This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 643964.

This work was supported (in part) by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract number 15.0091.

Demonstration of Sirius, a Multi-Cloud Network Virtualization Platform

Navtalk

08.03.2017

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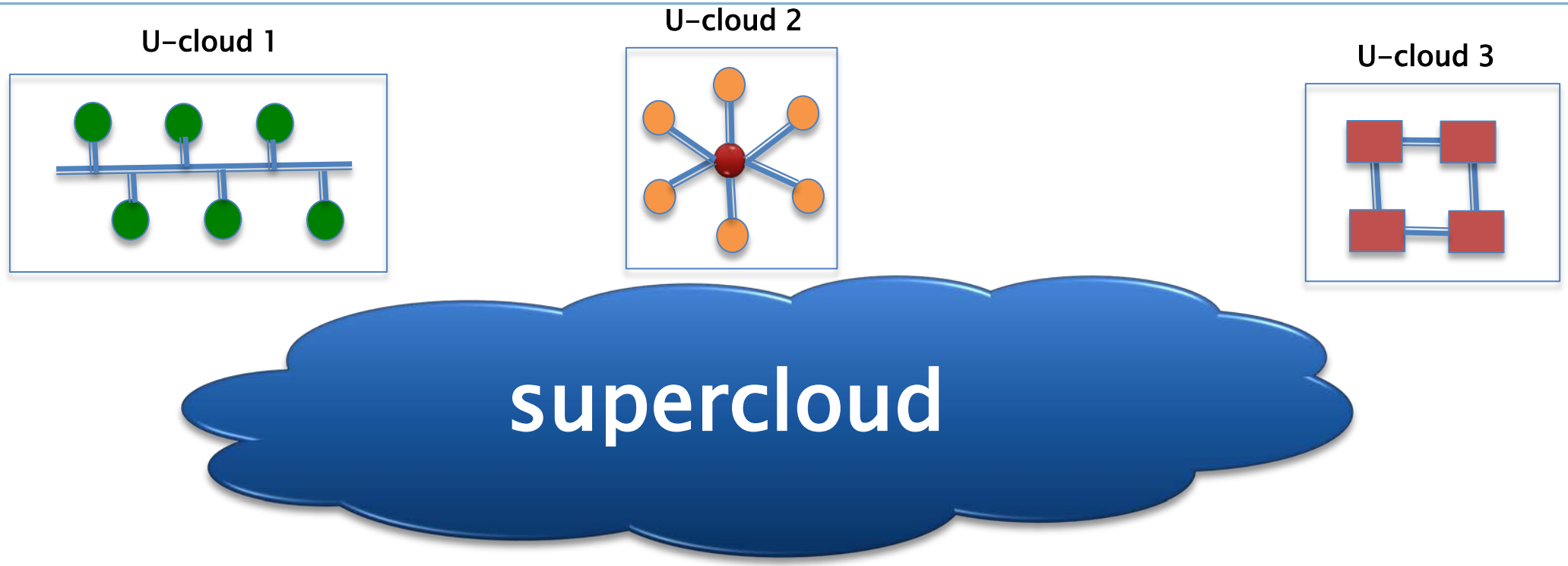
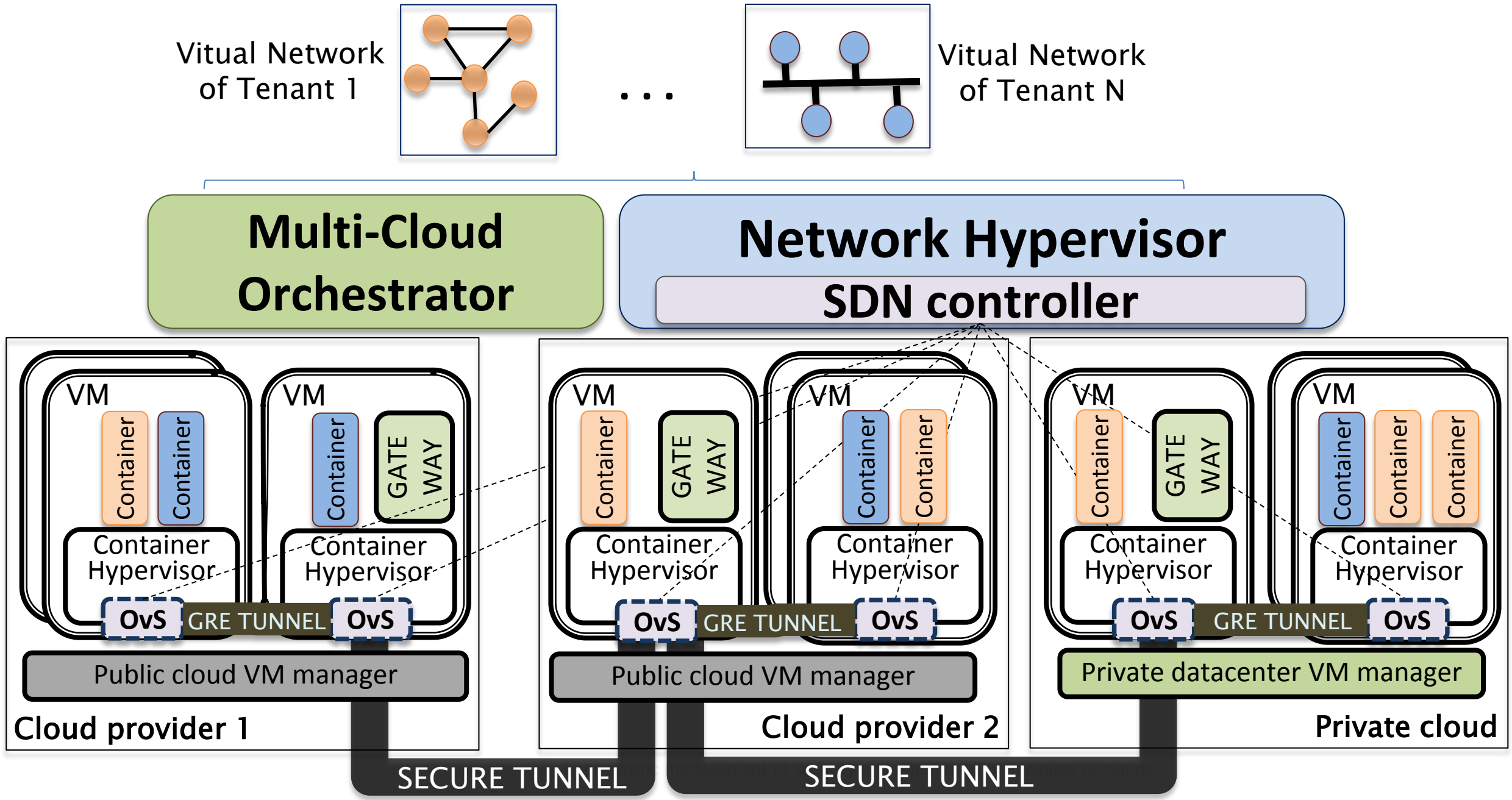
SUPER CLOUD

