



Expand Network Virtualization to the Cloud

Why & How

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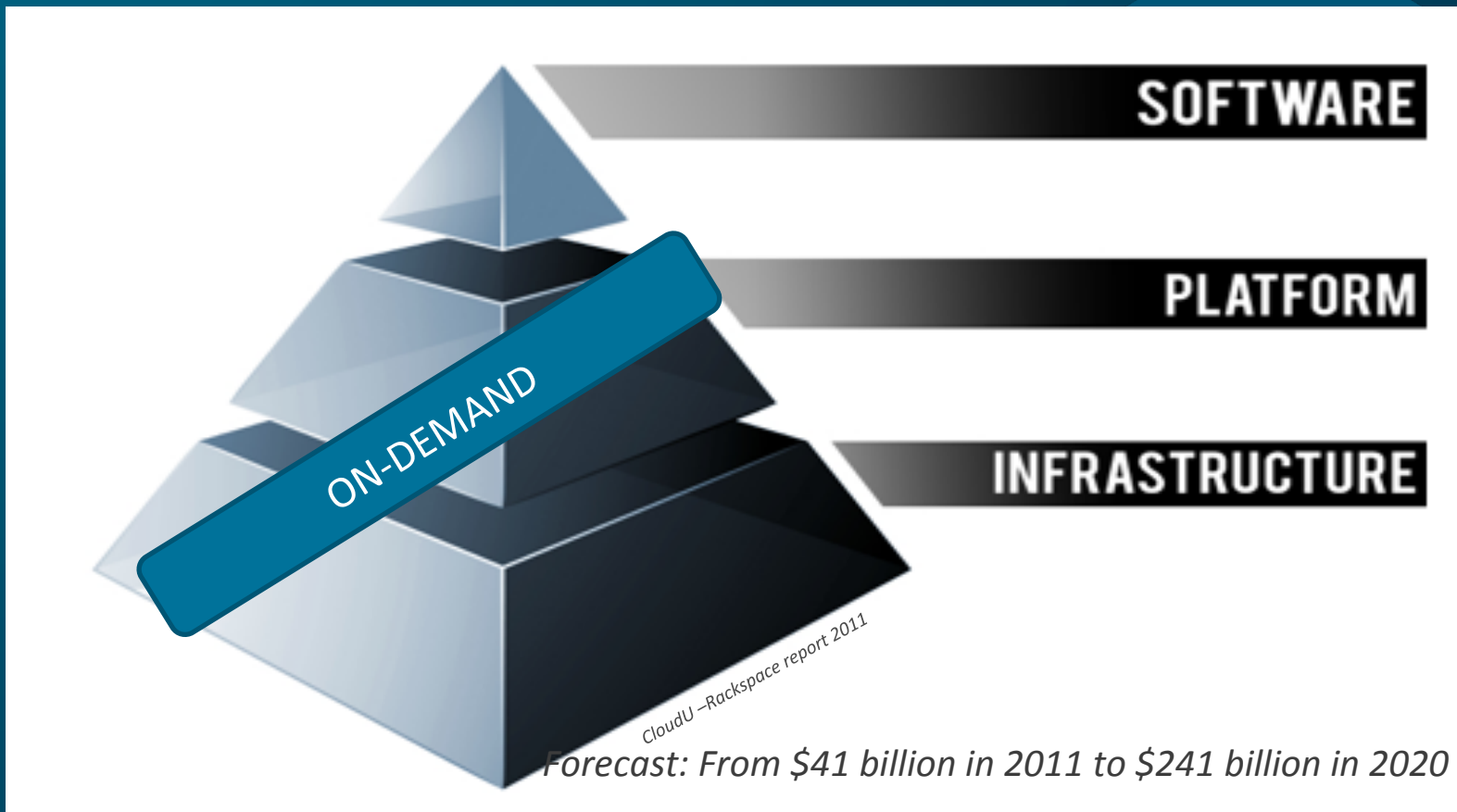


Outline

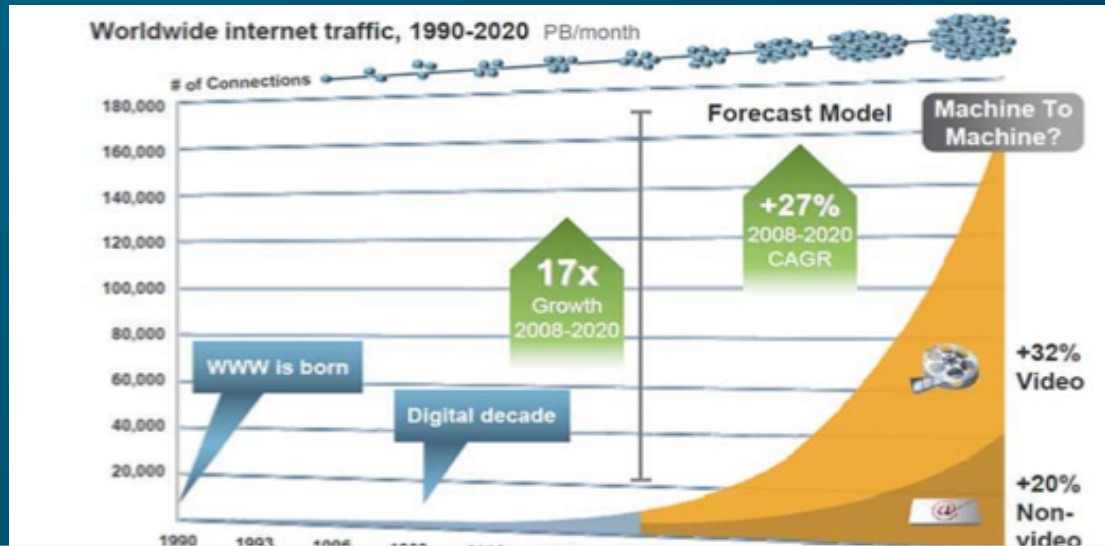
- Why
- Network virtualization
- Cloud network modeling
- Lyatiss CloudWeaver
- Conclusion

The Cloud Revolution

Applications, Development Environments & Infrastructures are moving to the Cloud and being delivered as a service



