Make proactive enterprise real

The ProaSense approach

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Introduction

• Proactive enterprise
  – From the idea to realization
  – From realization to exploitation
  – From exploitation to revenue

• Me
  – From technical coordinator to exploitation management
ProaSense vision

• Support a transition from Sensing enterprises into Proactive sensing enterprises
  – to go from reactive to proactive computing in order to prevent problems or capitalize on opportunities before they even occur

• To be achieved through the adoption of the Observe-Orient-Decide-Act (OODA) loop of situational awareness and development of corresponding technologies:
  – a scalable, distributed architecture for the management and processing of IoT big-data that will enable
  – continuous monitoring, detection of the need for service adaptation and propose corresponding changes in a (semi-) automatic way
Scenario

- The ProaSense prototype has been examined and validated in two real use cases (MHWirth and Hella), each of them addressing a different application domain and different challenges of the project’s objectives.

- Practical application of proactive **condition-based maintenance** (CBM) in the oil and gas industry
  - The strategy so far has mainly been to perform planned maintenance according to equipment manuals, mainly calendar based.
  - In this respect, the ProaSense project represents a good opportunity for change.
Challenges for a traditional approach
condition-based maintenance (CBM)

• Huge amount of parameters:
  – 4000 variables (16 selected)
  – OBSERVE

• Need for correlating parameters
  – ORIENT

• Defining proactive actions
  – DECIDE

• Adapt/learn
  – ACT
Scenario – observe phase

- CBM employs various monitoring means to detect failure in some critical drilling equipment, e.g. the rotation speed of the drilling machine’s main shaft in RPM
  - The entire data set available is more than **4000 variables** related to this equipment or the surrounding environment
    - monitoring engine temperature indicators, monitoring electric indicators (measuring change in the engine’s electric properties) and performing oil analysis
    - **16 variables** are selected (focus on thermal indicators)
      - All variables are sampled at 20 millisecond time resolution
      - 41 MB per day per variable
Scenario – orient phase

- **Several parameters should be correlated:**
  - oil temperature and RPM events characterized by an abnormal oil temperature rise (e.g. 10% above normal) measured over 30% of the drilling period when drilling RPM exceeds a threshold ...
  - in order to **anticipate future states of the system and predict the time** when a gearbox breakdown will occur along with its probability distribution function

- **This requires both offline and online learning**
Exploitation - challenges

• Complexity of the system
  – Difficult to understand what the system is about

• Stability/reliability/performances
  – Difficult to install, adapt, maintain

• Use case validation (measurable KPIs)
  – Difficult to find measurable indicators for the success
Exploitation: common pitfalls in projects

A SOLUTION IS DEFINED BUT THE INITIAL PROBLEM IS NOT WELL ADDRESSED

A PRODUCT IS DEVELOPED BUT IT IS NOT PROPERLY TESTED FOR COMMERCIAL EXPLOITATION

A PRODUCT IS DEVELOPED BUT THE MARKET IS MISSING
Exploitation process

Set of activities in order to get exploit results:
1. Problem-Solution definition
2. Business Model Draft
3. Market Deep Dive
4. Business Model Fit
5. Problem-Solution Fit
6. Product-Market Fit
Exploitation process: Business Model Draft

**Key Partners (KP)**
- OEM

**Key Activities (KA)**
- Promotion
- Platform Management
- CRM
- Develop Platform

**Key Resources (KR)**
- Software
- Team
- IPR

**Value proposition (VP)**
- Co-create value
- Reduction of Interruptions
- High decision quality
- Improve drilling efficiency

**Customer relationships (CR)**
- Dedicated personal relationship
- Co-creation of value
- Distribution Channels (DC)
  - Sales force
  - Website
  - OEM
  - Trade Shows

**Customer segment (CS)**
- OEM
- Drilling Companies

**Cost structure (CS)**
- Personnel
- Marketing
- Licenses
- Cloud Services

**Revenue streams (RS)**
- Licenses
- Maintenance Fees
Exploitation architecture

CORE – the infrastructure
How to apply it in an industry?

- Starting with the small pilot project as PoC (proof of the concept)
  1. Selected process data is shared for test (smaller amount)
     - A rigorous Data privacy and security approach is already in place
       - Data can be anonymized, if required
  2. Testing is performed in our infrastructure
  3. The results are shared with the process owners (CO-CREATION)
  4. Discussion about the validity of the approach
  5. Next steps defined
- Time frame for this phase (PoC): 2-3 months
Exploitation process++

Set of activities in order to get paying customers:
1. Problem-Solution definition
2. Business Model Draft
3. Market Deep Dive
4. Business Model Fit
5. Problem-Solution Fit
6. Product-Market Fit
STANDARDIZE: ProaSense and RAMI (Reference Architecture Model for Industry 4.0)
Conclusion

• Different approach
• Promissing
• To be continued
Thank you for your attention!

QUESTIONS?
Scenario – decide phase

- Based on the predicted probability distribution for the occurrence of a future gearbox breakdown, the **proactive recommendations of actions** can be provided.
- Recommendations along with **the recommended activation time** should
  - mitigate (i.e. reduce the probability of occurrence) or
  - completely eliminate the future gearbox breakdown.
- Examples:
  - to take the equipment down for full maintenance - an action that completely eliminates the predicted gearbox breakdown
  - increase lubrication of metal parts
  - shift drilling to lower pressure mode
- The suggestion of one of these actions may consider the **company’s business context**
  - location of drilling equipment
  - availability of resources
  - next planned maintenance
Scenario – act phase

• After realizing the recommended action, the responsible actor should provide feedback on its success, enabling ProaSense to learn and adapt
• The business improvement analyzer allows users to correlate progress of key performance indicators and recommendations made
  – How downtime of a specific gearbox and the drilling rate have evolved and how many recommendations were made during a specific period of time?
• This analysis will support users in understanding if recommendations are contributing to having an indicator meet its target value or not
  – In case of divergence between an indicator and target value, a deeper action may be required, such as the replacement of a piece of equipment