VERTIV™

# BICSI – Mainland Europe Conference and Exhibition
# Milan – 8th November 2018

***Part of the world we know is "fast" changing.***

Bicsi

Future

Evolution

Smart City

Trasformation

Edge

IoT

Passion

Opportunity

Cloud

Enthusiasm

Determination

Market trend

People

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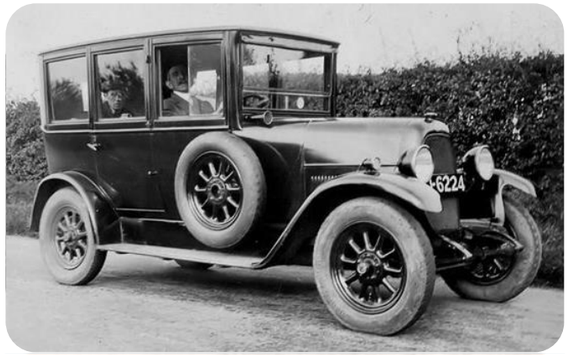
# Technology evolution: a mix of contribution from multiple sources

| Importance of the driver & car performances | VS | Optimisation |
|---|---|---|



*Yesterday*

*Today*

*Tomorrow*

?

# Learning from F1: it’s not anymore only the the pilot and the car

# The Car Is An Element Supported By The "Infrastructure"





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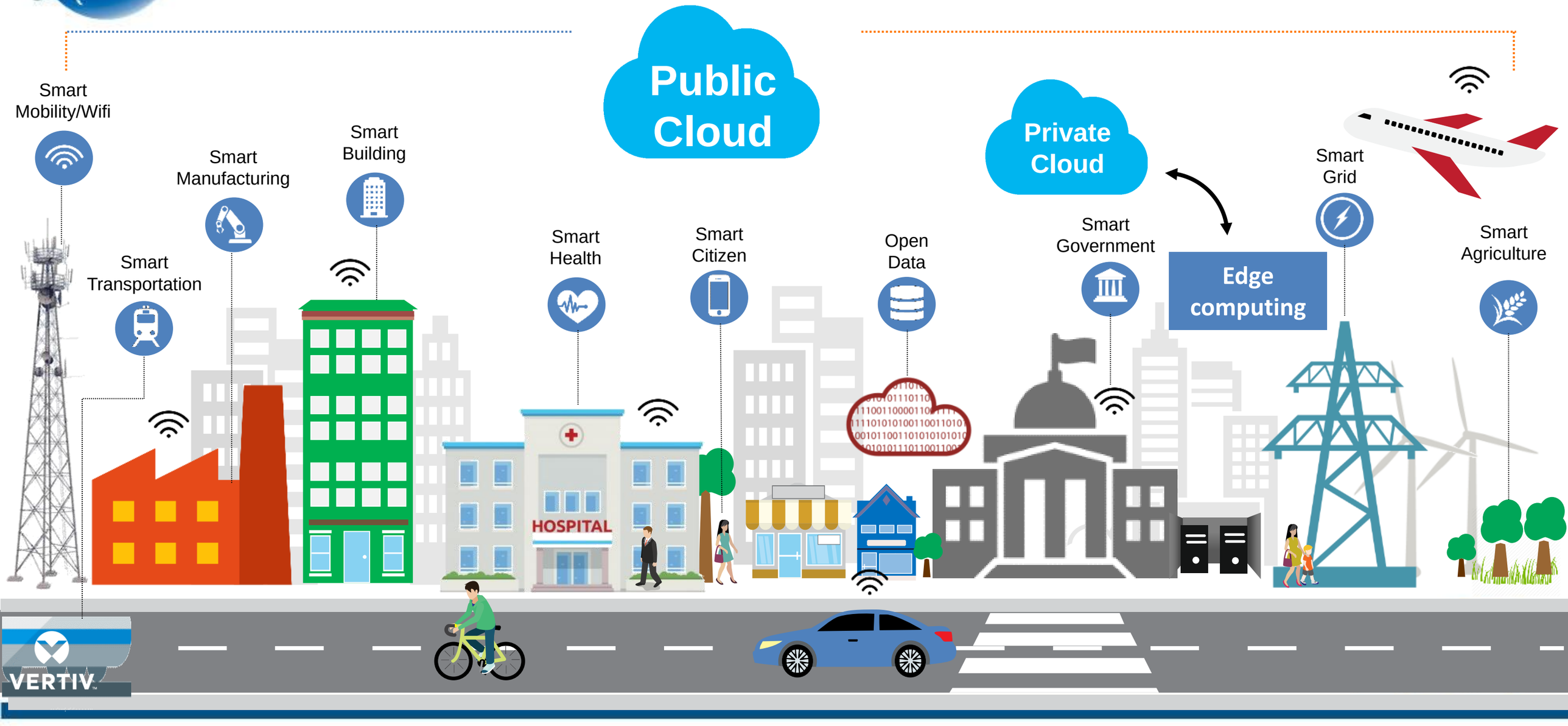
# ...And when unthinkable happens, there is the need to prevent the worse

# ON THE MODERN FORMULA ONE RACING TRACK TYRES AND “BOX” ARE STRATEGIC TO WIN together with car technology & safety.

## WHAT’S ABOUT OUR DAILY LIFE?

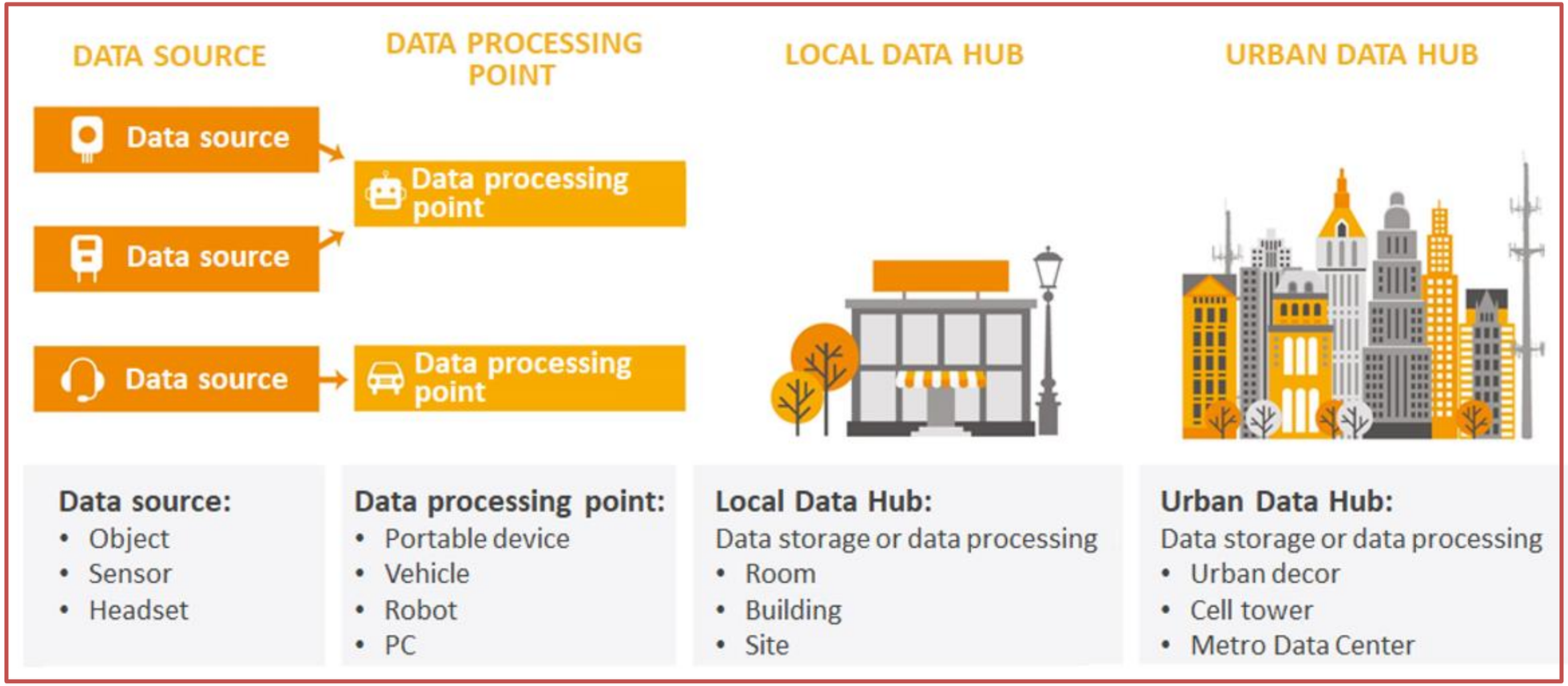
# We live in a simple complex environment



# What does it mean “Smart City”

«City characterized by the integration of know-how, structures and technologically advanced means, of the communication and information society, aimed at growth sustainable and improving the quality of life. *Definition from vocabulary*.

In practice?




