Breakout 2: Internet of Services & heterogeneous clouds

Franck Fleurey, SINTEF & Technical Coordinator, HEADS
Marc Shapiro, INRIA & LIP6 & Coordinator, Syncfree

CloudWATCH is funded by the European Commission Framework Programme 7
DG Connect Software & Services, Cloud. Contract No. 610994

Projects & presenters

Call 8 Lightning Talks

- **ARTIST** - Clara Pezuela, ATOS
- **BETaaS** - Luca Cucchi, INTECS
- **Broker@Cloud** - Ewald Quak, SINTEF
- **COMPOSE** - Benny Mandler IBM - Haifa Research Lab
- **SUCRE** - Eleni Toli, University of Athens

Call 10 Lightning Talks

- **FELIX** - Bartosz Belter, PSNC
- **Heads** - Franck Fleurey, SINTEF
- **HTML5Apps** - Daniel Dardailler, WC3
- **Panacea** - Dimiter Avresky, International Research Institute for Autonomic Network Computing - IRIANC
- **SeaClouds** - Francesco D'Andria, ATOS Spain
- **SyncFree** - Tyler Crain, INRIA,

Call 5 Lightning Talk: SOCIETIES - Micheal Crotty, TSSG, Waterford Institute of Technology

Plan

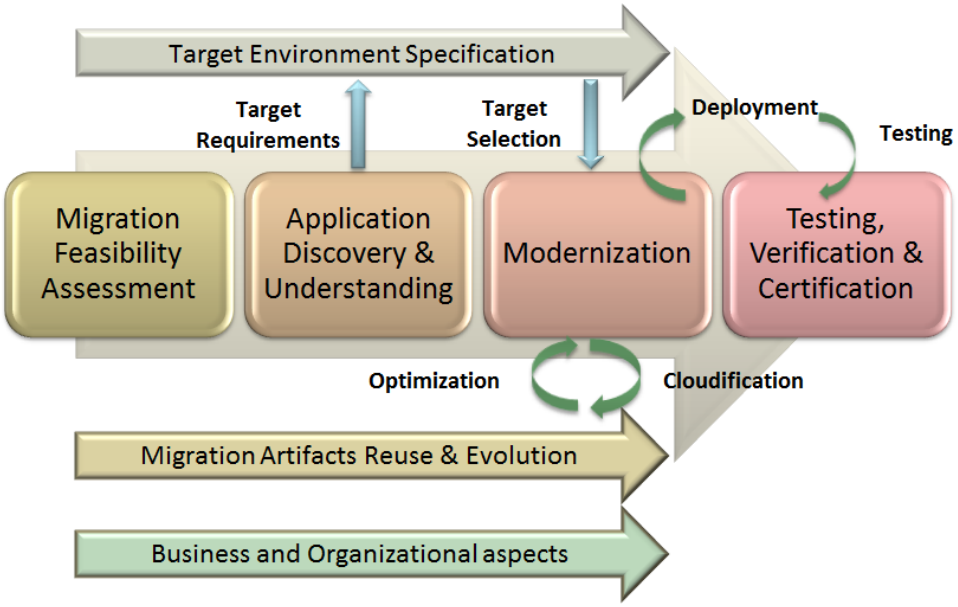
- **Call 8 lightning talks**
  - Roundtable - 15 mins
    - Top 5 Cross cutting themes
- **Call 10 lightning talks**
- **Call 5 lightning talk**
  - Roundtable – to create final list of top 5s + vision for future
    - Top 5 Cross cutting themes
    - Top 5 R&D Challenges not yet addressed
    - Top 5 New collaboration opportunities and new ideas
    - A view to the future: A vision of what the interoperable cloud ecosystem will look like in 2016
- Feedback in plenary session by moderators & roundtable participation (16:15 – 17:30)

ARTIST: an end-to-end assisted migration solution for non-cloud software

Clara Pezuela, Project Coordinator

Focus area

- ARTIST offers a set of **methods** and **tools**
- which provide an **end-to-end** and **assisted migration** service
- to **transform** non-cloud software applications
- taking full advantage of **cloud features**
- from an **holistic** perspective (technical, business, organizational)



Relevant Standards for Interoperability and Portability

- All tools based on:
  - existing standards: OMG UML2, SPEM 2.0, KDM, fUML, OASIS TOSCA, ISO27000 series
  - and upcoming ones: ISO Cloud computing reference architecture
  - and best practices: ITIL
- Some partners active in OMG and ISO JT/SC38
- Joint development (with ModaClouds and PaSaage) of CloudML
  - modelling main features of cloud at infrastructure and application level

Achievements to date & Future plans

To date

- First version of **methodology** and supporting **tools**
- **CloudML@ARTIST** language
- **Certification** model
- First implementation of 4 **use cases**
- Web site and **dissemination** material are available
- 18 **events** attended and 14 **publications** submitted
- Market analysis and **business scenarios** identified

Future plans

- First **validation** of methodology and tools by use cases (and outsiders when possible)
- More **advance prototypes** of tools
- First **integrated tools chain** through methodology and repository
- Engagement of relevant **open source communities** (Modisco, Eclipse, ATL)
- First definition of **exploitation** strategy

Identity card

Project name: Advanced software-based seRvice provisioning and migraTIon of legacy Software

Project type: IP

Duration: 36 months

Start date: 1 October 2012

End date: 30 September 2015

Total budget / Total EC funding: 9,690,258 euros / 6,953,705 euros

Project Consortium: 10 partners (3 third parties)

Contact & social info

www.artist-project.eu

@ARTISTeu

http://www.youtube.com/channel/UCHpiFKFs8Jbw4cv4EHqrglQ

http://www.linkedin.com/groups/ARTIST-PROJECT-4836922

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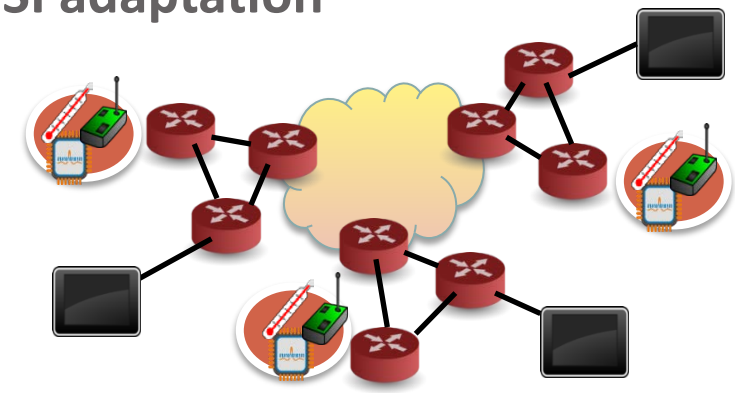
  - +34 664 103 005