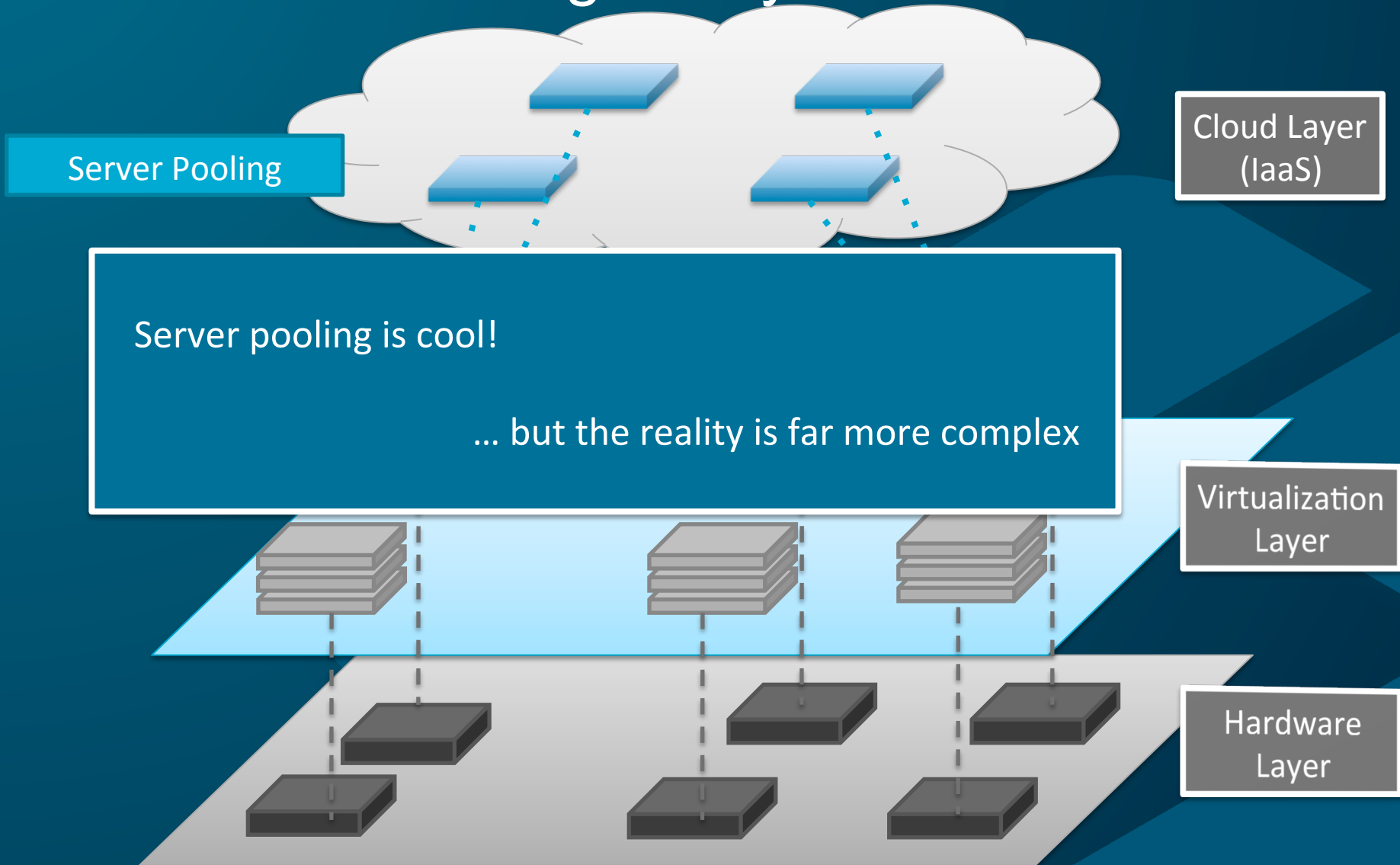
The Coming Data Deluge



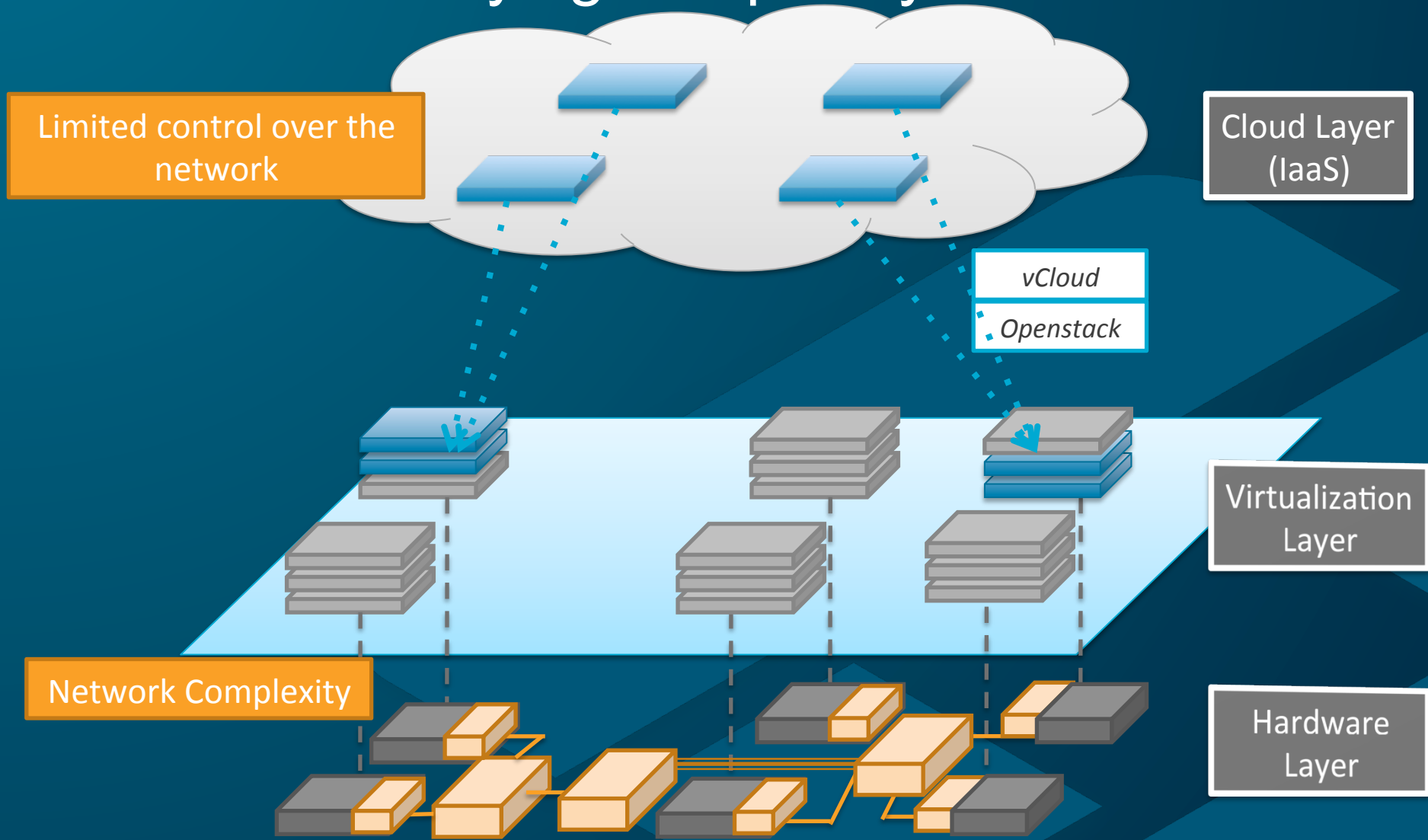
Next generation of Cloud Applications

- Rich Media
- Real Time
- Collaborative
- Big Data

Cloud Provisioning Today



Cloud: Underlying complexity



Example: multiple Cloud Applications Sharing a Best Effort Network

3D Server

Cascading effects

of traffic spikes in an uncontrolled network

VM
Snapshot

Ignoring Network in Cloud leads to

- **Unmanageable** network complexity
- **Capacity wastage** due to overprovisioning
- **Poor performance** with large number of users
- **Cascading network failures**
- **Unpredictable** user experience

