reTHINK: A NEW COMMUNICATION INFRASTRUCTURE SUPPORTING SMART CITIES

Almanac; Copenhagen 30.09.2015; Joachim Schonowski T-Labs

LIFE IS FOR SHARING.

AGENDA

1. T-Labs overview

2. Telecommunication market erodes – digitization comes!

3. reTHINK

    1. Mission statement & project organisation

    2. Hyperty concept and signalling on the fly

    3. Use case 1: Communication between two CSP's

    4. Use case 2: IoT user scenario – neighbohood application
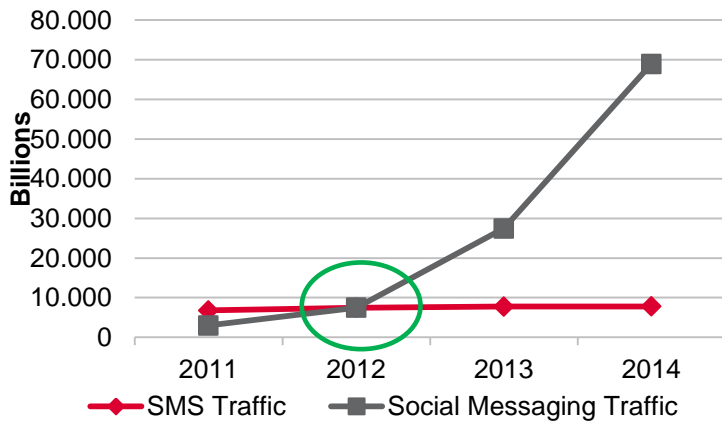
4. Almanac and reTHINK – possible interplay

MARKET DEVELOPMENT

SOCIAL MESSAGING KILLS DT 'REVENUE PER BIT' BM
Joyn Can't Competet with Agile OTT Communication

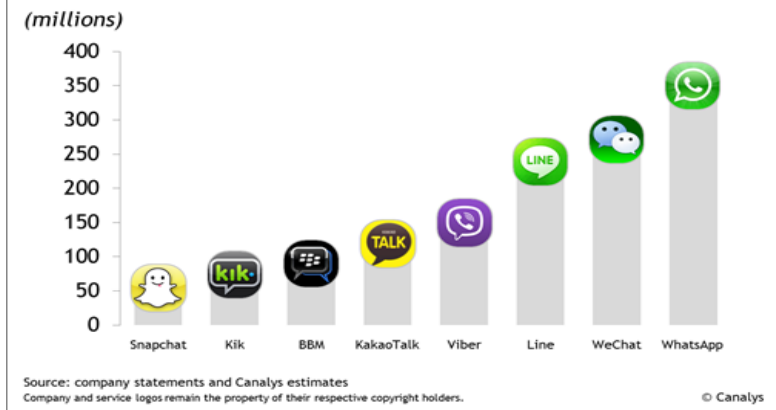### Social messaging exceeded „traditional" SMS traffic in 2012. *

SMS/sub /day
2011:3
2016:3

	2011	2012	2013
Subscribers	241 million	773 million	1.2 billion
Messages per subscriber per day	34	26	63

→Operators need to return to future proof direct revenue models for own Communication services, which also hold in case WIFI access is used. **

SM to cannibalize ~ $54bn of SMS revenues by 2016.**

Cross-platform social messaging apps
- monthly active users globally (November 2013)
(millions)

Source: company statements and Canalys estimates
Company and service logos remain the property of their respective copyright holders.
© Canalys

→ "OTT players as highly disruptive forces, intent to transform into rich media platforms.**

→ Carriers are still demonstrating appealling tardiness at offering any compelling bundle of text, voice and video messaging alternatives.*

WhatsApp new daily record (02 April 14): 20B messages sent and 44B messages received in just 24 hours!
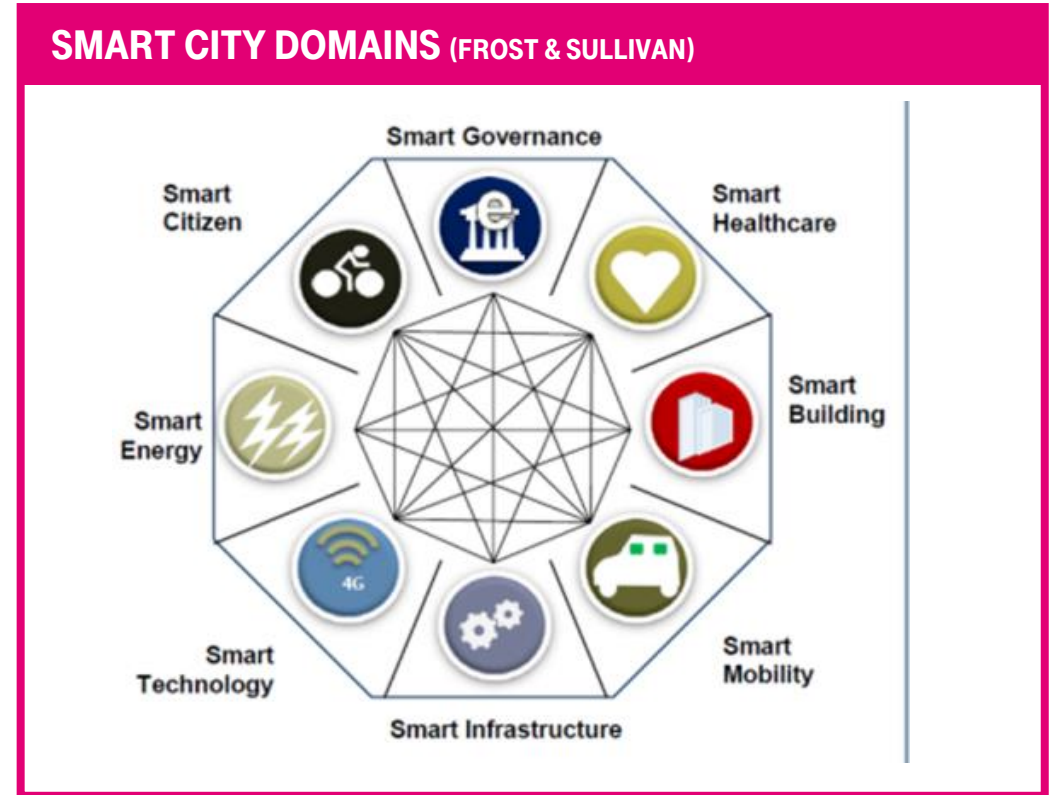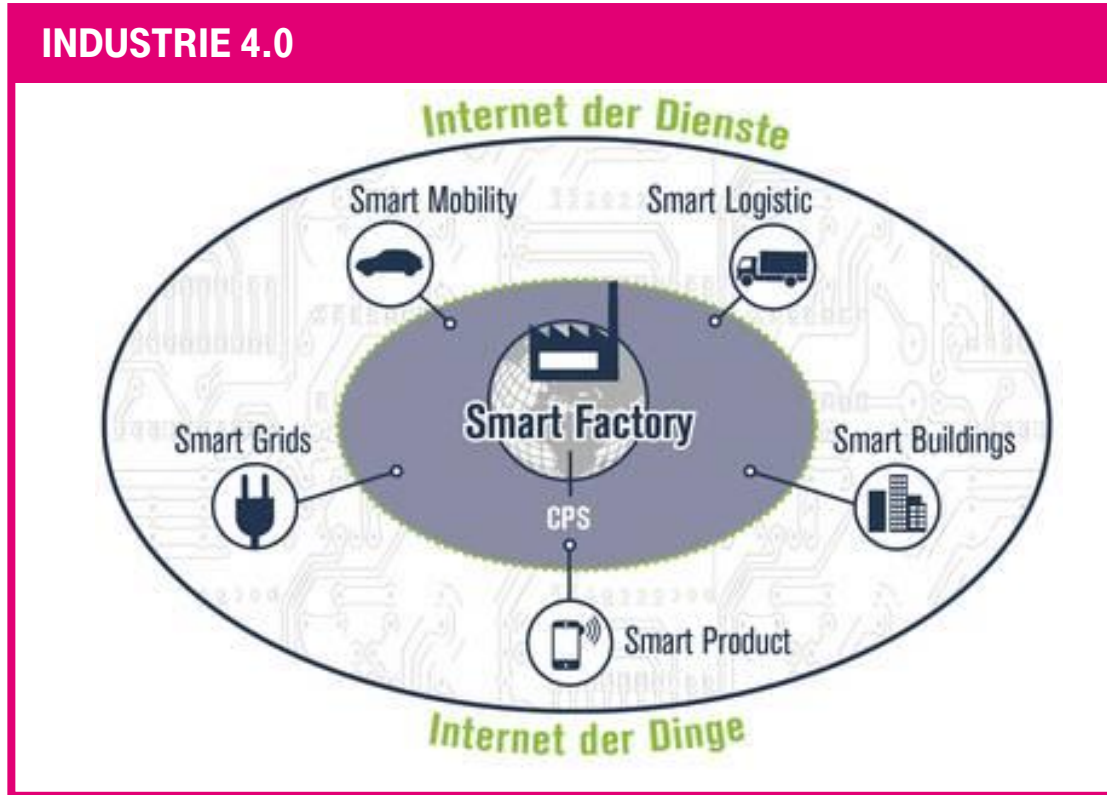
Telekom **Innovation Laboratories**   www.laboratories.telekom.com   @T_Labs   7

