A Primer on Edge Intelligence for Smart Grids

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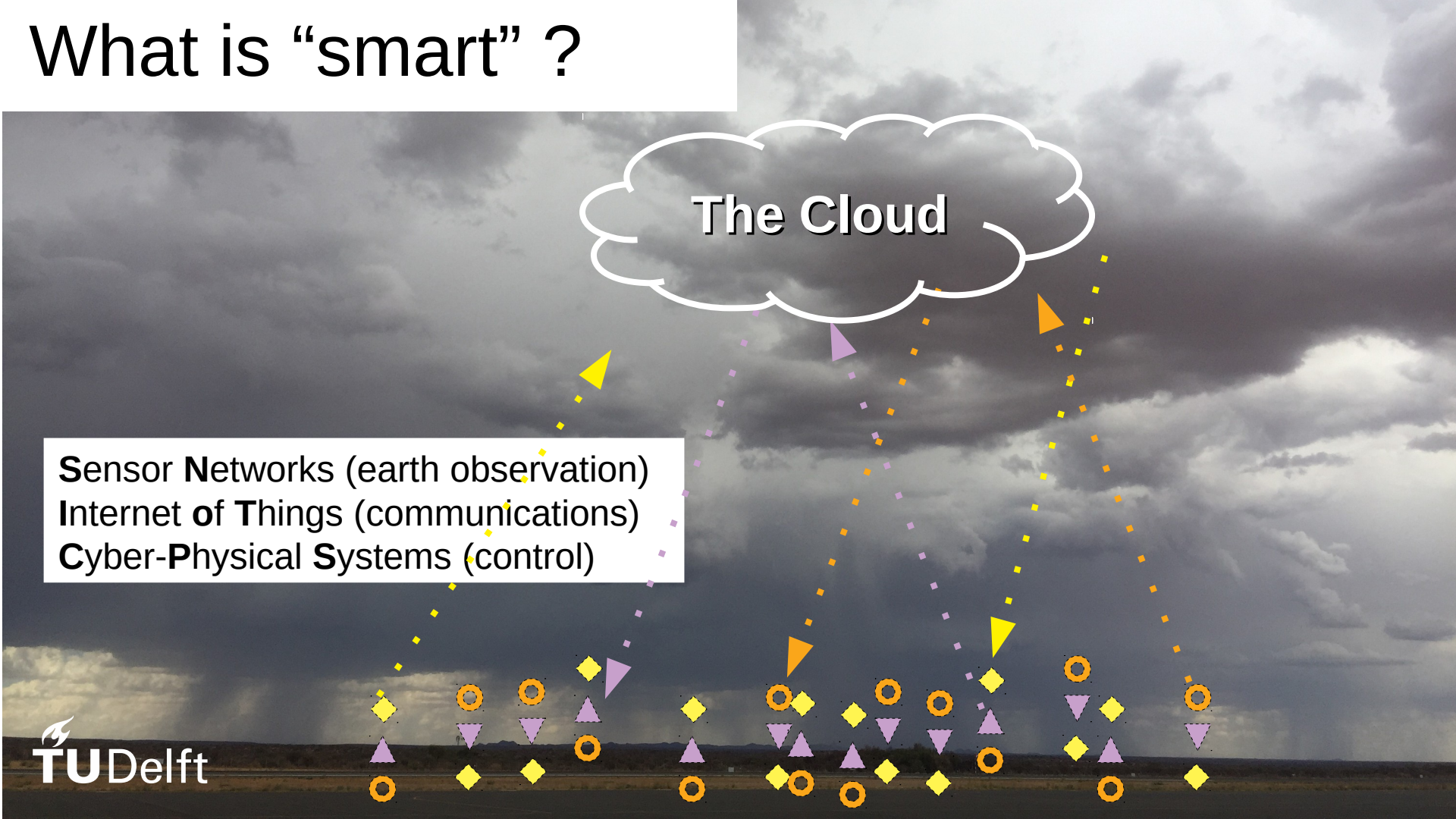
TU Delft

Presentation Objective

- What
- Why
- Where

Provide you with a framework to think about Edge Intelligence in smart grids

What is “smart” ?



