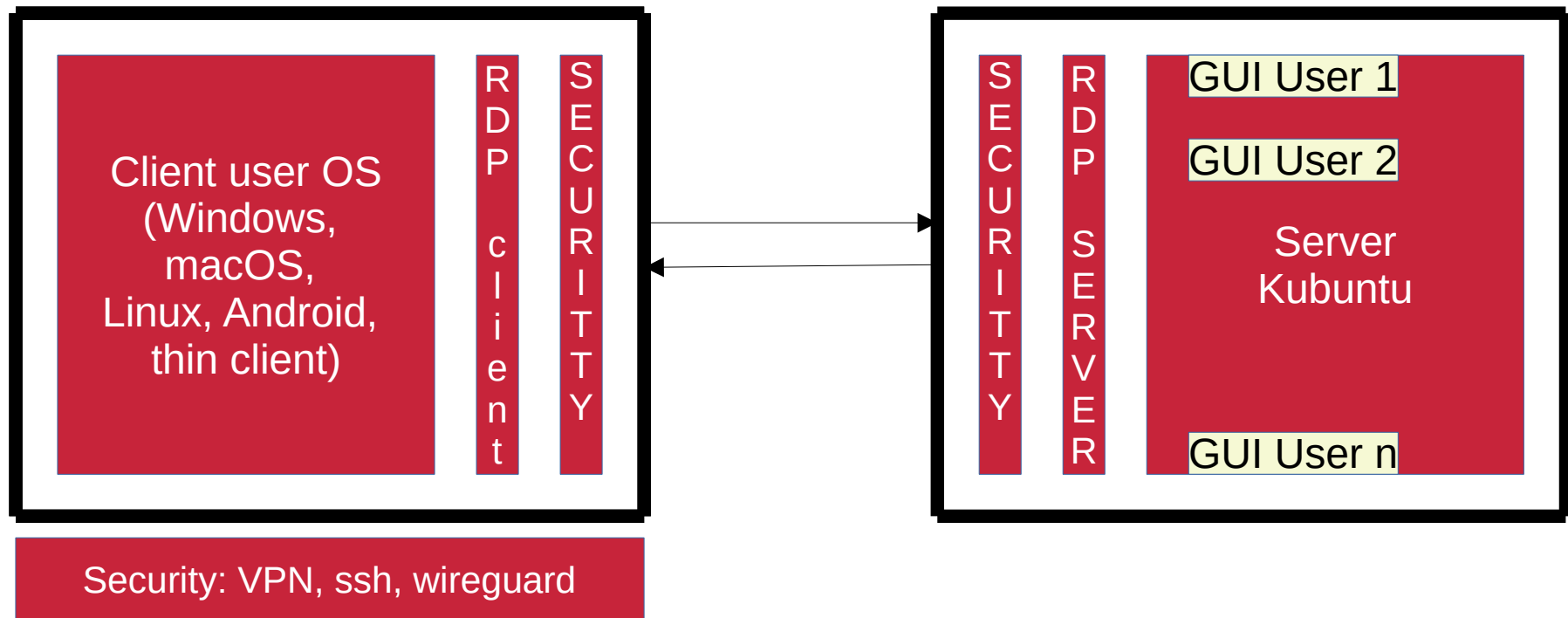


Hands-on learning through
virtualized remote desktops - green,
inexpensive and efficient

