The emergence of cognitive architecture

TERATEC FORUM 2017 - **Algorithms and Deep Learning, new paradigms and challenges?**

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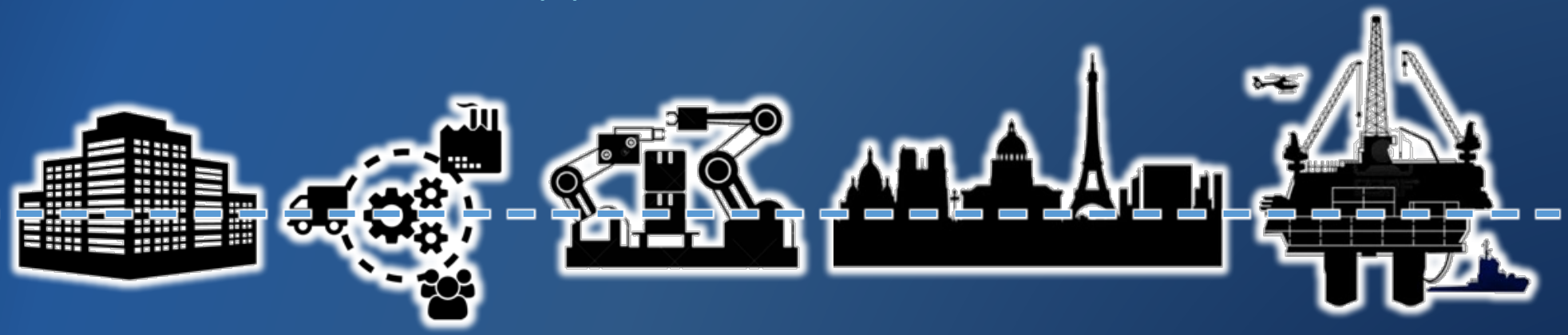
Sr Director, Engineering, Paris Innovation & Research Lab
June 2017

Digitization Age:
The Rise of Programmable & Collaborative Infrastructures!

Applications

APIs

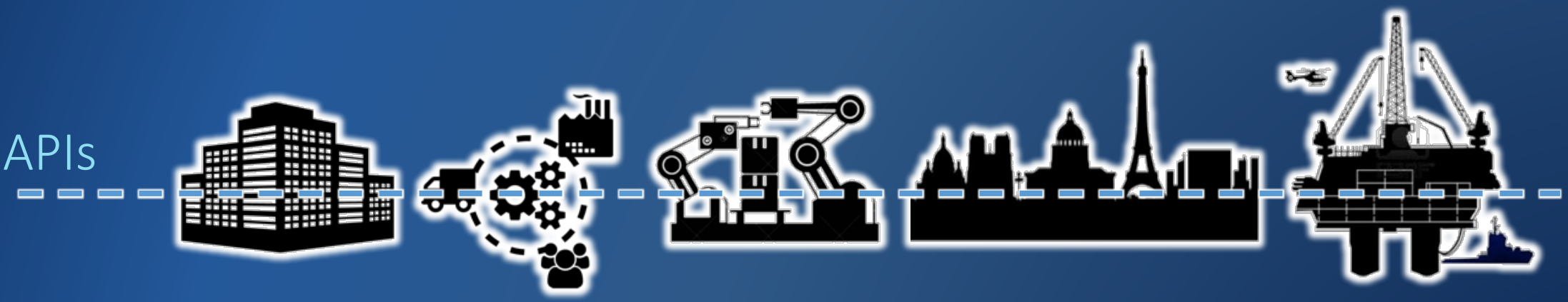


Platform

IT > < OT

Digitization Age:
The Rise of Programmable & Collaborative Infrastructures!

