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OPERATION PART FINANCED BY THE EUROPEAN UNION  
European Regional Development Fund

# **CLASS** **Conference 2014** CloudAssisted Services

## **STORM CLOUDS**

### **Bringing Public Services to the Cloud**

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# Summary

- The STORM CLOUDS project
- STORM CLOUDS Platform (SCP)
- Pilot Cities
- User-centric Open Innovation – co-design methodologies
- Services to be cloudified
- Call for Cities



Project co-funded by the European Union's  
Competitiveness and Innovation Framework  
Programme

# The STORM CLOUDS project

Storm Clouds explores how Municipalities can cloudify their public services and how that will impact citizen's lives.

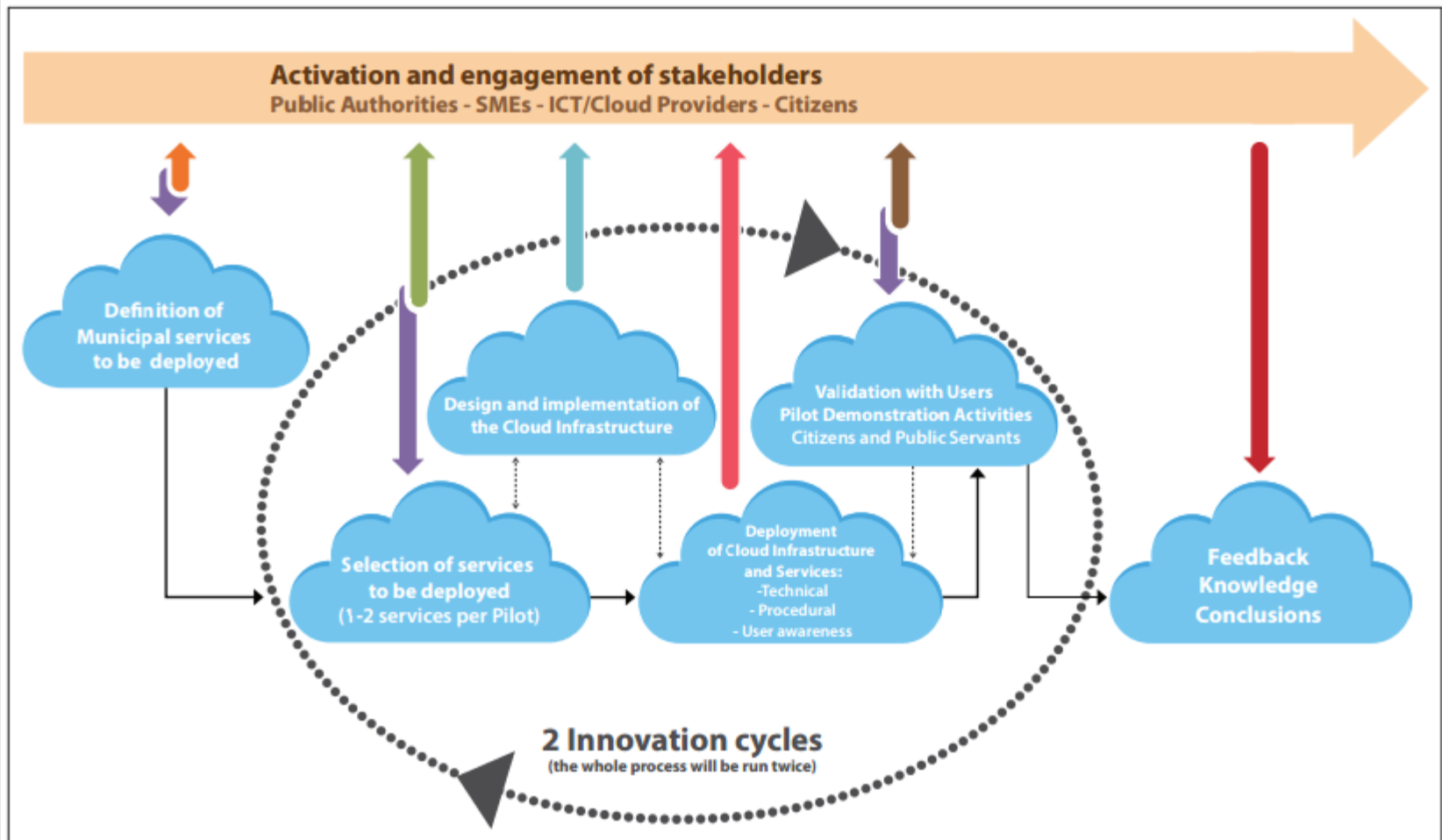
Its purpose is to **provide useful guidelines for policy makers**, so that they can address this process in an organized and fast-paced manner.

