

# A Primer on Edge Intelligence for Smart Grids

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# Presentation Objective

- What
- Why
- Where

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

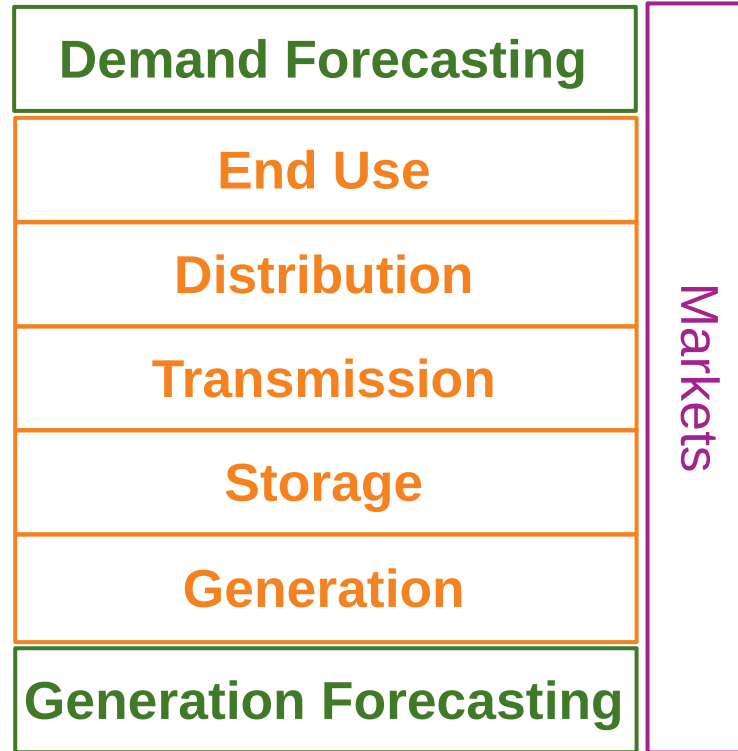
# What is “smart” ?

The Cloud

A diagram illustrating the connection between ground-based systems and the cloud. At the top, a white-outlined cloud contains the text "The Cloud". Below it, a white box lists three categories: "Sensor Networks (earth observation)", "Internet of Things (communications)", and "Cyber-Physical Systems (control)". At the bottom, a landscape with a horizon line is populated with various colored geometric shapes: yellow diamonds, orange circles, purple triangles, and yellow triangles. Dotted lines of corresponding colors connect these shapes to the cloud, representing data transmission. The background is a photograph of a cloudy sky over a field.

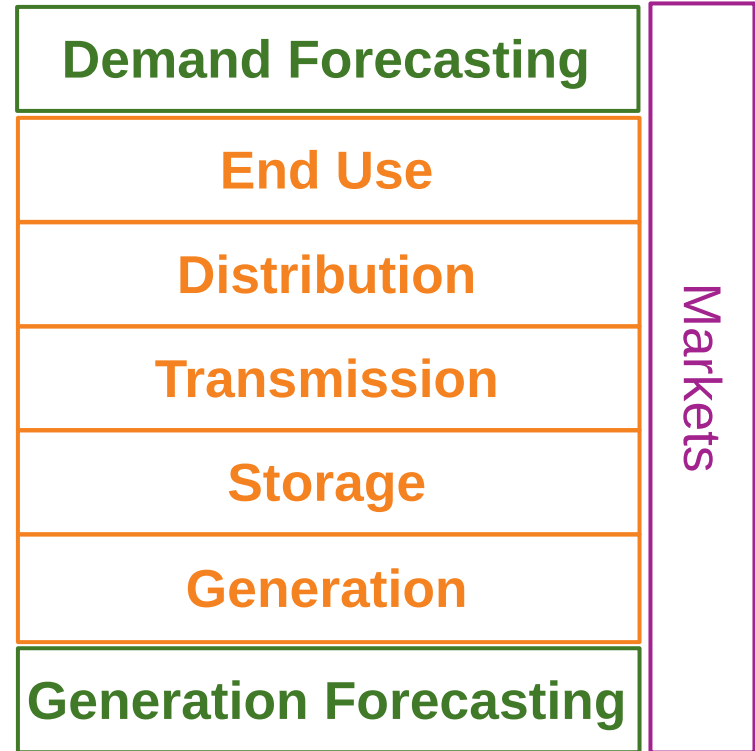
**Sensor Networks** (earth observation)  
**Internet of Things** (communications)  
**Cyber-Physical Systems** (control)

