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SmatFIRE Project: Enabling Experimentation Driven Research by federating EU and KR Facilities

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SEVENTH FRAMEWORK PROGRAMME

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Fact Sheet

Grant agreement: 611165

Funding scheme: Collaborative Project

Call identifier: FP7-ICT-2013-10

EC Directorate General: DG CONNECT, Unit 4

Duration: 26 months
(Nov. 2013 – Jan 2016)

Partnership:

A complementary and unique blend of expertise from partners, either in OpenFlow or in the wireless networking research field

UNIVERSITY OF THESSALY
ETRI
서울대학교 SEOUL NATIONAL UNIVERSITY
UPMC SORBONNE UNIVERSITÉS
KAIST
iMinds CONNECT.INNOVATE.CREATE
GIST Gwangju Institute of Science and Technology
KiSTi www.kisti.re.kr
SIGMAORIONIS
NICTA

The consortium

European Partners

- University of Thessaly, Greece (UTH)
- University Pierre et Marie Curie, France (UPMC)
- iMinds, Belgium
- University of Murcia, Spain (UMU)
- SIGMA Orionis, France (SIGMA)
- National ICT Australia (NICTA)

South Korean Partners

- Gwangju Institute of Science and Technology, S. Korea (GIST)
- Korea Institute of Science and Technology Information, S. Korea (KISTI)
- Korea Advanced Institute of Science and Technology, S. Korea (KAIST)
- Electronics and Telecommunications Research Institute, S. Korea (ETRI)
- Seoul National University, S. Korea (SNU)

The context

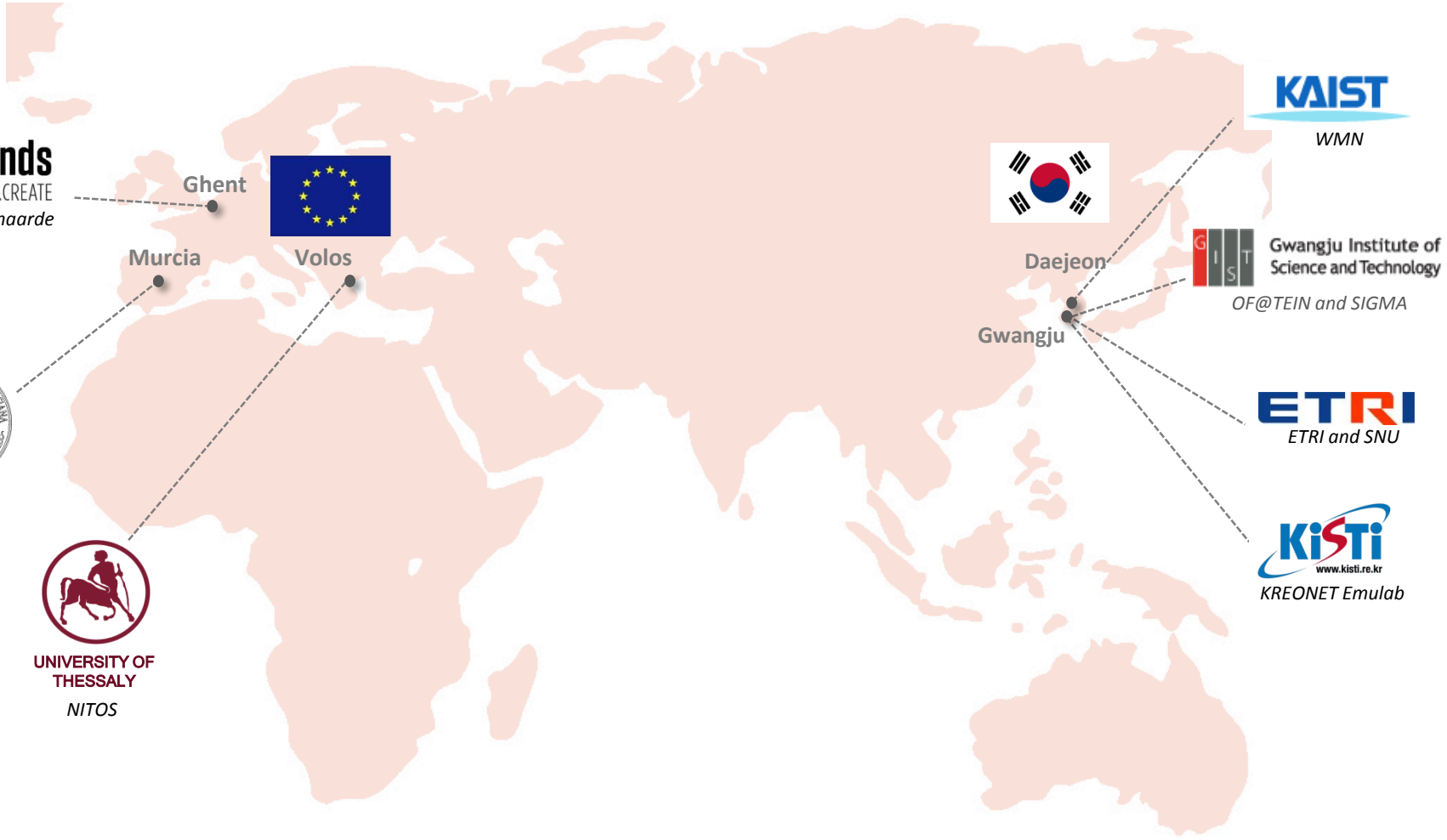
- Today, in many countries around the world where networking research is conducted, a variety of new ideas regarding the **communication protocols** and **networking equipment** go untried and untested, because of the **lack of suitable facilities for deployment and experimentation** with these ideas.