Sensor **N**etworks (earth observation)
Internet **o**f **T**hings (communications)
Cyber-**P**hysical **S**ystems (control)

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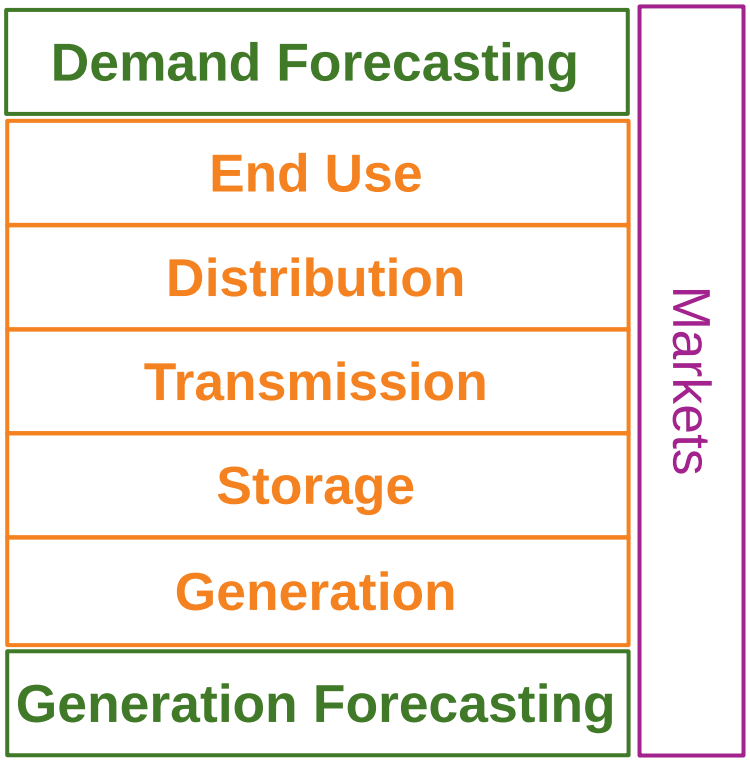
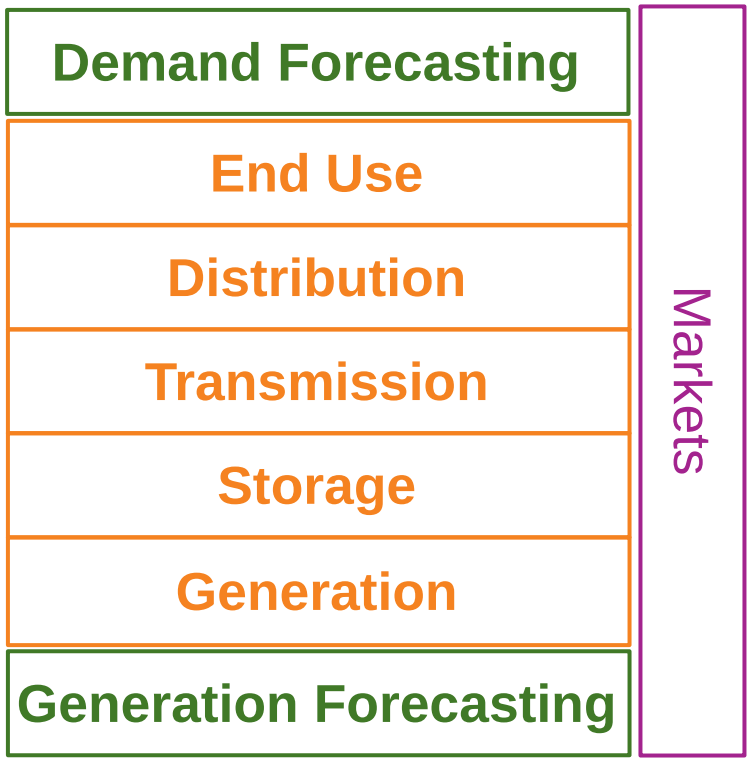
What are Smart Grids?



What are Smart Grids?

- **Secure & real-time 2-way power & information flows**
- Integration of intermittent renewable energy sources
- Effective demand management & grid operation
- **Reduce demand & increase efficiency with energy usage data**