Software Defined Process Virtualized Functions DevOps & Automation

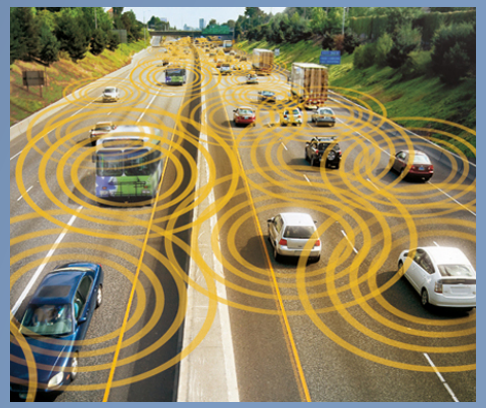


Wearable
Augmented Reality
Artificial Intelligence

Big Data Analytics
Vision & Sensor Fusion
Block Chain

Cloud to Fog Architectures
IoT Connectivity
IPv6, ICN, 5G, LPWAN

Digital Nervous System



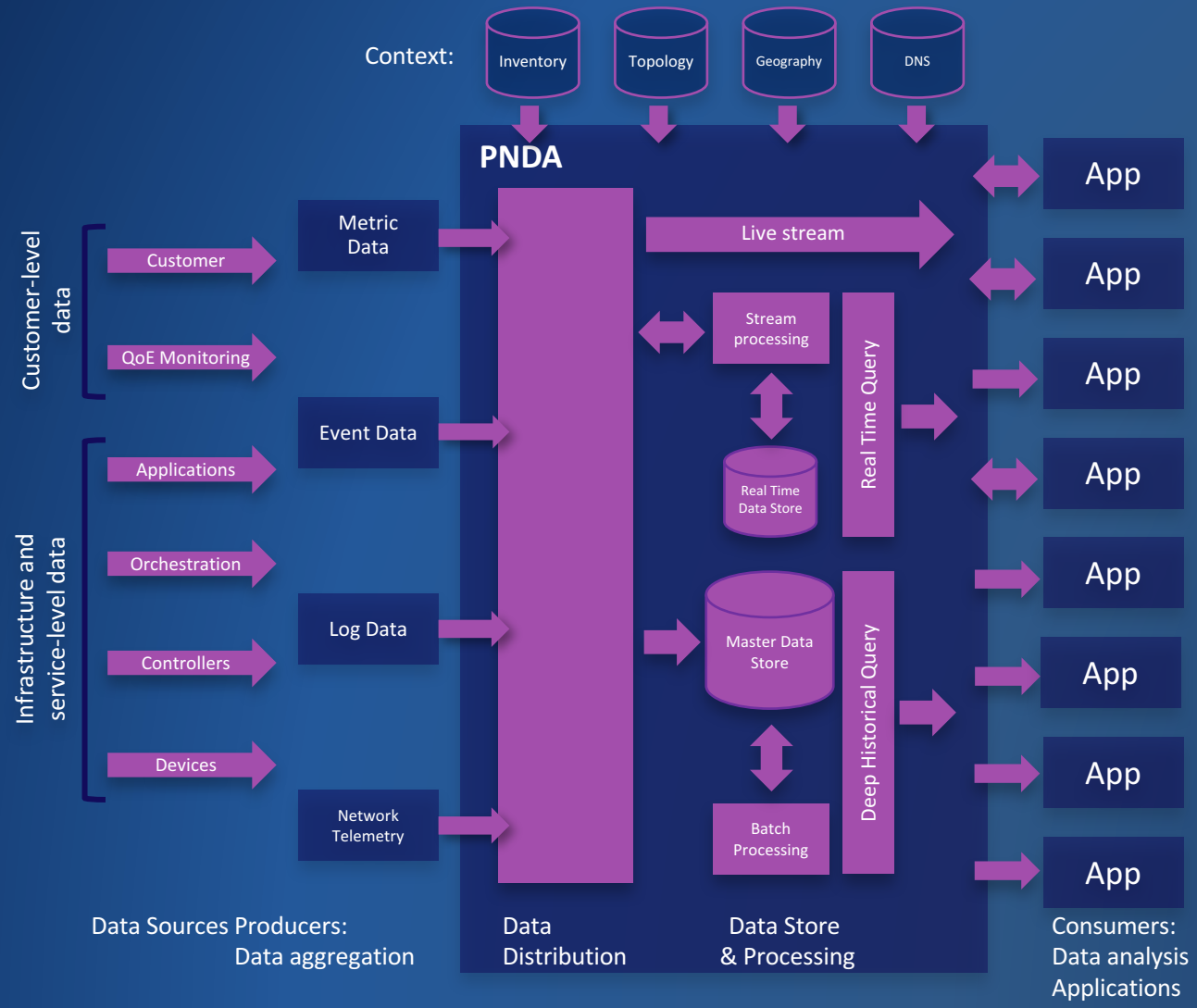
Connected cars will send 25 gigabytes of data to the cloud every hour

The current A350 model has close to 6,000 sensors across the plane and generates 2.5 Tb of data /day

The total volume of data generated by IoT will reach 600 ZB per year by 2020

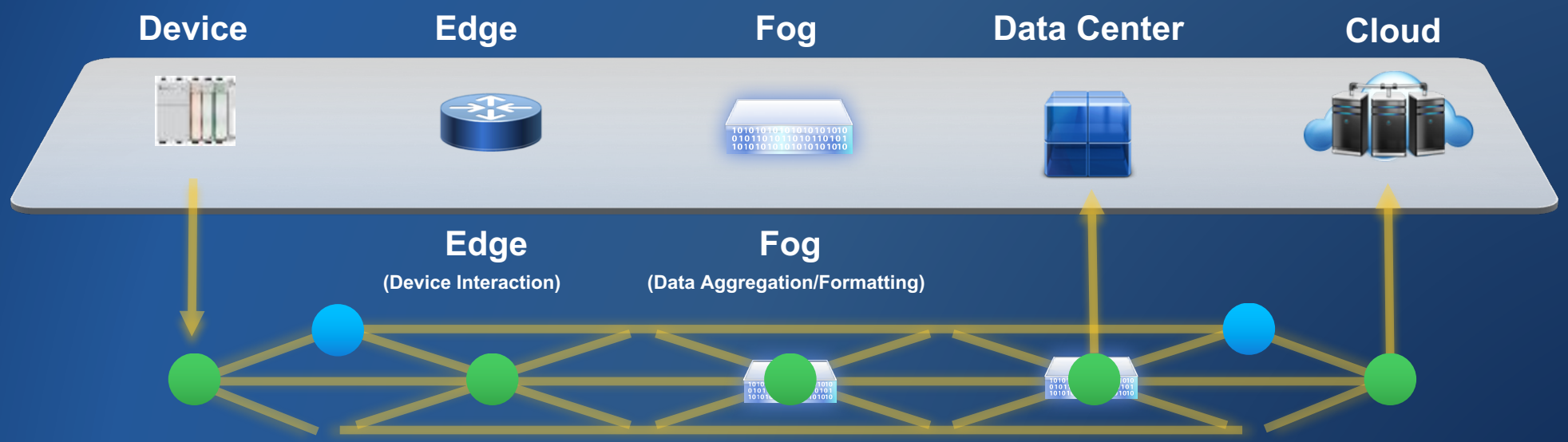
- What: Monitor/Detect
- Why: Analyze
- When: Predict
- What if: Optimize

www.pnda.io



- Simple, scalable open data platform
- Open architecture for data aggregation distribution and processing
- Horizontally scalable platform for analytics and data processing applications
- Support for near-real-time stream processing and in-depth batch analysis on massive datasets
- Leverages best current practise in big data analytics

Fog to cloud Architectures

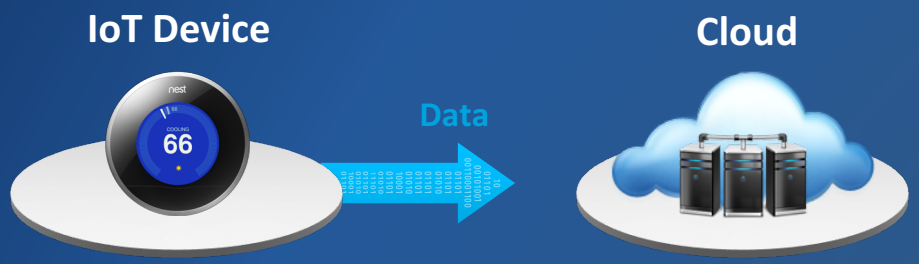


Why Compute at the Edge?

