

Electronics Laboratory



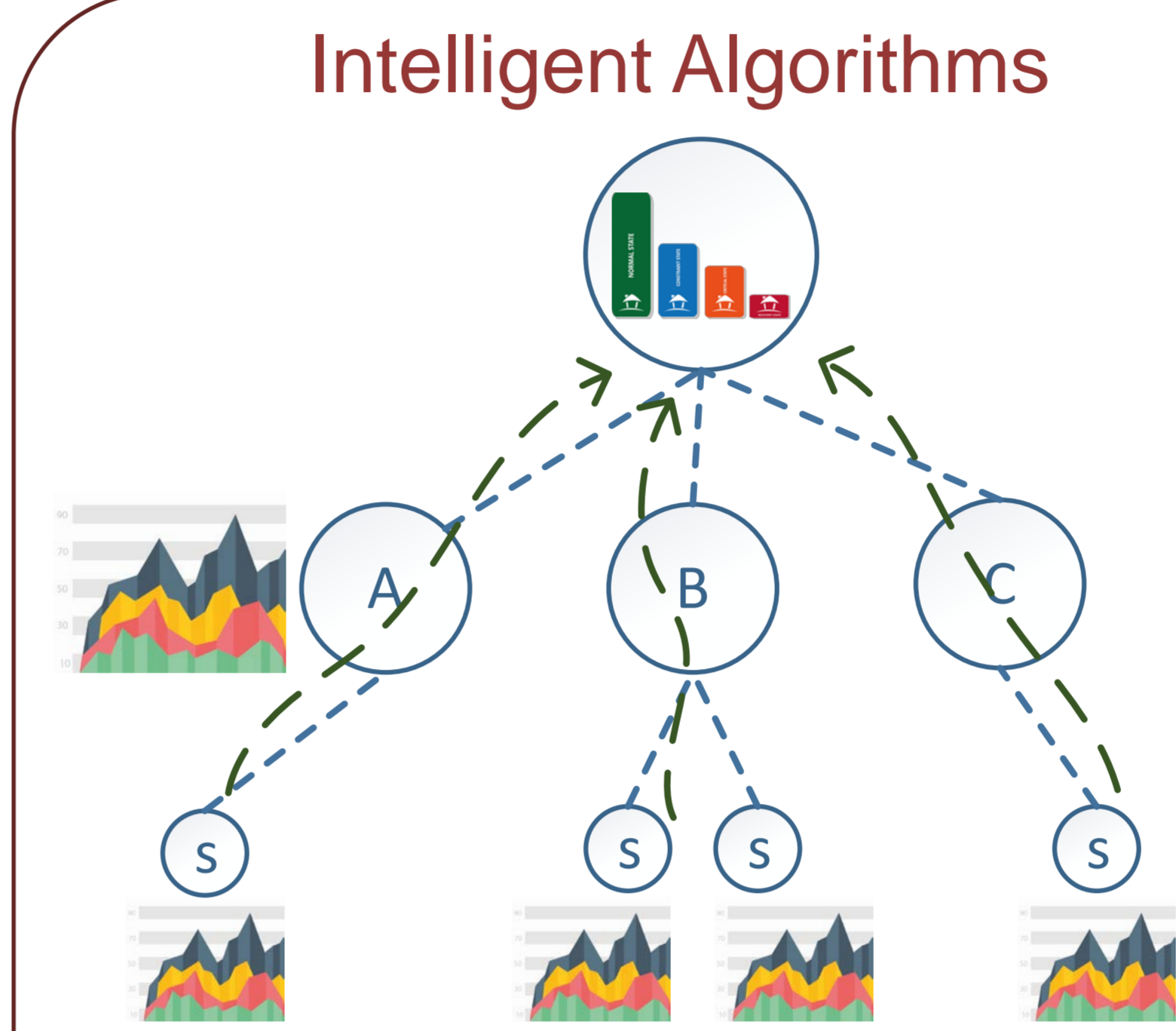
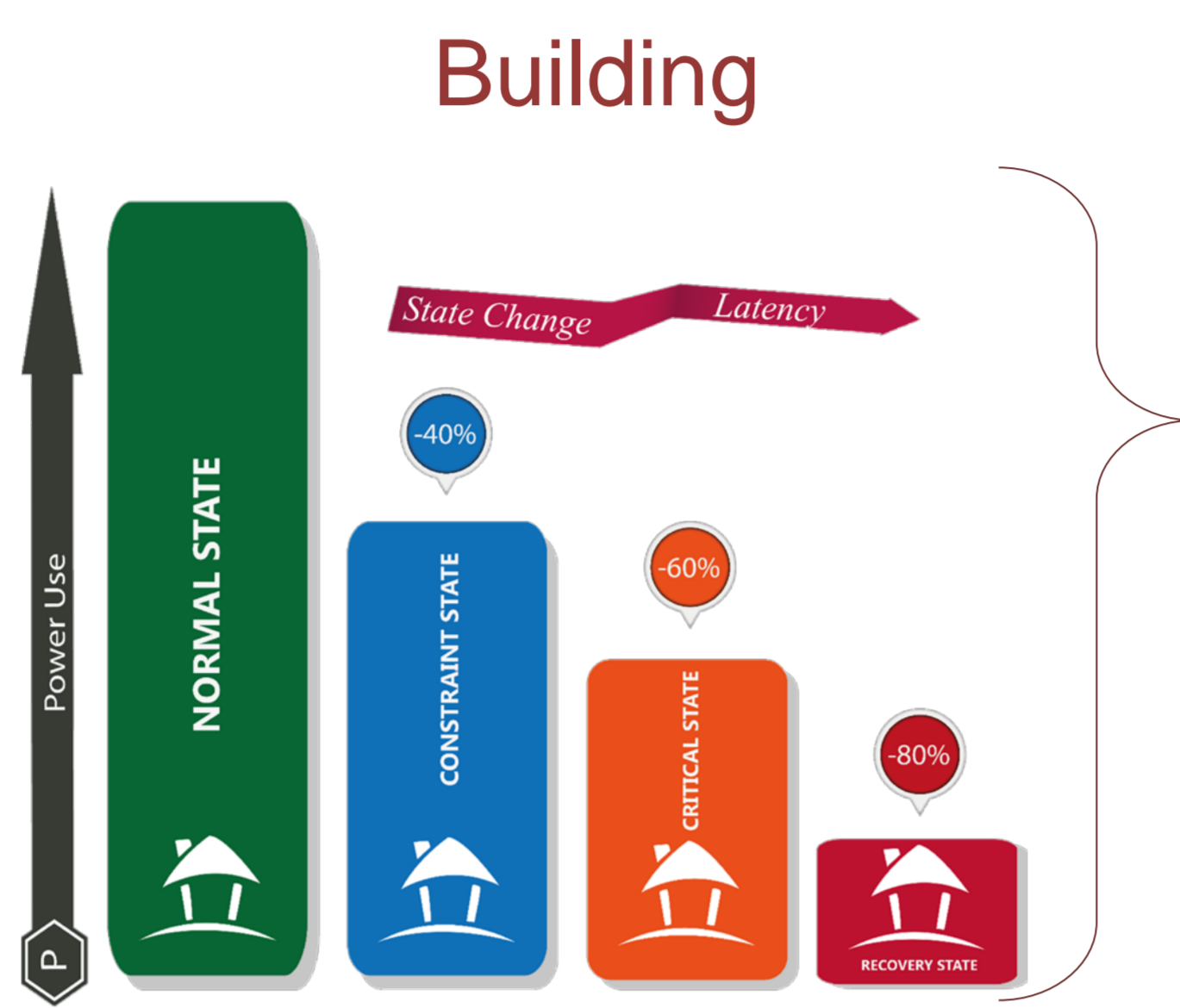
