
# Project overview and summary

# Problem at hand

- In the current computing paradigm, users are just consumers of services offered by cloud service providers
- However these days even “everyday” users may have significant resources that just “sit” or are underutilized for plain trivial tasks
- Users can range from individuals to organizations and councils
- Resources can be:
  - hardware resources (running nothing)
  - software resources (with nowhere to run)
  - data (nowhere to be stored or processed)

# iKaaS vision (1/2)

- A “multi-cloud”-based ecosystem where users:
  - Can be providers of resources
  - Can consume resources offered by other “users as providers”

- Benefits include:
  - Range and scope/scale extension of offered IoT services
  - Creation of an otherwise not possible knowledge base due to
    - lack of needed data
    - lack of Big Data analytics capabilities
    - both
  - Knowledge-as-a-Service (KaaS) concept

# iKaaS vision (2/2)

# Not everything is bright in the KaaS world…

- Many challenges to be tackled before this vision materializes
  - Heterogeneity at data, software and hardware level
  - Trust issues:
    - Not strictly tested IoT devices
    - Multiple interacting human parties
  - Security and privacy of data
    - Share what and when I want to certain parties alone
  - Service management over a multi-cloud environment
    - Do IoT service requirements go hand in hand with cloud resource optimization?
    - Autonomicity; can this be transparent to users?

# iKaaS helped to make things brighter (1/2)

- Heterogeneity at data, software and hardware level
  - We made resources able to be exposed and speak the same language
    - Detailed modelling work
    - Reusing standards when possible rather than reinventing the wheel for the fun of it
  - Trust issues
    - One may not control directly IoT devices and software components; but we can rank their reputation (behaviour monitoring)
    - At human level we established a transparent to the user way to calculate trust

# iKaaS helped to make things brighter (2/2)

- Security and privacy of data
  - State of the art approaches developed; widely accepted through successful standardization
  - Makes on a per-dataset definition of handling policies feasible
  - Offers flexibility to changing policies
- Service management over a multi-cloud environment
  - Delivered components to manage services spanning inter-connected clouds
  - IoT awareness together with cloud resource awareness
  - Autonomic and transparent to the user behaviour

# All these are fine but one needs to prove they work; agreed!

- iKaaS implemented and tested 5 diverse use cases in the broader Smart City/Smart Home arena that addressed real-life diverse problems
  - Environmental service
  - Assisted living
  - Health support
  - Town management
  - Combinations of them
  - All well received by users and stakeholders

- Allowed us to benchmark how well the iKaaS approach fares when using cloud technologies in the considered context

# One needed to be organised in order to succeed…

- WP1 to manage people
- WP2 to enable collection, processing of data and set the guidelines on how to expose resources
- WP3 to manipulate resources in a secure and trusted way
- WP4 to bring everything together
- WP5 to implement our “lead by example” approach
- WP6 to make our work known and ensure our legacy continues

# And also have regular checkpoints…

- MS1 “Foundations and Project Setup” at M08
- MS2 “Platform Development for Functional Tests” at M12
- MS3 “First Implementation, Integration and Application Testing” at M24
- MS4 “First Complete Integration” at M30
- MS5 “Second Implementation, Integration and Application Testing” at M33
- MS6 “Final Implementation, Consolidation and Transfer” at M36

# This is what we set out to do…

- Overall Project Objectives
  - Define a unified data model based on the Semantic Web for data collected from IoT devices and stored in cloud platforms (OP.1)
  - Define and develop the various concepts in trust-management (OP.2)
  - Develop and implement a decentralized heterogeneous secure multi-cloud environment spanning across borders (OP.3)
  - Realize the notion of Knowledge-as-a-Service (OP.4)
  - Develop more than one applications for validation (OP.5)
  - Validate the analytics methodology and determine the utility of the distributed knowledge-base through experiments in model **smart cities** and **smart homes** (OP.6)

# And this is what we did… % per year1, 2, 3 and overall (1/13)

- OP.1: Define a  unified data model based on the Semantic Web for data collected from IoT and stored in cloud platforms (50%, 50%, 0%, 100%)
  - Y1 measurable success factors
    - Delivery of D2.1 (data model components) **(achieved)**
    - Fulfilment of MS2 **(achieved)**
  - Y2 measurable success factors
    - Delivery of D2.2, D2.3 (data model components) **(achieved)**
    - Fulfilment of MS3 **(achieved)**
  - Clarifications on use and link to LOD in D5.4 (Y3)
  - Fulfilment of MS4 through use of models for WP4 integration (Y3)

# And this is what we did… % per year1, 2, 3 and overall (2/13)

- OP.2: Define and develop the various concepts in trust-management (40%, 60%, 0%, 100%)
  - Y1 measurable success factors
    - Delivery of D3.1 (mechanisms for security and privacy) **(achieved)**
    - Fulfilment of MS2 **(achieved)**
  - Y2 measurable success factors
    - D3.2 (reputation manager and human-level trust manager), D2.2 and D2.3 (data models for trust representation) **(achieved)**
    - Fulfilment of MS3 **(achieved)**
  - Fulfilment of MS4 through use of models for WP4 integration (Y3)