**Data source:**
- Object
- Sensor
- Headset

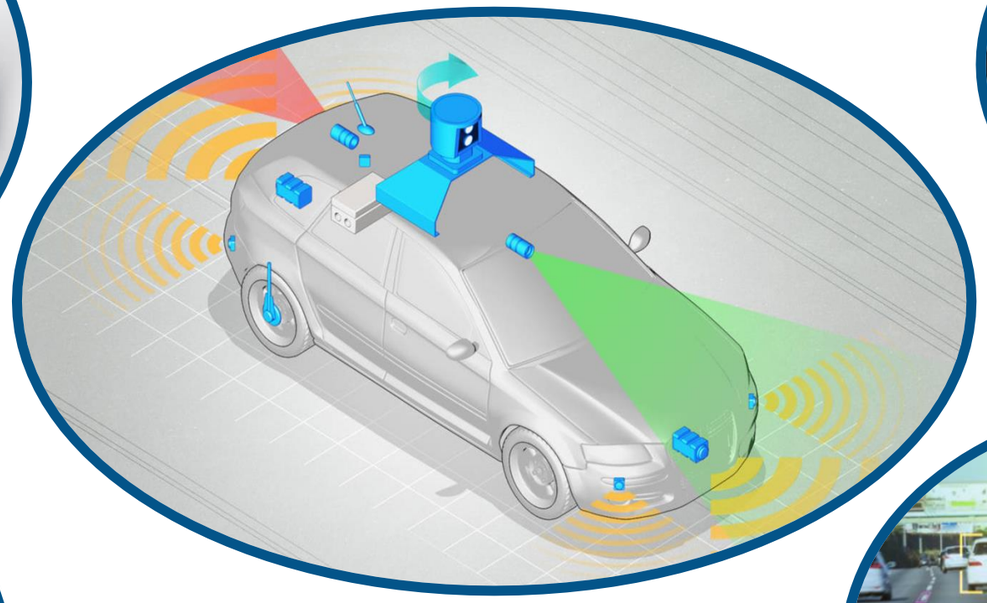
**Data processing point:**
- Portable device
- Vehicle
- Robot
- PC

**Local Data Hub:**
Data storage or data processing
- Room
- Building
- Site

**Urban Data Hub:**
Data storage or data processing
- Urban decor
- Cell tower
- Metro Data Center


**Regional Data Hub:**
- Cloud availability area
- Colocation Data Center

# Smart City & Self Driving Car: it’s not just the car but a strong  Infrastructure is required!



# Smart Agricolture: changing the paradigm!

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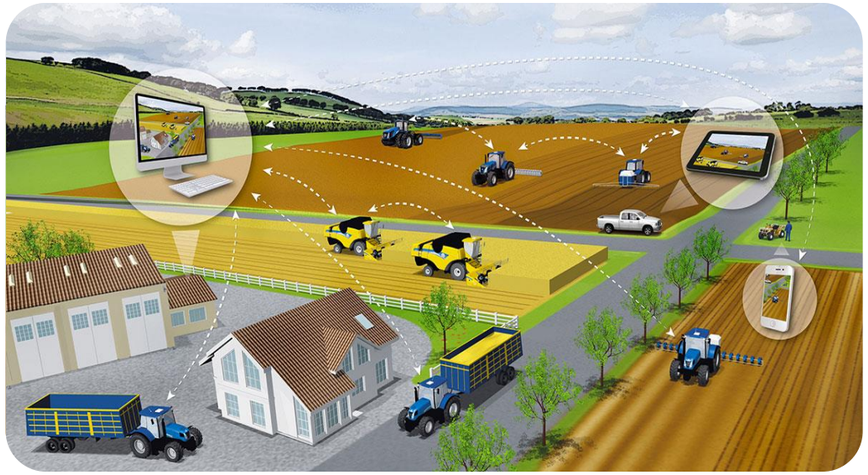

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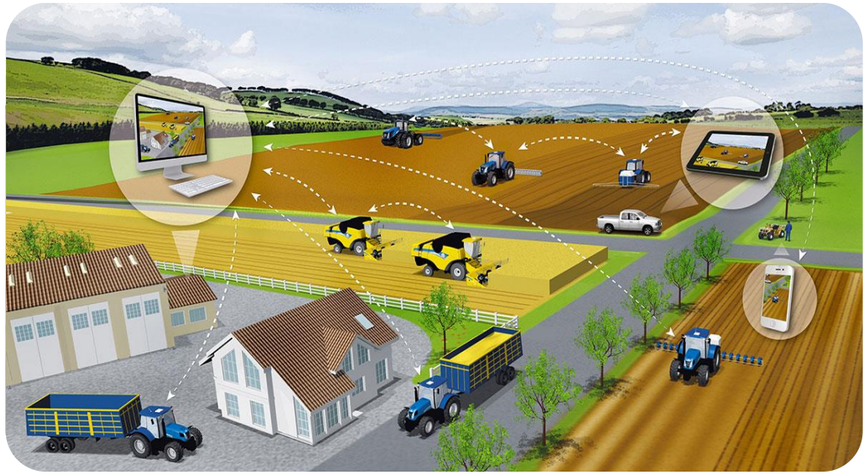

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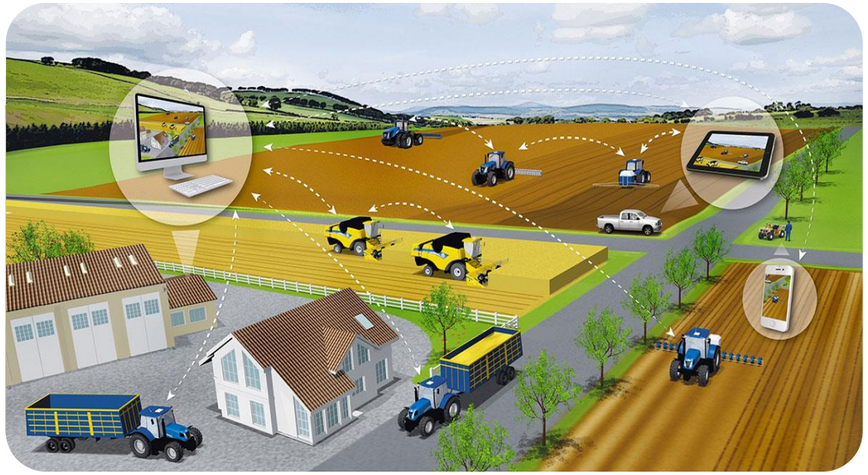
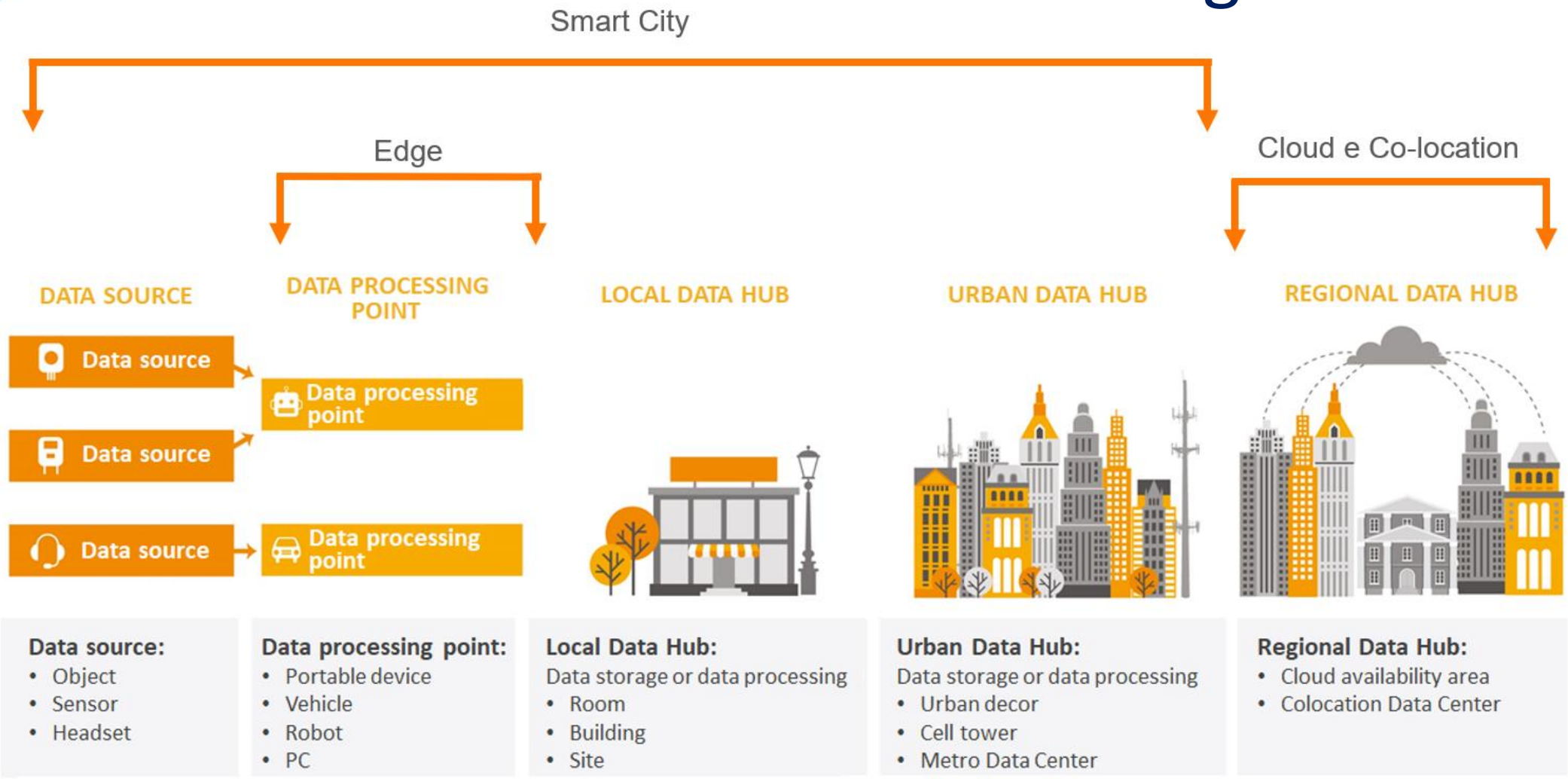