- An **alternative federated facility** with a **plenty of innovative services**, that collapse the barrier to entry for new ideas, would **accelerate the process towards a Future Internet** released from restricting obstacles. SMARTFIRE will take advantage of the **current leading network technologies** and **federate existing Future Internet testbeds** in Europe and South Korea.

Concept & objectives

1. Create a common and unified way of experimenting with a **large-scale experimental facility**, enabling networking experimentation and distributed applications,
2. **Incorporate SDN research** that is primarily conducted by the South Korean Partners, and **wireless networking experimentation** that is carried out by the European Partners,
3. **Federate the European and the South Korean infrastructure**, in order to allow large-scale experimentation by including resources from both sides in a single experiment instance,
4. Demonstrate the potential of the federated facility, by **conducting large-scale experiments** that will promote the Future Internet research field, on top of the federated facilities,
5. Enhance the **collaboration and exchange of know-how** between the two consortia.

Testbeds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NITOS
Daejeon
Gwangju
KAIST
WMN
Gwangju Institute of Science and Technology
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Testbeds

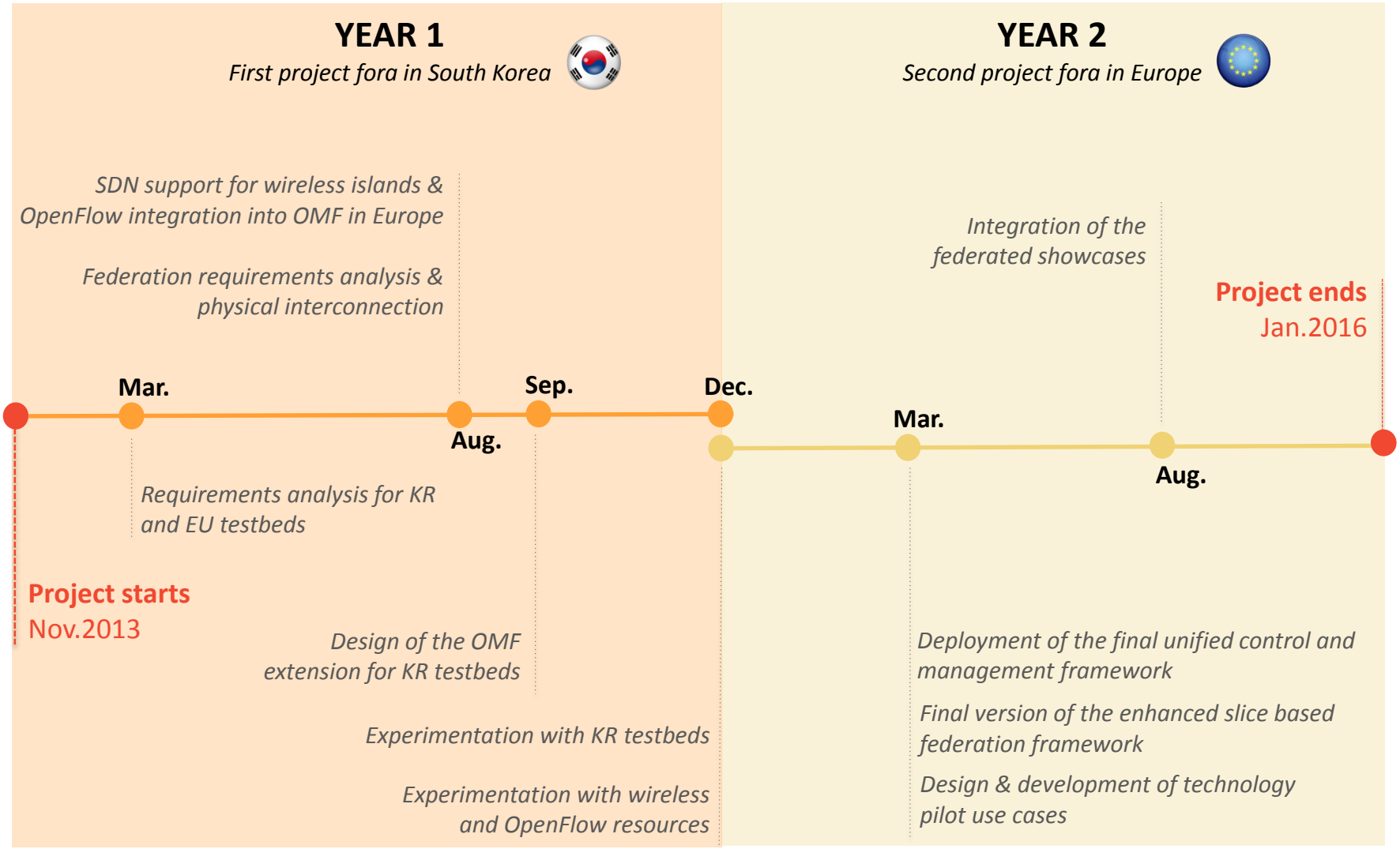
European Testbeds

- NITOS (UTH)
- w-iLab.t (iMinds)
- GAIA (UMU)

South Korean Testbeds

- OF@TEIN (GIST)
- KREONET-Emulab (KISTI)
- WMN testbed (KAIST)
- MOFI (ETRI)
- SNU testbed (SNU)

Timeline of main activities



Main Contributions (1)

- European facilities will support more users (for performing experiments through the shared use of EU and Korean facilities). To make this possible, new hardware will be added to the iMinds, UMU and UTH islands, and more manpower will be devoted to the operation of these islands.
- Current Control framework of the existing testbeds will be enhanced, making it more stable, easier to use and providing more features in the areas of security, efficiency and monitoring.
- Extension of the control framework to support the federation of OCF and OMF based EU testbeds with the Korean OpenFlow and wireless facilities.
- Increase the diversity of OpenFlow-enabled hardware in the EU testbeds (NITOS and w-iLab.t wireless testbeds). Both integrated testbeds will be managed and controlled though the OMF framework.
- Deployment of the OMF framework in all (with KISTI exception) South Korean testbeds, enabling the OpenFlow support.