The guidelines will be prepared in accordance to direct experimentation in Águeda (PT), Manchester (UK), Valladolid (ES) and Thessaloniki (GR) among other European cities.





# Project Timeline



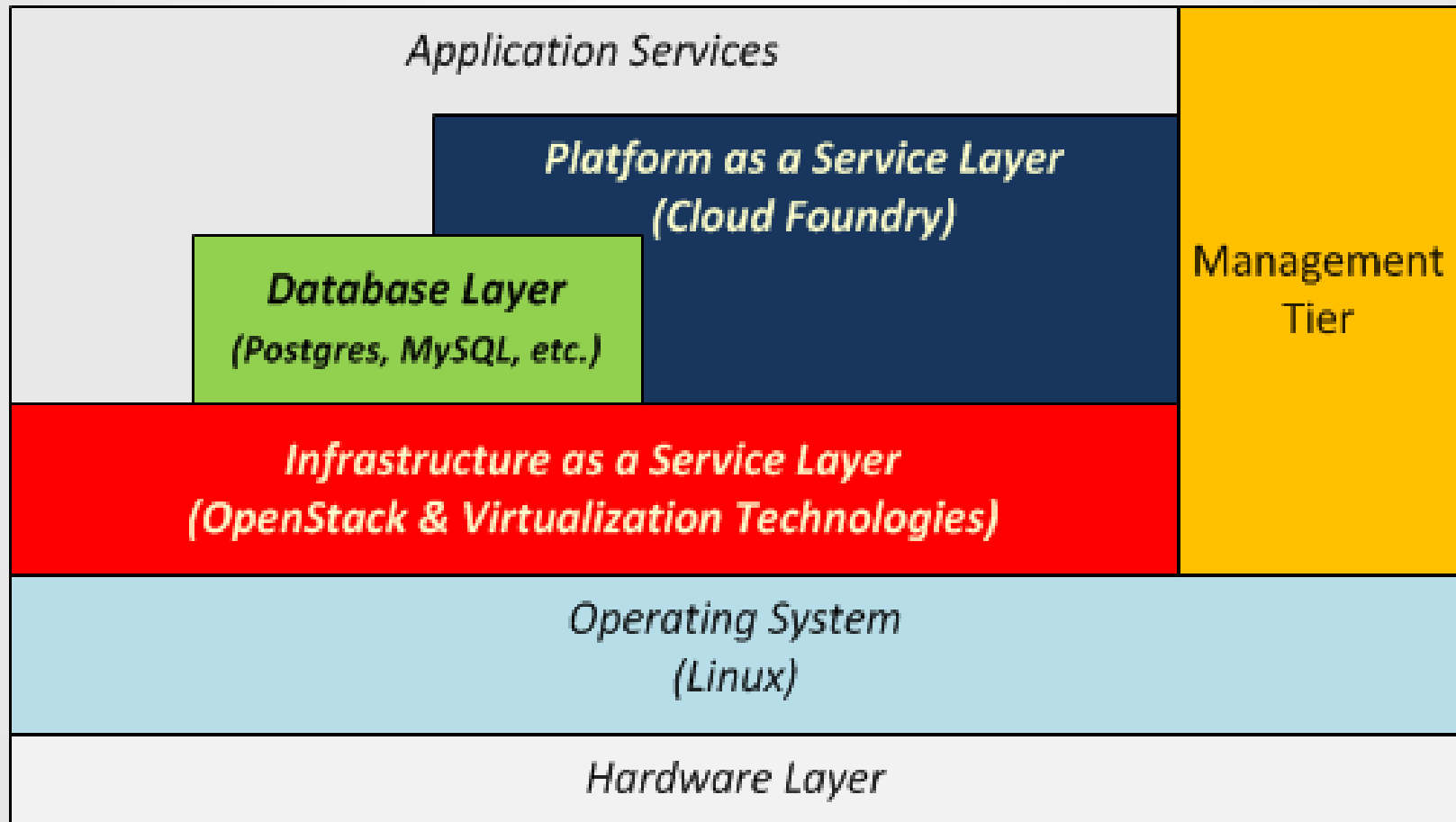


# What is the Storm Cloud Platform?

- Storm Cloud Platform (SCP) provides the infrastructure for running the applications of the STORM project
- SCP implements a “as-a-Service” paradigm; resources are allocated/de-allocated on-demand
- SCP is both an actual implementation and an architectural blue-print
- SCP architecture is mainly focused on the software components; the architecture can be deployed on commodity hardware
- SCP is implemented using Open Source components available under popular Open Software Licenses (Apache 2.0, GNU GPL, LGPL, etc.)



