Case Study

Telecom Operators & Communication Service Providers
Synergy and collaboration between teams and solutions

Digis Squared* Integrates TCP Optimization for Mobile Operator

Facing increased demand, mobile network operator (MNO) works with telecom integrator Digis Squared to optimize TCP traffic, using Intel architecture servers, improving throughput by 30% in a three core-site implementation.

Like many of its peers around the world, one MNO is experiencing dramatic growth in wireless data consumption – and predicting it to continue.

The MNO is one of the top three mobile network operators in its market, with more than approximately 30 million subscribers. The MNO's network covers more than 99% of the population using more than 6,000 base stations.

The success of its service has brought ever increasing demand for bandwidth. Like most MNOs, the operator is seeing significant growth in mobile data from mobile devices with video, gaming and app downloads driving the rate of growth. Figure 1 shows two estimates of skyrocketing mobile data growth that mirror what is happening at the MNO.

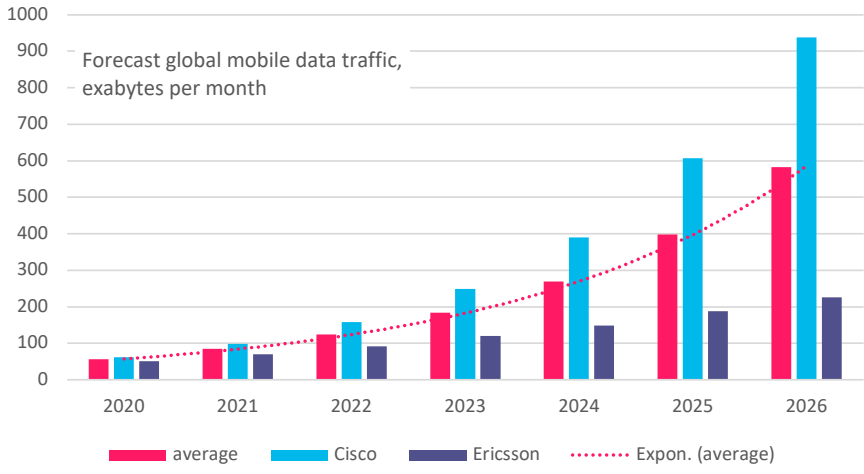

Figure 1. Forecast industry-wide growth in demand for mobile data. Sources: Ericsson: Mobile data traffic outlook and ResearchGate (Cisco)

One solution is to upgrade the network infrastructure with additional antenna towers and base station equipment. But this is expensive and time consuming and there are often other constraints about why this is not feasible. Another option is TCP optimization, which offers a cost-effective way to boost bandwidth significantly without having to upgrade network capacity.

At a Glance

- MNO is a top 3 mobile services leader
- Industry wide, mobile data consumption is growing dramatically; MNO is caught up in this trend
- MNO needed to optimize network to stay ahead of demand
- Worked with Digis Squared to implement TCP optimization for a significant improvement in throughput

To implement TCP optimization and keep ahead of wireless traffic demand, the MNO turned to UK-based integrator Digis Squared to develop and manage the entire integration of end-to-end services and implementation for video and TCP optimization on top of the packet core over three core sites.

TCP Optimization Reduces Error Packets For More Throughput

Transmission Control Protocol (TCP) and Internet Protocol (IP) are two interrelated standards that define the structure of data packets and how they move through the network. TCP is a connection-oriented protocol that requires a connection between the sending and the destination hosts before packets can be transmitted. Since its invention in the 1970s, TCP has provided reliable, ordered, and error-checked delivery of IP-formatted data packets which has enabled all major Internet applications from email to the worldwide web to video streaming.

Starting with 4G/LTE, TCP was adopted into wireless networks where its universal usage in wireline networks and technical advantages (access speed, capacity, architectural simplicity, etc.) helped usher mobile networks into the era of mobile data.

To stay efficient in an evolving mobile network, TCP needs tuning. An optimized TCP implementation reduces the number of errors which require packet retransmission thus increasing the percent of packets that are "goodput" and effectively increasing the network capacity.

Other benefits of TCP tuning include improved network efficiency, high TCP transfer speeds, lower retransmission rates, and more consistent TCP round-trip times. With optimized TCP efficiency, consumers get the bandwidth they need for their applications and operators can get more out of their existing network infrastructure investment.

Digis Squared Implements a TCP Solution

To manage the implementation of their TCP optimization, the MNO chose Digis Squared, an Intel® Network Builder ecosystem member. Digis Squared offers managed services, system integration and consulting services all designed to bridge the gap between service providers and new technologies.