User-centric management of security and dependability in clouds of clouds

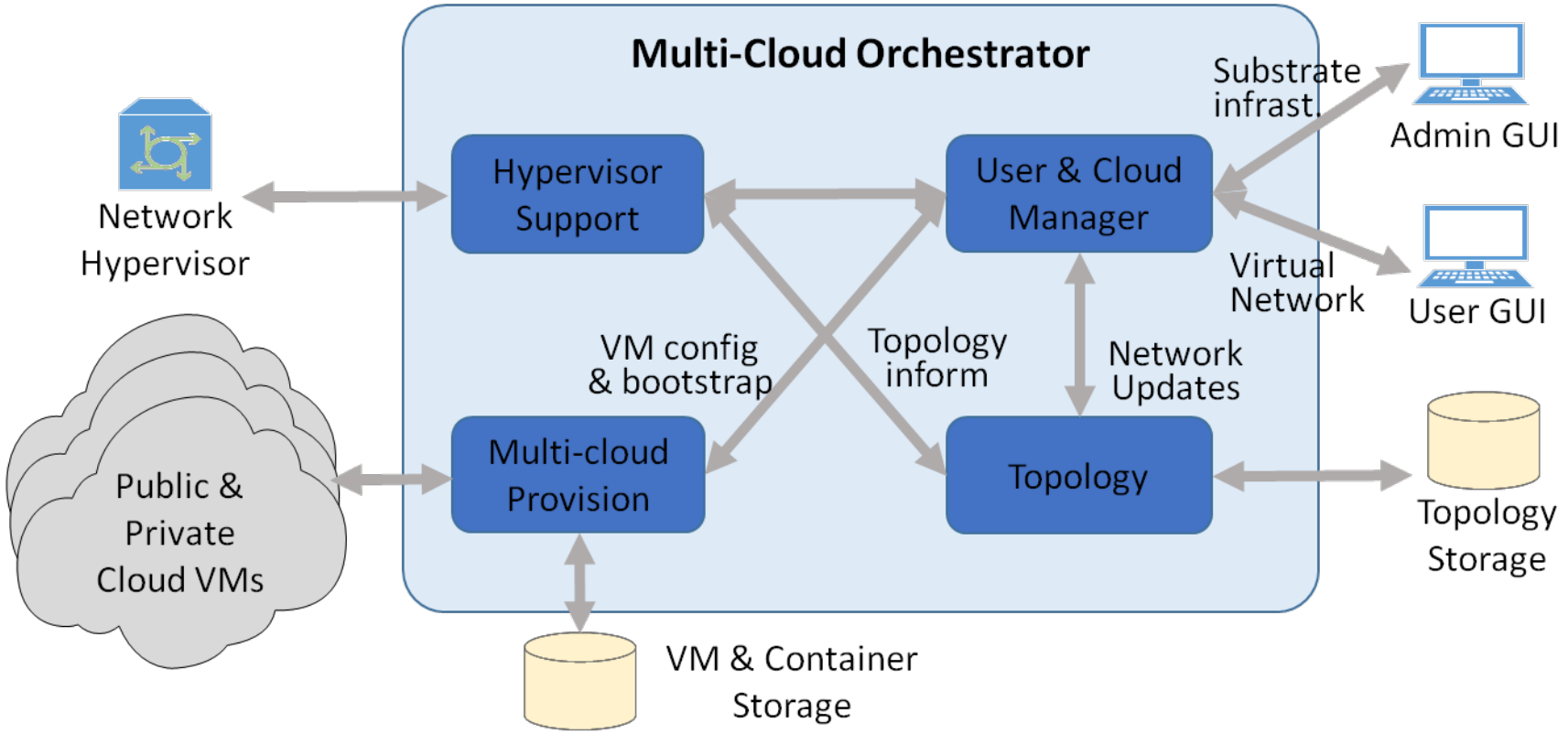
Context


U-cloud 1
U-cloud 2
U-cloud 3
supercloud
supercloud network hypervisor

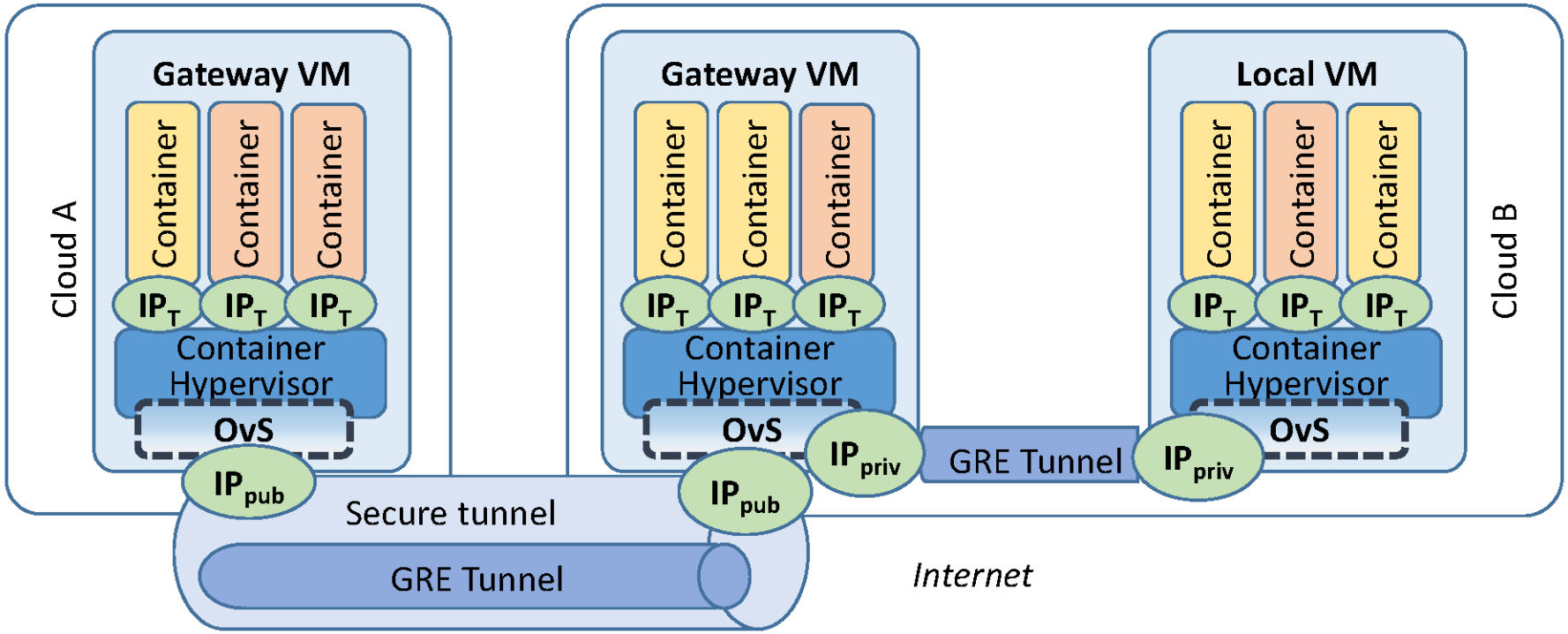
Sirius architecture



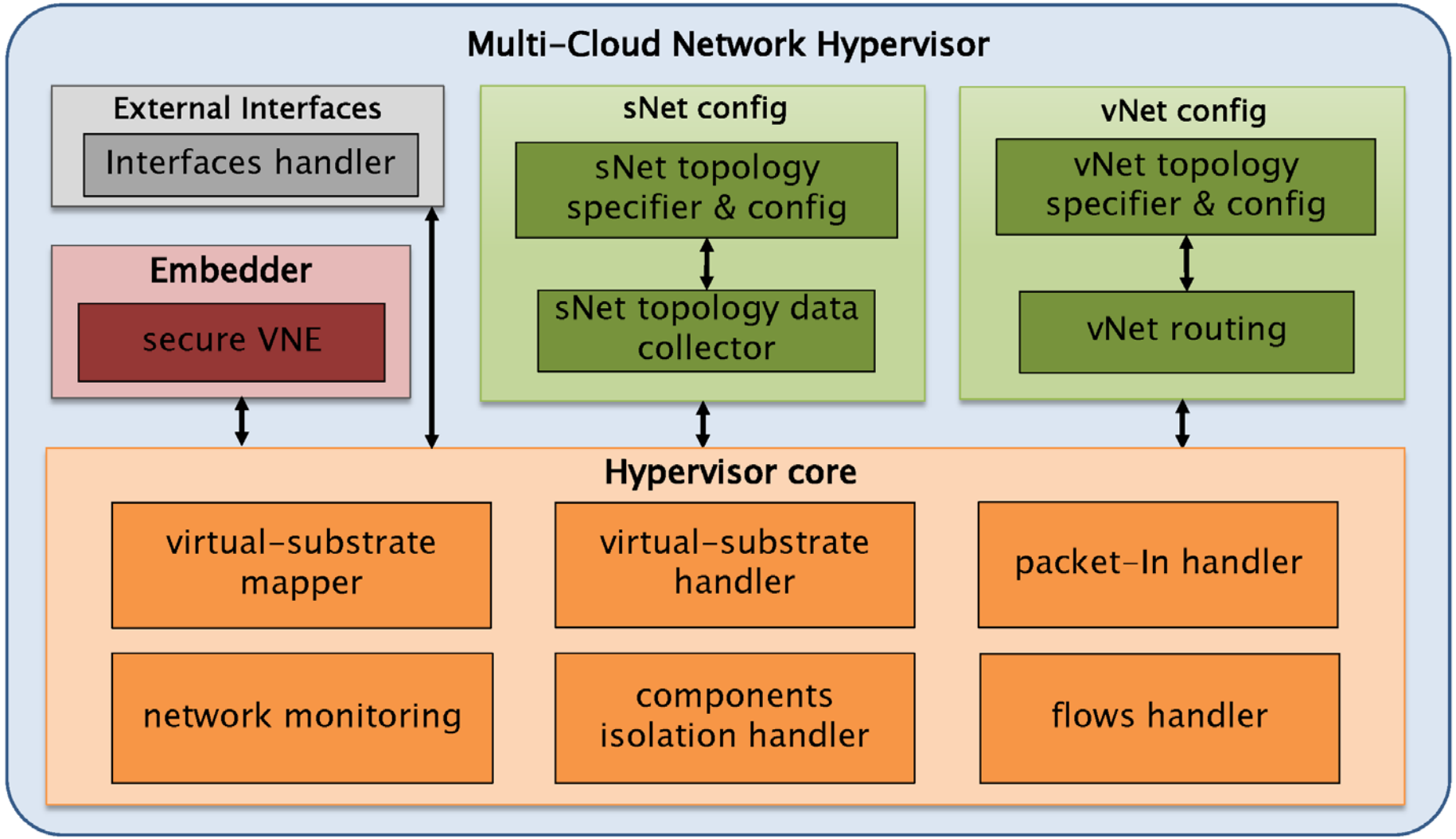
Orchestrator main modules



Inter- and intra-cloud connections



Network hypervisor