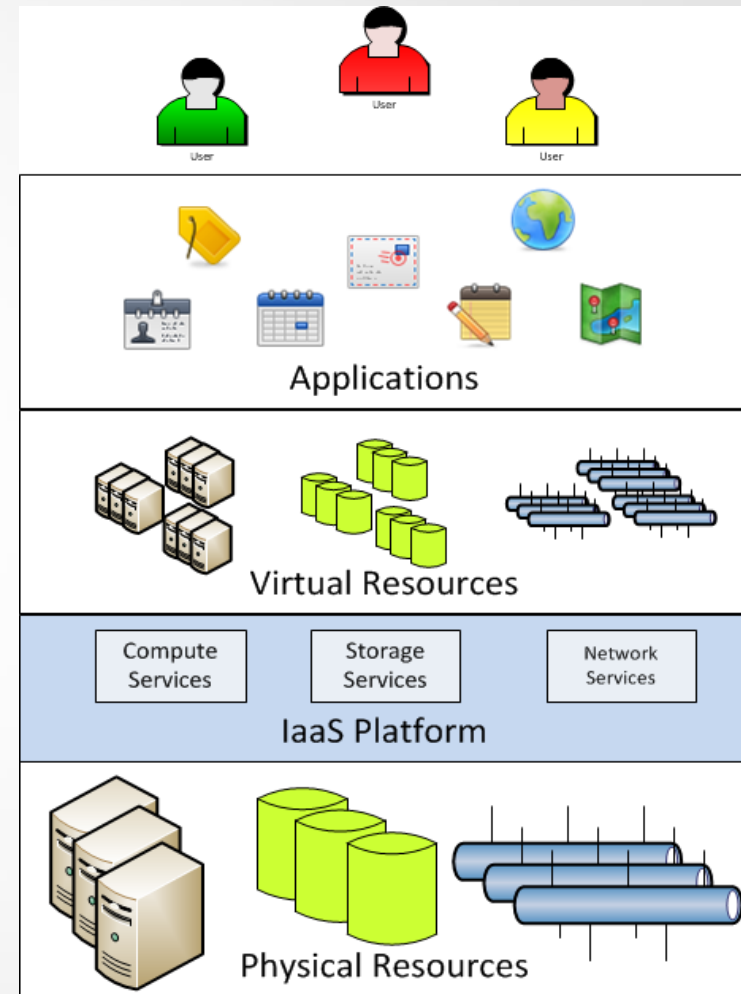
# SCP - Overall Architecture





# IaaS Layer - Concepts

- IaaS Layer provides **elastic** allocation of IT resources
  - **Computation:** the ability to start Virtual Machines with an operating system application software
  - **Storage:** ability to create storage elements like virtual disks or files
  - **Networking:** ability to create network elements (Layer 2 networks, subnets, DHCP services, etc).
- IaaS Layer provides resources using **virtualization**, a software layer that simulates the existence of a piece of hardware





