Outline

- Objectives
- Features
- Technical choices and architecture
- Image creation
- Automated login
- Monitoring
- Status and future development
- Demo

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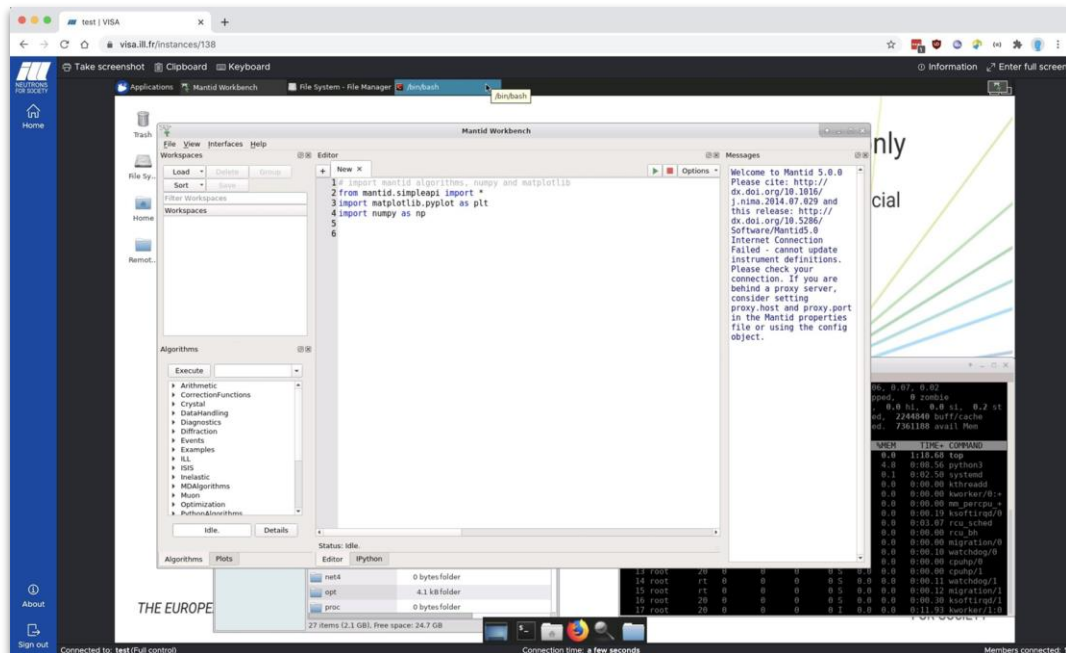
Objectives

- Provide remote data analysis services with access to
  - Experimental data
  - Analysis software
  - Compute infrastructure
  - Support (IT and Scientific)
- Make access as simple as possible using a web browser
  - Remote desktop as if the user was sitting in front of an ILL data treatment workstation
  - Easy and flexible machine management
- Allow scientific collaborations
  - Sharing desktops
- Enable remote experiments
  - Access Nomad (SCI) to perform instrument control
  - This is the current priority for the next reactor cycle (August)

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NEUTRONS FOR SOCIETY

Features

- Creation and deletion of linux machines (Ubuntu 18.04)
  - User can choose from predefined *flavours* (CPU & RAM)
  - Scientific software is already pre-installed
- Remote Desktop via a browser
  - Apache Guacamole proxying of RDP via socket.io
- Sharing machines with other users
  - Enable scientific collaborations
  - Allow for scientific support (all ILL scientists can access instances)
- On screen keyboard and clipboard integration
- OpenID Connect authentication
  - Provided by Keycloak (login.ill.fr)
- Machine lifetime management
  - Automatic deletion after 14 days or 4 days of inactivity
- Externally accessible at https://visa.ill.fr

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NEUTRONS FOR SOCIETY

Technical choices

- **Virtual Machines on OpenStack**
  - API to manage instances, images, flavours and security groups
  - Managed by NDS
- **XRDP for access to remote desktop**
  - Other protocols were evaluated (SPICE, NoVNC etc.)
- **Apache Guacamole**
  - Converts RDP (and VNC, SSH) into a common protocol (guacd process on the instance)
  - Bridges a web application to guacd server
    - Translates TCP socket messages to websocket messages
- **Java server**
  - REST/GraphQL API
  - Web-socket (socket.io)
- **Single page web application (Angular 6)**