DIGITIZATION→ THE INTERNET OF (EVERY) THING(S) CHALLENGES AND OPPORTUNITIES FOR THE OPERATOR

Cisco
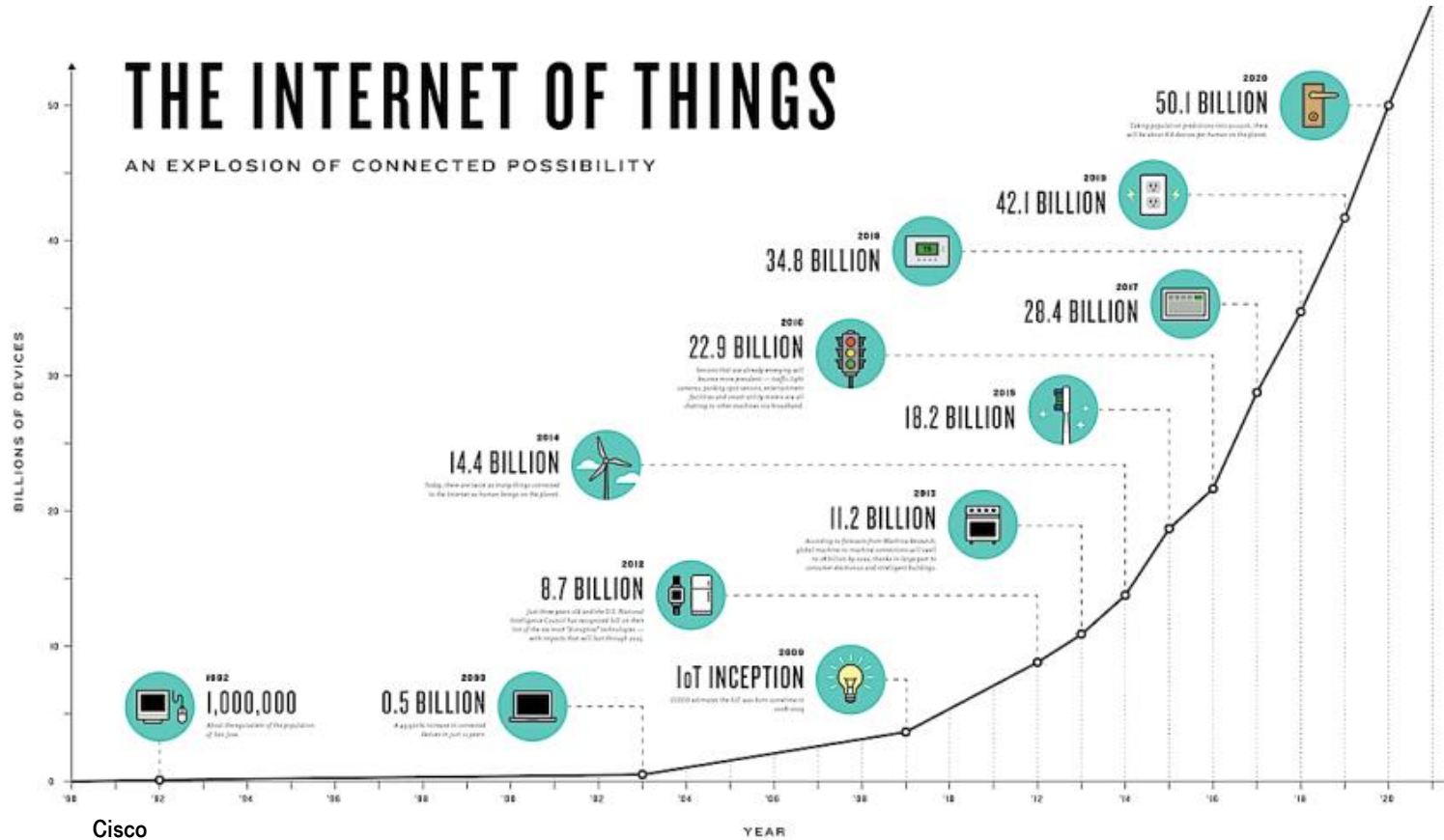
DIGITIZATION FOSTERS INDUSTRIE 4.0 & SMART CITIES
HYBRID COMMUNICATION H AND M WILL EVOLVE

