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ALLIANCE FOR INTERNET OF THINGS INNOVATION

IoT Week 2017 - Workshop on "Globally Interoperable IoT Identification and Data Processing"
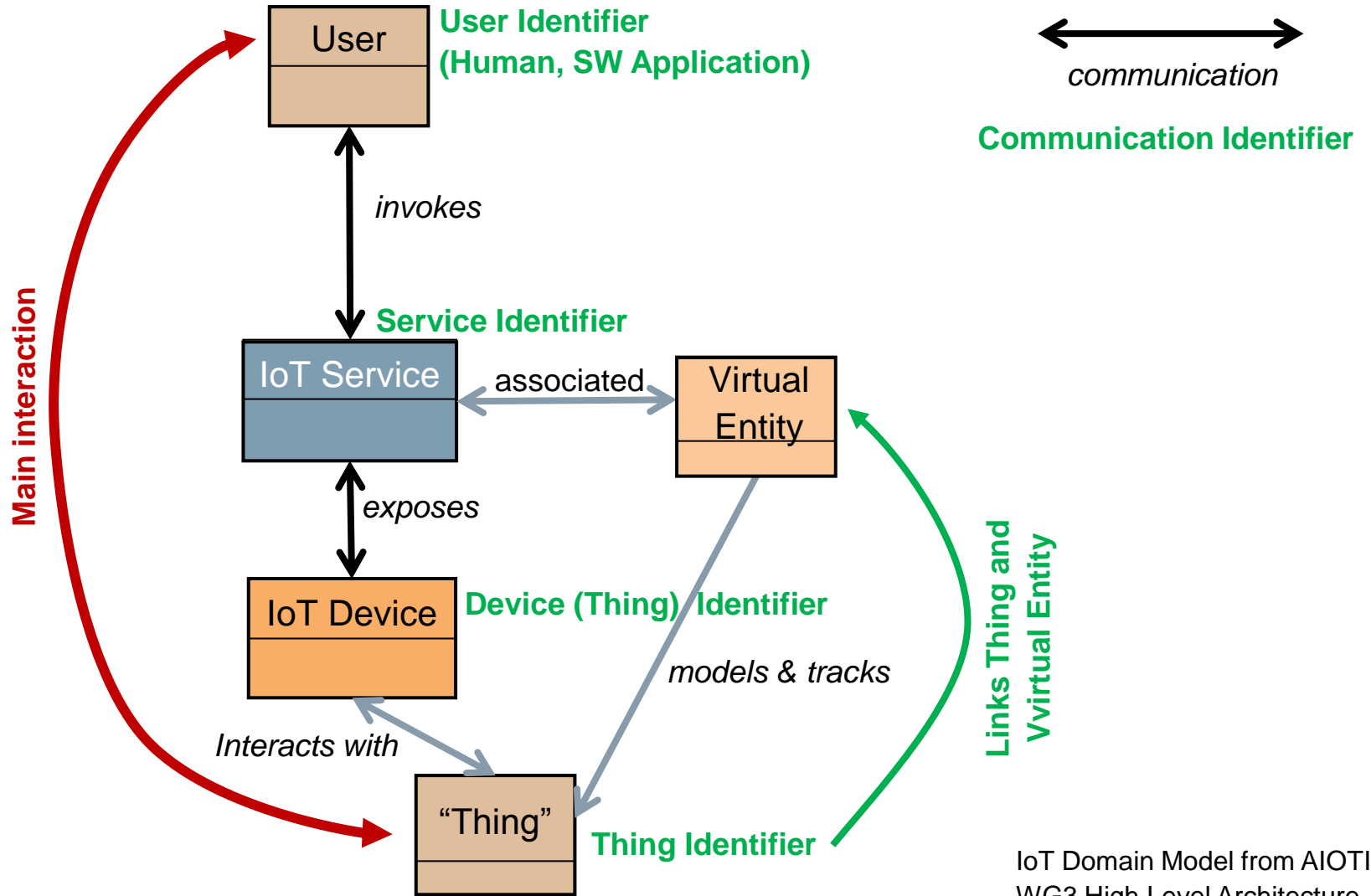
Identifiers in IoT

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Introduction

- In any system of interacting components, identification of these components is needed in order to ensure the correct composition and operation of the system.
This applies to the assembly and commissioning of the systems, and is also relevant for system operations, especially in case of flexible and dynamic interactions between system components.