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Logical architecture
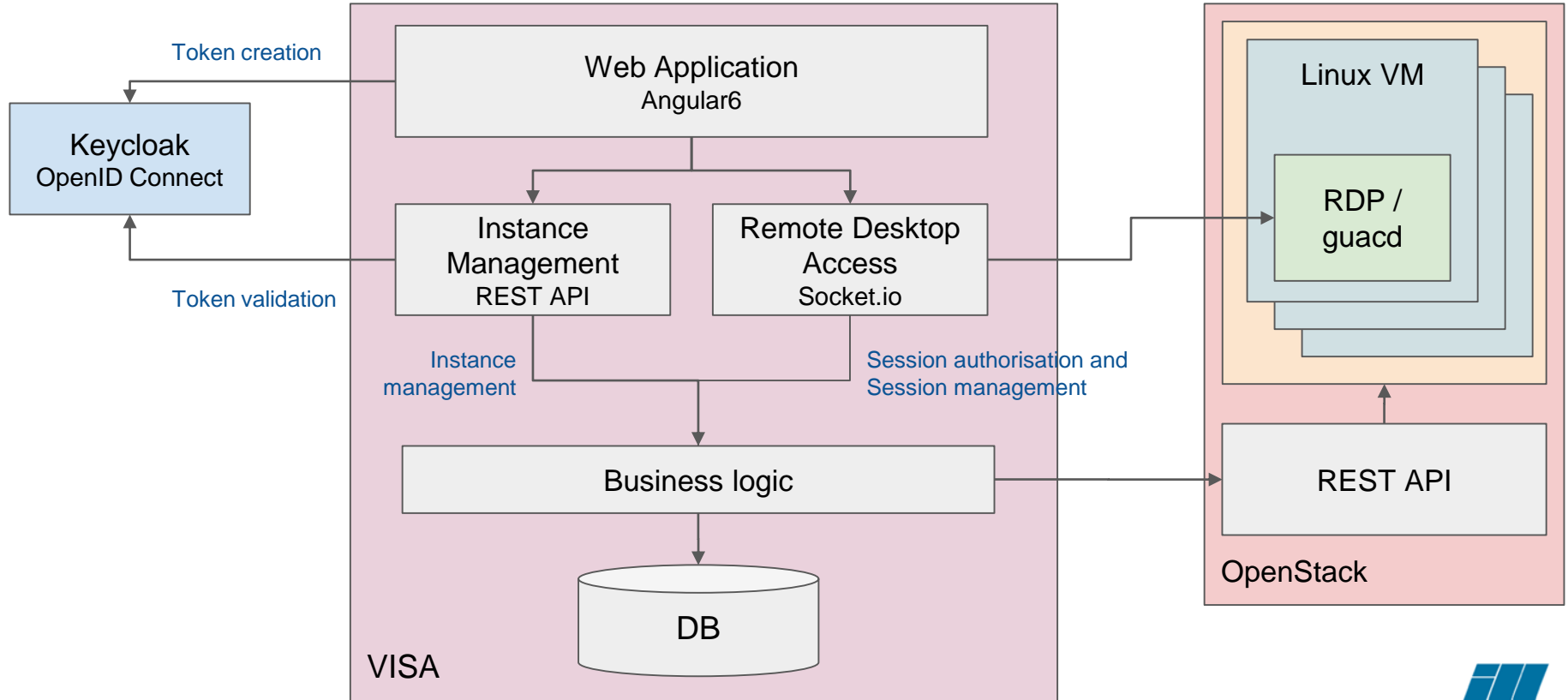