# Where Data and Computing Capacity are the Infrastructure Challenges

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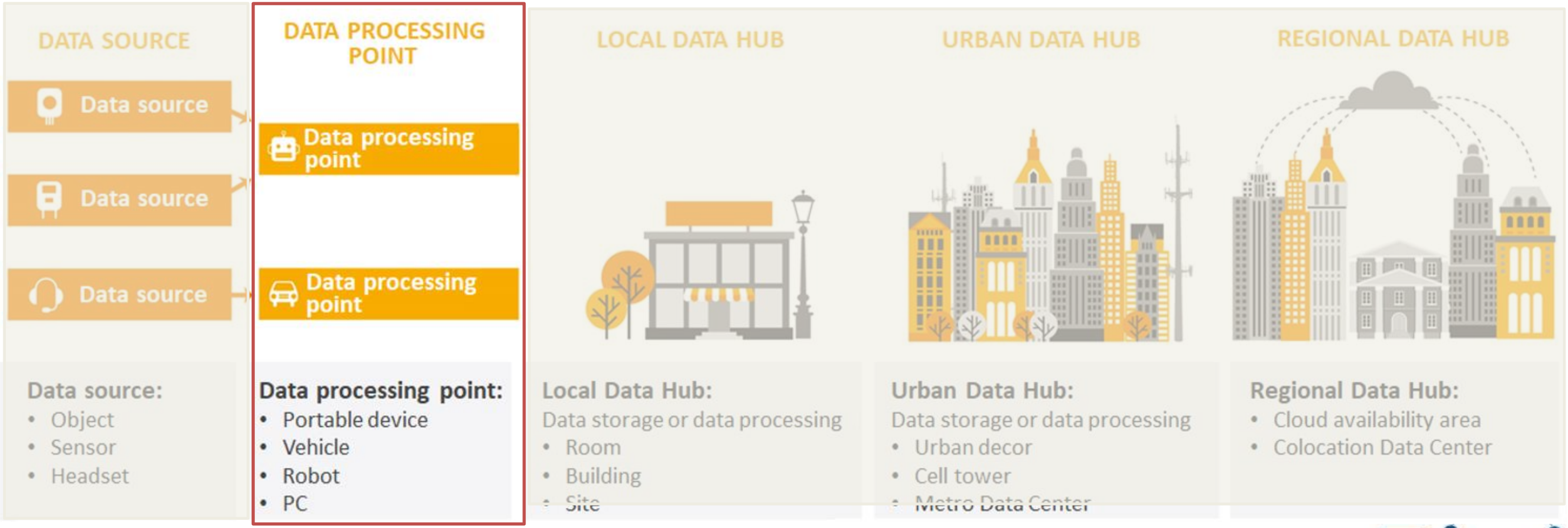
# What is EDGE COMPUTING

«The edge computing is a distributed and open IT architecture with decentralized processing power, set up for mobile computing technologies and the Internet of Things (IoT).

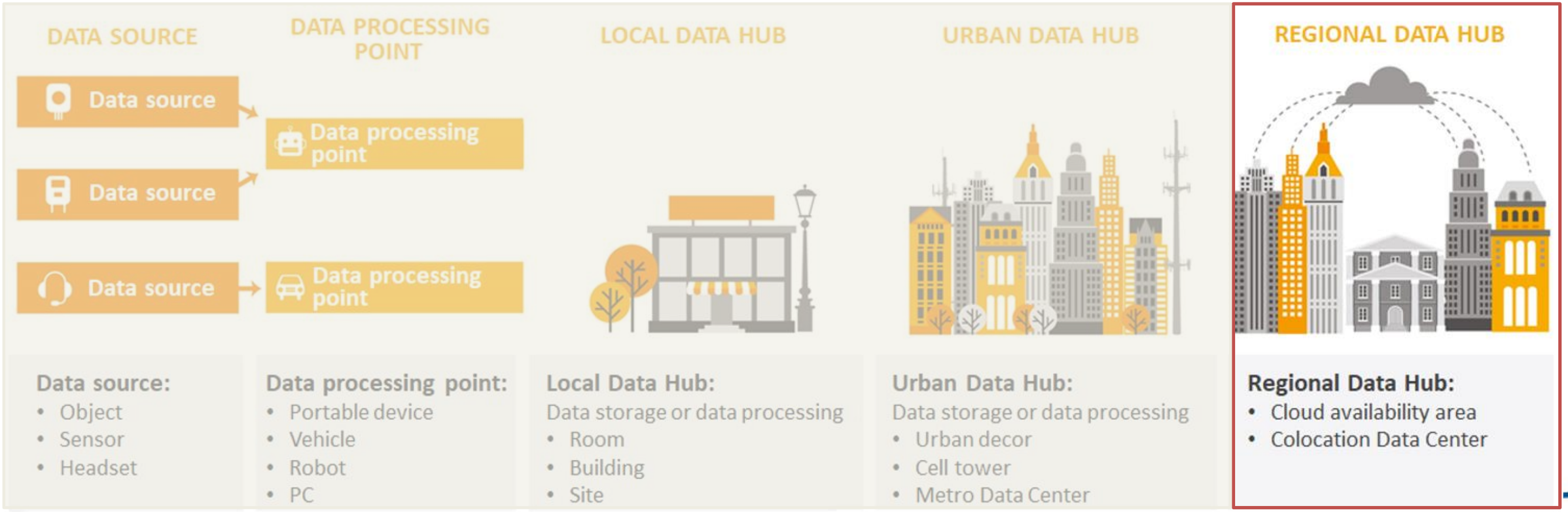
In edge computing, data are processed by the device or by a local computer/server, instead of being transmitted to the data center. It can be defined as an Information and Communication Technology resource that is positioned and activated near the end user or, as in the case of the Internet of Things, close to the data source »



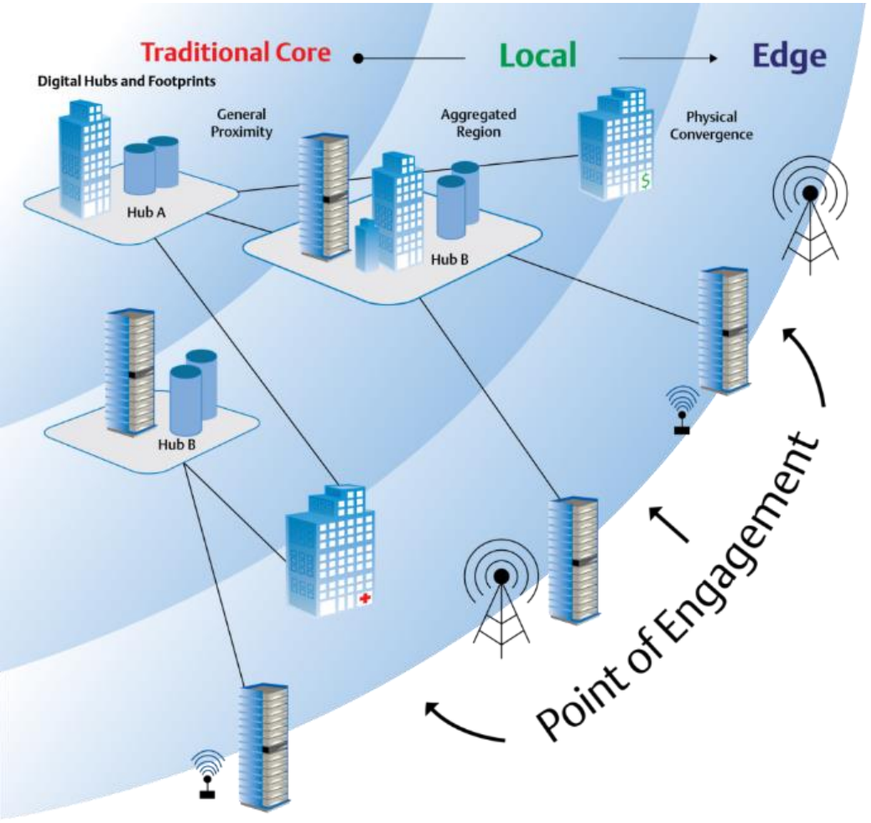
# Cloud e colocation

«Cloud computing is a flexible execution environment that allows network and on-demand access to a shared set of computing resources that can be configured as services at various levels of granularity. These services can be requested, provided and released with minimal user effort and minimal interaction with the supplier»

«A Colocation Center (also known as co-location o colo), is a type of data center where space, equipment and band are available to offer a paid IT services to their customers»



# Summarizing: Emerging IT trends



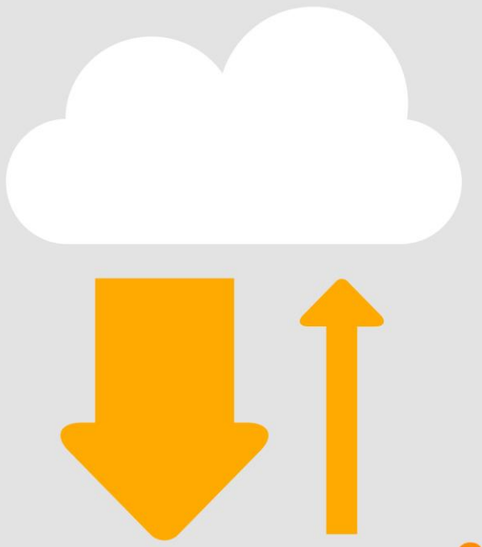

- Devices everywhere. The "connected devices" model is becoming real and expansive.
- The Time Factor. More applications are demanding near real-time response.
- Organizations are re-evaluating how to best deliver needs from "edge to the core".

| Examples |
| --- |
| Edge is near: Self-driving cars, logistic, mobile society smart cities and more |
| Video explosion, online transactions - universe doubles every two years |
| Security move to the front seat, both physical and virtual |
| Time: Growing demands, user needs requires rapid response and agility |
| Cost: More IT is needed, but must be conducted economically |