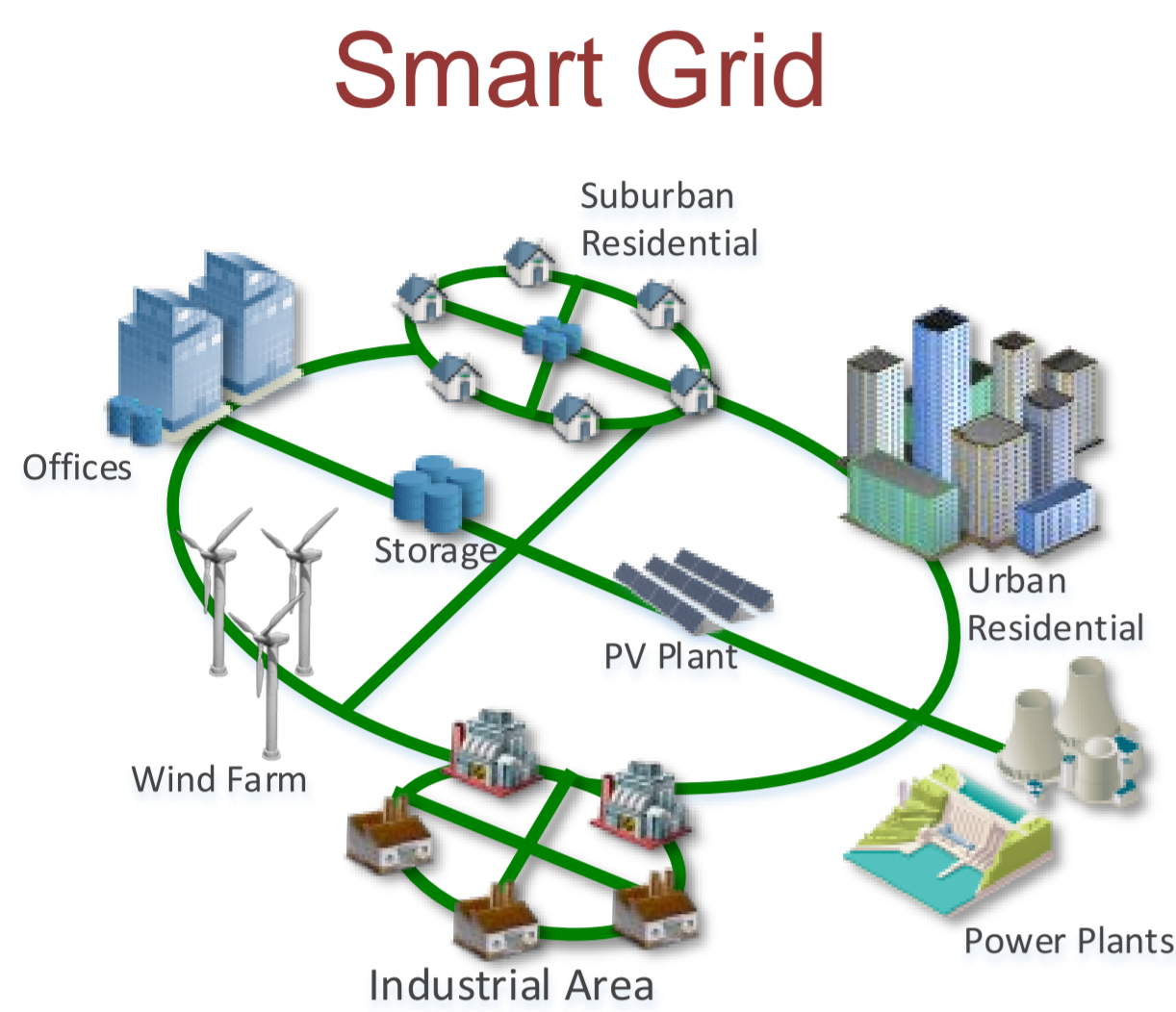
A Distributed, Event-driven Building Management Middleware



