Future Internet: Infrastructures and Services
(FI-Programme)

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Cloud provisioning models

• IaaS (Infrastructure)
  – Virtualization, dynamic scaling, Internet connectivity, utility computing (e.g. a VM)

• SaaS (Software)
  – Apps hosted in vendors (e.g. a Google doc), automatic updates, compatibility

• PaaS (Platform)
  – Outgrowth of SaaS: Apps are available through the Internet (e.g. a VM with ready installed Software Enablers)

• What's the difference?
  – IaaS: underlying infrastructure | PaaS: Development platform

• Private Cloud & Public Cloud
  – No difference in terms of architecture but in terms of accessibility.
    – Private: Single Organisation
    – Public: Rendered over the net

• Hybrid provisioning models?
The aim of FI-WARE is to be useful for Europe
open to the community

Future Internet Core Platform

Provisioning – Hosting – Refactoring – Brokering – Consumption

App/Services ecosystem and delivery framework

Internet of Things
Cloud Hosting
Interface to Networks

Suppliers
Manufacturer
Wholesalers
Retailers
Consumers
Governments
The VISION

- FI-WARE will be a technological foundation to satisfy the demands of application/services providers and consumers across various usage areas, stimulating and cultivating a sustainable FI service ecosystem.
Elements & Functions of FI Core Platform

- The FI Core Platform comprises a set of technological “Generic Enablers” which are considered general purpose and common to several current and future “usage areas”
- Generic Enablers (therefore, the FI Core Platform) will provide open interfaces for development of Applications

Usage area projects under the PPP

Open Interfaces

Cloud Hosting
App/Service Delivery
Support Services
Interface to IoT
Interface to Network
Security, Trust
Dev Tools
What is a FI-WARE Generic Enabler (GE)?

• A FI-WARE Generic Enabler (GE) is a functional building block of FI-WARE

• Any **implementation** of a Generic Enabler (GE) is made up of a set of **components** which together supports a concrete set of Functions and provides a concrete set of APIs and interoperable interfaces that are in **compliance with open specifications published for that GE**

• There might be **multiple compliant implementations of a given GE**
What is a FI-WARE Generic Enabler (GE)?

• User authentication!
  – Why not having a unique authentication system for all our actions?
  – Identity management GE
    • works for accounts on:
      – Facebook, Google mail, hotmail etc.
Cloud in sensitive domains: Healthcare provisioning

• Why cloud computing & what is the problem?
  – Standards, regulations, recommendation
    • legislation, ISO standards
  – Security standards (ISO 27000)
    • there are severe restrictions to data transfer, storage, aggregation and analysis
  – Cloud computing:
    • remote services (data management in distant datacenters)
Problem area: Healthcare provisioning
Hybrid Cloud Deployment: Software to Data

• Hybrid Cloud:
  – A reverse cloud approach that offer the required framework (Public Cloud) to allow Software Enablers to be initiated at clients’ sites and to be hosted in a Private Cloud

• Software to data cloud model
  – Provider Edge
  – Consumer Edge
FI-STAR at a glance

• Future Internet Social and Technological Alignment Research (FISTAR) project
  – attempting to identify suitable software to data solutions based on Generic Enabler technology provided from FI-WARE
  – to establish early trials in the health domain

• FI-STAR will develop and deploy 8 use case Future Internet (FI) applications
Overall Goal

• FI-STAR establishes early trials in the Health Care domain building on Future Internet (FI) technology leveraging on the outcomes of FI-PPP Phase 1.
• To meet the requirements of a global Health industry FI-STAR will use a fundamentally different, “reverse” cloud approach that is.
• It will bring the software to the data, rather than bringing the data to the software.
• FI-STAR will deploy and execute 7 early trials across Europe
• FI-STAR will validate the FI-PPP core platform concept by using GEs to build its framework (7 use cases applications)
Tromsø, Norway
Tele-health network for Diabetes patients: the Norwegian Centre for Integrated Care and Telemedicine (NCT) in Tromsø, Norway, is a well-established tele-health centre providing care to a rural community north of the Arctic Circle. They will improve and extend the existing tele-health network for Diabetes patients, aiming at the development of smart phone based multi-channeling allowing for streaming of different data at the same time (sensor data and audio and video).

Leeds, UK
2-D bar-coding for real time reverse medication supply chain: Medicentre is a SME Pharmacy wholesaler in Leeds, UK, and will implement the 2-D bar-coding use case trial to offer real time reverse supply chain modelling to prevent error and counterfeiting and create interfaces to additional third party services.

Bilbao, Spain
New Interactive Future Internet based services for people with Mental Health problems: Osakidetza, in Spain, is a healthcare organization providing healthcare for more than 2 Million people, and will implement its use case trial with the objective of improving access to the care and to apply the E-PPP core platform to other already existing services successively.

Bologna, Italy
Provision of a network capable to connect different applications and services: CUP 2003, in Italy, on behalf of the Emilia-Romagna Region and Health Authority of Bologna, develops new healthcare networks to allow general practitioners, specialists and healthcare professionals to share the assisted person's healthcare and disease data in real-time, allowing citizens to know and access healthcare data at anytime from anywhere. The use case will implement a regional socio-health administrative framework where necessary medical information is collected and elaborated according to specific logics, and to the potential of the FI-WARE platform.