Focus area

- Build a service platform for the IoT and the M2M over a local cloud of gateways
- Thing as a Service
- Semantic-based access
- Context and Resources awareness
- Extend Capabilities: QoS, Big Data, Dependability, Trust, Virtualization
- ETSI adaptation



The BETaaS FP7 project – Facts

Start date: **1/10/12**
End date: **31/3/15 (30 months)**
Cost: **3,376,640 €**
Funding: **2,515,000 €**
Estimated effort: **441 PM**
Call identifier: **FP7-ICT-2011-8**
Website: **www.betaas.eu**

BETaaS can run on any capable device:

- Home routers
- Smartphone/Tablets
- Laptops/Desktops

Relevant Standards

- The Consortium partners bring their standard experience into the platform development:

  - ✓ AAU (Aalborg University) contributed to IoT-GSI (Global Standard Initiative) with requirements, recommendations, and functional IoT architectures
  - ✓ AAU also partecipated to Focus Group on Cloud Computing (FG Cloud) at ITU-T (International Telecommunication Union – Telecommunication Standardization Bureau)
  - ✓ Intecs partecipated as an ETSI member to the M2M technical commettee

- The Consortium focuses on defining BETaaS concepts that are likely to become the target of future standardization activities

Achievements to date & Future plans

- **Important achievements in the Y1**
  - Basic implementation of BETaaS platform *that is* a ***first practical*** demonstration of the key innovative concepts of BETaaS (presented in the Y1 Review meeting, on 20 Nov 2013 in Brussels)
    - context and resource awareness
    - content-centric principles
    - local cloud, distribution
- **Future plans**
  - Organization of a **BETaaS 1st workshop** on the occasion of GWS2014 (http://gws2014.org/) **A new era in IoT frameworks and local cloud based platforms**
  - Development of product-oriented web site
  - Second practical demo in the second year Review meeting

Broker@Cloud

Enabling Continuous Quality Assurance and Optimization in Future Enterprise Cloud Service Brokers

- November 1, 2012 – October 31, 2015
- Call FP7-ICT-2011-8
- Grant agreement 318392
- www.broker-cloud.eu
- andreas.friesen@sap.com

Relevant Standards for Interoperability and Portability

Broker@Cloud

Cloud Service Modelling:

- USDL (Unified Service Description Language) - Linked USDL
- http://www.linked-usdl.org/
- Planned: extensions of Linked USDL for different aspects of quality assurance and optimization

Achievements to Date and Future Plans

- Requirements Engineering
  - Service Lifecycle Process
  - Requirements Specification Methodology
  - Themes, Epics, User Stories and derived Capabilities
- Conceptual Architecture
  - Refined Service Lifecycle Process
  - Minimal Cloud Service Broker Model
  - CSB platform technical reference architecture
  - 2-layer framework architecture for capabilities and mechanisms
- Next steps
  - Framework APIs and platform neutral data exchange
  - 2 industrial showcases

COMPOSE

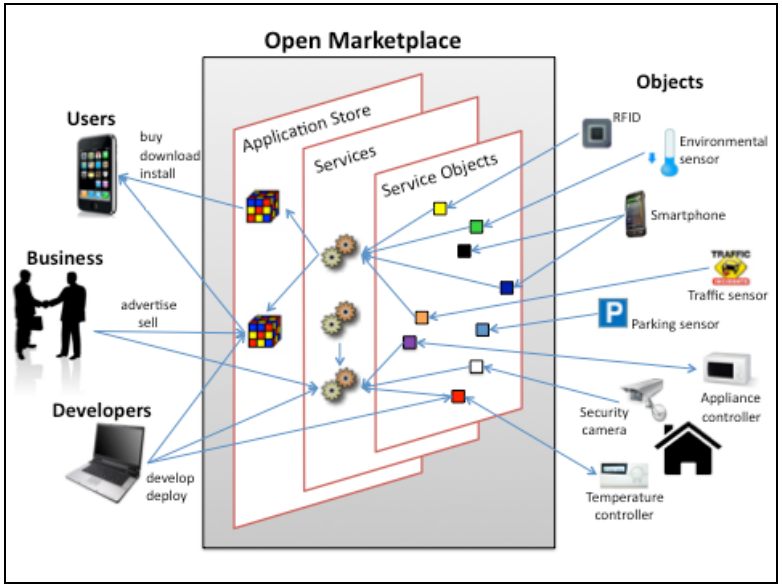
Collaborative **O**pen **M**arket to **P**lace **O**bjects at your **Se**rvice

Benny Mandler

Brussels March 12-13, 2014

Focus Area

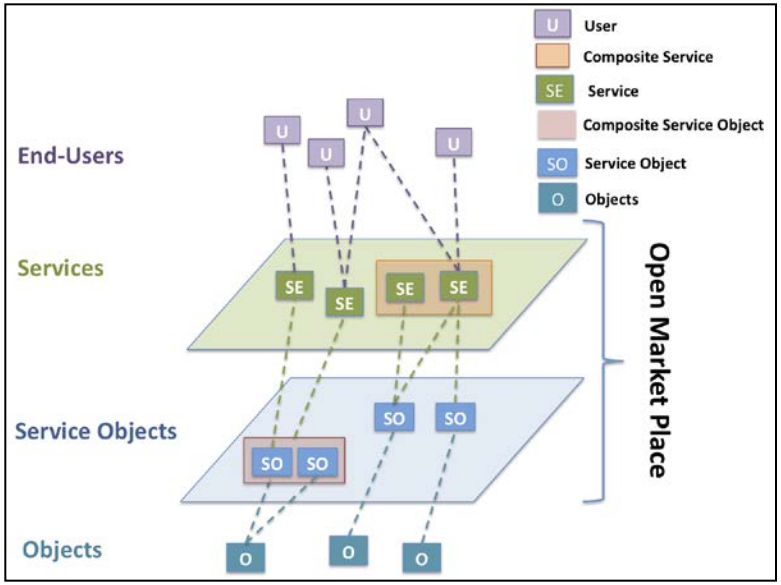
- Provide an IoT enabling ecosystem
- Easily and securely develop, deploy, share and maintain services based on Internet-connected smart objects
- Use-case driven
- Cover the whole service lifecycle
- To study and identify new business models and value chains
- To promote standardization and technology adoption



- Staggering amount and growth rate of “things”
- Project duration: Nov. 2012 – Oct. 2015

Relevant Standards for Interoperability and Portability

- W3C Community Group (Web of Things)
- Semantic interoperability
- Security, trust and privacy
- Protocols and APIs – Open Markets
- Apps and Services interoperability – Underlying languages used, including interface definitions



Achievements to date & Future plans

- First comprehensive version of the architecture
- Data Management prototype
  - Historical and real-time data
- Smart retail Pilot initial prototype
  - **U-Hopper** got awarded the **Lamarck Prize** at **SMAU Milano**
- Scalable communication prototype
- Service discovery prototype
- Initial installation of the IoT cloud foundations
- First hackathon organized
- Two keynotes and several papers published
- Next steps: First wave of technologies from all WPs (April); First integrated platform and final architecture document (October)