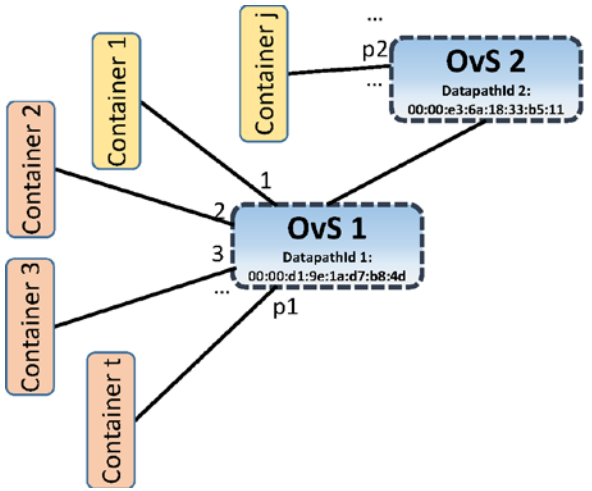
Virtualization: main techniques

- Secure & Dependable Virtual Network Embedding to allow arbitrary topologies

- Tunneling and edge-based address translation for arbitrary addressing and service models

Virtualization runtime: achieving isolation

- Tenants host are uniquely identified
  - Each container is connected to a specific switch and attached to a specific port*hostID = (datapathID,port)*
- Edge address translation
  - We have network-wide visibility and control
  - At the edge the host MAC is translated to an ephemeral MAC (eMAC) based on the *hostID*
- ARP handling
  - We emulate ARP functionality as we want unmodified hosts to use our platform
- Flow table isolation
  - Each tenant as a quota of forwarding table space per switch
  - OpenFlow *cache*