INDUSTRIE 4.0

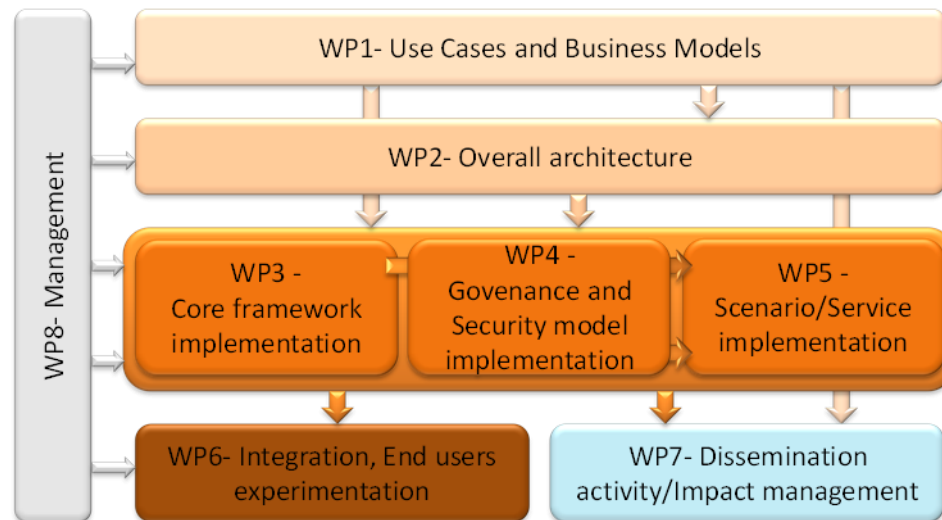

SMART CITY DOMAINS (FROST & SULLIVAN)

RETHINK

RETHINK
Project overview!

reTHINK – Trustful hyper-linked entities in dynamic networks

- reTHINK project contributes to the sub call ICT-05-2014 of H2020-ICT-2014 "Smart Networks and novel Internet Architectures" – started in 2015 - 2018
- https://rethink-project.eu/

Participants

- France-Telecom/Orange-Lab, coordination
- Eurescom
- Portugal Telecom Innovaçao
- Instituto de Engenharia de Sistemas e Computadores Lisboa
- Fokus Fraunhofer
- Apizee
- Institut Mines-Telecom, Telecom Sud Paris
- Deutsche Telekom, Cross team joint venture of Labs Teams: Future Communication (Lead), Payments & Transactions, Seamless Network Control
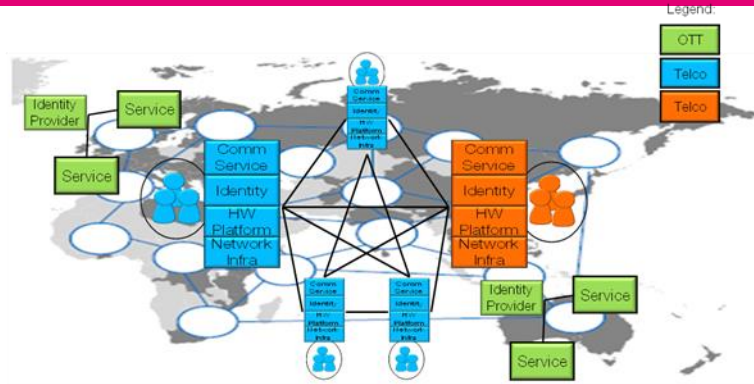- TU Berlin (SNET)

RETHINK OBJECTIVE:
NEW INFRASTRUCTURE FOR H2H H&M COMMUNICATION

Telcos versus OTT – Leverage the Best of Both Worlds
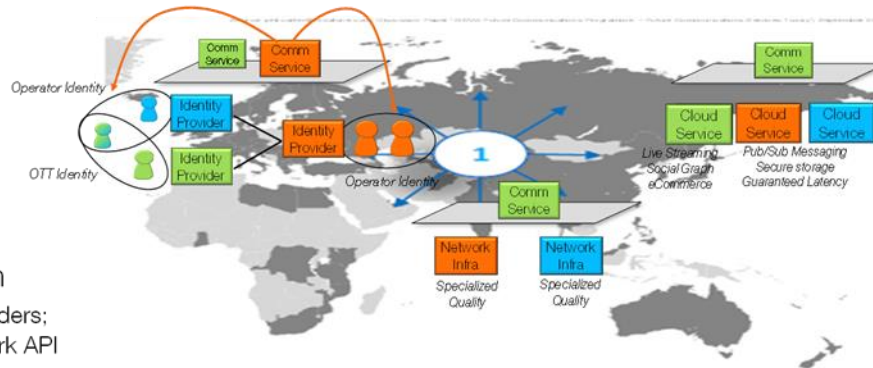

Federated Distribution Model
Telco federation agree on the new communication service ➯ Each Telco distribute to its own user base ➯ The Telco federation distribute region-wide / world-wide.

From here

To there ?

Horizontal Distribution Model using Identity Providers; Cloud Providers and Network API (SDN)

Internet changed traditional business

- Traditional operator-enabled services are losing importance due to a variety of new OTT ones.
- Less need for access-controlled com- services → instead cheap context based communication.

Develop Web-centric P2P Service Archit.

- Enable dynamic trusted relationships among distributed applications called Hyperlinked Entities ("Hyperties"), e.g. contextual & social, M2M/IoT and content oriented communication - services.
- Enable any type of service delivery through specialized network quality commitments, powered by specialized P2P and/or Cloud services (delivered as SaaS, PaaS or IaaS).

RETHINK: TWO CORE AREAS DEFINED
CONTEXT BASED COMMUNICATION & SMART CITY

NEW COMMUNICATION INFRASTRUCTURE – FOCUS ON HUMAN TO HUMAN INTERACTION

- Unlock current OTT communication silos.
- Search for contacts based on context.

NEW COMMUNICATION INFRASTRUCTURE – INTEGRATE IoT AND ENABLE H2M2 H OR OTHER INTERACTION

- **Integrate Internet of Things infrastructure into communication.**
- Enhance communication between humans and infrastructure, e.g. status, location, real time situations ...

http://www.smart-cities.eu/model.html
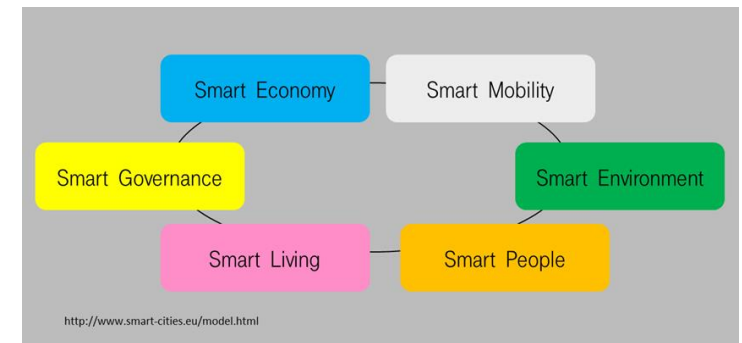
RETHINK
Architecture: Provide Telco Services Quick and Simple!