# And this is what we did… % per year1, 2, 3 and overall (3/13)

- OP.3: Develop and implement a decentralized heterogeneous secure-by-design multi-cloud environment spanning across borders (25%, 45%, 30%, 100%)
  - Y1 measurable success factors
    - Delivery of D2.1 (data processing and knowledge acquisition) **(achieved)**
    - Delivery of D3.1 (service (de)composition/migration) **(achieved)**
    - Delivery of D4.1 (draft architecture) **(achieved)**
    - Fulfilment of MS2 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (4/13)

- OP.3: Develop and implement a decentralized heterogeneous secure-by-design multi-cloud environment spanning across borders (25%, 45%, 30%, 100%)
  - Y2 measurable success factors
    - Delivery of D2.2, D2.3 (data processing and knowledge acquisition, supporting data models) **(achieved)**
    - Delivery of D3.2 (service (de)composition/migration, iKaaS PaaS concept) **(achieved)**
    - Delivery of D4.2, D4.3 (architecture/interfaces/iKaaS software for use in demos/trials) **(achieved)**
    - Fulfilment of MS3 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (5/13)

- OP.3: Develop and implement a decentralized heterogeneous secure-by-design multi-cloud environment spanning across borders (25%, 45%, 30%, 100%)
  - Y3 measurable success factors
    - Delivery of D4.5 and D4.5 (interfaces/iKaaS software for use in demos/trials and for public use) **(achieved)**
    - Fulfilment of MS4 and MS6 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (6/13)

- OP.4: Knowledge-as-a-Service platform (35%, 45%, 20%, 100%)
  - Y1 measurable success factors
    - Delivery of D2.1 (data processing and knowledge acquisition) **(achieved)**
    - Delivery of D3.1 (service (de)composition/migration) **(achieved)**
    - Delivery of D4.1 (draft architecture) **(achieved)**
    - Fulfilment of MS2 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (7/13)

- OP.4: Knowledge-as-a-Service platform (35%, 45%, 20%, 100%)
  - Y2 measurable success factors
    - Delivery of D2.2, D2.3 (data processing and knowledge acquisition, supporting data models) **(achieved)**
    - Delivery of D3.2 (service management/knowledge acquisition) **(achieved)**
    - Delivery of D4.2, D4.3 (architecture/interfaces/iKaaS software for use in demos/trials) **(achieved)**
    - Fulfilment of MS3 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (8/13)

- OP.4: Knowledge-as-a-Service platform (35%, 45%, 20%, 100%)
  - Y3 measurable success factors
    - Delivery of D4.5 and D4.5 (KaaS interfaces/iKaaS software for use in demos/trials and for public use) **(achieved)**
    - Fulfilment of MS4 and MS6 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (9/13)

- OP.5: Develop more than one applications for validation (30%, 50%, 20%, 100%)
  - Y1 measurable success factors
    - Delivery of D5.1 (application scenarios definition) **(achieved)**
    - Fulfilment of MS2 **(achieved)**
  - Y2 measurable success factors
    - Delivery of D5.2 (roadmaps for use case validation) **(achieved)**
    - Delivery of D6.4 (business models and value) **(achieved)**
    - Fulfilment of MS3 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (10/13)

- OP.5: Develop more than one applications for validation (30%, 50%, 20%, 100%)
  - Y3 measurable success factors
    - Delivery of D6.6 (business models and value) **(achieved)**
    - Fulfilment of MS4, MS5 and MS6 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (11/13)

- OP.6: Validate the analytics methodology and determine the utility of the distributed knowledge-base through experiments in model smart cities and smart homes (0%, 35%, 65%, 100%)
  - Y1 measurable success factors
    - Delivery of D5.5 (compliance with ethical standards) **(achieved)**
  - Y2 measurable success factors
    - Delivery of D5.3 (initial use case validation) **(achieved)**
    - Delivery of D5.6 (compliance with ethical standards, free flow of data findings) **(achieved)**
    - Fulfilment of MS3 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (12/13)

- OP.6: Validate the analytics methodology and determine the utility of the distributed knowledge-base through experiments in model smart cities and smart homes (0%, 35%, 65%, 100%)
  - Y3 measurable success factors
    - Delivery of D5.4 (final use case validation) **(achieved)**
    - Delivery of D5.7 (compliance with ethical standards, free flow of data findings) **(achieved)**
    - Fulfilment of MS5 **(achieved)**

# And this is what we did… % per year1, 2, 3 and overall (13/13)

- To establish the foundations, MS1 Foundations and Project Setup was fulfilled through:
  - D1.1 “iKaaS Handbook”
  - D1.5 “1st iKaaS Technological Roadmap”
  - D6.1 “iKaaS website”
  - D6.2 “1st Standardization, dissemination and Collaboration Bridge Building”
- And follow up on progress and status was maintained through subsequent Technological Roadmap deliverables and Progress Reports (WP1)

# Speaking of legacy…

- iKaaS doesn't end here
- iKaaS is not a set of deliverables ending up in a drawer after the usual farewell hand shakes
- Numerous developed components have been made publicly available
- Not only iKaaS partners, but anyone can use them for offering services and enhancing their portfolio

# Thank you!