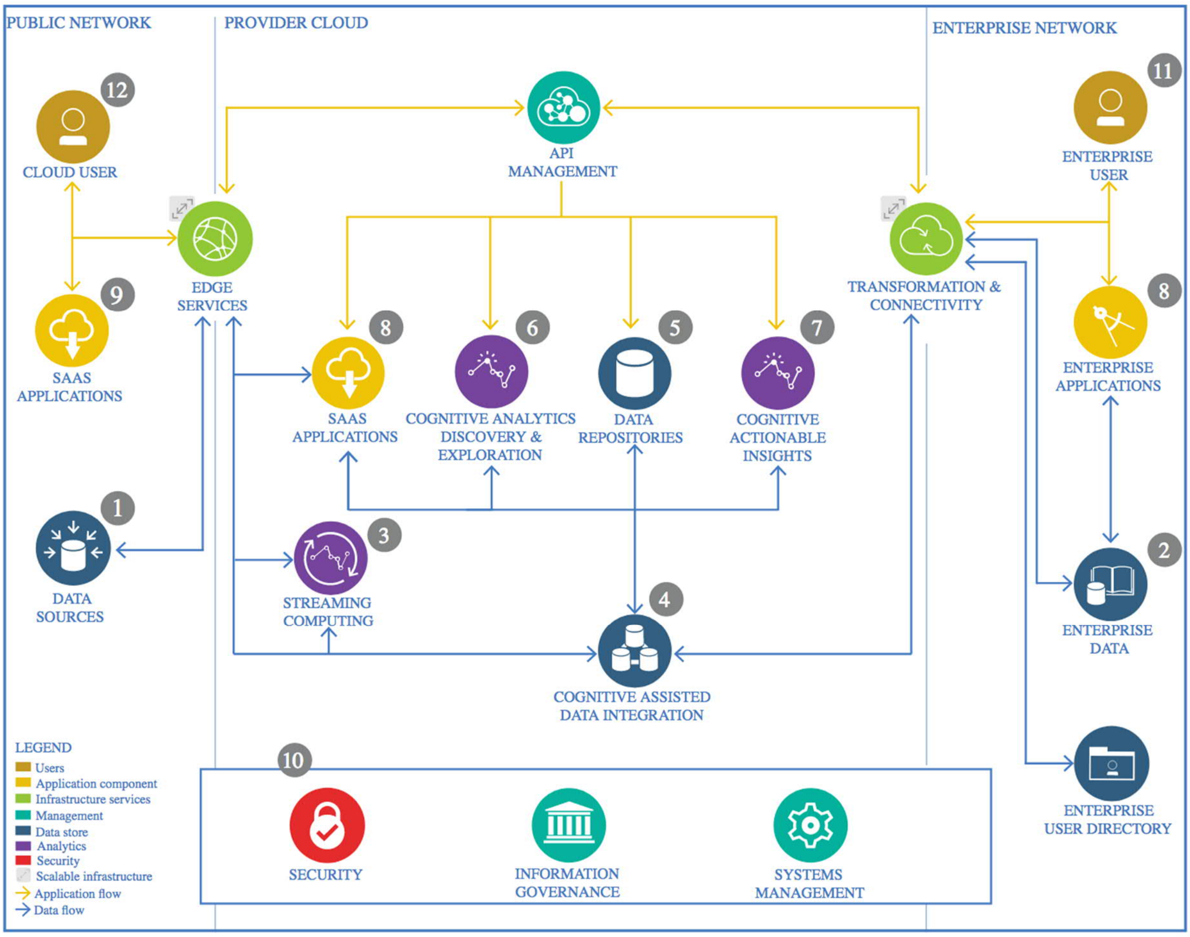
The Lightweight IBM Cloud Garage Method for Data Science

Architectural Decisions Document Template

1 Architectural Components Overview



IBM Data and Analytics Reference Architecture. Source: IBM Corporation

1.1 Data Source

1.1.1 Technology Choice

The data source is a CSV file and is uploaded to the IBM Watson Studio.

1.1.2 Justification
Since the dataset is small (<10k datapoints) there is no need for more complex architectures.

1.2 Enterprise Data

1.2.1 Technology Choice
The data is uploaded to the IBM Watson Studio.

1.2.2 Justification
Since the dataset is small (<10k datapoints) there is no need for more complex architectures. In case of a more sophisticated application (e.g. several embedded devices uploading data on a regular basis) a more robust approach should be considered, evaluating availability, redundancy, data security and integrity checks.

1.3 Streaming analytics

1.3.1 Technology Choice
In the scope of the capstone there is streaming capability.

1.3.2 Justification
Since the dataset is static there is no need for streaming analytics. In a real world application streaming would need to be taken into account.

1.4 Data Integration

1.4.1 Technology Choice
The data integration platform of choice is jupyter notebook.

1.4.2 Justification
Jupyter notebook is an adequate tool for data cleaning and exploration. However, for a real world application the choice should be revised.

1.5 Data Repository

1.5.1 Technology Choice
Since the dataset is static it was simply uploaded to the IBM Watson Studio.

1.5.2 Justification

Given that the data is static and easily available at the UCI repository, simply uploading to the IBM Watson Studio is appropriate. For a real world application a more robust choice of data repository is needed.

1.6 Discovery and Exploration

1.6.1 Technology Choice

Jupyter notebook is an adequate tool for data cleaning and exploration.

1.6.2 Justification

Jupyter notebook is an simple enough and can be used to explore data and comment design choices.

1.7 Actionable Insights

1.7.1 Technology Choice

Main insights were the need for data validations (% of missing values) and normalization.

1.7.2 Justification

The use case considered is rather simple and the database provided is of reasonable good quality.

1.8 Applications / Data Products

1.8.1 Technology Choice

LSTM can perform a good reconstruction of the desired signal. However in a real world application issues of model recalibration (e.g. sensor loss, aging) of fault detection should be addressed.

1.8.2 Justification

LSTM are a simple but effective approach. GRU should be investigated as well.

1.9 Security, Information Governance and Systems Management

1.9.1 Technology Choice

This was not approached in the capstone project.

1.9.2 Justification

For a capstone project this would be out of scope. In a real world application issues of model recalibration (e.g. sensor loss, aging) of fault detection should be addressed. Furthermore issues of system security and availability should be considered.

Additional issues:

- Data quality is assessed by the percentage of nan in each feature because too many missing values may make time-series prediction very hard or impossible
- Normalization is used for feature engineering because many techniques, including neural networks work best on scaled data
- Linear regression was used a simple, fast baseline. LSTM is used for accurate predictions of sequences.
- Scikit learn provide a simple implementation of linear regression and evaluation metrics. Tensorflow 2.0 provide powerful tools for monitoring training (e.g. tensorboard)
- Mean Absolute Error (MAE) is used because it is less sensitive to outliers.