



PAW

Use cases

draft-bernardos-spawn-use-cases-00

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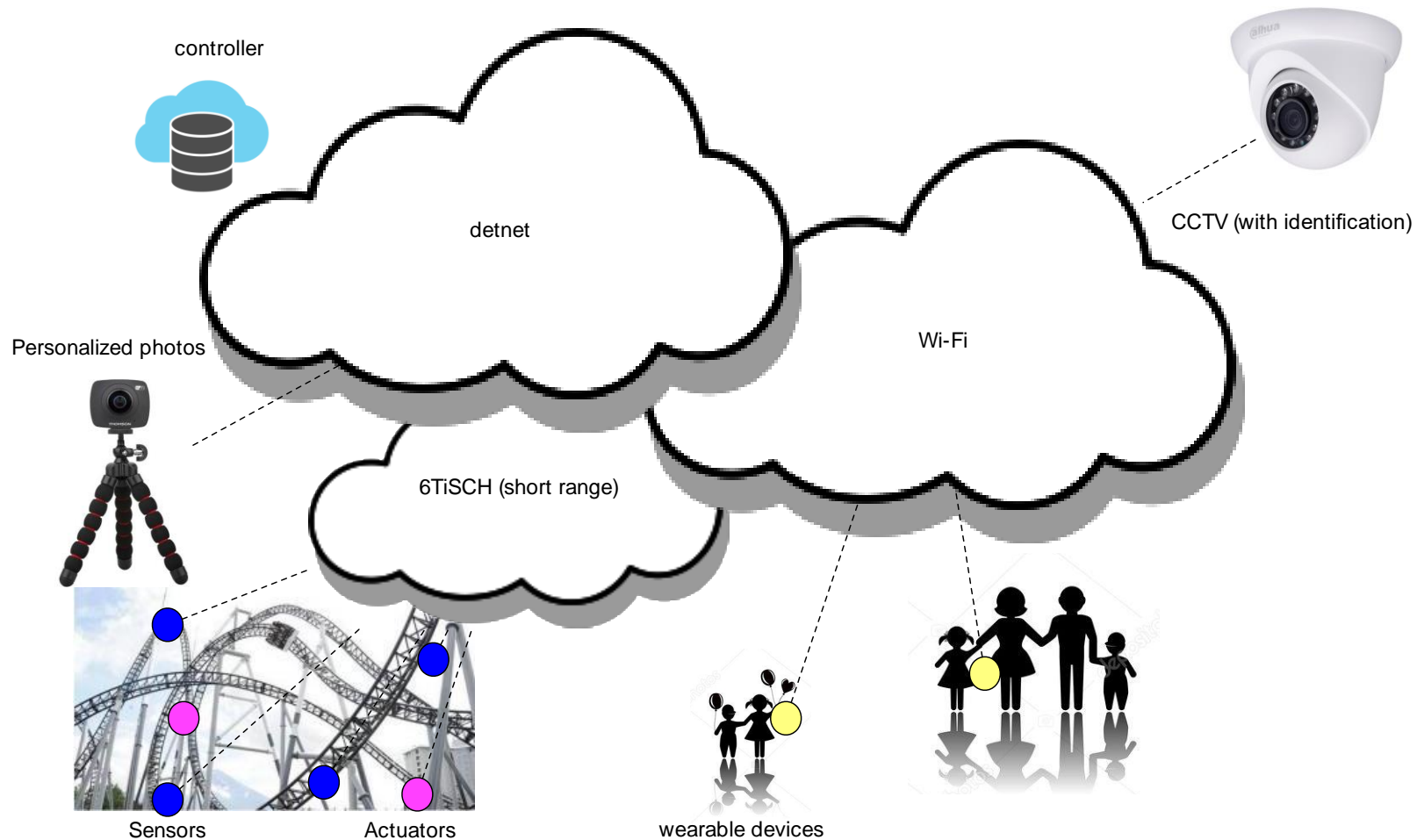
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Outline

- Amusement Parks
- Wireless for Industrial Applications
- Pro Audio and Video
- UAV platooning and control
- Edge Robotics control

Amusement Parks: Use Case Description





Amusement Parks: Specificities

- **Multiscale topology**
 - Local area
 - Real-Time Sensors and Actuators
 - Wearable devices
 - Identification, reservation, user experience
 - Global information system
 - predictive maintenance, etc.