Telcos versus OTT – Leverage the Best of Both Worlds
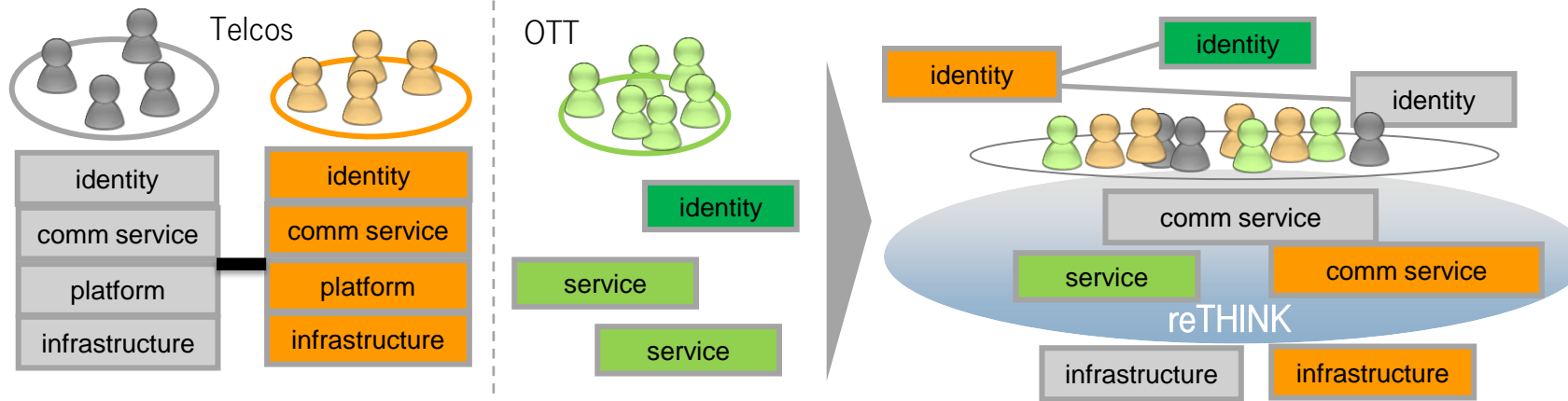
Federated Distribution Model

- Well established services with high security levels and interoperability among Telcos.
- It 's not possible to extend existing or provide new services in an agile and quick manner.

Walled Garden Distribution Model

- Agile, cost effective and innovative service to borderless markets is vulnerable to security and privacy breaches.
- Interoperability is given just within one domain (e.g. only among skype users).

Trusted cooperative service delivery model

- reTHINK provides an P2P–based application-layer.
- It is based on open and standardized modern web technologies.
- It includes reliable authentication and IdM for trusted communication and managed quality of service (QoS).

RETHINK
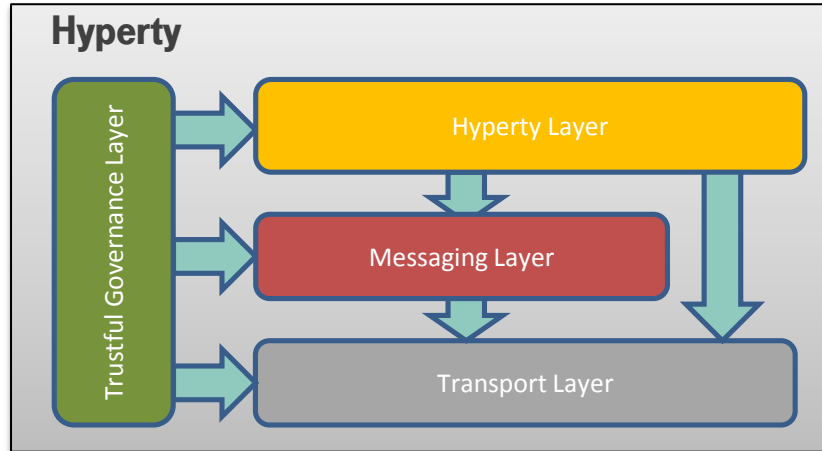## Core of the Architecture: Hyperties

---

Hyperties – the Main Concept of the Framework Architecture

Hyperties are hyperlinked web-entities, offering a specialized functionality in a **trusted , secure** *and* **interoperable** *way.*

Hyperty Layer: It contains the actual service logic of the Hyperty. This logic can be quiet simple (like a sensor) or rather complex (like a WebRTC communication service).

Messaging Layer: It ensures the interoperability of Hyperties by implementing and improving the „protocol on-the–fly" concept from WONDER project.
Each Hyperty offers a downloadable messaging stub, which implements the special communication protocol for this particular Hyperty.

Transport Layer: Provides media and data streams for P2P connectivity between Hyperties and manages communication sessions.

Trustful Governance Layer: It offers management functions for the life-cycle as well as support functions for Identity management and discovery of Hyperties.

RETHINK
Core of the Architecture: Hyperties

HYPERTY

- (micro)services that run in a runtime
- in the scope of rethink: hyperties are realized in JavaScript

HYPERTY RUNTIME

- runtime can be a browser (including the restrictions defined above), or a JavaScript runtime environment on a server or embedded device -> runtimes have different runtime features, but a basic set must be common
- runtimes can be enhanced by loadable (on demand) libraries
- minimal functionalities of a runtime:
    - local registry
    - local event bus (maybe a signalling bus)
    - „protocol on the fly"-engine
    - policy engine
    - optional: WebRTC engine

Use New Agile Communication Infrastructure in an Exemplary Smart City Domain

E-Municipalities
E-Governments
Administrative Layer

Service enabling platform, Including location detection and Hyperty management

Service Layer

Urban area with Hyperties

Citizens
Citizens
Citizens

Access Layer "City"

Municipality

Service logic

Peer 2 Peer communication

Geolocation
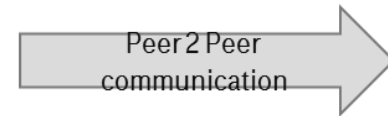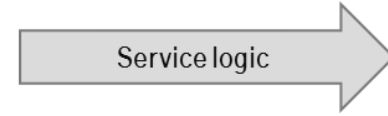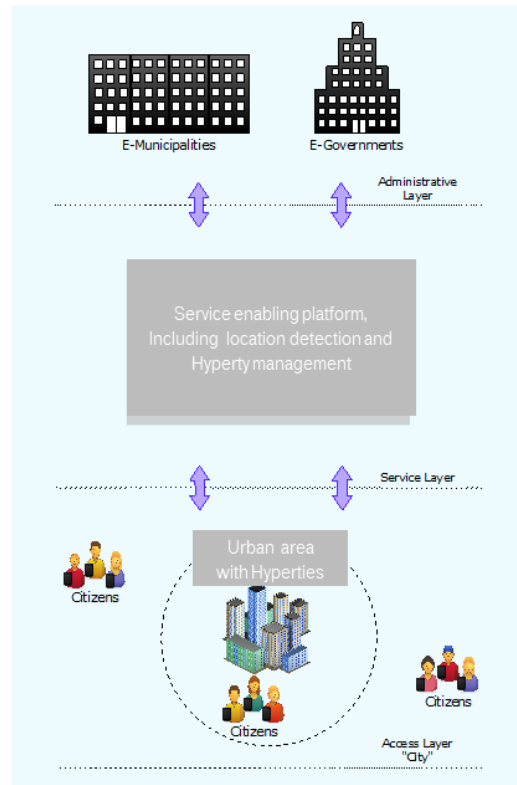
Secure contextual (geo-fence) based secure social communication addresses rising demand

- Enable information and participatory communication services between municipality and citizens.

