Internet of future application scenario.
Airport and Aviation Network Management.

(1) What use case and scenario in your area would you consider the most appropriate and representative one for large-scale experimentation with the Future Internet platform to be built starting from 2013

A current project is aimed to deliver an architecture and infrastructure to allow an integration of widely used enterprise information systems with High End Computing architectures and applications.

The main target of such integration is providing new features and a new quality of service to solutions depended on intensive calculations combined with high volume on communication and interactions between solution components.

Currently available services and applications are very limited in their scalability and interconnectivity, WPS and others are not suitable for High Performance Computing needs. High End Computing, High Performance Computing and Storage are not supported within current Internet-based applications. Connectivity options of used enterprise applications are limited, data transfer practices should be considered as a major bottle neck.
There are many similar use cases available in different areas as Data Processing and Simulation, Transport, Logistics and Mobility. An extreme example is Airport and Aviation Network Management.

The complex and open aviation system unavoidably emerges a ground floor of interference i.e. of more or less critical deviations from “the plan” coordinating all activity system-wide. E.g. facing the expected doubling of air-traffic within about 10 years this is a serious issue for airports, airlines and in politics in the whole EU.

Avoiding the amplification and propagation of interferences across airport operations is a significant challenge. Ensuring safety needs to identify incidents with the potential to drive the criticality of the actual operations scene. I.e. in the first instance amplification needs to be anticipated. This translates technically into two tasks: Growing the understanding of criticality (this is about learning) as well as parallel simulation and pattern recognition with an effort overlinearily growing with the strain. In the second instance criticality is a reason to prepare for unplanned action (“B-plans”) able of avoiding or at least mitigating the problem.

Given a service management system – a functional multiagent-based prototype has been already developed - able of analysing critical paths as well as of providing advice to the responsible dispatchers.

Some figures may give an idea of the requirements for massive communication as well as massive parallel data processing: In peak-time a large airport systems may have to supervise 50 – 100 aircrafts and about 20 – 30 services around each of them in parallel involving a large number of operations control systems distributed across different organisations and places and also that there may be 10 or 20 critical incidents per hour.

At first the system will find information in its ontology that most likely consequence of delays is that the delay increases and thus continue to observe the trajectory of the respective aircraft. If the delay actually increases the system will analyse the impact to operations and find that highloader capacity (trucks serving aircrafts) is fully employed i.e. that a further increase of

the delay will cause that the two highloaders in the meantime already waiting at the respective aircraft parking position are significantly running out of their schedule and the highloaders now are running out of their time buffers (amplification). As mentioned all other highloaders are busy and thus it is to be expected that subsequent flights will be affected (propagation). Now the system will consult its ontology and find the strategy for a "B-plan" which requires preparing for cooperation with other aircraft clearance services (e.g. passenger boarding, cabin cleaning) for the subsequent flights in order to catch up with the case – requiring now analysing a manifold further paths, to submit proposals to the dispatchers, to iterate in case of rejected or to prompt and control subsequent activity in case of accepted proposals.

Further examples with comparable requirements and huge data transfer rates and communication load are available from e-Energy, Physics, Oil & Gas Exploration, Genetic Algorithms, and Climatology.

(2) What innovative Internet functionality and technologies would you consider important for your suggested use case and scenario (e.g. context awareness, sensor networks, advanced real time processing capabilities handling huge volume of data, ad hoc service composition and mash-up, managed broadband connectivity and services, embedded media support for interfaces easing the interpretation of processed contextual data, etc.)?

The Future Internet Core Platform (FI-CP) should support connectivity to heterogeneous Enterprise Information Systems (EIS).
For enterprise application integration, bi-directional connectivity between FI-CP and EIS is essential. A standard architecture is needed to integrate various EISs with FI-CP. Without a standard, EIS vendors may have to use vendor-specific architectures to provide EIS integration. Outbound communication allows FI-CP to connect to an EIS system and perform work. Inbound communication allows an EIS to call FI-CP service and perform work. All communication is initiated by the EIS in this case (service providing).

