FELIX project : Overview and the results

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on behalf of all FELIX partners

European Partners:

PSNC (coord.)

NXW

i2CAT

EICT

iMinds

SURFNet

Japanese Partners:

AIST (coord.)

KDDI

Felix Management Stack (FMS) available online: https://github.com/ict-felix
Demonstration movies are available at “ict-felix” channel of YouTube

The objective of the FELIX project is to create a common framework of federating SDN islands

- Manage compute and network resources in islands, and intra-islands network
- Users can request, monitor and manage a slice provisioned over distributed and distant facilities

We defined FELIX Federated Framework

- A general architecture for federation of different Future Internet facilities (SDN islands), interconnected with controllable transit network domains

We developed FELIX Management Stack (FMS)

- An Open Source implementation of the FELIX Federated Framework

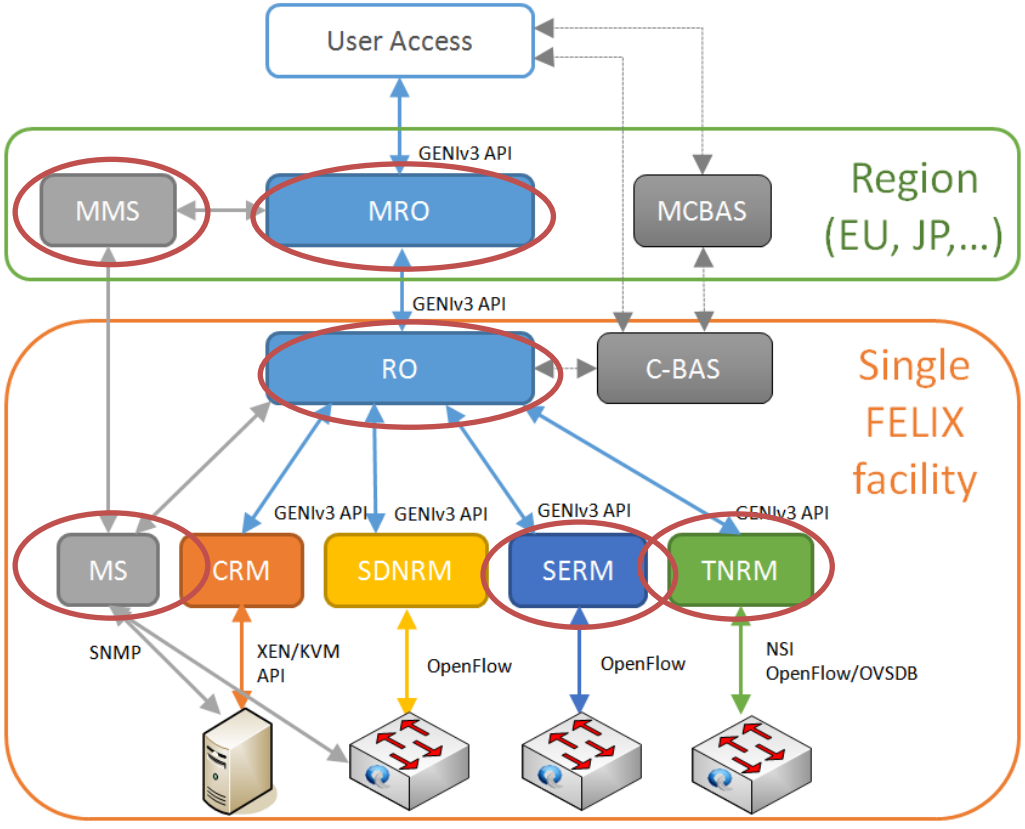
We constructed FELIX testbed

- A distributed experimentation facility
- The FMS manages infrastructure slices created from IT and network resources and data links interconnecting testbed islands

