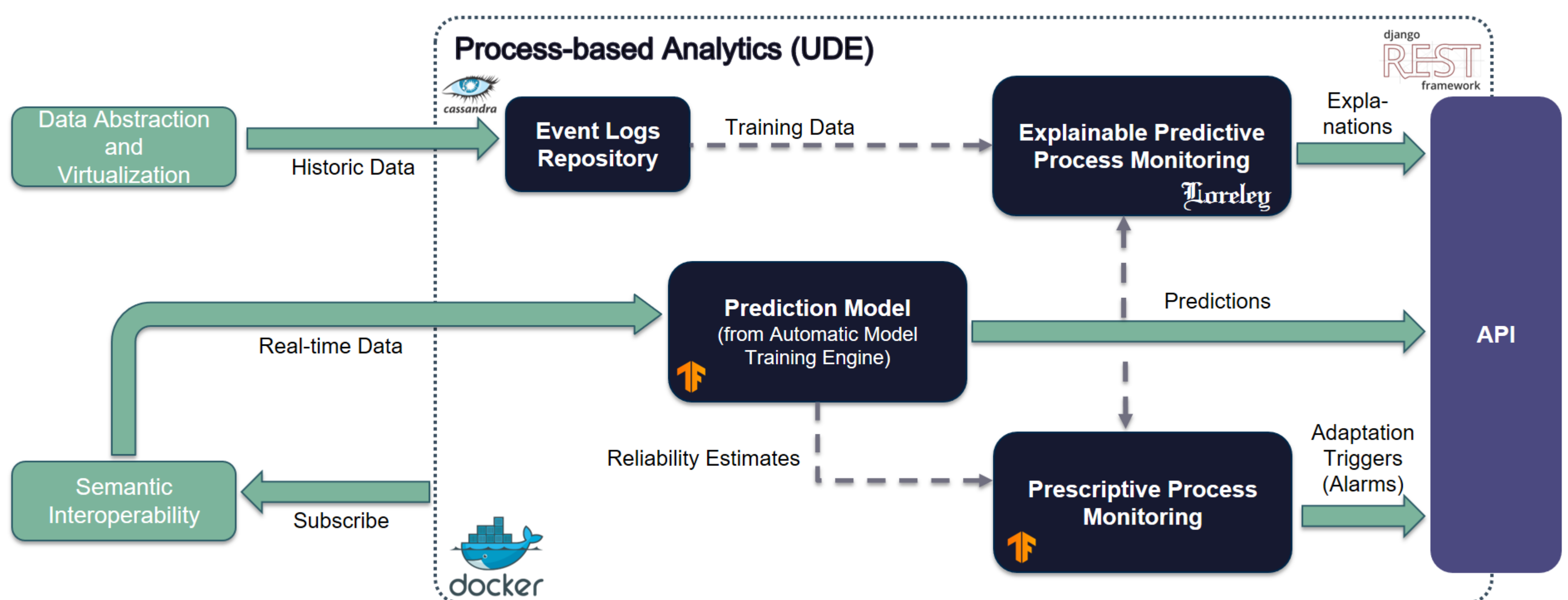


Overview



The Process-based Analytics component (PBAC) provides advanced capabilities to monitor and adapt running business processes in the port domain. To this end, PBAC combines different state-of-the-art ML techniques, in particular reinforcement learning, and explainable AI. It analyses business processes by using both historic and real-time data available inside the DataPorts platform to provide its predictive results to cognitive applications, which inform the end-users about the predictions.

Component at a glance



Query data (historical and real-time) from the available datasets in the DataPorts ecosystem

1

Received data is saved in the right format in an event log repository

2

Event logs are used to train the predictive process monitoring model

3

The trained model can be used for historical and real-time predictions

4

The explainable process monitoring components generates explanations for each prediction

5

The prescriptive process monitoring components generates reliability scores for every suggested adaption

6

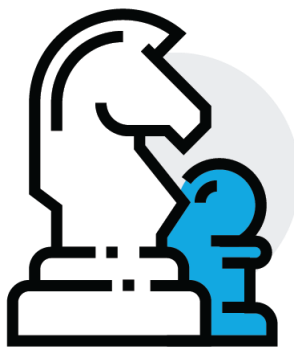
The results of the whole component can be accessed via the API

