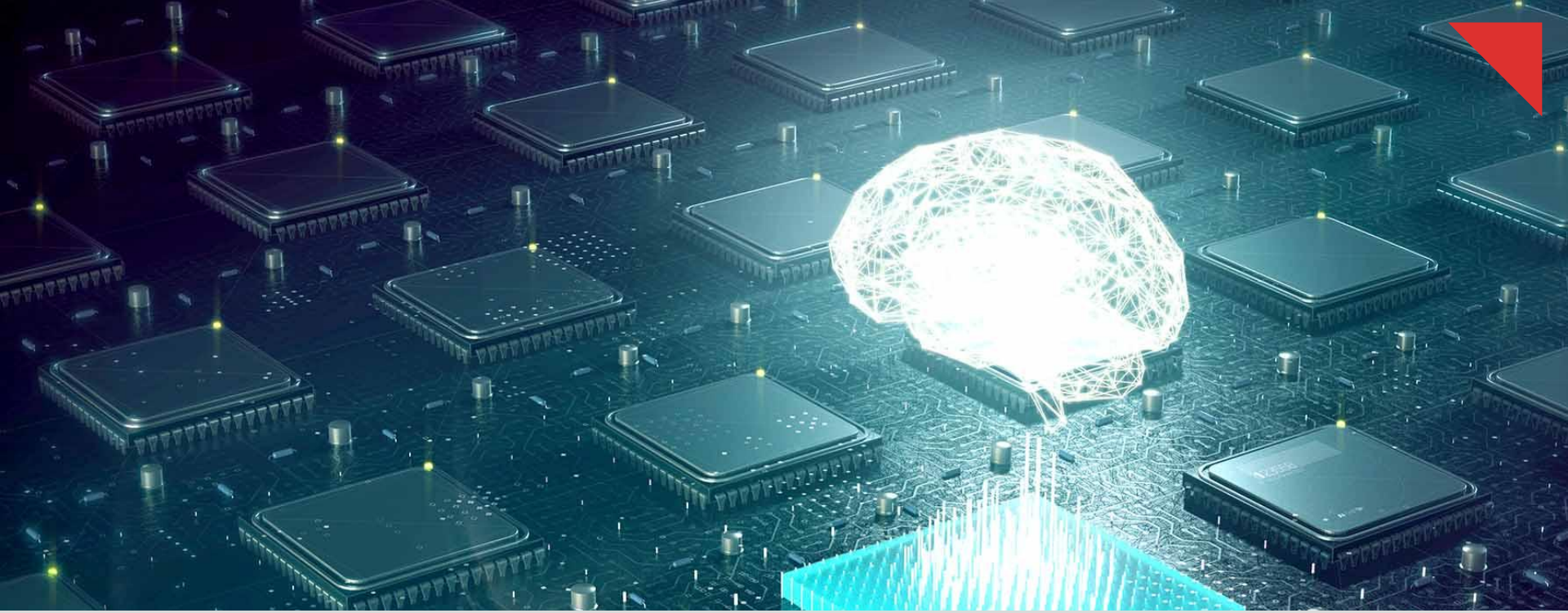

Prodapt powering global telecom

Developing a network event prediction model using AI/ML techniques

Credits

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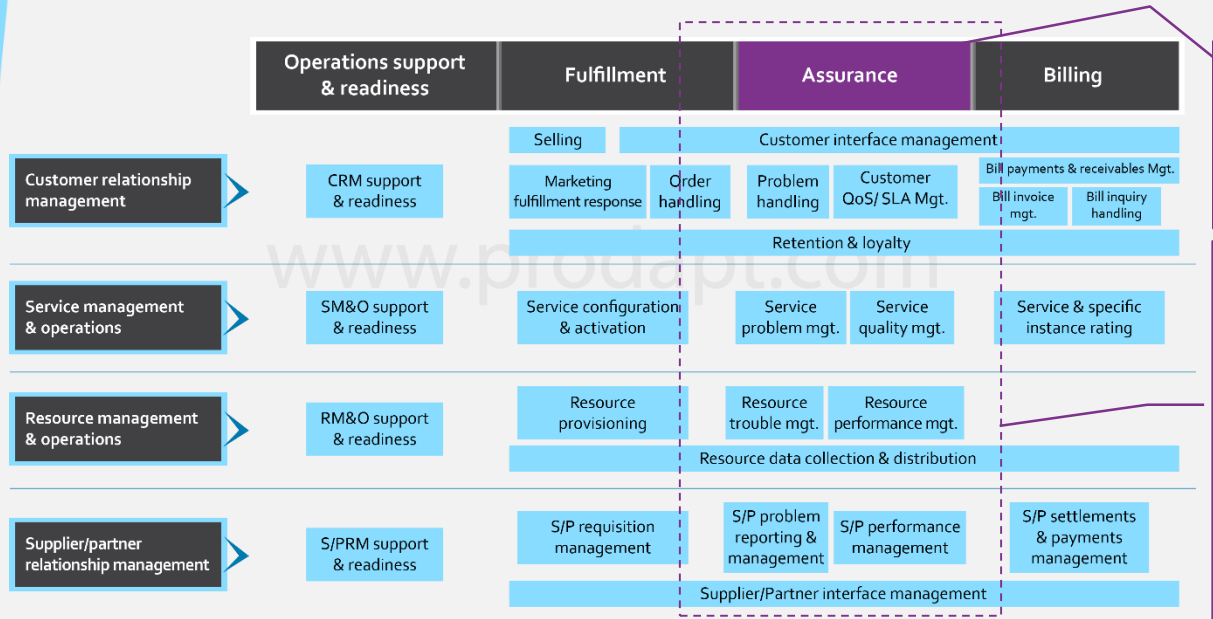
Challenges faced by DSPs in service assurance

Causing unexpected service outages, more open incidents, and higher OPEX

The telecom service assurance landscape includes probe monitoring, fault management, quality & service management, network performance monitoring, and workforce management.

As per heavy reading's service assurance and analytics research study conducted with 100+ network operators and service providers, nearly 40% reported that every issue around service assurance is rated a massive or significant challenge.



Service assurance is a big focus area for all the DSPs and they are looking at ways to address the common problems.

Common problems in the service assurance area are:

- Lower QoS & performance issues
- Accumulated network faults
- Network traffic congestion
- Multi-vendor based network device upgrades
- High downtime of network devices
- Exhausted capacity
- Reactive network event handling
- More open incidents