Supporting Cloud Research Exploitation

Eleni Toli

Concertation Meeting - E2 Software & Services, Cloud Computing

March 12, 2014, Brussels

Focus area

Project Id: SUCRE CSA-SA 318024 - Start Date: October 2012 - Duration: 24 months

National and Kapodistrian University of Athens · Poznan Supercomputing and Networking · Singular Logic · Manchester 1824 The University of Manchester · Innovation Agency for ICT and Media innovation.mfg.de · Zephyr · NTT

- Embrace/support two high impact communities plus international cooperation:
  - Public sector
  - Healthcare
  - EU-Japan
- Used Tools and Venues include:
  - EU-Japan workgroup and workshop
  - Community and Stakeholder workshops
  - Young Researchers Forum
  - Magazine, Portal, Interviews, etc.

    http://www.sucreproject.eu/videos
- Outcomes:
  - State-of-the-art report highlighting current solutions
  - Primer for the usage of Open Cloud Computing in both domains
  - Comparison report among various European public sectors
  - Checklist for successful implementation and use of Open Clouds
  - EU-Japan workgroup recommendations

Relevant standards for Interoperability and portability

Cloud standardization

- **General status and regional approaches**
  - Standardization can be pursued through adoption of OS Clouds
  - At the same time, marketing issues should not be neglected
- **Industrial collaboration and diversification**
  - Standardization through cooperation vs. commercial companies
  - Selection of highly specific issues at an international level
- **Challenges and ongoing efforts in all Cloud layers**
  - SaaS and PaaS are more challenging due to greater diversification
  - IaaS needs further standardization efforts

Data portability

- Data portability is a **more politically than technically** pressing issue
- **Specialization vs. Portability**: Two contradictory values
- **Standardization and security** aspects are important to be addressed
- Cloud providers will be **convinced to fully support** data portability by
  - Client demand (which leads to increased revenues)
  - Regulatory frameworks (e.g. the EU Data Protection Directive)

Let's collaborate! What's next

Pre-FIA Workshop: The future of Cloud computing: Elasticity, Legacy Support, Interoperability and Quality of Service

In collaboration with ARTIST, CELAR and MODAClouds

18 March 2014, Athens Concert Hall,
Athens, Greece

SUCRE Healthcare Workshop

Within the eHealth Conference

12 May 2014, Athens Concert Hall,
Athens, Greece

SUCRE EU-Japan Workshop

In collaboration with ClouT and OCEAN

16 May 2014, DG CONNECT Building,
Avenue de Beaulieu 25, Brussels, Belgium

and…

CloudSource #3

Open Clouds for the Healthcare provisioning Industry, April 2014

Call for abstracts for CloudSource #4

EU-Japan Interoperable Clouds, Deadline June 2014

Videos

Primers for Public Sector and Healthcare

Find out more and contact us:

http://www.sucreproject.eu

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@SUCRE_project, #SUCRE

www.facebook.com/SUCREproject

www.scoop.it/u/sucre-project

FEDERATED TEST-BEDS FOR LARGE SCALE INFRASTRUCTURE EXPERIMENTS

Federation of SDN-enabled networks to support heterogeneous clouds & computing-intensive applications

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

Concertation Meeting, Unit E2 Software & Services, Cloud Computing
Wednesday, 12th March

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.)

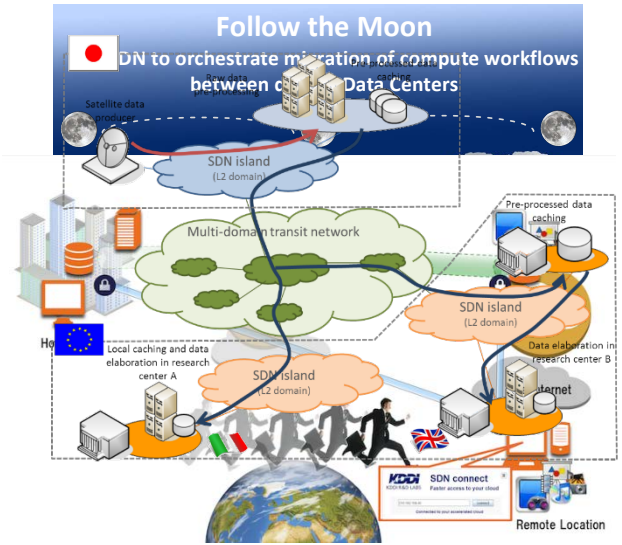
KDDI

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 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”?*



Relevant Standards for Interoperability and Portability

OpenGridForum (OGF) http://www.ogf.org

- **Network Services Interface Workign Group** (NSI-WG)
  - An interface to request a multi-domain dynamic network service
  - Being currently standardized in OGF
  - To be deployed by R&E networks in Europe, Asia and US

  In FELIX: A means to achieve inter-domain connectivity for SDN Islands, contribution to SDN extensions in NSI

- **Network Modeling Language Working Group** (NML-WG)
  - a standardised network description ontology and schema, facilitating interoperability between different research projects and existing initatives

  In FELIX: ontology for SDN and NSI resources

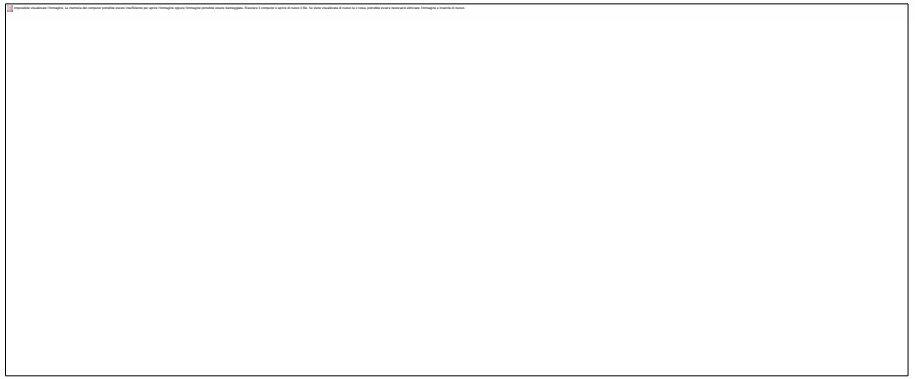
Internet Research Task Force (IRTF) https://irtf.org/

- **Software-Defined Networking Research Group** (SDNRG)
  - Classification of SDN models (Definitions, Taxonomies, Relationship to work ongoing in the IETF and other SDOs)
  - SDN model scalability and applicability
  - Multi-layer programability and feedback control systems
  - Network description languages, abstractions, interfaces and compilers

  In FELIX: contribution to multi-domain SDN architectures, interfaces and description lang.

