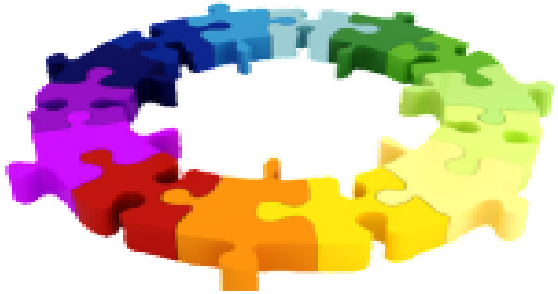
1st ITU Workshop on Data Processing and Management for IoT and Smart Cities & Communities

Brussels, Belgium, 19 February 2018



AIOTI

ALLIANCE FOR INTERNET OF THINGS INNOVATION

Trends and opportunities for data-rich smart cities

omar.elloumi@nokia.com – AIOTI WG08 Chairman

The development of the AIOTI

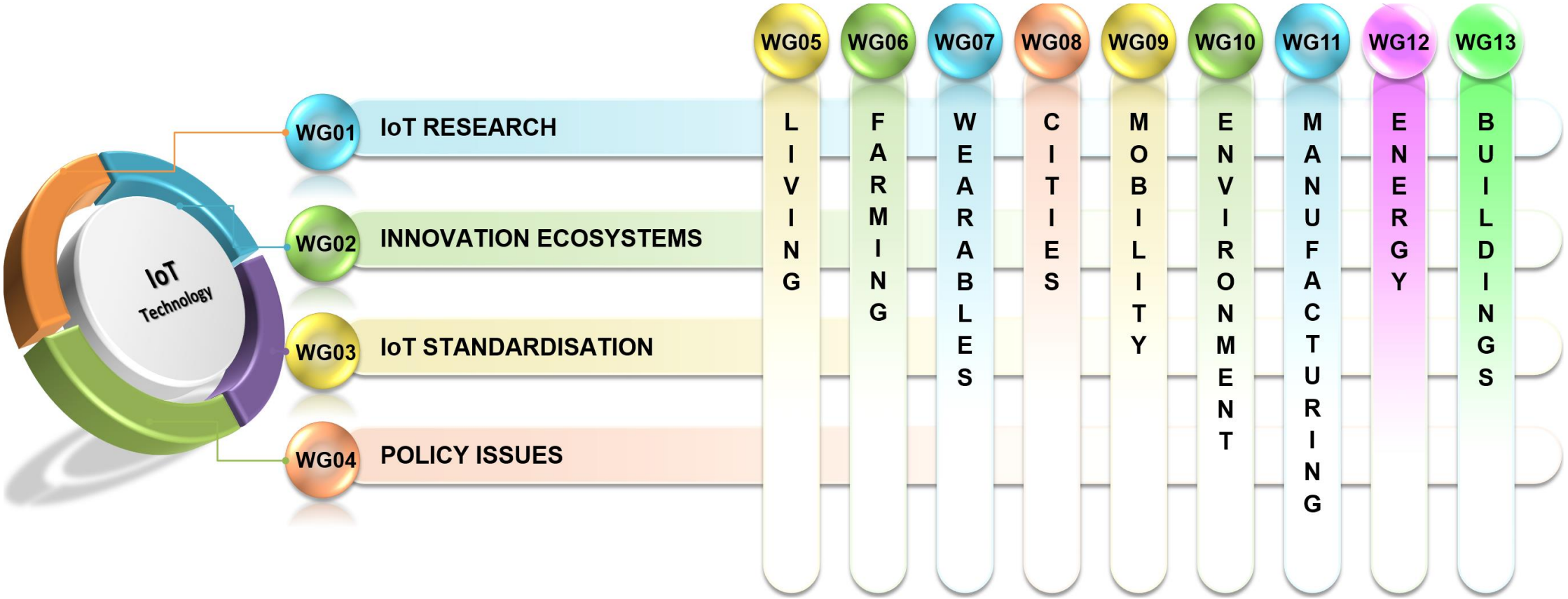
The **Alliance for Internet of Things Innovation** (AIOTI) was initiated by the European Commission in 2015, with the aim to strengthen the dialogue and interaction among IoT players in Europe, and to contribute to the creation of a dynamic European IoT ecosystem to speed up the take up of IoT (*www.aioti.eu*)