Devastating for enterprises relying on Cloud services for business and IT

The power of network abstraction

- Virtualizing means **decoupling** from physical world:
 - For hiding details of implementation
 - For manipulating the lifetime (time sharing)
 - For aggregating or partitioning in different entities
 - Transposing the capabilities in virtual world
 - Expand functionalities on logical entities

Network Virtualization: Basic concepts

Virtual Routers

Virtual Links

- With Network virtualization:
 - Increase net resources exploitation
 - Deploy rapidly new configurations
 - Enable mobility
 - Offer redundancy
 - Increase security

Physical
Router



Physical Routers

Virtual networks

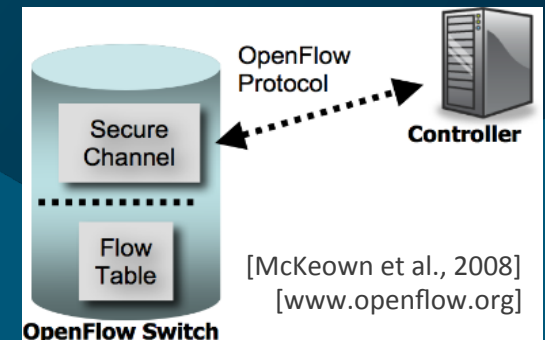
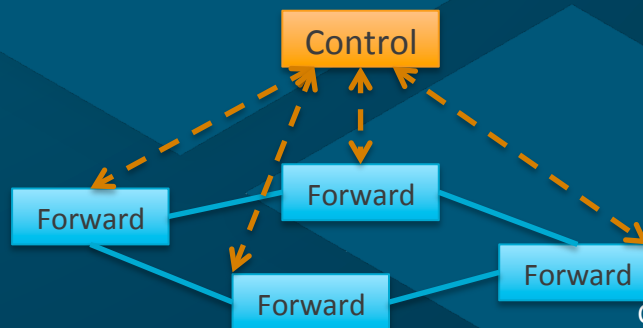
Network virtualization history

Virtualizing links

Virtualizing routers and network control

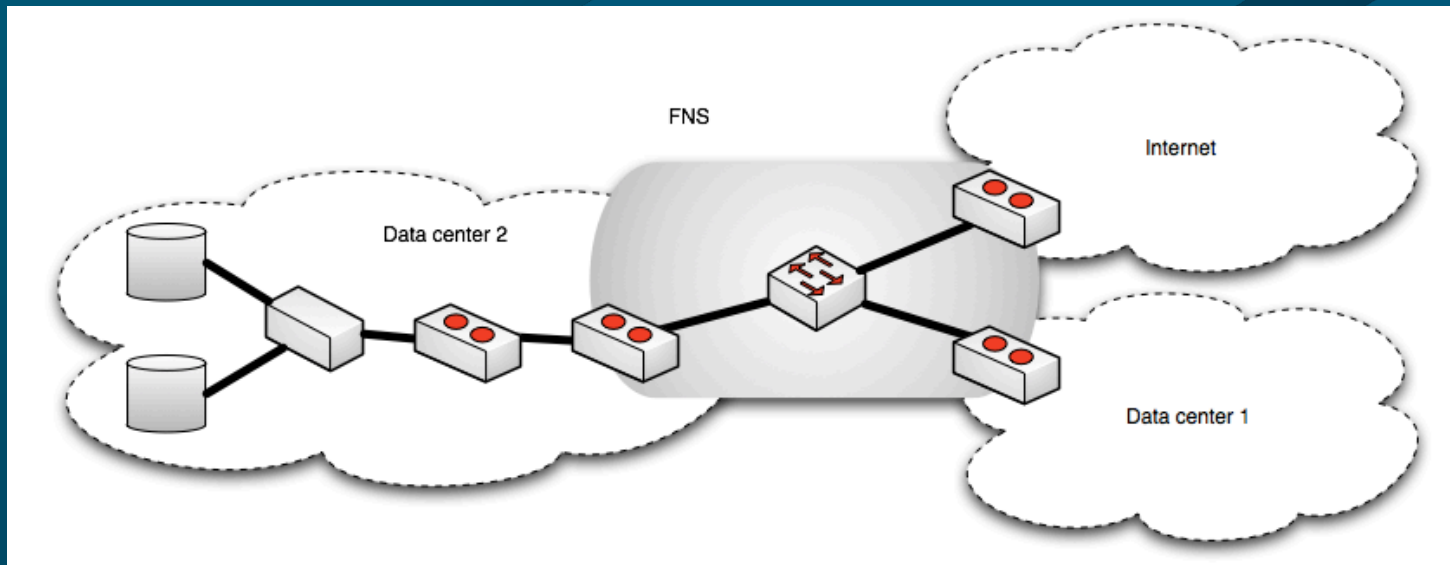
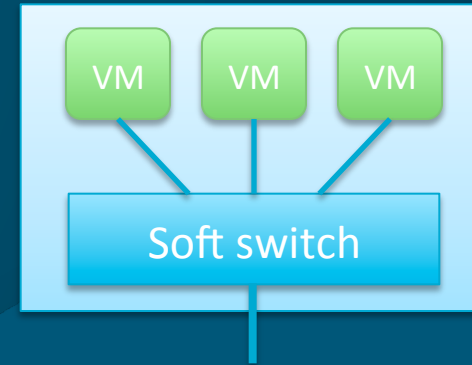
Extracting and programming the control plane

- VLAN: virtual local area network
- VPN: virtual private network
- Programmable/active networks
- Overlay networks
- Virtual overlays (e.g., PlanetLab)
- Virtual Networks with virtual routers and virtual links (e.g., VINI [Bavier 2006], EU 4WARD, GENI, EU Federica) → Clouds
- ForCES: Forwarding and Control Element Separation
- OpenFlow