# What are Smart Grids?



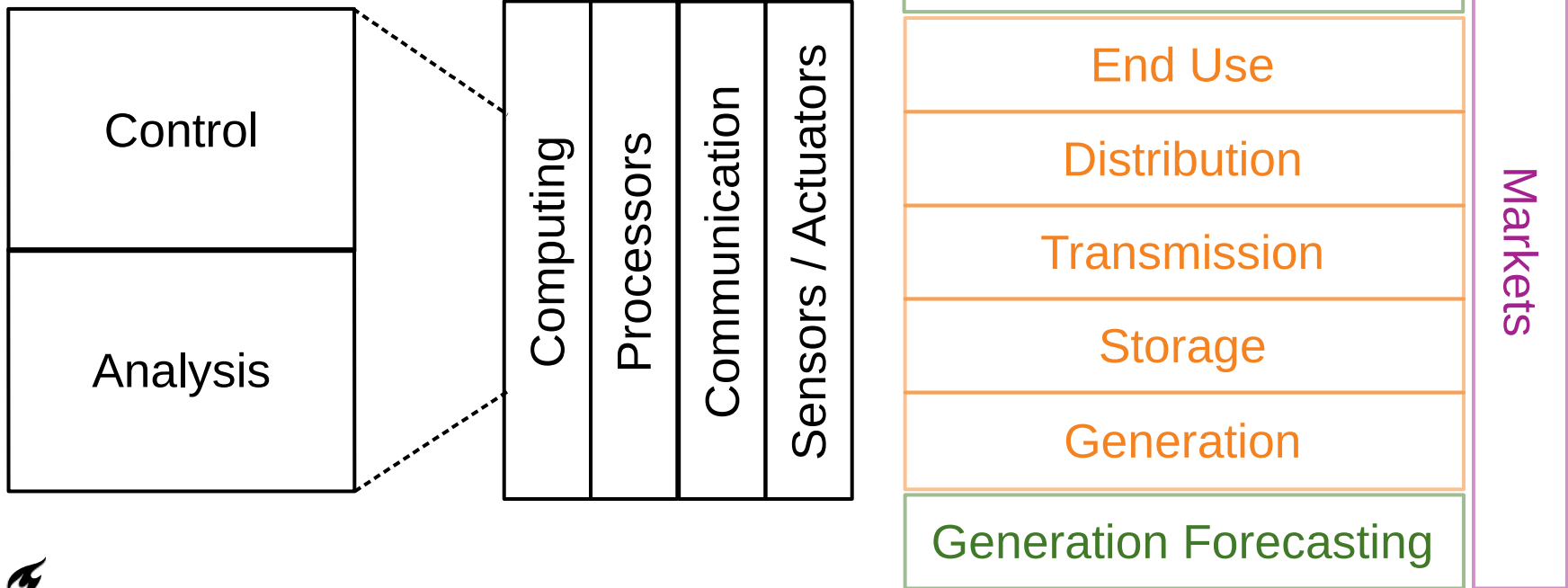
# What are Smart Grids?