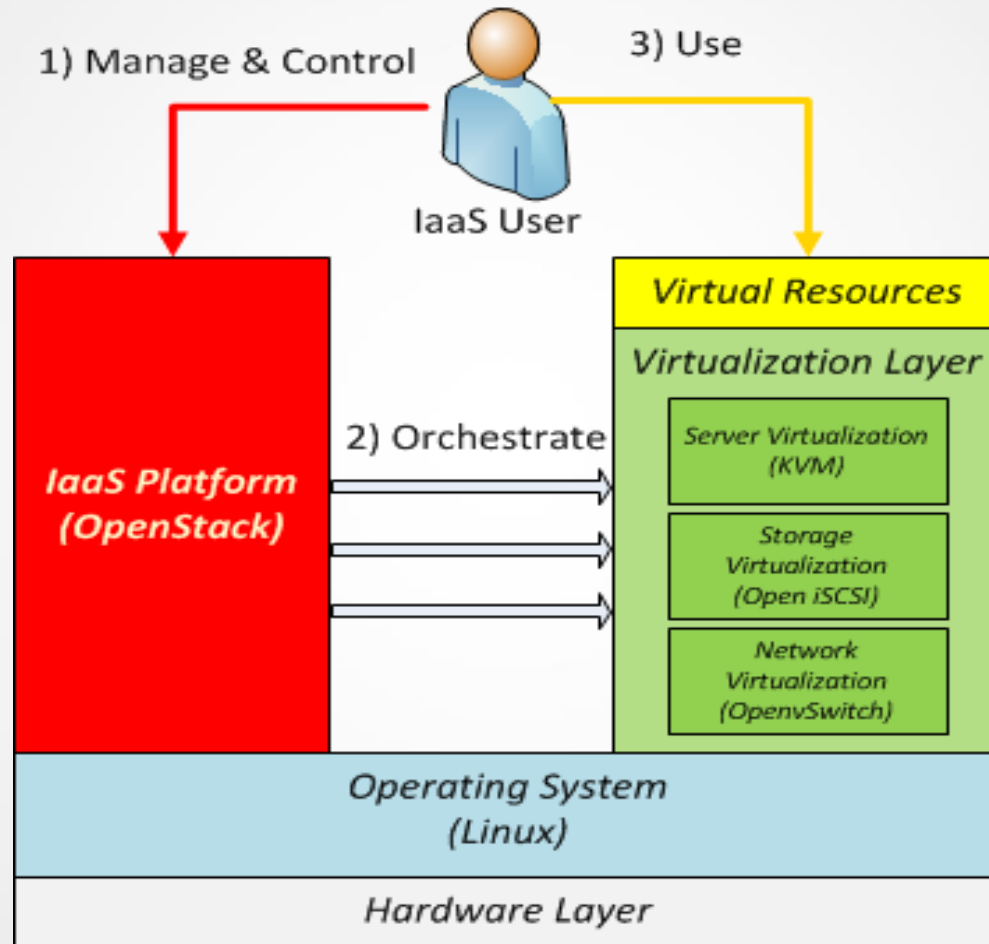
# IaaS Layer – OpenStack

- **OpenStack** implements the SCP IaaS Layer
  - A project and a community backed by an independent foundation
  - Supported by several corporate sponsors (HP, IBM, Cisco, Ericsson, Intel, AT&T, Redhat, RackSpace, etc.)
  - All source code is freely available under the Apache 2.0 license
  - It provides a documented and open API
  - Some providers use OpenStack for implementing public clouds (HP, RackSpace, Enter, etc.)
- **Virtualization Technologies**
  - **KVM** → Server Virtualization
  - **iSCSI** and **LVM** → Storage Virtualization
  - **OpenvSwitch**, **Linux iptables** and **dnsmasq** → NW Virtualization