We performed FELIX experiments

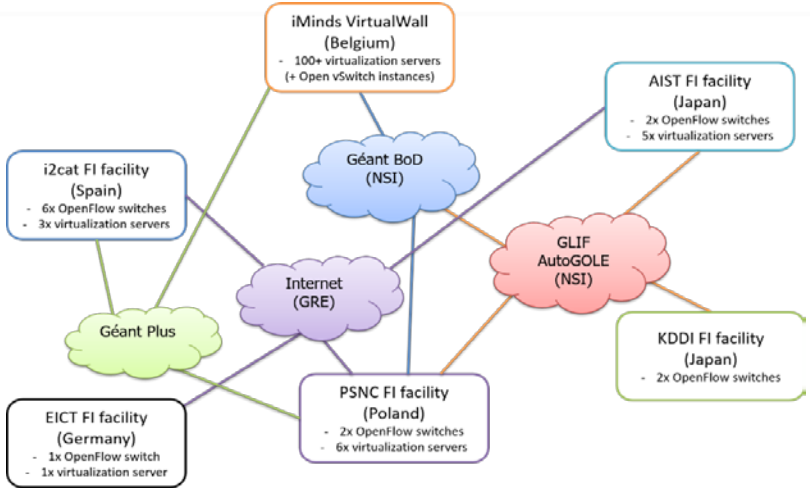
- An implementation of project proof-of-concept use-cases:
  - i) to test and validate the software stack developed in the project
  - ii) provide guidelines for third party experimenters how to run experiments in FELIX

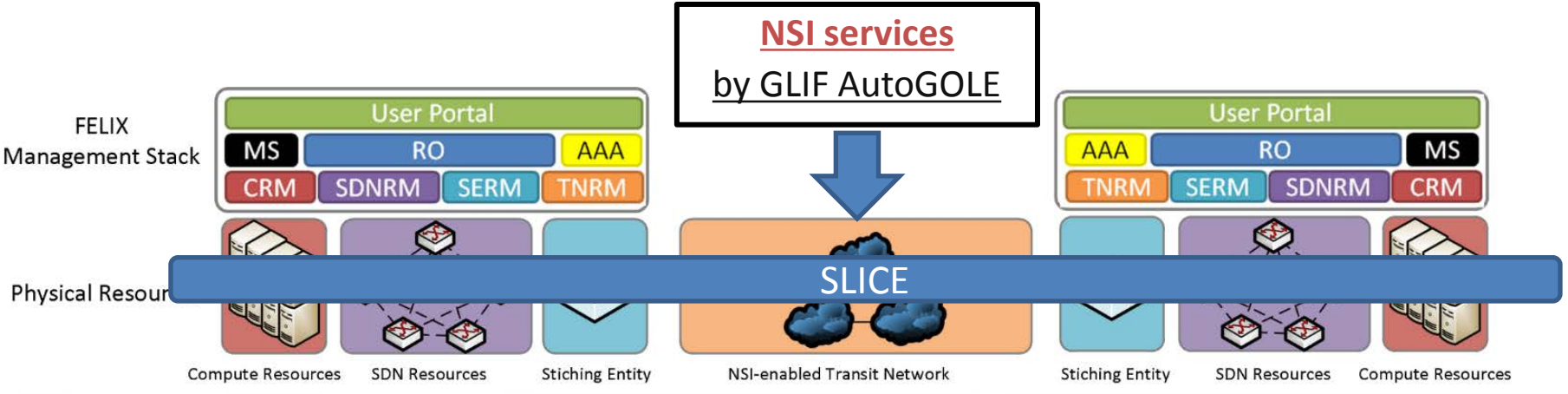
Leverages on existing software frameworks, but also brings new components, implemented from scratch



Six islands with **OpenFlow and compute** resources

- FMS components deployed in each island
- Accessible from **jFED** (FELIX resources available in Fed4FIRE federation)





AutoGOLE delivers dynamic inter-domain circuits end-to-end

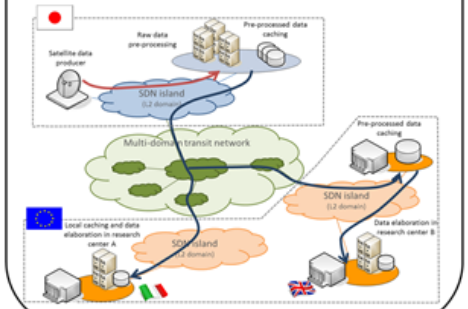
- The FELIX testbed leverages on the **GLIF AutoGOLE testbed** to establish an inter-SDN island path (higher quality and bandwidth)
  - The Global Lambda Integrated Facility (GLIF) Automated GOLE (AutoGOLE) is a collaboration of GLIF Open Lightpath Exchanges (GOLEs) and networks to deliver dynamic circuits end-to-end.
  - The Network Service Interface (NSI) is used to request circuits in AutoGOLE
  - Over 20 participating R&E network domains from around the world, such as SURFnet with Netherlight, GEANT, iCAIR (StarLight), and JGN-X

- FELIX is one of the **alpha users** of AutoGOLE and acts as a source of feedback
  - AutoGOLE provides stable connection between SDN islands dynamically.
  - AutoGOLE provides L2 circuits, which is transparent from the viewpoint of slice users.

