Topic sheet

Discover more value in your IoT data

the digital universe is expanding, not just data but also the devices that generate that data

It is estimated that there will be more than 20x connected devices per person on the entire planet by 2020, anything from 50 billion up to over 200 billion IoT devices * that's a lot of data being generated from IoT ecosystems.
The Internet of Things (IoT) is slowly taking over the world one way or the other and is beyond a buzz word and certainly not the end state, by definition; Iot is the network of connected devices or "things" with sensors that collect and transfer data through the internet. IoT crosses many verticals such as wearable devices, connected vehicles, smart homes and even smarter cities to the Industrial Internet of Things (IIoT) or Industry 4.0.
The challenge will be making all that data accessible and understandable to start extracting value from it all.

**Source: Gartner, IDC and Cisco*

Delivery architecture of the IoT ecosystem

The Internet of Things eco system, as we see it, can be broken down into four distinct layers;
Devices, Connectivity, Operations and Analytics

Devices — where the IoT devices and sensors are

Connectivity — where IoT devices are connected and managed, data from sensors is collected, local logic is executed from within the device or even device to device

Operations — where centralized logic is executed on the collected data, enabling action

Analytics — where new insight is discovered and new logic is born which can be fed back into the eco system at the Operational layer, Connectivity or even the Devices layer

As data flows within the IoT ecosystem it can be classified by one of three states, data in motion, in use and at rest.

- **Data in motion** occurs predominately at the Connectivity and IoT Devices layers. Also known as data in transit as it flows from Machine to Machine (M2M) and is not really analysed or stored. It is data under a constant state of change on its way to being processed somewhere.
- **Data in use** occurs mainly at the Operations layer and is active data or messages from things that can be used as event triggers, to activate other things, actions or behaviours. Normally by predefined rules and logic assigned to drive lower value decisions that need to happen mostly automated and in real-time (or near-real-time). Data in use is normally described as being processed before becoming permanently stored somewhere.
- **Data at rest** occurs firmly in the Analytics layer. At the end of the IoT data flow, data finally becomes static and at rest, even if that be for a brief period. It is in this state where IoT data can be analysed against historical data or even just the previous record. The Analytics layer is used to drive higher value tactical or strategic decisions through analytics. Data points can be analysed and measured enabling organisations to become agile data driven businesses. Whether it be measuring quality of data, enhancing performance, optimising processes or even discovering new innovative ways of doing business.

The journey from Data to Insights

To build a successful IoT strategy it is important to encompass the delivery architecture of your IoT ecosystem, that is not just how data is collected, managed and maintained but also how value will ultimately be created from IoT data. Being able to gleam those valuable insights enables one to move from just managing and maintaining to fully optimizing their IoT eco system. You want to be able to see across entire data sets and discover those "Ah ha" moments that spark true innovation. To finally realise the full value potential, the whole of the organisation must be enabled to access the data securely but in such a way for them to act or even start this discovery process for themselves.

	**Value Creation**	To create value out of IoT data, it needs to be **associated** with other data
	**Innovation**	Innovation from IoT is data driven, it needs to be **discovered** in the data
	**Value Realization**	For IoT value to be realized, insights need to be **shared** to be acted upon

Value Creation

How do you conquer the so far unknown values of your IoT data? To create value of IoT data, it needs to be associated with other data. With other connected devices, with IoT operational data or other source systems where data is created. It needs to be related with near-real time data and historical data. This is done through analytics, or predefined logic that has been defined through analytics.
Predictive maintenance of equipment based on statistical models is a well-known use case and IoT sensor data is improving the accuracy of the model, but to drive more value, more variables like equipment location, service scheduling, cost optimization and margin, and incident effects are needed to create more value. Aggregating all this data without the right tools can be time consuming and costly.

Innovation

Innovation from IoT is data driven, it needs to be discovered in the data. A requirements specification for innovation cannot be written based on IoT data alone, it needs to be put in the context of your business situation to be able to understand the real value potential. Conversely not all the data is needed to start discovering, just like Columbus didn't have a map of the world to find America. Innovation is born from ideas and self-service will be a critical enabler of this data driven innovation.

Value Realization

For IoT value to be realized, insights need to be shared to be acted upon, be it by a human or in some algorithm implemented in a system or an app. But even machine learning starts with people. It is people who will find new insights to apply smartness to data for machine to machine logic for example. So, it is important to ensure that the insights are shared with the people who are expected to act on these insights. From the service technician who is expected to perform maintenance procedures, and needs to understand why a certain operation is needed, to the data scientists who need insights to optimize your IoT eco system whether it be a change to the operational logic, rules or algorithms used at the IoT connectivity layer, or even inside the IoT device itself.

Analytics of Things drives data innovation

Having a broader understanding of these three key points will help make a successful strategy in discovering more value from your IoT data. In short it's not just about the collection of data from all those connected IoT devices it's about making that data accessible and providing the tools to make sense of the IoT data and therefore extract value from it, drive innovation and realise the full value. This side of IoT has been referred to as Analytics of Things (AoT) but how do you do this?

It will be important to analyse where logic/rules/algorithms are effective and just as important what situations or behaviours are not. You will need an analytics system that can not only integrate with the many systems within an IoT ecosystem but also connect to and transverse multiple disparate data sources and combine them so that it can show you the whole story in your data. By seeing both the included and excluded will help you to visualise, identify and understand more variables that should be included in algorithms and the like.

You want a flexible analytics system that will be future proof by being extendable, web based and ideally with a responsive design so you can use any device to conduct analysis. One that is scalable and can grow as you grow and above all one that offers governance of your data but without suffocating the sharing and collaboration of analytics desperately needed throughout the organisation.

Look for an analytics system that can provide the following;

- Flexible web based deployment (on premise, on or in the cloud)
- Connecting to your IoT platform(s) of choice
- Connecting to multiple data sources and combines them
- Connecting to authentication systems
- Governance of data and users with flexible rules based security
- Expanding analytics across the enterprise to your users
- Delivering analytics beyond the enterprise to your partners and customers
- Open APIs (Extending, Customise, Embedding)

At Qlik we have many customers benefiting from using our technology in their IoT ecosystem today. Here are just a few examples;

- In the Energy & Utilities sector, companies are using Qlik to leverage the big data their smart meters are generating and gaining a better understanding of how much energy their customers are using, sparking innovative tarrif plans such as free energy days.
- In the agriculture space, Mesur.io, an interesting start-up company, is combining securely integrated smart sensor technology with state-of-the-art predictive analytics and discovery engines to enable accurate decisions. They use Qlik to merge results of big data analytics and external data sources (such as weather, GIS, etc) with both historical and real-time feeds from devices. Growers can now easily monitor areas of concern, from water usage to feed storage conditions and beyond. Results include up to 35% reduction in water consumption.
- We also have a large automotive manufacturer using Qlik to analyse machine generated data in several areas such as connected car data, paint shop robotics and diagnostic readouts in service. Qlik is used to analyse data from advanced analytics for creation and tuning of algorithms as well as delivering insight into the business processes.

How can Qlik help you discover more value in your IoT data ?