Service Offering for the Future Internet

SOFI Newsletter

May 2012

This SOFI newsletter reaches you as the Future Internet Assembly (FIA) takes place in Aalborg, Denmark. When the next FIA starts in around 6 months from now, there will be no SOFI newsletter. The support action Service Offering for the Future Internet (SOFI) was a two years funded project which started in June 2010 with the goal to support the services and cloud communities' activity in the EU led initiative of the Future Internet.

So FIA Aalborg marks our farewell as a support action, while the importance of the services and cloud research and development community will remain to the future evolution of the Internet. As such, it was important to us, in this final newsletter, to continue to highlight the results and achievements in projects in the SSA&I unit as well as remind readers how to ensure all these Future Internet achievements can be properly captured and preserved for the future.

SOFI, ending this month, has as a goal to ensure the sustainability of the service and cloud communities contributions to Future Internet, as a service to future projects to draw from and build on prior work. The SOFI website (http://sofi-project.eu) has reported regularly on Future Internet activity from the perspective of the services and cloud community along the various activities, while news from all the Future Internet projects in the SSA&I unit are now easier to follow via SOFIs RSS and Twitter aggregation (http://sofi-project.eu/project-news/).

The past two years has seen SOFI contributions to the Future Internet activities, mediating between the FI community and the services & cloud projects. The key contributions are collected together at a dedicated page on the EUs Future Internet portal - choose FIA Working Groups and then Service Offering[1] - while opportunities still exist to contribute before these activities come to a close. Just enjoy reading the project reports in this final SOFI newsletter, and at the end you will find out how your project can still make a contribution to the Future Internet via SOFI - before it's too late.

Yours,

SOFI project co-ordinator

Dr Lyndon Nixon

[1] http://future-internet.eu/home/fisa-futureinternetsupportactions/service-offering.html

In this newsletter you can find interesting contributions from several European projects, as follows:

- Vision Cloud - http://www.visioncloud.eu/;
- 4CaaSt - http://4caast.morfeo-project.org/;
- FastFix - https://services.txt.it/fastfix-project/;
- SEQUOIA - www.sequoiaproject.eu/;
- CHOReOS - http://www.choreos.eu/;
- Contrail - http://contrail-project.eu/;
- I2Web - http://i2web.eu/.

VISION Cloud as an enabler for the Future Internet

VISION Cloud is a three year project creating a next generation storage cloud as a key building block supporting the Future Internet.

In particular, as the basis for supporting a data intensive service oriented infrastructure, VISION Cloud is addressing the following research issues:

- Enriching objects with both user and system defined meta-data to support more powerful access, management and manipulation of stored data. This will also support the derivation of relationships betweens objects, leading to much more intuitive and useful search capabilities.
- Efficient ways to migrate and store data such as through deduplication techniques, and predictive compression.
- The creation of computational storage which will bring computing close to the storage, executing in a secure environment. This will not only increase the efficiency of computation tasks such as autonomous data derivation and transformations, but will also save on bandwidth costs and the overall time required to perform a computational task.
- Content centric storage to make the content of objects visible to users and applications, as opposed to the objects' underlying storage containers. This will lead to the creation of domain specific storage optimizations, leading to more efficient storage access.
- Advanced security mechanisms for storage clouds.

Project outputs to be provided

Vision Cloud is creating an open reference architecture for a storage cloud. The project is making available all of design papers, including interface specifications and well as studies on the State of the Art, and requirements. Portions of the project will be donated to the Open Source community. Additionally, the results of the use case experimentation coming from the fields of media, enterprise, healthcare and telco are being made publically available.

4CaaSt Major FI Innovations

4CaaSt project aims at creating an innovative framework for creating, marketing, deploying and managing applications on the Cloud, both over platform products and platform as a service. In particular:

Blueprinting the Cloud: 4CaaSt introduces the concept of 'blueprint', a technical description of an application or a service that decouples the various dependencies it has along the Cloud layers. The long-term benefits of Cloud Blueprinting address concerns at the heart of the Enterprise of the Future Internet and global service marketplaces by:

- Enabling novel geography spanning, end-to-end service applications to be built.
- Empowering service developers to better meet changing application requirements and develop customised service applications.
- Allowing new, innovative business models to be developed through the use of on-demand‖ service platforms, infrastructure and supporting services.