## CURRENT STATE

**DATA MEETS CONSUMPTION**

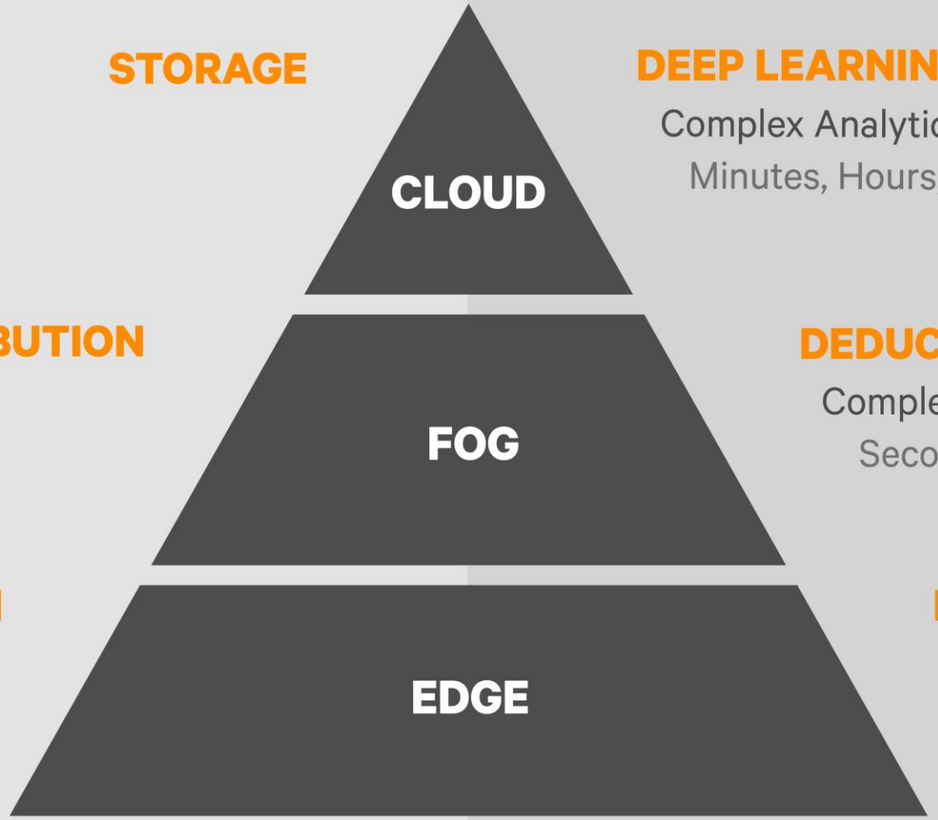
**EDGE TODAY**



**STORAGE**

**DISTRIBUTION**

**CONSUMPTION**




## FUTURE STATE

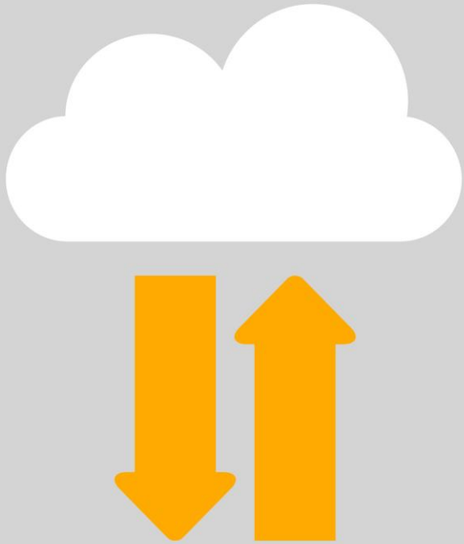
**DATA MEETS THINGS**

**EDGE TOMORROW**

**DEEP LEARNING**
Complex Analytics
Minutes, Hours, Days

**DEDUCTION**
Complex Validation
Seconds

**DECISION**
Data Generation
Binary Decisions
Milliseconds



# In addition to the FTTH, 5G is the enabler

## 4G

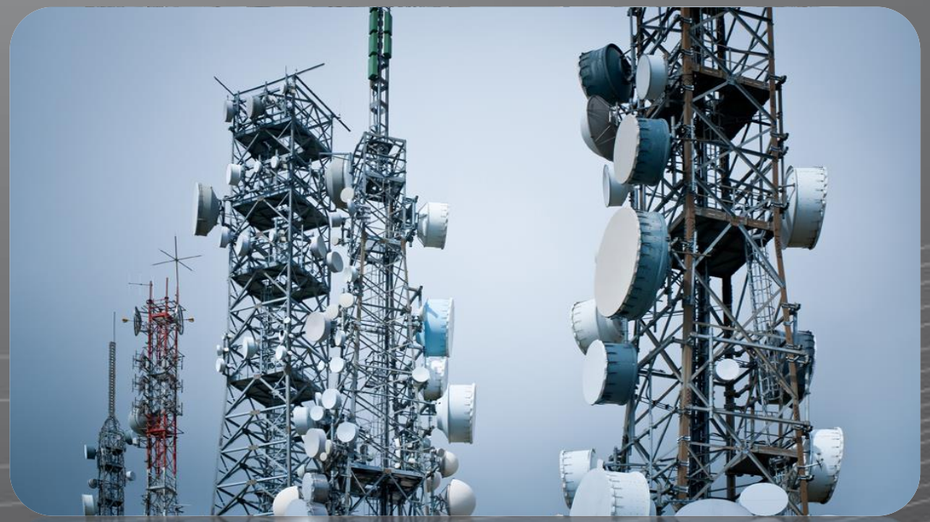
## 5G

Latency and bandwidth NEEDS are driving infrastructure deployments

**75 Mbps**

**215,000x Cell Sites**

**10 ms**



**1000x FASTER**

**600,000x Cell Sites**

**<1 ms**

*Additional Notes

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# Focusing @ Edge level: 4 Archetypes

## Data Intensive

Amount of data too great to be transferred over the network

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- Virtual Reality
- HD Content Distribution
- High Network Costs
- Smart Home/Buildings
- Smart Factories

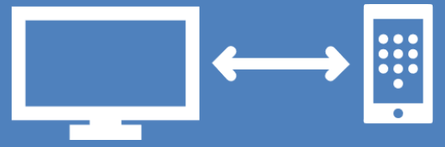
## Human Latency Sensitive

Optimization for human consumption

- Website Optimization
- Augmented Reality
- Smart Retail
- Natural Language Processing

## M2M Latency Sensitive

Optimization for machine consumption



- Real Time Analytics
- Arbitrage Market
- Smart Security — Facial Recognition
- Smart Grid

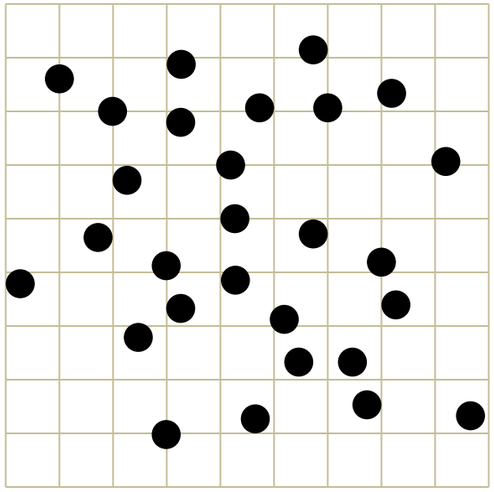
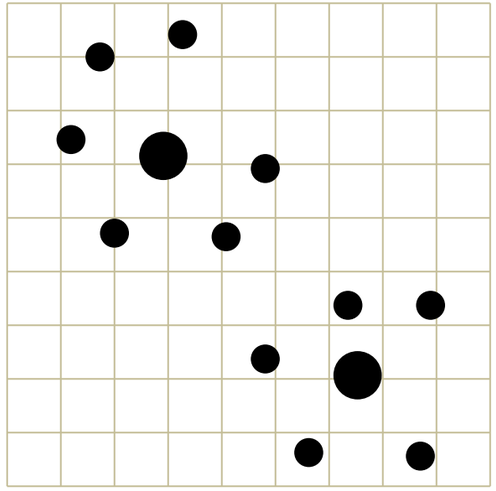
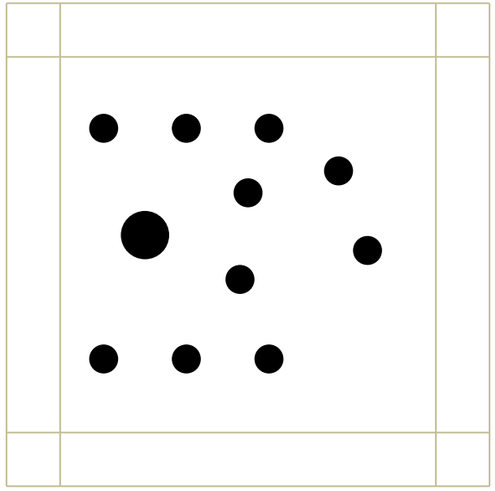
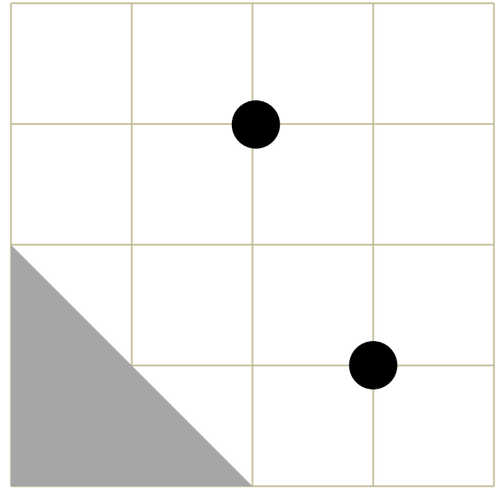
## Life Critical

High risk of injuries caused by machines interacting with humans

- Digital Health
- Autonomous cars
- Drones
- Smart Transportation & Logistics
- Autonomous Robots

# Capacity profile

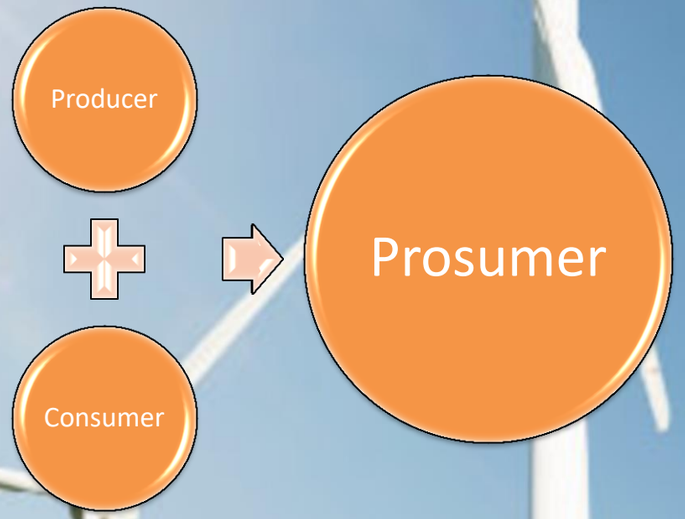
# What does the footprint look like?

| | Geographically Disperse | Hub and Spoke | Locally Concentrated | Self-Sustained Frontier |
|---|---|---|---|---|
| |  |  |  |  |
| ***Examples*** | ▪ Retail<br>▪ Consumer finance | ▪ Communications<br>▪ Logistics | ▪ Campuses: Data Centers, Co-location, Industrial, Healthcare, Education | ▪ Solitary Criticality |
| ***Geography*** | ▪ Global / Regional | ▪ Global / Regional | ▪ Local | ▪ Local<br>▪ Remote |

