Groundhog CovMo Uses Intel® In-Memory Analytics Acceleration for 5G

Groundhog Technologies' CovMo relies on Intel® In-Memory Analytics Acceleration and 4th Gen Intel® Xeon® Scalable CPUs to ensure data ingestion is not a bottleneck for superior 5G customer experience

intel. XEON

O Groundhog

Keeping mobile networks up and running is a data intensive job.

Mobile devices and mobile networks create a lot of data in the course of normal operation. Figure 1 shows just how much demographic, signaling, location, transaction, online and calling behavior data that is generated daily by 100 million users.
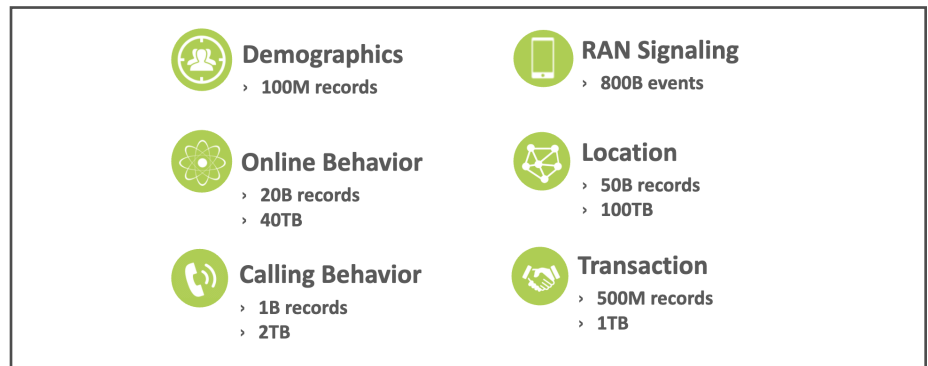
Demographics
› 100M records

RAN Signaling
› 800B events

Online Behavior
› 20B records
› 40TB

Location
› 50B records
› 100TB

Calling Behavior
› 1B records
› 2TB

Transaction
› 500M records
› 1TB

Figure 1. Daily mobile network data generated by 100 million users.

Within this data lies answers to network health issues that impact customer experiences and break service level agreements. Finding the geographic location of network troubles is one of the challenges. Knowing the exact base station and even radio at that base station allows network trouble shooters to quickly resolve radio access networks (RAN)-related issues.

Groundhog Technologies' CovMo leverages geolocation data and analytics to pinpoint network health issues for faster resolution. Today, leading operators with more than one billion subscribers rely on CovMo for the most efficient resolution of network issues.

The growth in 5G standalone (SA) network deployments results in higher network density, more mobility and high data rates that translate into larger volumes of data for CovMo to process with tighter real-time constraints.

Groundhog, an Intel® Network Builders Community member, has worked with Intel to leverage In-Memory Analytics that, combined with the use of ClickHouse database management system (DBMS), improves data ingest and query processes boosting CovMo's ability to process and handle ever larger data sets.
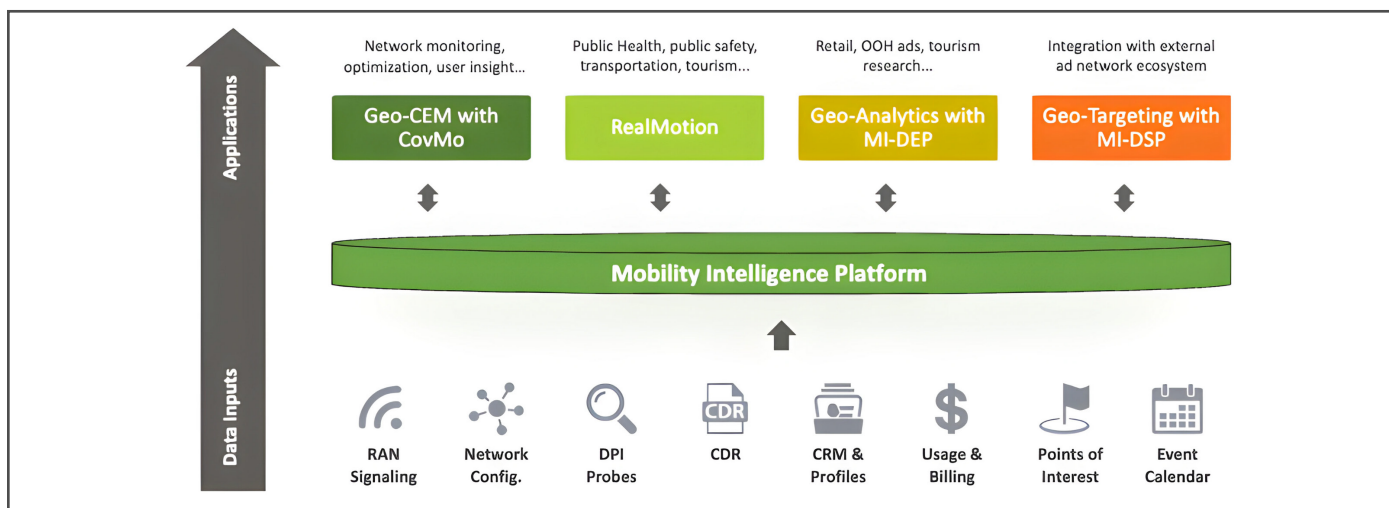
Figure 2. This figure shows CovMo in action, ingesting data from the data inputs into the mobility intelligence platform, which analyzes the data in order to inform a variety of applications.