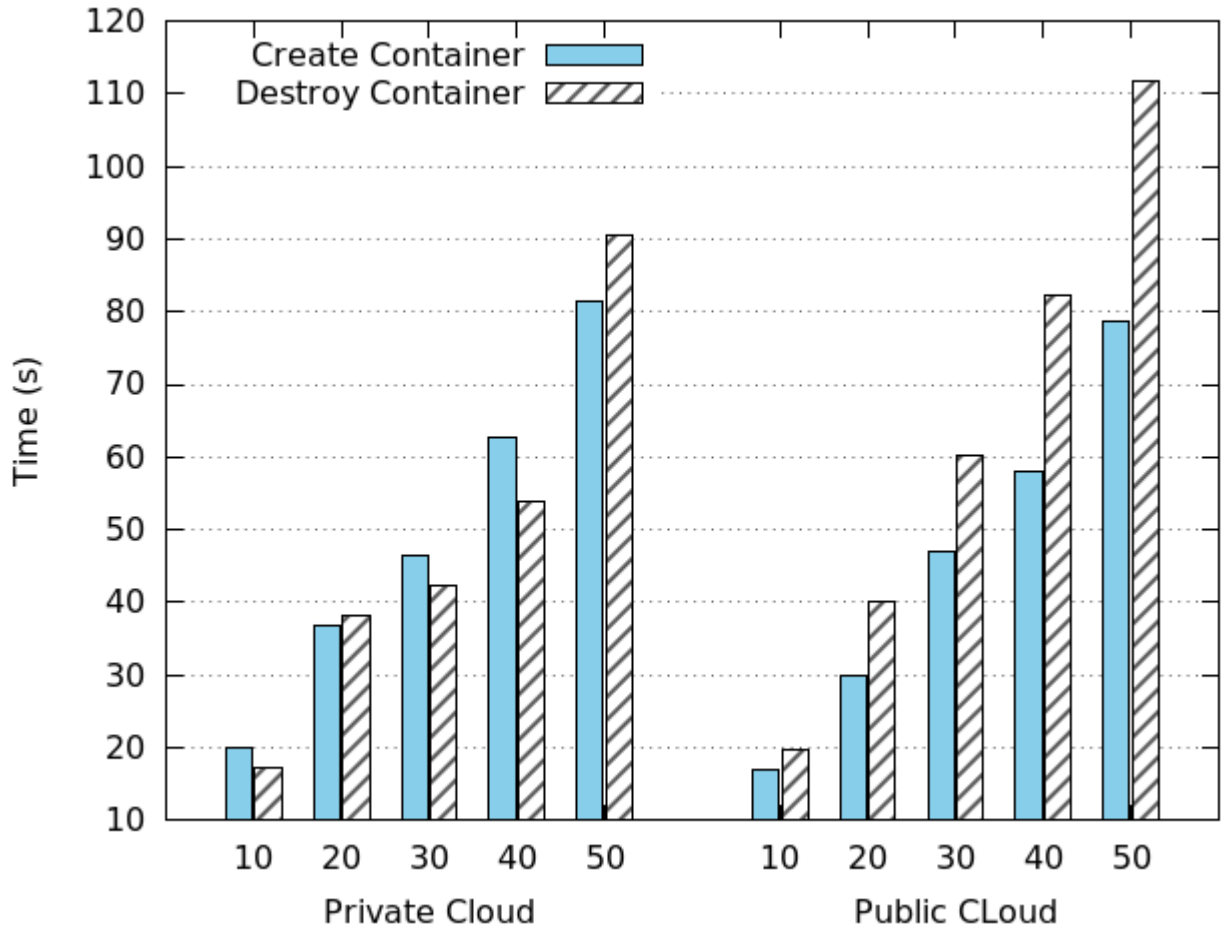
host ID (host location)	Tenant
< 1, 00:00:d2:9e:1a:d7:b8:4d >	1
< 2, 00:00:d2:9e:1a:d7:b8:4d >	2
< 3, 00:00:d2:9e:1a:d7:b8:4d >	2
...	...
< p2, 00:00:e3:6a:18:33:b5:11 >	1