One Stop Shop for Cloud Services: 4CaaSt provides a cloud One Stop Shop marketplace that supports the trading of different types of XaaS (SaaS, PaaS, etc.) services in a unified way. A single access point to all type of service XaaS offerings is provided, which uses the most appropriate available revenue models for each specific service providing the benefits of:

- Dynamic, versatile, automated ecosystems
- Easy access and data based marketplace customisation based on social data.
- Business decision engine based on market analysis and various data sources.

Automated Virtual Machine Construction and Provisioning for Heterogeneous Components: The 4CaaSt platform will generate deployment designs and provision the required resources including construction and configuration of VMs to an optimal platform target, offering:

- QoS and scalability support and automated provisioning.
- Optimised platform and technology choice.
- Multi-tier, multi-tenancy support.

Elasticity in the PaaS Layer: dynamic scaling of the 4CaaSt platform products and components is supported natively. The various scaling options include:

- User defined scaling based on KPIs and Platform scaling based on real-time monitoring.
- Horizontal and vertical scaling of IaaS and PaaS with customizable limits of platform size.

Network-as-a-Service (NaaS) Support: The ability to define virtual networks at layers 2 and 3 as large enterprise and telecommunications industry for wide-ranging control of traffic to services is offered, supporting:

- User customisation of networks, VLANs and IP ranges, fine grained via an API.
- Network QoS to deliver services to customer end points through networking hardware.

Enabling native service and immigrant PaaS technologies in 4CaaSt: Cloud solutions and "traditional" technologies migrated to the Cloud and offered "as a service" with platform integration, for example:

- Existing IaaS services; context data relevant to services and applications, network enablers, communication technologies and storage capabilities offered in a uniform fashion.
- Integration directly to applications and easy creation of front end composite applications.

FastFix

FastFix at a glance

Project title: Monitoring Control for Remote Software Maintenance (STREP)
Project coordinator: Miguel A. Juan S2 Grupo (ES)
Partners: Technische Universitaet Muenchen (DE), Lero (IE), Instituto de Engenharia de Sistemas e Computadores, Investigacao e Desenvolvimento em Lisboa (PT), TXT e-solutions (IT), Prodevelop (ES)
Duration: June 2010 – March 2013
Total cost: € 3.5 M
Website: http://www.fastfixproject.eu
Linked-in: http://www.linkedin.com/groups?gid=3668475

The overall purpose of FastFix is to provide software engineers of Future Internet applications with a "real-time" maintenance environment that increases efficiency and reduces total cost by (a) accurately identifying failure causes (b) facilitating their resolution. FastFix includes a platform and a set of novel tools to remotely monitor customer environments, collecting information on application execution and user interaction. FastFix correlates the monitored information and automatically identifies symptoms of execution errors, performance degradation, or changes in users' behaviour.

FastFix comprises two main components: the FastFix client running in the executionenvironment of the target application, and the FastFix server running in the maintenance environment. The server communicates with all clients over a network. Both components include specialized subsystems that interoperate as follows :

1) Error Report Generation: Error reports typically lack relevant context information needed by developers to understand the conditions under which the error happened. FastFix automatically generates error reports that contain relevant information to reproduce and fix errors. To this end, FastFix sensors continuously gather context information, including data on application execution and user interaction. The sensors are integrated into target application, runtime environment, and operating system.

2) Error Reproduction: By recording execution traces, FastFix enables deterministic reproduction of errors. The traces are obfuscated before sending them to the maintenance environment. FastFix links a video-like replay with the issue tracker and the debugger and augments it by relevant context information, such as current CPU load, key interactions of the user, or her level of experience.

3) Issue and Cause Detection: Developers typically manually correlate symptoms in error reports with error causes. FastFix automatically identifies incorrect execution patterns (symptoms) and infers probable issues and their causes using event correlation and pattern

matching. Maintenance knowledge is stored in ontologies. Correlation results are reported to maintenance engineers to facilitate error diagnosis.

