Deployment of a partial mesh network for adaption of district level energy optimization schemes

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The Challenges

Buildings account for approx. 40% of the total energy consumed in the EU

Cities cover only 2% of world's surface – emit almost 75% of global CO_2 emissions

The pace of urbanization is increasing exponentially

DSOs in Europe

Energy management at district level

District Energy Management and Information System

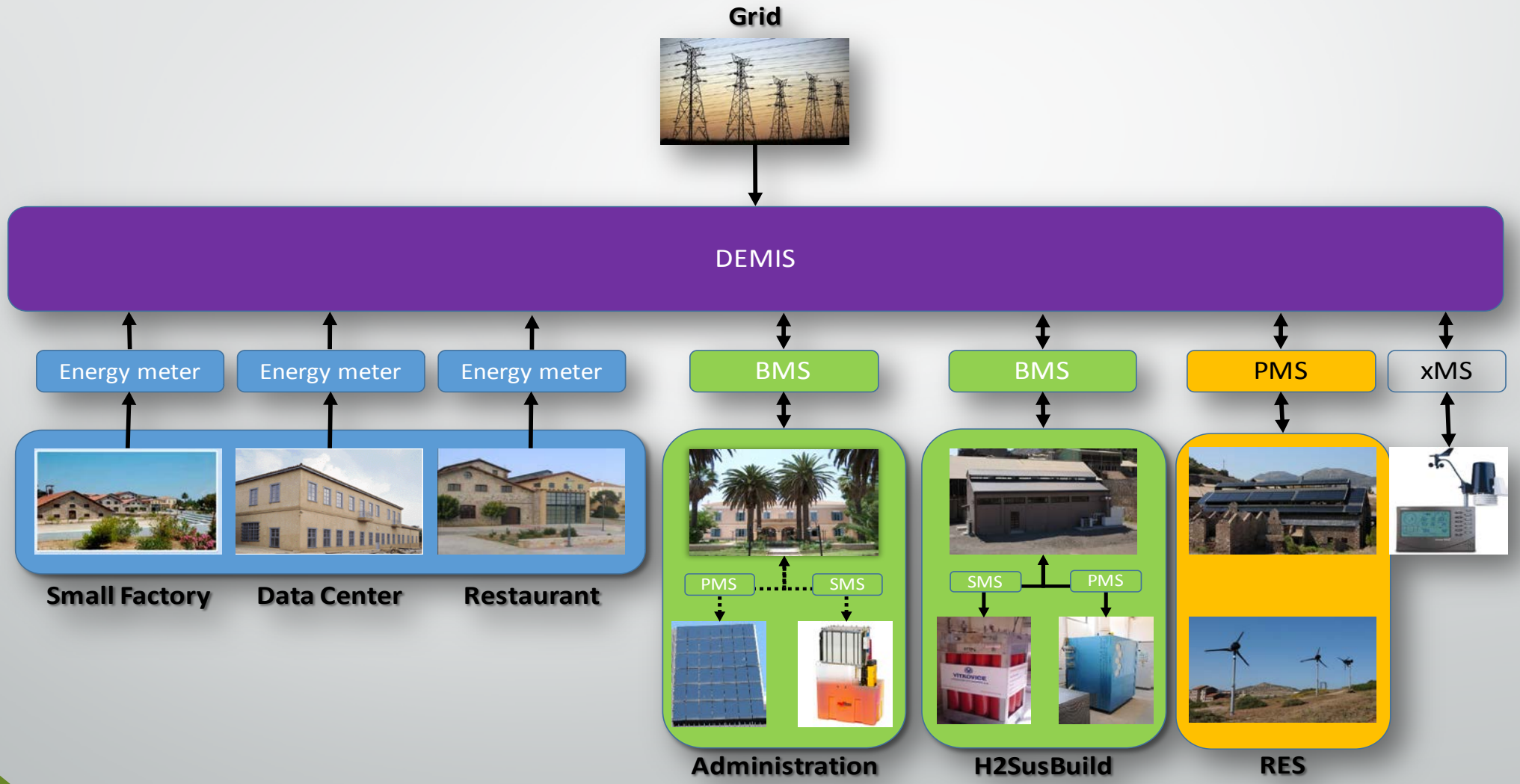
Test site

LAVRION TECHNOLOGICAL AND CULTURAL PARK (LTCP)

- LTCP is located in Lavrion, in South-eastern Attica, Greece, approximately 50 km from the center of Athens.