Amusement Parks: The Need for Wireless

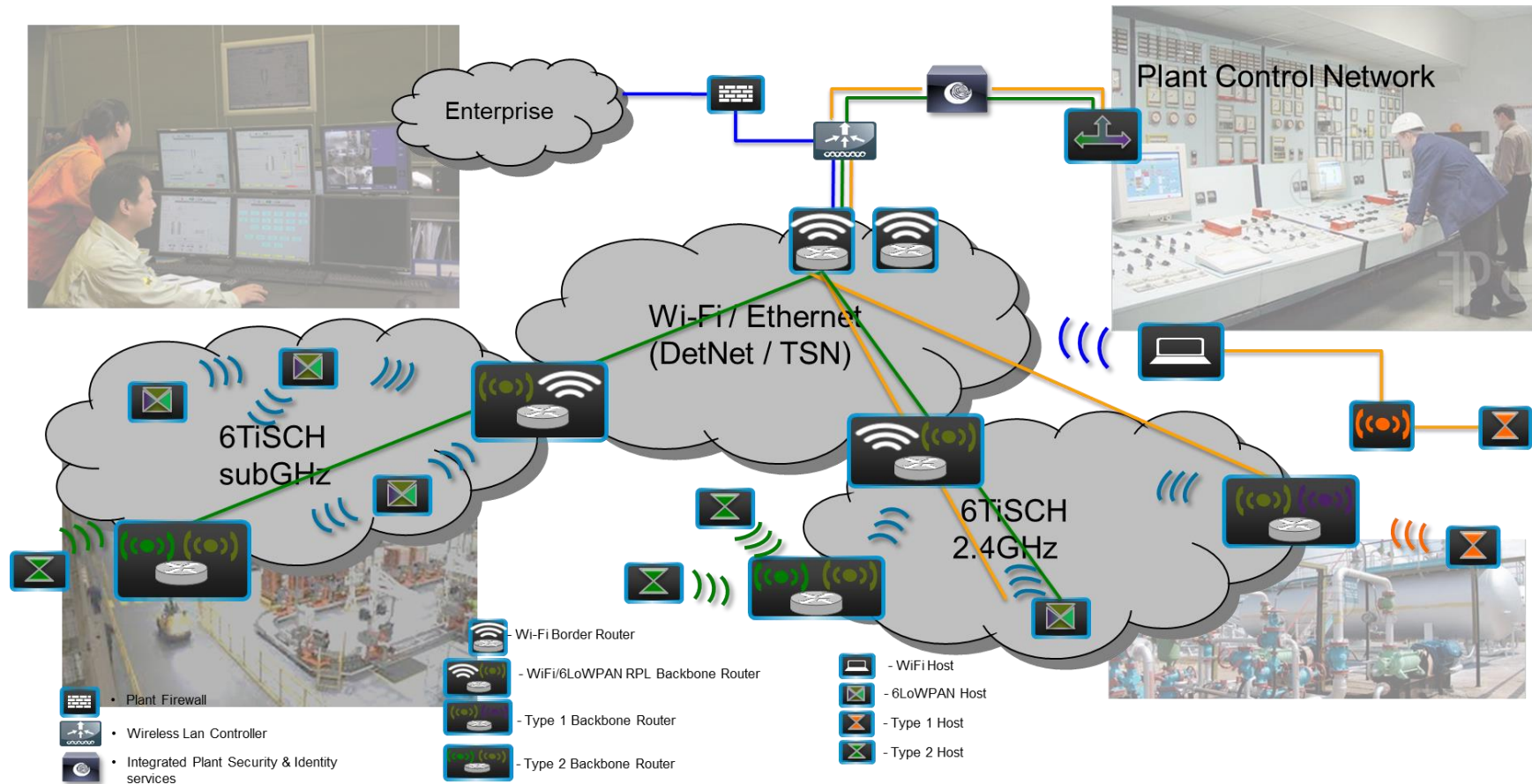
- **Wireless is cheap**
 - Large areas to cover (km²)
- **Wearable devices (mobile)**
 - Fast Identification
- **Global interconnection**
 - Predictive maintenance
 - Marketing (user tracking)