- In general an identifier is a pattern to uniquely identify a single entity (instance identifier) or a class of entities (type identifier) within a specific context.

- Depending on the application and user needs various types of identifiers with different requirements are needed

Identifiers in IoT

IoT Domain Model from AIOTI
WG3 High Level Architecture
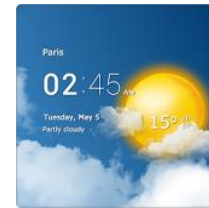
Thing identifiers

- Things are at the centre of IoT and unique identification of Things is a prerequisite for IoT systems.

- The Thing is the object that is of interest to the user

- Things can be any kind of objects (some examples):

Goods along their lifecycle
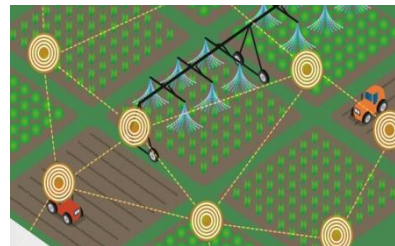

Traffic flow at intersection

Climate at specific locations

Software, e-books, music & video

Vehicle & Container tracking

Farming vehicles, animals & field yields
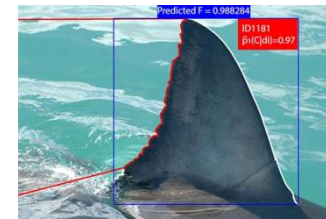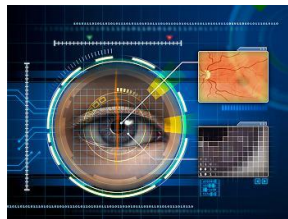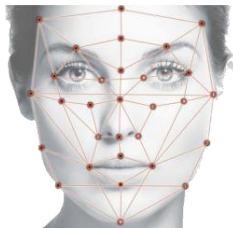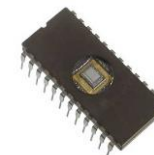

Humans fitness & health condition

Thing identifiers

- Identification can be based on inherent patterns of the thing itself

- In most cases a specific pattern is added by technical means

SERIAL NUMBER
PH0901-123456

6 71860 01362 4

RFID

- Identification is already used for a long time and many, often application area specific solutions, exist

| **RFC 2396** | **ISO/IEC 15459** | **ISO/IEC 29161** | **ISO 14223** |
| URI | Products & Packages | IoT Identification | RFID for Animals |

| **ISO 16739** | **IEEE 1451** | **ISO 2108** | **BS 7666** | **GS1 GTIN** |
| Construction & Facility Management | Smart Transducers | Books | UK Property Reference Number | Trade Items |

- Users often prefer their own identification scheme (e.g. Manufacturer -> Serial Number; Building Manager -> Building, floor, room)

Things, IoT Devices & Virtual Entities

- Things are the objects that are of interest to the user

- A Thing could be made up of a set of Things. A whole system can be a Thing.

- IoT Devices (sensors, actuators) interact with the Thing by providing information about the Thing and manipulating it

- A IoT Device can be a Thing in case a user is interested in it, e.g. doing maintenance and management of the IoT device

- Things can have integrated IoT devices (e.g. sensors on Smart Phones)

- Virtual Entities (also called Digital Twins) represent Things in the digital world. Identifiers provide the linkage between a Thing and its Virtual Entity