- For the purposes of the project, the LTCP demonstration site contains 5 buildings:
  - The administration building (hosts the LTCP managing authority and administrative services)
  - The H2SusBuild building (research installation of NTUA's Laboratory of Metallurgy)
  - A building hosting a data center
  - A building hosting a small industrial company
  - A building hosting a small cafeteria/restaurant

System architecture



Monitoring requirements

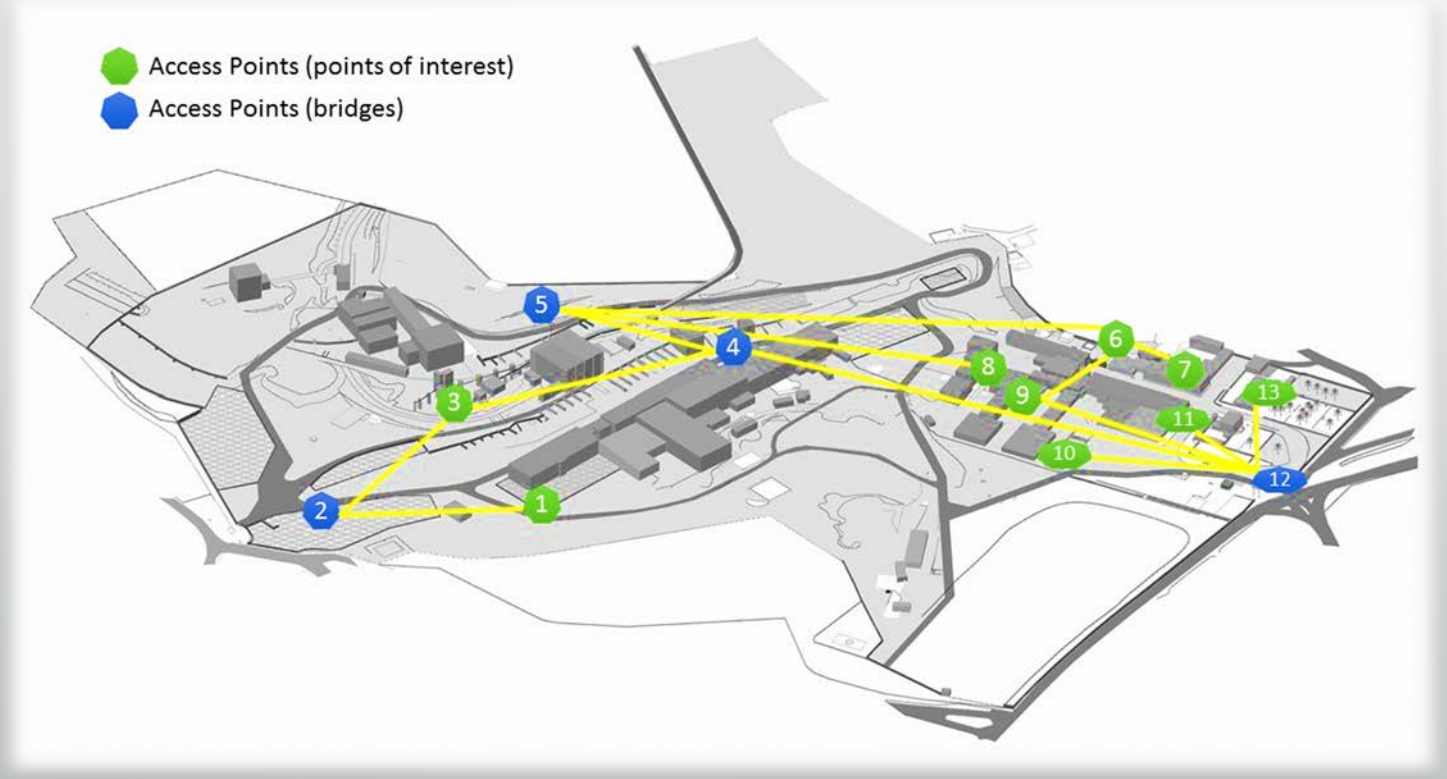
- A total of 34 smart power metering devices have been installed within the Park. The electrical supplies that are measured are:
  - Total electrical consumption of each building
  - Renewable Energy Sources (PV, WT systems and Micro-CHP Fuel Cell separately)
  - Electrical consumption of each building load (lighting, HVAC and other loads separately)
  - Electrical consumption of electrolyser and H_2 compressor