Georgios Lilis, Gilbert Conus, Nastaran Asadi, Maher Kayal

Electronics Laboratory, EPFL - École Polytechnique Fédérale de Lausanne

Objectives – A sustainable urban development



The new generation of electrical network. Building is a core component of its demand side management.

Building operates in universal power states and with the state transition latency, they are the mainly exchanged data with grid.

Building management platform (BMS): aggregates the multiple endpoints in clusters (A,B,C...) and assembles them in operation states for delegation to grid.

However building is not a machine, they are *living quarter* mirroring inhabitant personality and comfort. BMS is taking that into account as well.

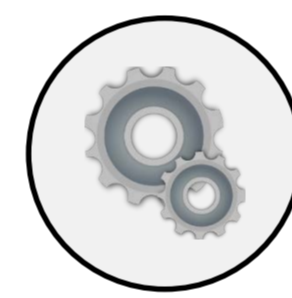
Interfaces



User-centered awareness with cross-platform applications



Supervisor high granularity access with security policy enforcing



M2M communication with API for automation optimization

Architecture – An hierarchical approach

Management server

Main server:

- Abstraction layer of the building-specific entities
- Universal across buildings
- API => transparency in operation

RealTime server:

- *Tornado* event loop
- *WebSockets*

Distributed middleware

Built on ZMQ's PUB/SUB principles

Inter-protocol gateway

No area bounded

Endpoint devices

High number of devices, requires

- *Coordination*
- *Energy and Latency* efficient protocols

Multiprotocol communication

Distributed storage units close to data generation
Dedicated TSDB

