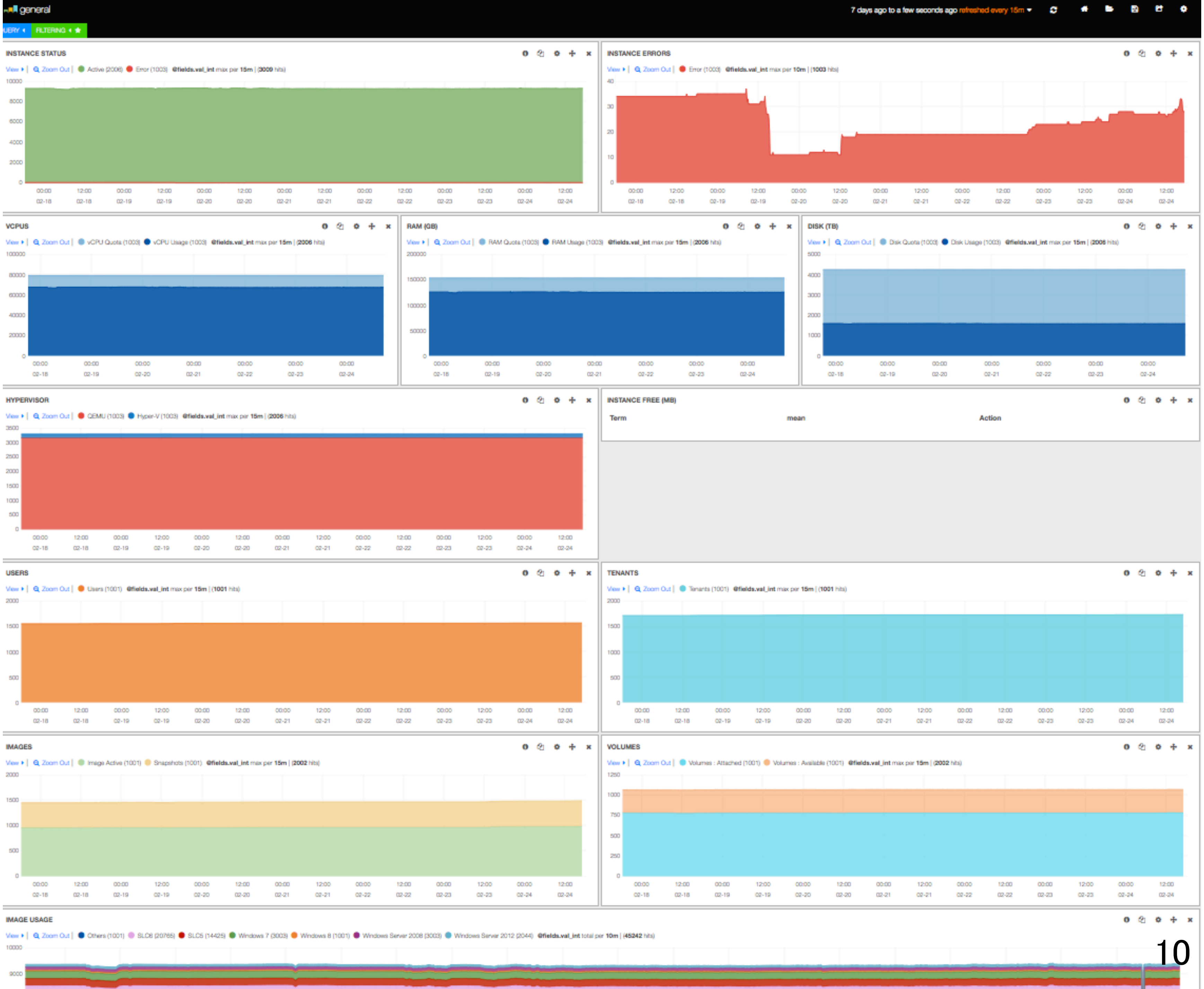
- 15 members work in the team
  - Components management
  - Windows(Hyper-V) support
  - Migration from old virtualization Infrastructure to OpenStack
  - Keystone related developments
    - Federation
    - SSO, Kerberos, X.509 authentications support at CERN
  - Heat and Neutron investigation
  - Workflow automation
  - Monitoring

What am I doing at CERN?