4) Patch Generation and Self-Healing: Manual development of small patches is time-consuming and complex for highly available systems. FastFix is able to automatically generate patches that remove specific issues by analyzing the application code. FastFix prevents identified errors from happening by employing supervision mechanisms (actuators), excluding faulty execution paths from the application.

SEQUOIA

SEQUOIA has contributed to the Future Internet in the following areas:

- Making the Internet more user-friendly
- Deployment of the Internet of Services
- Internet for All

SEQUOIA has contributed in these areas through its fostering of a culture of self-assessment. SEQUOIA helped the IoS projects think more about their own end-users and beneficiaries, and about the potential economic and social implications of their technological research.

Further, in its methodology SEQUOIA invited and encouraged the projects to think about how their innovations could impact the working routines of their intended users and how they could improve the users' quality of life.

Overall, the SEQUOIA methodology helps the IoS projects understand how they can contribute to reaching the objectives of the Digital Agenda 2020, which are in good measure related to the Future Internet.

CHOReOS: Large Scale Choreographies for the Future Internet

Future Internet Challenges Addressed by CHOReOS

The evolution of the Internet from a source of information towards an Internet of Services, involving people, smart objects, and services poses new technical challenges:

- Everything about the Internet of the Future will be ***large-scale*** – number of users, diversity of services, data processing load and heterogeneity of networked systems;
- The development of service-oriented software must change from a mostly static developer-centric process to a ***highly dynamic*** user-centric process.

The CHOReOS solution offers a new approach in the development and management of networked services based on the concept of choreography-centric service-oriented systems.

The CHOReOS project will deliver the CHOReOS Integrated Development and Runtime Environment (IDRE), a dynamic development process and associated methods, tools, and middleware.

CHOReOS Solutions for the Future Internet Challenges

CHOReOS defines a ***model-driven development and runtime process*** for service choreography lifecycle from design to deployment and evolution. CHOReOS provides techniques and tools to support requirements specification, choreography modeling by domain experts (as opposed to IT professionals), and automated synthesis of QoS-aware choreographies built on top of an ultra-large repository of services. ***The first version of CHOReOS development process has been defined using BPMN 2.0***, but it is expected to be refined as the project continues.

The ***CHOReOS Integrated Development and Runtime Environment (IDRE)*** provides a sophisticated development and execution process for choreographies. User requirements are captured via dedicated tools. The choreography is then synthesized into coordination logic. The development phase results in a deployable service choreography based on coordination delegates interfacing with networked services.

The ***Runtime Environment*** offers runtime capabilities for discovering, deploying, running, adapting, governing and monitoring large-scale choreographies. The ***CHOReOS Middleware*** enables a uniform access to heterogeneous infrastructures involving both business services and services from the Internet of Things.

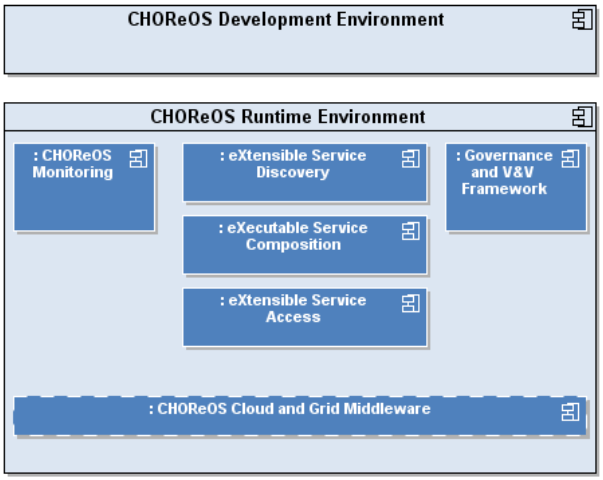


Figure 1. CHOReOS IDRE Components

CHOReOS Runtime Environment provides a set of components dealing with the Future Internet challenges:

eXtensible Service Discovery (XSD) is responsible for resolving the mass and heterogeneity problems and facilitating effective and efficient discovery of available services based on service abstractions;

eXecutable Service Composition (XSC) enacts choreography by selecting appropriate services from available service base;

eXtensible Service Access (XSA) implements a unified approach to service access. XSA extends the Enterprise Service Bus (ESB) paradigm, which is the established solution in service-oriented computing for dealing with interaction protocol diversity;

