



Event Processing in Asset Management

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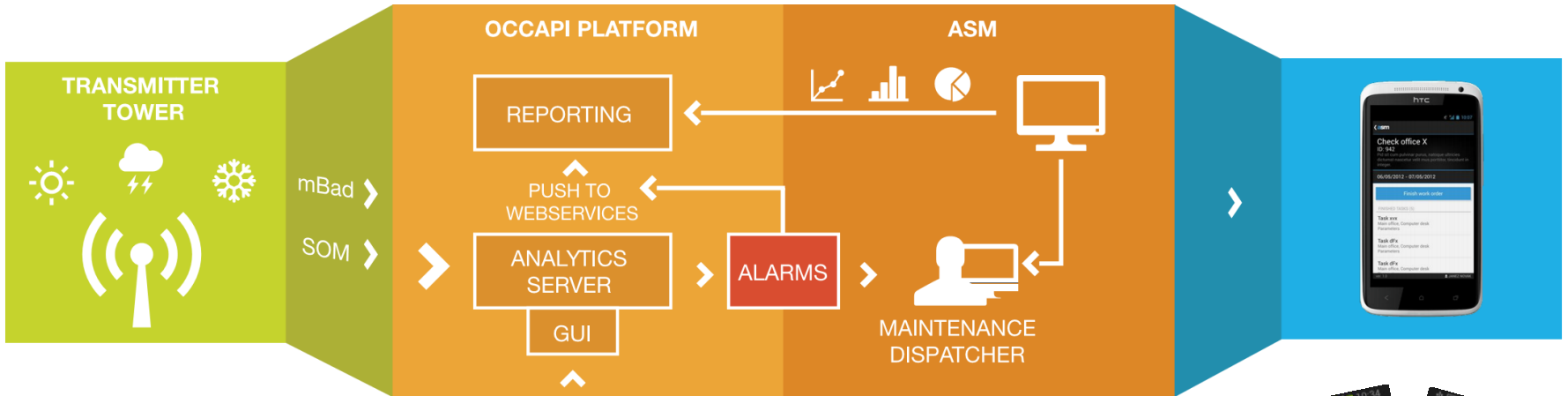
Outline

- Description of the ASM use-case
- Conceptual Architecture
- Sensor Data Stream
- Event Processing
- Implementation
- Conclusions & Future Work