- Enable new Hyperties based interaction service logics based e.g. Machine 2 Human interaction.

- Provide peer 2 peer communication between using WebRTC.

- Enable Geolocation based services like voting to different user groups, e.g. neighborhood, tourists.

SET THE SCENE: SMART CITY BERSABON
INFRASTRUCTURE AND HUMAN INTERACTION SPACE

BERSABON

Bersabon is a typical European city situated at a medium size river and a population of 750.000 citizens. The city is well known for its cultural institutions, parks or nightlife and is therefore not only attractive for its citizens but also for tourists. To enhance quality of life, the city council puts much effort in various future topics, like reduction of traffic pollution.

In order to receive real time information on City conditions the authorities use a variety of different kinds of sensor data. For example, a variety of sensors are in use to receive air quality data in each of the 16 neighborhoods. They are located along some radial highways but also at some main places. Some sensors are located in streetlights to validate current traffic, measure air quality or to provide information about available parking spots.

Furthermore city authorities use video surveillance to keep the city safe and secure. Public transportation companies use video surveillance to provide a new service called "Bus in time", where video cameras check the number of people waiting at bus stops. This enables them to react on peak times or in case special events happen.

In addition they launched a mobile city app called "Participate", which provides local static and real time information, exchange possibilities between government authorities and citizens or between citizens themselves and enables citizen participation via a voting function. The city plans to integrate heatmaps providing real time information from their city sensors into Participate, e.g. providing information on the air quality across the city.

City authorities followed citizen request for mobile open government and provide a variety of online services on their mobile devices. This enables citizens not only to upload and download information but also to get in touch with city authorities during opening times from their mobile website. To use the service citizens receive a unique and unambiguous identity upon request from the city. Bersabon citizens use this unique ID at a variety of city institutions.

Two examples are the local Kindergarten and School, where parents can contact and steer video cameras in order to see if their children are still at the institute :::::

EXAMPLE USER SCENARIO 1: CALL BETWEEN DIFFERENT CSP'S

USER SCENARIO: FOCUS COMMUNICATION
OPG

Focus 1: Context H2H communication

- 3.4.2.1   User Scenario: Daily Life in a Smart City – Human-To-Human Communication:

- Alice wants to meet her longtime friend Bob. Both are registered users of the communication service provider "TalkNow". Alice calls Bob, as she knows his identifier. They arrange to meet in a nearby café one hour later and they talk about everybody and his dog. Among other things, Bob tells Alice about a new location he discovered recently and Alice promises to go and visit it with him soon. [in this case both participants subscribed with the same CSP]

- A few hours later, Alice receives a call from Lisa, an event manager. They met at a party last weekend and exchanged their contacts. Lisa is a user of the communication service "Participate". [both participants subscribers of different CSP] She tells Lisa about a new project. She is on the scout for a location for a business event she is going to organize. What a coincidence. Alice tells Lisa about her friend Bob's discovery and sends her the address. Lisa is very interested and wants to discuss it with her boss Peter, so she calls him. Peter, also a user of "Participate", likes the idea and recommends an expert for interior decoration by the name Catherine Decorette.

- Lisa drives to the location with the help of the location data provided by Alice. As soon as she reaches her target she searches for Catherine via her directory service and tries to establish a video call with her. Because Lisa does so with a verified and therefor an identity considered being trustworthy, Catherine accepts the call. They discuss Catherine's potential employment and Lisa shows Catherine the location.

- The quality of the transmitted video stream is that good that Catherine is able to use the stills to draft some of the ideas they discussed during the video call. She submits them to Lisa for further consideration.

Actors/ Roles
- Lisa subscriber of CSP "Partizipate"
- Alice subscriber of CSP "TalkNow"
- Global registry
- PotF-stub hoster

Requirements
- Cross domain communication
- Cross domain registry
- PotF-stub hoster who provides stubs for download

CROSS DOMAIN CALL – KEEP OWN USER INTERFACE
INITIATE INTERACTION

1. Send request to gobal registry with RegistryKey (UserUUID) of Alice

2: Deliver List of Hyperties: HypertyType, HypertyID, RuntimeID, TimeoutToken, MN-Stub-URL

Application

Global Registry

3. Call „HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL "

Runtime Lisa (Participate)

H

PotF

Runtime Alice (TalkNow)

H

PotF

MN Participate

Stub-hoster

MN TalkNow
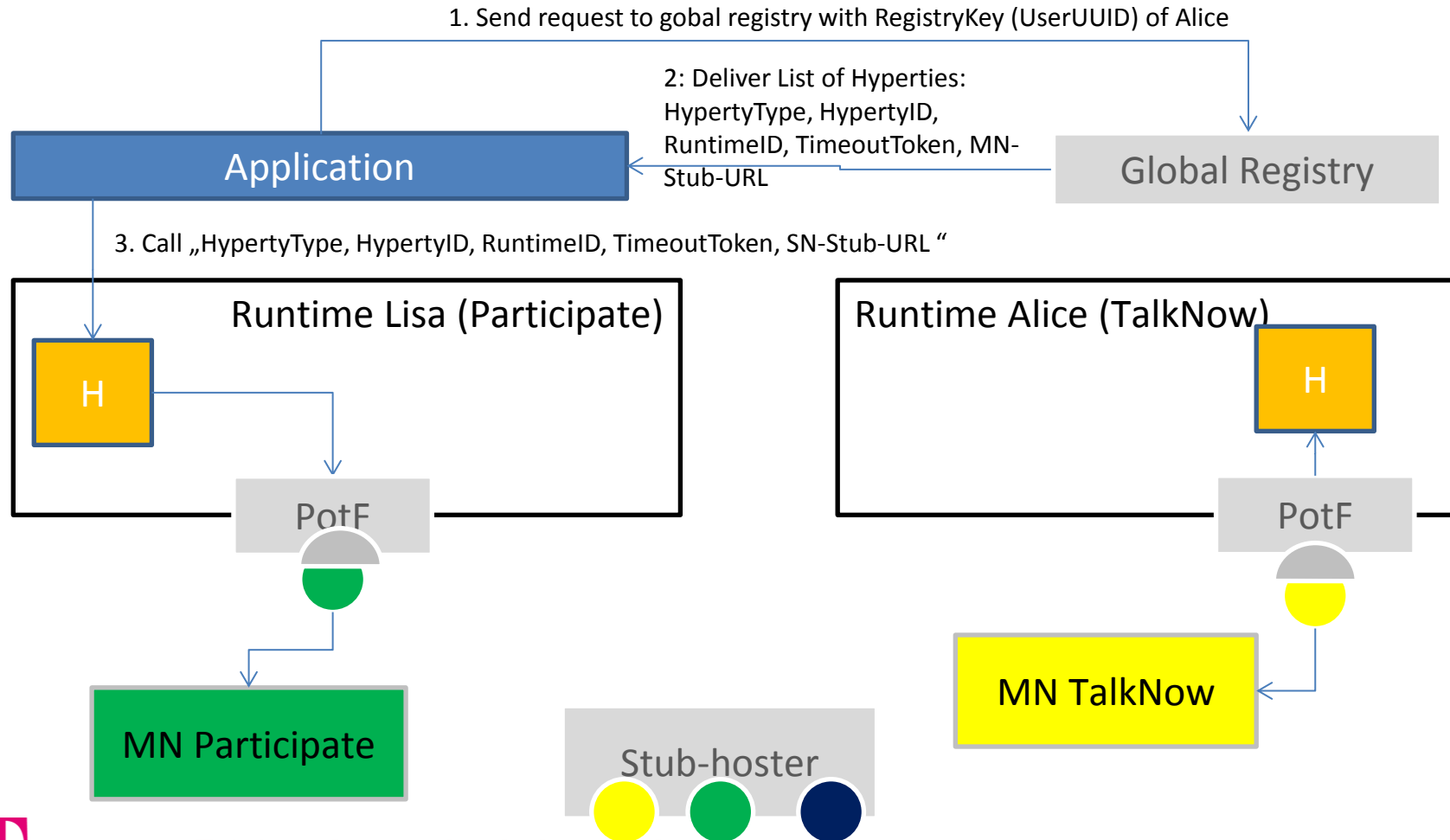
CROSS DOMAIN CALL – KEEP OWN USER INTERFACE
REQUEST AND LOAD REQUIRED STUB

