• G4. Enrich the KOS infrastructure with the ability of handling incomplete logs (task in WP2 without deliverable)

• G5. Provide advanced process monitoring facilities.
Objective (from DoW)

- definition and development of mechanisms for the hybrid monitoring of processes.
- Hybrid = combining symbolic and statistical approaches.
Tasks (from DoW)

- **T3.1** Definition of a framework to combine symbolic and statistical approaches for process monitoring. [10 PM]

- **T3.2** Analysis and tuning of existing machine learning techniques for hybrid monitoring approaches. [6 PM]

- **T3.3** Extracting symbolic representations of properties from data. [6 PM]

- **T3.4** Concept drift detection. [6 PM]

**Effort:** FBK: 16PM, UniBZ: 8PM, UniINNSBRUCK: 4PM
Deliverables

- **D3.1** First hybrid process monitoring framework (Result of T3.1) [Report, M 24]

- **D3.2** Techniques for tuned machine learning (Result of T3.2) [Report, M 30]

- **D3.3** Techniques for extracting symbolic representations from data, and concept drift detection (Result of T3.3, T3.4) [Report, M 36]
Next steps:

- **T3.1** Definition of a framework to combine symbolic and statistical approaches for process monitoring. [10 PM]

- **T3.2** Analysis and tuning of existing machine learning techniques for hybrid monitoring approaches. [6 PM]

- Extend abductive framework for dealing with incomplete event logs with probabilistic abduction.

- FBK and UniBZ
Next steps:

- Insert data
- Validate data
- Send to APSS
- Verify outcome
- Add to send queue

Learning from past traces
Making hypothesis
What is the meaning of numbers?

- Frequency,
- Probability
- Next activity rather than the entire path?
Effective verification of process+data

- DCDS
- Planning
Next steps:

- **T3.3** Extracting symbolic representations of properties from data. [6 PM]

- *Apriori and Sequence Analysis for Discovering Declarative Process Models*
  Taavi Kala, Fabrizio Maria Maggi, Claudio Di Ciccio and Chiara Di Francescomarino. To appear at EDOC 2016

- FBK
Next steps:

- A new approach based on:
  - A-priori algorithm
  - Sequence Analysis

- Significant performance improvement of ProM Declare Miner plugin

Execution Logs

Declare Miner

A is always eventually followed by B

C and D never occur together
Next steps:

- **T3.4** Concept drift detection.

- UniINNSBRUCK
Concept drifts

- Types of concept drifts
  - Sudden
  - Incremental
  - Gradual
  - Recurring

- Object of the drift
  - The process model we are monitoring
  - The stream of events which we are analyzing

- Principle: recent events are more important than old events

- Goal
  - Embed the principle into monitoring approaches
  - Monitor for new classes