**Every «Dot» includes of Energy Using Devices with some degree of Demand Flexibility and/or Energy Storage capability**

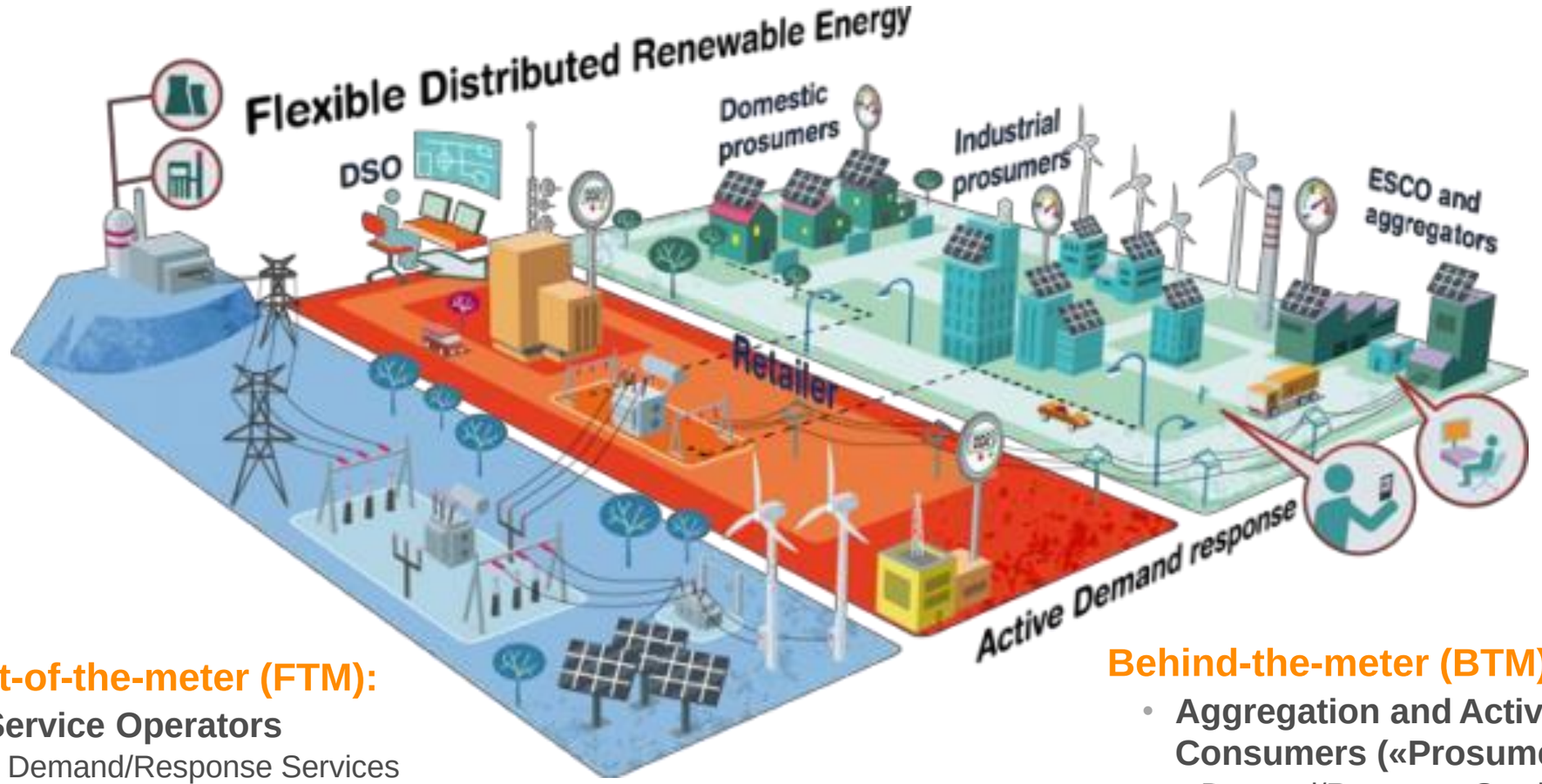
# …and the way of understanding energy
# FROM CONSUMER TO PROSUMER

Data centers and other types of critical infrastructure have energy generation systems but these are used to maintain **availability during a grid outage** rather than as a **primary energy source**. There are indications however that this relationship is beginning to shift.




There have been previous efforts to encourage more critical facilities to use batteries or generators to take part in so-called **demand/response with the grid** – reducing grid energy use or feeding energy in – but uptake has been relatively modest to date.

# Changing the paradigm in energy management through IT




**Front-of-the-meter (FTM):**

- **Service Operators**
  - Demand/Response Services
  - Levelised Cost of Energy
  - Renewables Integration

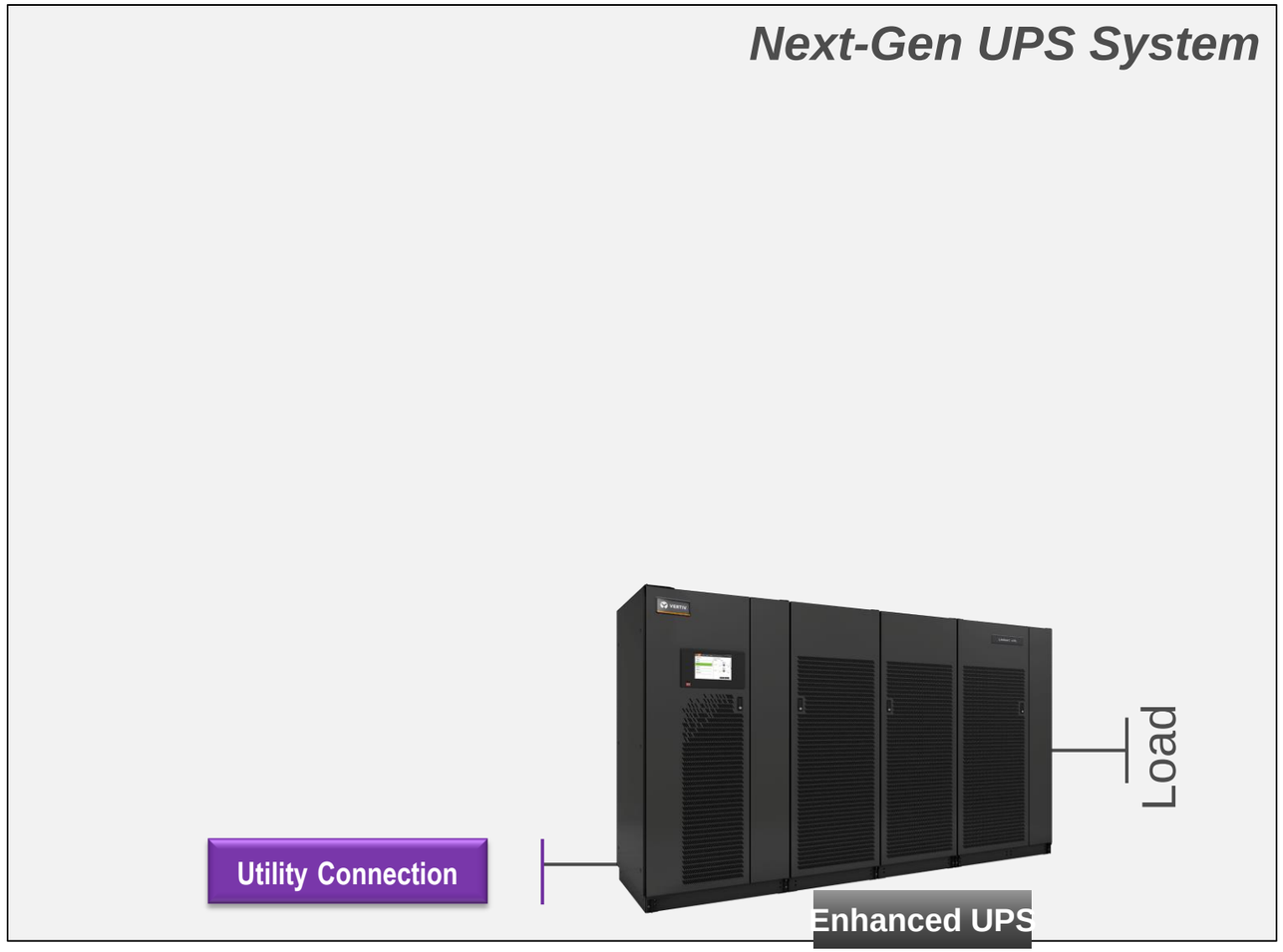
**Behind-the-meter (BTM):**

- **Aggregation and Active Consumers («Prosumers»)**
  - Demand/Response Services
  - Energy Cost Optimisation
  - Micro-Grids

# Influence of energy storage trends on the evolution of the ups

| | |
|---|---|
| **Lower lithium-ion pack costs** | **Dramatic increase in lithium-ion adoption for UPS systems** |
| **Increased lithium-ion energy density** | **UPS systems can increase battery capacity without increasing footprint, enabling new services** |
| **Increased sophistication of cloud-based dispatch** | **UPS acts as an energy storage device, shifting when electrons flow from the grid to the battery and/or end user based on dispatch instructions** |
| **Increased aggregation of energy storage** | **UPS systems join aggregations of storage assets, enabling owners with smaller systems to participate in markets** |