Architecure

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



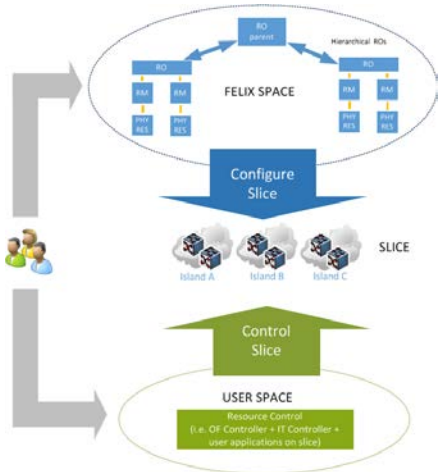
http://www.ict-felix.eu/wp-content/uploads/2014/03/FELIX-D2.1.pdf

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

.felix

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

HEADS

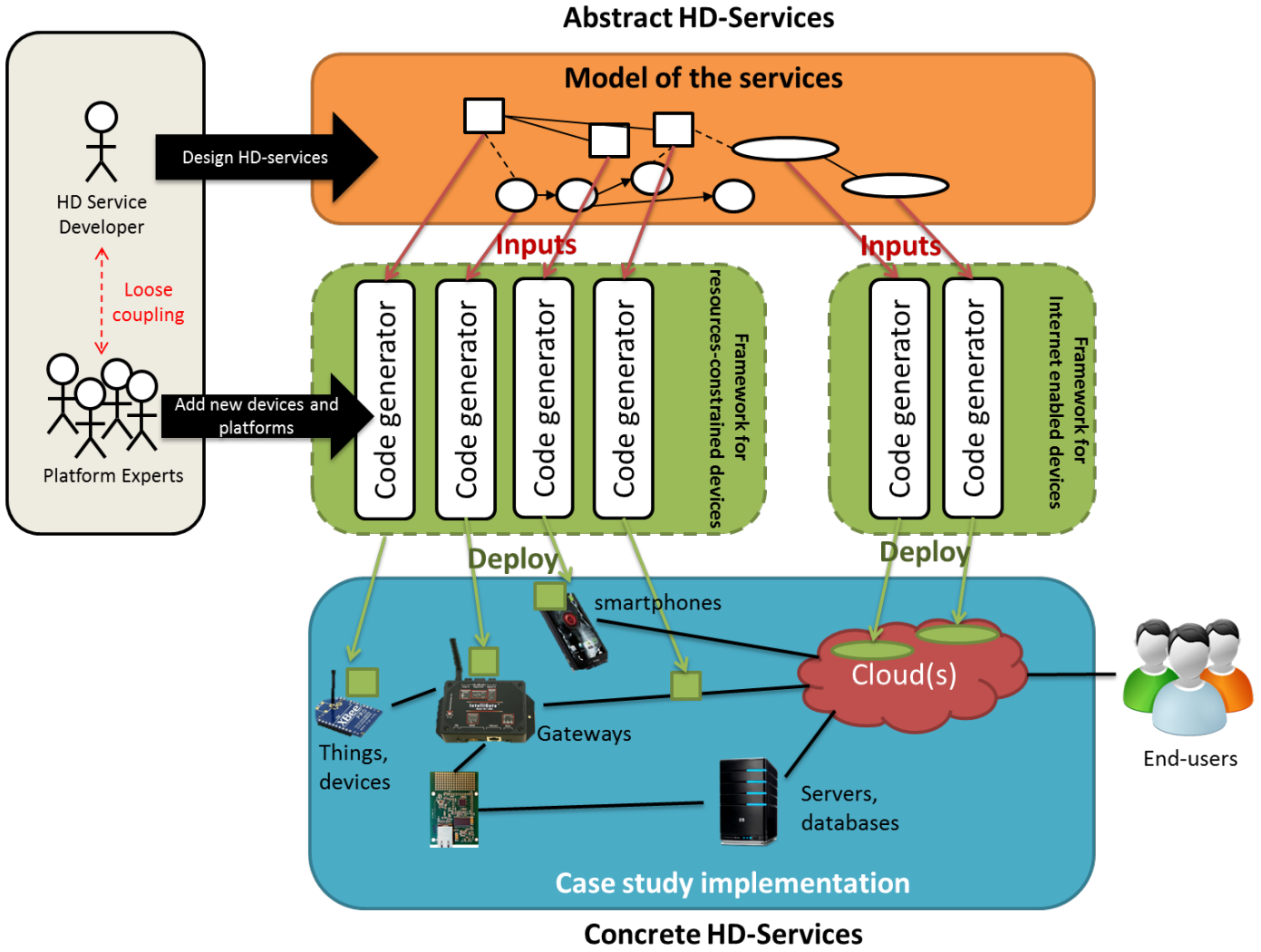
Heterogeneous and Distributed Services for the Future Computing Continuum

- Call 10 project (October 2013 – September 2016)
- Consortium:

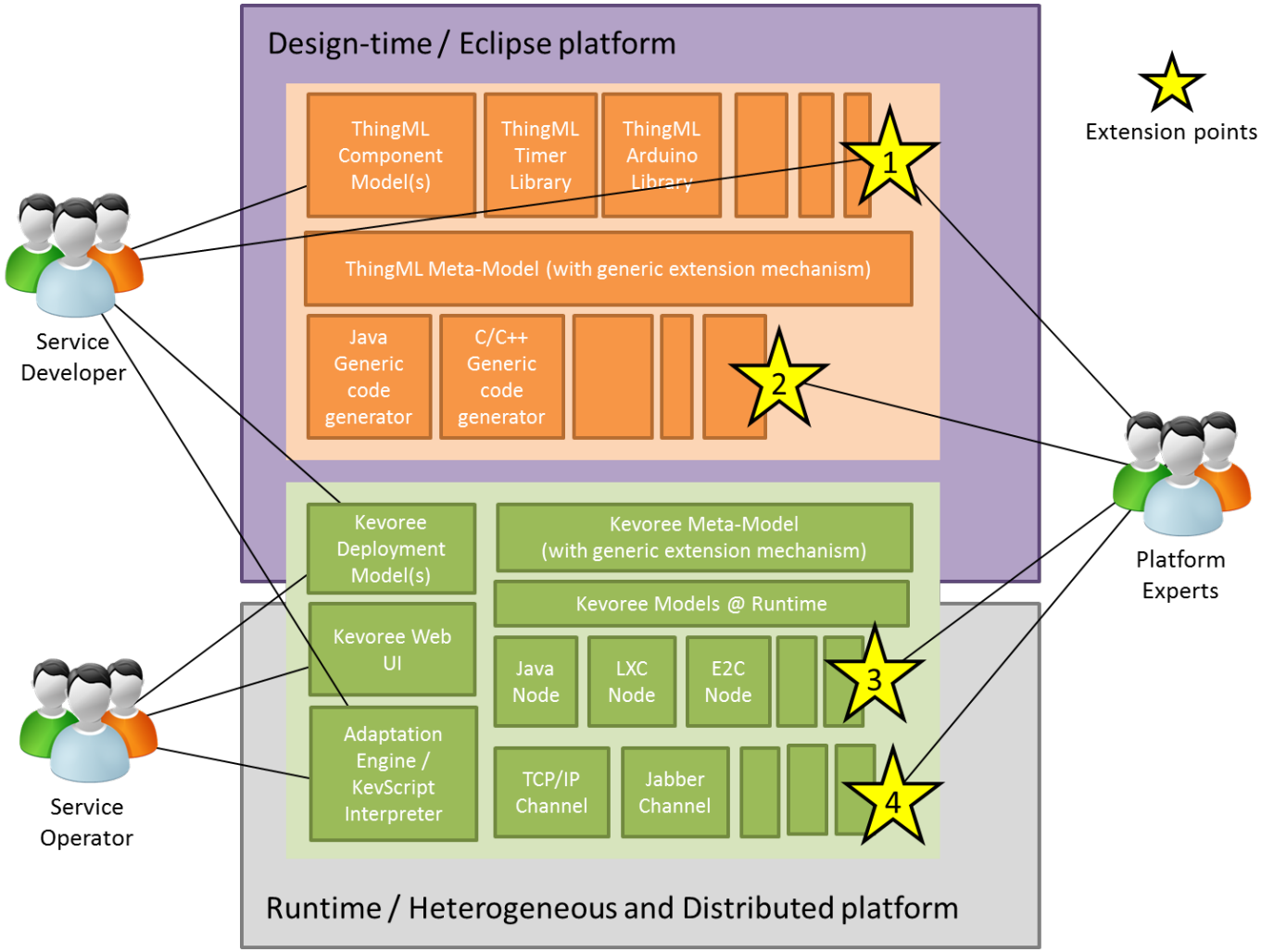
SINTEF, software AG, ATC (Athens Technology Center), Inria (informatics mathematics), M2M2on, tell.u

- Coordinator: SINTEF
  - Project coordinator: Trine Seeberg (trine.seeberg@sintef.no)
  - Technical coordinator: **Franck Fleurey** (franck.fleurey@sintef.no)

HEADS big picture



HEADS Results (in progress)



Relevant Standards for Interoperability and Portability

- HEADS not specific to any runtime platform
- Leverage existing standards
  - IoT/M2M: eg. MQTT, COAP, etc
  - Modelling: eg. MOF / EMF / Eclipse
  - Cloud: eg. Openstack, Jcloud
  - Runtime: eg. C/Posix, Java/OSGi
- Partners contribute to some of these standards
- HEADS IDE released as open-source

PANACEA

"Proactive Autonomic Management of Cloud Resources"

Dr. D. R. Avresky (IRIANC) – R&D Coordinator

autonomic@irianc.com

Irianc

Imperial College London

LAAS-CNRS

Atos

UNIVERSIDAD COMPLUTENSE MADRID

QOS DESIGN

IBM

PANACEA Project - FOCUS area

Grant agreement no: 610764 Start : October 1st 2013 – End: March 31st 2016

- *The main objective of the project "PANACEA" is to provide Proactive Autonomic Management of Cloud Resources, based on Machine Learning, as a remedy to the exponentially growing complexity.*
- PANACEA will allow users several advanced possibilities, based on the Machine Learning (ML) framework, and the autonomic principles:
  - Proactive autonomic management of cloud resources.
  - Proactive software migration within the cloud(s).
  - Creating mission-oriented distributed clouds with autonomic self* properties.
  - Efficient use of cloud resources.
  - ** Monitoring, controlling and pro-actively managing applications' executions (VMs migrations, proactive rejuvenation, predicting the threshold violation of response time of servers, predicting the time to crash of software).**
  - Increasing the availability of user applications and private cloud services.

PANACEA Project

- Relevant Standards for Interoperability and Portability

PANACEA will use standard APIs, interfaces and formats, like OCCI to interface with OpenNebula or OVF to define VMs. OpenNebula in turns provides adapters and translators to other APIs, interfaces and formats, whether standard or not.

Moreover, PANACEA will provide feedback to international standardization bodies about its feasibility and usability, such as Web Servers Standard.

- Achievements to date & Future plans

The General Architecture of Panacea, as Infrastructure as a Service (IaaS), has been created. It will allow to form private research clouds, based on scalable Intra (Inter) Overlays and Intra (Inter) Autonomic Cloud Managers. Machine Learning (ML) Framework for collecting data during execution of cloud applications and building large Training Data Sets is built. It will allow different ML techniques to be analyzed for predicting the time to crash of cloud applications and servers. Three Use Cases has been selected for conducting Panacea experiments. We are planning in the future, as a first step, the open source server to execute applications under a open source synthetic workload. Anomalies (such as memory leaks and Threads) will be injected during the run time of the applications on Virtual Machines (VMs) in the Intra Overlay network(s.)

Seamless adaptive multi-cloud management of service-based applications

SeaClouds - Open source multi-cloud application manager for PaaS

Francesco D´andria (Project Coordinator), Atos
francesco.dandria@atos.net

Focus area

SEACLOUDS
AGILITY AFTER DEPLOYMENT
Modelling Planning Controlling

Project title

Seamless adaptive multi-cloud management of service-based applications

Project coordinator:

Francesco D'Andria, ATOS Spain SA,
francesco.dandria@atos.net

Partners

ATOS SPAIN SA
UNIVERSIDAD DE MALAGA
UNIVERSITA DI PISA
POLITECNICO DI MILANO
CLOUDSOFT CORPORATION LIMITED
NUROGAMES GMBH

Duration

October 2013 – February 2016

Total cost/EC contribution

2,99 M € / 2.19 M €

Website: www.seaclouds-project.eu

Programme: FP7 ICT Call 10

SeaClouds project aims at giving to organizations the capability of "Agility after Deployment".

It takes care of different aspects of the cloud development life-cycle, such an open, generic and interoperable foundation to orchestrate parts of cloud-based applications.

