GÉANT BoD Service Evolution

Introducing SDN capabilities in backbone

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GÉANT

LHCOPN/ONE meeting – Amsterdam
28th – 29th Oct 2015

Agenda

- Current Implementation of BoD Service in GÉANT
- Role of Technology Proxy
- DynPac Framework
  - Path Computation Element
- SDN based BoD Architecture
- Work in progress

Current implementation of BoD Service

BoD Portal

cNIS

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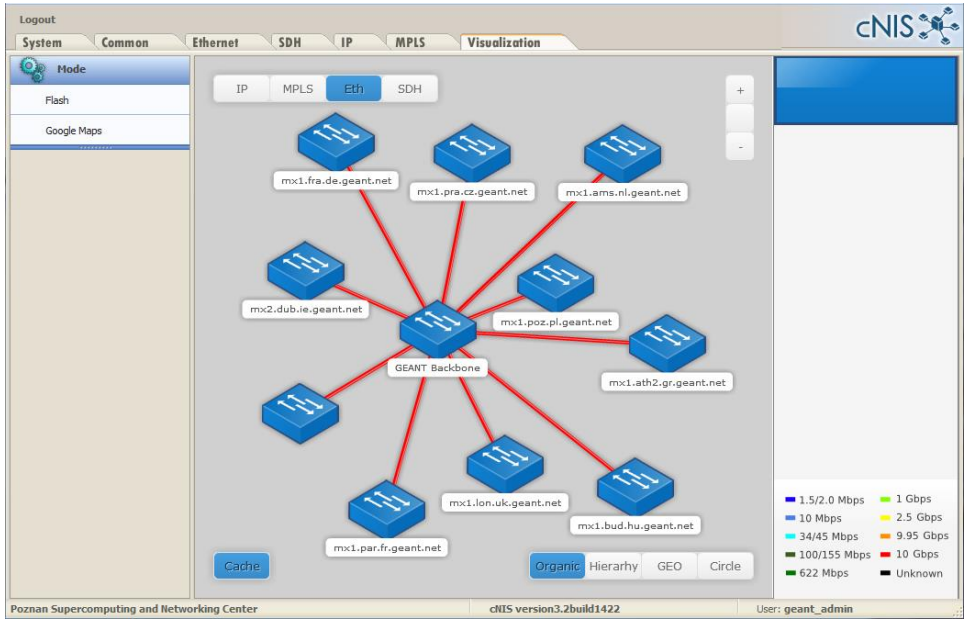
It is repository for data regarding the network topology which is loaded into Autobahn at startup



Current implementation of BoD Service

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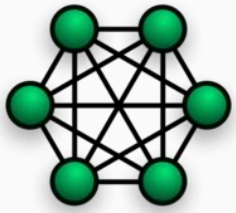
BoD Portal

cNIS



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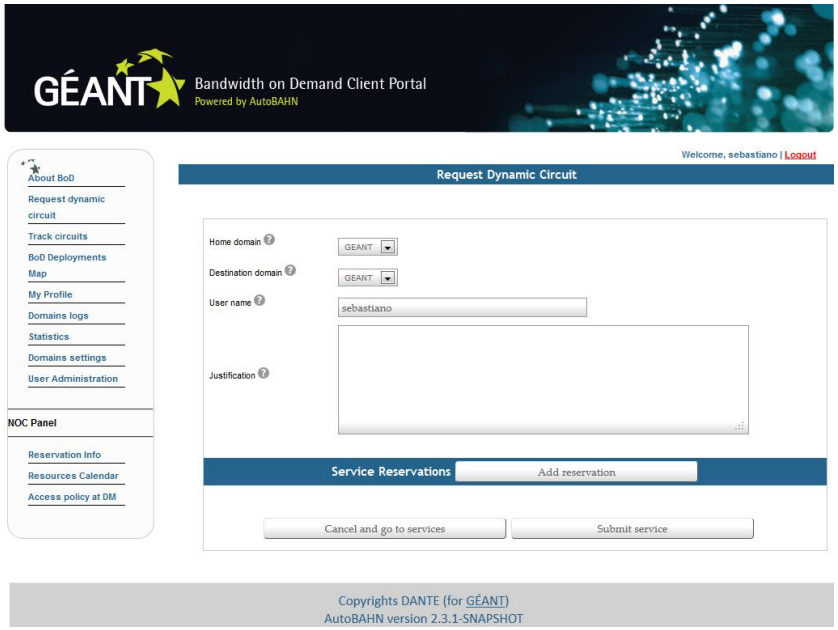
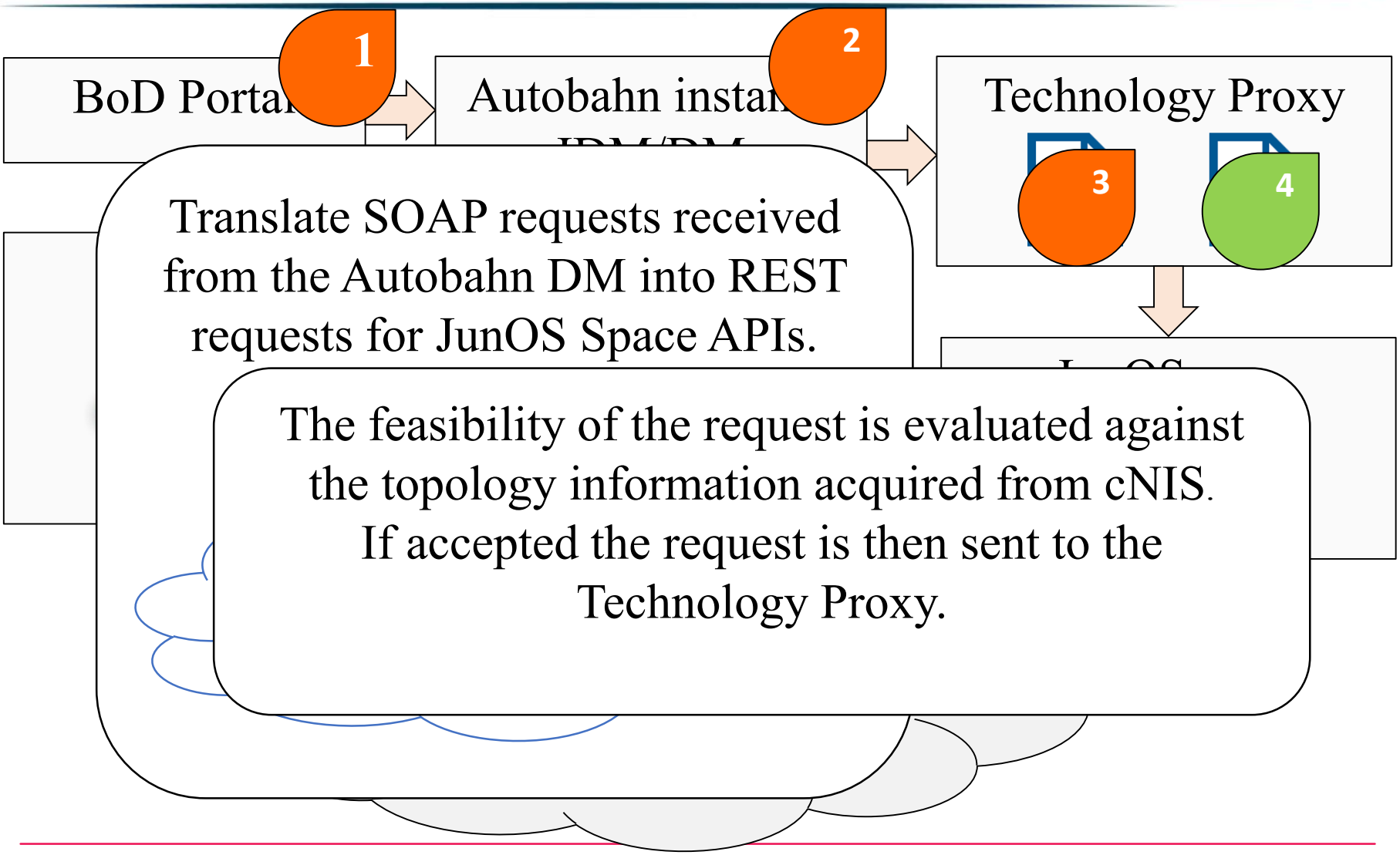
A request comes in thru the user's interface to BoD