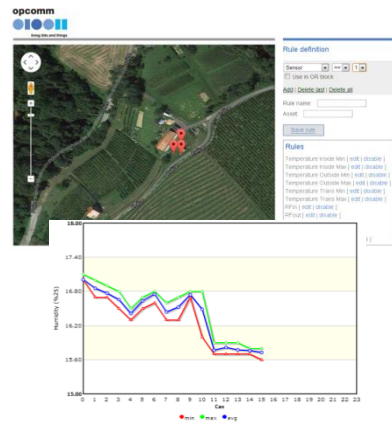




The Use-case



EXPERT USER
RULE DEFINITION,
TESTING



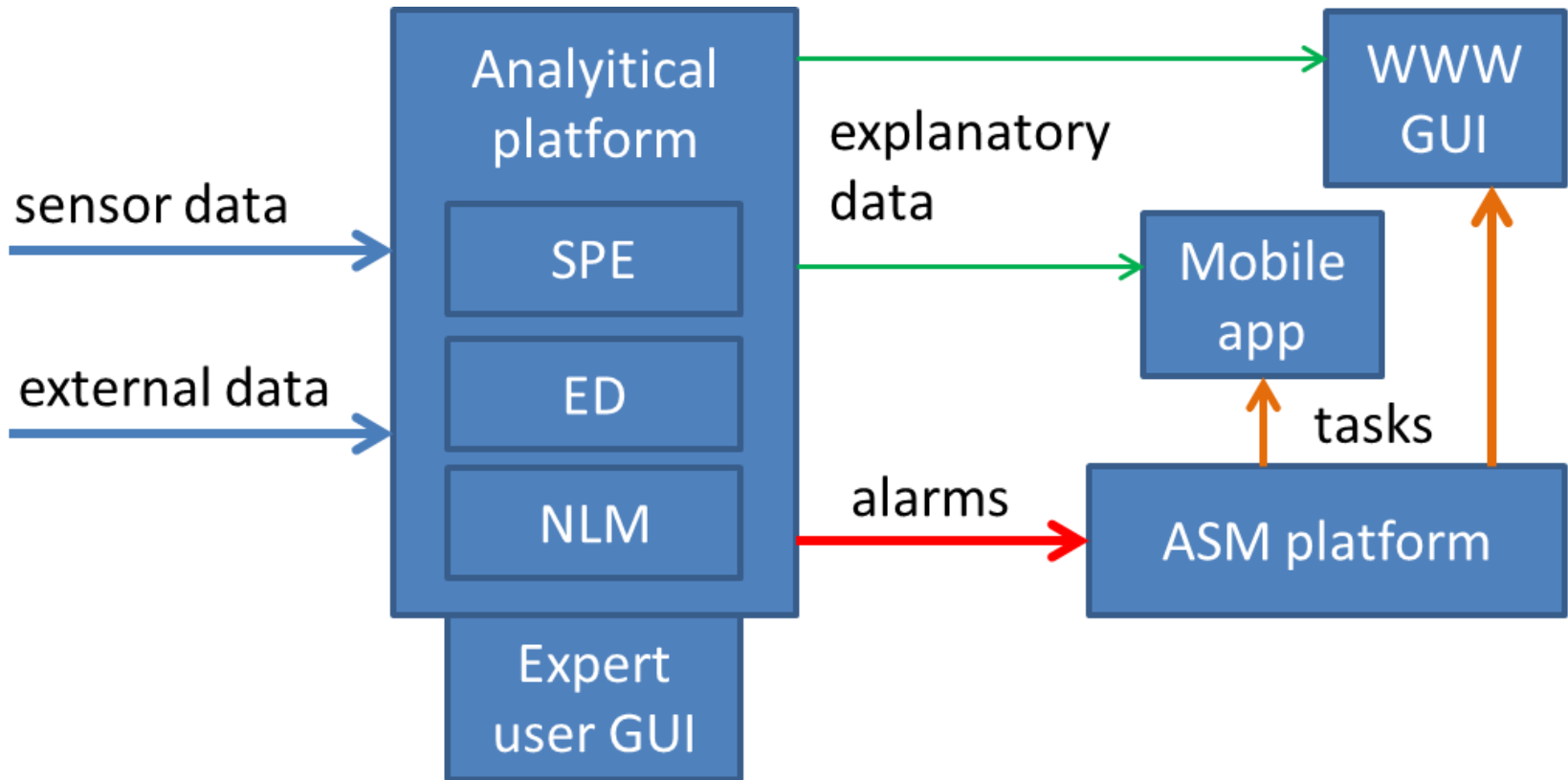
Work Orders View and manage your work orders

Name	Assigned to	Start	End	Tasks
■ Poseg na sredstvu (Occapi) 150 - 15.8.2013	Automatic (Occapi)	Schedule - Actual -	Schedule - Actual -	1
■ Poseg na sredstvu (Occapi) - Gasper #3 150 - 6.8.2013	Gasper Postard	Schedule - Actual -	Schedule - Actual -	2