Network virtualization

- End to end control
- Performance & Isolation
- Modeling



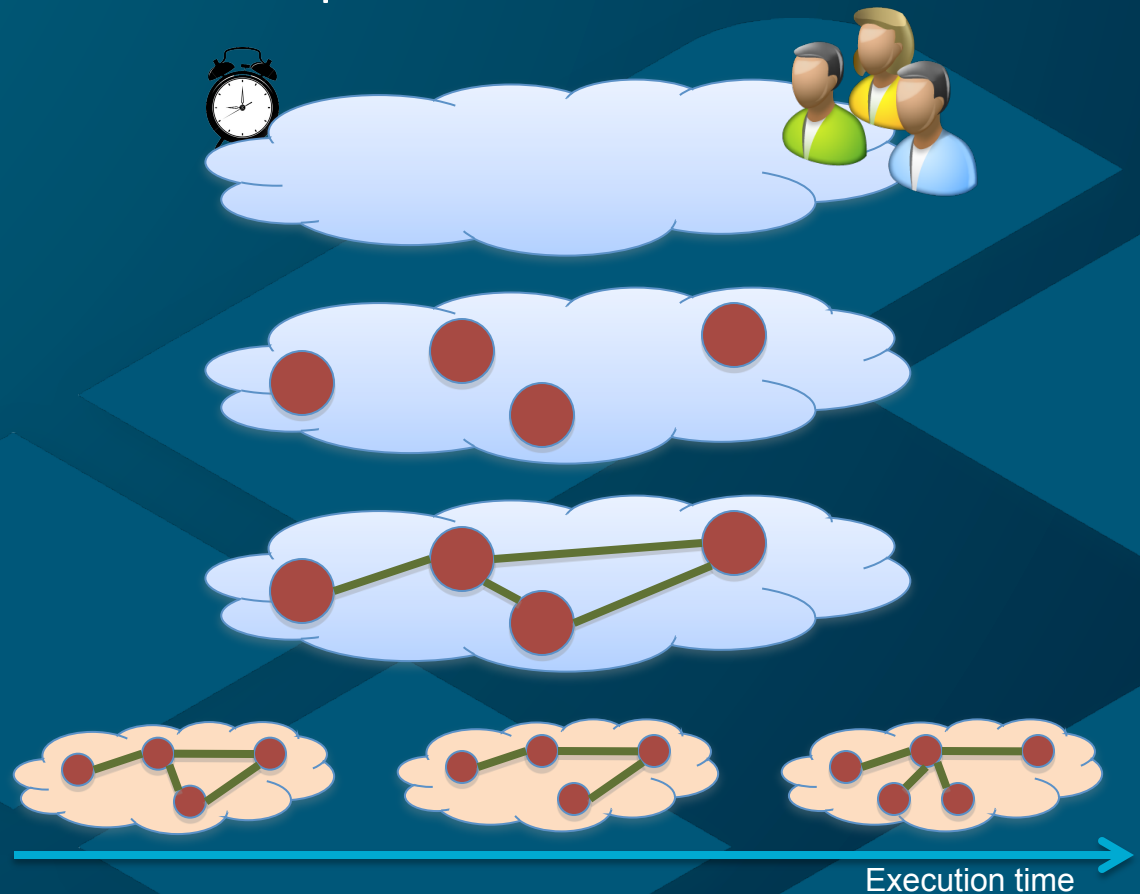
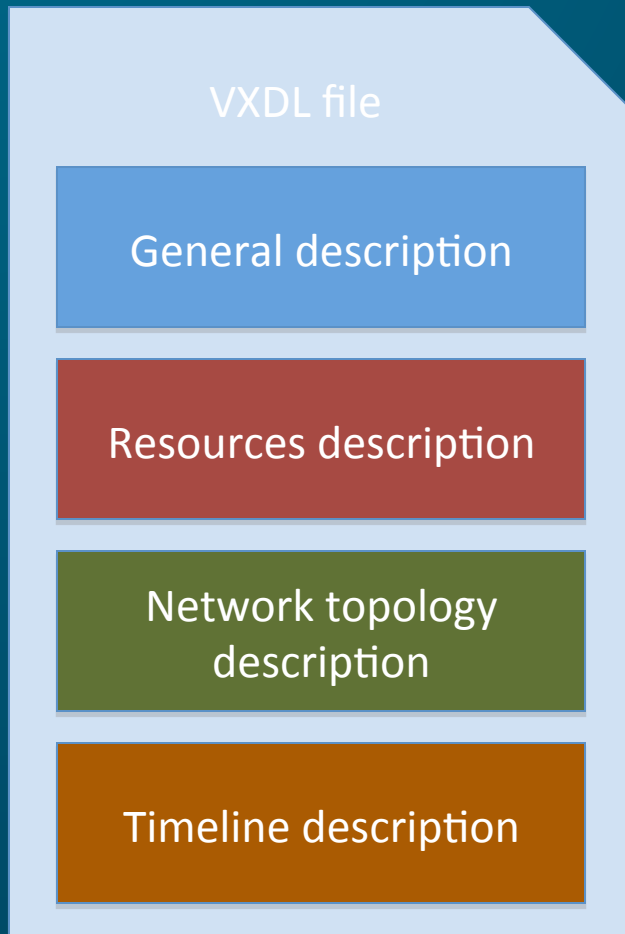
VXDL: A modeling language for VN & Clouds

- Model-based approach for VI
 - A model is the formal specification of the function, structure and/or behavior of a system
 - Abstract representation
 - Related to application domain
 - Goal
 - Maximizing compatibility
 - Simplifying design process
 - Promoting communication among stakeholders
 - Must make sense for users