Launch in 2015 by Commissioner Günther Oettinger → In context of the preparation of Large Scale IoT Projects under EC's Horizon 2020 initiative → From 2016 one-stop-shop for IoT in Europe and globally

AIOTI key strategic challenges

- Addressing rapid technological developments
- User acceptance of IoT innovation, building trust
- Drive towards deployment
- Managing the risk of fragmentation, converge in a field of international competition
- Education and information to stakeholders in their context

AIOTI Working Group Structure



The road to Smart Cities – not straight but exciting and rewarding

Let's stop the debate, conferences, publications on what exactly a Smart City is…
let's get on the road to find out

Key elements:

- Identifying meaningful use cases, starting from end-user perspective
- Financial justification, business models, collaborative value creation
- Adoption and trust by all stakeholders
- A structural platform approach
- Exploring unique opportunities for Europe

Source: Kees Van Der Klaw, AIOTI Chair

Assessment of Smart Cities deployments

- **Connectivity, plenty to chose from…**
  - But manageability could become a challenge

- **Open data already happening but often static and fragmented :** Traffic, parking, number of people in a geographical region, library occupancy, etc.

- Operational **city funded projects** remain vertically integrated and justified by **short term RoI** (e.g. street light) or very specific needs,
  - Nobody buys “IoT”, cities buy a outcome-based solution for a specific problem

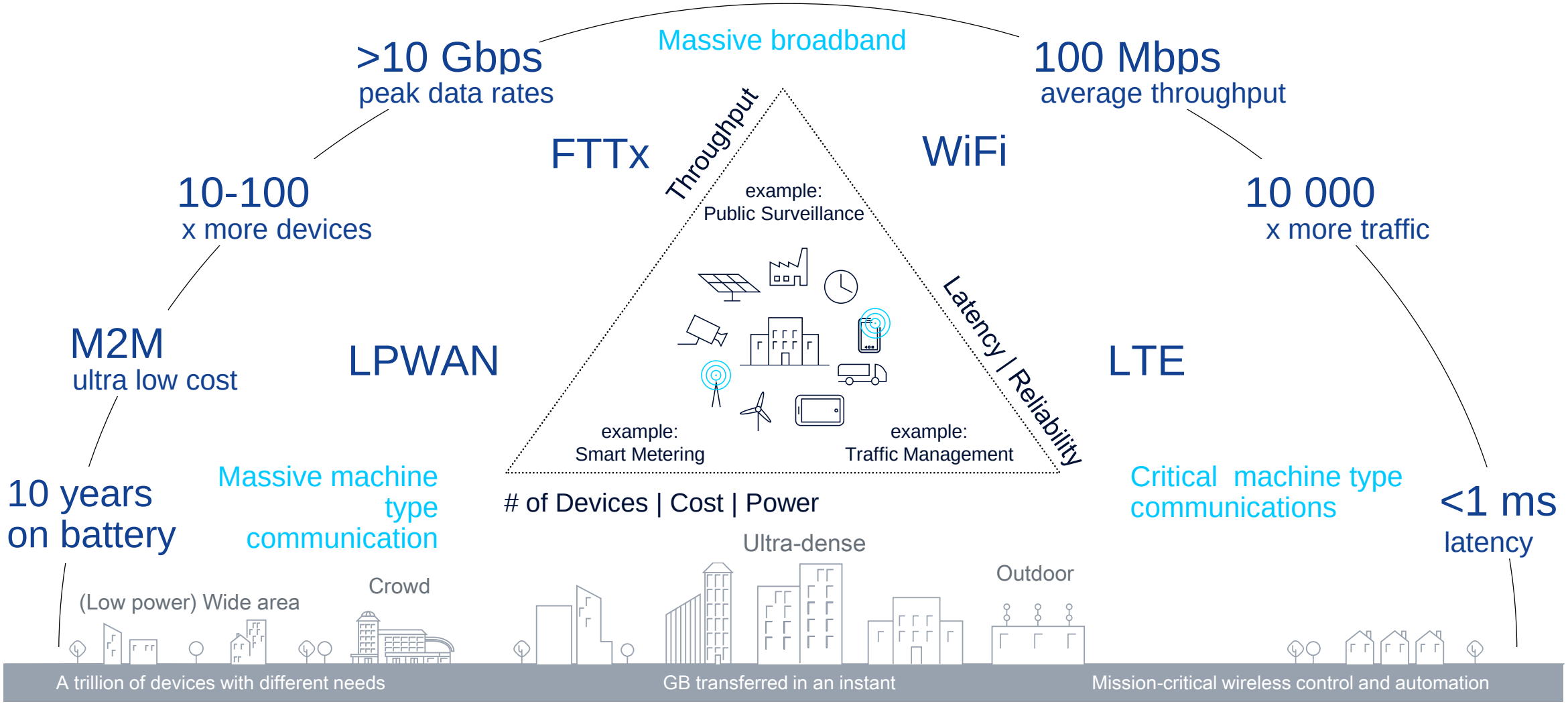
- **Horizontal platform** and **cross vertical** data exchange remain **limited to pilots or policy funded projects**