Amusement Parks: Asks for SPAWN

- Real-time interactions
 - Control loop actuators / sensors / controller
 - Photo on a rollercoaster pushed to twitter / Facebook
 - Integration of mobile devices
 - A no-queue amusement park / VIP access

Wireless for Industrial Apps.: Use Case Description





Wireless for Industrial Apps.:

Specificities

- Control loops
 - Different needs (industry specific) period from hundreds to few ms
 - In all cases, packets need to flow deterministically between the sensor and the PLC, losses and jitter cannot occur
- Unmeasured data (monitoring and diagnostics)
 - Data needed to improve the performance of a production line (e.g., using ML predictions)
 - Should not be mixed with the control traffic



Wireless for Industrial Apps.:

The Need for Wireless

- Using wires with mobile parts is not a good match
- Deploying the needed wiring at every place where data is needed is too expensive
 - Even if a network exists, it is preferred to deploy another network for monitoring that can independently scale and is isolated from the control network



Wireless for Industrial Apps.:

Asks for SPAWN

- SPAWN should be able to lock so-called hard cells for use by a centralized scheduler, and program so-called end-to-end Tracks over those cells
- SPAWN should be able to setup a Track over a wireless access segment such as TSCH and a backbone segment such as Ethernet or WI-Fi, to report a sensor data or a critical monitoring within a bounded latency

Pro Audio and Video: Use Case Description

Announcement speakers and CCTV camera @ train station platforms, airports, theme parks etc.





Pro Audio and Video: Specificities

- **Uninterrupted Stream Playback**
 - Uninterrupted stream for live playback in the presence of network errors cannot be achieved by re-trying the transmission
- **Synchronized Stream Playback**
 - Latency must be bounded
 - Sound must remain consistent to the movement in the video



Pro Audio and Video: The Need for Wireless

- The deployed announcement speakers for instance along the platforms of the train stations, need wireless communication to forward the traffic in real time



Pro Audio and Video:

Asks for SPAWN

- The network infrastructure needs to support heterogeneous types of traffic (including QoS)
- Content delivery must be under bounded (lowest possible) latency
- The deployed network topology should allow multipath



UAV control:

Use Case Description

- Unmanned Aerial Vehicles (UAVs) are becoming very popular for many different applications
- UAVs can be used to perform aerial surveillance activities, traffic monitoring, support of emergency situations, and even transportation of small goods
- UAVs typically have various forms of wireless connectivity:
 - Cellular
 - IEEE 802.11



UAV control: Specificities

- There is the need for continuous and predictable connectivity between an UAV and a control center and also among UAVs:
 - Some of the use cases/tasks involving drones require coordination among drones
 - Others involve complex compute tasks that might not be performed using the limited computing resources that a drone typically has