A standard architecture should define the following set of standard contracts between FICP and EIS:
· A connection management contract that enables FI-CP to pool connections to an underlying EIS, and enables application components to connect to an EIS. This leads to a scalable application environment that can support a large number of clients requiring access to EISs.
· A security contract that enables secure access to and from EIS. This contract provides support for a secure application environment that reduces security threats.
· A lifecycle management contract allows FI-CP to manage the lifecycle of EIS connectivity.
· A Job management contract that allows a resource adapter to do work (monitor network endpoints, call application components, etc.) by submitting Jobs to FI-CP for execution. The FI-CP allocates resources to execute Jobs.

(3) Which of the identified functionalities would you expect the Future Internet core technology platform to deliver to support your and other usage area scenarios?

According to the proposal paper on Core Platform, following enablers on FI-CP considered the following issues being most important:
· Application user usage accounting should allow end users to track their usage and give users the possibility to determine which information can be processed by platform components.
· Platform usage accounting & logging for support of IaaS (Infrastructure as a Service) and PaaS (Platform as a Service) Cloud hosting. It should allow platform users to monitor/track the usage or resources in the Platform.

· Larger broad band capacity enabled software, hardware, and network solutions for expelling the limits for future high end application services.

Some emerging approaches of future internet applications like multi-agent platforms make "Event and Data Management and Processing" very important part of FI-CP. This category encompasses all those enablers whose functions are related to handling, composing, transforming, classifying and, in general terms, managing all kind of data and events:
• Event / data aggregation, correlation and filtering will allow the aggregation and hierarchical handling of data and events (e.g. event filtering and aggregation at different levels).
• Event Transformation deals with the inference of new events and/or semantics; application of syntactic pre-processing etc. Real-time and data mashups will also be elements related to this enabler.

As defined in position paper on the Core Platform, the IoT-Enabler will be a major component of FI Core Platform as the technological foundation for a true interconnection of physical and digital worlds that will enable the integration of person-to-object and object-to-object communications in advanced business processes.

Due to the huge number of objects, information services, and large number of devices, common information models, which rely on advanced semantic representations, and new event-based processing paradigms for distributed intelligence should be addressed.

For providing Future Internet enabled Applications, Platform as a Service (PaaS) gives a higher level of abstraction for service provisioning where the platform provides development tools, application containers, integrated technologies (libraries, APIs, utilities, etc.) and automatic scalability tools, allowing the Service Providers to concentrate on the development of their Service Components.

PaaS capabilities should be exposed to our Usage Area and help promote the easy integration with currently available systems.

(4) What kind of experimentation environment would you consider necessary for broad large scale testing of the platform to be developed in your use area? What would be needed to experiment new services and applications cutting across use areas (services and application mash-up) and building a new services and application ecosystem around the prototype implementations of the platform?

Some kind of computing infrastructure with fast networks, InfiniBand, nxGE-transfer rates, IO and communication channeling, and broadband to external parties are needed. Open Source Middleware as an integration layer. Near real-time capabilities for processing, interactive use for new quality of user experience.

(5) How do you see the potential role of your organisation in the FI-PPP, in the context of Usage areas taking a prominent role in the Initiative, to ensure an appropriate application driven approach?

Currently a network of partners is built in Germany being responsible for development of named technologies.

From the one side, the network is responsible for providing an implementation for a specific type of application component. It provides application components with connectivity to an

EIS by transparently managing connections, security and resources using the system-level contracts with the EIS.

On the other side, close interaction with expertise providers in system-level programming, with its focus on the development of a scalable, secure, and distributable container.

Moreover, the network should provide tools that allow the system administrator to monitor, manage, and account a platform and application components during runtime. Data and function/resources mining tools enable application component providers to look at the scope and structure of data and functions existing in an EIS. Analysis and design tools enable application component providers to design an application in terms of EIS data and functions.

The network should also provide significant interdisciplinary and scientific support, High End Computing practice and experience and integrate the necessary legal informatics research on a legal European and international base for the future internet facilities.