CHOReOS Monitoring is responsible for observing how choreography enactments and used services are proceeding based on defined monitoring rules;

Governance and V&V Framework provides tools supporting the monitoring and testing activities during design, development, and runtime of choreographies;

CHOReOS Cloud & Grid Middleware implements a novel mechanism for the execution of complex, distributed SOA systems on the Cloud.

Currently, CHOReOS provides prototype implementations of the major CHOReOS IDRE components. CHOReOS components are developed as open source project hosted by OW2 at https://forge.ow2.org.

Learn more about CHOReOS project: www.choreos.eu.

For further information about CHOReOS please contact the project coordinator Hugues Vincent, hugues.vincent@thalesgroup.com.

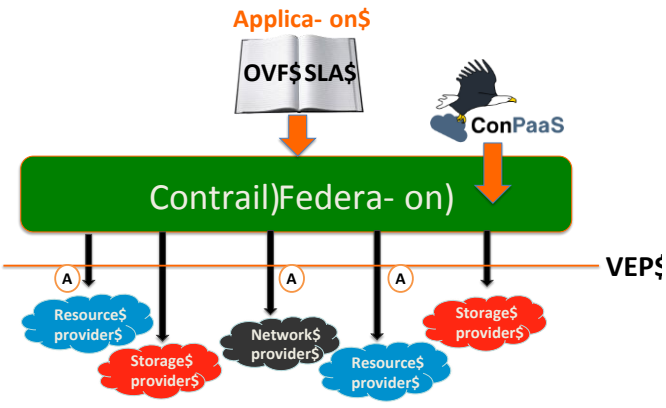
Contrail: A reliable and trustworthy cloud platform

After decades in which companies used to host their entire IT infrastructures in-house, a major shift is occurring where these infrastructures are outsourced to external operators such as Data Centers and Computing Clouds. However, although this market is in rapid expansion in Europe, this growth may soon be hindered by user concerns such as lock-in within a single commercial offer (which reduces the necessary competition between many infrastructure providers), ownership and privacy issues of the data stored in the Cloud, and the lack of performance predictability of current Clouds.

These are some of the major challenges of the Internet of Service, one of the many facets of the Future Internet. These challenges can be addressed by creating the technology for offering an elastic, dependable, and trustworthy cloud service to customers.

Contrail[2] develops an integrated approach to virtualization, offering Infrastructure as a Service services (IaaS), services for federating IaaS clouds and Contrail Platform as a Service services (ConPaaS) on top of federated clouds.

The first gateway for a dependable cloud service is the Federation component. It is not only a broker that selects the most suitable cloud provider, but it also enables to span and split the application deployment over several providers to better satisfy the application's requirements. These requirements, both in terms of Quality of Service (QoS) or Quality of Protection (QoP), are specified in SLAs that are negotiated between the customer and the federation. Through an SLA the user can for example specify the desired availability and security level or require that her application or data must reside in a specific geographical location. The Contrail project addresses the mistrust in cloud platforms and provides a federation layer support for bringing together a multitude of cloud providers, both private and public. This will allow multi-tenancy and cloud-bursting capability to end user cloud applications while supporting SLAs and QoP.



The Virtual Execution Platform (VEP) component of Contrail breaks the last barrier of vendor lock-in by providing the needed interoperability across different cloud platforms and providers. VEP is in charge of provisioning hardware resources from Cloud providers and to deploy and run distributed applications under the control of a negotiated SLA. VEP already supports OVF to describe distributed applications

[2] http://contrail-project.eu/

and its runtime configuration and plans to implement OCCI to build and manage distributed applications. Contrail implements a REST API and plans to adopt the CIMI model.