Design once,
provision and run it
on any platform

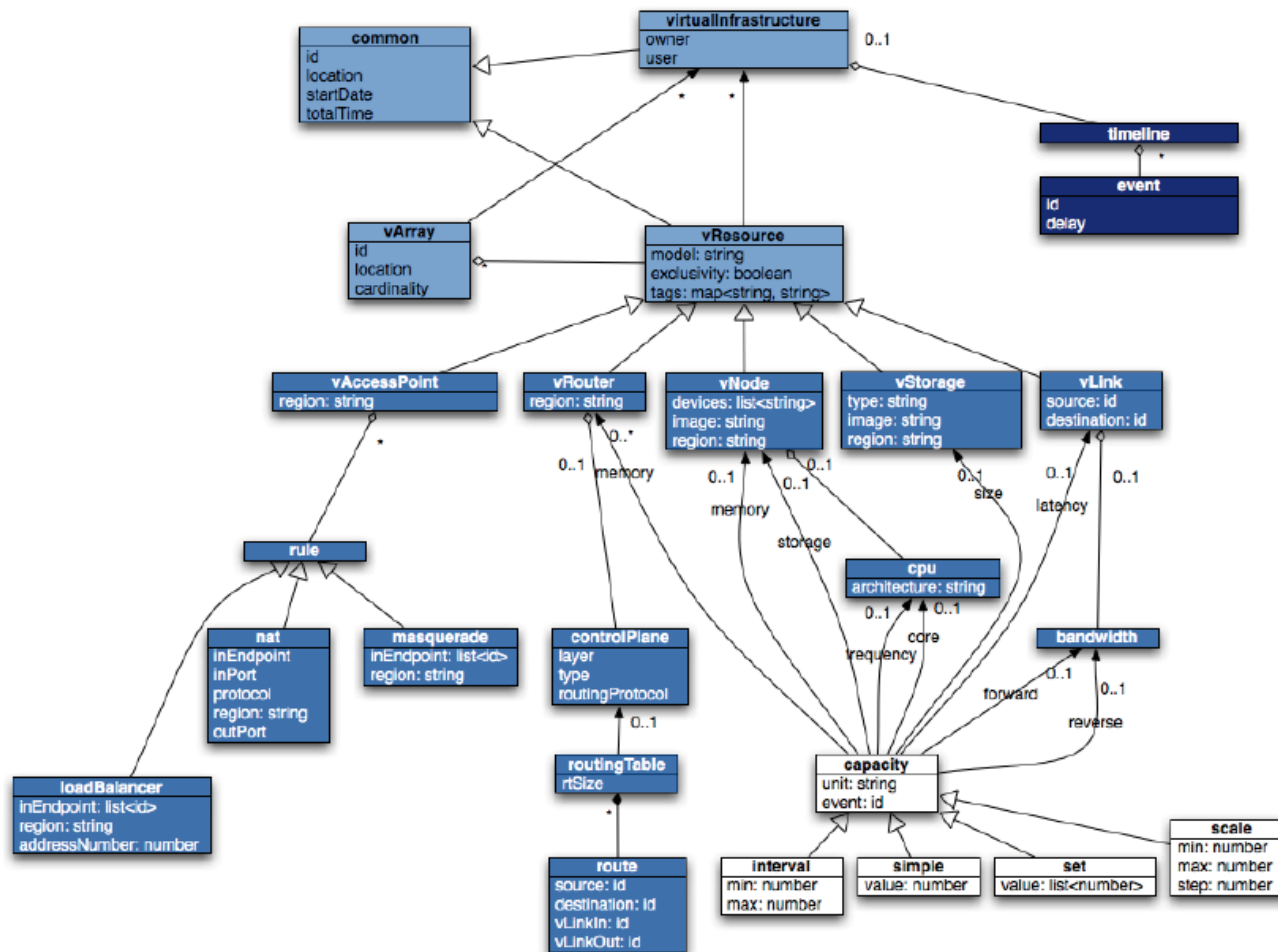
VXDL file structure

A VXDL file contains the formal description of a VI

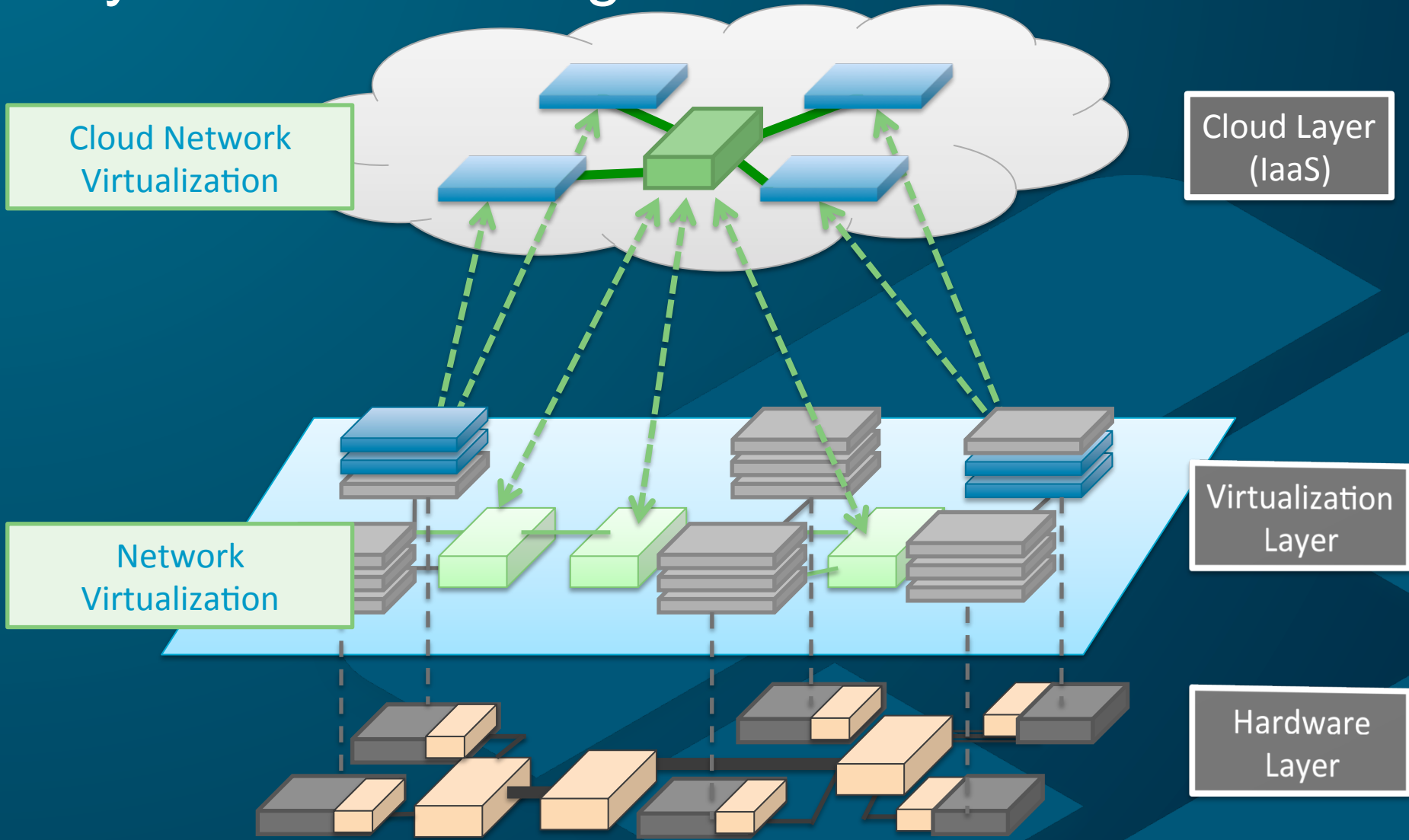


