WHITEPAPER

Advanced Analytics for Intelligent Connectivity:

Machine Learning as a Growth Engine for Telcos in the Age of 5G

VERTICA

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Introduction

The world is entering into a new era of ultra-connectivity, as more people and devices than ever before tap into operator networks and come online.

The number of global users connected to the mobile internet topped 3 billion in 2017. By 2025, GSMA Intelligence forecasts that figure will grow by more than 1.75 billion to reach a total of 5 billion[1].

In the same timeframe, GSMA Intelligence predicts the market will experience massive growth in the number of Internet of Things (IoT) connections across cellular and non-cellular technologies. There were already 6.3 billion connected IoT devices in 2017, and that figure is expected to nearly quadruple to reach 25.2 billion in 2025[2], offering operators a $1.1 trillion revenue opportunity[3].

Operator networks provide the magic to fuel this march. Uptake of 5G technology, with its lightning-fast speeds and ultra-low latency, has the potential to enable entirely new user experiences and a more intelligent kind of connectivity.

Just two years from now, GSMA Intelligence predicts as many as 50 million people worldwide will have 5G connections. By 2025, that figure is expected to rise to 1.2 billion[4], with Asia, North America and Europe leading the charge.

Of course, next generation networks raise the spectre of new complexity challenges for operators, and with the influx of new connections will come a sea of data to navigate. But carriers can rise to the occasion with new data management platforms, using predictive analytics and machine learning to correlate network, user, device and application activity for greater customer gains and operational efficiencies.

[1] GSMA Intelligence, "Unique subscribers and mobile internet users". February 2018.
[2] GSMA Intelligence, "IoT: the next wave of connectivity and services". April, 2018.
[3] GSMA Intelligence, "IoT: the $1 trillion revenue opportunity". May 2018.
[4] GSMA Intelligence, "5G connections to surpass 1 billion by 2025". August 2017

Intelligent connectivity

GSMA defines[5] intelligent connectivity as a fusion of 5G, IoT and artificial intelligence (AI) technologies which will enable new, transformational capabilities across a wide range of verticals, including everything from entertainment and healthcare to transport and industry.

5G will play a key role in this mix, providing a critical foundation of ubiquitous connectivity with increased network capacity, throughput and unprecedented responsiveness. Network slicing, which allows operators to split a single physical network into many layers using virtualised architecture, will also become much more granular in a 5G world, enabling service providers to tailor connectivity to individual applications and users.

This will open the door for the advancement of new products and services which depend on reliable, low-latency connectivity, such as autonomous cars, augmented reality, real-time gaming, remote surgery and more.

Additionally, operators will gain access to a flood of essential real-world data as 5G drives a massive expansion of the IoT. This information will in turn fuel new machine learning applications, AI development and product personalisation.

GSMA's vision of intelligent connectivity previews a world in which insights from big data will improve decision-making across the board, making roads safer, people healthier, factories more productive, and delivery of products, services and education more on-demand and engaging.

But in order to transform this vision into a reality, organisations need the right tools to manage these next-generation networks and the data which flows through them.

Managing complexity

Though 5G will bring increased opportunities for operators and other communications service providers, it will also bring increased complexity to the network.

Operators will need to effectively manage each network slice that is created, as well as the new products and services which run on them.

While it's impossible to know now exactly how many network slices operators will be juggling, Ericsson tips[6] the figure to be "quite high". That's because even though operators can develop slice templates based on the needs of certain verticals, the specific operational, service and business requirements of each user mean each template might yield "any number" of individual slices.

In order to keep costs down and preserve the business case for network slicing, operators will need to turn to automated systems to manage these assets.

Operators will also need to find an efficient way to sift through and monetise a tidal wave of data as the number of connected consumer and IoT devices rises.

[5] GSMA, "Intelligent Connectivity: How the combination of 5G, AI, and IoT is set to change the Americas". September 2018.
[6] Ericsson blog, "How many network slices are needed". July 2018.

Svetlana Grant, GSMA's IoT Program Director, wrote[7] the quantity of data generated by IoT devices will be "unthinkable," adding "in its raw, unstructured form, this data is of limited value to anyone, and current analytics tools will be simply unable to cope." But she also noted that data can become a "bankable asset" if managed and used properly.

An Ericsson survey[8] of 20 leading operators released in April 2018 found they were pursuing multiple paths to generate revenue from the IoT, but concluded 70 % lacked a well-defined strategy for tackling the market opportunity.

In order to reap the most benefit from both 5G and the IoT and be successful in the long-term, Nokia CTO Marcus Weldon said[9] operators must expand beyond their traditional role as connectivity providers and use data to offer value-added services.