Contrail technology also deploys ConPaaS services, which are self-managed, elastic and scalable. A ConPaaS service can deploy itself on the Cloud, monitor its own performance, and increase or decrease its processing capacity by dynamically (de-)provisioning instances of itself in the Cloud.

The main results of Contrail that provide solutions to the challenges for a dependable cloud service are the following:

- A Federation service integrating security to select the best matching resources (with variable prices) offered by multiple cloud providers
- SLA negotiation and enforcement via monitoring capabilities to guarantee QoS and QoP terms
- VEP to implement interoperability for deploying applications in a dynamic and heterogeneous environment
- ConPaaS to offer an open-source runtime environment for easy and scalable applications in the cloud

Addressing these important challenges is fundamental to support large user communities formed of individual citizens and/or organizations relying on Cloud resources for their mission-critical applications.

Inclusive Future Internet Services – A short update

Authors: Carlos A Velasco (Fraunhofer FIT) and John O'Flaherty (MAC)

I2Web[3] is an FP7 ICT consortium of industry, researchers and user organizations from across Europe that is investigating the Future Internet Services eAccessibility needs of disabled and older people. In the previous issue we reported some of our results on the user requirements analysis phase. The project continued its work and now the industrial and research partners are immersed in the implementation phase of the prototypes.

The user, device and application models have reached a mature state and have been successfully presented in the 9th International Cross-Disciplinary Conference on Web Accessibility, W4A 2012,[4] "The Web of Data and Web Accessibility" co-located with the 21st International World Wide Web Conference, WWW2012, in Lyon, France, 16-17 April 2012. Our presentation can be downloaded from our web site and the paper is available in the ACM Digital Library: http://doi.acm.org/10.1145/2207016.2207018.

There is also a new release of the REST API that allows the communication between the testing and compliance infrastructure and the authoring environments. This API will be published as open source in our web site in the coming weeks and will be sent to standardisation bodies. It has already been shared informally with interested actors with a very positive feedback.

The industrial partners have finalised the first versions of their accessible web applications in three different domains: a multiplatform e-banking framework, a multiplatform e-government application and a multimedia content management system. These prototypes are being tested by our user organisations led by the University of York. The results of these evaluations will be incorporated in our final prototypes.

[3] http://i2web.eu/
[4] http://www.w4a.info/2012

Backword

Around two years ago, as the support actions for the Future Internet kicked off, a set of specific cross-domain activities within the Future Internet initiative were set up - roadmapping, international collaboration, standardisation, a Future Internet architecture. These groups have been recording their work at http://fisa.future-internet.eu while we in SOFI have been adding the services and cloud perspective in dedicated pages under http://services.future-internet.eu.

In our final SOFI newsletter we want to give a last chance to our projects to ensure that their achievements are recorded in these activities via SOFI. Don't miss this opportunity!

FUTURE INTERNET STANDARISATION ACTIVITY

The FI Standards group was set up to enable a greater activity of the projects within the Future Internet in standardisation bodies and activities. SOFI has participated in this group on behalf of the services and cloud research projects in the SSA&I unit.

SOFI has participated in this activity particularly in that it has set up and maintained a table of past and current standardisation activities by the SSA&I projects[5]. Using semantic mediawiki technology, the captured activities are easily sorted by category, status, standards body or project. This table can be used not only to reflect the current known activities for (pre-)standards in the unit but also for researchers to find and draw on previous standardisation work in their future research. By the end of May we want to ensure this table is as up-to-date as possible. Just send the following details for your project(s) by e-mail to: emilia.cimpian@sti2.org before May 28, 2012, or simply fill-in the form now and return it to Lyndon Nixon:

Thanks, and wishing you success in your standardisation work!

[5] http://fisa.future-internet.eu/index.php/Semantic_markup_of_activities

Name of the standardization activity:

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has status (0-5, from idea to standardized):

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is related to (another activity):

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in standards body:

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date of last update:

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acronym:

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description:

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contact person:

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contact organization:

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project:

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documentation (URL):