Communication Identifiers
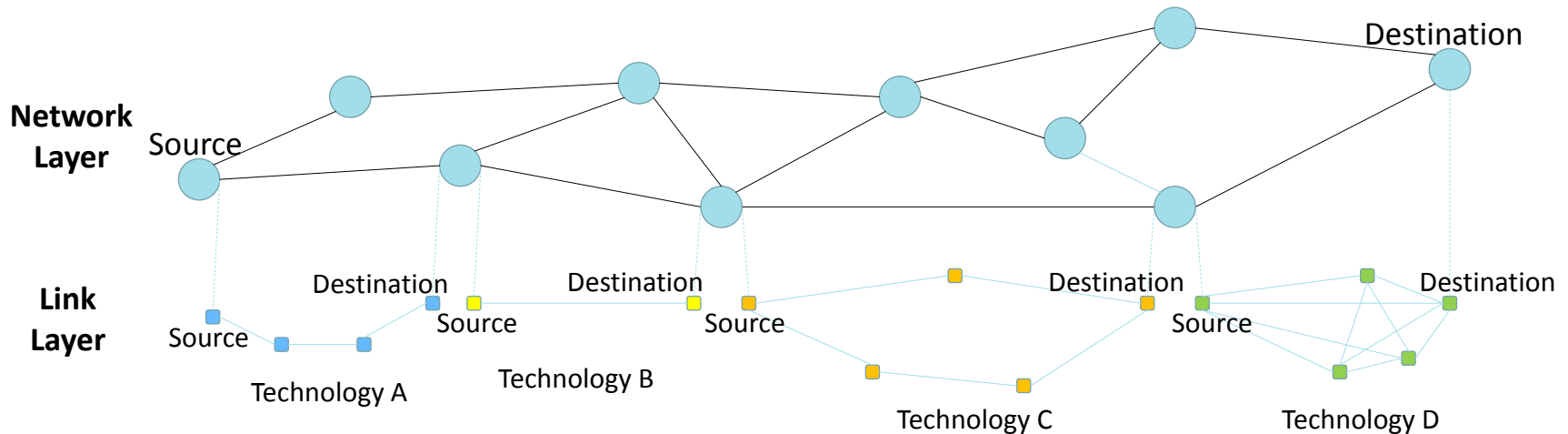
- Communication identifiers define source and destination of the communication relations

- Communication identifiers must be unique within the boundaries of the specific network and layer

- Identifiers are bound to the specific communication technology and defined as part of the standardization of the technology

Communication Identifiers

- Depending on the network size and routing approach the identifiers may have a structure that reflects the network topology
  - IP addresses and phone numbers reflect topologies
  - MAC addresses don't reflect topologies (but have vendor information in order to ensure global uniqueness)
- Communication identifiers should not be used as Thing identifiers
  - Communication addresses can change as the Thing moves, when a network interface is replaced, when the network topology is changed
  - Not all things have communication interfaces
  - Some things may have more than one communication interface (e.g. redundancy)

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Security & Privacy

- For security reasons authentication may be needed to validate the claims asserted by the identifier

- Authentication may apply for all components in a IoT system, human users, software applications, IoT Devices and Things

- Identifiers may raise privacy concerns for personal data. This is not only related to identifiers for humans itself, but also for Thing Identifiers in case the Thing can be related to human activities (e.g. Car, Smart Phone, Smart Watch).

- Data protection can be an issue for all kind of Things in order to protection for example intellectual property and other sensitive company data (e.g. drug tests, test of new products, failure pattern of a machine, production data)

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IoT Identifier issues

- Various categories of identifiers and their demarcation (e.g. Thing, Communication, Service, User)

- Variety of existing standards and ongoing standardization activities

- Interoperability of identifiers within and across domains

- Support of legacy

- Support of multiple (user specific) identifier schemes

- Security

- Privacy and data protection

Alliance for Internet of Things Innovation AIOTI

- Initiated by the European Commission as informal group in March 2015 and established as an Association under Belgium law in September 2016