It provides an *Open Source Solution* to monitor, manage and migrate the cloud providers (public/private) leveraging on service level agreement policies to guarantee the required performance and QoS on multi-cloud environments.

i) **Orchestration, adaptation, and verification** of services distributed over different Cloud providers

ii) **Monitoring** and **runtime reconfiguration** of services distributed over multiple Cloud
iii) **Unified management** of services distributed over multiple Cloud

iv) **Promotion and alignment** with major **standards** for cloud interoperability

Relevant Standards for Interoperability and Portability

CAMP (Cloud Application Management for Platforms)

OASIS
Advancing open standards for the information society

TOSCA (Topology and Orchestration Specification for Cloud Applications)

For Portability & Interoperability

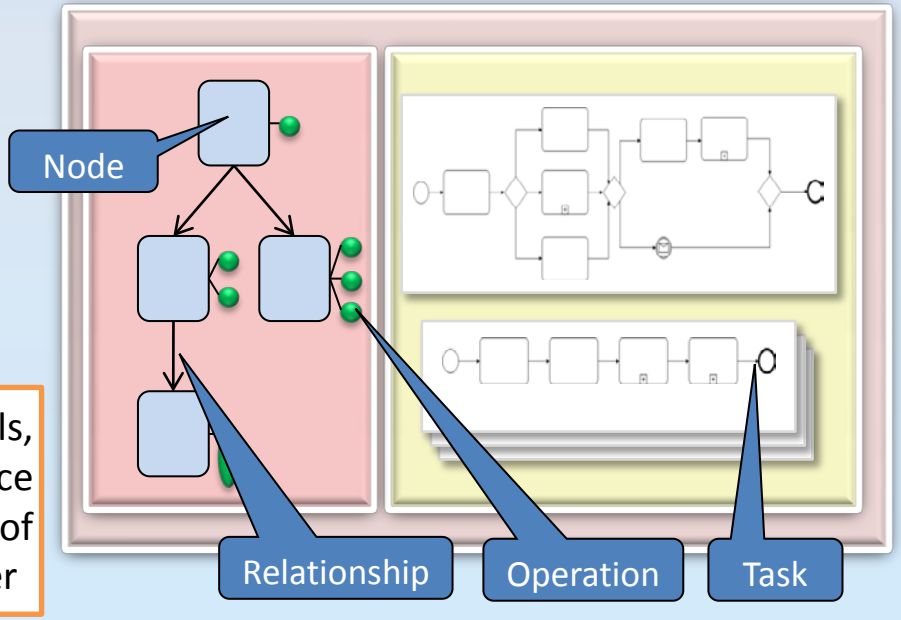
REST API + Platform Deployment Package

For Application Management

Application Lifecycle Model + Application Resource Model

CAMP aims at defining a harmonized API, models, mechanisms and protocols for the self-service management (provisioning, monitoring and control) of applications in a PaaS, independently of the cloud provider

Topology Model | Orchestrated Behaviours (Plans)

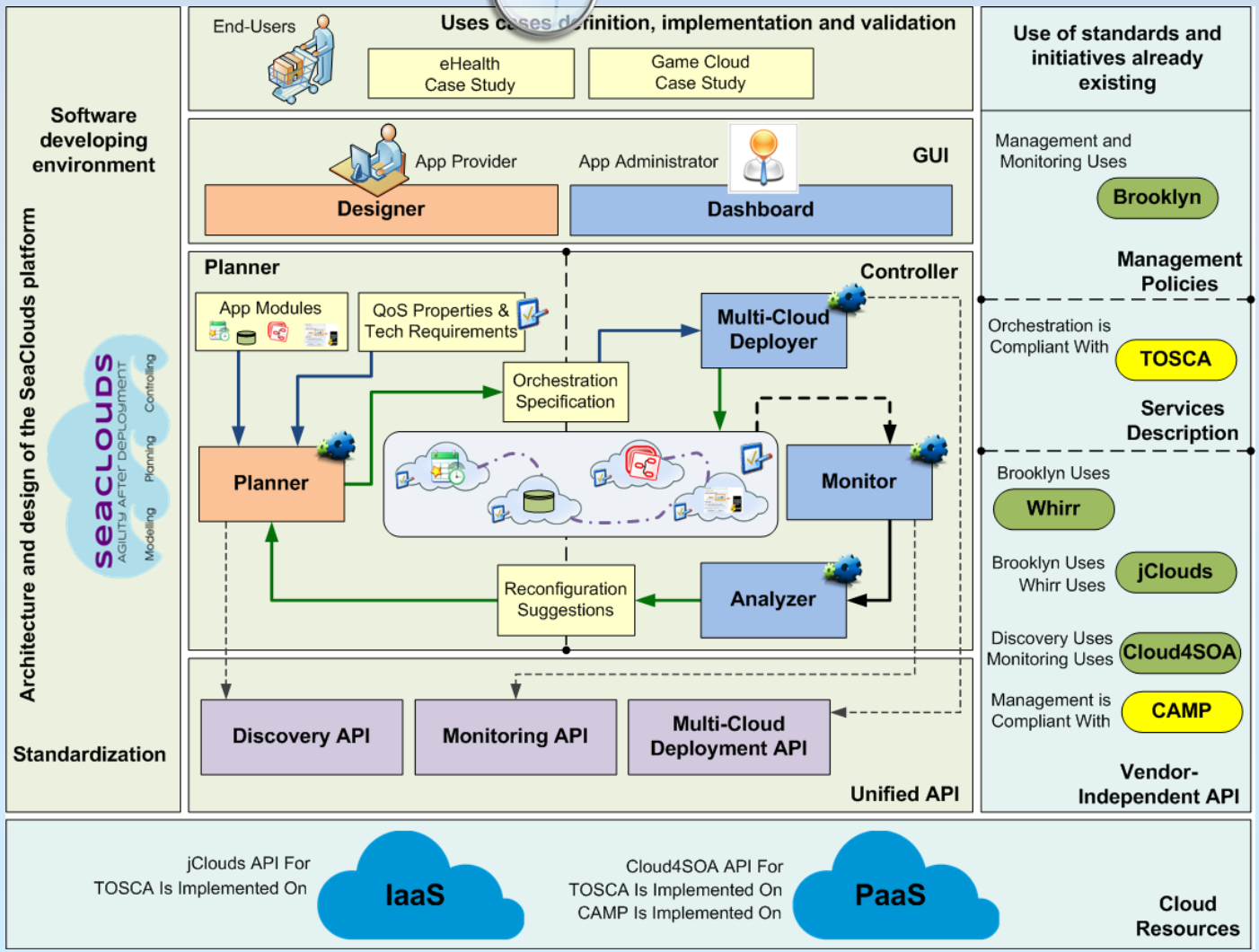


TOSCA aims at enhancing the portability of cloud applications and services. The main aim of TOSCA is to enable the interoperable description of application and infrastructure cloud services, the relationships between parts of the service, and the operational behavior of these services, independently from the cloud provider.

