FEDERATED TEST-BEDS FOR LARGE SCALE INFRASTRUCTURE EXPERIMENTS

The use case of FELIX for achieving energy efficiency in SDN-enabled cloud federations

Bartosz Belter bartosz.belter@man.poznan.pl, PSNC

Cloud Federations and SDN/NFV: the highways towards improved QoE, Cost and Energy Efficiency

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FELIX in a nutshell

Total costs requested to EC: 1 499K €

Total costs requested to NICT: 150M ¥

Duration (36 months): 01.04.2013 – 31.03.2016

Project resources: 302 PM (person months)

European Partners:

PSNC (coord.)

NXW

i2CAT

EICT

iMinds

SURFNet

Japanese Partners:

AIST (coord.)

KDDI

Federation of SDN Testbeds

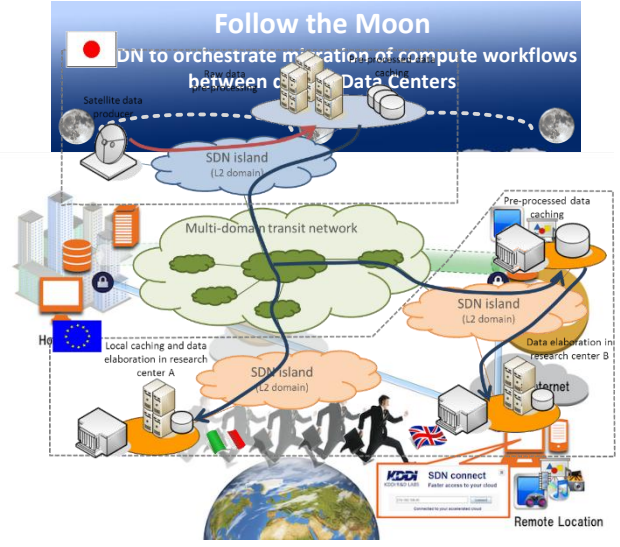
- To **increase mutual benefits** of European and Japanese researchers by **creating more complex environments** for specialized research and experiments
- To **create new opportunities** for experiments due to **geographical dispersion** of testbeds

Joint Europe-Japan experiments (selected)

- A Follow the Moon | Sun Model – green energy in Data Centers
  - **Research question.** *How can we move the compute workflow to the nearest & greenest power available in a federation?*

- Pre-processing and delivery of nearly real-time [satellite] data to geographically distant locations
  - **Research question.** *Can we reduce the size of data to be delivered across the transit network and elaborate at the geographically distributed research centers to improve the overall performance?*

- Data Mobility Service by SDN Technologies - Inter-Cloud use case
  - **Research question.** *Can the cloud system monitor the performance and move data „closer to the remote location”?*

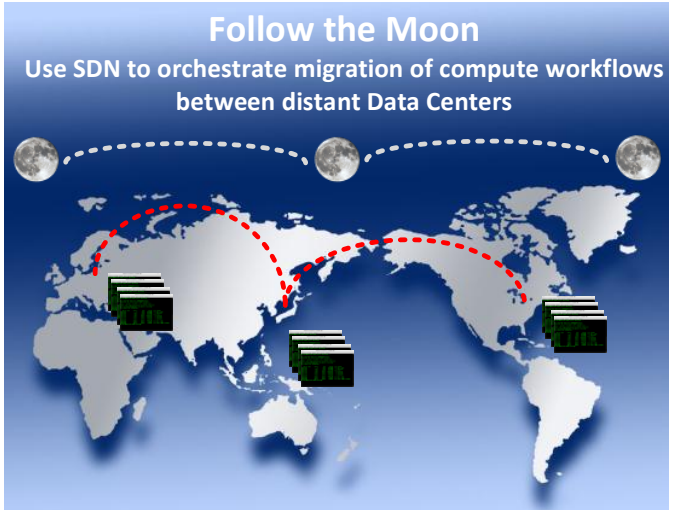


Internet usage curves are following a similar daily pattern everywhere in the world

- there is a natural potential to shift the load of data centres to places in the world where it is currently night

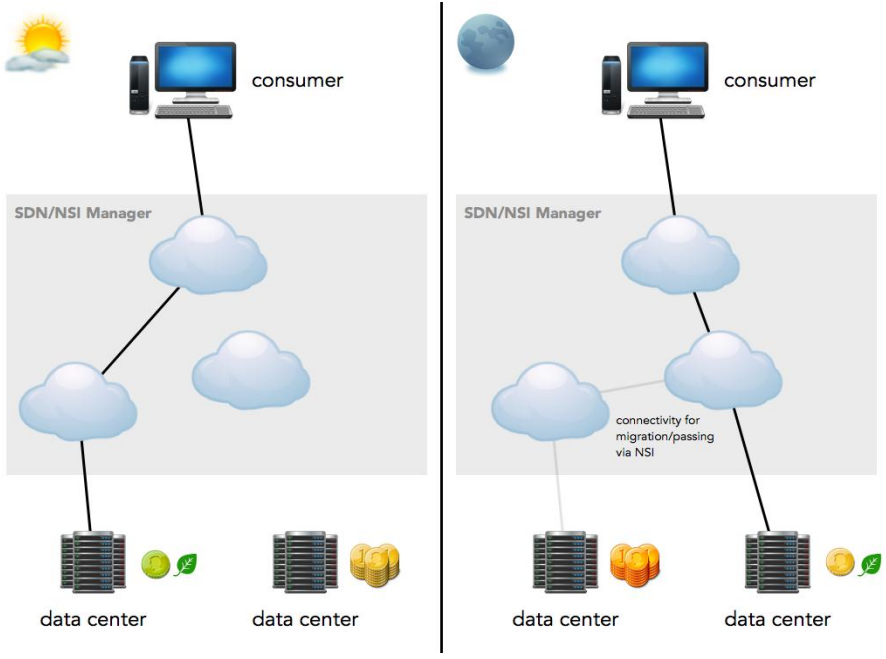
but also:

- **Prices of renewable energy** strongly depend on the availability of wind and solar energy
- **Cooling** is reported to amount up to 50% of the total energy bill of data centres
  - large data centre providers have started to place infrastructure in formerly unusual places such as Iceland and Finland
    - low environmental temperatures for cooling
  - Similar projects considered in desert areas
    - the amount of solar energy available may even make up for the additional cooling required



1. To minimize the total cost of operation for a virtual data centre while maintaining an acceptable end-user experience
   - mainly determined by the energy costs, but also: CPU/RAM usage and bandwidth costs

2. To regulate the usage of resources in a data centre
   - to shape the consumption according to the availability (time and place) of renewable energy sources

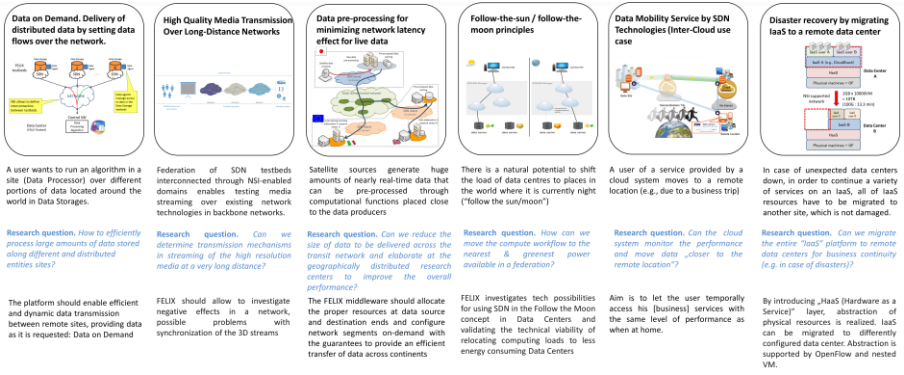


- Workload migration between data centres in a federation → automatic use of the most environmentally-friendly and (energy) efficient data centre available
  - **Complete migration**
    - the workload is moved to the more efficient data centre entirely and the consumers' traffic is rerouted
  - **Delegation**
    - The less efficient data centre handes the consumers' requests and delegates the actual processing to the more efficient data centre

- Both scenarios express strong requirements:
  - for establishing dynamic, on-demand end-to-end connections between the data centres
  - the use of SDN mechanisms for (re-)routing of the consumers' traffic, the traffic within the data centres and between them
  - When the workload is moved from one data centre to another, compute resources need to be provisioned.

Architecure

- Six project use cases have been identified and described (September 2013)
- FELIX architecture has been released (February 2014)



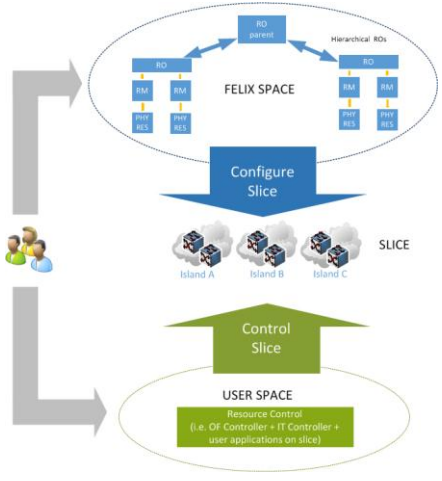
http://www.ict-felix.eu/wp-content/uploads/2014/03/FELIX-D2.1.pdf

Implementation

- Prototype implementations of the architectural framework are expected by Q12015

Experimental validation

- FELIX experiments and implementation of project use cases will start from Q12015



http://www.ict-felix.eu/wp-content/uploads/2014/03/FELIX_D2.2_General_Architecture_and_Functional_Blocks.pdf

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PARTNERS

Poznan Supercomputing
and Networking Center
Poland

National Institute
of Advanced Industrial Science
and Technology
Japan

Nextworks
Italy

Fundacio Privada i2CAT,
Internet I Innovacio Digital A Catalunya
Spain

SURFnet bv
Netherlands

European Center for Information
and Communication Technologies Gmbh
Germany

iMinds VZW
Belgium

KDDI
Japan

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