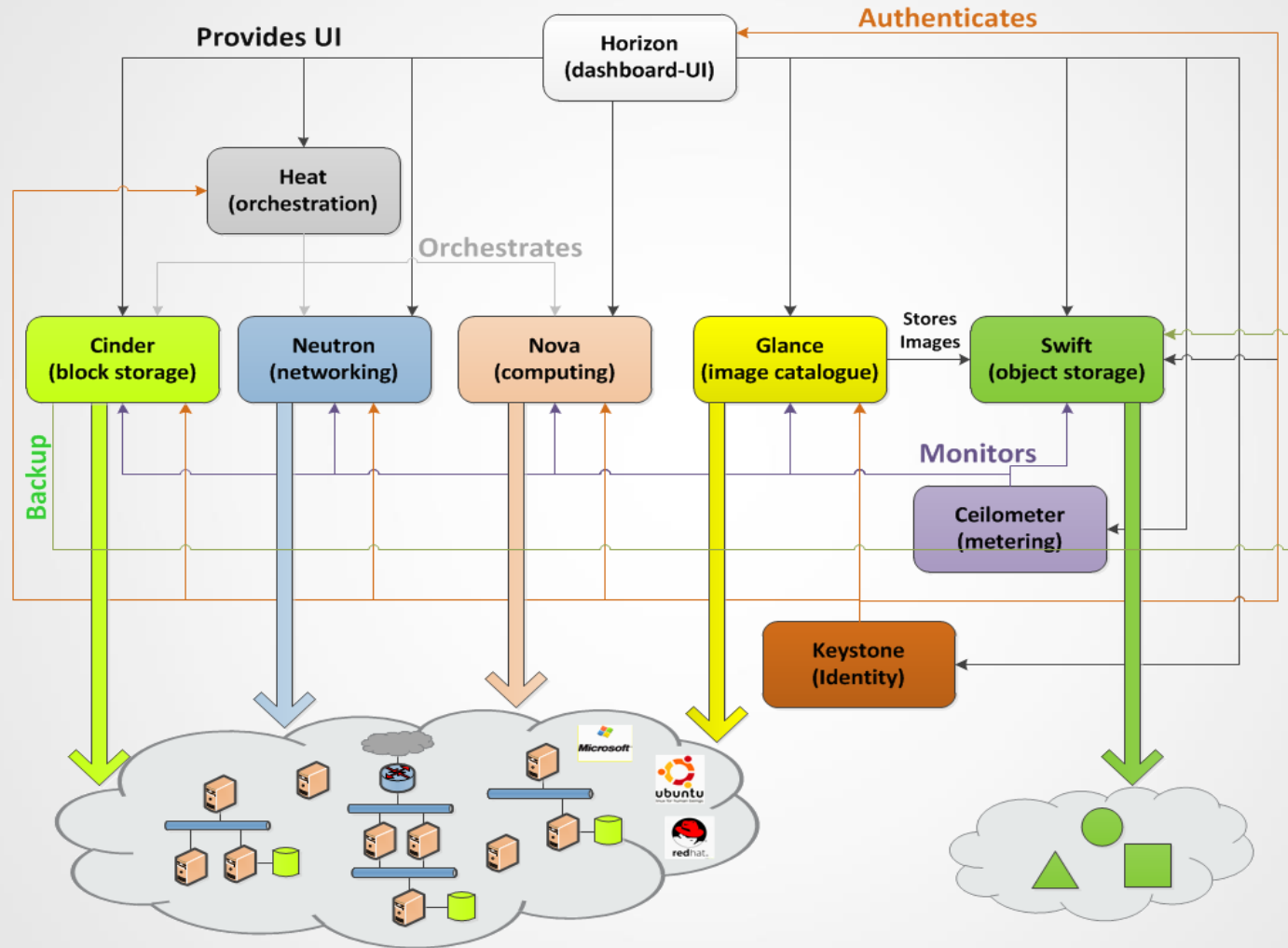


# IaaS Layer – Architecture - 1/2





# IaaS Layer – Architecture - 2/2



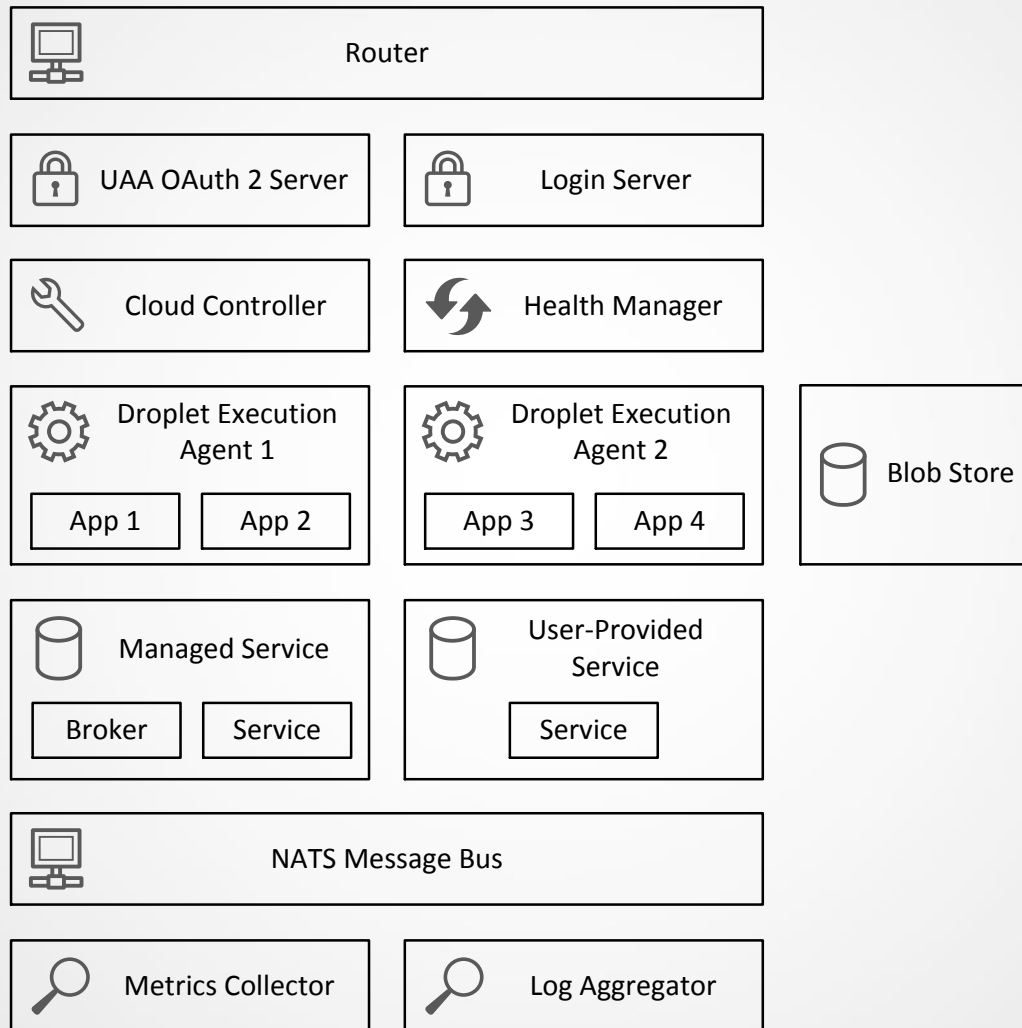


# PaaS Layer - Concepts

- The PaaS Layer hides infrastructure complexity and focuses on applications and services instead
- The user provides the application package and selects any required services (e.g. DB); the platform allocates resources and deploys the application transparently.
- Developers can run scalable and highly available applications without any advanced operations knowledge
- The drawback is that the platform places some restrictions on applications:
  - Use only the supported languages and runtimes
  - Use only the supported services (or use external services instead)
  - Limited or no customization possible on the execution environment



# PaaS Layer - Architecture





# DBaaS Layer - Concepts

- **DBaaS Layer** implements database capabilities for applications running in SCP (IaaS and PaaS)
  - It provides **MySQL** and **PostgreSQL** DB engines
  - It is implemented using IaaS capabilities
  - It implements High/Availability and Load Balancing (next release)



# SCP – Migration Options

- PaaS + DBaaS
  - No infrastructure management required by the user: the platform does it
  - Applications need some changes to comply with PaaS rules
  - No special configuration/tuning allowed on application server or database
  - Best option for standard applications
- IaaS + DBaaS
  - Allows installation of special modules, complete configurability, etc.
  - Applications can be ported to the cloud as-is
  - However the increased control comes with system administration burden
  - Still benefits from externally provided (and managed) database
  - Recommended for applications that do not fit in the PaaS model
- Full IaaS
  - All components are completely managed by the user, including the DB.
  - Recommended when full control is required



# Cloud Computing Risks (1/2)

## Lack of control over the data in the cloud

1. Use of proprietary technology resulting in lack of availability due to lack of interoperability (**vendor lock-in**), which complicates the data shift between different cloud-based systems (data portability) as well as the exchange of data between entities using different cloud services;
2. Sharing of resources, resulting in **lack of integrity**, since the cloud is a shared system;
3. Law enforcement requesting disclosure of information directly to a cloud provider, resulting in **lack of confidentiality**;
4. Outsourcing by providers, resulting in **lack of intervenability**. The complexity of the outsourcing chain can result in situations where services end up being facilitated by various providers without the client fully knowing who is looking after their contract;
5. **Limited availability of necessary measures and tools**, where a provider does not assist the controller to manage their data, resulting in lack of intervenability;
6. Possible **data leakage**, resulting in lack of isolation. A cloud provider has multiple clients acting on its behalf (in an administrator role) that are equipped with enough privileged access (high-risk roles) to adversely affect the security of individual clients