# The next generation UPS



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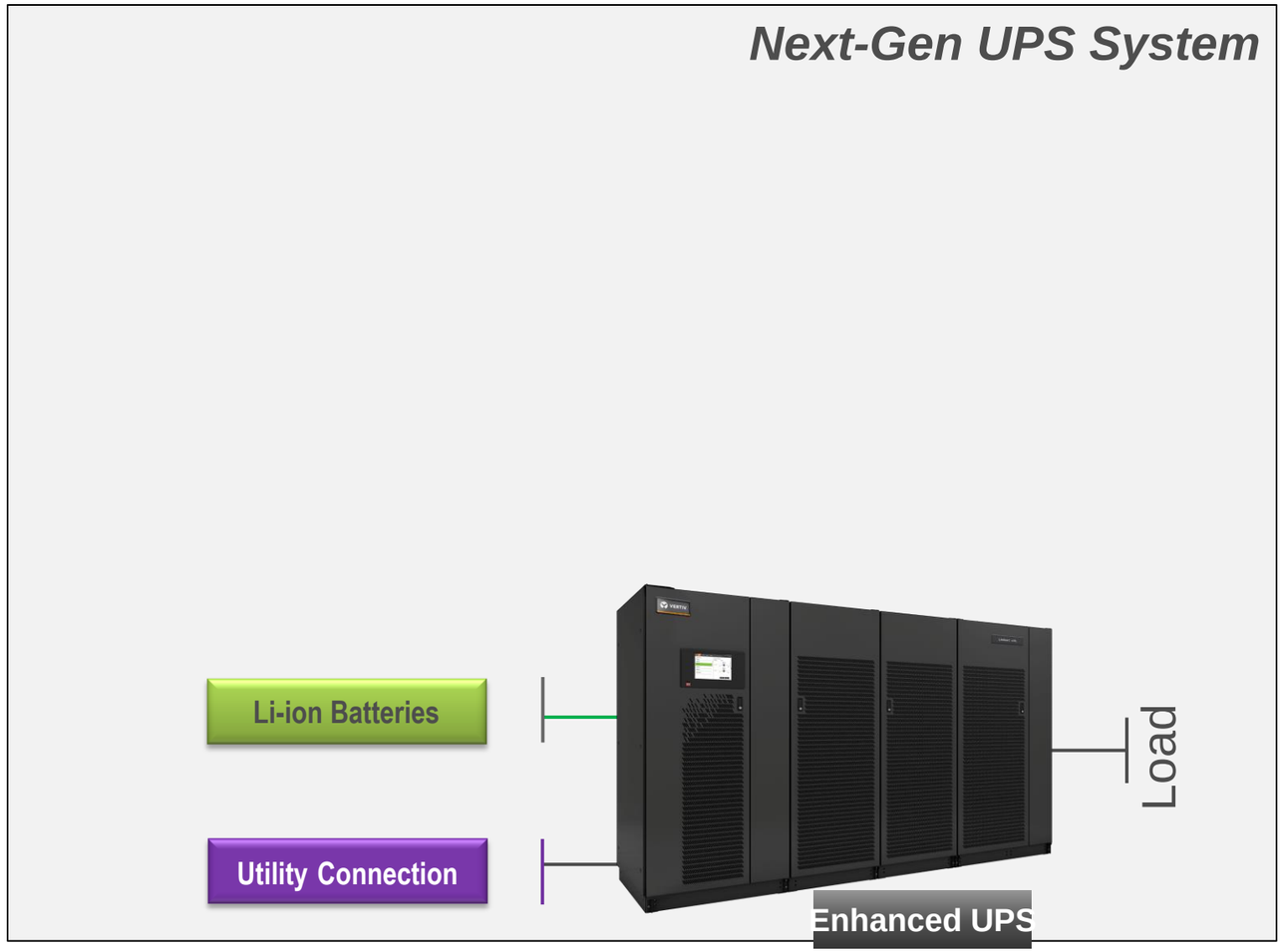

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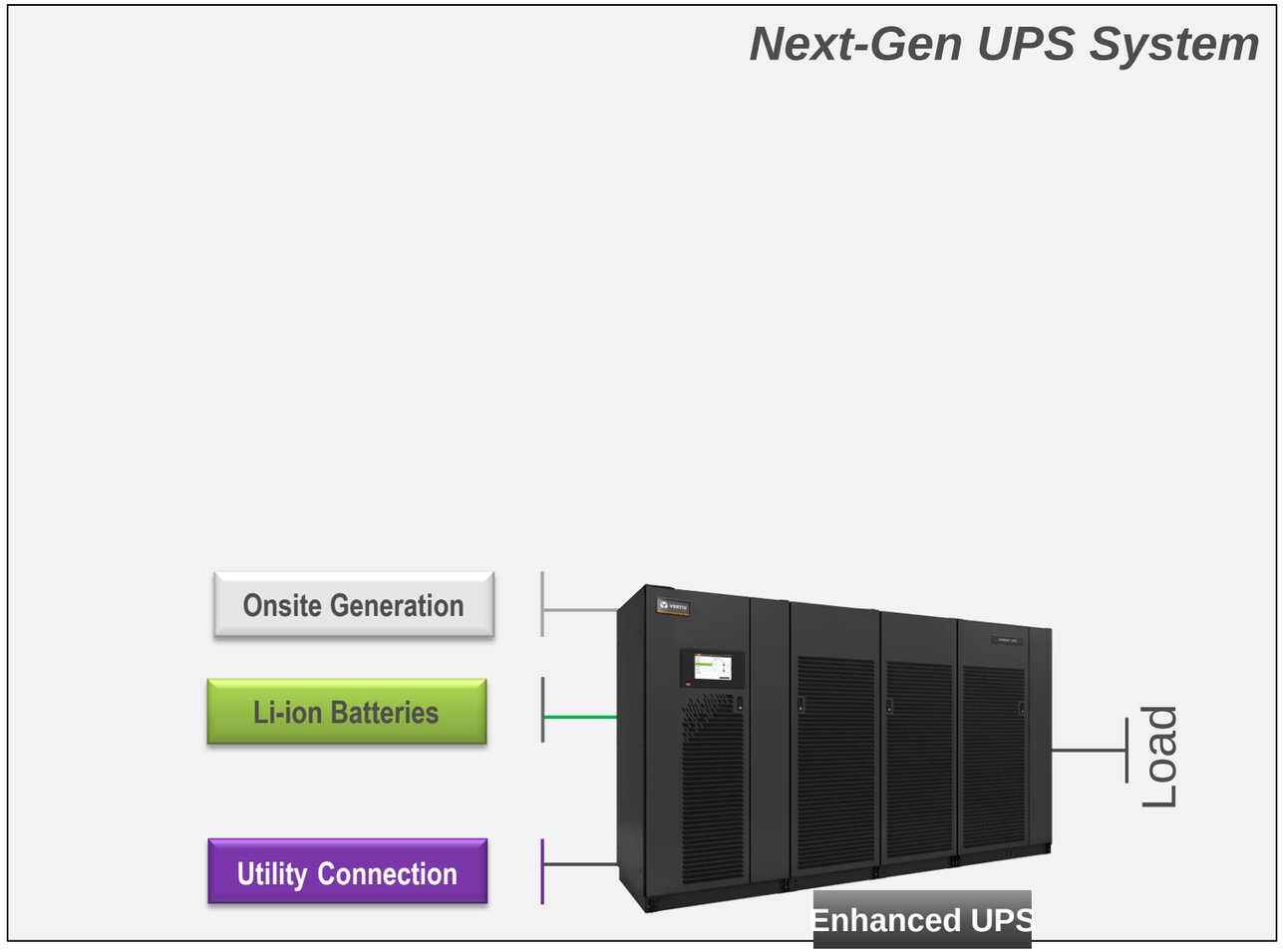