DSPs need to ensure end customer satisfaction and quickly mitigate any network performance issues, where any incident could easily cost them millions of dollars. DSPs should be able to analyse data at detailed levels to track the underlying quality of network performance and avoid unexpected outages.

DSPs are moving towards improving service assurance by leveraging insights from operational data and AI/ML techniques

Illustration below shows various data feeds that can be fed into an AI/ML engine to process the data, visualize and predict

Various Data Sources

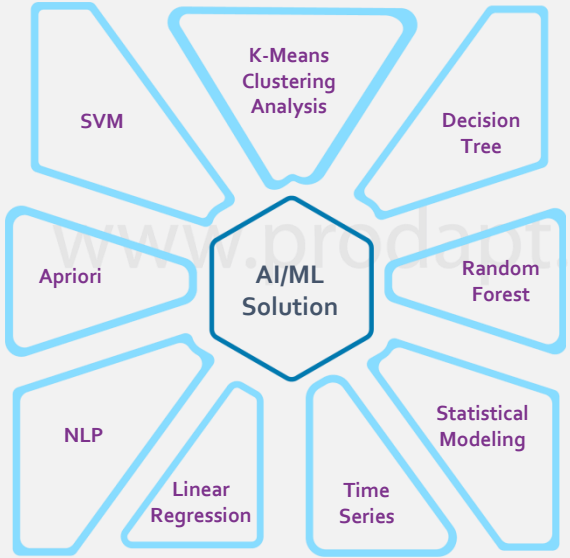
Inventory
Device details
Bills & orders
GIS associated details

NMS/EMS
Network topology
Network status (Traffic, BW)
Device health

Workforce
ERP details
Demography & skillset
Scheduled jobs & ranking

Operations & Service Info
QoE/QoS details
SLA, outage reports
Intrusion/theft details

Social Media Integration



Actionable Insights

Visualization

Predictions

Diagnostics

Prescriptions

Use of AI/ML in Service Assurance Domain

- Enabling preventive maintenance
- Intelligent decision support system
- Instant traffic threshold setup
- Traffic type prediction
- Network/device upgrades
- Capacity planning