System architecture
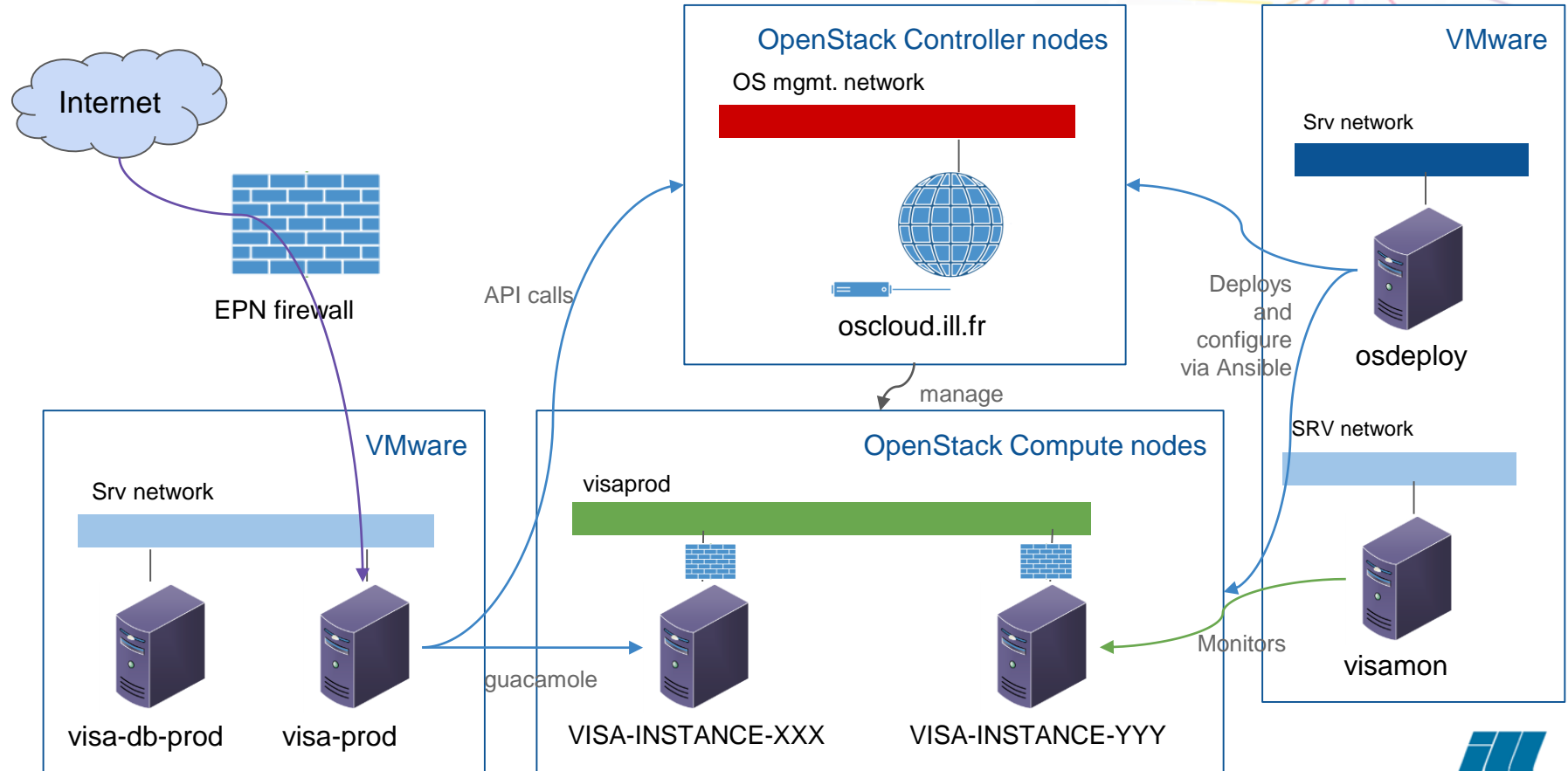
Cloud resources