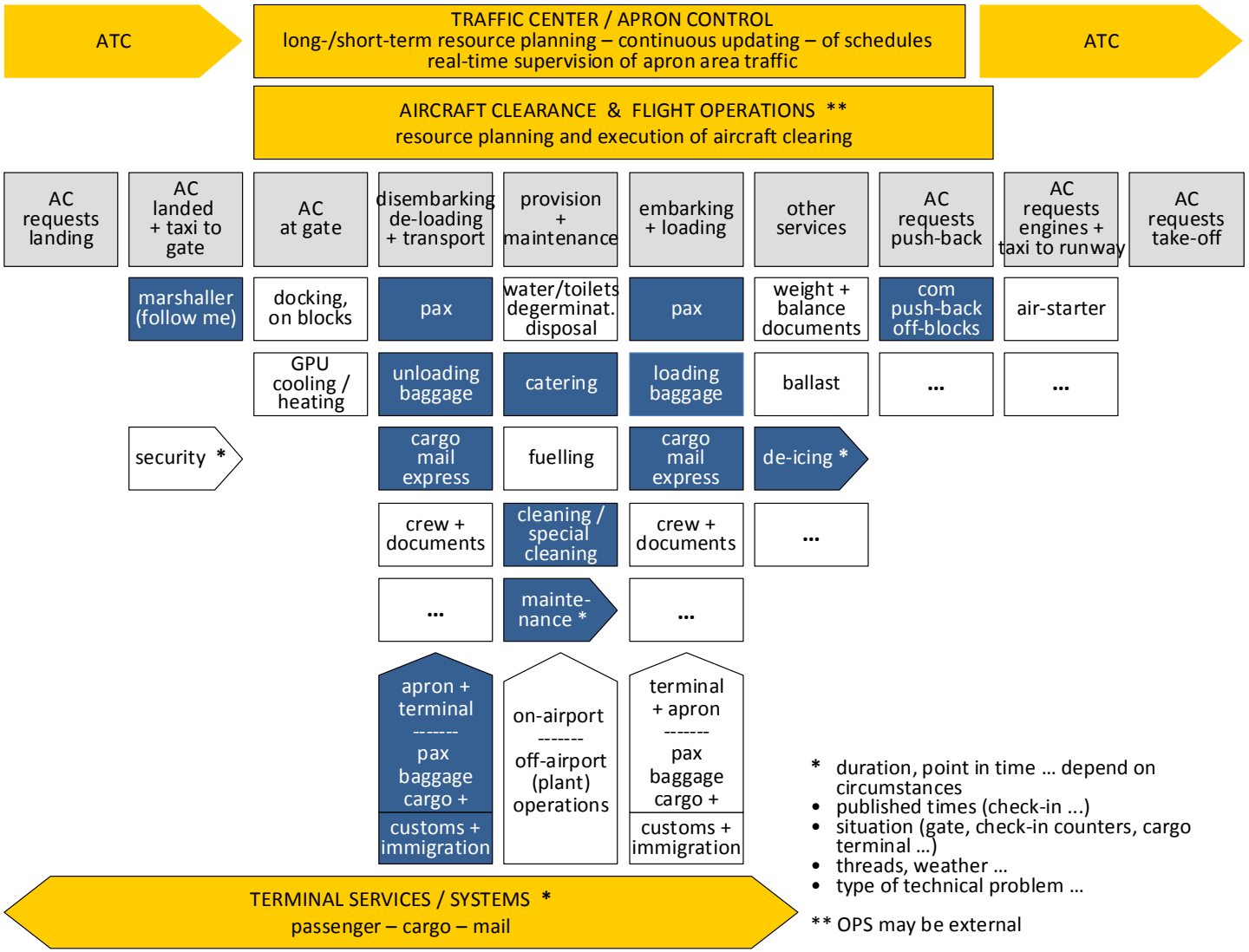

Figure1. Airport Ground Services