Munich, Germany
Virtualization of operating theatre environments and real time data integration for monitoring and reduction of errors: Klinikum Rechts der Isar, in Germany, is the major teaching hospital for Technical University Munich, and will implement the virtualization of operating theatres use case trial to develop innovative methodologies for minimal invasive operating room.

Krakow, Poland
Interactive online facilities for access and quality of care: John Paul II Hospital, in Krakow, is one of the leading e-health applying hospitals in Poland, and will improve the access to and quality of care by designing improved interactive online facilities for their cancer patients, involving dedicated hardware (life monitoring sensors, tablets, cameras) and software (knowledge portal, web based, treatment diary, mobile application, video conferencing client).

Bucharest, Romania
Online Cardiology service for people with heart failure: University of Medicine and Pharmacy Carol Davila Bucharest, in Romania, is one of 3 major acute hospitals providing care to the 2 Million inhabitants of Bucharest, and will establish the online cardiology service for people with heart failure, in particular for people after myocardial infarction, by testing software applications in the integration experimentation site, real-time vital parameters internet-monitoring, improvement of physical training and improvement in secondary prevention programs.
Building blocks of FI-Applications

• Generic Enablers (GEs) are considered as software modules:
  – offer various functionalities along with protocols
  – interfaces for operation and communication.

• Using GEs FI-STAR will develop Specific Enablers that highlight:
  1. Light-weight applications
  2. Robust security and privacy functionality
  3. Optimal usage of network resources
  4. Virtualization of resources
Generic Enablers

• **GEs at a glance:**
  – Open specification for developing modules
  – Implementation from a service provider
  – Images with installed GEs (available by FIWARE)
  – Documentation
    • Installation
    • Administration
    • Testing
The High level architecture of the diabetes care FI application
Architecture of GEs
http://cloud.intellicloud.tuc.gr

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Openstack Architecture of Intellicloud

- Identity Service (Keystone)
- Image Service (Glance)
- Compute Service (Nova)
- Block Storage (Cinder)
- Network Service (Quantum)
- Dashboard Service (Horizon)

- MySQL Server
- RabbitMQ Server
- NTP Server

- Compute Service (Nova)
- Network Service (Quantum)
- Virtual Network Service (OpenVSwitch)
- KVM Hypervisor
- NTP Server

**Openstack Grizzly, 8 nodes installation**
- **48 Cores**
- **256 GB Ram**
- **8 TB**
Physical Network Architecture

Openstack Management Network eth1
Openstack VM Configuration Network br-int
Openstack VM Internet Access br-ex
Intellicloud Services

Current Cloud Services

• IaaS
  – CPU
  – Memory
  – HD
  – Network & Internet
    • Virtual Topologies
  – OS
    • Images

GEs

• PaaS
  – IaaS
  + GE (Development Platform)

• SaaS
  – IaaS + PaaS
  – A Future Internet Application
Creating VMs

• Requirements
  – SSH client [http://www.putty.org, cygwin]

• Browse: http://cloud.intellicloud.tuc.gr
  – Create a new keypair (download it)
  – Edit the default security group rules

<table>
<thead>
<tr>
<th>IP Protocol</th>
<th>From Port</th>
<th>To Port</th>
<th>Source</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP</td>
<td>22</td>
<td>22</td>
<td>0.0.0.0/0 (CIDR)</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>TCP</td>
<td>80</td>
<td>80</td>
<td>0.0.0.0/0 (CIDR)</td>
<td>Delete Rule</td>
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<tr>
<td>TCP</td>
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<td>8080</td>
<td>0.0.0.0/0 (CIDR)</td>
<td>Delete Rule</td>
</tr>
<tr>
<td>ICMP</td>
<td>-1</td>
<td>-1</td>
<td>0.0.0.0/0 (CIDR)</td>
<td>Delete Rule</td>
</tr>
</tbody>
</table>

Displaying 4 items
Creating VMs cont.

– Create a new network
  • Network address [e.g. 20.20.0.0/24]
  • DNS [e.g. 8.8.8.7, 8.8.8.8]

– Launch a new VM instance using the glance images
  • Set flavor (computational capabilities)
  • Set image (e.g. Ubuntu64)
  • Set public key
  • Set security group
  • Set network

– Allocate a new floating IP (based on the intellicloud subnet 247.27.50.20-240)

– Assign a floating ip to instance [Access & Security]
– Ssh from remote host using [set: chmod 600 key_name.pem]
  • ssh -i my_key.pem ubuntu@147.27.50.22
– Enjoy!
Further stuff

- Create images
  - Upload using glance and launch!
- Create a new volume
  - e.g. for backup
- Create a new virtual network topologies
  - Create subnets & routers
Are you interested?

• Enter the catalogue
  – http://catalogue.fi-ware.eu
OpenStack Demo

• Using intellicloud infrastructure
• Using GEs
• Building a cloud application
  – IaaS
  – PaaS
  – SaaS