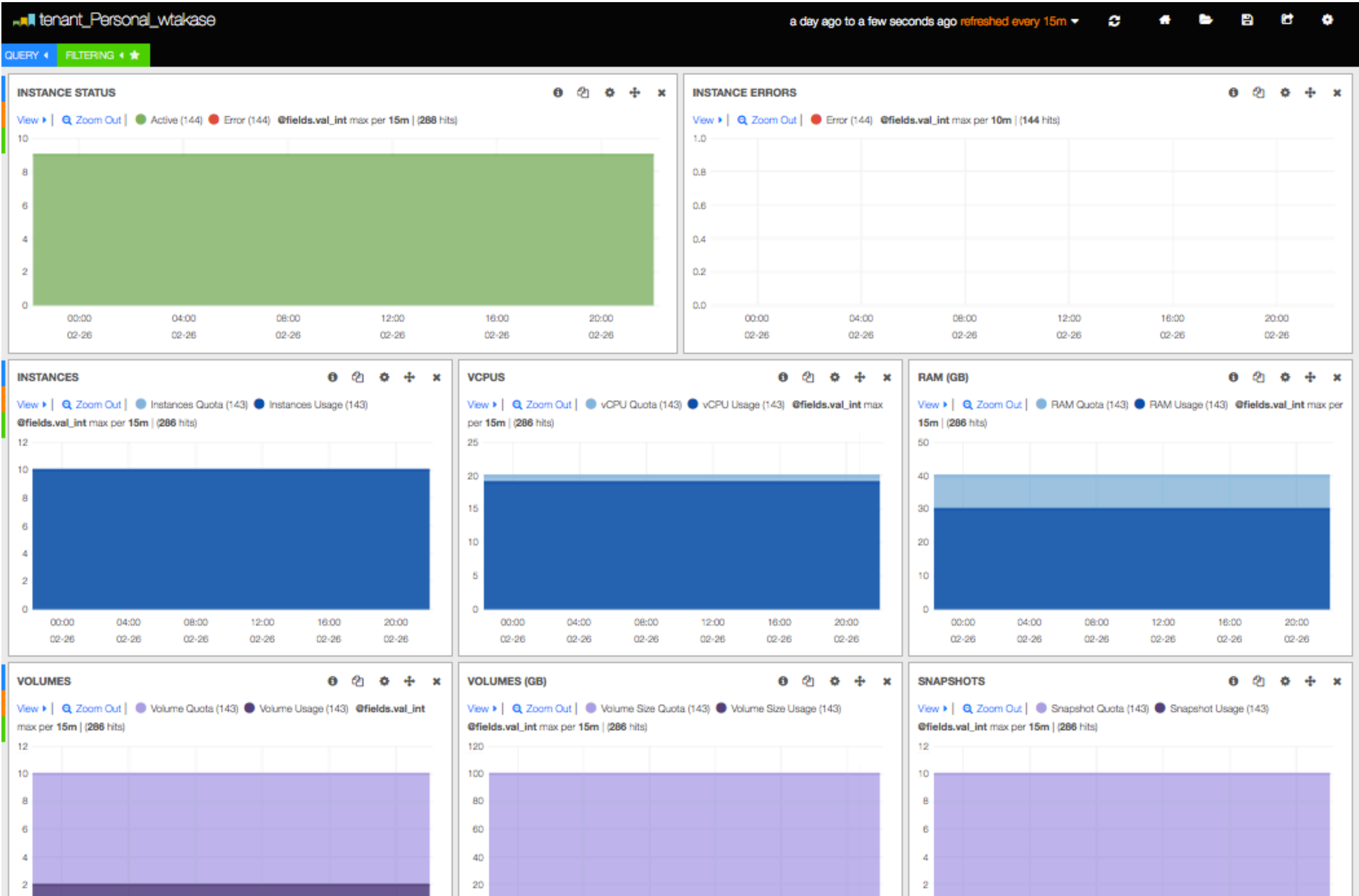
- Monitoring
  - Resource management
  - Service verification