GEAN

Current implementation of BoD Service



Current implementation of BoD Service

Technology Proxy

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JunOS Space

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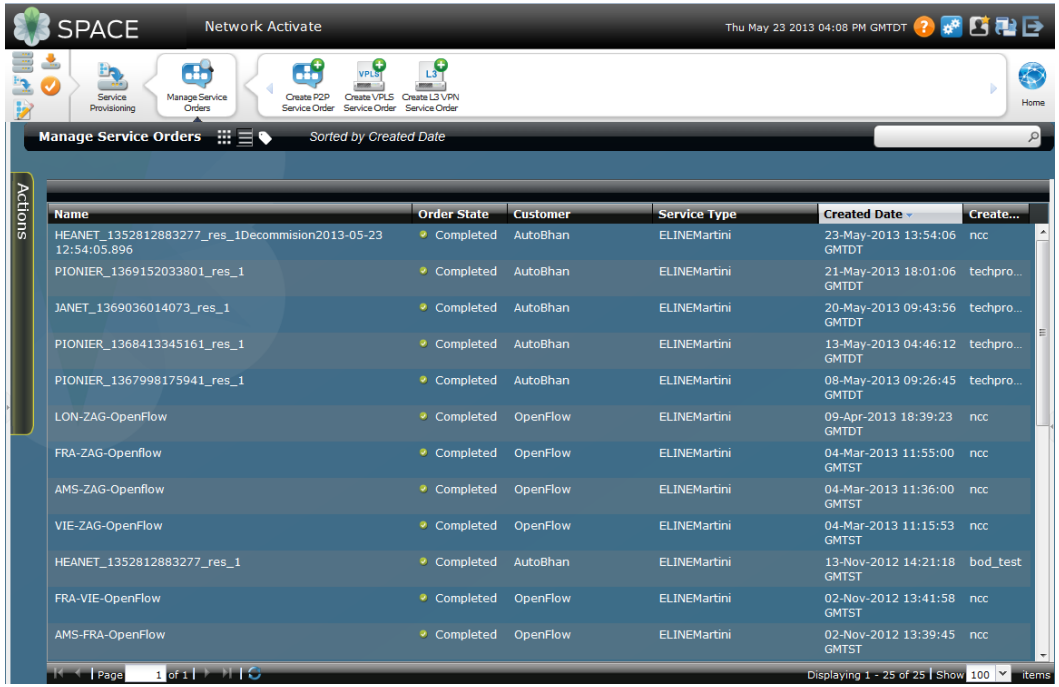
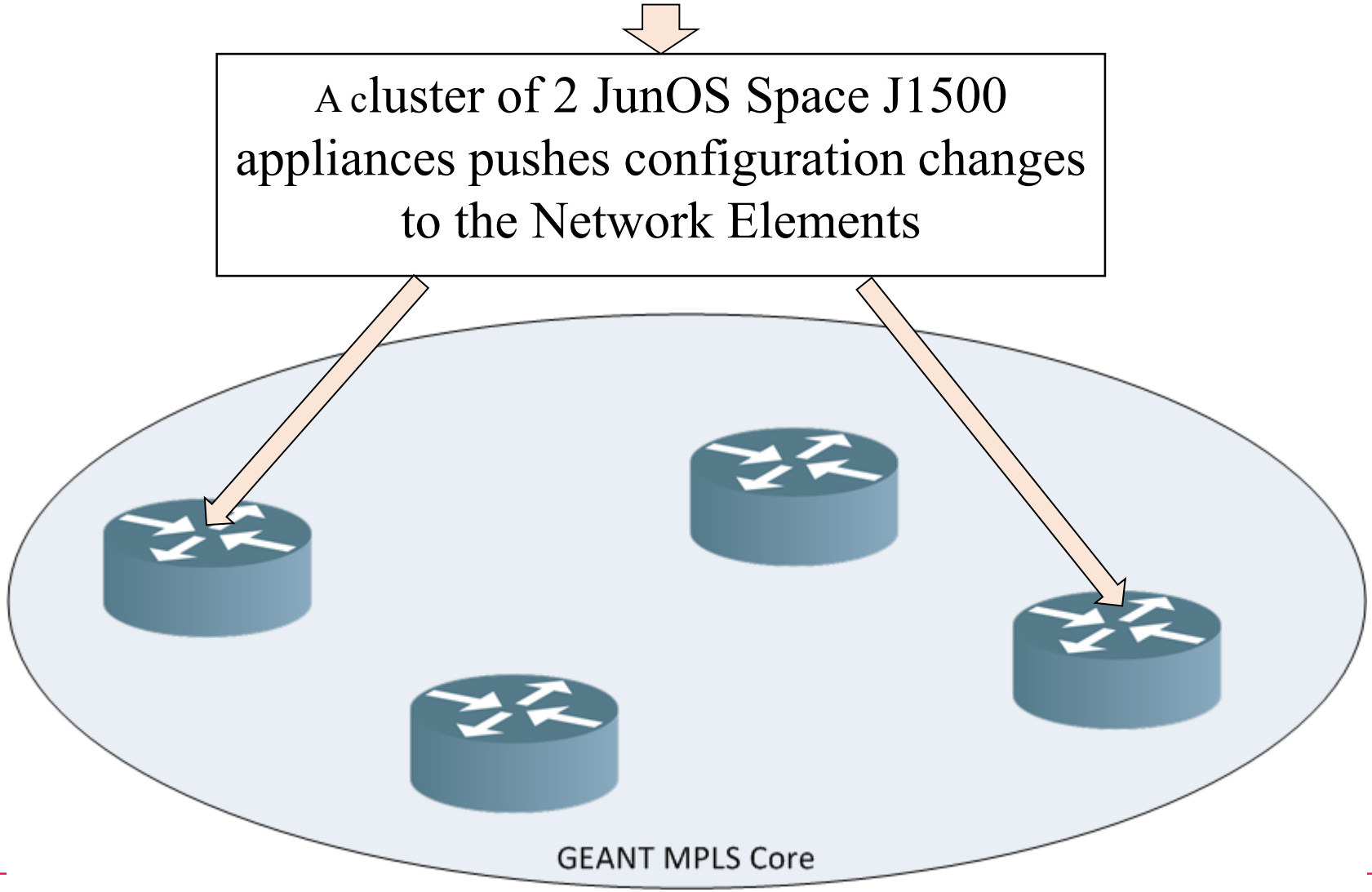
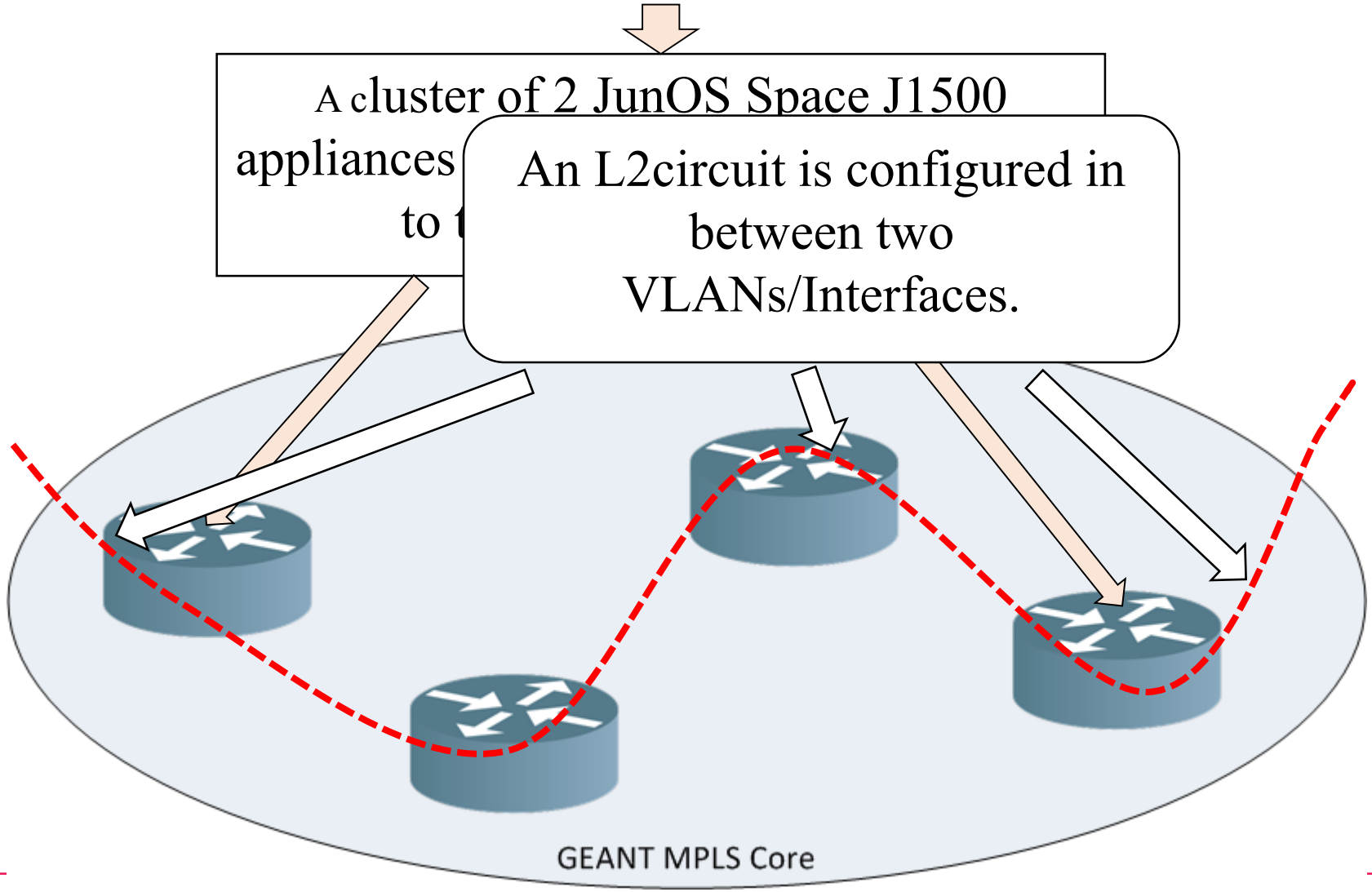
Controls and configure the devices in the network.



Current implementation of BoD Service

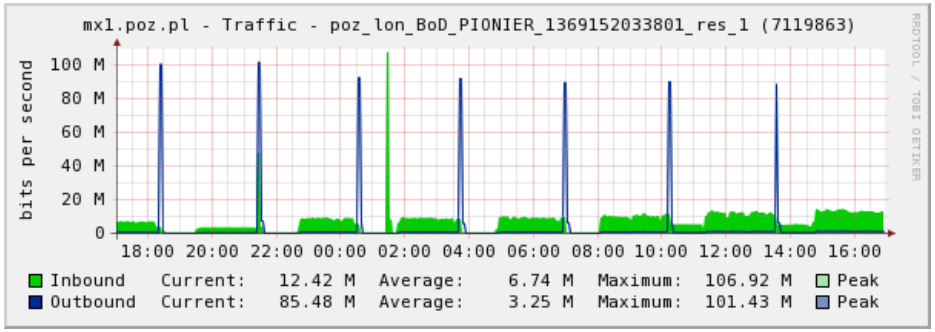


Current implementation of BoD Service



The role of the Technology Proxy

The Technology Proxy is responsible for communicating with our Operation Database, Cacti and for informing us via email should an issue be encountered.

