The CloudNets Network Virtualization Architecture

Johannes Grassler
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Teil I

CloudNets Architecture
The CloudNets Ecosystem
The CloudNets Ecosystem

Based on the CloudNets virtualisation architecture and hierarchy of federated roles.
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FleRD: a resource description language for both virtual networks and substrate networks.
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- Based on the CloudNets virtualisation architecture and hierarchy of federated roles.
- FleRD: a resource description language for both virtual networks and substrate networks.
- Flerdit: an editor for FleRD (currently under development)
CloudNets: Hierarchy Of Roles

Roles

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The CloudNets Network Virtualization Architecture
CloudNets: Hierarchy Of Roles

Roles

SP: Service Provider
VNO: Virtual Network Operator
VNP: Virtual Network Provider
PIP: Physical Infrastructure Provider

Function

SP: specifies and operates a service.
VNO: specifies and operates a VNet based on the SP's needs.
VNP: implements a VNet on a substrate of one or more PIPs.
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CloudNets: Hierarchy Of Roles

Roles

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CloudNets: Data Structures

FleRD graphs describe both substrate and VNet topologies.

Mapping Layer graphs map from VNet to substrate.

Mapping Layer graph segments VNet elements mapped to multiple substrate elements.

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Teil II

FleRD: Flexible Resource Description
The FleRD Resource description language

Types of graphs

- UL (Underlay): describes a role’s substrate topology.
- OL (Overlay): describes a virtual network’s topology.
- ML (Mapping Layer): maps a virtual network graph to a substrate graph.

Graph structure

- Vertices: NetworkElement-Objects (NE) - both links and hosts.
- Edges: \([0, n]\) NetworkInterface Objects attached to NetworkElements.
Example: VNet With 2 Nodes

Resources:
/node/host/ RAM: 1024
/node/host/ CPU/clock: 1600
/node/host/ HDD: 20000
/node/host/ CPU/count: 2

C1: /node/host

Resources:
/interface/bw/up: 100
/interface/bw/down: 100

eth0

Resources:
/interface/bw/up: 100
/interface/bw/down: 100

network_interface

Resources:
/link/bw/upstream: 100
/link/bw/downstream: 100

L1: /link/generic

network_element

Resources:
/node/host/ RAM: 1024
/node/host/ CPU/clock: 1600
/node/host/ HDD: 20000
/node/host/ CPU/count: 2

C2: /node/host

Resources:
/interface/bw/up: 100
/interface/bw/down: 100

eth0

network_interface

network_element

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The CloudNets Network Virtualization Architecture
The CloudNets Prototype

FleRD: Database schema with object-relational interface, graphs serialized to YAML.
LP-Solver computes VNet Embeddings.
Substrate-dependent plugins implement VNets on different kinds of physical infrastructure.

Virtualisation technologies
Host-Virtualisation: Xen and KVM.
Link-Virtualisation: Currently VLANs, OpenFlow planned.

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The CloudNets Network Virtualization Architecture
Life cycle of a VNet request

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The CloudNets Network Virtualization Architecture
Substrate on the VNP level

PIP1

PIP2

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The CloudNets Network Virtualization Architecture
Mapping on the VNP level
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The CloudNets Network Virtualization Architecture
Try cloudnets-framework!

Source available on our project page

https://projects.inet.tu-berlin.de/projects/cloudnets-framework/

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Thank You!