# Cloud Computing Risks (2/2)

## Lack of transparency related to the processing of data via cloud computing

1. Insufficient information about a CSP processing operations poses a risk to controllers as well as to data subjects because they might not be aware of potential threats and risks and thus cannot take measures they deem appropriate
2. An improper or incomplete understanding of the chain of processing and whether multiple subcontractors may be involved;
3. Lack of knowledge as to where data may actually be geographically located upon processing and throughout the duration of storage in the cloud;
4. Unknown transfer of data to countries outside the European Economic Area (EEA), which do not ensure an adequate level of protection;

## Inability to apply the EU data protection laws

Cloud provider with a relevant establishment outside the EU;





# User-centric Open Innovation – co-design methodologies

## 1. Definition of relevant stakeholders in the (municipal) ecosystem

### – External:

- Citizens
- SMEs / Companies
- Other municipalities

### – Internal:

- Municipal Services/Departments
- City Council / Mayor (strategic planning)



# User-centric Open Innovation – co-design methodologies

## 2. Engaging stakeholders (tools)

- Open call for participation (online)
- Email contact to partners (SMEs, Companies, etc.)
- Workshop / face-to-face meeting
  - WIN methodology – Wishes, Interests and Needs



# User-centric Open Innovation – co-design methodologies

## 3. Co-designing the Services

- Shortlist of meaningful services to the ecosystem
- Requirement specification through focus group / workshop

**Constrains and requirements of the cloud infrastructure.**

**Services that will not involve developing additional infrastructure in the city.**

## 4. Validation, feedback and follow-up

- Present the prototypes to the stakeholders
- Trial the services in the ecosystem (real-life)
- Iterate to produce replicable service

# Valladolid Pilot



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# User dynamics - Valladolid

- Email and phone to get stakeholders involved.
  - Internal: All users accepted participation
  - External: 60% users accepted participation
- 90 min meeting
  - to present applications to stakeholders
  - to start discussion about pros and cons of each application
- Application selected by consensus over the email during the week after
- Meetings scheduled every two months, unless quick decisions are needed



# Services to be Cloudified

Applications identified for 1<sup>st</sup> cloudification process.

- **Águeda:**
  - PPGIS
- **Manchester:**
  - Wifi-Map
- **Thessaloniki:**
  - Virtual Marketplace
  - Crowdfunding
- **Valladolid:**
  - UeR

# Valladolid - UeR



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The screenshot shows a web browser window with the URL [www10.ava.es/Visor/](http://www10.ava.es/Visor/). The browser tabs include 'Urbanismo en Red - Ayuntamiento de Valladolid' and 'Urbanismo En Red - Visor'. The browser's address bar shows the URL. The browser's toolbar includes 'Aplicaciones', 'Wifi municipal', 'Ayuntamiento de Vitor...', 'absysNET 2.0', 'UE - Research Particip...', 'portugués', 'BMC Remedy Mid Tier ...', 'Aranzadi', and 'Incidencias Aytos'. The application interface features a header with logos for 'AYUNTAMIENTO de VALLADOLID', 'red.es', and 'UNIÓN EUROPEA'. Below the header is a navigation menu with 'Ficha Urbanística', 'Registro', 'Capas', 'Búsqueda', 'Vista General', and 'Ayuda'. A toolbar with various icons is located below the navigation menu. The main area displays a map of Valladolid with various colored zones. A 'Capas' (Layers) panel is open, showing a list of layers with checkboxes and sliders. The layers are organized into folders: 'CAPAS', 'PLANEAMIENTO', 'IDEE', 'DIBUJOS', and 'MARKERS'. The 'PLANEAMIENTO' folder is expanded, showing the following layers: 'Clasificación' (checked), 'Categorías', 'Zonas de edificación', 'Zonas de uso' (checked), 'Zonas de altura', 'Zonas de edificabilidad', 'Gestión', 'Sistemas', 'Cat. de Bienes Protegidos', 'Cat. Arqueológico', 'Afecciones', 'Alineaciones', and 'Acciones'. The 'IDEE' folder contains 'IDEE', and the 'DIBUJOS' folder contains 'DIBUJOS'. The 'MARKERS' folder is empty. The status bar at the bottom of the application shows 'CL CANTERAC 47 VALLADOLID...', '357100.40931, 4611503.22461', 'Área Visible: 30.69 Km<sup>2</sup>', 'Escala aproximada: 1:17301', and 'V: 2.0.0'.



CloudAssisted Services



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# Call for Cities

[www.stormclouds.eu](http://www.stormclouds.eu)

## SPRING 2015



CloudAssisted Services





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# Thank You

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