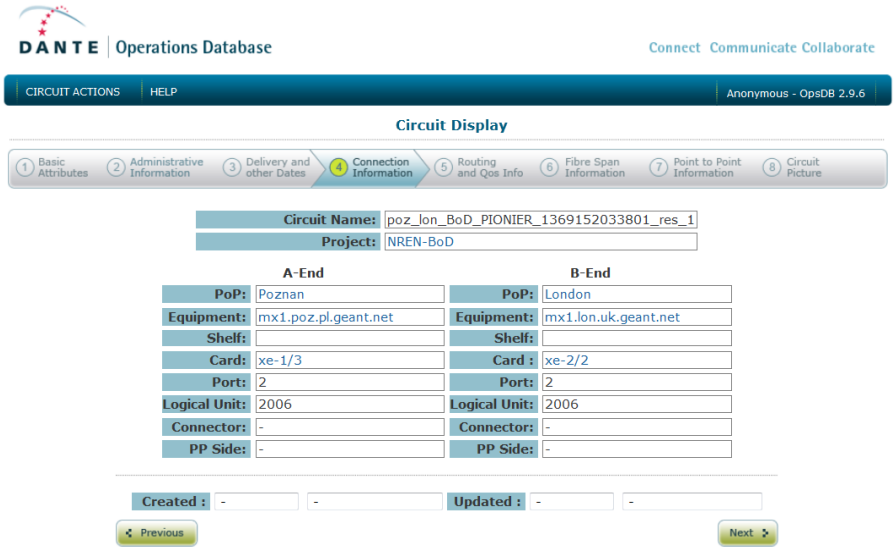


Hello SDE,

An exception occurred while notifying one of the DANTE tool at http://test-opsdb01.geant.net/api/bod/create.php about path with reservation ID - GEANT_1353665096223_res_1.

Details of the error message -
Not able to notify service at 'http://test-opsdb01.geant.net/api/bod/create.php' about BoD Service reservation with Id 'GEANT_1353665096223_res_1', Due to following reason - Unable to exceute POST request: <?xml version="1.0" encoding="UTF-8" standalone="yes"?> <RESTOperation xmlns="services.schema.networkapi.jmp.juniper.net">
<Response>
<Data>
<Identity>
<Type>BoD-Request</Type>
<Value>4390994</Value>
</Identity>
<OperationSpecificData>
<ResponseMessage>
<HTTPResponseCode>400</HTTPResponseCode>
<ResponseMessage>Circuit already exists in OpsDB to mx1.cop.dk.geant.net xe-2/3/2 vlan 990</ResponseMessage>
</ResponseMessage>
</OperationSpecificData>
</Data>
</Response>
</RESTOperation>

Regards,
the GEANT Technology Proxy Team



DynPaC: Dynamic and Adaptive Traffic Engineering for SDNs

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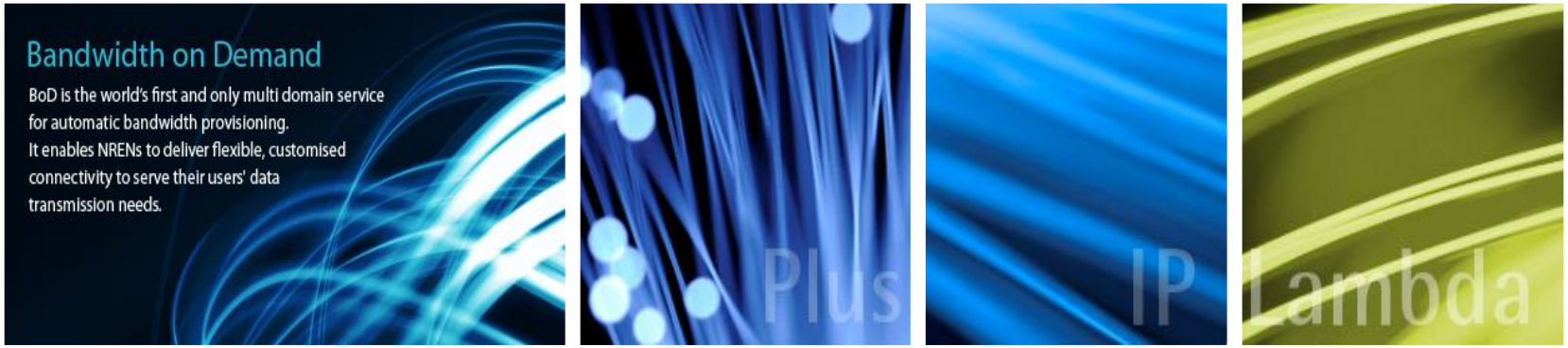
Universidad del País Vasco Euskal Herriko Unibertsitatea

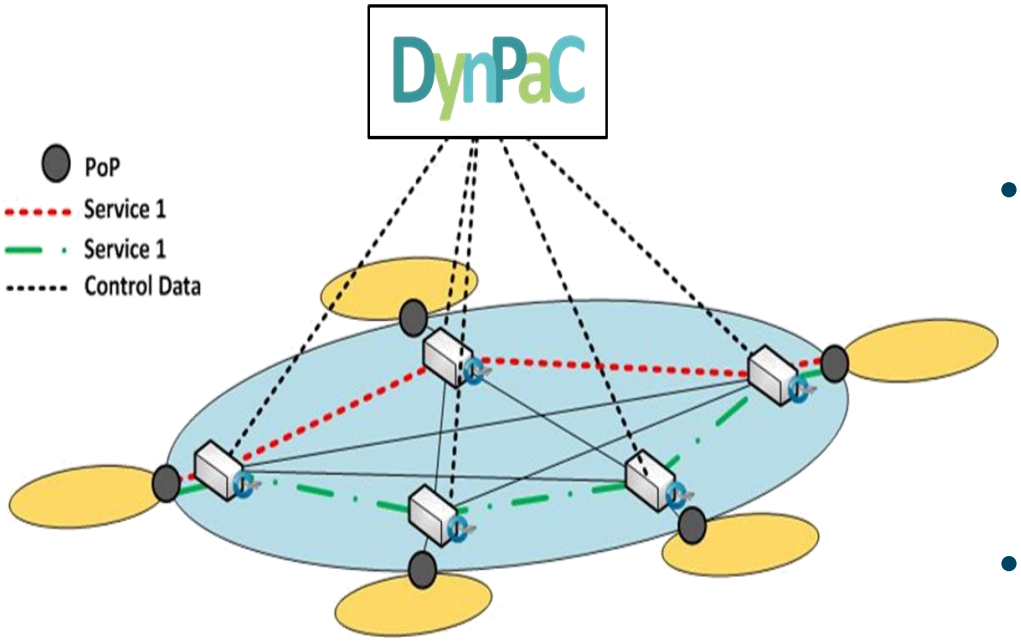
GÉANT Connectivity Services



How can we improve this service?