- In addition a total of 62 different sensors/actuators were installed in the five buildings which are measuring:
  - Indoor temperature
  - Relative humidity
  - CO2 concertation
  - Occupancy
  - Light level
  - Movement sensors
  - Hot & cold water thermostats
  - Meteorological conditions (outdoor air temperature, solar radiation, humidity, barometric pressure, wind speed)

The solution - WLAN

A dedicated **Wireless Local Area Network (WLAN)** was designed, installed and commissioned in the perimeter of the park. A wireless solution was preferred mainly for three reasons:

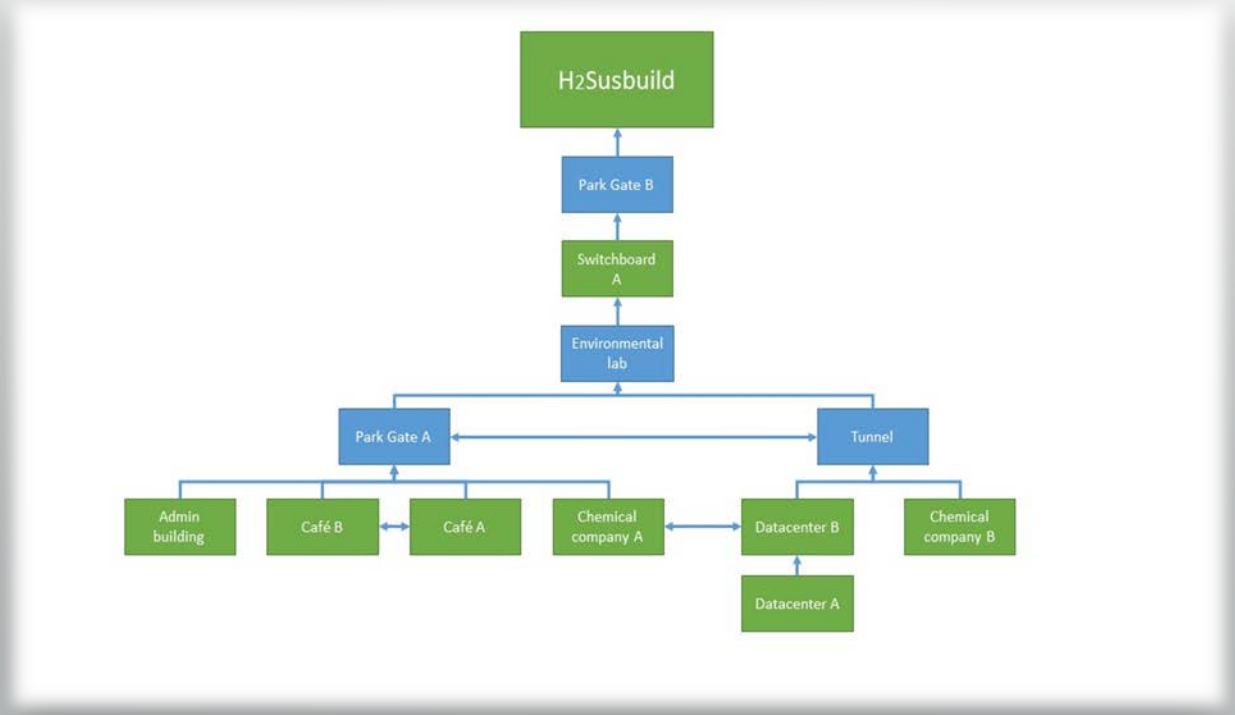
- Considerable cost of Ethernet cabling
- Unreachable areas for cabling routing
- Visual impact of cabling



The solution – Topological structure

A partial MESH topology was selected based on the following criteria:

