

# Semantic Infrastructures

Jeroen van der Ham, Chariklis Pittaris, Paola Grosso & Cees de Laat

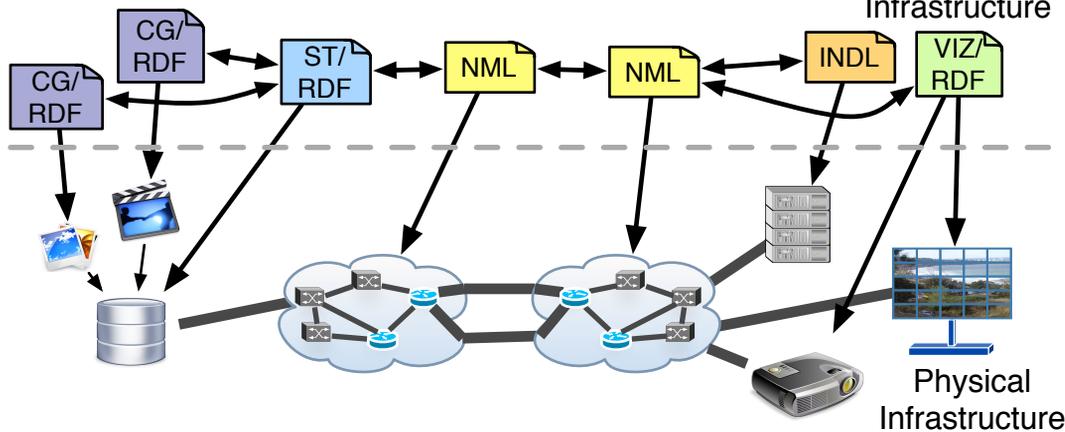
## Modelling Computing Infrastructures

We develop semantically rich information models to describe resources and services in e-Infrastructures. These models provide the means to develop inter-domain path finding algorithms that can use aggregated or incomplete information. The same models are also at the basis of federation methods for integrated services in Future Internet platforms. Future challenges include the modelling of clouds with their virtual devices and networks and how to make scheduling in these environments more efficient and energy-aware.

## Infrastructure Description Language

The Infrastructure Description Language (INDL) allows operators and users to describe physical topologies, attached resources, and allows linking with other kinds of resources attached to the infrastructure. INDL contains the Network Markup Language, a standard way of describing network topologies. Together with other ontologies we can look at problems such as: "Find a movie containing X and transcode it to show on this tiled display"

## Semantic Infrastructure



## Adoption

The descriptions have been adopted by the following entities:

- OGF Network Markup Language
- OGF Network Services Interface
- SURFsara NOC
- NSF program GENI
- I2CAT
- Global Lambda Integrated Facility
- ENVRI

## Virtual Network Embedding

The Virtual Network Embedding (VNE) problem is to map virtual resources to the physical infrastructure, i.e. a request from a user contains a (virtual) resource topology, which must be mapped to the physical topology of the provider. The challenge is to minimise the cost for the user as well as the amount of used resources. This problem is even more difficult when applying it to a federation of resource providers or multiple clouds.

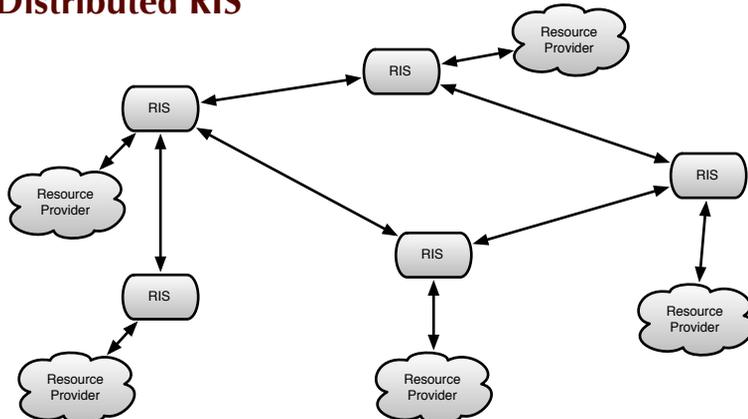
## Resource Information Service

The Resource Information Service (RIS) provides a complete distributed semantic backend for storing, querying, manipulating and discovering descriptions for cloud providers that take part in a federation. The RIS service supports the VNE (Virtual Network Embedding) problem in the federation, providing all the necessary information, and performing all the discovery tasks in the federation (finding available resources, providing overview utilisation values).

We have successfully implemented the RIS service to support the NOVI project, which federates Future Internet Platforms such as PlanetLab and FEDERICA, and are working on interfacing with ExoGENI.

Future challenges include providing the right caching for monitoring values so that results can be returned timely, and accurately. We are also integrating this solution with larger workflow frameworks to automatically solve questions such as the one stated above.

## Distributed RIS



<http://sne.science.uva.nl/ndl/>