There may not be enough network bandwidth	Data Reduction
Most of the data is not interesting	Filtering
The use of data may be at the edge	Latency Optimization
Computation can be optimized for some purposes	Partitioning
Data normalization	Application Simplification
Data redirection based on the content of the data	Dynamic Changes
Data time stamping for later forensic analytics	Analytic Support

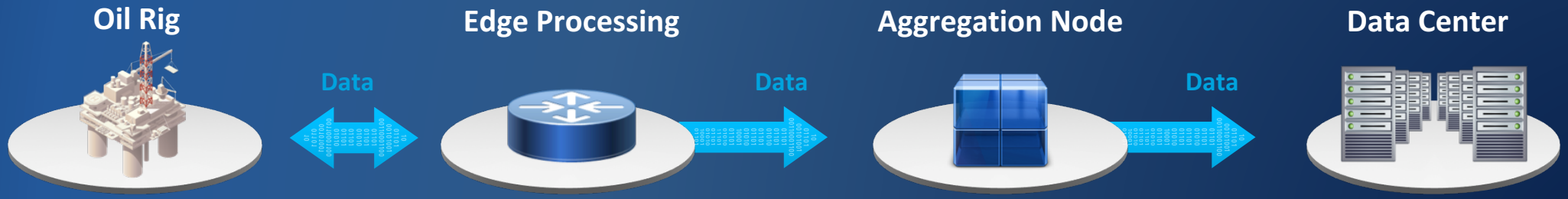
General Patterns

2 Tier

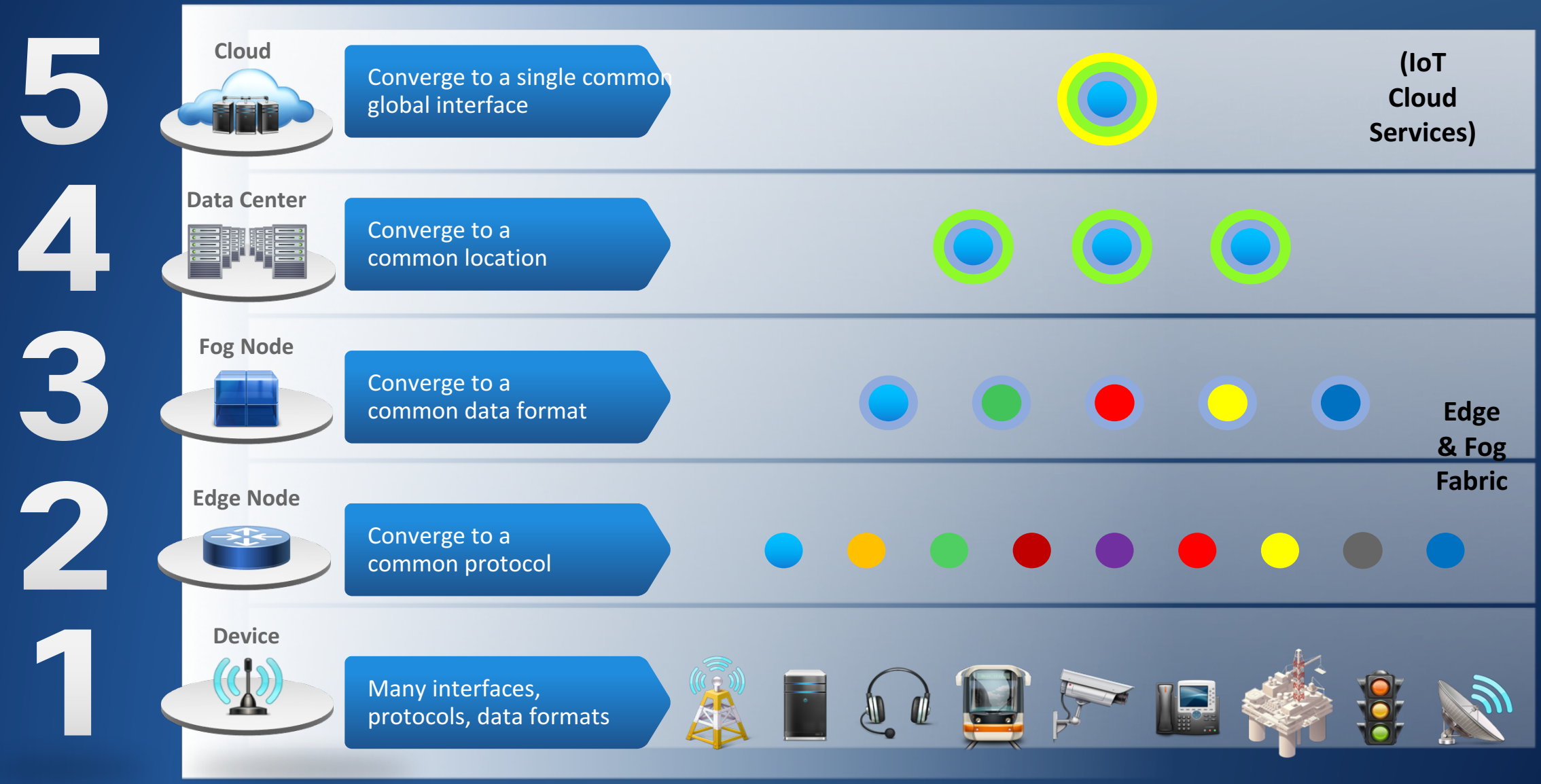


3 Tier

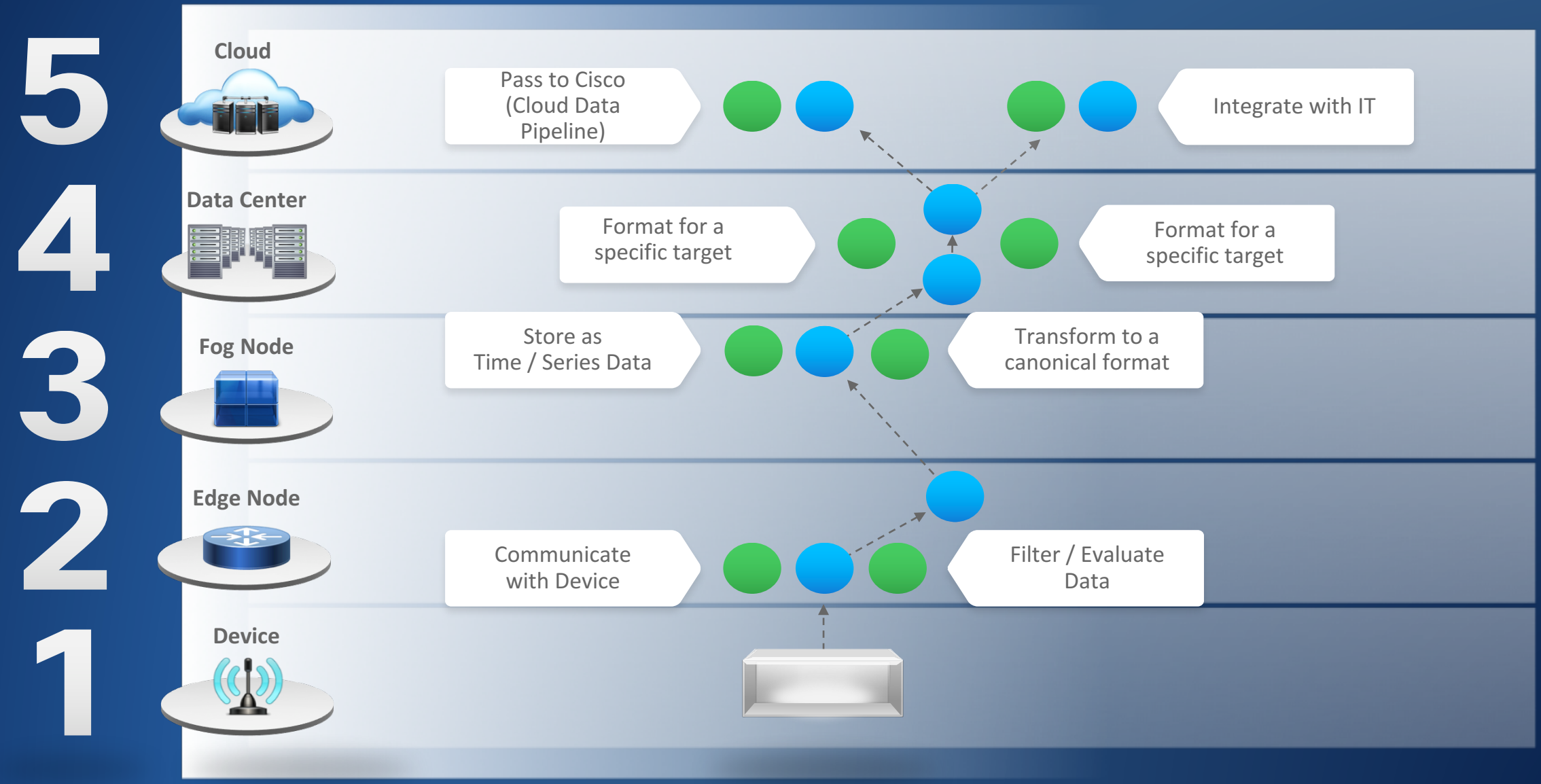
4 Tier



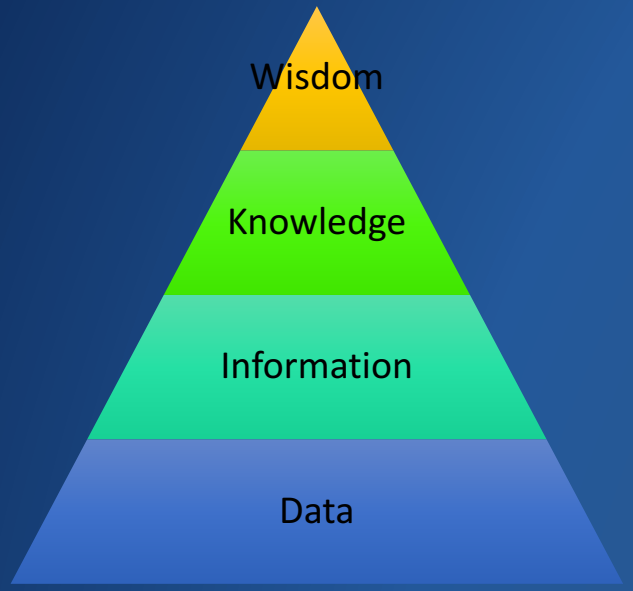
Methodology



Edge and Fog "Fabric" example



Supervising Complex Systems of Systems



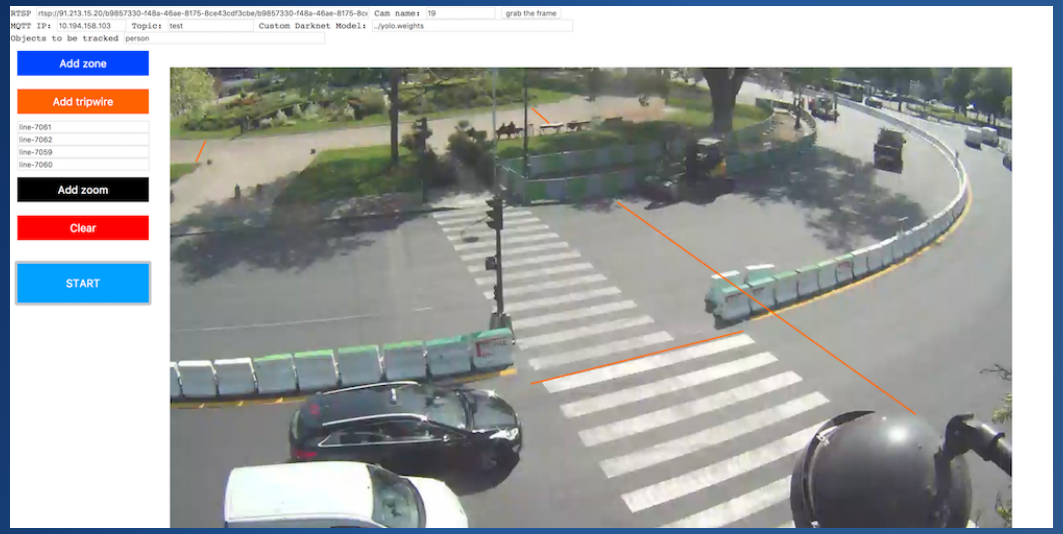