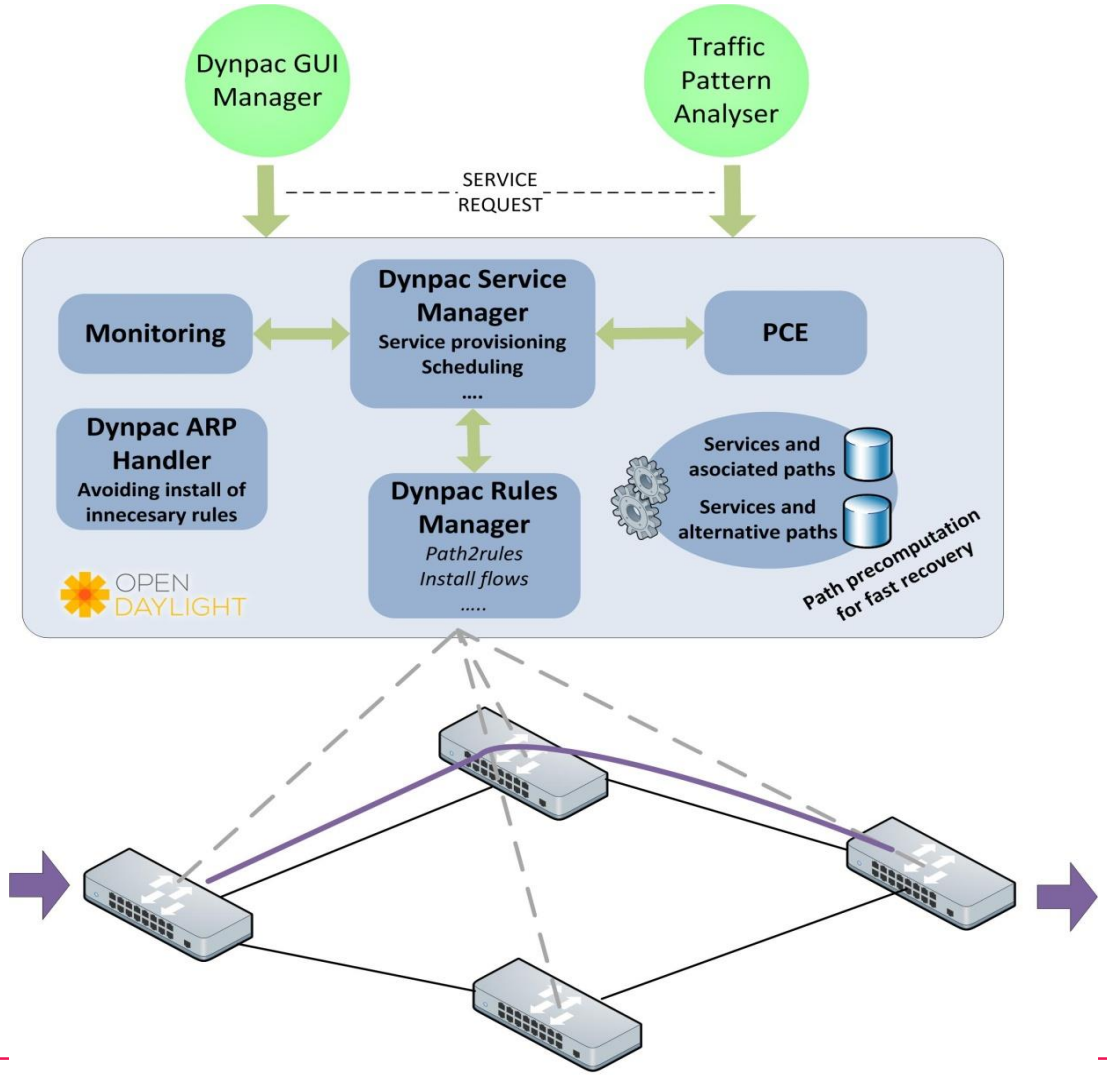
DynPaC

The DynPaC Framework



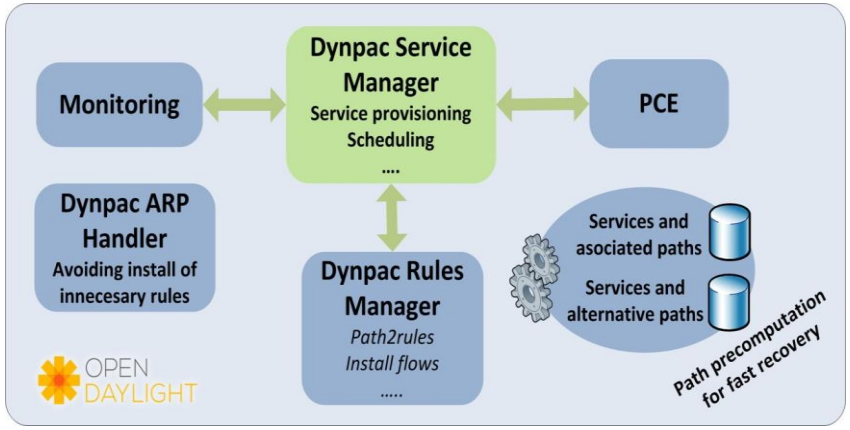
- **Objectives:**
  - Efficient use of the network capacity:
    - Flow relocation.
    - Flow disaggregation.
  - Resiliency in case of a link failure with quick recovery times:
    - Pre-computed backup paths.
    - Two types of services: regular and gold.
  - Reduction of the operational costs of the service management:
  - Improvement of the network monitoring by gathering real time information.