UAV control: The Need for Wireless

- UAVs cannot be connected through any type of wired media



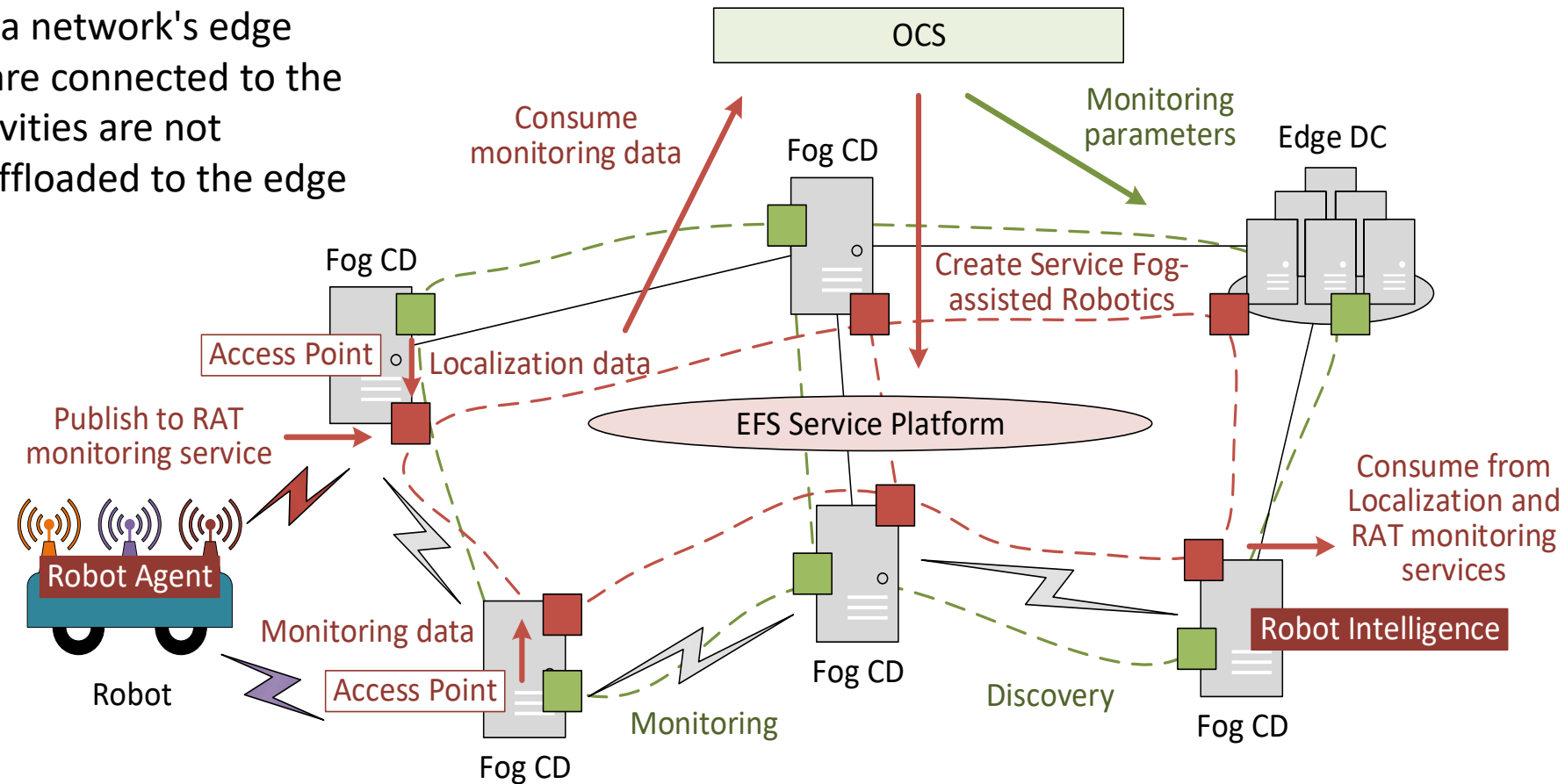
UAV control:

Asks for SPAWN

- If UAVs share/offload computing tasks, the network infrastructure is actually composed by the UAVs themselves: this requires self-configuration capabilities
- Heterogeneous types of traffic need to be supported: from extremely critical ones requiring ultra low latency and high resiliency, to traffic requiring low-medium latency
- When a given service is decomposed into chained functions hosted at different UAVs, each link connecting two given functions would have a well-defined set of requirements

Edge Robotics control: Use Case Description

Several robots, deployed in a given area, inter-connected via an access network to a network's edge device or a data center. The robots are connected to the edge so complex computational activities are not executed locally at the robots, but offloaded to the edge





Edge Robotics control: Specificities

- Some use cases/tasks involving robots benefit from decomposing a service in an SFC distributed among robots and the edge
 - These require continuous connectivity with the control center and among drones
- Robot control is require very low latencies between the robot and the location where the control intelligence resides



Edge Robotics control: The Need for Wireless

- Using wired connectivity is not feasible
 - Robots are mobile
 - Some deployment scenarios would make wiring unfeasible (e.g., shopping malls where robots are used for cleaning or delivery of goods)



Edge Robotics control:

Asks for SPAWN

- The network infrastructure needs to support heterogeneous types of traffic, from robot control to video streaming
- When a given service is decomposed into functions -- hosted at different robots -- each link connecting two given functions would have a well-defined set of requirements



Conclusion and next steps

- Different use cases do need wireless connectivity for various purposes demanding predictable deterministic wireless behavior
- Should we document additional use cases and try to better characterize their needs in terms of requirements?
- Comments and contributions are very much welcome!