- What: Monitor/Detect
- Why: Analyze
- When: Predict
- What if: Optimize

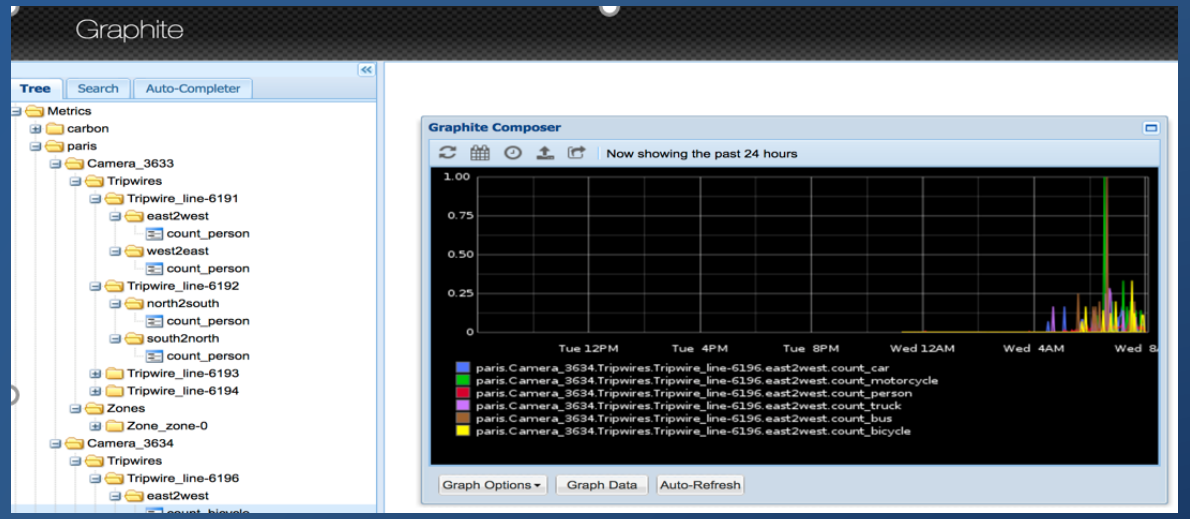
Digitizing Systems of Systems

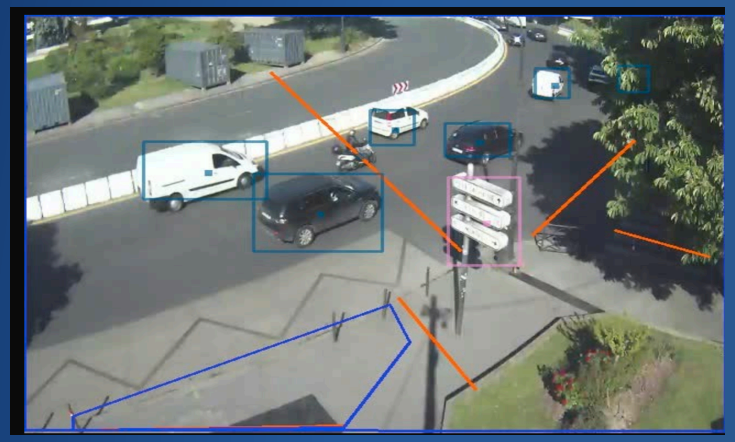
- What: Monitor/Detect
- Why: Analyze
- When: Predict
- What if: Optimize

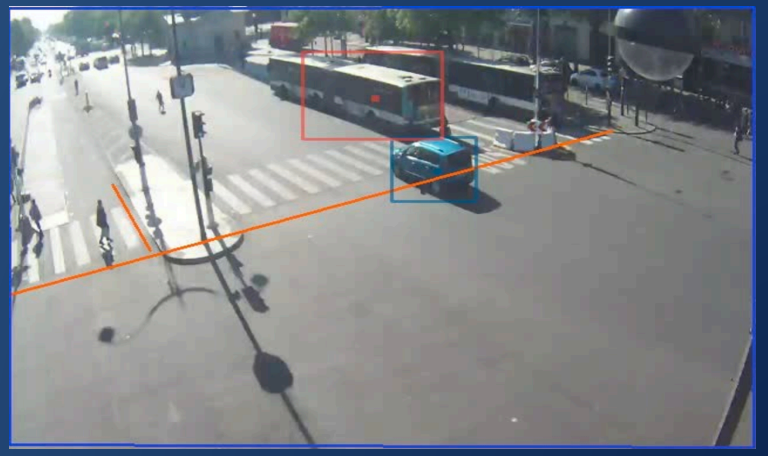
Cisco PIRL Immersive Lab - Paris Innovation & Research Lab