Implemented FELIX use-cases

High Quality Media Transmission Over Long-Distance Networks

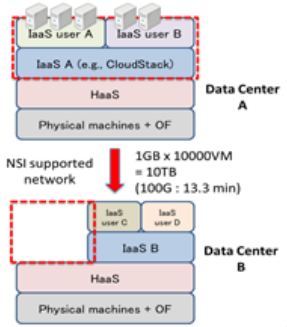
Data pre-processing for minimizing network latency effect for live data



Data domain

Data Mobility Service by SDN Technologies (Inter-Cloud use case

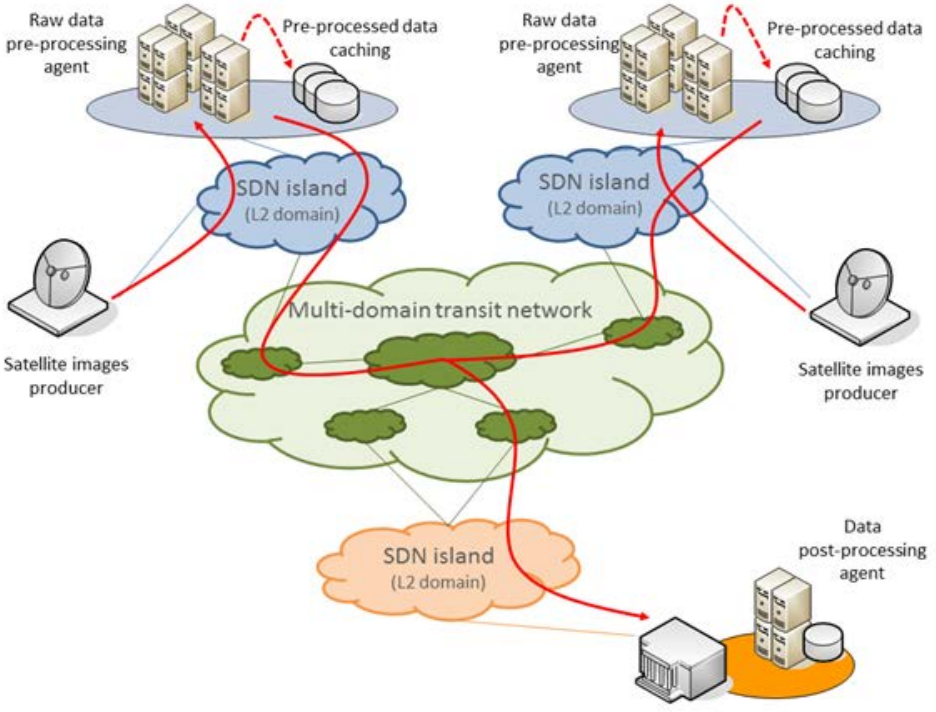
Disaster recovery by migrating IaaS to a remote data center



Infrastructure domain

Validate the coordinated control of the different kind of resources managed by the FELIX Management Stack (i.e. computing, SDN, stitching or transport) and **to provide a dynamic and on-demand reconfiguration** of the network connections through NSI and SDN (**resource coordination** and **intelligent network mapper** at M/RO).

Compressed data is moved from the sources to the proper destination, defined by the experimenter. At the destination island the incoming data is **post-processed** to reproduce the images for the final experimenters.