- **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**

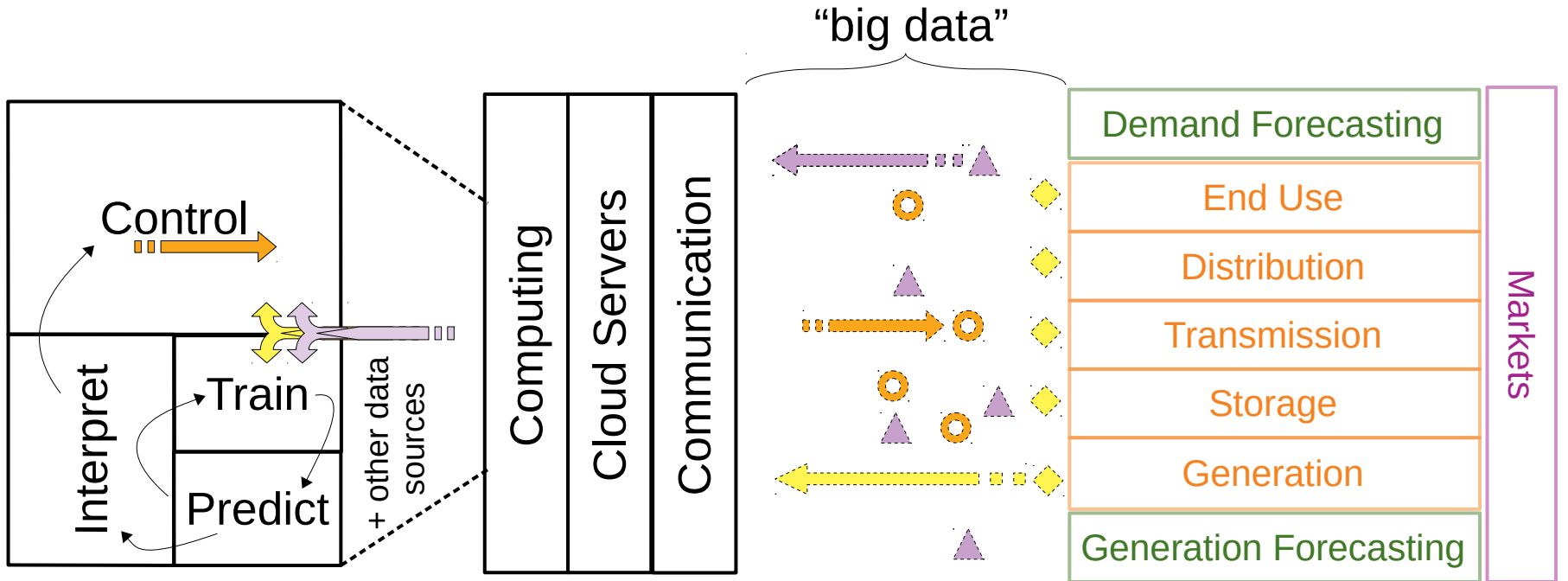


S. Massoud Amin, 2011

# Highlevel View of ICT in Smart Grids

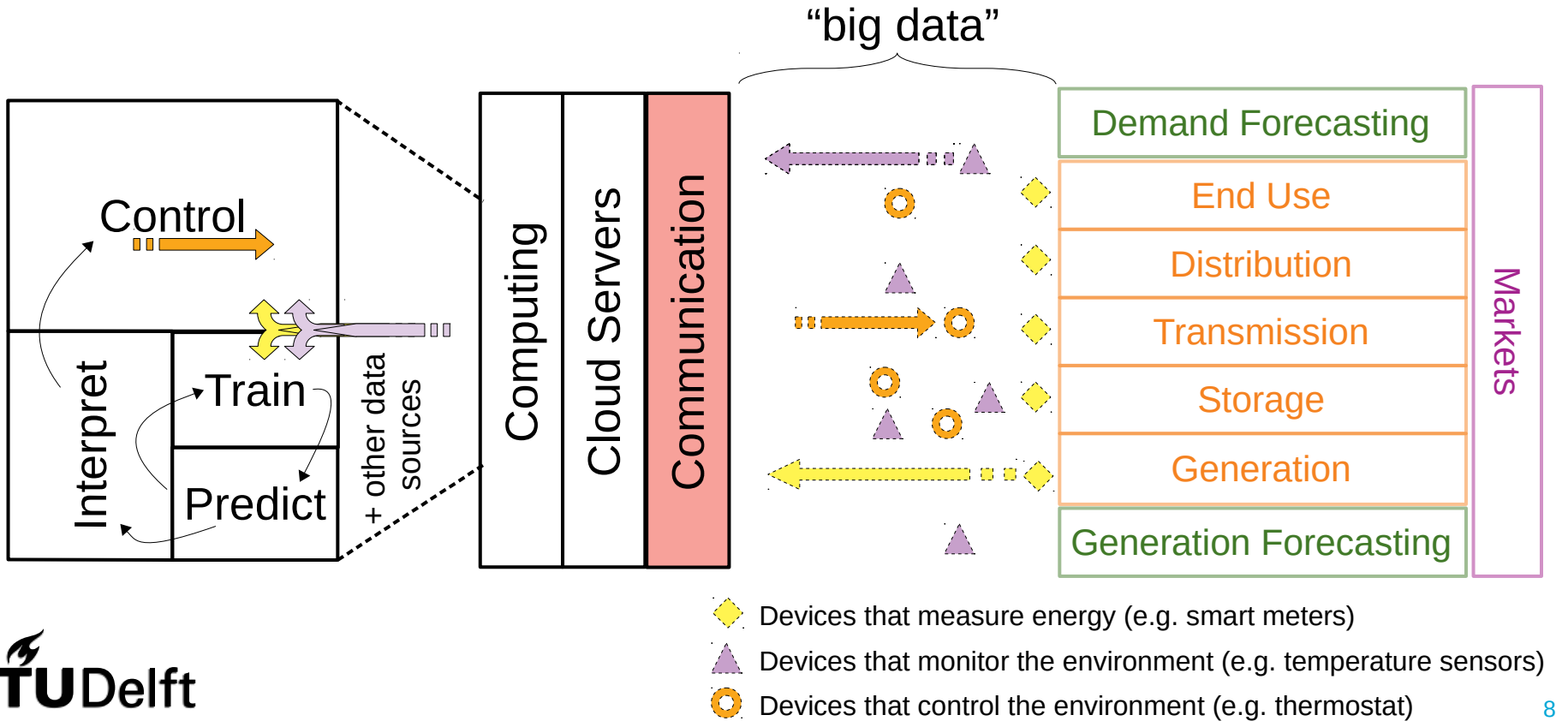


# Big Data in Smart Grids



- ◆ Devices that measure energy (e.g. smart meters)
