5G Analytics: Addressing the Data Explosion
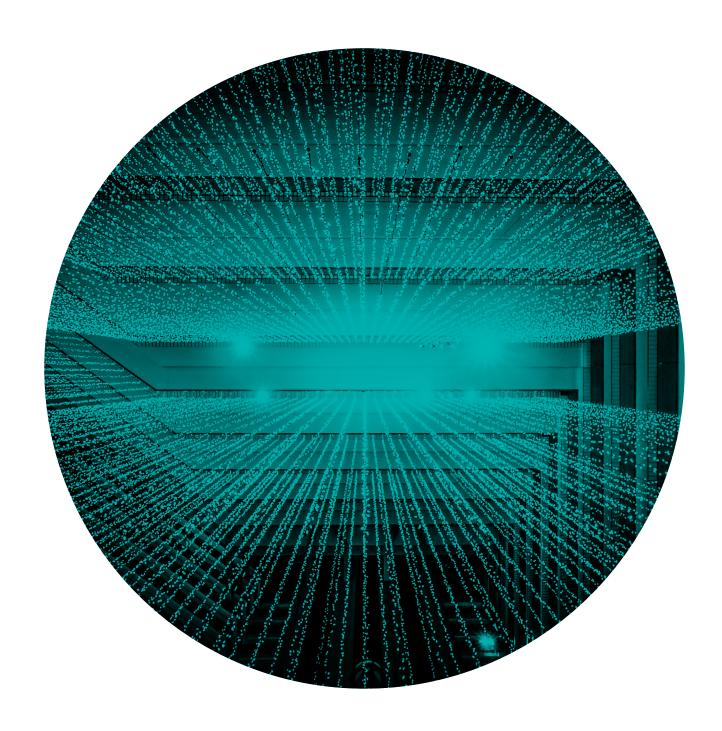

Nadine Manjaro
07.21 / COMMUNICATIONS

teradata.

Table of Contents

5G Analytics: Addressing the Data Explosion

U.S. operators will spend more than $250 billion to deploy 5G wireless networks from 2020 to 2025. The recent C-band (5G spectrum) auction where four operators accounted for $79 billion of the $81 billion raised increased 5G costs by an additional 40%. The top U.S. operators (Verizon, T-Mobile, and AT&T) will complete the majority of their 5G deployments over the next five years. As they continue to expand their 5G coverage and capacity, a key concern is how to recoup their 5G investments while minimizing deployment costs.

The most common focus areas for revenue growth include:

- Fixed wireless access
- Expanded B2B offers
- Network monetization
- Increasing average revenue per user (ARPU) from the existing customer base

Along with increasing revenue, operators are also focused on minimizing costs through optimized capital allocation and automation.

Data analytics will be critical to both increasing revenue and managing costs in a highly competitive mobile market. Personalized services and exceptional customer experiences will be key to retaining existing customers and adding new subscribers; both require data analytics across multiple domains and data sources. In addition, real-time visibility into network performance at an aggregated view ensures faster issue resolution time and improved overall quality of experience. Network data analytics integrated with customer experience data can enable this system of insights.

Teradata's QueryGrid feature enables users to query data from disparate sources without moving the data to Teradata Vantage™, the connected multi-cloud data platform. The data is then integrated and analyzed leveraging machine learning models trained from

teradata.

historical data. Inferences from these trained models will enable near real-time actions and will improve the customer experience.

5G introduces new frequency bands such as CBRS (3.5GHz to 3.7GHz), C-band (3.7GHz to 3.98GHz), and millimeter wave spectrum (24GHz to 100GHz). Optimizing small cell deployment requires the integration of customer value data, available spectrum, and cost data. This information helps to determine future growth patterns and ideal small cell placement.

The Role of Small Cells

According to the CTIA, 80% of all future network build out will be small cells. Small cells include femto, micro, and pico cells. Small cells typically generate less power, receive and transmit data in shorter ranges than macro cells, and are typically co-located on other infrastructures. They are used for densification or to add coverage and capacity to a mobile network.

The introduction of mmWave spectrum into 5G increases the number of small cells exponentially (Figure 1). According to information published by operators and industry analysts, mmWave will require 10 times more small cells than low band spectrum for the same coverage area due to limited propagation; less than 1,000 feet compared to two to three miles. The C-band will also require three to five times more small cells than low band.