Main Contributions (2)

- Extension of the OMF framework with the unique features of current South Korean testbeds (e.g., C-Flow, MOFI framework), incorporating the features of the latter to the former.
- Harmonize South Korean testbeds towards a common and unified control and management framework.
- The requirements for a federated environment will be analyzed.
- The different experimental sites will be interconnected among them, utilizing existing research high-speed networks in Europe and S. Korea.
- Existing control frameworks will be extended in order to support the new testbeds (S. Korean) and their experimentation capabilities.
- Resources from different testbeds will be controlled in a common and unified way.
- Experiments using the SMARTFIRE facilities will be performed in a transparent to the end user way.

Main Contributions (3)

- Design of scenarios that promote Future Internet technologies in a single experiment, utilizing resources from both sides of SMARTFIRE
- Setup and execution of the proof of principle demonstrations.
- Evaluation of the system based on performance metrics and provision of feedback.
- The designed scenarios that will demonstrate the capabilities of the overall infrastructure are based on the current research trends of IoT and Video Streaming applications over various heterogeneous platforms.

Distributed IoT measurement aggregation and processing

- Demonstrate how distributed measurements gathered from distant locations will be stored and processed in a Cloud Computing system that the end user will access transparently, without any knowledge of its location.
- The sensor deployments of all the EU testbed operators that take part in the project will be exploited, based on the NITOS' promising smart sensing devices and UMU's IoT deployment on SmartBuildings, as well as the ones from the KR partner at KAIST.
- The measurements gathered from distributed resources will utilize SMARTFIRE infrastructure, as they will use the OMF extensions developed in the project, for the setup of the experiment of gathering the measurements and transmitting them over the OpenFlow technology backbone to a distributed Cloud Computing system for storage and processing.

Video Streaming over different technologies

- We will examine how the different technologies and bottlenecks of distant intercontinental links can impair video streaming applications, and how we may apply different QoS policies in order to alleviate this problem.
- A setup in the EU testbeds, where data captured live by a video camera will be transmitted over a wireless link, and then routed through the OpenFlow backend.
- A realistic scenario where the backbone of our network will utilize a ICN, where video will be routed based on its content, to several testbed clients in S. Korea.
- We consider implementing the following QoS-enabling schemes:
  - The long established backpressure algorithm for video routing over wireless networks
  - Routing schemes for OpenFlow technology, taking into account several time constraints for the transmitted video data, thus ensuring acceptable intercontinental video transmission.

Main Outcomes

- The deployment of a **new control framework** and its operation at the South Korean testbeds,
- The **enhancement of the European testbed** facilities by the extensions acquired from the South Korean ones,
- The **federation of the South Korean and European testbeds** using a Slice-based architecture via adapting and deploying existing software suites,
- The development of **local and federated technology pilots** by means of two real life scenarios and a video streaming application,
- The organisation of **two project fora**, one in South Korea during the first year and the second in Europe in the second year of the project.

Existing Projects

- SMARTFIRE will leverage on the outcomes of existing projects that make use of SDN technology
- An excellent example is the **FIBRE-EU** project, involving partners from Europe and Brazil.
  - Enhancing the OMF framework, extending in several ways and providing a programmable virtualization layer on top of the mesoscale testbed base station's scheduler
  - collaborate with the Brazilian partners in the federation of the individual wireless testbeds.
  - the federation between wired-OpenFlow-based and wireless-OMF-based testbeds of FIBRE.

Existing Projects

- **Fed4FIRE** project: Develop a demand-driven common federation framework, based on an open architecture and specification.
  - Simple, efficient, and cost effective experimental processes built around experimenters' and facility owners' requirements.

- **OFELIA**: A unique experimental facility that allows researchers to not only experiment "on" a test network but to control and extend the network itself precisely and dynamically.
  - OFELIA facility is based on OpenFlow allowing virtualization and control of the network environment.

Expected Impact

- World-wide federation of testbeds for future internet research
- Broader dissemination of the results in order to foster wide adoption, eventually going beyond testbed frameworks if appropriate
- More durable culture of collaboration between European and South Korean actors

감사합니다

Thank you