- **No single IoT platform will dominate**
  - Diversity is already a market reality that we must deal with

- **Vendor/platform lock-in remains a key concern**

Telecom infrastructure: multiple type of connectivity technologies are needed

Diversity and scale of Smart City use cases poses unique and contradictory challenges on the network

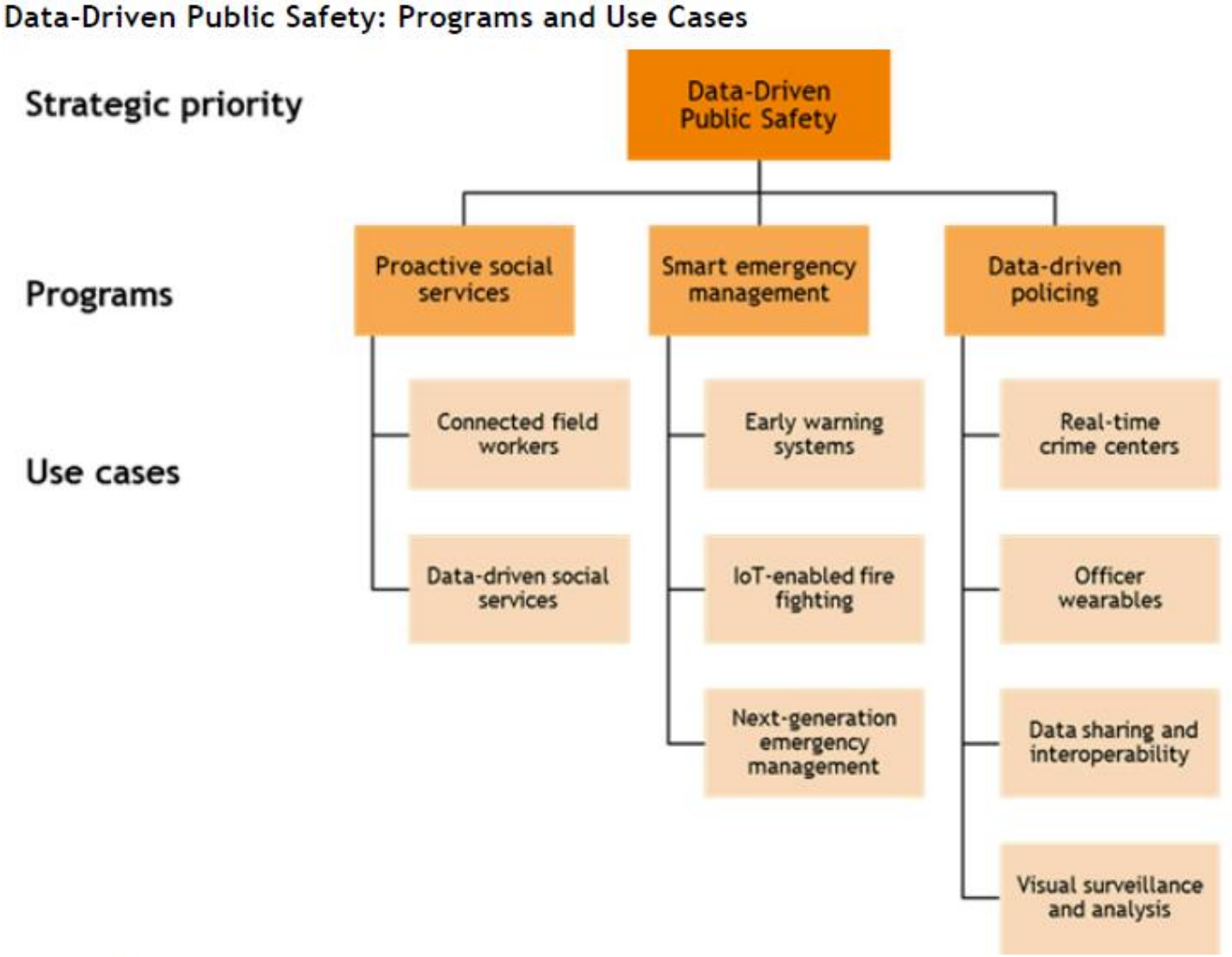


Source: NOKIA

3 trends in 2018 for IoT and DPM

Cross domain/application use cases	• Identification of **commercially viable cross domain and cross applications use cases will raise awareness and drive the need for horizontalization** (not a single platform) and **DPM** • Replication guidelines leveraging ongoing pilots
Platform to platform interoperability	• Platforms will ultimately need to exchange data • Requirements are under development, e.g. H2020 SymbIoTe and Inter-IoT • Need industry convergence to ensure success • Emerging as an important PPI (Pivotal Point of Interoperability)
Streams processing	• From data points to streams and realtime data analysis • Video analytics for **data driven public safety** as a key driver • Distributed cloud approach • Value proposition: faster response to emergencies, improved decision making, increased operational efficiency, efficient asset management, etc.

Data driven public safety use cases are real and emerging (source IDC 2017)



Stream processing example: real-time city dashboard with alerts

(source Bell Labs and worldwidestreams.iot)

1. Request in user language

i.e: Alert me when yellow car 123 XY is detected in this area

City dashboard

3. Real time Information

Relevant set of streams is delivered

World wide streams (WWS)