Operator	5G Small Cells (Dec 2021)	5G Macro Cells
Verizon	31,000	17,000
T-Mobile	50,000	85,000
AT&T	~40,000 initial plans	
Crown Castle	~20,000	~40,000

Figure 1: 5G Small Cells and Macro Cells, U.S. Market

Automation is essential to minimize deployment costs. This means automating cell site configuration, neighbor lists, carrier aggregation, and more. Some of this automation is addressed with self-organizing networks (SON), but additional analytics are needed to further enhance this capability. In addition, cell site operations and maintenance require automation. Otherwise, they would be cost prohibitive to deploy and manage. Data analytics is the foundation of automation.

Small cell placement also requires analyzing data across multiple components to determine ideal location. Information such as site capacity, frequency bands available, number of sectors at a site, channel bandwidth, vendors, vendor lead time and costs, and right away access are analyzed to develop the best site with the shortest deployment time. This process must be automated to reduce time and costs. The configuration, placement, and management of small cells require automation to effectively manage capital and operational expenditure.

Operators like Verizon that already invested over $60 billion in spectrum will need to closely manage capital and operational expenditures to deploy and manage the network to ensure a strong return on investment. Analytics are critical to ensure optimal capital allocation across all sites throughout the operator's footprint.

Vantage's 4D analytics with geospatial capabilities help operators find ideal locations for small cell placement. This information also helps show the new coverage areas.

The Opportunity for Fixed Wireless Access

The COVID-19 pandemic drove the demand for more global broadband internet services. Operators saw a 20% to 50% increase in home bandwidth usage due to remote work and schooling. This created the opportunity for fixed wireless access (FWA). FWA is not a new service. Operators were delivering fixed wireless with Long-Term Evolution (LTE) before the pandemic. However, 5G significantly enhanced operators' ability to deliver this service on a wider scale due to increased

teradata.

network capacity and lessons learned from the 4G fixed wireless deployments. The three major U.S. operators include FWA as a key component of their 2021 revenue growth strategy for both their enterprise and consumer segments. Figure 2 shows Verizon's planned expansion.

The new FWA packages may now include both home and mobile broadband internet and streaming services as a bundle. These new bundles will increase ARPU.
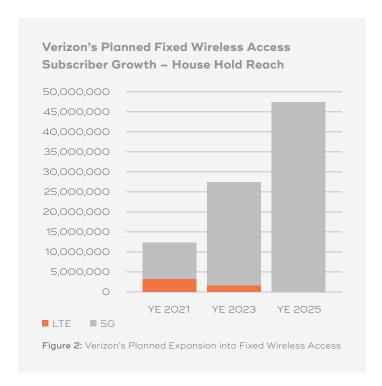
Some key aspects for the success of FWA are self–installations; under one–hour installations with optimal quality of experience (QoE). Data analytics will be essential to delivering QoE. Vantage's nPath will help with the customer journey during self–installations, while Vantage's temporal and times series analytics will help operators identify failure points and prevent future issues.

Path analytics can be used to show the full customer journey to successful installation or failure. Text analytics will show customer sentiments regarding their self-installation experience. Event captured analytics can show bandwidth throughput, connection failures, and successes. Vantage can be easily integrated with third-party visualization tools to quickly create dashboards to KPIs.

Expanded B2B Offers

5G will help operators expand their B2B offers. This will make it feasible for many enterprises to bring their digital vision to reality. Mobile operators that can articulate their role in this digital transformation will have the opportunity to increase enterprise revenue. These enterprises include manufacturing, distribution, retail, transportation, and more. Enterprise digitization strategies leverage technologies such as IoT, cloud, blockchain, and 5G to enable automation and predictability with end–to–end visibility.

Operators are collaborating with multiple cloud and industry partners to create new offers to serve these vertical industries. For example, Verizon is partnering with several vendors to create various industry solutions such as utilizing Microsoft for enterprise Edge services and AWS for public Edge services.

Verizon's Planned Fixed Wireless Access Subscriber Growth – House Hold Reach

Figure 2: Verizon's Planned Expansion into Fixed Wireless Access

Within the enterprise, analytics are needed across IoT devices, 4G/5G networks, sensors, and other connected equipment to ensure end–to–end visibility and accurate benchmarking. For example, in a manufacturing environment, models must be trained to detect defects or non-compliance. Then the models are deployed to automate anomaly detection and enable proactive actions to prevent breakdowns through optimized maintenance. Benchmarking data is used to ensure that all factories, equipment, and vehicles are performing to standards, or implement corrective action for non–compliance.

In many cases, Vantage is already used within the enterprise to manage financial, supply chain, and other business data. Now the platform can be used to integrate data from manufacturing execution systems (MES), sensors, PLCs, and other siloed manufacturing systems. Outcomes can be modeled using Vantage tools or a "bring your own model" feature and then scored. Inferences can be deployed to continuously monitor and optimize the supply chain and manufacturing processes.