VXDL v2.0 UML diagram

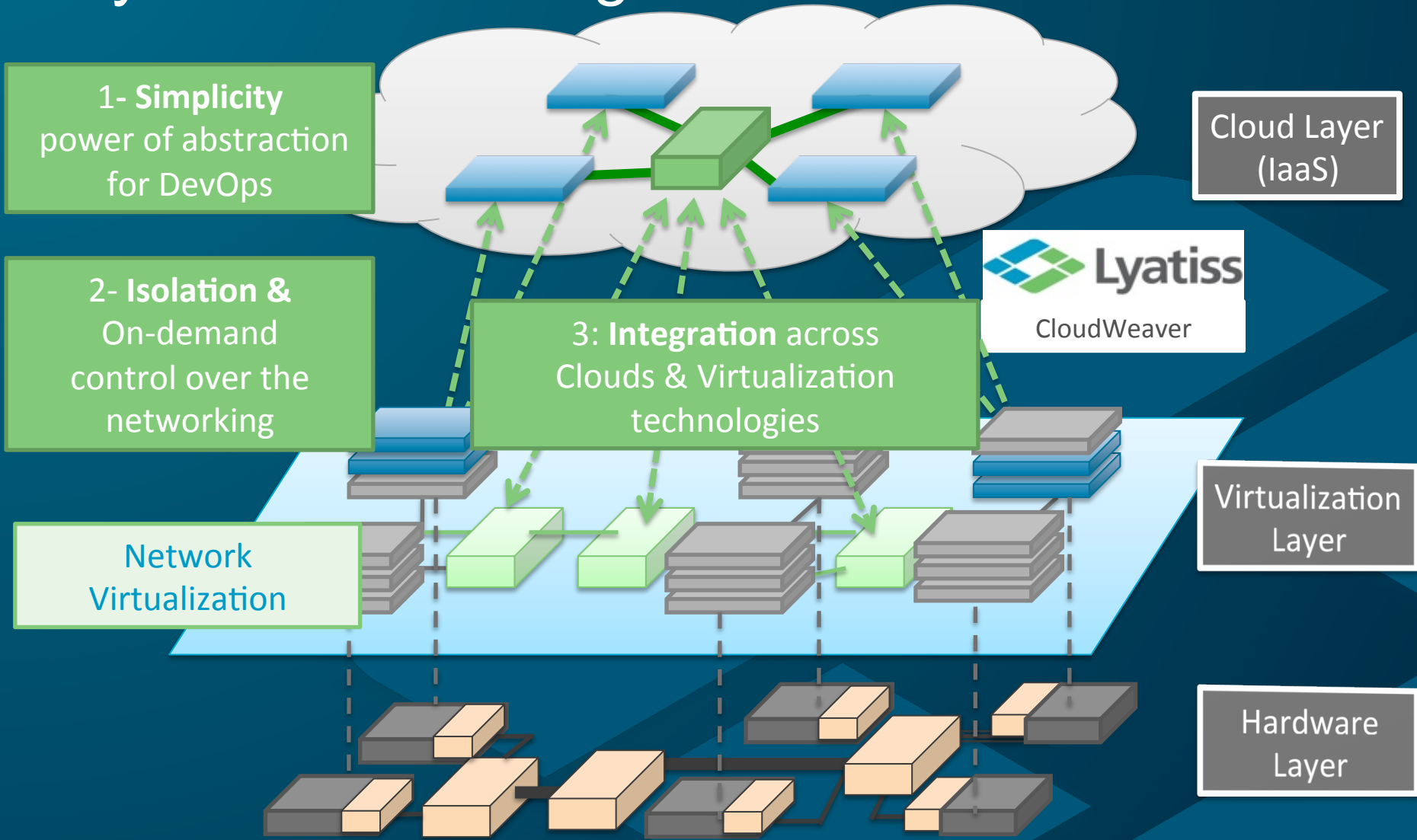
6 VXDL UML representation



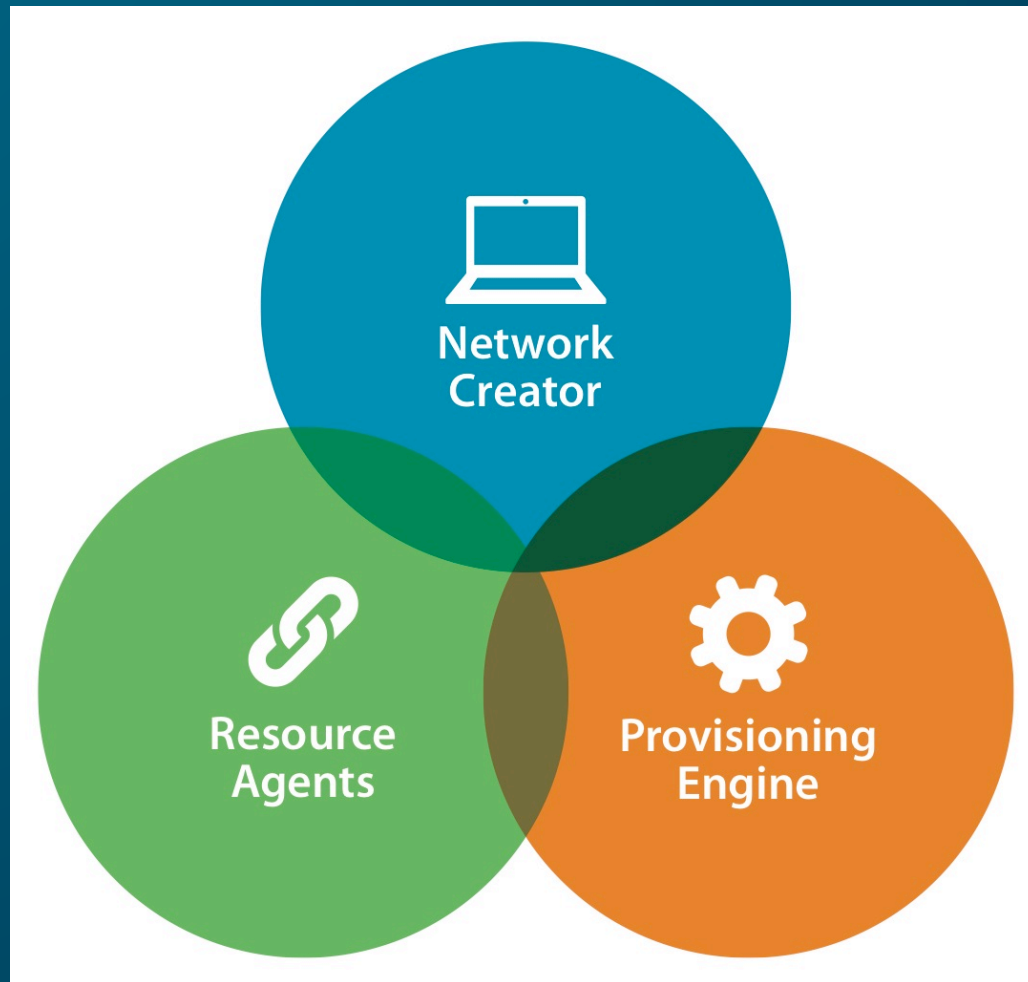
Lyatiss: Virtualizing the Cloud Network



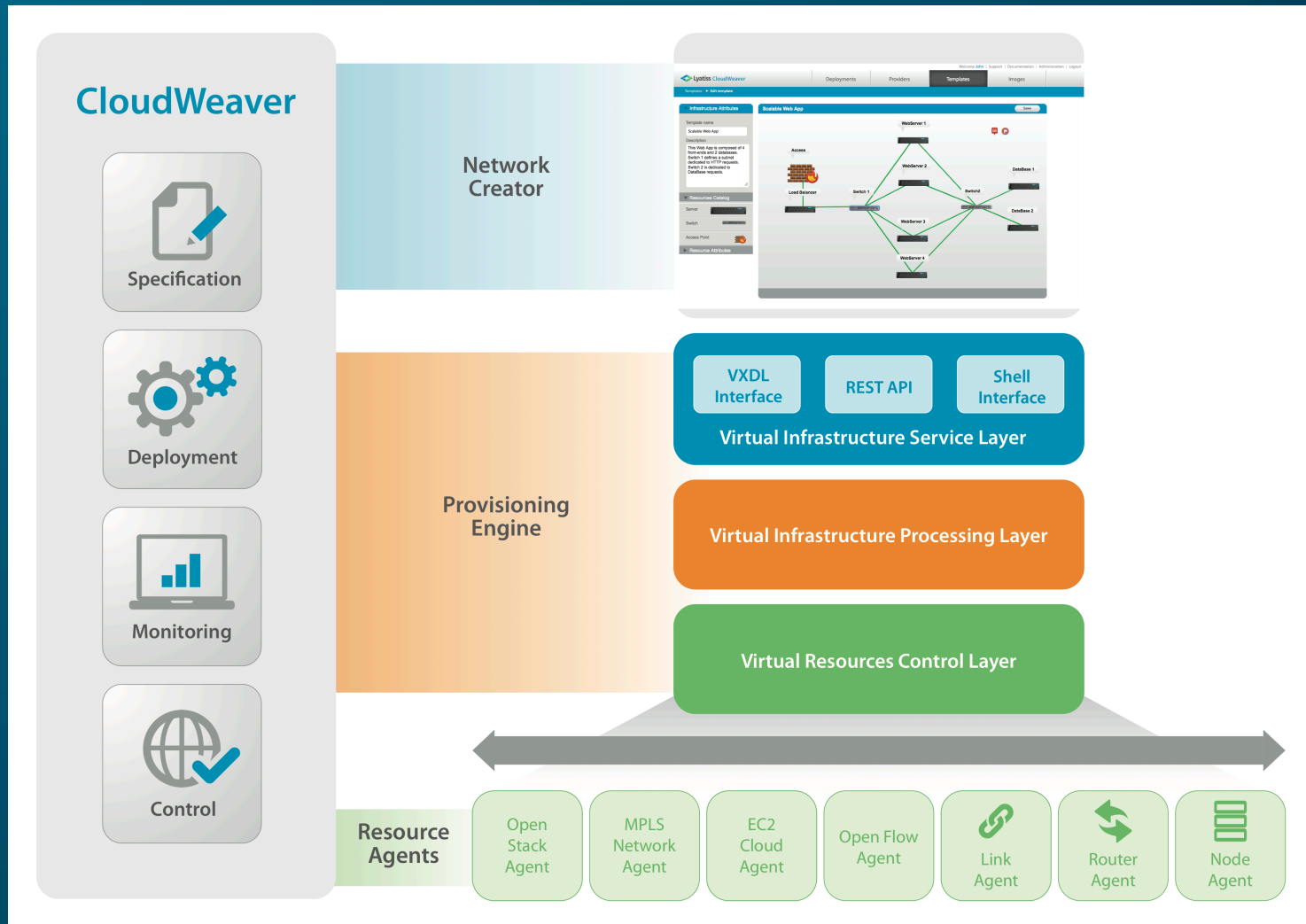
