SDN/NFV experiments on Grid'5000

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SDN experiments: methods and tools

- ▶ Simulators
- ▶ Single-node emulation: Mininet (using OpenVSwitch)
- ▶ Multi-node emulation (Emulab)
- ▶ Continent-scale testbeds
- ▶ Planetary-scale real deployments

Grid'5000 current offerings

- ▶ Focus on flexible reconfigurable infrastructure
    - ♦ High-level, multi-node emulation with **Distem**
    - ♦ Low-level, physical topologies with **KaVLAN**
    - ♦ Future plans: **deployable switches**

Distem: multi-node emulation for SDN

- Multi-purpose, distributed emulator
  - Large-scale (100s of physical nodes, 10000s of virtual nodes)
  - CPU performance emulation ↝ HPC runtimes evaluation
  - Network topologies emulation using Linux TC/Netem + VXLAN
- Now supports OpenVSwitch inside virtual nodes
  - Soon: experiments with 100s of switches
- Also working on Chameleon and CloudLab
  - Work in progress to solve remaining issues
    - Including to deal with differences between testbeds
    - Talk at next GEFI meeting? :-)

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http://distem.gforge.inria.fr/
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SDN with KaVLAN

- ► **KaVLAN**: reconfiguration of network switches to provide L2 isolation
  - ♦ To protect the testbed from experiments
  - ♦ To protect experiments from the testbed
- ► Idea: build topologies using several VLANs on multi-NIC nodes
  - ♦ Physical machines, not VMs/containers
- ► Current status:
  - ♦ Prototype tool to handle VLAN assignment for a topology
  - ♦ Preliminary experiments:
    - ★ Several OpenVSwitch nodes
    - ★ DPDK for high-performance packet switching

Future plans: deployable switches

- Bare-metal / white-box / open networking switches:
  - e.g. Dell/Force10 S6000-ON (32x 40 Gbps)
  - Linux-powered switches
  - Customizable software stack (Dell's OS10 based on Debian)
  - Reinstallable using ONIE ($\approx$ PXE)
- Plan:
  - Add some of them in Grid'5000 (outside of the core infrastructure)
  - Enable users to reserve and reinstall them