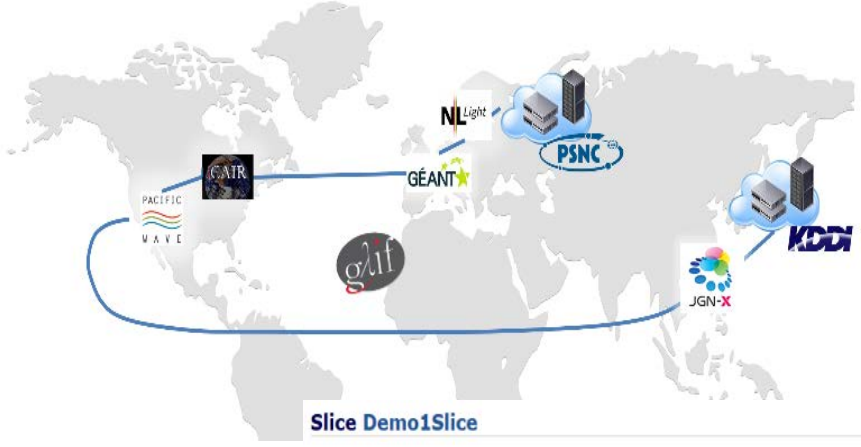


Reported:
Deliverable D4.2 and D4.3

Experiment provided the validation of the FELIX capability and the user experience (QoE) improvement.

The **user's virtual desktop** is running on the Computing Resouce in home site. When the user access to their desktop with VPN from the remote site, the VDI (Virtual Desktop Infrastructure) system **migrates the virtual desktop to the appropriate cloud based on the user location**.

In consequence, the user experiences the **same level of performance** as in the home site.