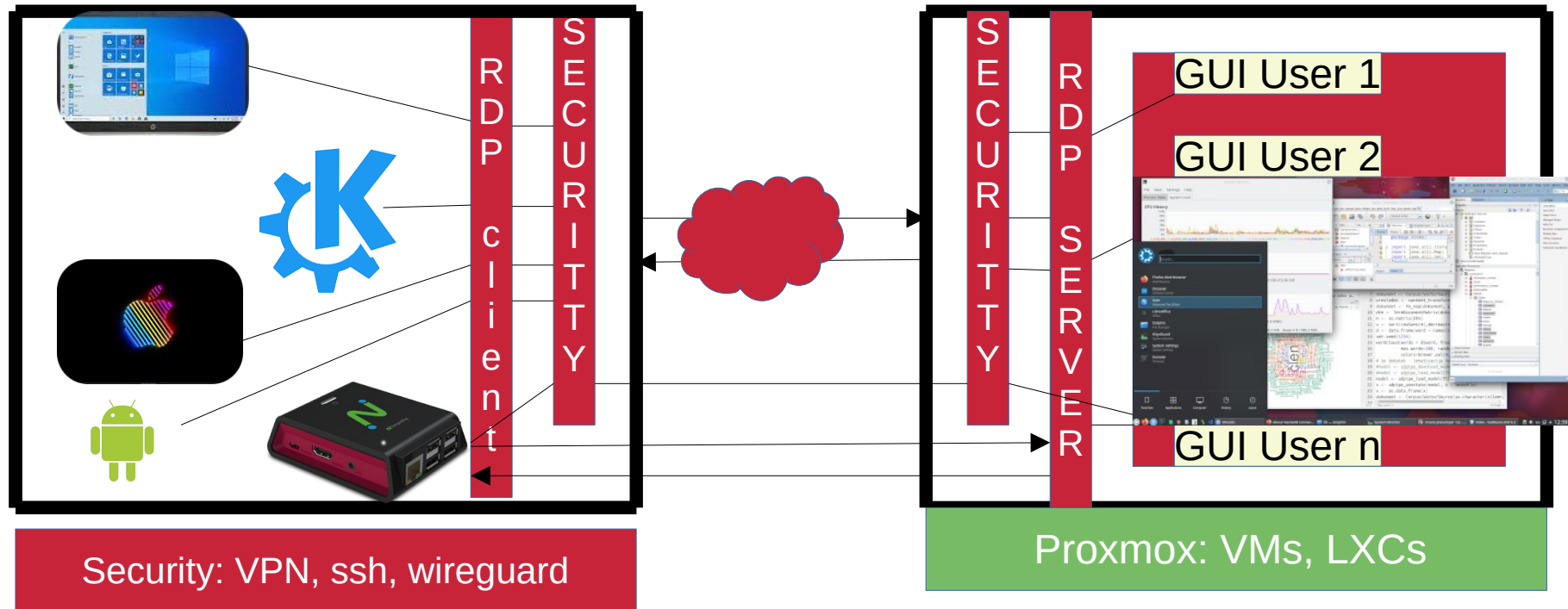
Robert Leskovar, Alenka Baggia

University of Maribor, Faculty of Organizational Sciences

What is virtualized remote desktop?



What is virtualized remote desktop?



Setup

- On-premise: 2 physical servers with Proxmox, 2 virtual machines with Kubuntu: 16-24 CPUs, 96-192 GB RAM, 250 GB NVRAM disk, 2 OpenLDAP LXC
- clients: a) Raspberry Pi based thin clients for on-premise classroom , b) remote desktop clients on Windows, macOS, Linux and Android

Current state

- Scope of use: graduate and master students enrolled in courses Introduction to Computer Science and Informatics, System Analysis, Information System development Project, Object-oriented analysis and development, Software Quality, Statistics
- Scale of use: more than 500 students in this academic year
- Hands-on learning in lectures and lab excercises: computer languages (C++, PHP, Java, Javascript, R), development tools (Oracle SQL Developer, Datamodeler, JDeveloper, phpmyadmin, wine, RStudio, Orange, KDenlive, FreeCAD), dockers (Openproject, OracleXE, WordPress)

Green

- **Green on client side:** power consumption of Raspberry Pi + LCD monitor, keyboard and mouse or PC with remote desktop client installed.
- **Green on server side:** power consumption of the above Kubuntu configuration.
- It serves well simultaneously up to 60 users/server for non-demanding courses and up to 25 for demanding courses (i.e.usage of Oracle JDeveloper).

Inexpensive

- 3500-4500 €/server (40 core Intel and 32 core AMD Ryzen, 128-265GB RAM, 1TB nvmmram)
- Thin client approx. 250 € each with monitor, keyboard and mouse;
- low overall cost of maintenance

Efficient

- with hands-on learning each student get experience about concepts learned, get skills on development tools, can experiment beyond regular classes.
- hands-on learning during in-class or on-line lessons result in learning more relevant contents in less time.

Contact:
robert.leskovar@um.si

