Implementation of OMERO and PPMS on the basis of a central user database at a multi-user/system core facility

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Introduction

In 2013, the University of Erlangen-Nuremberg inaugurated a new central institute, the Optical Imaging Center Erlangen (OICE), with the mission of both providing a Core Facility Unit (CFU) for researchers working with high- and super-resolution microscopy and conducting research on novel optical microscopy techniques in its Experimental Research Unit (ERU).

When the institute was set up, the goal was to provide users with an easy, efficient and uniform workflow. To realize this, an IT-system was implemented that allows users to handle every step in the workflow with just a single account. This system is easy to administrate via a series of browser-based configuration utilities. All data is kept on a high performance storage server, secured against hardware failure and is backed up with an external location.

Methods

The figure below shows a schematic view of the network of IT-services at the OICE and their dependencies and interactions. At the core, the OpenLDAP server provides authentication services for a variety of connected services. Currently, these are the OMERO.server module, the PPMS booking system, the DocuWiki web service, the Gosa² configuration web service and – indirectly via the Samba 3 server – the microscope control computers.

The DocuWiki service provides a first point of contact for new users at the CFU. After a login with their central account they can access all necessary information to interact with the remaining IT services offered by the OICE. Additionally, the wiki holds usage and safety regulations and documents how to use the various on-site devices and control computers.

The GOsa² browser interface acts as a frontend to the LDAP directory and enables a convenient, central management of user accounts and permissions. System administrators can add and delete users and assign them to various groups.

These group memberships are queried by the connected services and used to determine whether particular users are allowed to access certain parts of a service, e.g. the functionality to read staff-only pages on the DocuWiki or the OMERO.server. GOsa² is also used by non-privileged CFU users to change their personal details such as affiliations or their passwords.

The PPMS booking system, currently the only closed-source component, also authenticates all logins with the central OpenLDAP server and provides a comprehensive browser interface for scheduling time slots on OICE equipment, regulating access to different devices and invoicing services.

The OMERO.server represents the core of the system. It enables OICE users to access, share and analyze their data from any external location with Internet access. Authentication is done via the OpenLDAP server for users with proper group membership.

Currently, all bookable microscopes at the OICE are controlled by PCs running versions of Microsoft Windows. In order to provide users with a unique login on those devices, a Windows Primary Domain Controller (PDC) realized with Samba 3 was implemented at the OICE and computers were joined to a central domain. The Samba PDC also uses OpenLDAP as its database backend, so users can again utilize their standard account on those machines. After logging in, the time spent working with the devices is monitored by a tracking script which reports usage times to the PPMS servers for invoicing.

Data storage at the OICE is realized via an iSCSI connection to a dedicated machine housing a RAID 6 array of high performance magnetic hard discs, currently providing 6 TB of space, which can be easily extended. Additionally, the system is fully backed up on a daily basis with the University's IT service provider in case of fire or other natural disasters. The backup is implemented in a way that allows users to restore files from arbitrary points in the past up to a certain limit.