1. Send request to gobal registry with RegistryKey of Alice

2: Deliver List of Hyperties: HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL

Application

Global Registry

3. Call „HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL "

Runtime Lisa (Participate)

Runtime Alice (TalkNow)

H

H

PotF

PotF

4. Request & Load TalkNow-stub

MN Participate

Stub-hoster

MN TalkNow
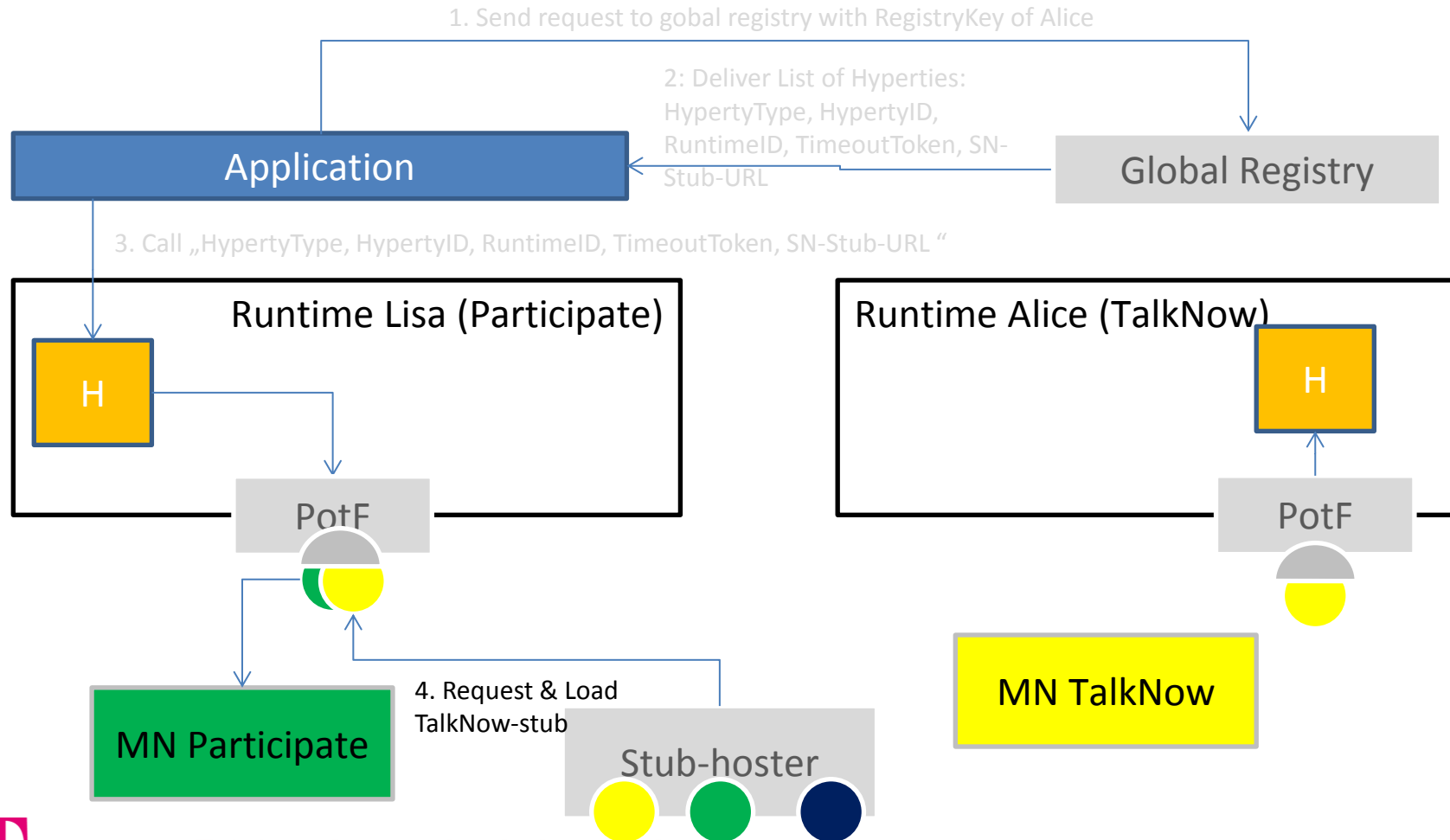
CROSS DOMAIN CALL – KEEP OWN USER INTERFACE
CALL PREPARATIONS FINISHED

1. Send request to gobal registry with RegistryKey of Alice

2: Deliver List of Hyperties: HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL

Application

Global Registry

3. Call „HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL "

Runtime Lisa (Participate)

Runtime Alice (TalkNow)

H

H

PotF

PotF

5. Send offer to runtimeAlice/hypertyAliceTalkNow

4. Request & Load TalkNow-stub

MN Participate

Stub-hoster

MN TalkNow

6. offer

CROSS DOMAIN SEARCH
CONTEXTUAL INFORMATION AS SOLE PREREQUISITE

Focus 1: Context H2H communication

- 3.4.2.1   User Scenario: Daily Life in a Smart City – Human-To-Human Communication:

- Alice wants to meet her longtime friend Bob. Both are registered users of the communication service provider "TalkNow". Alice calls Bob, as she knows his identifier. They arrange to meet in a nearby café one hour later and they talk about everybody and his dog. Among other things, Bob tells Alice about a new location he discovered recently and Alice promises to go and visit it with him soon. [in this case both participants subscribed with the same CSP]

- A few hours later, Alice receives a call from Lisa, an event manager. They met at a party last weekend and exchanged their contacts. Lisa is a user of the communication service "Participate". [both participants subscribers of different CSP] She tells Lisa about a new project. She is on the scout for a location for a business event she is going to organize. What a coincidence. Alice tells Lisa about her friend Bob's discovery and sends her the address. Lisa is very interested and wants to discuss it with her boss Peter, so she calls him. Peter, also a user of "Participate", likes the idea and recommends an expert for interior decoration by the name Catherine Decorette.