- I am developing and improving of monitoring related tools

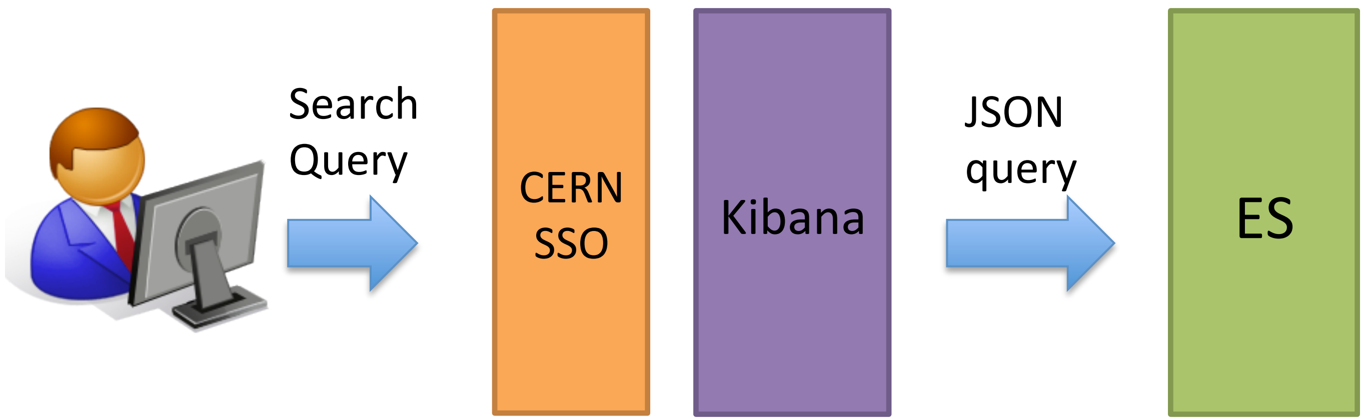

general
7 days ago to a few seconds ago refreshed every 15m
FILTERING
INSTANCE STATUS
Active (2006) Error (1003) @fields.val_int max per 15m | (3009 hits)
INSTANCE ERRORS
Error (1003) @fields.val_int max per 10m | (1003 hits)
VCPUS
vCPU Quota (1003) vCPU Usage (1003) @fields.val_int max per 15m | (2006 hits)
RAM (GB)
RAM Quota (1003) RAM Usage (1003) @fields.val_int max per 15m | (2006 hits)
DISK (TB)
Disk Quota (1003) Disk Usage (1003) @fields.val_int max per 15m | (2006 hits)
HYPERVISOR
QEMU (1003) Hyper-V (1003) @fields.val_int max per 15m | (2006 hits)
INSTANCE FREE (MB)
Term
mean
Action
USERS
Users (1001) @fields.val_int max per 15m | (1001 hits)
TENANTS
Tenants (1001) @fields.val_int max per 15m | (1001 hits)
IMAGES
Image Active (1001) Snapshots (1001) @fields.val_int max per 15m | (2002 hits)
VOLUMES
Volumes : Attached (1001) Volumes : Available (1001) @fields.val_int max per 15m | (2002 hits)
IMAGE USAGE
Others (1001) SLC6 (20765) SLC5 (14425) Windows 7 (3003) Windows 8 (1001) Windows Server 2008 (3003) Windows Server 2012 (2044) @fields.val_int total per 10m | (45242 hits)

Resource Usage Dashboards for Each Tenant



Published Kibana Dashboard to Users

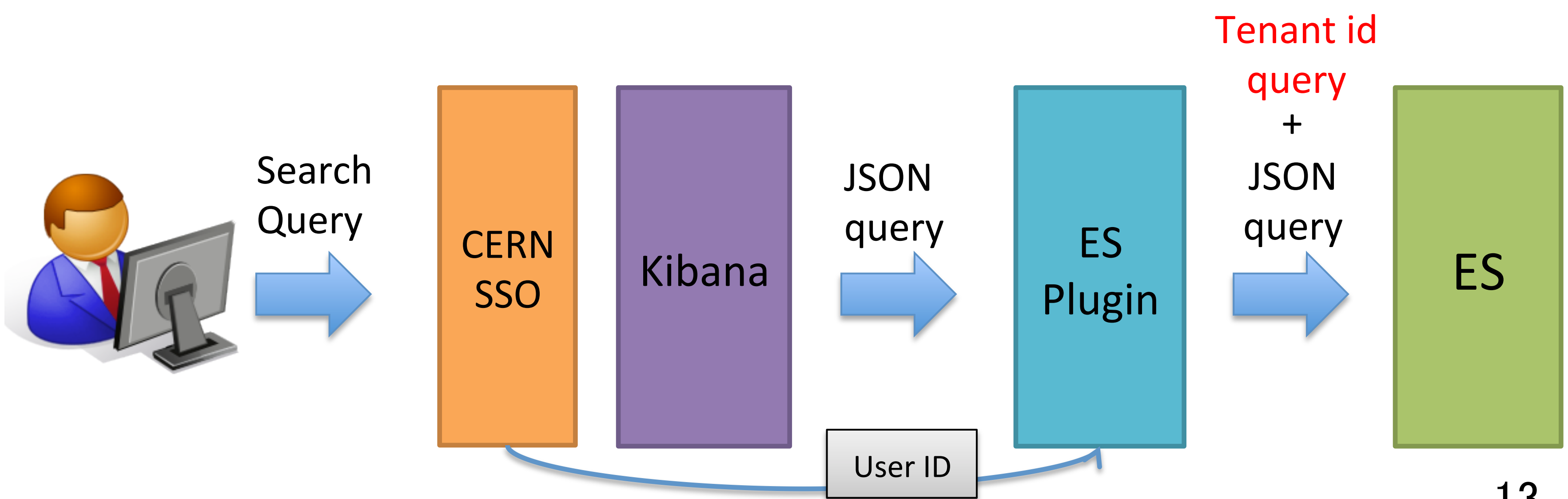
- Kibana and ElasticSearch don't have access control function
- All users who can access to Kibana can see all dashboards



