# Virtualization of the Columbus Control Room Infrastructure

Author: Trebbin, N. - LSE Space GmbH, D-82234 Wessling, Germany

## COL-CC CLIENT VIRTUALIZATION

In 2015, all operational resources of all three control rooms of the Columbus Control Center (DLR/GSOC) have been fully virtualized. The virtualization of all operational tools included the creation of nearly 100 virtual client machines in two isolated data centers, which could be accessed by 40 physical Thin Clients spread over two buildings and nine discrete rooms.

To manage, configure, dynamically assign and administer both the virtual machines and the physical machines, the development of a middleware, capable of all operational requirements, was mandatory.

Therefore LSE Space, on behalf of DLR, developed PyCon – A python connection broker which includes all necessary features to allow a continuous, secure and fail-safe 24/7 operational environment to support daily operations on board of the International Space Station.

## PYCON KEY FEATURES

- Increase of flexibility and easy integration due to modularized approach
- Centralized configuration and monitoring of common virtual- and physical infrastructure
- On-demand wake-up of virtual- and physical machines
- Custom Window Manager on Thin Client to support minimalistic operational approach
- Remote administration of virtual- and physical machines
- Support for fully encrypted traffic between Thin Client, virtual machine and configuration interface
- Centralized user- and Thin Client right management
- Daemon for monitoring virtual- and physical infrastructure planned

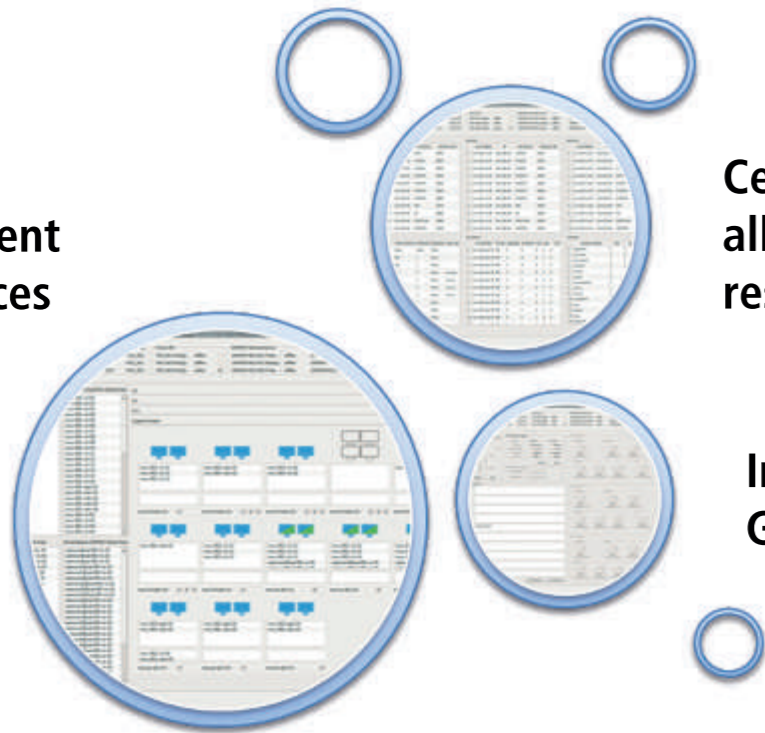Multiple monitor and virtual client support on one Thin Client