- ▲ Devices that monitor the environment (e.g. temperature sensors)
- Devices that control the environment (e.g. thermostat)

# Big Data in Smart Grids

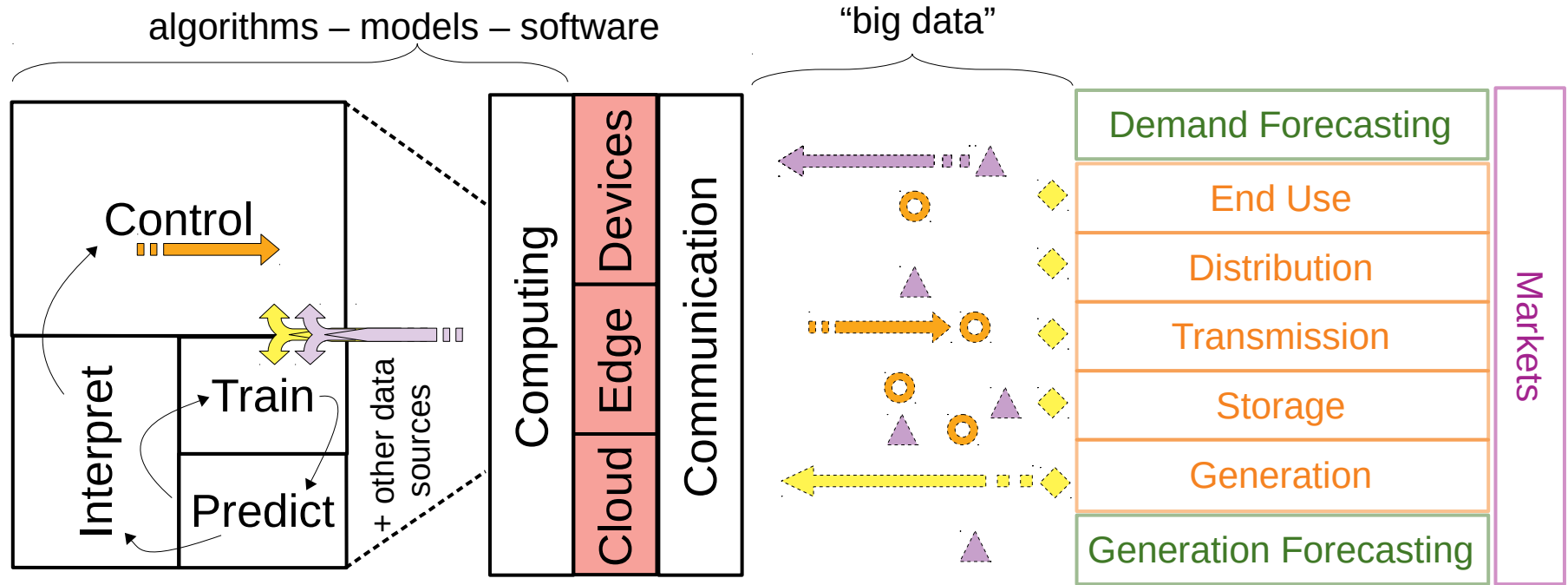




# Challenges with the Cloud

- 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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