- Needed to consider how to limit user request:
  - Ex. User-A can see only User-A tenant dashboard.

Solution: Creating ElasticSearch Plugin

- Plugin appends user specific query
  – tenant_id="xxxxxxxxx"
- User gets result related to own tenants



Working on Rally

- Benchmarking tool for OpenStack
  - https://github.com/stackforge/rally
- Rally provides more than 100 test scenarios:
  - Boot server and migrate it
  - Create image and boot server
  - Create volume and attach to server
  - …

What does Rally Provide for CERN Cloud?

- Cloud verification
- Check services work correctly
  - Rally runs against QA and Production environments regularly
  - We can compare results between the environments
- I am:
  - Deploying Rally
  - Creating a patch which allows non-admin user to test
  - Adding test scenarios
    - Contributing to upstream
  - Creating Kibana dashboard for checking test result

Rally Monitoring Page on Kibana

CernVM Workshop (March 5-6, 2015)

- CernVM is small virtual machine image
  - Kernel + CernVM-FS client < 15MB
  - OS is downloaded on demand from CernVM-FS
    - SL4, SL5, SL6
- Creating elastic cluster on Cloud
  - Cloud EC2 API + CernVM + CernVM-FS + Contextualization + HTCondor

https://indico.cern.ch/event/348657

CernVM Workshop (March 5-6, 2015)

- ALICE cloud usage
  - CernVM + CernVM-FS + HTCondor + elastiq + Clouds(EC2 API)
    - https://indico.cern.ch/event/348657/session/0/contribution/28/material/slides/0.pdf
- ATLAS cloud usage
  - CernVM + CernVM-FS + HTCondor + Cloud Scheduler + Multiple Clouds(Amazon EC2, OpenStack, GCE...)
    - https://indico.cern.ch/event/348657/session/1/contribution/7/material/slides/1.pdf