Power of prediction

Predictive analytics and machine learning can help operators tackle a number of the aforementioned challenges, giving them tools which can be used across business processes including everything from customer experience management, network performance analytics, capacity planning and revenue assurance to security analytics, fraud detection and myriad other data monetisation use cases.

Simply put, machine learning[10] is a tool which can help identify patterns and relationships in a data set and predict outcomes based on those inputs using statistical models. The insights gleaned through the use of advanced analytics and machine learning allow companies to be proactive rather than reactive, and offer both better customer service and better products.

Recognising and tapping information from the appropriate information sources[11] is the first step in turning data into dollars. Sources run the gamut, including everything from network data, call detail records (CDR), sensors and other connected devices, apps, services and CRM systems.

Once the data is gathered, it can be used to generate models that predict future actions and outcomes, such as the probability of customer churn or how an impending event will impact network performance.

There are applications for predictive analytics across business segments. For example, predictive analytics can help operators provide service assurance and improve user experience on their networks. Additionally, operators and vendors can use it as a tool for IoT data management and predictive maintenance for devices. Media companies and over-the-top (OTT) video providers can apply predictive analytics to gather audience metrics and personalise content offers. It can also help advertising technology firms crunch data faster to measure ad performance and reallocate resources accordingly.

[7] GSMA, "Scaling the IoT Becomes the Next Frontier for the Mobile Industry in 2018". January 2018.
[8] Ericsson, "Exploring IoT Strategies". April 2018.
[9] Mobile World Live, "Nokia CTO puts value on edge cloud". May 2018.
[10] Microfocus, "Unlock Machine Learning for the New Speed and Scale of Business". September 2017
[11] Microfocus, "Unlock Machine Learning for the New Speed and Scale of Business". September 2017

Telco and Mobile Operator Use Cases	Data Sources
Capacity Planning and Management	**Network Usage**
Network Performance Monitoring	Call Detail Records (CDR)
Customer Churn Analysis	Internet Protocol Detail Records (IPDR)
Targeted Marketing and Promotions	**Network Traffic**
Content Personalization	Equipment Probes
Fraud Detection	Sensors
Revenue Assurance	Log Files
Customer 360	**Web and Mobile Applications**
Network Optimization	User Events
Security Analytics	Content Metadata
	Clickstream
	Latency or Bitrate
	Business Applications
	Customer Relationship Management (CRM
	Enterprise Resource Planning (ERP)
	Marketing Automation
	Digital Advertising
	Impressions
	Clicks
	Conversions

Hitting a wall

Tools like predictive analytics and machine learning go hand in hand with the idea of intelligent connectivity. Absent the ability to process the massive amounts of data generated by mobile networks – including 5G and the IoT – operators and other organisations will be unable to effectively capitalise on the opportunity to offer not only network innovation but also new, personalised products and services.

However, legacy systems are ill-equipped for the challenge.

One issue common to many organisations is siloed data[12], which occurs when different branches of a single company have control over different data sets. Data from one branch may be stored in the cloud, while another is kept in an on-premises data warehouse and still another is stored in a Hadoop data lake.

These historic silos make it difficult for organisations to get a unified picture of their data and run analytics across all of these information pools. Efforts to bridge the gap between these resources can be both expensive and time consuming since they require specialised skillsets, making projects which rely on analytics more complex to manage and subject to delays. The process of merging data from disparate systems into a unified set can also leave companies working with inconsistent data points and incomplete information, yielding results which may not live up to expectations.

Legacy systems also present obstacles to scale and speed. Companies are now collecting data from more sources than ever before – cell phones, sensors, machine equipment, the network itself. But this influx of information creates a number of challenges since the old tools companies have at hand were not built to have so many users running complex analytics on such a large volume of data.

One of the key value propositions offered by analytics is the ability for companies to glean actionable information from data sets very quickly.

When corporate SLAs and high customer expectations are on the line, the speed and accuracy of analytics are critical, particularly as companies move to automate more processes. In the case of a network outage, for example, the right system could help an operator reduce response times from hours, minutes or seconds to just milliseconds, and pinpoint which services and revenue streams are most impacted to prioritise restoration efforts. It might even identify problems with a key network asset so it can be replaced or maintained in advance, thus preventing the outage altogether.

Of course, the more users – both internal and external – who can access those kinds of insights, the more value companies can generate from a given data set.

However, attempts to run too many queries concurrently on a legacy database can slow down processing significantly, meaning organisations and their clients cannot be as agile with their data as they might like.

Companies which have recognised these problems often double down on legacy systems, investing more money on the solutions they have in place in an effort to head off the issues. But all too often these systems rely on proprietary technology, which limits companies' hardware and software choices.