- Lisa drives to the location with the help of the location data provided by Alice. As soon as she reaches her target she searches for Catherine via her directory service and tries to establish a video call with her. Because Lisa does so with a verified and therefor an identity considered being trustworthy, Catherine accepts the call. They discuss Catherine's potential employment and Lisa shows Catherine the location.

- The quality of the transmitted video stream is that good that Catherine is able to use the stills to draft some of the ideas they discussed during the video call. She submits them to Lisa for further consideration.

Actors/ Roles
- Lisa subscriber of CSP "Partcipate"
- Catherine Decorette, expert for interior decoration, living in Bersabon
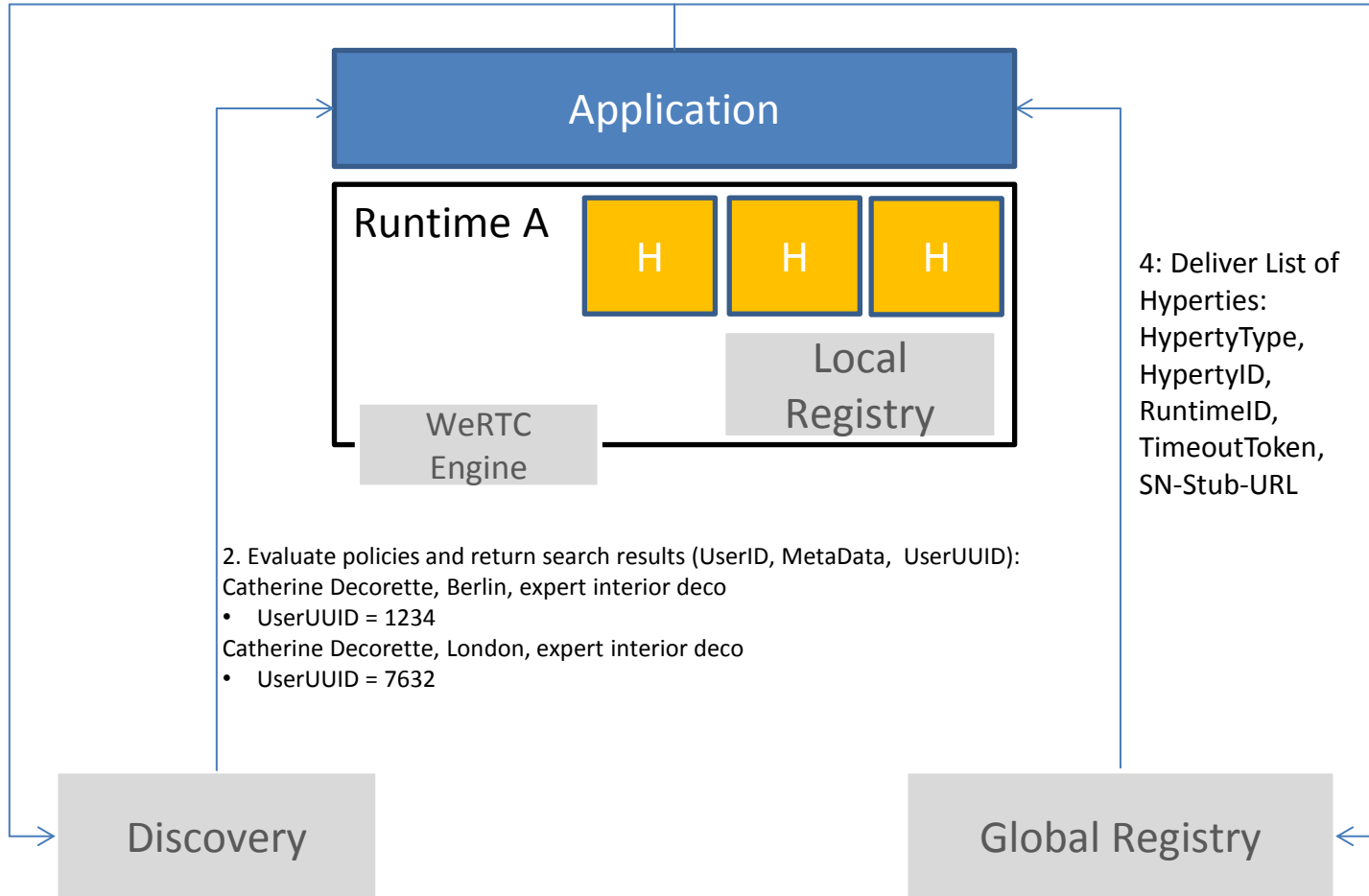- Discovery Service / Search

Requirements
- Cross domain search

MOTIONLOGIC - INDOOR ANALYTICS
OPTIMIZING THROUGH CUSTOMER UNDERSTANDING

1. search item: „ Catherine Decorette, expert for interior decoration"

3. Select search result for Berlin & TalkNow and start registry request with UserUUID = 1234

Application

Runtime A

H H H

Local Registry

WeRTC Engine

4: Deliver List of Hyperties: HypertyType, HypertyID, RuntimeID, TimeoutToken, SN-Stub-URL

2. Evaluate policies and return search results (UserID, MetaData, UserUUID):
Catherine Decorette, Berlin, expert interior deco
- UserUUID = 1234
Catherine Decorette, London, expert interior deco
- UserUUID = 7632

5: Further with cross domain call as shown above …..

Discovery

Global Registry

MOTIONLOGIC - INDOOR ANALYTICS
OPTIMIZING THROUGH CUSTOMER UNDERSTANDING

anonymous	Not authenticated	authenticated	trusted
no identifier displayed	Any identifier displayed	Identifier authenticated	Identifier is authenticated and trusted
─ ─	✓ 🔒	✓ 🔒	✓ 🔒