The DynPaC Framework



The DynPaC Framework:
DynPaC Service Manager

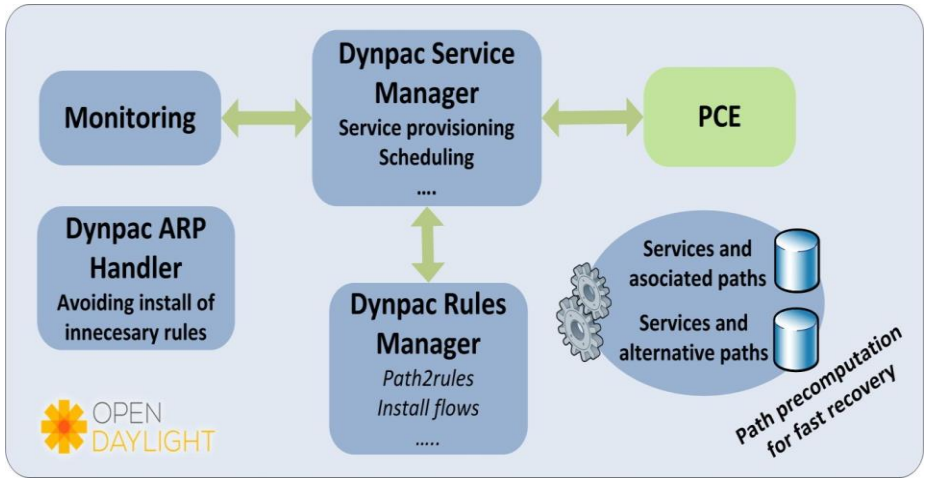
- DynPaC Service Manager:
  - The CORE of the DynPaC framework.
  - Acts as the coordinator.
    - Orchestrates the interaction between the modules of the framework.
    - Listens to topological and monitoring events to react upon changing conditions.



- Manages the introduction of new services in the network. If necessary…
  - Moving ongoing flows to alternative paths.
  - Asking for the disaggregation of ongoing services.
- Provides resiliency and fault recovery:
  - Keeping track of the services and the links they are using.
  - When a link goes down, it identifies the affected services and commits the backup path.
- Performs the scheduling of the services.
  - By defining network snapshots.

The DynPaC Framework:
Path Computation Element

- Path Computation Element:
  - Obtains the network physical topology and computes the shortest path between two network points:
    - ODL topology and switch manager modules are used for this purpouse.
  - It takes into consideration bandwidth constraints and scheduling information.
  - Provides a primary path and a pair of auxiliary paths.



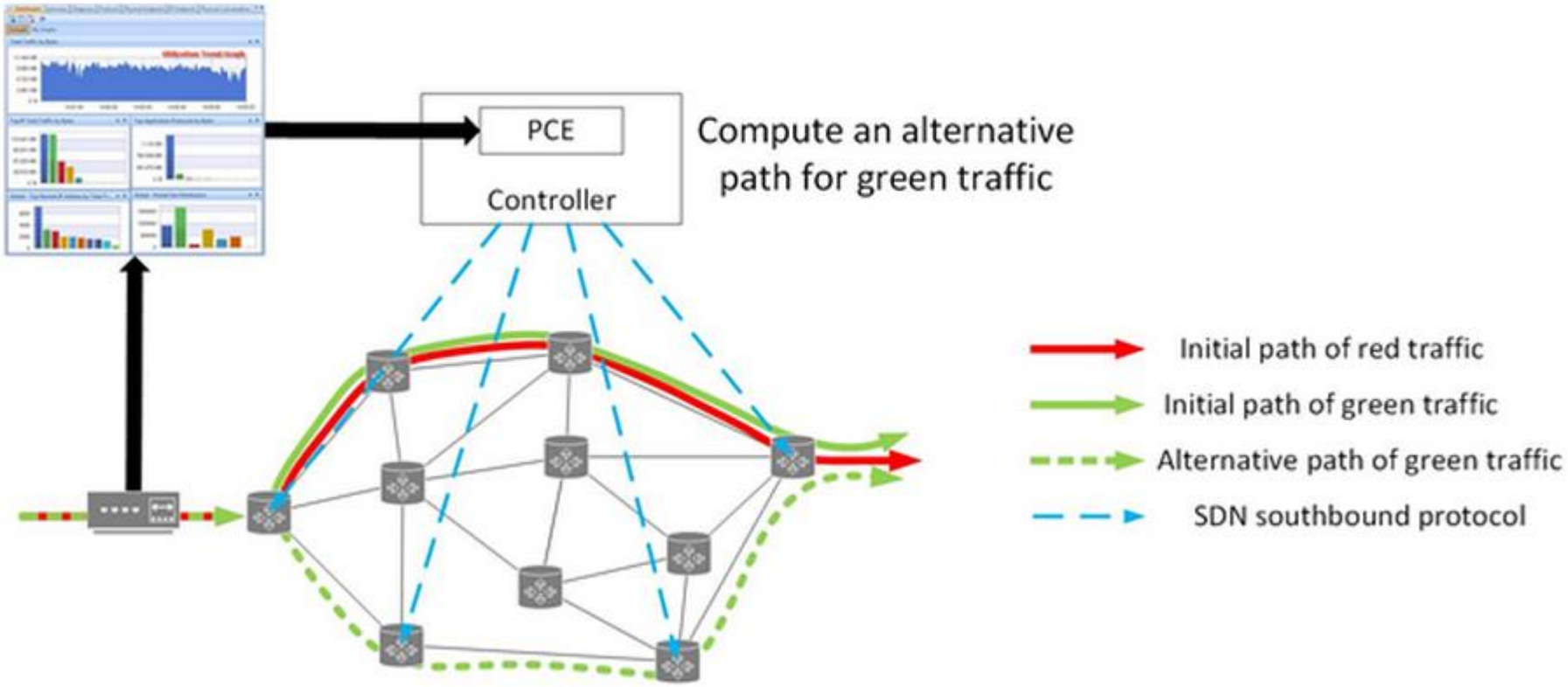
DynPaC Service Manager asks the PCE for a path between the source and destination nodes, accordingly with the available bandwidth and topology.