Deep Fusion Smart City and Transportation

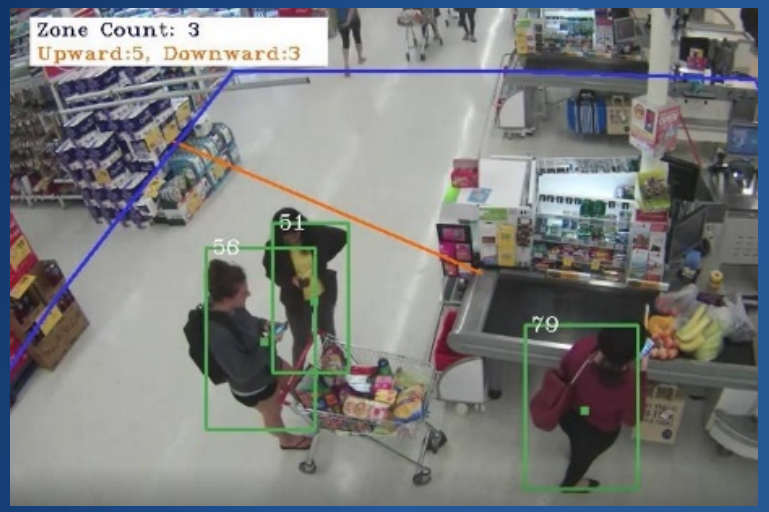


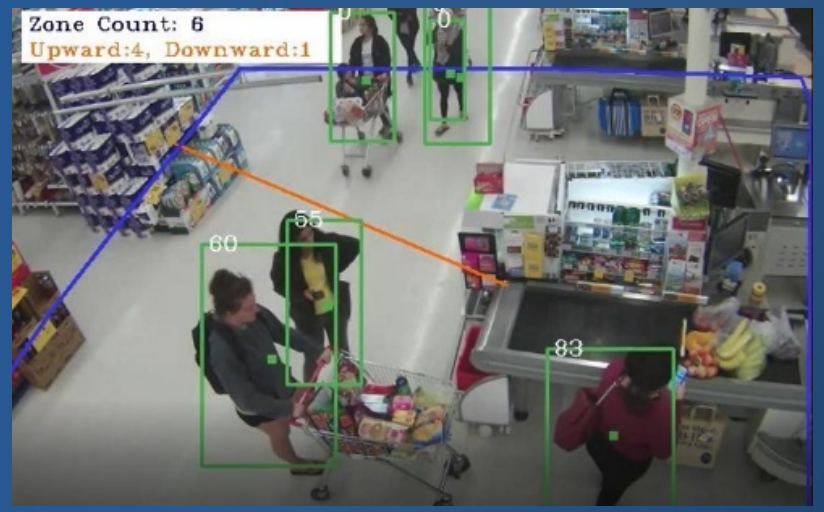


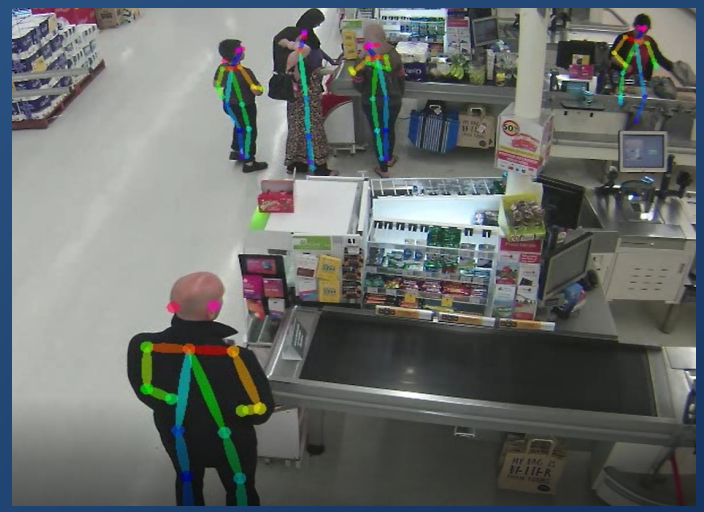




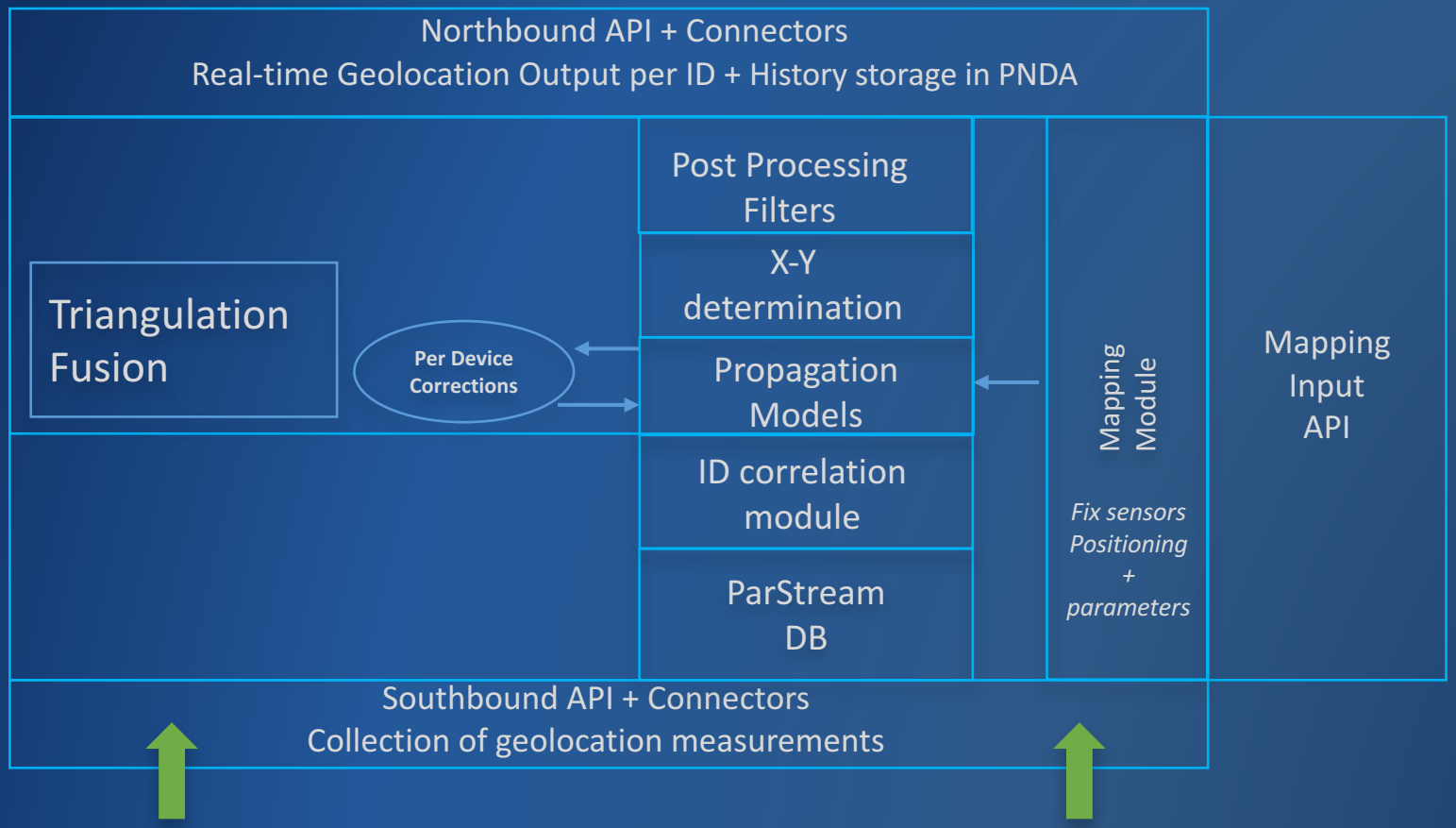
Deep Fusion: Queue management



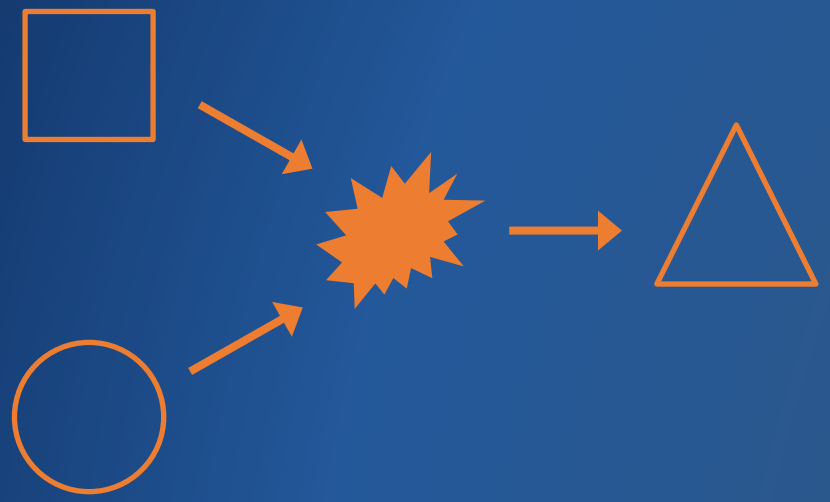




In-door geo-location



Sensor Data Fusion Frameworks



- Fusion of Numerical Properties
  - Kalman filter
- Fusion of Symbolic Properties
  - Symbols represents abstractions
  - Abstractions represent categories, relations, actions, events and knowledge
  - Knowledge is represented by (hyper)-graphs with (hyper)-edges connecting relations-to-relations or (hyper)-relations connecting relations with nodes