For this MNO, the company provided a full range of system integration services starting with an independent design review of the end-to-end TCP optimization solution. Digis Squared provided a vendor agnostic opinion and recommendations to enable the operator to have a clear view of the capability of the proposed system. Once the project plan was agreed upon, the Digis Squared project management team managed the complex multi-vendor program.

After the integration project was deployed, Digis Squared provided verification, testing and audit of system performance, demonstrating that the MNO achieved the expanded capacity they needed.

TCP Optimization Software

For this project, Digis Squared selected an off the shelf TCP optimization software and combined it with servers utilizing 2nd generation Intel® Xeon® Scalable processors. The initial effort was focused on end-to-end services and implementation for video and TCP optimization on top of the packet core over three core sites. The goal of the project was to enable faster TCP connections, and optimization of available bit rate (ABR) for better customer experience.

Processing power is needed for TCP optimization solutions because of the smarter policies they utilize. Deep packet inspection and real-time traffic analysis provides session-level congestion awareness that can drive and fine-tune optimization policies. Expected benefits of the initiative include:

- **Better Service Quality:** Optimization minimizes the lag that is built into TCP data transmissions. Reducing this provides lower network latency for better quality of experience.
- **Maximize Goodput:** By reducing retransmissions, the TCP optimization solution can increase the percentage of good packets in the network which boosts capacity.
- **Better Cost Effectiveness:** When compared to other infrastructure build out options, TCP optimization can deliver up to 30% additional throughput for a fraction of the cost.
- **Optimize Existing Network Capacity:** Optimization can impact TCP's "SlowStart" feature in which each data flow must ramp-up to maximum rates. By reducing this ramp up network utilization can be improved.

Servers Powered by Intel® Xeon® Scalable Processors

The servers for the MNO's optimization program are based on Intel Xeon Scalable processors. Intel Xeon Scalable processors are the foundation for powerful platforms that deliver compute agility and scalability. Disruptive by design, they benefit from decades of innovation for the most in-demand workload requirements and are part of a complete set of network technology from Intel. Intel Xeon Scalable processors enhance edge server solutions with a balanced architecture that supports AI with built-in acceleration and hardware-based security features. These CPUs are also engineered for modern 5G network workloads, targeting low latency, high throughput, deterministic performance, and high performance per watt.[1]

Future deployments will use the latest 3rd generation Intel Xeon Scalable processor with even more processing power and support for high speed PCIe 16 connections to peripherals such as 100GbE network adapters. These CPUs are available with between 8 to 40 powerful cores and a wide range of frequency, feature, and power levels. They also feature crypto acceleration that improves the performance of a wide variety of security applications.

With servers based on 3rd generation Intel Xeon Scalable processors, the MNO's TCP optimization project will leverage the enhanced processing capabilities of this CPU family to deliver even more improvements in KPIs and enhanced customer experience.

Elements of optimization undertaken by Digis Squared for the MNO's network include:

- Bottleneck bandwidth and round-trip propagation time (BBR)
- Wireless link optimization
- HTTP header compression
- Sponsored data
- Content+ ad insertion
- URL detection
- Application detection
- Layer 7 load balancing

By understanding the traffic characteristics and keeping the current inadequate algorithms in mind, service providers can implement an ideal TCP stack. The combined solution implemented by Digis Squared brought a greater than 30% improvement in mobile data downlink goodput,[2] meeting the operator's goals. The company will expand the solution throughout its network where capacity is strained.

Conclusion

Consumers rely on the MNO's network daily for both business and for the – just as essential – personal communications that connect humans together. There is something special about the magic of mobile video, whether that is seeing distant loved ones on screen, or watching the response to an important business conversation. Through this TCP optimization program, Digis Squared has fine-tuned the very foundation of the network, reducing error messaging, and making room for more good data to flow through the network. This enables the MNO to get the most out of its existing infrastructure and investments. With the performance of Intel Xeon Scalable processors and the expert integration by Digis Squared, the solution lived up to its promise leading the operator to plan for future expansion.

Learn More

Intel® Network Builders

Digis Squared

Intel® Xeon® Scalable Processors

Notices & Disclaimers

[1] https://www.intel.com/content/www/us/en/products/docs/processors/xeon/3rd-gen-xeon-scalable-processors-brief.html

[2] Performance claim is based on Digis Squared's pre- and post- implementation test data.

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