SATMON
CLI/WKS CLI
mcs-k03-ph
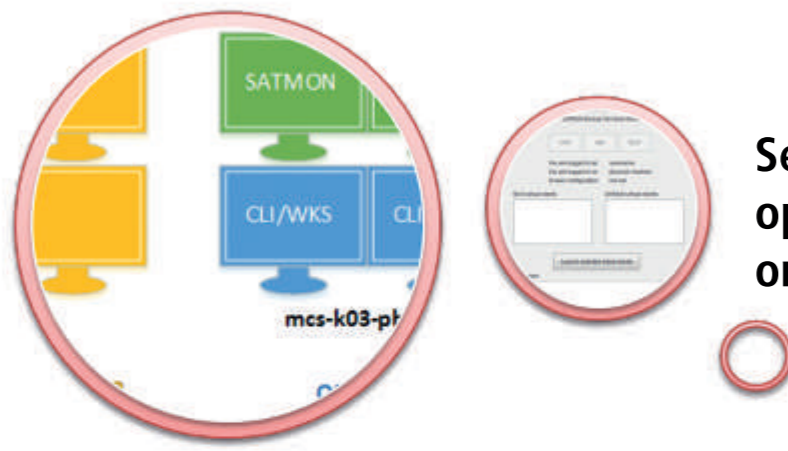
Selection of required operational resources on-demand
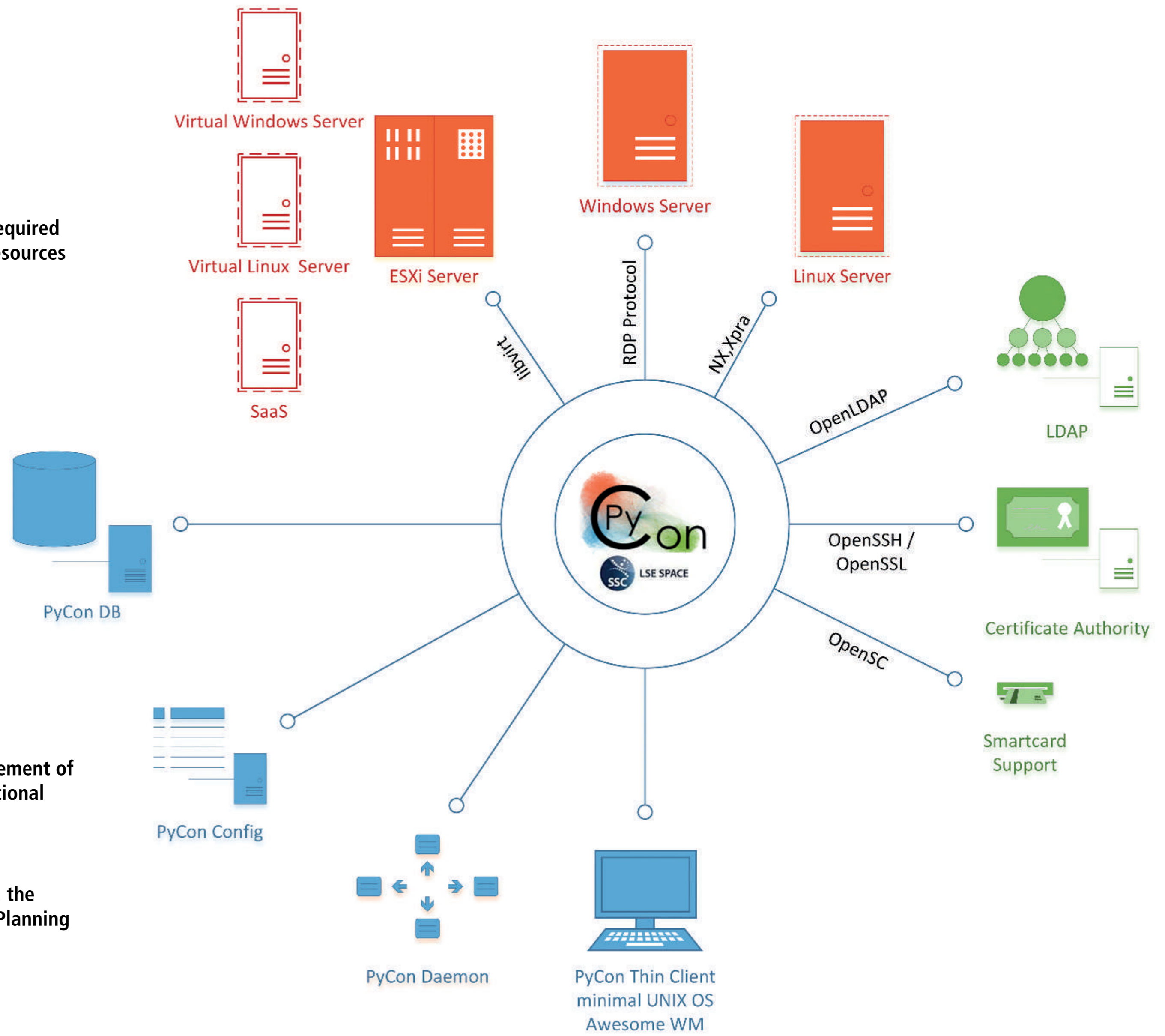
**FLIGHT CONTROL TEAM**

**GROUND CONTROL TEAM**

Flexible assignment of virtual resources

Centralized management of all available operational resources

Integration within the Ground Segment Planning

Virtual Windows Server

Virtual Linux Server

SaaS

ESXi Server

Windows Server

Linux Server

libvirt

RDP Protocol

NX.Xpra

OpenLDAP

LDAP

PyCon DB

PyCon
SSC LSE SPACE

OpenSSH / OpenSSL

Certificate Authority

OpenSC

PyCon Config

Smartcard Support

PyCon Daemon

PyCon Thin Client minimal UNIX OS Awesome WM

## INTEGRATION INTO EXISTING INFRASTRUCTURE

- Tailored LDAP integration to integrate all your existing users
- Integration into your certificate authority, to prohibit external access to your operational network
- Commonly used smart card authentication supported

## OPERATIONAL BENEFITS

- Support for multiple missions/instances within one control room
- Reduction of costs (hardware, maintenance, power) and flexible reallocation of resources
- Swap of control rooms and mission related software at any time
- Faster installation- and verification cycles of mission critical software

## SUPPORTED OPERATING SYSTEMS

### Virtual machines

- Legacy support for SLES 10, SLES 11 SP0
- > SLES 11 SP3, openSUSE with KDE/GNOME Desktop
- > Ubuntu 12.04 LTS with KDE/GNOME Desktop
- > Debian 6 with KDE/GNOME Desktop
- > Windows 7 SP1, Windows Server 2008 R2
- Windows Server 2012 with RemoteFX

### Hypervisor

- > VMware ESX vSphere 5.1
- Support for Hyper-V planned

**DLR** Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

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