S. Massoud Amin, 2011



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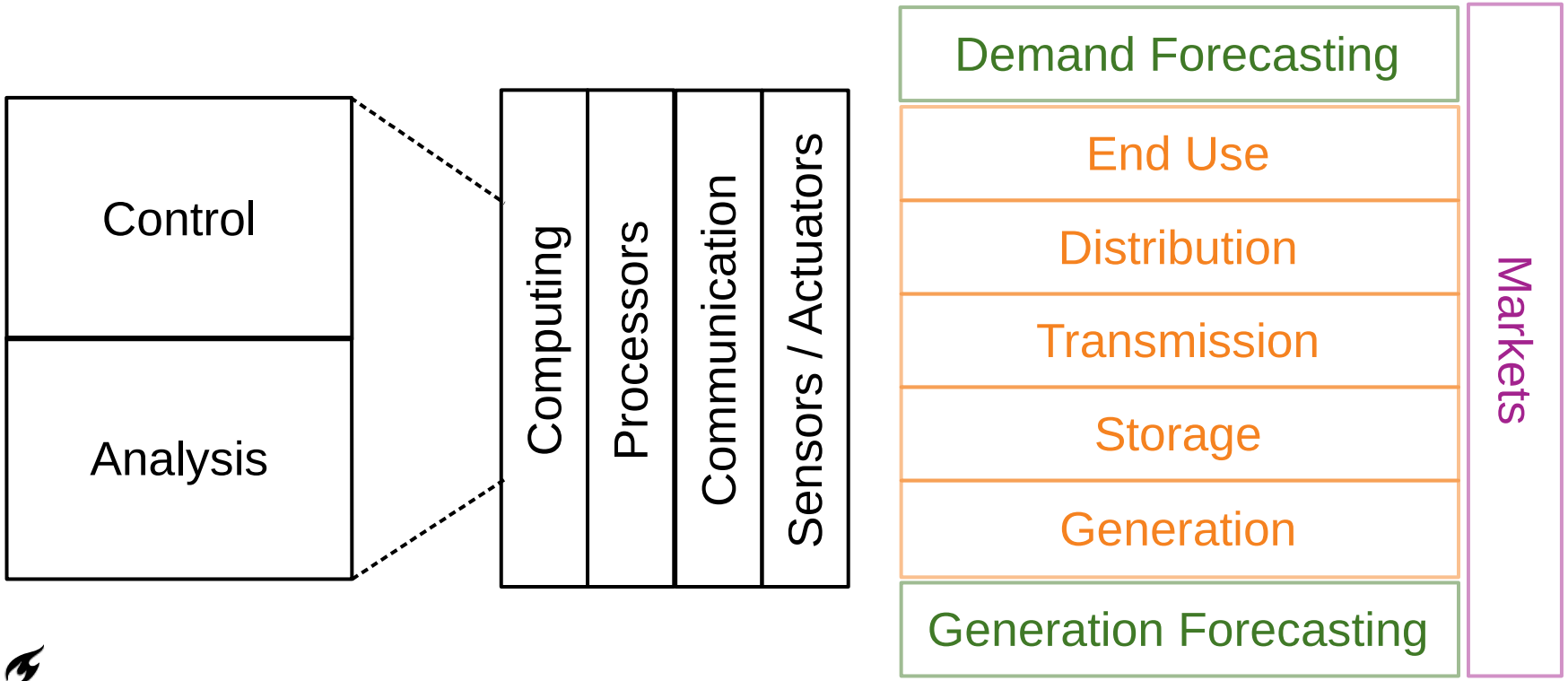
Highlevel View of ICT in Smart Grids



