FAS Simulator – Executive Summary

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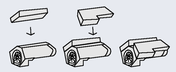
Topic

- Once upon a time, there was a factory.

- The factory had a process.



- The process creates a log file.

```
Product moved to Workplace 1
Part A attached to Product
Product moved to Workplace 2
Part B attached to Product
Product moved to Workplace 3
Product tested
```

- Multiple products are going through the factory at the same time.
- The log becomes interlaced.

```
Product moved to Workplace 1
Part A attached to Product
Product moved to Workplace 2
Product moved to Workplace 1
Part A attached to Product
Part B attached to Product
Product moved to Workplace 3
Product moved to Workplace 2
Part B attached to Product
Product tested
Product moved to Workplace 3
Product tested
```

- The factory owner adds an internet of things vibration sensors to the equipment, to get information when the equipment is started and stopped.
- These events are mixed into the logs along with the process events.

```
Product moved to Workplace 1
Equipment 1 started
Equipment 1 stopped
Part A attached to Product
Product moved to Workplace 2
Product moved to Workplace 1
Equipment 1 started
Equipment 1 stopped
Part A attached to Product
Equipment 2 started
Equipment 2 stopped
Part B attached to Product
Product moved to Workplace 3
Product moved to Workplace 2
Equipment 2 started
Equipment 2 stopped
Part B attached to Product
Product tested
Product moved to Workplace 3
Product tested
```

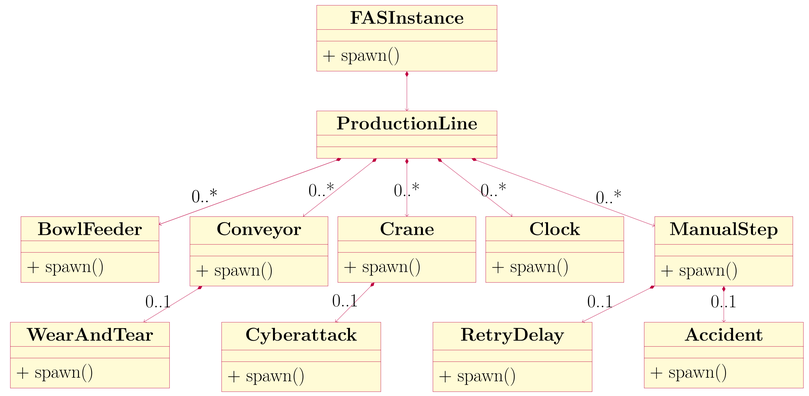
Idea

- If we had a learning system that can learn these kinds of processes from observing the logs, it could alert us if it sees something unexpected.
- How can we support the design a learning system that is adept at learning process models from symbolic logs?

Discrete Event Simulator

- A Discrete Event Simulator (DES) is a system which simulates a system in an event-oriented fashion.
- The system consists of component processes which wait and send events, and interact.
- The result is a sequence of events and timestamps that happened.

Simulator



From Simulators to Learning Systems

All kinds of industrial and logistic processes create event logs. The events in these logs are created by different devices, and often we do not know the explicit process model of the processes that create these events.
Wouldn't it be great if we could create a machine learning system that can observe these kinds of logs, and deduce the model of the process?
There are some existing methods for that, but those are very limited. Current methods can only extract an explicit process model from logs when the process instance is identified for each event. The extracted process model is formal and definite and does not capture an intuitive understanding of the process, only allowed and not allowed sequences.
Modern machine learning methods can capture intuitive understanding and approximate facts of such processes. For example, a system can observe that the new vibration sensor added is related to the process even if the vibration events are not matched one-to-one to a specific product.