- Mission:
  - Contribute to **EU Large Scale Pilots**
    to foster experimentation, replication and deployment and to support convergence & interoperability of IoT standards
  - **Develop IoT ecosystem across vertical silos**
    including start-ups and SMEs
  - Identify, communicate and **champion EU spearheads**
    to speed up the take up of IoT
  - Gather evidence on market obstacles for **IoT deployment**
    in a Digital Single Market context
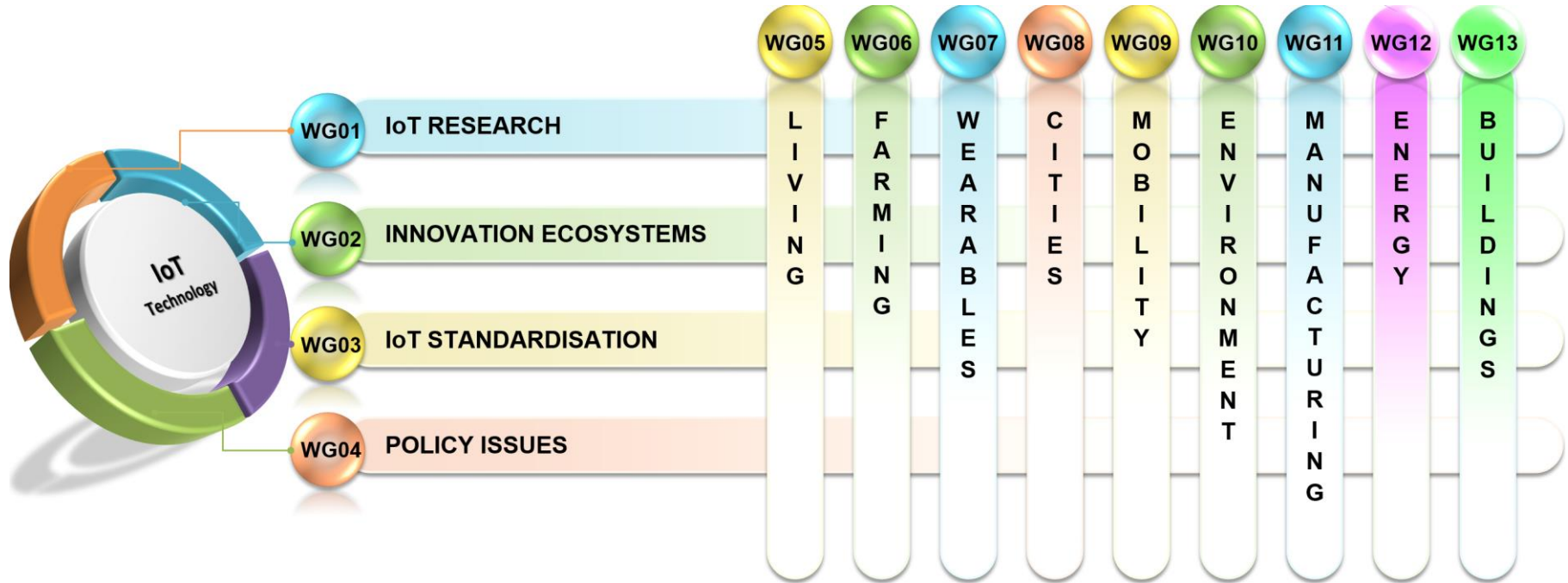 - **Mapping & Bridging** global, EU and Members States' IoT innovation activities.

AIOTI is <u>NOT</u> a Standard Development Organization

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AIOTI Working Groups

AIOTI WG3 IoT Identifier Task Force Scope

- Evaluate identification needs for IoT and related requirements

- Classify different identification needs

- Collect existing identification standards and ongoing standardization work and elaborate their applicability for IoT

- Consider interoperability of identifiers

- Identify standardization gaps related to the IoT identification needs

- Consider security and privacy issues related to identification together with the Privacy and Security sub-groups of WG03 and the related work/activities in AIOTI WG04

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AIOTI WG3 IoT Identifier Task Force Activities

- The task force generates a document that collects, evaluates and summarizes the topics covered by its scope including:
    - IoT identification needs and related requirements
    - Collection of existing identification standards and ongoing standardization work and their applicability for IoT
    - Standardization gaps related to the IoT identification needs
    - The document will further consider specific topics like:
    - Interoperability of identifiers
    - Security and privacy issues related to identification
- As a starting point a open web based survey related to the above topics has been performed (**IoT Identifier Survey)** with 82 responses

Thank you!

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