



**NORDUGRID**

*Grid Solution For Wide Area  
Computing and Data Handling*

# **An organization of elective Nordugrid installation course for students in Dubna**

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# Talk Outline

- Purpose and general requirements for training
- Requirements for virtualization
- User mode Linux (UML)
- UML disadvantage
- Hardware resources
- Scheme of training infrastructure
- Current state
- Future plans

## **Purpose and general requirements for training**

- Purpose: teaching students grid technologies
- Essential feature: each student should be capable to do Nordugrid ARC middleware installation himself (not as spectator)
- Simultaneous practical training a group of students (not personally)

**Conclusion:** Each student should have a set of machines. Number of physical machines is limited. Hence, virtualization should be applied.

## Requirements for virtualization

- Several virtual machines (VM) should be run on one physical machine (host). So VM should be quite lightweight from host load point of view.
- Students should have root's privileges only inside VM
- VMs have to be accessible through the network

# User mode Linux (UML)

Virtualization was achieved by using UML.

Some UML features:

- Doesn't emulate hardware (UML is quite lightweight for host)
- User has root privileges within VM
- A set of transport types support to exchange packets with other hosts (VM is accessible through network)
- Copy-on-write (COW) layering capability (allows to share single file system among several VMs; each VM writes its data to own file if data block differs from original FS)
- UML is opensource

# UML disadvantage

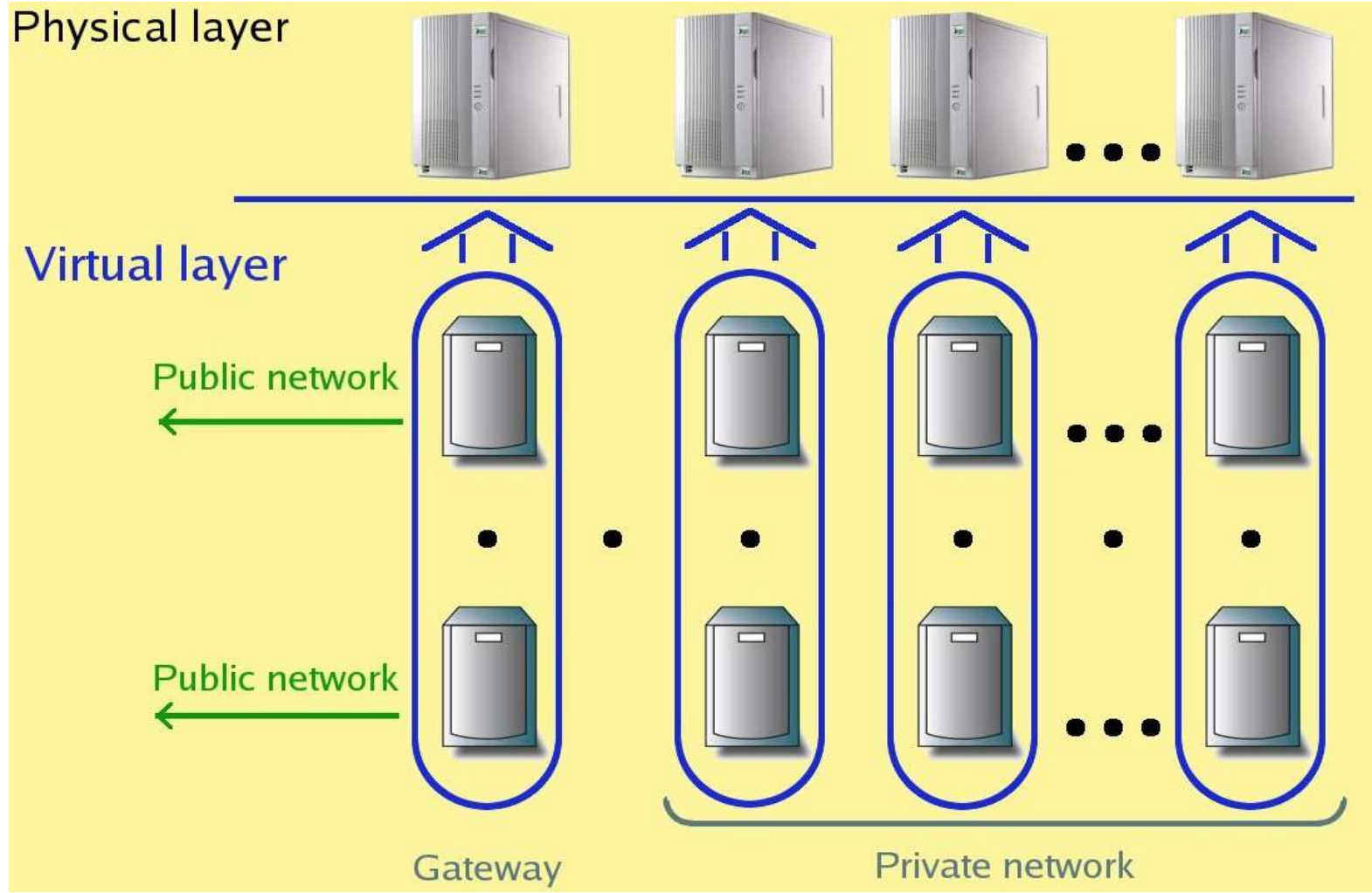
UML doesn't yet support Native POSIX thread library (NPTL) what may cause to some incompatibilities in distributions what use NPTL (e.g. Scientific Linux)

# Hardware resources

## Hardware resources

CPU	RAM, Gb	HDD, Gb	Quantity
Pentium 4 2.53GHz	1	80	1
Pentium 4 3GHz	1	2x80	5

# Scheme of training infrastructure



# Current state

- 5 students of University center of Joint Institute for Nuclear Research take first Nordugrid site installation course
- Course includes an installation of basic nordugrid site (cluster and storage element)
- Nordugrid ARC middleware 0.4.x version is used

# Future plans

- Increase a number of VMs (some optimization is needed on the host)
- Add logger, smart storage element, RLS setup
- Using one of Nordugrid site on VMs for user training

# References



<http://user-mode-linux.sourceforge.net/>

web-page of University Center of Joint Institute for Nuclear Research



<http://uc.jinr.ru/>

Nordugrid site installation tutorial in Russian

<http://uc.jinr.ru/nordugrid>