7

Goals of the component

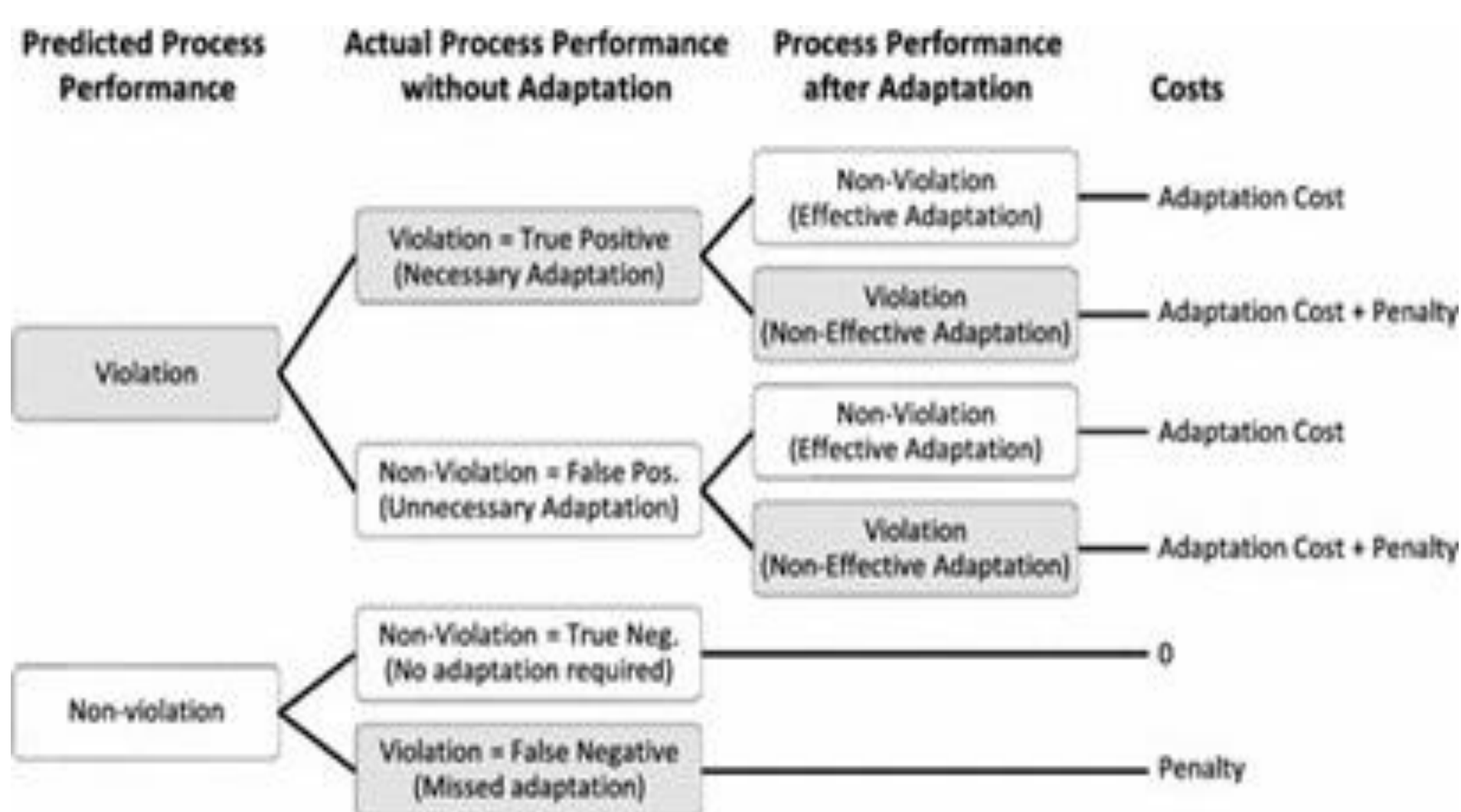
The PBAC leverages the prediction models trained as part of the Automatic Model Training Engine and connects the outcomes of this prediction model with two novel two sub-components, each of which utilises a different, complementary set of ML techniques:

- **Explainable Predictive Process Monitoring:** Predictive business process monitoring is usually performed via deep learning models, such as the LSTMs. Although such models achieve consistently higher prediction accuracy than simple models, one major drawback is their lack of interpretability, which limits their adoption in practice. This sub-component uses state-of-the-art XAI methods to explain the predictions made by the prediction model trained in the AMTE component.
- **Prescriptive Process Monitoring:** For this sub-component, we developed an approach that uses Online Reinforcement Learning to resolve a fundamental trade-off between prediction accuracy and prediction earliness. This sub-component provides indicators that estimate the reliability of individual predictions made by the predictive models of the AMTE component. Such reliability estimates quantify the likelihood that the prediction is correct, which provides additional information for decision making.



About the component

- **PBAC:** A combination of state-of-the-art solutions for monitoring and optimizing ports operations via ML
- **API:** An interface that enables direct connection and interaction with the component to query its results



Target users

DataPorts Process Based Analytics Component API 1.0.0 OAS3

The screenshot shows the API documentation for the DataPorts Process Based Analytics Component API (version 1.0.0, OAS3). It lists several endpoints with their respective HTTP methods and descriptions:

- GET /datasets**: Returns meta information on all available datasets
- GET /datasets/{dataset_id}**: Query the meta information about a dataset by its specific id
- POST /callback/incoming/historicdata**: Method to receive incoming callbacks with historic data
- POST /callback/incoming/realtimedata**: Method to receive incoming callbacks with real-time data

Below the endpoints, there is a 'Schemas' section listing various data structures: ListReference, DatasetMeta, DatasetList, Case, CaseList, and Result.



Use case scenarios

- Support port operations decision-making
- Receive business process metadata
- Historical and real-time predictions of business process instances
- Reliable suggestions for ongoing-processes adaptation
- Explanations for historical and real-time predictions
- API for subscribing to specific business processes to receive real-time predictions and explanations



Benefits

- **Ease of use and deploy:** PBAC can be deployed in a PC, server, virtual machine, or cloud infrastructure
- **Prevent business losses:** PBAC monitors processes, notifying process managers about potential delays or SLA violations and suggesting adaptations to prevent losses.
- **Aids port operations:** Except from real-time monitoring, PBAC provides reliability estimates to help operators distinguish between more and less reliable predictions on a case-by-case basis.
- **Transparent services:** PBAC offers transparency by generating explanations of why a specific prediction was made, to ensure the acceptance and trust of users in adopting the predictive assistant system.
- **Extensible solution:** PBAC is developed with widely used technology, offering compatibility with other tools. Also aiding extensibility to meet port operator requirements.
- **Open source:** The implementation of PBAC is made open source.