Lyatiss: Virtualizing the Cloud Network



CloudWeaver : building blocks



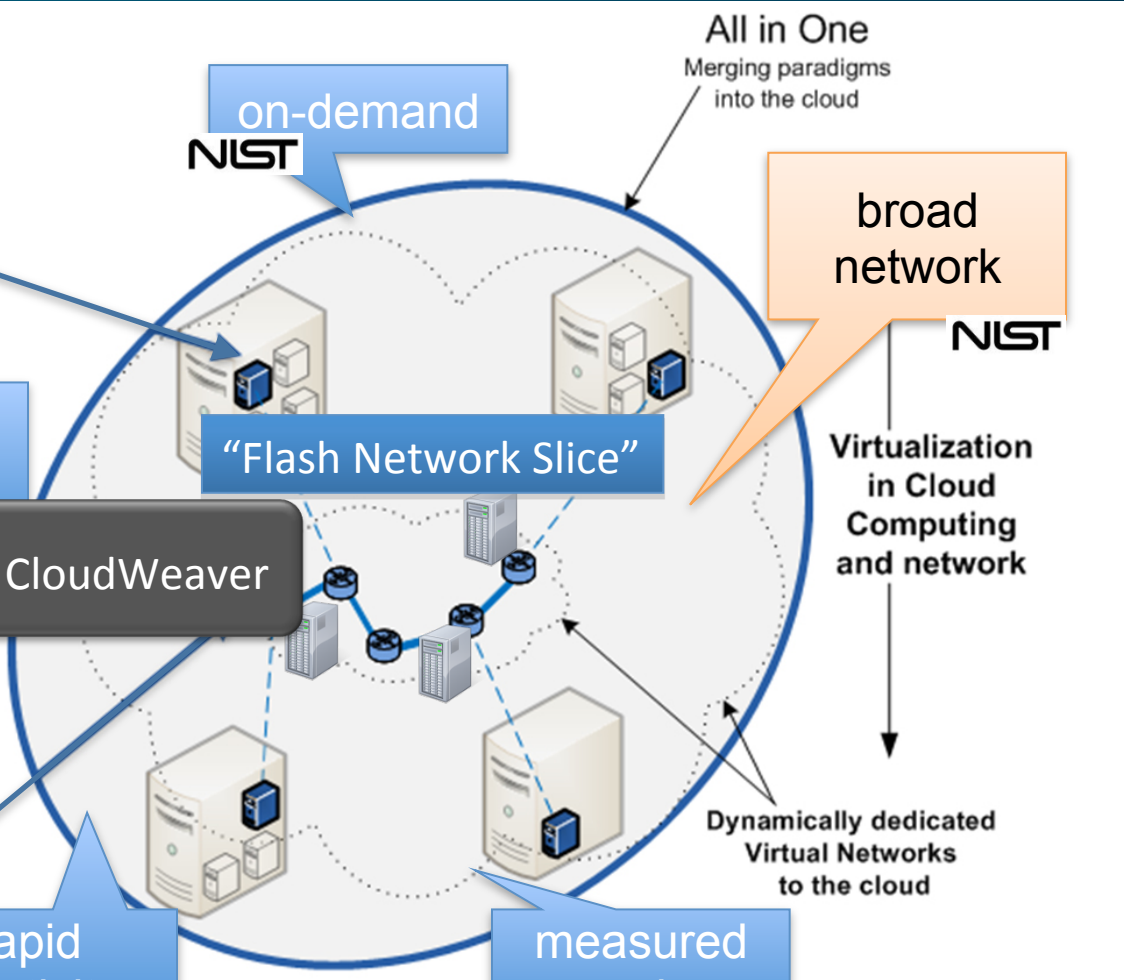
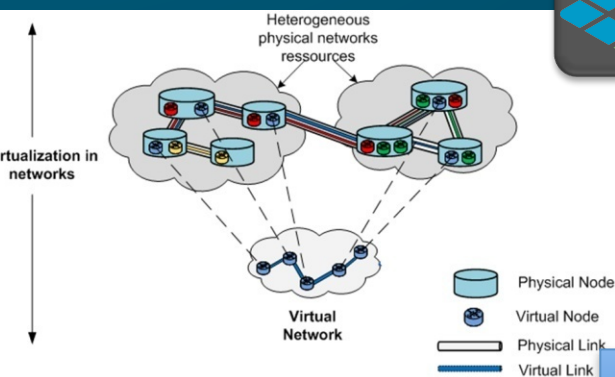
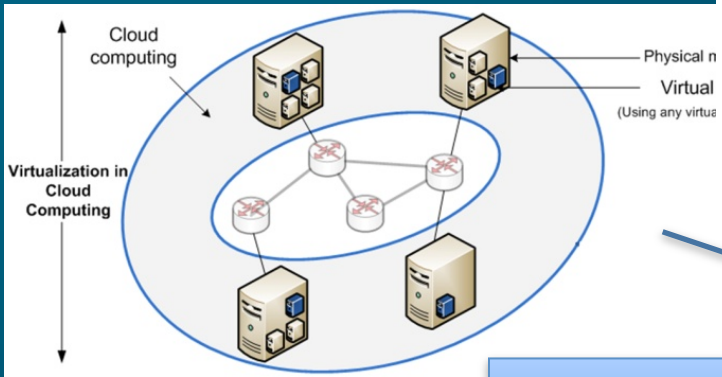
CloudWeaver: Architecture