Achievements to date & Future plans

- Requirements Elicitation
- First Architecture (just a draft)
- Case Studies scenarios

- (June) Architecture and design of the SeaClouds platform
- (Sept.) First low level specifications and prototypes
- (Sept.) Availability of the first SeaClouds components implementation



http://www.seaclouds-project.eu/deliverables.html

SyncFree: Large scale computation without synchronization

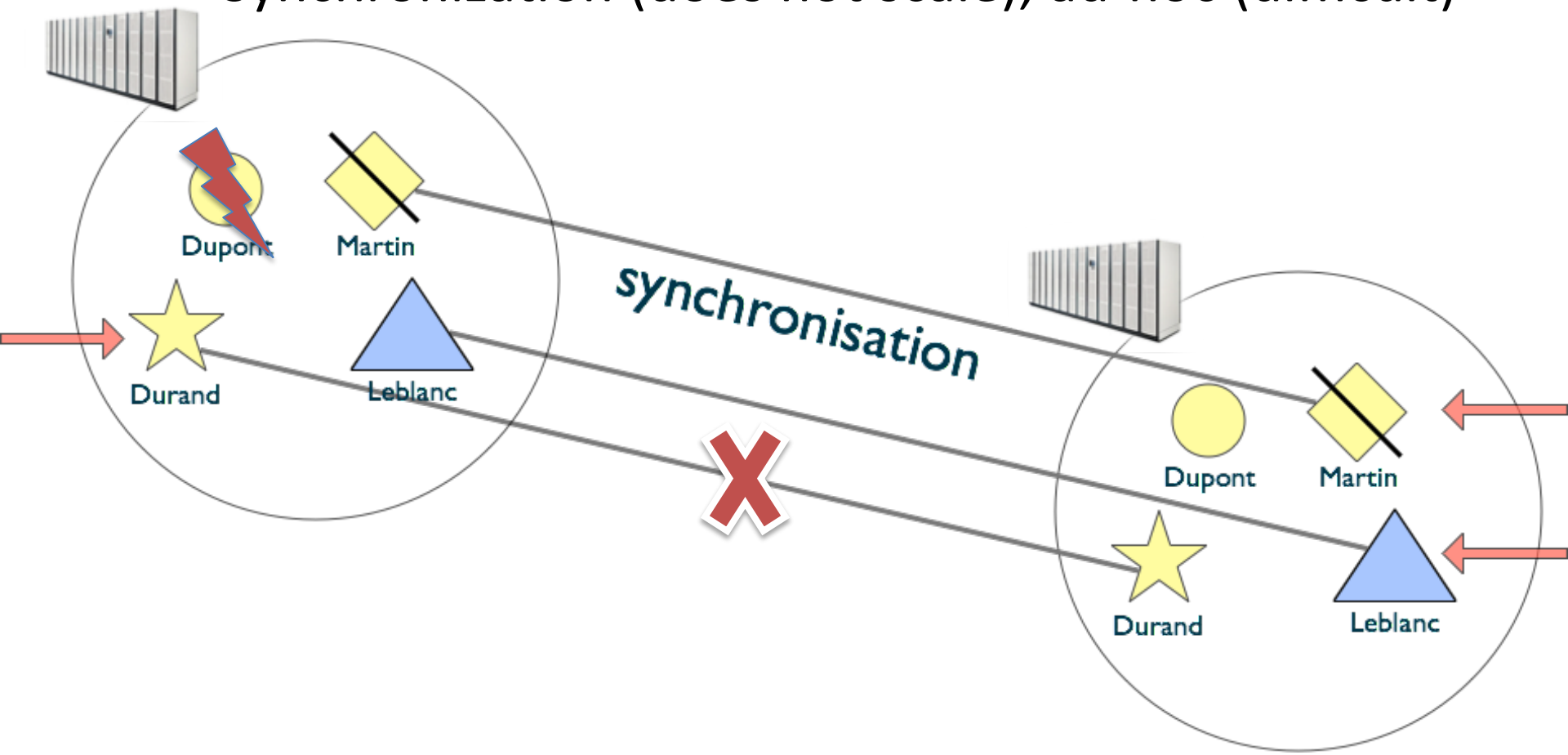
Tyler Crain

Marc Shapiro

This research is supported in part by European FP7 project 609551 SyncFree <http://syncfree.lip6.fr/> (2013--2016).

Programming applications for multi-data center clouds

- Solving consistency at extreme scale
  - Synchronization (does not scale), ad-hoc (difficult)



Conflict-Free Replicated Data Type (CRDT)

- Common data-types
  - Sets, maps, graphs, counters
- Exploit simple mathematical concepts to allow for safe conflicting concurrent updates
  - Monotonic updates
  - Commutativity
- Built for scalability
- Standards for consistency in clouds

Impact

- Real-world applications
  - Virtual currencies and wallets
  - Advertisement counters
- Open-source libraries
- Extreme-scale experiments

