PreCoMInd

GOALS

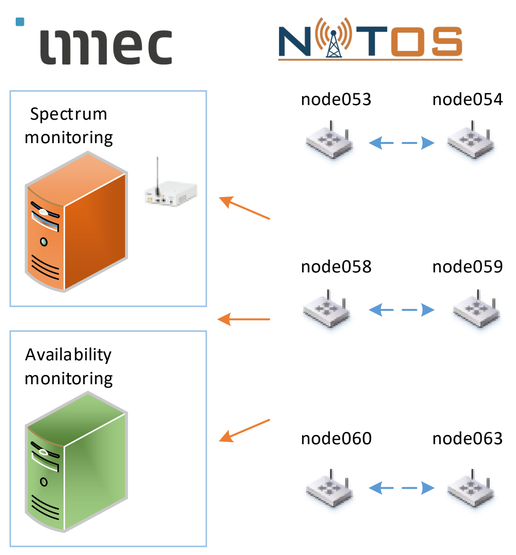
- Semantic dataset to support development of AI applications in complex systems, such as Industry 4.0, including: improved reporting, optimization, fault detection, automated security, and cognitive predictive maintenance
- More effective automated decision-making by integration of semantically annotated heterogeneous data sources with the domain knowledge.

CHALLENGES

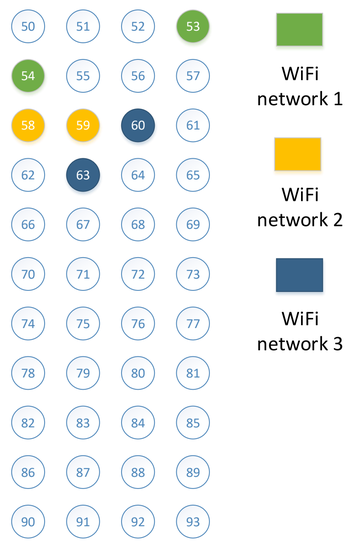
Complex Industry 4.0 systems consist of a large number of services, networks and devices on Edge and on Cloud. Development of data infrastructure for commercial applications in such environments is a challenge because appropriate data collection platforms do not exist.

FED4FIRE+ provides a set of networking and computational testbeds that could be used to address the challenge.

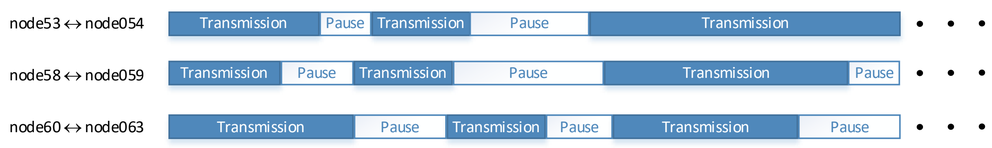
DEMO SETUP



Experiment scenario



Network topology

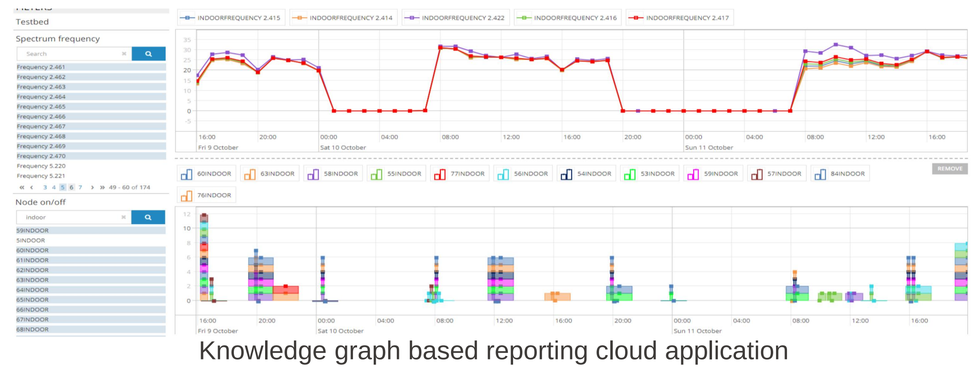


Experiment timing diagram

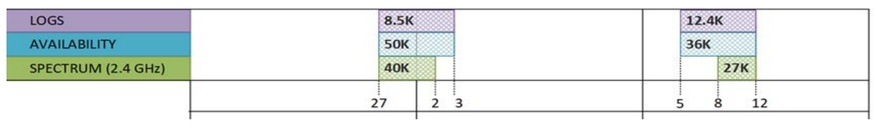
RESULTS

Semantic dataset integrates data about:

- Spectrum occupancy
- Nodes turned on-off
- Testebed server log entries
- Application URL: *https://193.190.127.248/precomind*



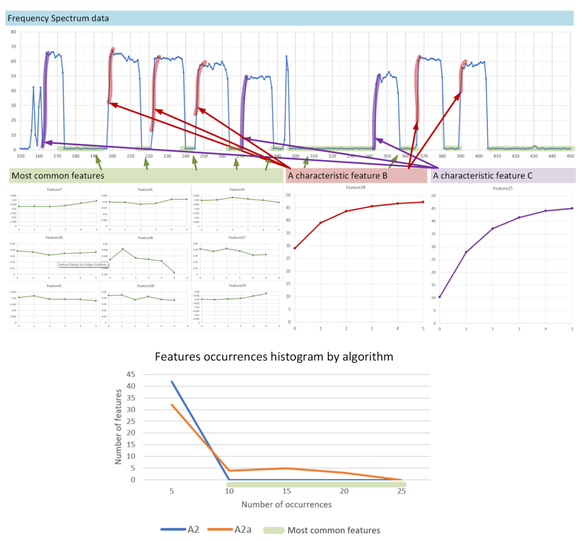
Knowledge graph based reporting cloud application

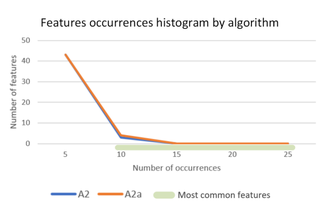


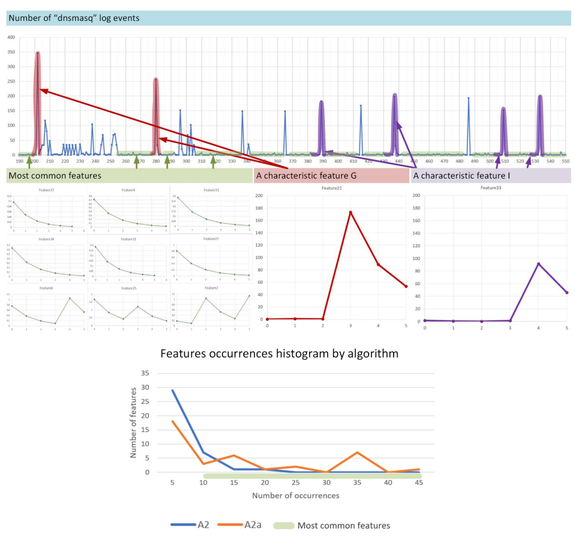
Number of triplets in dataset imported from NITOS indoor testbed

MORE RESULTS

FEATURES DETECTION

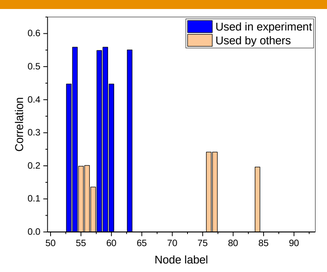




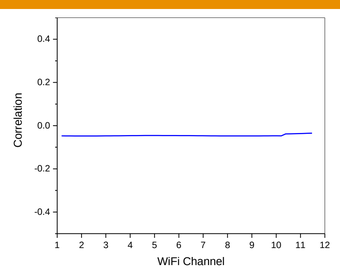


Features detected in all datasources: spectrum occupancy, number of nodes turned on, testbed server log entries.
Characteristic vs. common features: 10 occurences - a threshold

CONCLUSIONS



High correlation coefficient between node status and spectrum occupancy



Low correlation between spectrum occupancy and logged tags and programs

- Correlation found between couple of data sources is not enough for automatic synergy. Extension with additional data sources (individual devices logs, power consumption, etc.) is needed.
- Detected features indicate that the proposed semantic data integration, if combined with Deep Learning, is very promising approach to explainable AI.

POST MORTEM

- Extending the approach to data sources from other wireless testbeds in federation (individual devices logs, power consumption, etc.)
- Integration with Deep Neural Networks
- Support for near real-time data processing
- Clustering of data streams based on the detected semantic features
- Extend cloud application to support detected features management and advanced filtering
- Machine learning algorithm for anomaly detection