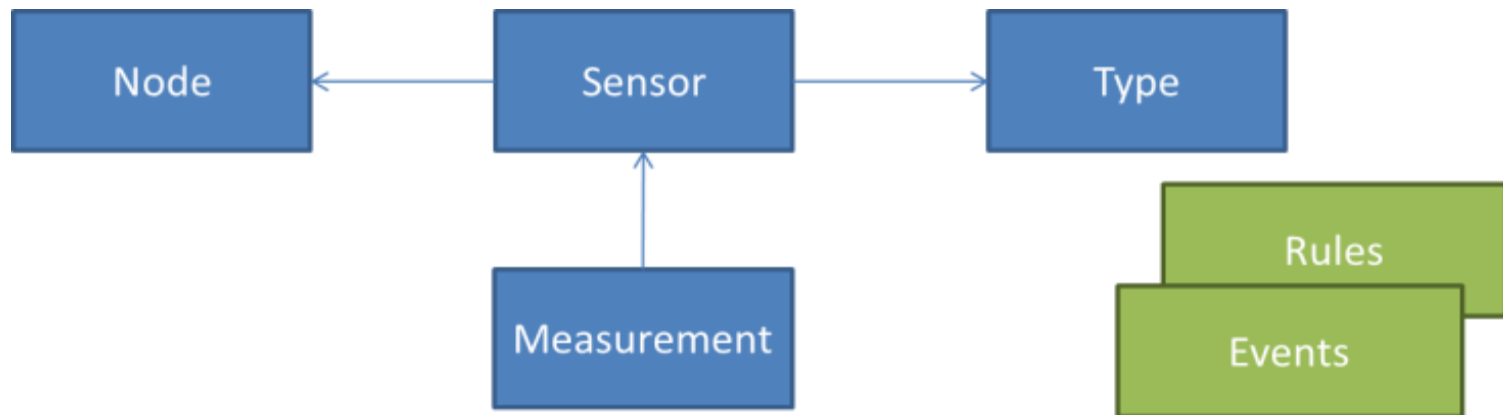
Conceptual Architecture





Handling the Sensor Data Stream

- Dedicated Stream Processing Engine (SPE)
 - vs. DBMS, rule engine





Event Processing

Rule discovery

- Expert user with sufficient knowledge
- Expert user with support of the measurements (testing hypothesis, refining rules); suggestion
- Building a prediction model from the list of measurements/known events

Event detection

- Able to evaluate high number of rules on a huge amount of data

Other:

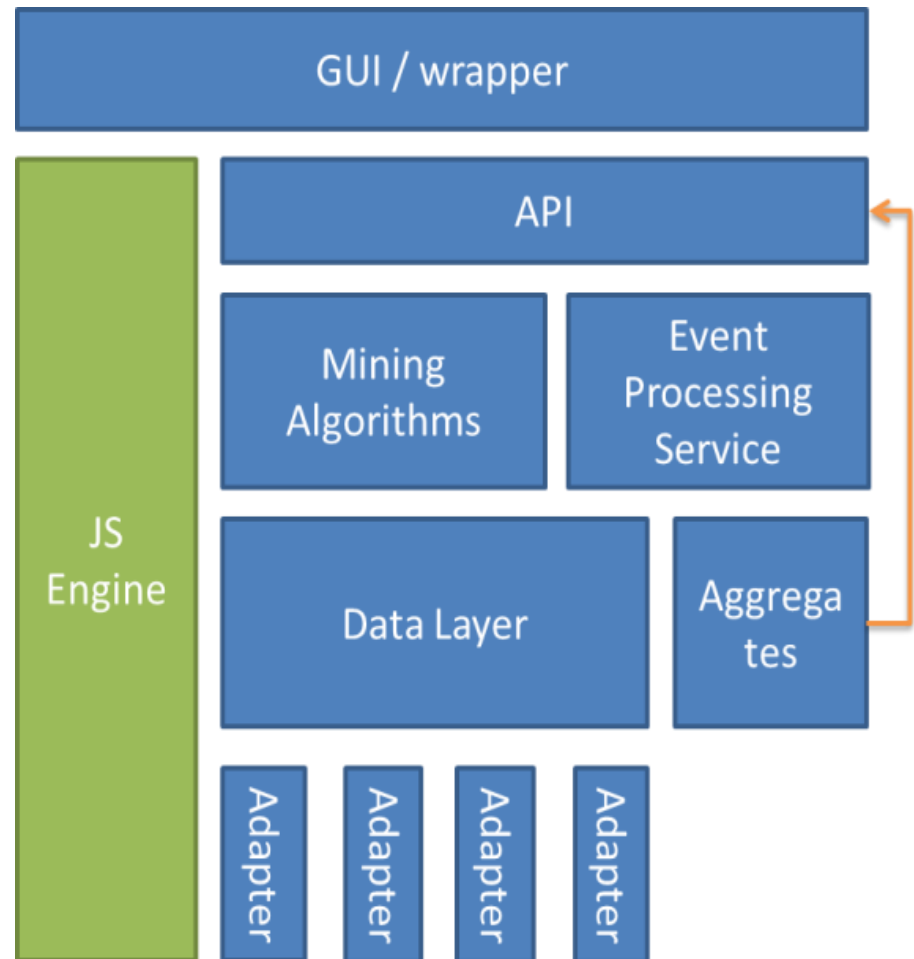
- Question of priority
- Exports





Implementation

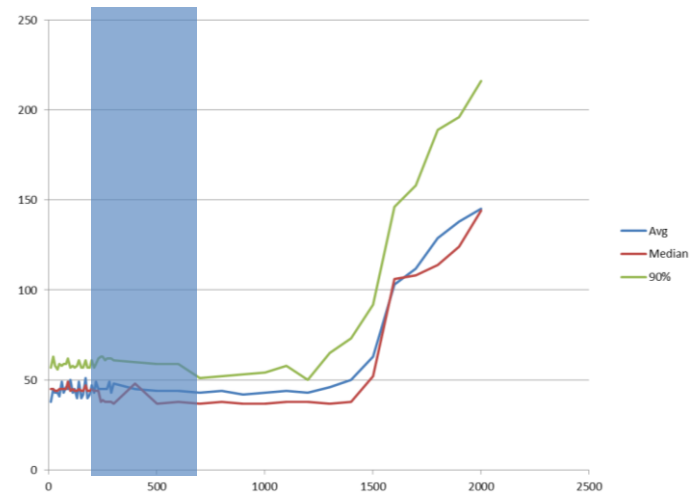
- EnStreamM
 - QMiner
 - C++
 - Integrated data layer (JSON definitions)
 - Integrated V8 JS engine
 - Event Processing Service





Rules and performance

- Expert users in the scenario only demanded simple rules
 - if temperature inside the station is lower than 5°C or higher than 40°C
 - if the temperature inside the emitting cell is lower than 5°C or higher than 35°C
 - if the voltage on all 5V devices is lower than 4V or higher than 6V
 - if the value on the WLTS device is not equal to 1186



JSON encoded rule:

```
{"Phenomena":"air_temperature",  
"Value":{"$gt":", 40.0"}}
```





User interfaces



Rule definition

Sensor: [dropdown] == [dropdown] 1 [dropdown]

Use in OR block

Add | Delete last | Delete all

Rule name: [input]

Asset: [input]

[Save rule](#)

Rules

- Temperature Inside Min [edit] [disable]
- Temperature Inside Max [edit] [disable]
- Temperature Outside Min [edit] [disable]
- Temperature Outside Max [edit] [disable]
- Temperature Trans Min [edit] [disable]
- Temperature Trans Max [edit] [disable]
- RFIn [edit] [disable]
- RFout [edit] [disable]
- Uagc Min [edit] [disable]
- Uagc Max [edit] [disable]
- Uagc Warning Min [edit] [disable]

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Poseg na sredstvu (Occapi) - Gašper #4

6.8.2013 0:00:00
Priority: 100

Maintenance

Temperature over 20deg outside!

ASSET

TENDA [input] [search]

COMMENT

Write comment [input]

[Finish task](#)

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WORK ORDERS | LOCATIONS | ASSETS

NEW (1)

Poseg na sredstvu (Occapi) - Gašper...
Start: n/a End: n/a Priority: 100

IN PROGRESS (1)

Poseg na sredstvu (Occapi) - Gašper...
Start: n/a End: n/a Priority: 100

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Work Orders View and manage your work orders

Pending | Sent | Closed | Late | Mine | All [input] [search] [+ Create Work Order](#)

Name	Assigned to	Start	End	Tasks
Poseg na sredstvu (Occapi) 103 - 16.1.2013	Automatic (Occapi)	Schedule: - Actual: -	Schedule: - Actual: -	1 [dropdown]
Poseg na sredstvu (Occapi) - Gašper #3 3100 - 6.8.2013	Gašper Pintarič	Schedule: - Actual: 6.8.2013	Schedule: - Actual: 6.8.2013	2 [dropdown]



Conclusions & Future Work

- Conceptual architecture for analytical module for stream processing in Asset Management
- Example of implementation
- Evaluation
- Future work:
 - extension to other bussiness cases (data stream processing, CEP, NL generation)
 - predictive capabilities (SVM, decision trees on streams) with fusion of external data sources
 - event triggers in NL
 - Combining expert rules with automatically generated rules





Questions?

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