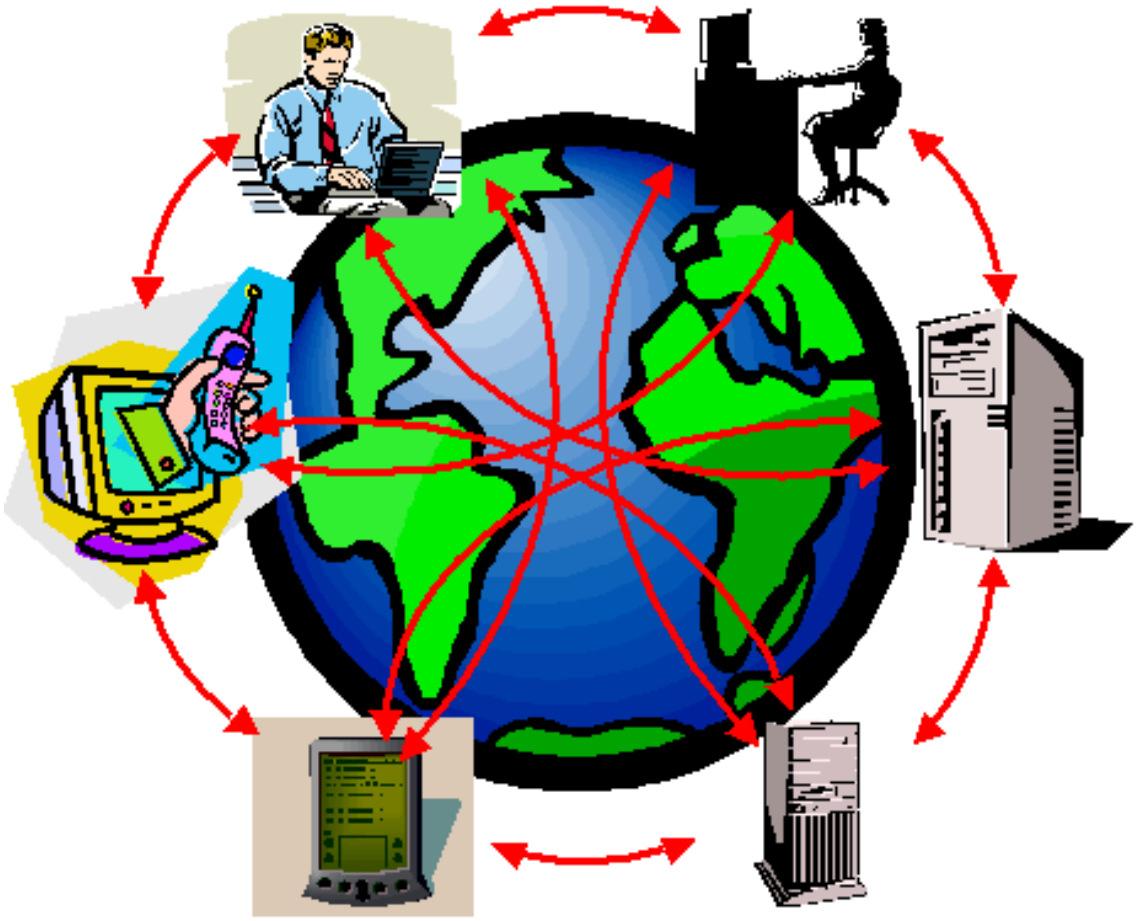
W3C/HTML5Apps Overview

html5apps-project.eu
@appshtml5

March 2014

Dr. Daniel Dardailler - W3C

World Wide Web Consortium



- Universality
- Founded by Tim Berners-Lee in 1994
- W3C Standards: HTML5, CSS, XML, WAI, RDF, ...
- About 80 staff, 4 hosts, 40% Europe

Native Apps: Issues

- Single platform/“walled gardens”
- Limited to smartphones
- Domination by non-Europeans:

…

WebApps: Promises

- Extra large base of web developers
  - ➡ development less costly
- Cross device development
  - ➡ access to tablet, TV, automobile, etc
- Web browser access
  - ➡ easy to deploy and update
- No single control point
  - ➡ direct relationship with customers

HTML5Apps: Goals

- Started Oct 2013 – 2 years
- Standardize OS level APIs for HTML5 apps, e.g:

  Execution, Alarm, Contacts, Messaging, Telephony, Sockets, Security, Payment…
- Identify future standardization efforts to close new gaps
- Dissemination and Interoperability
- Improve EU standardization efforts

societies

Self Orchestrating Communlty
ambiEnT IntelligEnce Spaces

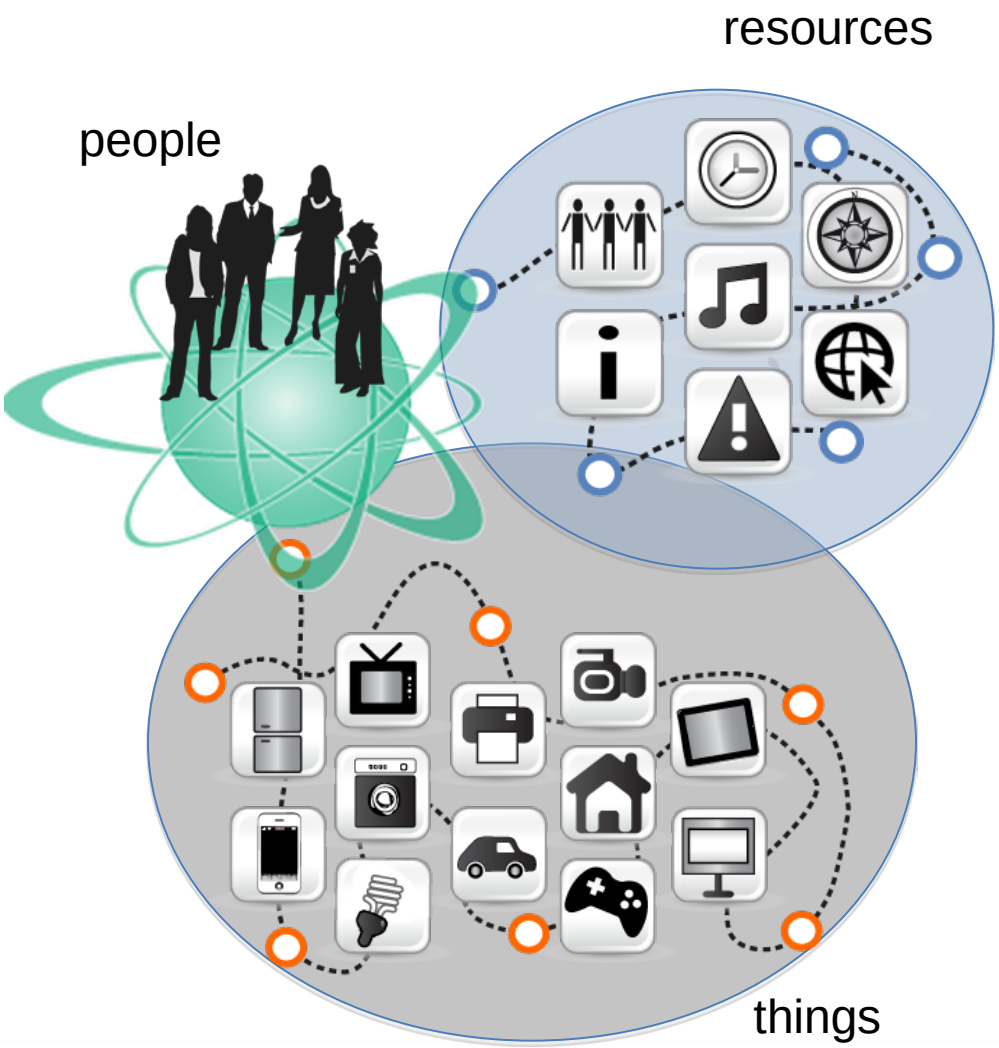
Lightning talk,

Concertation meeting

Micheal Crotty (TSSG)

SOCIETIES – Big Picture

SOCIETIES ENABLES **DISCOVERING**, **CONNECTING** & **ORGANISING** OF RELEVANT PEOPLE, RESOURCES & THINGS, CROSSING THE BOUNDARY BETWEEN THE DIGITAL & PHYSICAL WORLD.



Relevant standards

- XMPP
  - XEP under preparation “Community groups”
- W3C
  - Context aware and personalisation working group
  - Federated Social Web work group
    - XMPP, OStatus, ActivityStrea.ms
  - Future: Open Social “Community groups”
    - Web Sockets
    - ActivityStrea.ms (variant with JSON)

Summary Achievements

- Open source platform
  - http://www.ict-societies.eu/open-source

- Trials conducted.
  - Enterprise trials (1 role play trial, 1 in the wild)
  - Disaster trials (Focus group trials)
  - Student “in the wild” trial (6 weeks)

Summary achievements (2)

- Books (3)
- Papers
  - 58 conference papers (+ 3 submitted)
  - 15 journal papers
- Magazines
  - 5 magazine articles
  - 2 magazines produced (FIA Dublin 2013, ICT Vilnius 2013)