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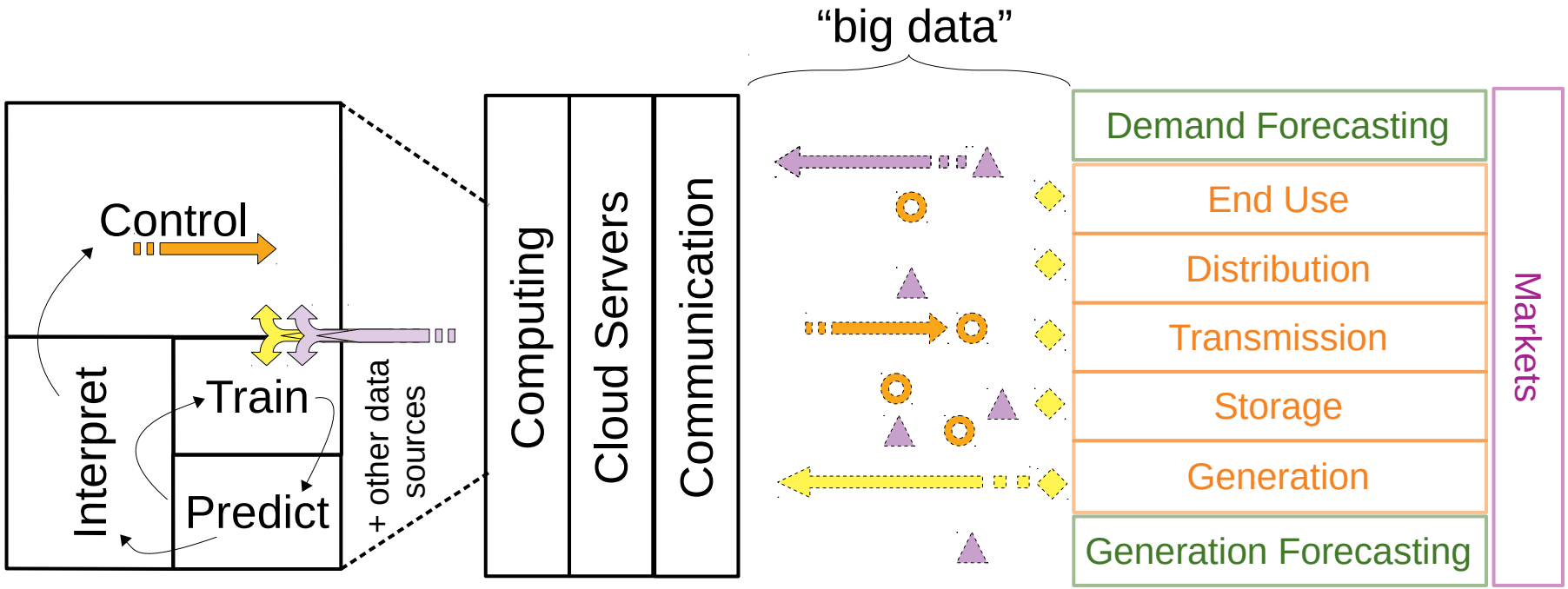
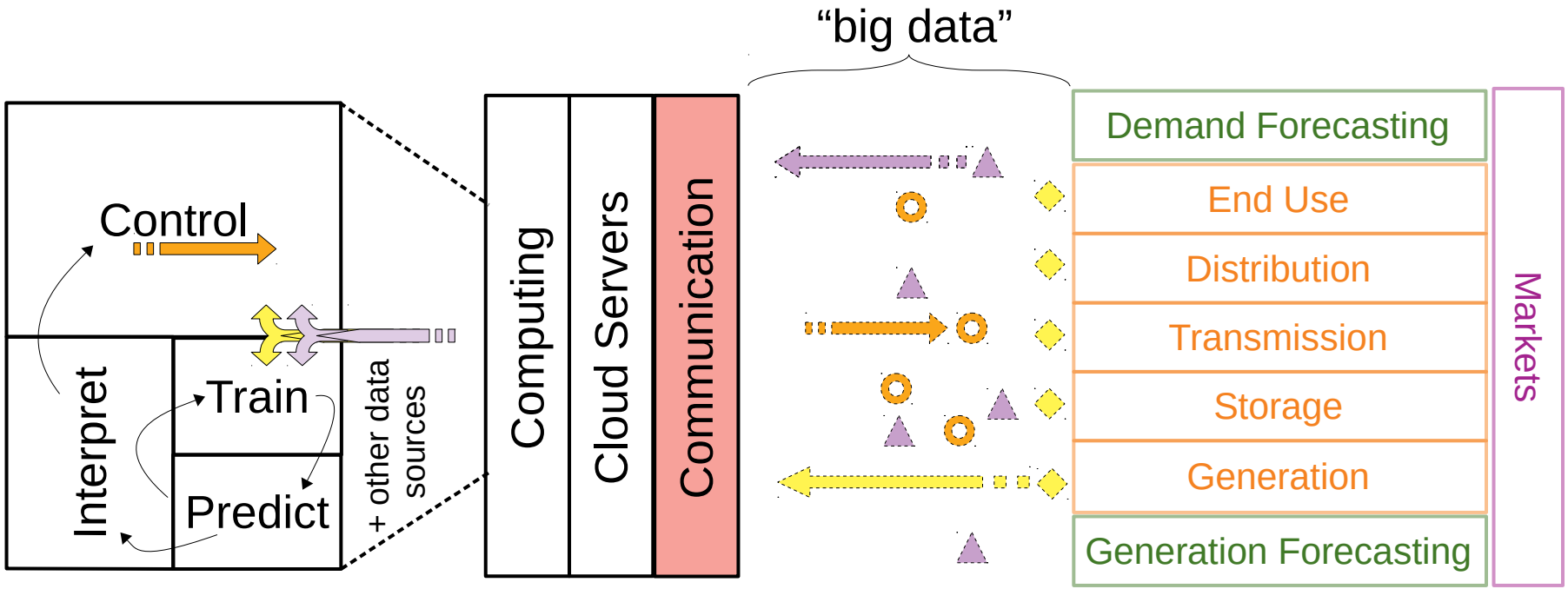
Big Data in Smart Grids