Lyatiss CloudWeaver benefits

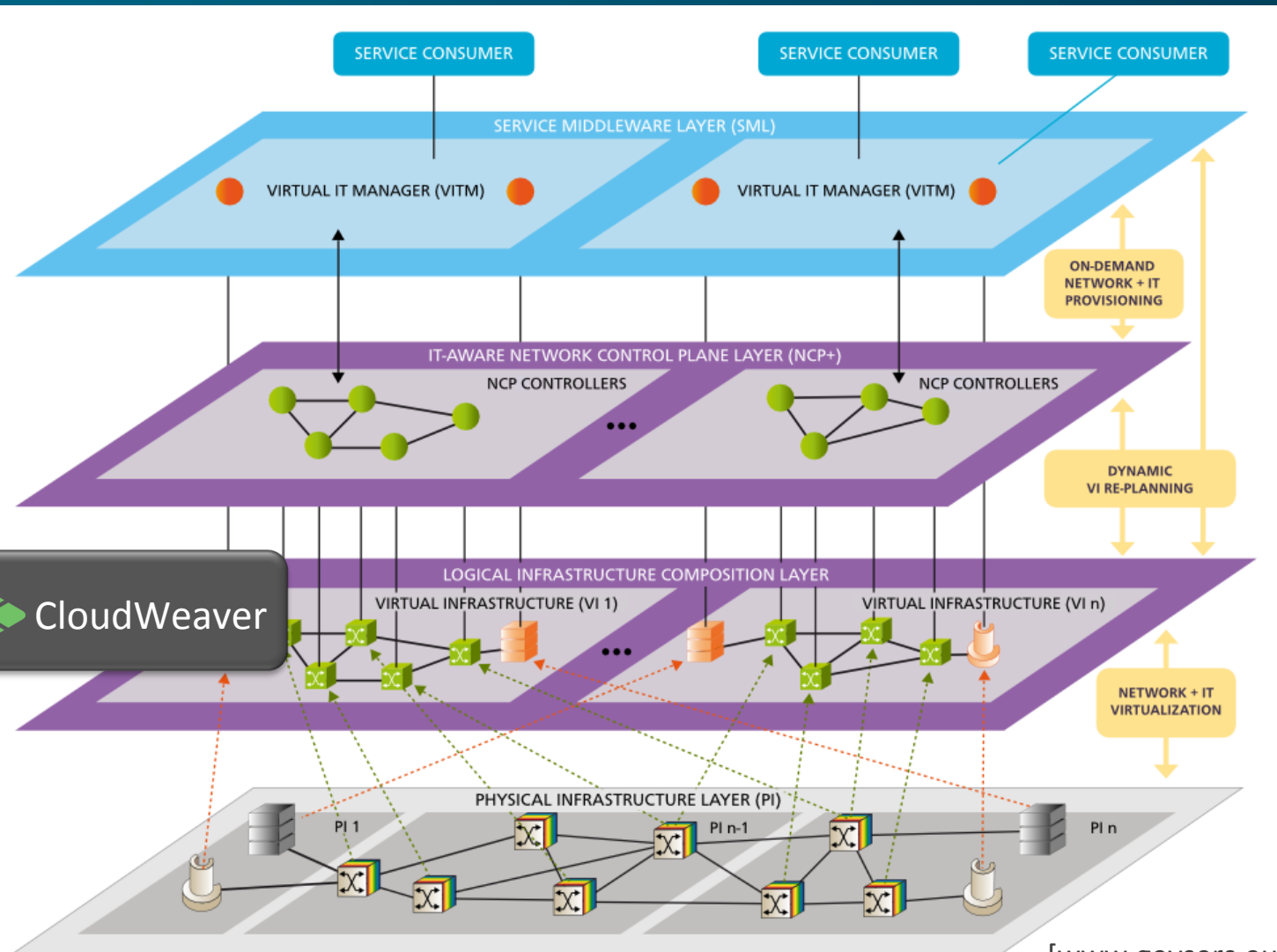
- Model Cloud resources and networks
- Get End-to-End control of Cloud Network
- Deliver application security and service levels
- Migrate and support complex workloads to the Cloud
- Support rich media applications with high quality

Deployment: SAIL EU FP7 project:



Deployment: GEYSERS EU FP7 project

Generalized Architecture for Dynamic Infrastructure Services



Service, e.g., for Cloud customers

Virtual Network Control

Virtual Infrastructure

Physical Infrastructure

Conclusion

- Need for network awareness and control in clouds
- Expand Network virtualization into the cloud
- VXDL: Modeling language for network of virtual resources
- CloudWeaver : Network-centric Cloud Control for
 - Infrastructure services with SLAs & security
 - Hybrid Cloud
 - Virtual Networks control

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