- **Provided by OpenStack**
  - **Managed by NDS**
- **Three namespaces available**
  - Production, staging and development
  - Firewall rules minimise access from VMs to other ILL resources
- **Current capacity**
  - 456 cores
  - 2.6TB RAM
- **Purchasing more performant servers before the next reactor cycle**
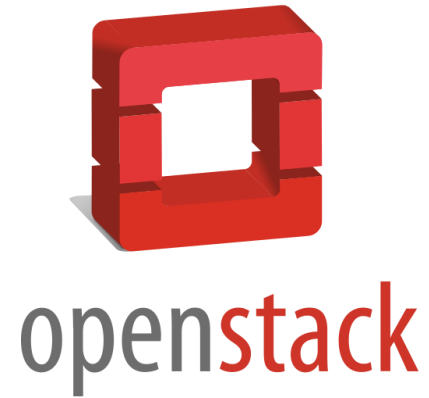 - In view of remote experiments using the VISA platform

NEUTRONS FOR SOCIETY

Image creation

- **Automated (scripted) process**
- **Using packer to build the image**
  - Build from scratch using a base ubuntu installer
- **Allows for versioning of images**
  - Configuration is stored inside a GIT repository
  - Each new release is tagged
- **Nightly builds (in progress)**
  - Linux security updates applied every day
  - Continuous Integration pipeline
- **Configured to install scientific software**
 - Matlab, MANTID, LAMP etc.

NEUTRONS FOR SOCIETY
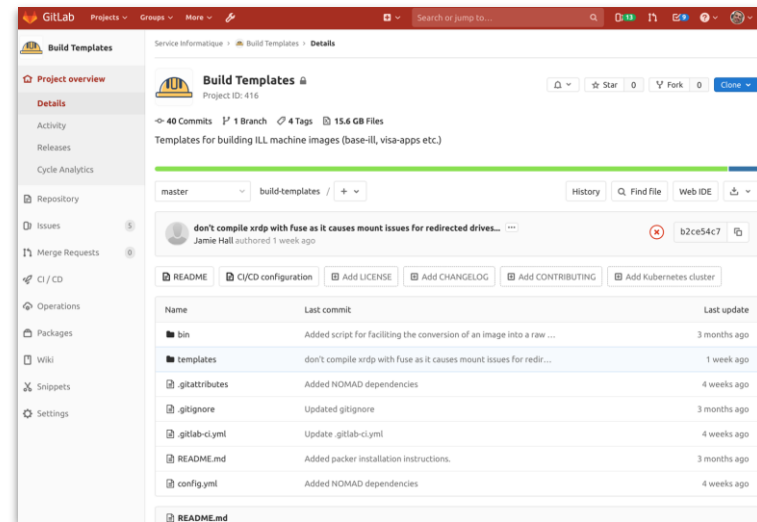
Automated login to VM

- Avoid having to login to both VISA application and VISA instance
  - User does not have to provide login data to access the VM
- Development of a PAM module
  - Linux Pluggable Authentication Module
  - Token-based login
  - Developed in C
- Token contains username and expiration time
  - Cryptographically signed in VISA server (private key)
  - Validated in the instance using public key
    - Public key added to image in creation process
    - Verifies also that the token has not expired and has not been modified
- Only applies to XRDP sessions

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Monitoring

- All instances run two prometheus processes
  - Node exporter and process exporter providing different insights
- Prometheus server polls all instances to obtain data about:
  - System usage
    - Memory, CPU, Disk, IO
  - Application usage
- Grafana used to visualise usage
  - Individual instances
  - Groups (flavours)
  - All instances
- Available on visamon.ill.fr