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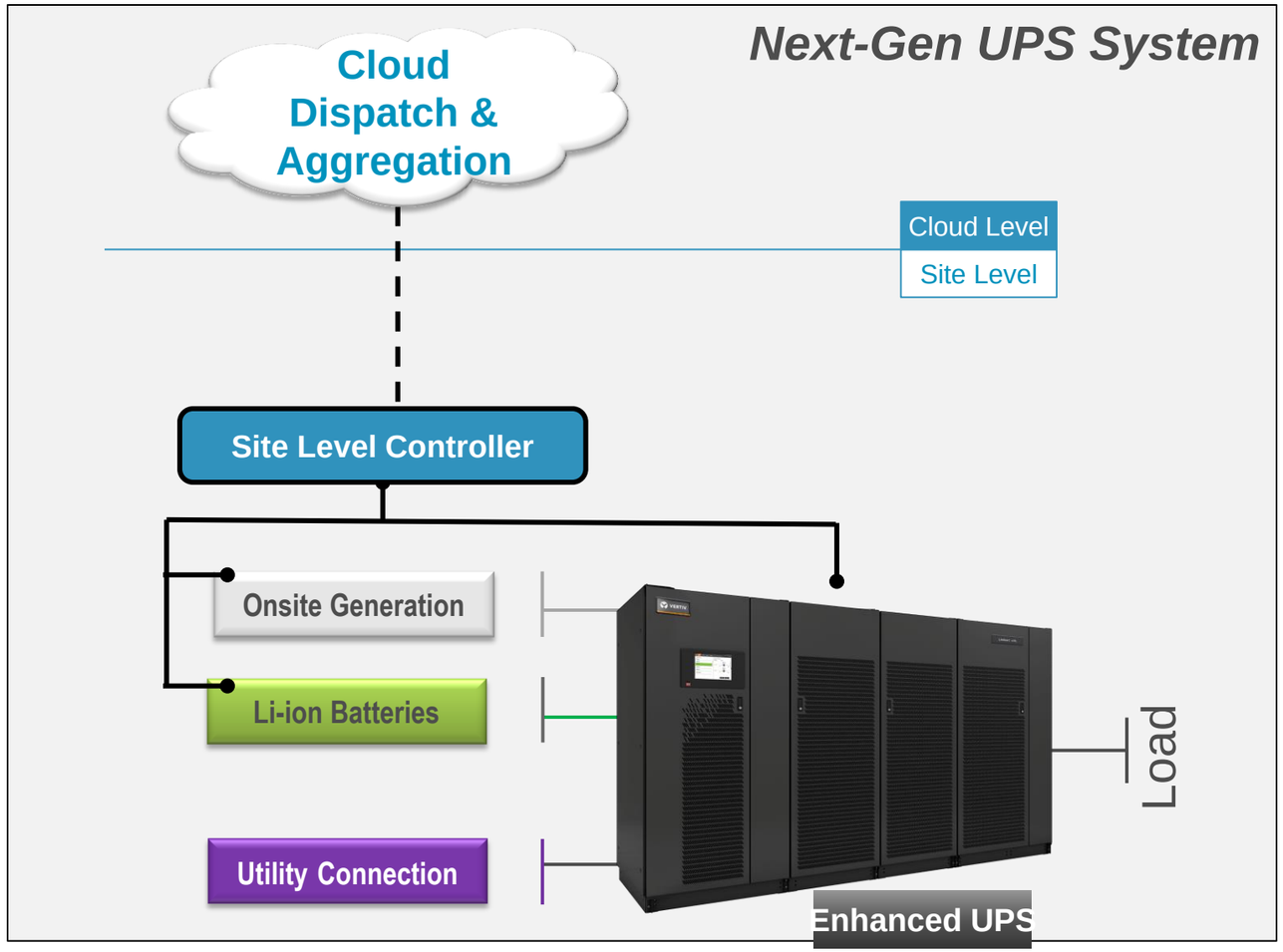
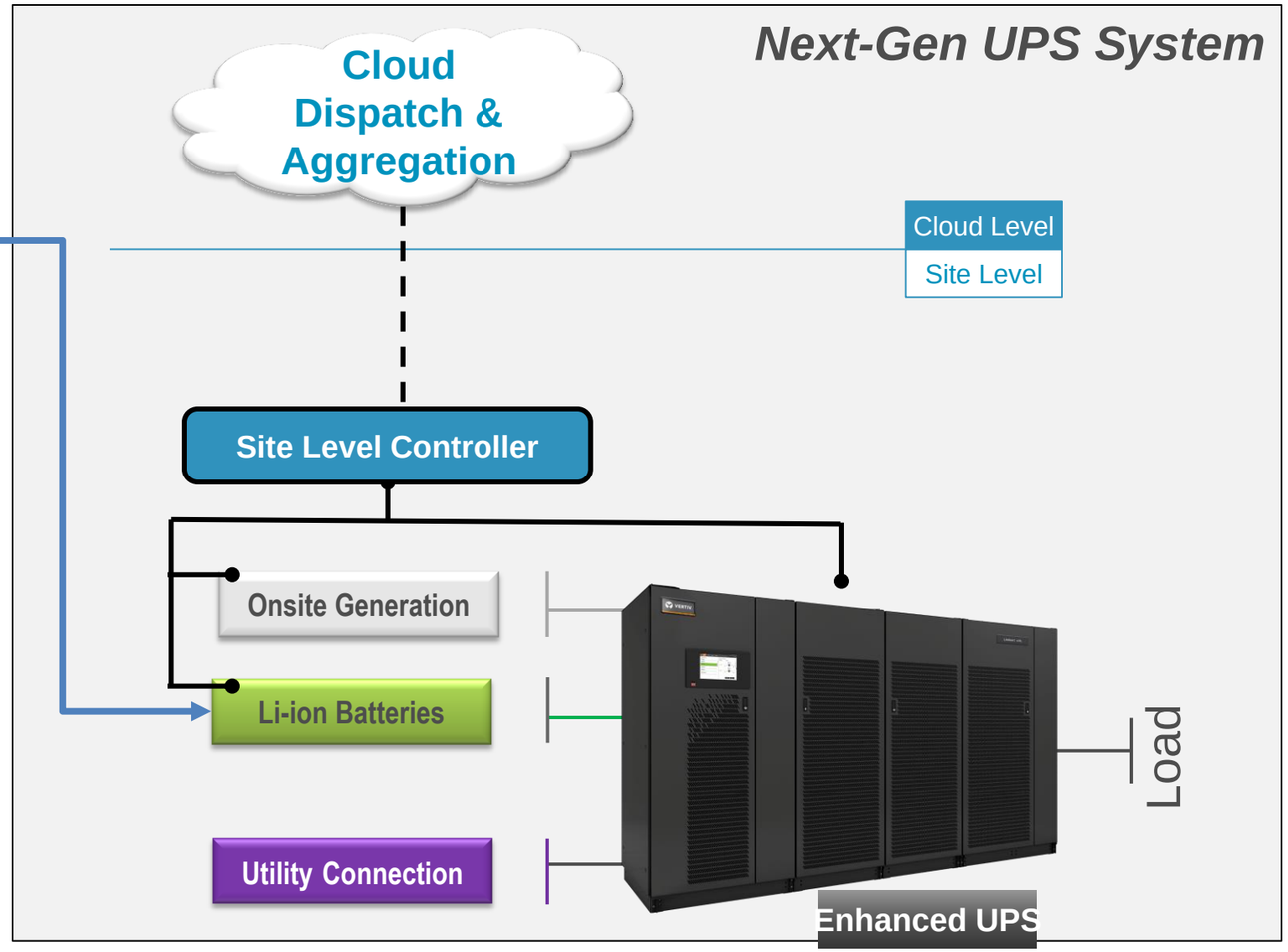


# The next generation UPS

**Falling cost of Li-Ion batteries**

→

**Increased adoption of Li-Ion batteries**



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**Falling cost of Li-Ion batteries**

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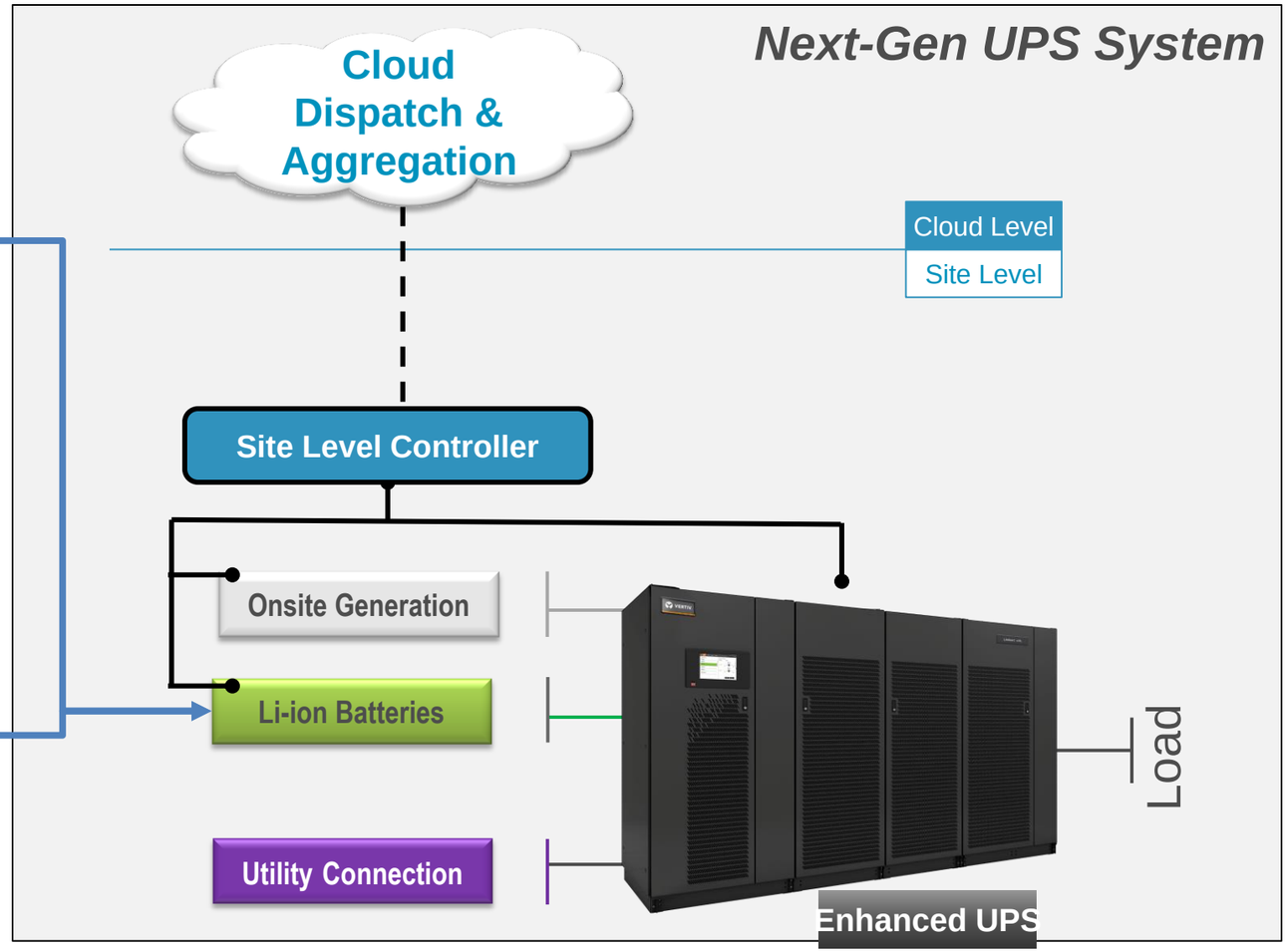
**Increased adoption of Li-Ion batteries**