2. Compile, deploy and process requests

WWS Control

Compile requests
Deployment policy

Analytics
Algorithms

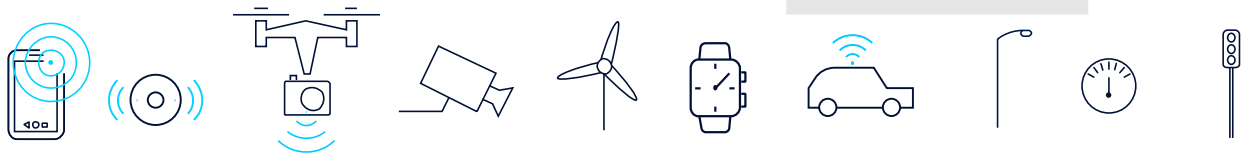
Deploy

WWS processing

Edge cloud

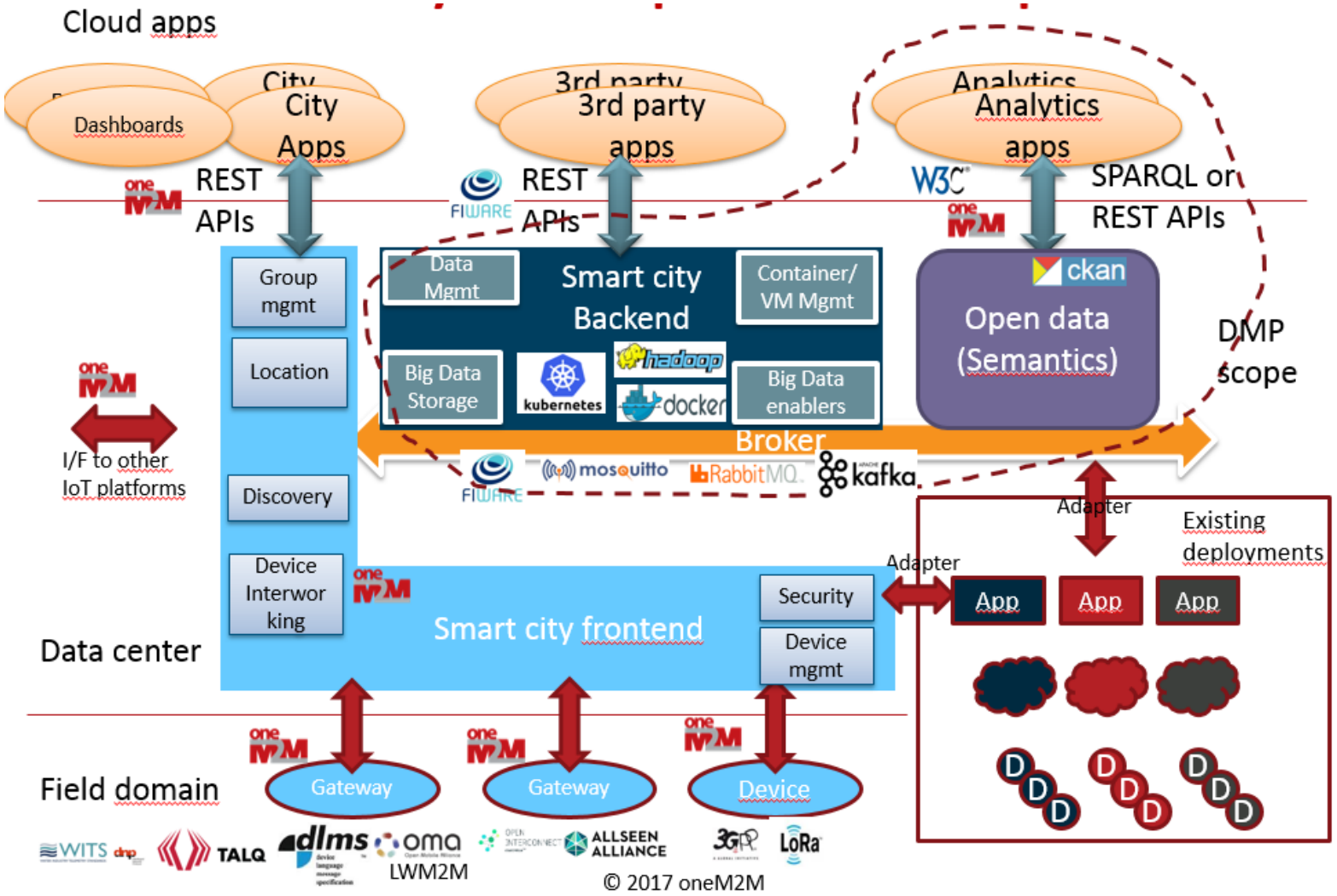
Core cloud

Live streams



Any sensor, any stream

IoT and Big data blue-print example based on oneM2M

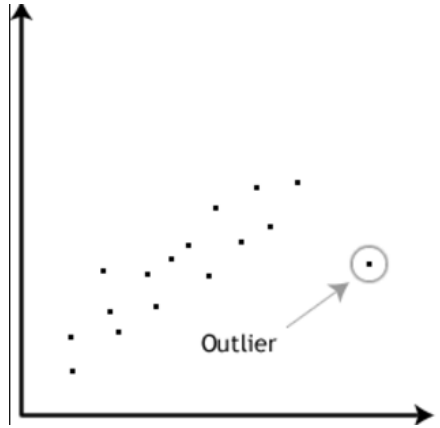


IoT and DPM will ultimately need to operate in a closed loop

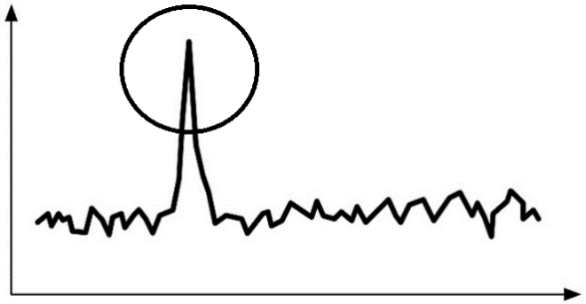
Example fault detection and isolation of IoT devices

- IoT is used for data collection and sharing
- DPM is used to detect faults in data sets using machine learning techniques
- When faults are detected IoT is triggered to put a faulty device into quarantine via e.g. Device Management