The DynPaC Framework:
Path Computation Element

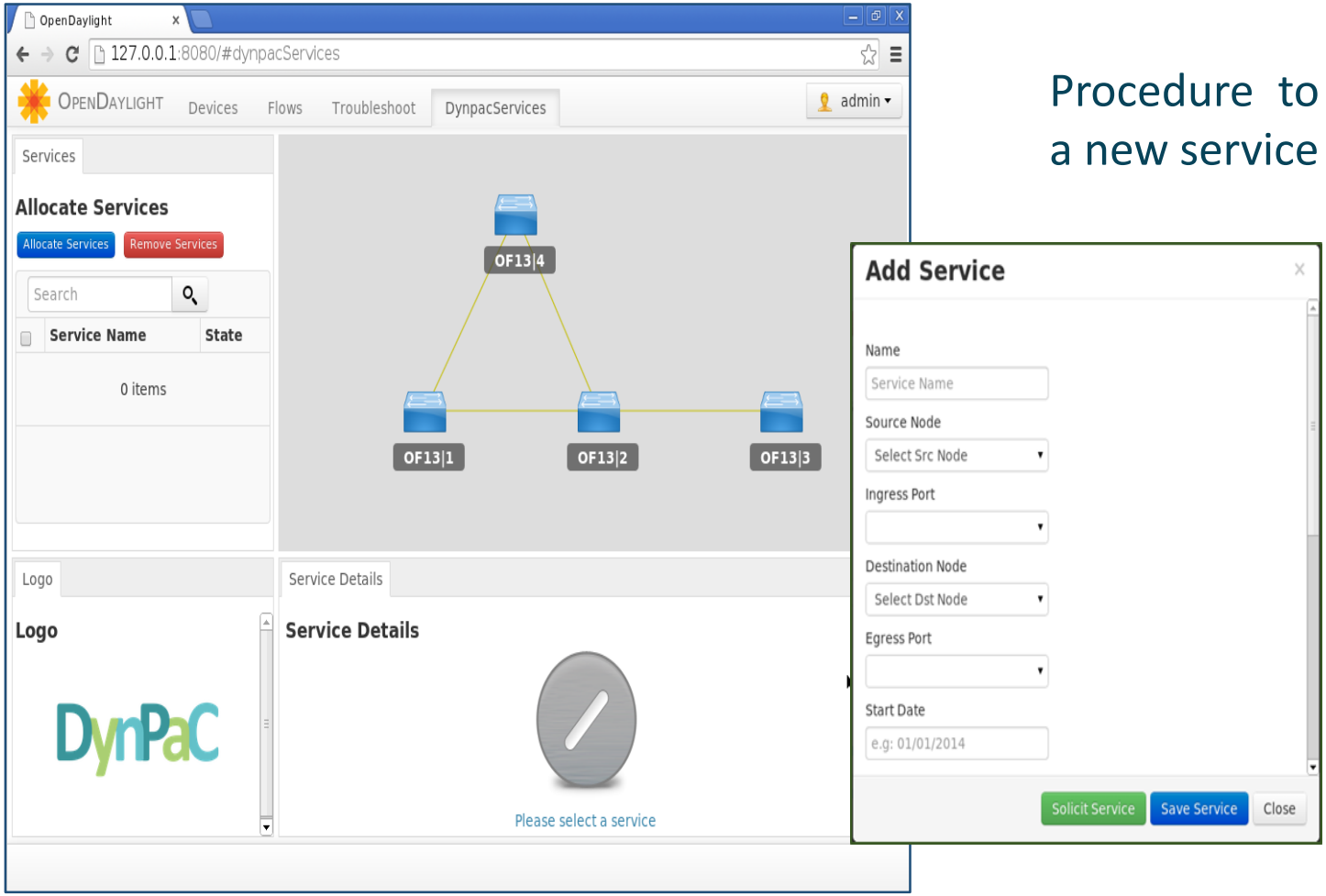
- Path Computation Element:
  - When a new service request cannot be provided with the current flow distribution:
    1. RELOCATION of flows: The DynPaC Service Manager implements an algorithm which evaluates all possible flow distributions for all the snapshots affected by the new service request.
    2. If the relocation algorithm does not provide a positive outcome for all the affected snapshots: **Traffic disaggregation.**

  - **Traffic disaggregation:**
    - Attempt to split flows according to the information provided by the Traffic Pattern Analyser.
    - Try to accommodate the resulting more granular sub-flows in the network.
    - The algorithm prioritizes solutions that minimize the number of split flows.