TENANT 1
TENANT 2
TENANT N

Preliminary evaluation

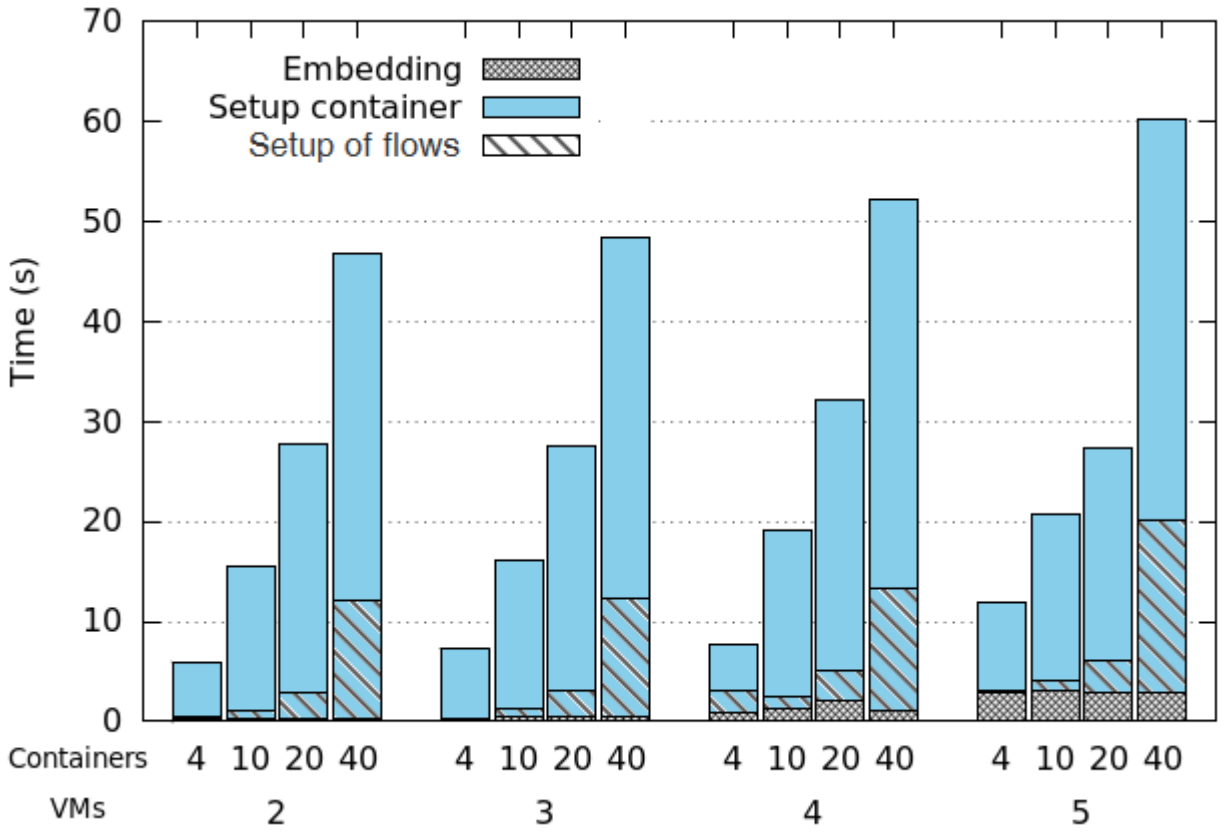
- One public and one private cloud
  - Public cloud: Amazon EC2 in Germany (Frankfurt)
  - Private cloud: our datacenter, located in Portugal (Lisbon)
- In Amazon EC2 we use t2.medium as gateway VMs and t2.micro as normal VMs.
- The private cloud is based on a rack of Dell R420, with 2 Intel Xeon E5520 quad-core, 2.2 GHz, and 32 GB RAM.
- VirtualBox managed the VMs, which were configured with 1 CPU and 2GB RAM.
- The VMs run Ubuntu with Docker (1.13.1) and OvS (2.5.0).
- The containers were also based in Ubuntu.

Time to bootstrap containers



#1 Time to create and destroy containers is relatively similar in private and public clouds.
#2 Grows linearly in either cloud (takes around one second to setup an additional container)

Time to setup a virtual network



#1 The growth rate of flow setup is problematic – maybe optimizations needed
#2 Time for embedding grows very fast with the number of switches – heuristics for Sec&Dep VNE needed

SUPERCLOUD Grant Agreement No. 643964

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