Cloud at KEK

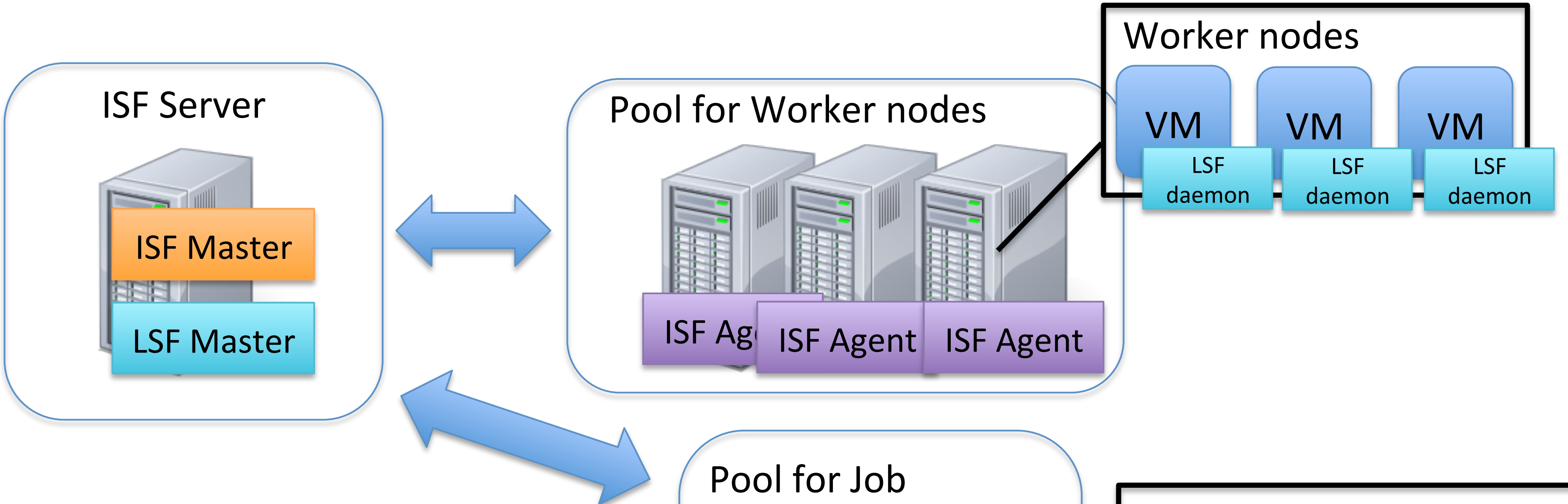
KEK Cloud

- Provides servers to experimental groups
  - Specific OSs and packages
    - Batch worker nodes
    - Service nodes for data analysis
- PaaS
- Under testing
  - Platform ISF

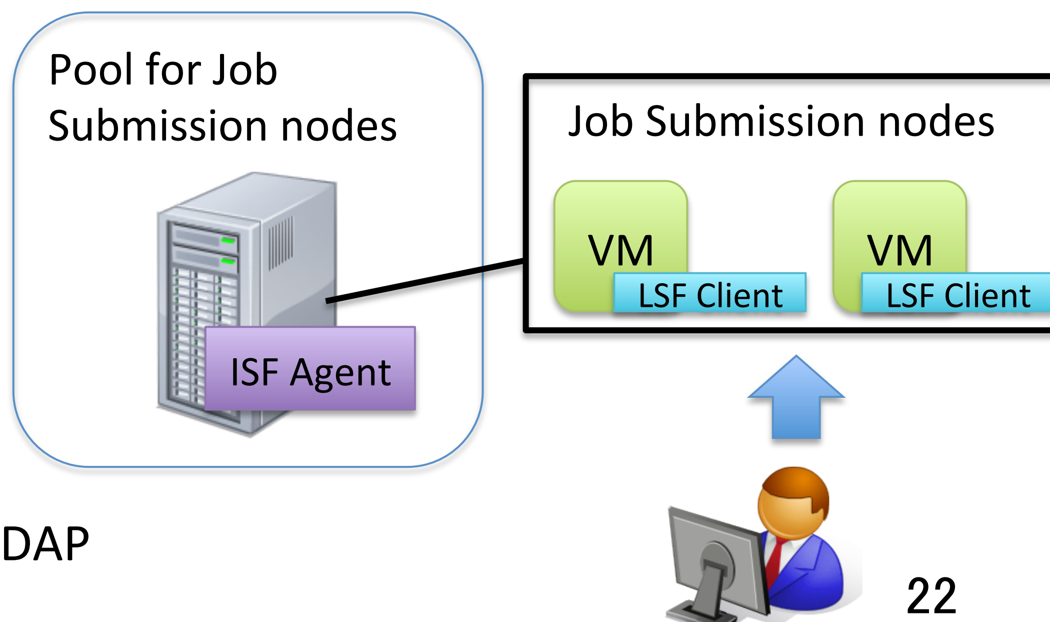
What is Platform ISF?

- Dynamic resource management software
  - Scheduling
  - Managing resources
  - Provisioning virtual clusters
- Can provision instances triggered by LSF job with LSF plugin
- Can do bare metal provisioning with xCAT
  - xCAT: Open source cluster management software