**Increasing density of Li-Ion batteries**

→

**More energy capacity**



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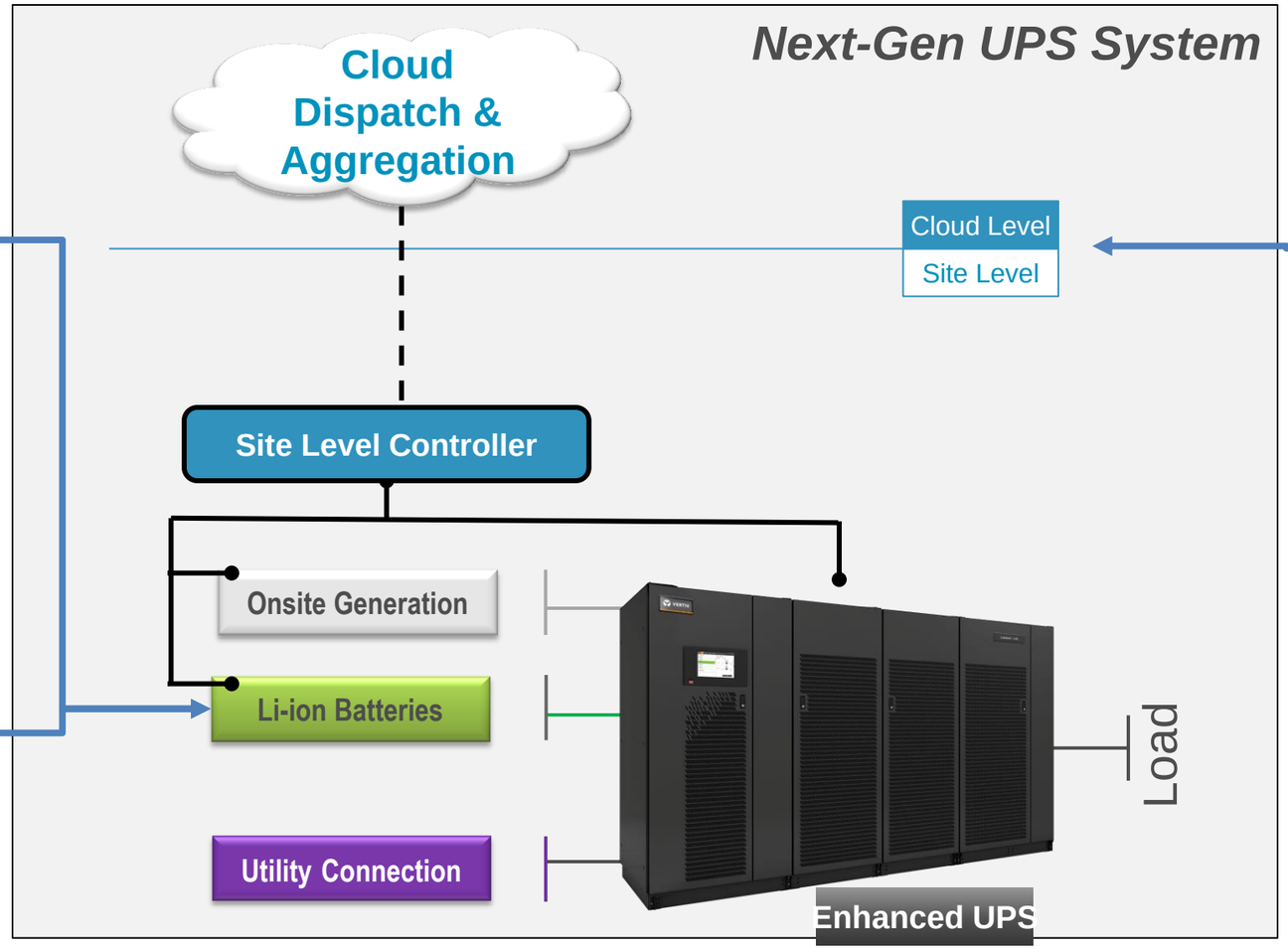


**More sophisticated cloud dispatch**

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**Cloud dispatch for UPS systems**

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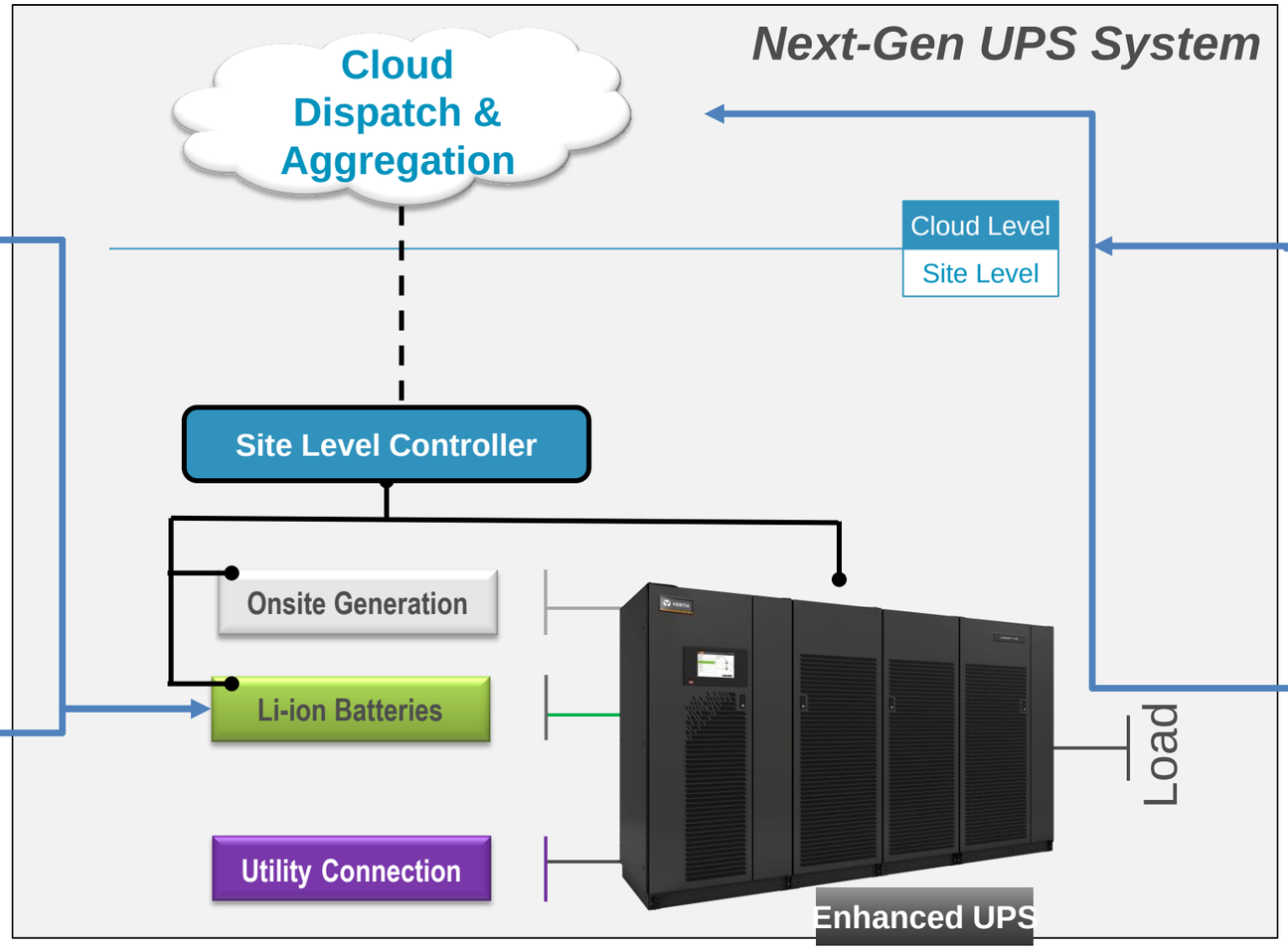


**More sophisticated cloud dispatch**

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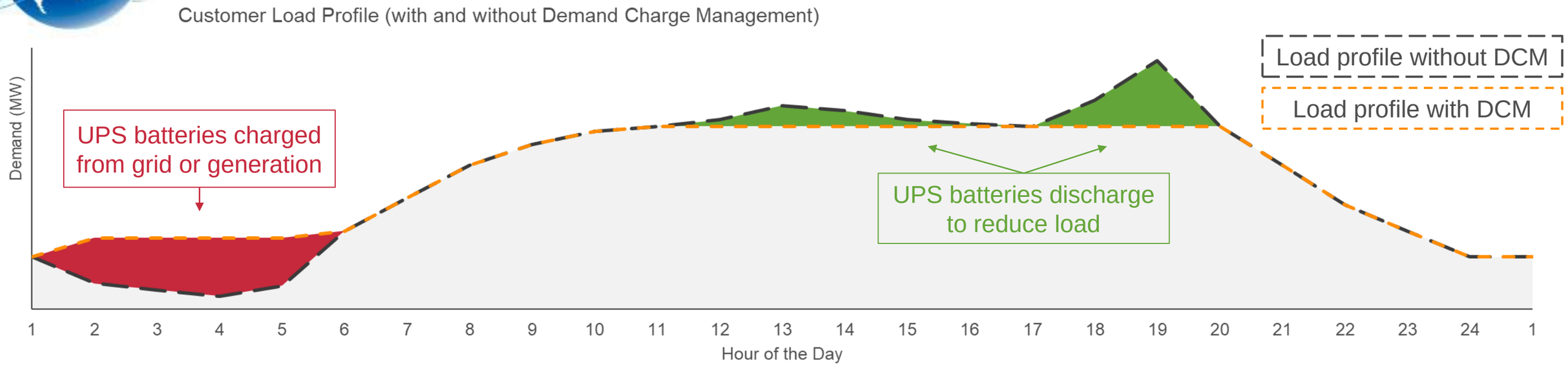
**Cloud dispatch for UPS systems**

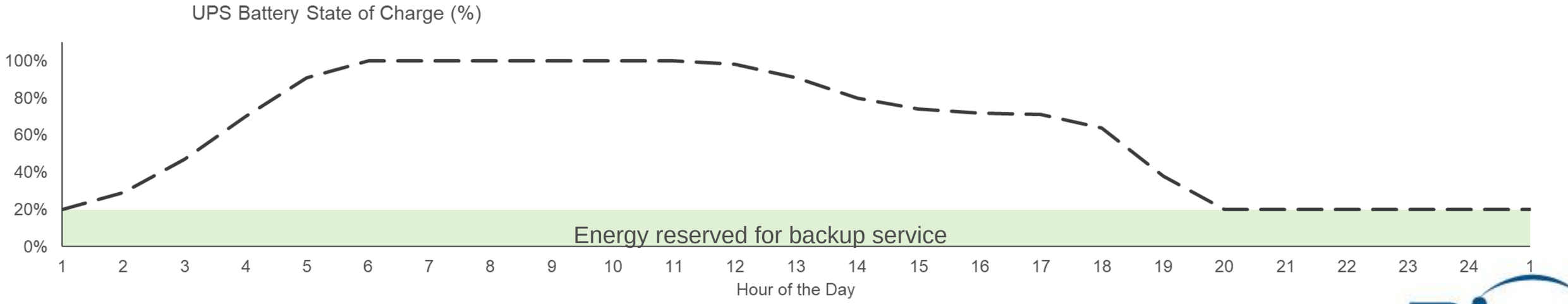
**Growth of ES aggregation**

→

**UPS systems join aggregations**

# Next Generation UPS: Demand Charge management



# There is probably only one direction

For further questions, contact:

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