The DynPaC Framework

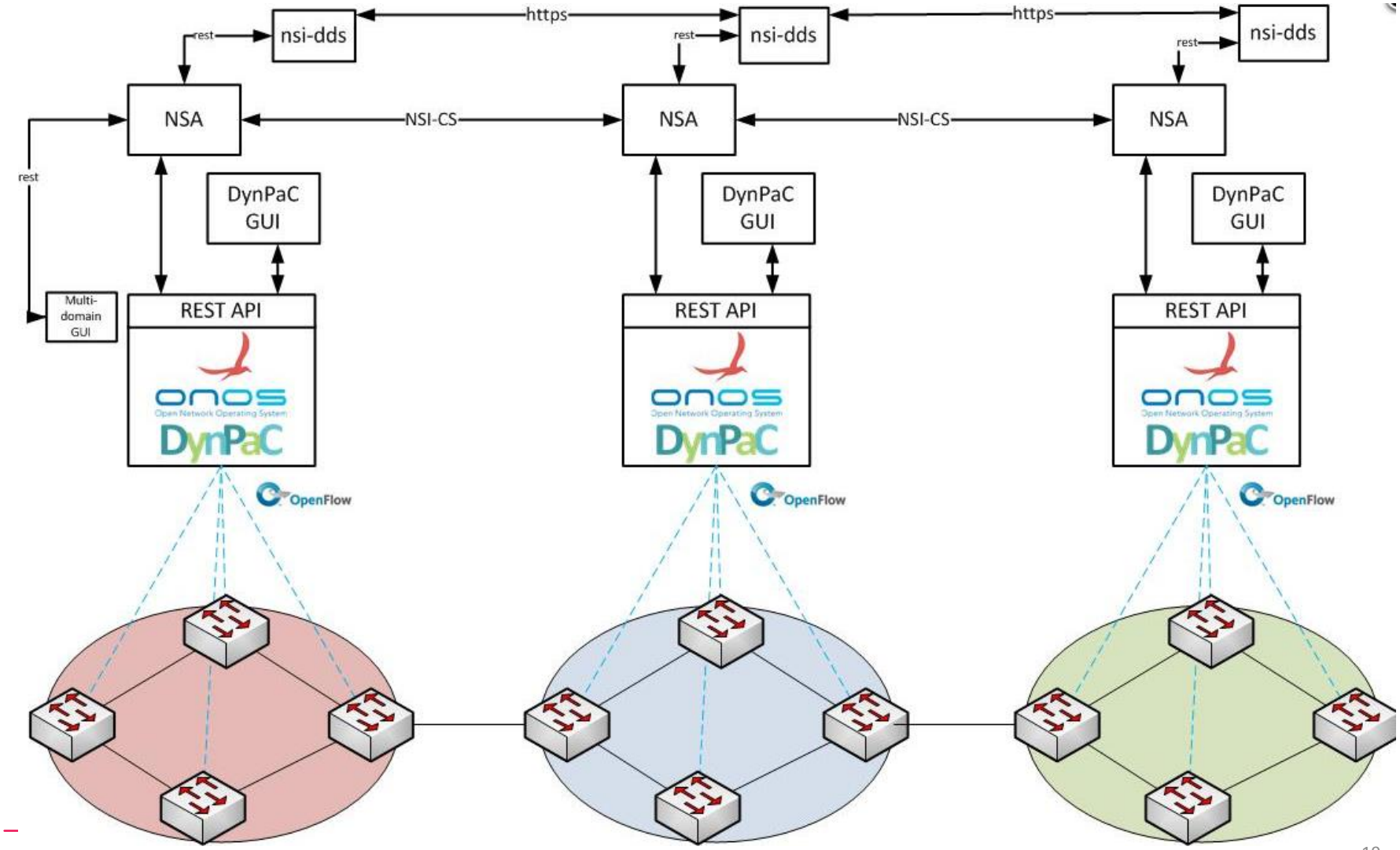


The DynPaC Framework:
GUI



Procedure to request a new service

SDN based BoD Architecture



SDN based BoD Architecture

Overview

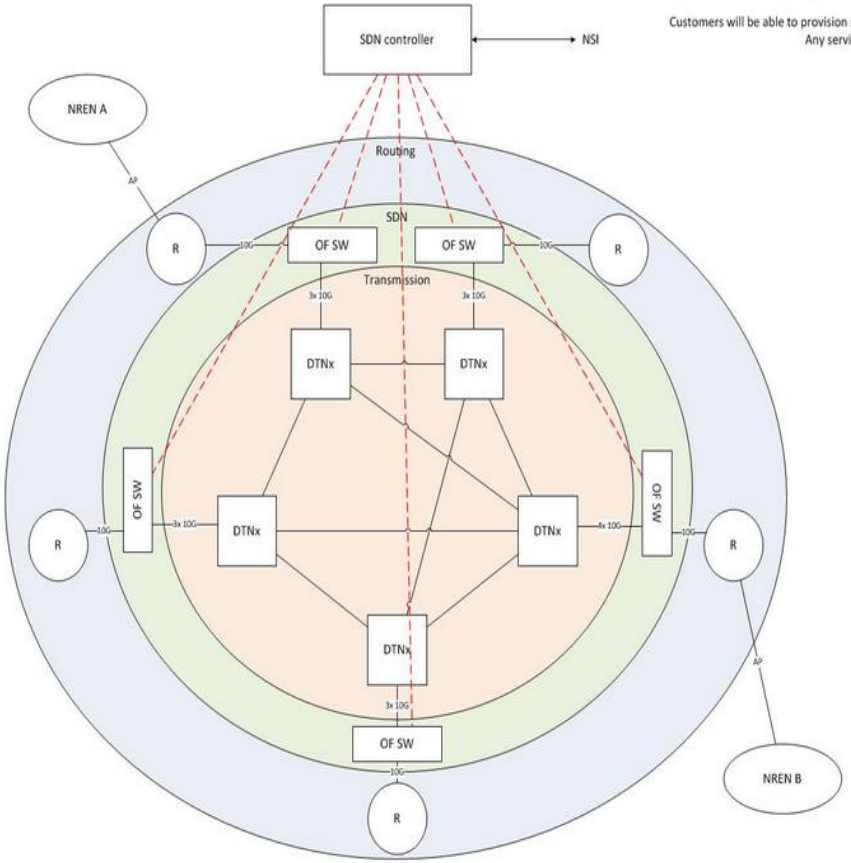
A set of SDN/OF enabled switches will be deployed at GEANT PoPs. The switches will be connected on the client side to the GEANT local router and at the line side with multiple links to the Infinera transmission platform. Lambdas will be provisioned in between switches at different PoPs in order to obtain a partial mesh. The mesh, will need to have enough links to makes sure that any client to client port service can be configured without contention; this may means some services have to be moved and will take less than optimal paths. The SDN controller will take care of routing services in between client ports and will re-route services in order to make space for other services if needed.

NRENs will access the P2P guaranteed services through their main connection to GEANT. This is terminated to a GEANT router port, a set of VLANs from this port will be switched across the router to the SDN switch, this will be pre-configured. A set of VLANs ie. 1-300 will be statically configured for access to the SDN BoD environment.

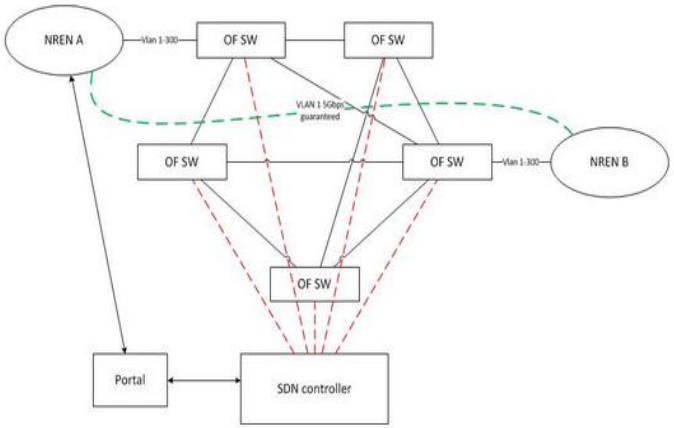
Customers will be able to provision services in between any access port to the SDN switching environment the services will be rate limited up to the access port speed and VLAN translation will also be available.

Any service provisioned in the environment will have full bandwidth guaranteed as it will use dedicated pipes through the GEANT transmission environment

Physical view



Logical SDN view



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Work in Progress

- DynPac GUI and Interface
- DynPac Migration to ONOS
- Topology Exchange
- Working with On.Lab, CORSA and Infinera to test these frameworks and develop new features
- Developing DynPac Framework / APP for ONOS Controller
- Developing REST API plugin for Infinera OTSv

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Thank you and any questions

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