Test Environment at KEK

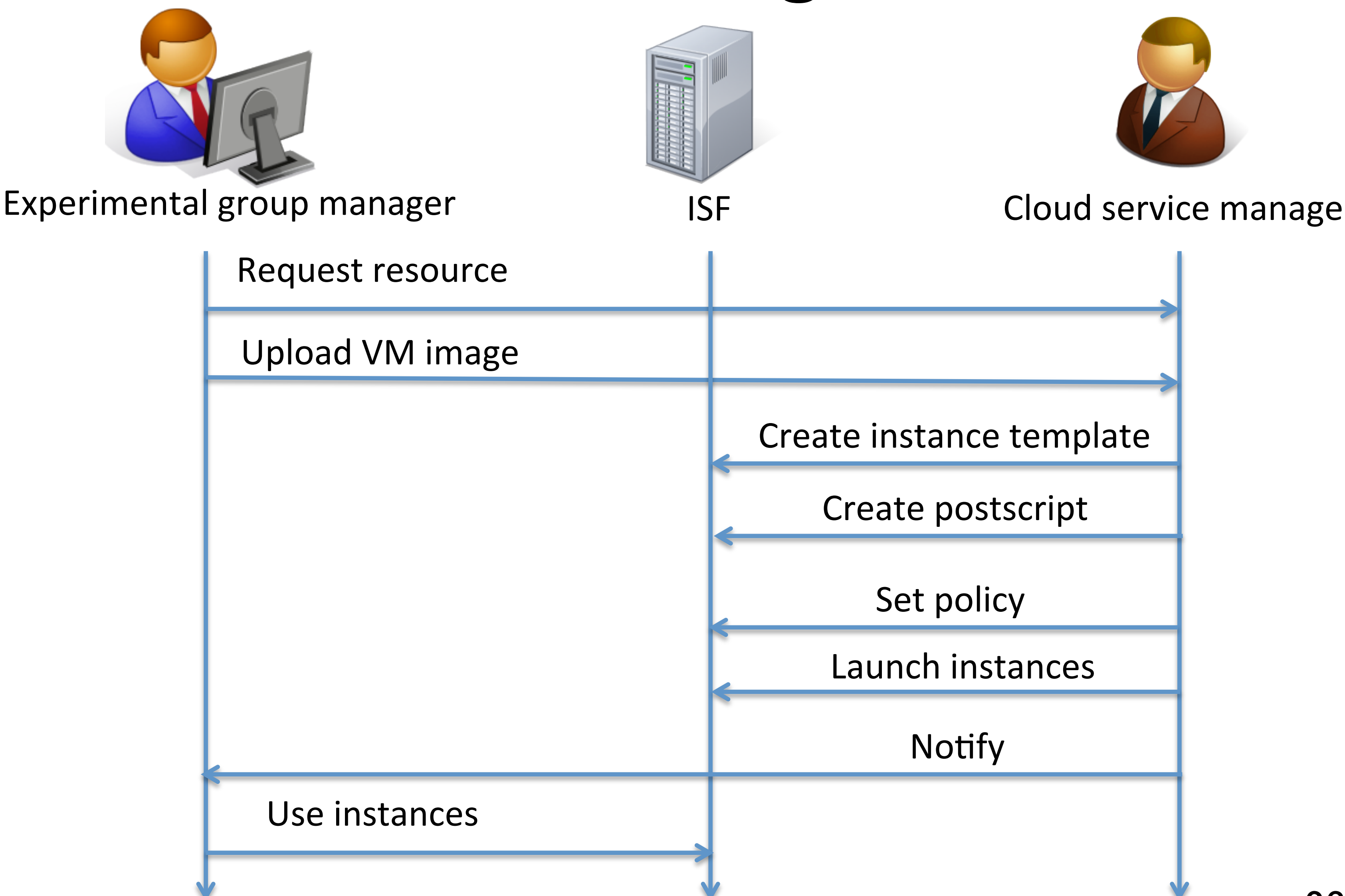


	Submission	Worker
Cores/server	12	12
RAM/server	60GB	40GB
Disk/server	1TB	1TB



- Authentication with production LDAP
- NFS access to production GPFS

Workflow of Using KEK Cloud



KEK Cloud Future Work: IaaS or PaaS?

- IaaS
  - Just provide instance creation space
  - Experimental groups prepare/manage own instances under certain policy
- PaaS
  - Provide data analysis environment
  - Cloud manager prepare/manage instances requested by groups

Requirements for Tool

- Stable service
- Easy to deploy and manage
- Workflow automation
- Bare metal provisioning for high data I/O job
- Web interface and CLI support
- Fit into our system
  - User authentication
  - File system
  - Bach system
  - Network
- EC2 API?
  - Compatibility with other clouds

Tools

- IBM PCMAE
  - Successor to Platform ISF
  - Strong coupling with LSF
- OpenStack
  - Human resources is limited
  - Commercial distributions
    - http://www.openstack.org/marketplace/distros/
- Others
  - VMWare vCloud Suite
  - HP CloudSystem Enterprise Suite
  - Cisco Systems Intelligent Automation for Cloud
  - Etc.

Summary

- Working with cloud monitoring at CERN:
  - Tenant usage dashboards have been published to end users
    - Access is controlled by ElasticSearch plugin
  - Deploying Rally to CERN cloud for service verification
- KEK cloud is under testing
  - IaaS, PaaS or both?
  - Tool
    - Satisfy our requirements?
    - Compatibility with other institute's clouds?