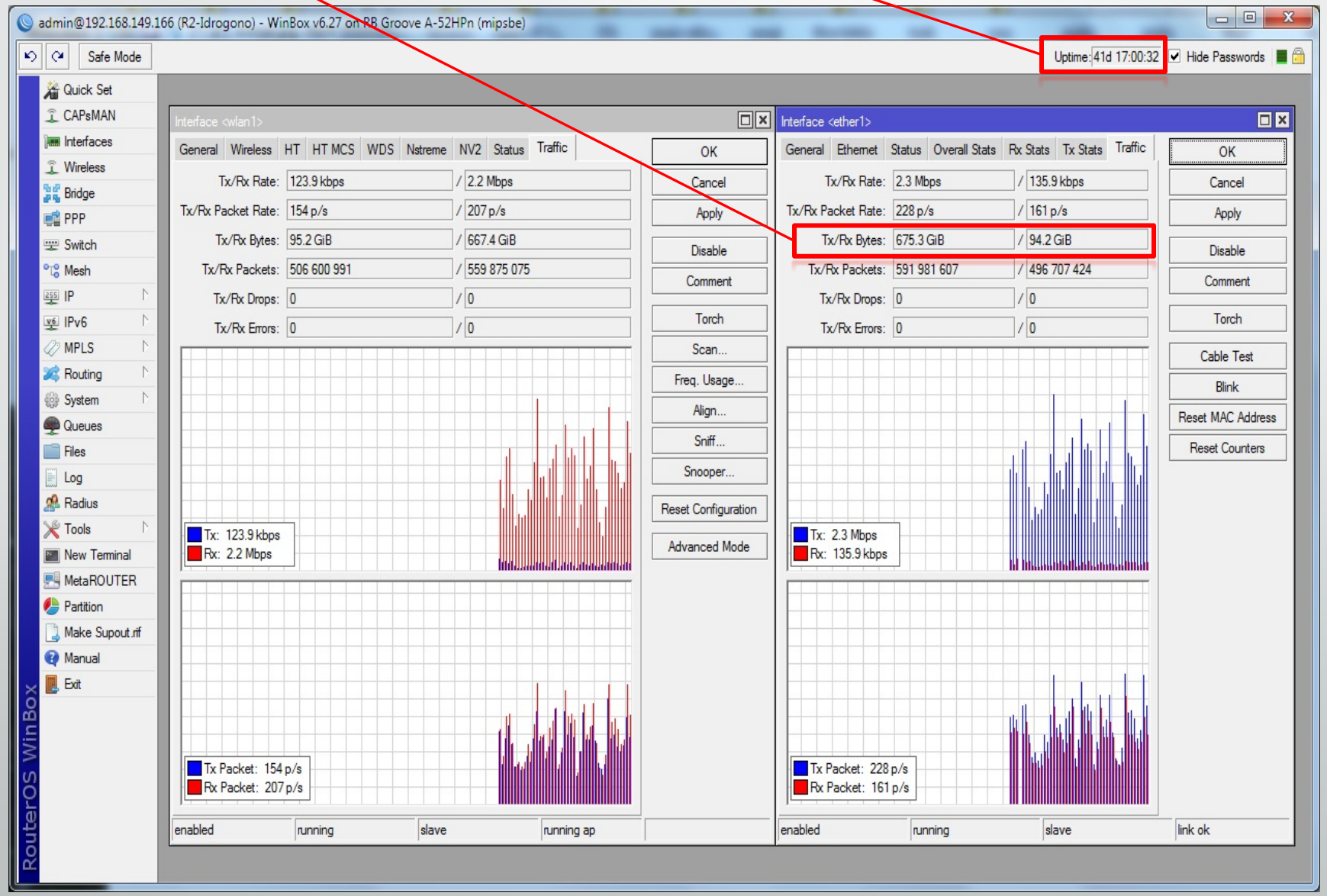
- The area to be covered (extension, topography, transmission issues –noise, interferences-, etc.)
- The pursued reliability and robustness, expressed by load balance mechanism implementations for data links and routes reconfiguration, due to broken links.
- The bandwidth needed for expected data traffic.
- The maximum data delay allowed.



Testing activities

769,5 GB of data transferred

Uninterrupted operation of 41 days 17 hours 8 minutes and 1 second



Conclusions

- Testing results showed that implemented partial mesh network achieves stable routes, it has very low packet loss rates, minor delays and more than adequate network throughput

- As the trend of smart cities with advanced interconnection requirements is likely to increase even more in the following years the need for low-cost and reliable communication solutions is more important than ever.

Thank you for your attention

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