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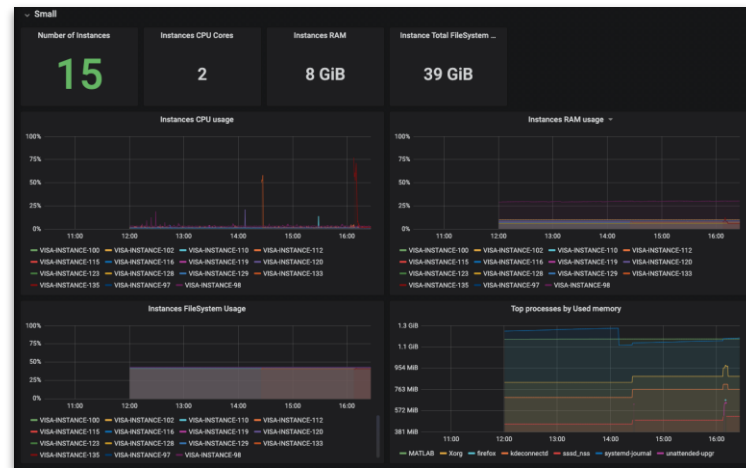
Status and future development

- Piloted by IN5 and D11 since January
- Announced to all ILL scientists in April
  - Available to all ILL users
- Software and infrastructure updated in May to account for remote instrument control
  - New compute nodes (more to be added over the coming months)
  - NOMAD and security groups
  - Scientific support user added
- Getting ready for the next reactor cycle
  - Admin & Sci. Support interfaces to be developed
  - Load balancing (horizontally scale)
- Integration into the PaNOSC project

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Extra
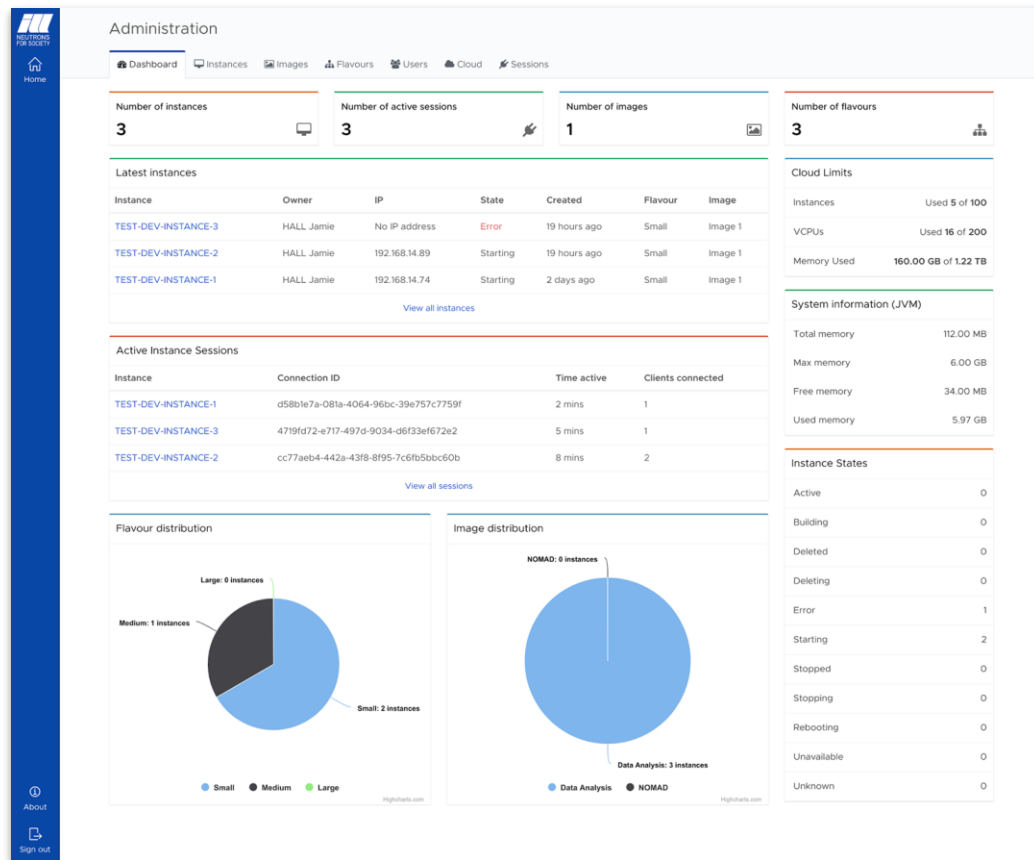
Administration interface UI
(in progress)

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Demo