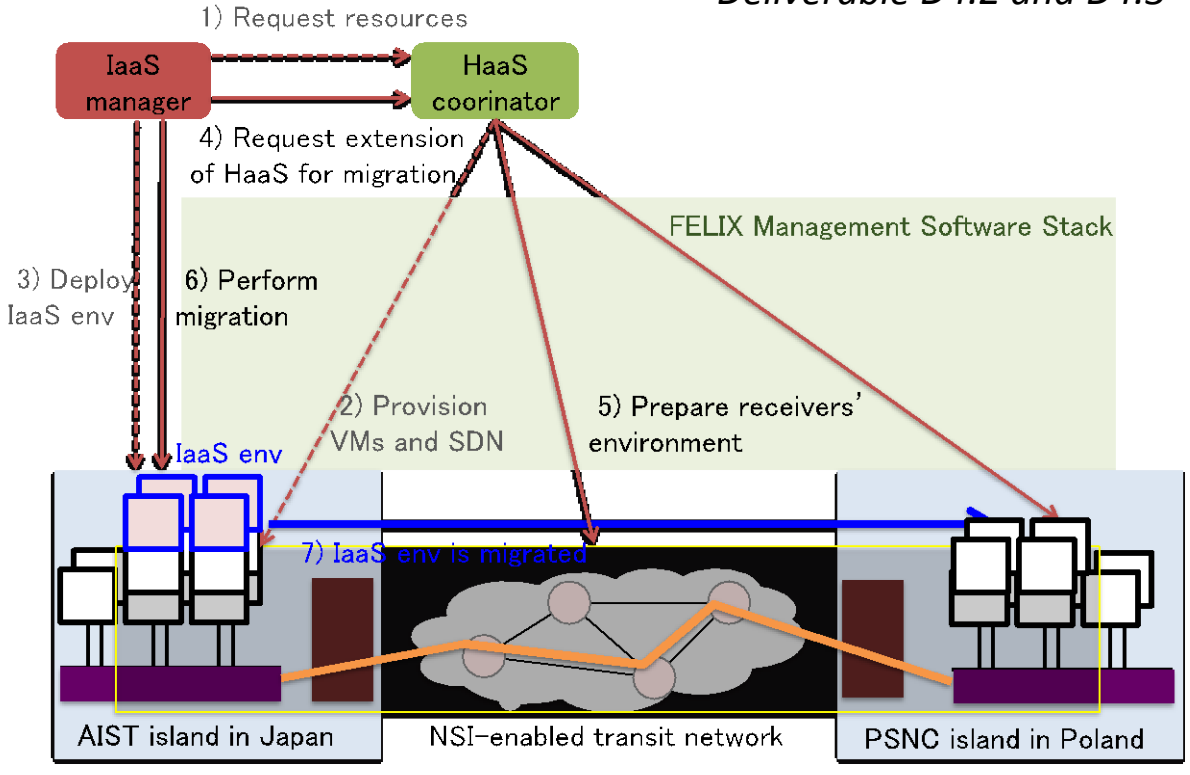


Reported: Deliverable D4.2 and D4.3

Reported:
Deliverable D4.2 and D4.3

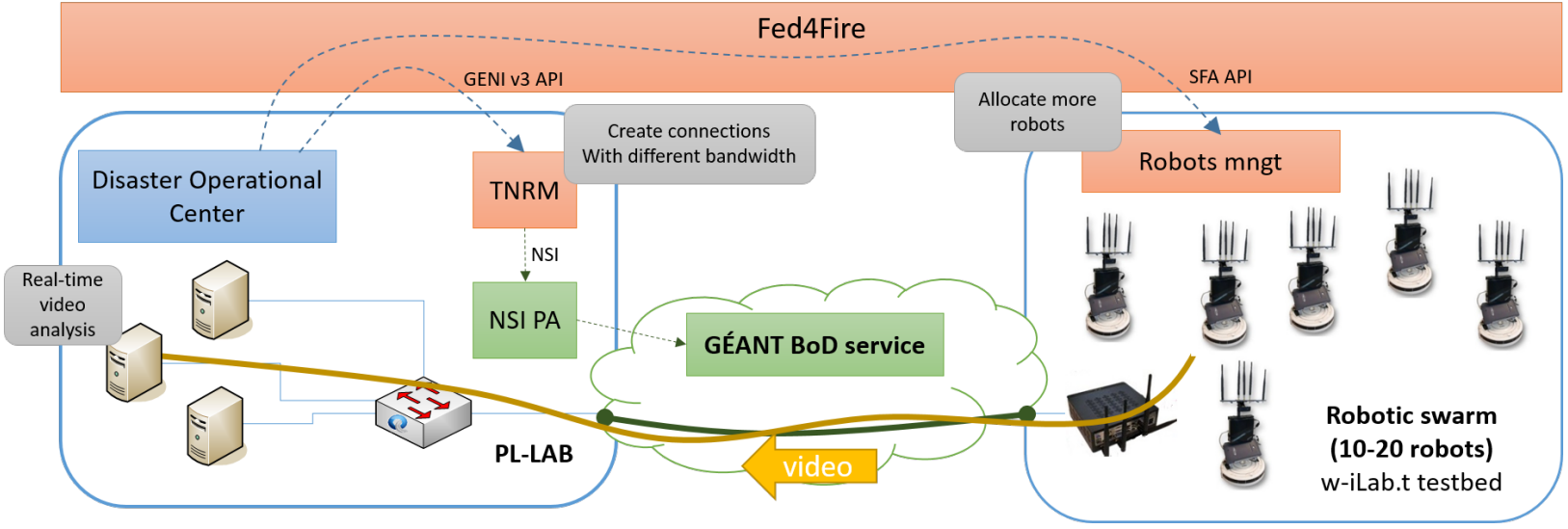
Examine the capability of the FELIX infrastructure to provide a seamless infrastructure to **enable migration of an entire IaaS** including all tenant associated resources **to a remote Data Centre.**

After the disaster trigger occurs, new compute and SDN resources are allocated in a remote Data Centre and the R&E transit network provides NSI-connection.



Confirmed that a reasonable **10-minute IaaS migration** over the FELIX testbed can be **achieved**.

Dynamic allocation of backbone optical channels in emergency deployment of wireless-enabled robotic swarms



Rapid deployment of robotic swarm For emergency situation

Verify the effectiveness and usability of this newly developed TNRM for dynamic and on-demand provision of backbone connections

Summary

- The FELIX project connects existing Internet testbeds and creates a "federation" of islands consisting of computing servers, SDN network and other resources.
- The resulting Software Defined Infrastructure (SDI) provides an environment for testing large-scale, innovative network applications.
- The FELIX architecture is modular by design to maintain a vendor-agnostic view of testbed.
- Our deployed stack enables users to experiment with provisioning resources, managing network connections, and monitoring infrastructure performance.
- Provided functionalities were examined and demonstrated through use cases in the data and infrastructure domains.

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