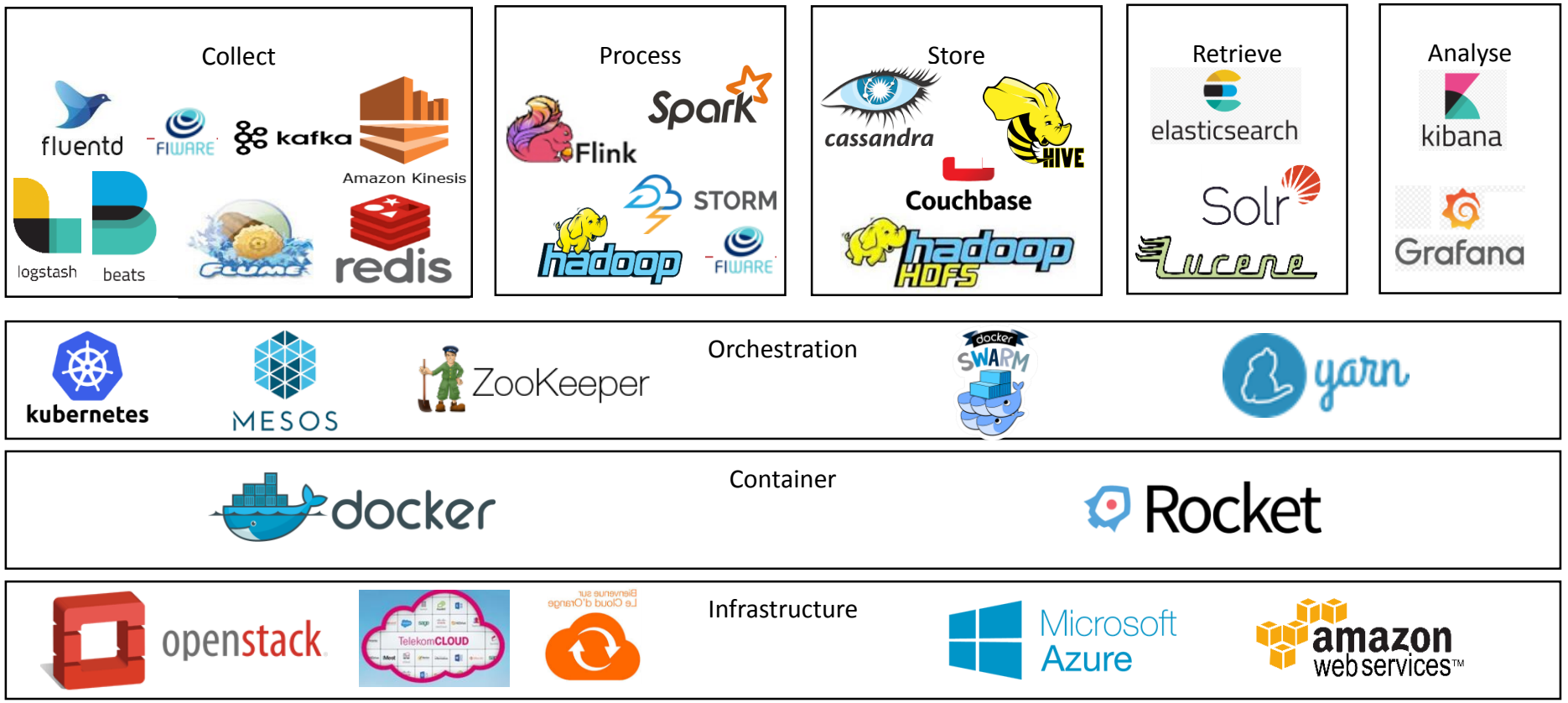
- **Outliers:** A single isolated event that is outside of the expected range of values to be returned.



- **Spikes:** A change in gradient over a period of time much greater than expected.



Open source is key in DPM



Additional recommendations

- Semantic approaches have largely used triple store technologies. Semantics will play a central role in interoperability. Big data approaches are not semantic-friendly. There is need for convergence
- Cities need **guidelines** to help them understand different options and avoid lock-in to:
  - IoT Platform provider
  - Cloud infrastructure provider
- Cities need **guidelines** for security and privacy protection
- Cloud native principles are being used for IoT implementations (Cloud native IoT): Containers, horizontal scalability, no single point of failure, DevOps, mircroservices, etc.
  - Cloud native principles can hardly be dissociated from big data, therefore should also be considered
- Data models for exposure of city data are needed to ensure app developers can use and leverage city data