[12] Information Week, "Data Silos: Now and Forever". November 2018

Analytics in action – success stories

The difference between legacy analytics systems and a solution like Vertica can be stark. Below are descriptions of three separate implementations of Vertica for very different use cases which illustrate just how wide the gap is:

Anritsu: service assurance

Anritsu, a provider of test and measurement solutions for network operators, faced an acute pair of challenges in 2012: rapidly growing data storage needs and increased demand among its clients for shorter response times from data analysis. Where formerly customers were happy to receive insights within 15 to 30 minutes, they began asking for results from larger data sets within a few seconds.

After evaluating factors including cost, scalability and time to deployment, Anritsu opted to switch to the Vertica Analytics Platform rather than spending big to upgrade its legacy system.

In addition to sparing the company around $2 million per year in upgrade costs, the move allowed Anritsu to improve performance and increase employee productivity.

With Vertica, the company is now aiming to use predictive analytics and machine learning to help operators prevent issues before they even arise[13].

Catch Media: personalisation

Catch Media similarly turned to Vertica to solve issues related to scale and speed, albeit with a different goal in mind.

The company's database simply wasn't scalable and enterprise-ready enough to grow with them. Catch Media needed a data analytics platform capable of tracking hundreds of millions of users, with tens of billions of data event transactions processed in near-real-time on a monthly basis, with no data aggregation or reduction in query performance or feature limitations.

Vertica offered a solution to this. Because Vertica is so scalable, Catch Media can query an unlimited amount of historical data without the need for pre-aggregation. Vertica gives Catch Media the performance, scalability, flexibility, and pricing structure to help their clients engage consumers, drive lifetime value, and increase revenues. As a result, they have shown a 50 percent increase in engagement through the effective segmentation of consumers into distinct audiences that can be targeted in-real time with messaging and recommendations personalized to their content consumption behavior[14].

Tuenti: user experience

Telefonica-owned mobile virtual network operator Tuenti Technologies also selected Vertica to process data faster and glean deeper insights to enhance its mobile app.

As its user base grew, Tuenti found it increasingly difficult and time-consuming to analyse data stored across its MySQL and Hadoop pools. It wanted deeper granularly and faster insights from its data sets to allow it to add and remove features from its app in response to customer demand.

Using Vertica, Tuenti was able to compress its raw Hadoop data set from 1TB to 50GB, and aggregate and measure multiple metrics daily. Vertica also made it possible for more employees to tap into insights from the data set, opening it to more than 150 internal developers rather than the three-person analysis team that previously had access to the information.

Now, the company is able to push out three to four app updates per month using insights from user data provided by Vertica[15].

[13] https://www.vertica.com/wp-content/uploads/2017/01/r24-HPE-Vertica-ROI-case-study-Anritsu.pdf
[14] https://www.brighttalk.com/webcast/8913/340965/4-steps-to-drive-customer-lifetime-value-gain-real-time-behavior-intelligence
[15] https://www.vertica.com/wp-content/uploads/2018/02/Tuenti-Case-Study.pdf

Conclusion

Intelligent connectivity is on the horizon, but the data flowing in from a growing number of consumer and IoT devices remains an underutilised resource.

The advent of 5G will bring with it even more potential, offering a potent combination of customisable network slices, faster speeds and ultra-low latency. Such capabilities will give companies the chance to offer new and personalised experiences to users around the globe, but truly responsive and intelligent data management is the key to unlocking this future of possibility.

The companies that will thrive in the age of intelligent connectivity will be those which scrap outdated data storage and analysis systems in favour of solutions which offer unified visibility across data silos, massive scalability, faster insights and an ability to generate accurate predictions using advanced analytics and machine learning.

With a solution like Vertica, companies will finally be able to fully leverage the power of advanced analytics and machine learning to effectively serve new use cases, offer highly-contextual user experiences, improve operational efficiencies, deliver better network quality and manage the increasing complexity of our connected world.

Vertica is trusted by thousands of leading data-driven enterprises around the world, including AT&T, Etsy, Cerner, Intuit, Uber and more to deliver speed, scale and reliability on mission-critical analytics. The Vertica Analytics Platform is purpose built from the very first line of code for Big Data analytics. It is designed for use in data warehouses and other big data workloads where speed, scalability, simplicity, and openness are crucial to the success of analytics. Vertica relies on a tested, reliable distributed architecture and columnar compression to deliver blazing fast speed. All based on the same powerful, unified architecture, the Vertica Analytics Platform provides you with the broadest range of deployment models – including on-premises, in the clouds, and on Hadoop - so that you have complete choice as your analytical needs evolve.

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