EXAMPLE USER SCENARIO 2: INTERACTION BETWEEN IOT AND HUMAN

SMART CITY SCENARIOS
INITIAL FOCUS ON STANDARD COMMUNICATION

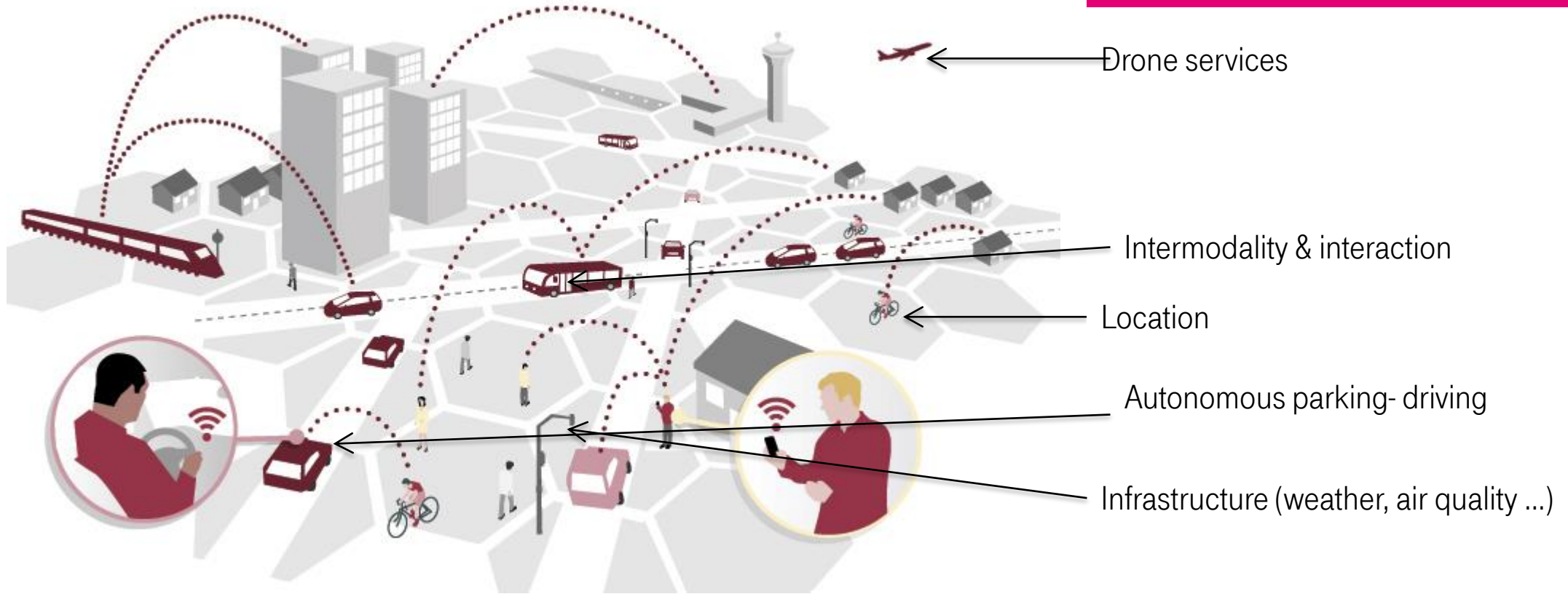| Scenario Category	Scenarios
Smart People	• **Daily life in a Smart City – Human-To-Human Communication** • **Individual Contextual Services - Daily Life In A Smart City** • **Tourism In A Smart City**
Smart Living	• Smart Health Care • Enriched Activity Communication Within An E-Health Service • Emergency Medically Assisted Intervention • Neighborhood Communication & Interaction Services
Smart Governance	• Mobile Location Based Sensing • Anonymous Mobile Collaborative Governance • Neighborhood Scenario
Smart Economy	• Hotel Guest Web Application • Smart Wear Application • Apartment Rental Monitoring And Control Application • Smart Enterprise –Contextual Enriched Communication in Smart Enterprises
Smart Environment	• Emergency Intervention In A Disaster
Smart Mobility	• As part of the second phase, it will be developed user scenarios towards sharing economy, smart logistics - e.g. drones, autonomous driving

SMART CITY HUMAN & IOT
MISSING "KILLER" SCENARIO

Context

- Drone services
- Intermodality & interaction
- Location
- Autonomous parking- driving
- Infrastructure (weather, air quality ...)

SUMMARY
CONCLUSION & NEXT STEPS

ALMANAC OBJECTIVES
FOCUS ON DATA GATHERING

ALMANAC AND RETHINK

- The vision of ALMANAC is to develop a comprehensive platform that enables the definition of an integrated Smart City information system for green and sustainable Smart City applications. This includes the creation of business models based on public-private partnerships, combining business needs with governance requirements as well as active citizen engagement.

- Network infrastructure, ALMANAC will ensure interoperability by supporting authorised data flows among private and/or public networks originally designed to achieve specific goals, therefore characterised by heterogeneous architectures, technologies, performance, architecture and policies.

- ALMANAC will enable communication interoperability among devices, sub-systems, existing urban services and external service providers allowing them to operate coherently in response to the Smart City application requirements.

- ALMANAC expects service level interoperability by allowing different developers to design and implement Smart City applications through a common set of tools and open, possibly cloud-based, interfaces.

- **Three prototypes**

- Development work in ALMANAC will be based on smart city applications in the City of Torino and is divided into three prototype stages.

- **The first prototype** will be an information gathering platform with data collected in real-time from large amounts of Smart City sensors and objects. The prototype will provide proof-of-concept interoperability with Smart City applications over the internet.

- **The second prototype** will extend the capillary network into the network layer through the M2M management components and provide end-to-end data management to the Smart City applications.

- **The third prototype** will be a fully operational prototype adding fully scalable and secure data management capabilities provided by the Data Management Framework.

ALMANAC ← → RETHINK
CONTEXT BASED COMMUNICATION & SMART CITY

ALMANAC WORKSHOP OBJECTIVES

ALMANAC: novel M2M technologies and their applications:

- Investigation on opportunities from M2M networks in a Smart City in terms of underlying technology, standards, services and applications.

- How to support massive smart city application development and deployment utilizing the network platforms and tools.

- From core technologies and network solutions to business development issues, service scenarios and end-user views and needs.

- → What are the real needs in a city?

reTHINK OBJECTIVES

Objective 1: Provide a communication framework that facilitates and supports peer to peer communications. It will consist of four layers: Hyperty, Messaging and Transport Layer with a transversal Trust Management Layer to the first three ones.

Objective 2: To design and develop security and portability features necessary to ensure a secure, trustworthy services.

Objective 3: Examine the business impact of developed concepts on today's communication and services ecosystems

Objective 4: To validate its effectiveness at use cases, such as real-time audio/video communication, content delivery via Content Delivery Networks (CDNs) and M2M communication enabled by the IoT.

Objective 5: To realize standardisation and exploitation activities.

CONCLUSION – NEXT STEPS
OPTIMIZING THROUGH CUSTOMER UNDERSTANDING

ALMANAC AND RETHINK – IS THERE ROOM FOR AN INTERPLAY?

Technology:

In which areas could we cooperate or exchange concepts?

Could we re-use testbeds?

Services:

Exchange on suitable interaction scenarios between humans and Smart City IoT infrastructure (H2M, H2M2X, M2H2H ...)

Which scenarios could be useful for both projects?

Business:

Exchange views on possible novel business models

THANK YOU!

WE SHAPE THE FUT

Telekom Innovation Laboratories

Telekom Innovation Laboratories

Joachim Schonowski

"Smart City Topic Responsible"
Telekom Innovation Laboratories

Address

Deutsche Telekom AG
Ernst-Reuter-Platz 7
10587 Berlin, Germany

Contacts

Phone: +49 30 8353 58 544
Mobille: +491712298768
E-Mail: joachim.schonowski@telekom.de

LIFE IS FOR SHARING.