Behavioral emergence at scale

100 IPv6 ADDRESSES FOR EVERY ATOM ON EARTH

IP V6

340,282,366,920,938,463,463,374,607,431,768,211,456

4,294,967,296

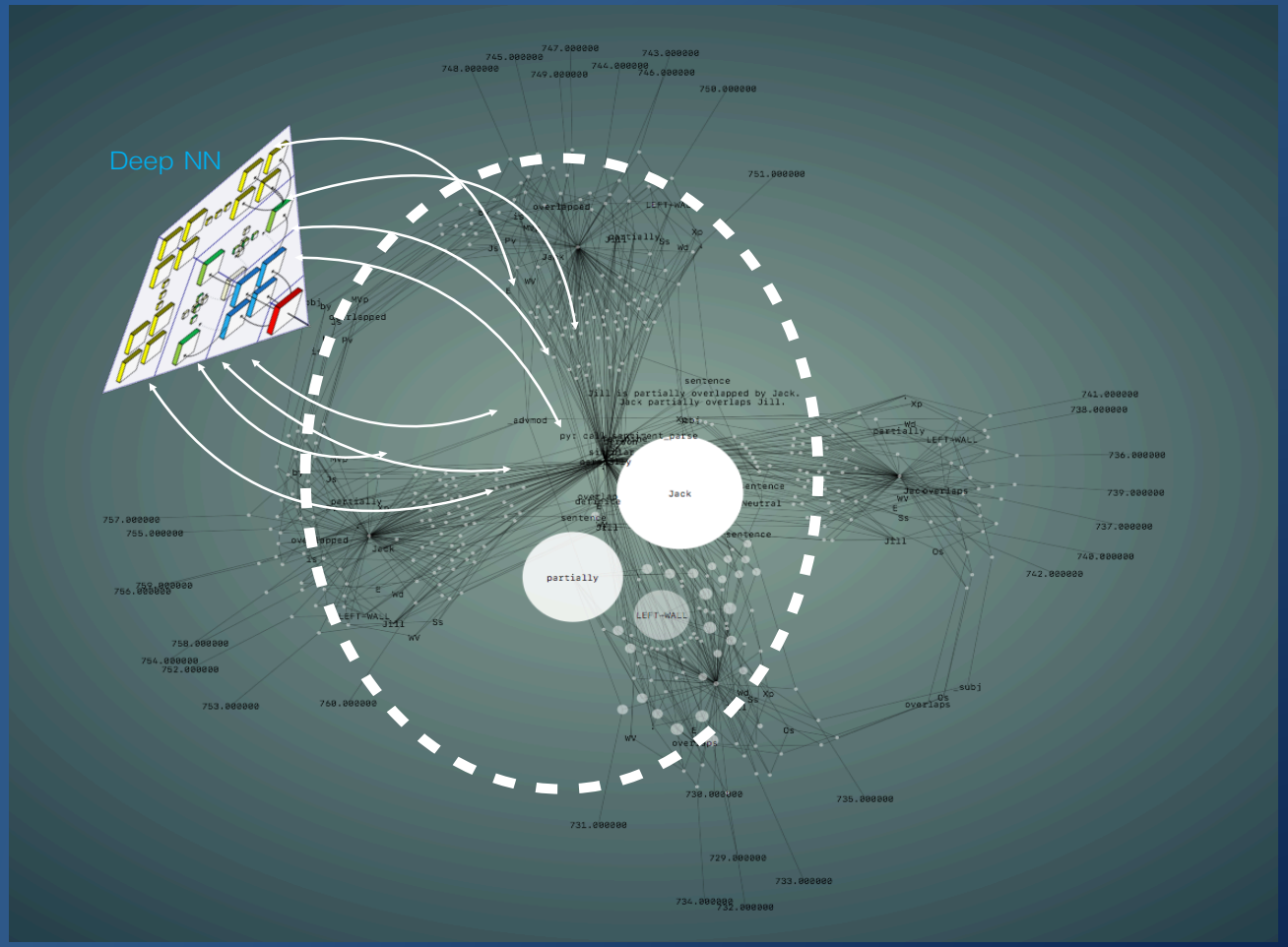
IP V4

Deep NNs <- pattern mining -> PLN Logic

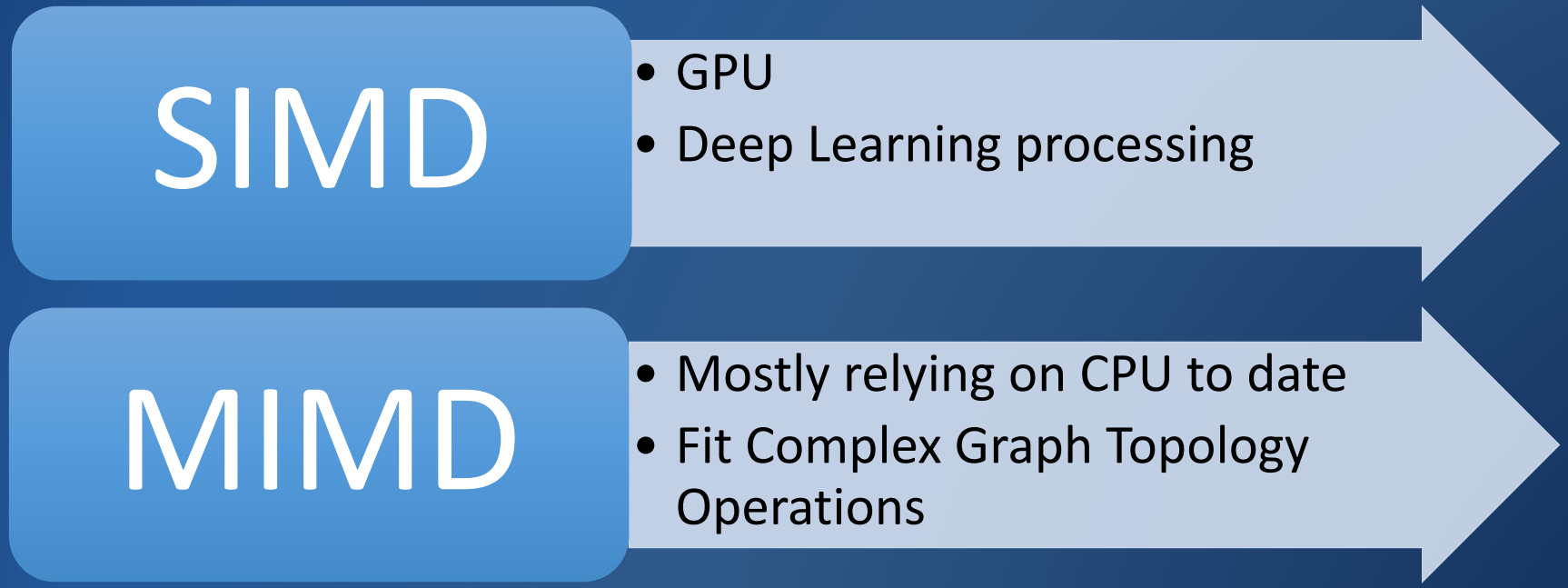
Ben Goertzel

Novamente LLC
corto.ai
Hanson Robotics

(Cisco PIRL Polytechnique Symposium March 2017)



SIMD vs MIMD processing



Agent supervision


CISCO