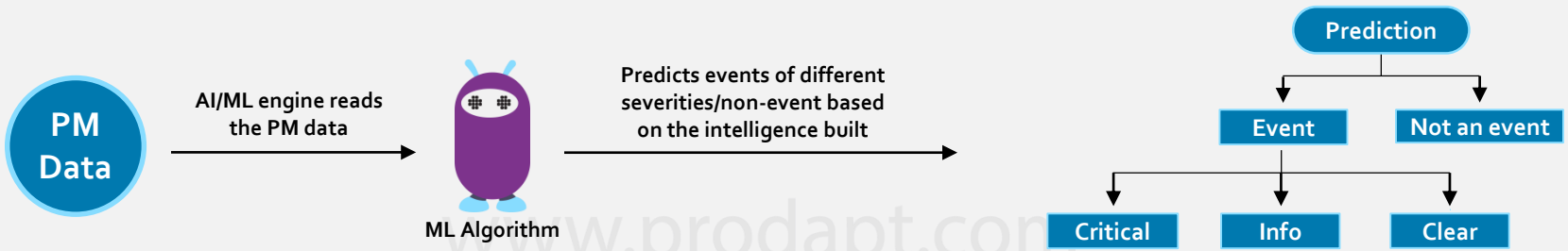
Network event prediction

With the overwhelming volumes and complexity of data coming from the service assurance domain, AI/ML techniques are proving to bring much value. This insight focusses on providing potential solution to develop a **real-time network event prediction** model using different AI/ML techniques.

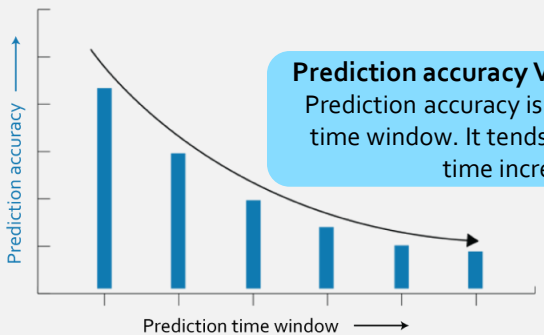
Network event prediction platform – enabling preventive maintenance

75% of faults predicted 30 mins ahead of time

Prediction of a network event along with its severity beforehand from the performance data of the network node - whenever a new PM data arrives, it predicts either as event/non-event based on built intelligence



Accuracy 75%



Prediction accuracy Vs. Prediction time window

Prediction accuracy is higher with shorter forecast time window. It tends to decrease as the forecast time increases gradually.

Confusion matrix

Actual				Predicted			
NE	CR	Info	Clear	NE	CR	Info	Clear
36	13	5	18	33	18	2	19

NE - Non Event
CR – Critical
Info – Information
Clear - Auto clear

Using these recommended AI/ML techniques, one of the leading tier 1 operators in the US was able to **predict the network events with 75%** of accuracy

Various AI/ML classification models used in network event prediction

Being an evolving industry, DSPs are doing a lot of research and innovations on AI/ML. Below are the recommended algorithms, which is used for network event prediction.

Random Forest Classifier

- Random forest is the most commonly used algorithm for classification problem
- Predicts accurately with less quantity of good data
- Easy to train the model with required inputs

Gradient Boosting Classifier

- More advanced than RF classifier model
- Prediction accuracy is better in most cases
- Easy to train in order to achieve best results
- Better prediction accuracy with less data

Recommended model for network event prediction

Neural Networks

- Requires a lot of tweaks by SMEs
- Requires high-end hardware (larger VM or GPU) for training
- Requires greater memory
- Hardware-intensive
- Scalable for larger data sets

Advanced ML Algorithms

Following algorithms work well with high quality & scalable data

- Perceptron (P), Boltzmann Machines (BM) & Restricted Boltzmann Machines (RBM)
- Learning Vector Quantization (LVQ), Recurrent Neural Networks (RNN)
- Temporal Convolutional Nets (TCNs), Support Vector Machine (SVM)

Gradient boosting model had better results compared to other models during network event prediction. This judgement is validated with an industry leading machine learning framework **AutoML by Anaconda.**

Moving towards a higher level of prediction accuracy

DSPs are already leveraging AI/ML techniques to improve service assurance issues. However, they face major challenges in achieving higher precision levels. Following are the list of recommended techniques, which help DSPs improve network event prediction accuracy.

- Obtain the SME's inputs to tag the contributing parameters by marking respective fields in the performance data during training or modelling phase
- Consider low severity events data before they become promoted alarm
- Ignore the demoted events data during the calculation of misclassification error percentage
- Appropriately consider seasonal data such as the data collected during a soccer match or a cricket match
- Performance data collection interval has to be in real time or near real time

DSPs need to make a trade-off between higher accuracy - shorter forecast window Vs lesser accuracy - higher forecast window in order to take any preventive or corrective actions.

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THANK YOU!