

# Resource Information Service

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## 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.

In the last case the request is split in sub-parts, and then each sub-part is assigned to different provider. In order to split the request, we use a cost function. The goal is to minimize the cost.

## Resource Information Service

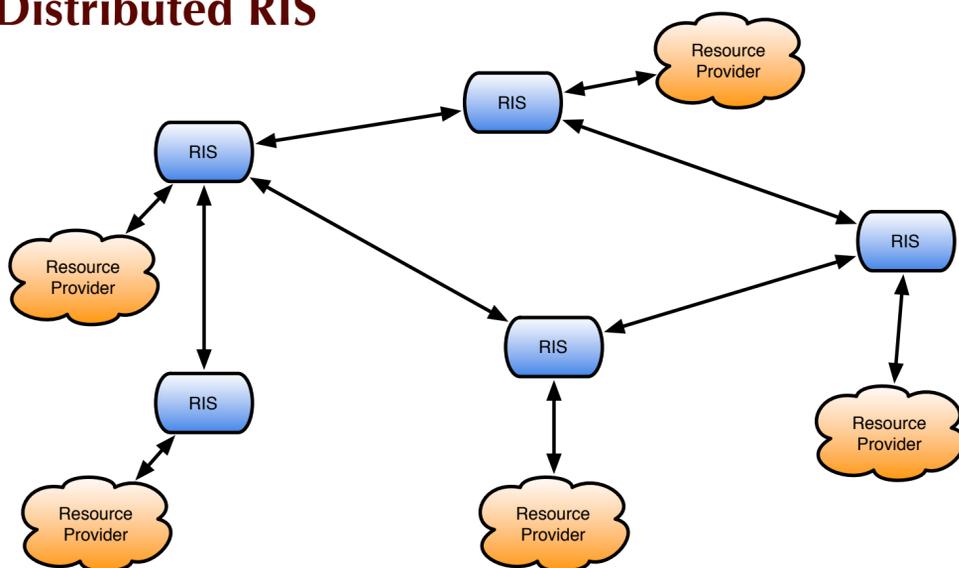
The Resource Information Service (RIS) provides a complete distributed semantic backend for storing, querying, manipulating and discovering resources for cloud providers that take part in a federation. The RIS service supports the VNE (Virtual Network Embedding) problem in the federation, providing all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

Furthermore, it supports the communication with the provider, for retrieving information and sending request. Also it supports the communication with the monitoring service for retrieving resource availability.

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 "Find a movie containing X and transcode it to show on this tiled display"

## Distributed RIS



## Discovery Framework for Dynamic Characteristics

The VNE algorithm requires a lot of information about the provider's resources. It requires the static characteristics of the resources (i.e. hardware type and OS), dynamic characteristics (i.e. CPU utilization and free memory) and in some cases overview utilization information per platform. The retrieval of the dynamic characteristics, and especially the calls to monitoring service, introduces a huge overhead in the overall VNE algorithm. We are working towards a framework (integrated in RIS) that will provide efficiently and fast the dynamic characteristics of the resources. Such a framework will contribute in the following aspects:

- Speed up the local embedding algorithm, which requires the dynamic characteristics of the resources
- Make able the use of complex and more sophisticated cost functions, which use dynamic characteristics and overview utilization values of the provider's infrastructure.

## 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 questions such as the one described above. We leverage the power of INDL and semantic web to describe the information in RIS. INDL is the glue that sticks together the different heterogeneous clouds.