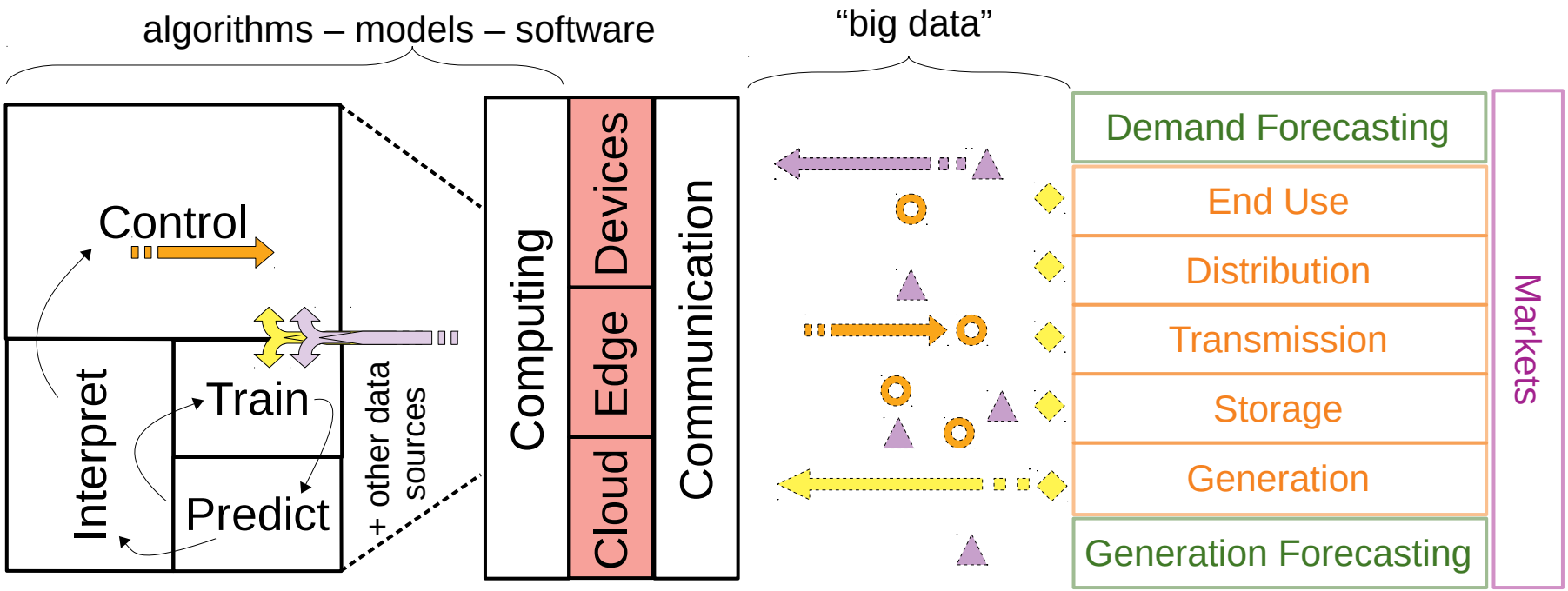
Big Data in Smart Grids



Challenges with the Cloud

- Bandwidth
  - Latency (→time delay)
  - Capacity
  - Traffic (→bottlenecks)
  - Cost
- Quality of Service
  - Connectivity & packet interruptions
- Privacy
- Security

Cloud – Edge Conceptual Architecture



What is Edge Intelligence?

- **Edge Computing**: distributed computing in limited resource environments (energy, computing power, memory)
- Distributing **Artificial Intelligence**: model training and inference across servers

Edge Computing + Artificial **Intelligence**

Edge Intelligence Opportunities

- Smart homes (privacy)
- Smart buildings (privacy)
- Renewable generation (local data integration, cost, latency)
- Electric vehicles (latency)

Thank You!

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