Most B2B offers will be executed through network slices. Network slicing is where each customer is given its own logical, isolated network instance customized for that

teradata.

customer's requirements. Network slicing will be geared toward premium customers. These instances will be tied to certain service level agreements (SLAs) that enable operators to charge premium pricing. However, the operator will have to ensure adherence to the SLAs or pay penalties.

Analytics are needed to ensure automated slice management at the operator and customer sites. In addition, analytics will enable compliance monitoring and reporting. Remote management tools for the operator and enterprise customer require model training, scoring, and deployment for optimized tools. These tools are needed to automate performance tracking and scaling slice capacity. Vantage can be used to develop the tools needed for network slices and SLA management. Figure 3 offers an example of the proposed architecture.

Deploying Mobile Edge Compute Centers

Mobile Edge Compute (MEC) centers are being deployed to support low latency, high bandwidth applications such as autonomous vehicles, augmented reality/virtual reality, gaming applications, and more. Application servers will be deployed close to the end user to optimize performance. Another component of this strategy is to
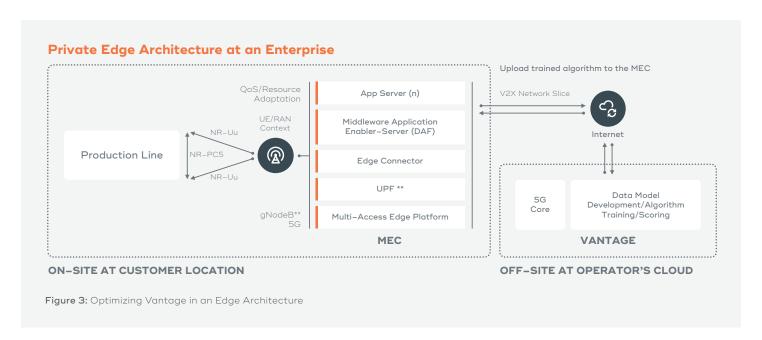
collect data and enable third-party developer access to create new offers. Revenue from the new offers can be shared between operators and developers.

Queries can be performed to combine data from the MEC centers with customer data and other data sources to enhance the data set available for new application creation. The enhanced data creates more value for operators because they can charge more for data use and access. Analytics on this new data set can also be used to improve service and customer experiences.

Vantage machine learning, deployed in regional zones, can train and score models from the various MEC centers.

Increasing ARPA/ARPU From the Existing Customer Base

Operators are looking at their existing customer base to attract content providers and upsell premium content. Streaming services and video game providers are seeking a new customer base to offer their products to and grow their business. Operators have detailed insights and access to market to their customer base. Customer segmentation analytics help operators target new offers to their high-value customers. For example, Verizon partnered with Disney to use its more than 100

Figure 3: Optimizing Vantage in an Edge Architecture

teradata.

million subscribers to upsell Disney+. A similar strategy will help operators attract other streaming providers and gaming services.

Vantage can help with customer segmentation and offer management.

Gain Scalability With a Cloud—Based Data Analytics Architecture

As operators look to recoup their 5G investment, laying a proper data foundation is as critical as securing spectrum. This requires establishing data governance and using a scalable, robust, modern data architecture with the ability to cost effectively scale as needed. The architecture will have the flexibility to integrate multiple disparate data sources across different cloud platforms and support analytics to enable real-time systems of insights across the entire infrastructure and customer base.

Billions of dollars have been invested securing spectrum and deploying wireless networks. Data analytics enable the automation required to reduce operational costs, optimize capital allocation, determine cell site placement, and optimize customer experiences. A Teradata partnership will enable operators with a solid data foundation to implement analytics at scale to grow revenue while optimizing capital expenditure.

About Teradata

Teradata is the connected multi-cloud data platform company. Our enterprise analytics solve business challenges from start to scale. Only Teradata gives you the flexibility to handle the massive and mixed data workloads of the future, today. The Teradata Vantage architecture is cloud native, delivered as-a-service, and built on an open ecosystem. These design features make Vantage the ideal platform to optimize price performance in a multi-cloud environment. Learn more at **Teradata.com**.

About the Author

Nadine Manjaro is a Principal Industry Consultant in Telecommunications and IoT at Teradata. She has more than 20 years of industry experience, including consultant and management roles with leading telcos. She holds a Master of Science degree in Engineering Management from the University of Kansas, School of Engineering, and undergraduate degrees in Industrial Engineering and Economics/Statistics from Rutgers University.

teradata.