CovMo Delivers Mobility Intelligence

CovMo is a cloud-native mobility intelligence solution that provides high-accuracy location data and analytics for 5G customer experience management and network optimization (see Figure 2).

CovMo can be used to pinpoint issues in a network ranging from the location of user equipment at all times and the mapping of radio conditions that could be causing poor user experience.

The software is cloud-native with a microservices architecture that enables a resilient and scalable platform for on-demand mobile data analytics.

CovMo has evolved to support the complexities of 5G network deployments. CovMo works equally well for indoor and outdoor applications, which is critical given that around 80% of wireless use is indoors and being indoors makes geo-localization more difficult.

This carrier-grade platform can process all of the daily network event and user experience data and convert that into ubiquitous intelligence through its analytics capabilities.

One operational mode is in Open RAN deployments where it is used as an application for a RAN intelligent controller (RIC) which facilitates third-party applications that improve network operations. Two RIC types have been defined: near-real time RIC (near-RT RIC) and the non-real time RIC (non-RT RIC).

When deployed as an rAPP in a non-RT RIC, CovMo can provide services that don't require real time granularity, for example radio optimization. When deployed as an xAPP, CovMo provides the full benefits of near real time data granularity including location intelligence.

Some of the 5G applications for CovMo include:

Network Planning and Design: 5G networks need visibility into network conditions to provide guaranteed service availability. CovMo data can also help operators detect traffic hotspots that may cause areas of poor subscriber experience. This data can be used to determine the areas where a 5G upgrade can have the most impact. Once the 5G network is

built, CovMo can help to maintain SLAs including high service availability.

Implementation and Troubleshooting: With its near real-time health site reports, CovMo can be used to validate 5G network design implementations. For example, areas where interference is caused by a dominant cell, CovMo can facilitate accurate rectification of the interference. This will grow more important as 5G networks grow more densely deployed.

Monitoring and Optimization: To ensure a quality user experience, MNOs must have a clear and immediate understanding of end-to-end network performance. Operators can leverage CovMo's geolocated network KPI feature to analyze and fine tune end-to-end 5G network interworking with legacy networks boosting 5G performance and superior customer experience.

Ensuring Data Ingestion is Not a Bottleneck

To help the system ingest terabytes of data, CovMo is integrated with the open source ClickHouse* a database management system (DBMS) for real-time online analytical processing (OLAP) applications. ClickHouse is a column-oriented DBMS which makes it better suited for OLAP applications because it is faster and uses less compute and storage resources. ClickHouse can quickly scan large amounts of data which is important for mobile use cases.

CovMo Also Leverages Intel® In-Memory Analytics

CovMo also makes use of Intel® In-Memory Analytics, a feature on all generations of Intel® Xeon® Scalable processors. With Intel In-Memory Analytics computing architecture, data resides in system memory, so it is close to the CPU, which reduces latency caused by the time the CPU needs to seek data on a hard disk and shuttle it close to the CPU. This makes the overall system much faster.

Intel In-Memory Analytics stores data in columns – like ClickHouse does – for the same performance benefits. In-memory analytics also supports massively parallel processing to leverage multi-core and multi-thread processors to reduce the latency of their processes.

But In-Memory Analytics takes extra CPU cycles away from other workloads. To free up the CPU and speed up throughput, Intel has built an In-Memory Analytics Accelerator (IAA) into its 4th Gen Intel Xeon Scalable processor.

The IAA combined with 4th Gen Intel Xeon Scalable processor[1] increased ClickHouse performance[2] by 1.59x and reduced memory bandwidth per query by up to 25%. With the 5th Gen Intel ®Xeon® Scalable processor[3], database performance increases by 2.49 times. All of the performance results were compared to performance of servers using 3rd Gen Intel® Xeon® Scalable processors.

The IAA processes analytic primitives including scan and filter, cyclic redundancy checks (CRC), compression and decompression. As a separate on-chip accelerator, the IAA provides more query throughput while reducing the CPU resources needed. This is especially true for scan and filter operations that require significant computational performance.

The IAA also provides deeper data compression than software compression which reduces the bandwidth needed to transport the data to storage and the disk space needed once it is stored.

CovMo also relies on the CPU power of the 4th Gen Intel Xeon processor for processing complex algorithms using deep learning AI. The processors provide faster matching and bidding decision time in-between user location, user interests and the right marketing actions for higher customer satisfaction.

CovMo for 5G Network Build Outs

As 5G networks grow in size and density, MNOs can anticipate QoE challenges that can be addressed by CovMo. CovMo can monitor the network's performance against a set of 5G-specific KPIs and analyze for inter-radio access technology (RAT) to help planners ensure the smooth growth of 5G.

CovMo also improves visibility into network performance allowing MNOs to provide connectivity for smart healthcare, smart factory, connected frontline, cloud gaming, and smart drone applications.

Using an implementation of CovMo 5G Geolocation supporting both NSA and SA deployment, MNOs are able to monitor the quality of experience (QoE) across network generations simultaneously using one centralized platform.

Conclusion

5G networks create a large amount of data that can be used to keep the network optimized and to detect areas where radio issues are impacting customers. CovMo provides geolocation-based mobility intelligence platform that can identify where problems are located for fast resolution. MNOs use CovMo for network performance but also for spectrum planning and to ensure KPIs are being met.

To ensure CovMo has the compute platform that can keep up with growing 5G networks and users, it uses ClickHouse to ingest and query large volumes of data. By adding Intel IAA, built into 4th Gen Intel Xeon Scalable Processors, CovMo can access unprecedented level of computing to ingest, transform and analyze data at 5G SA scale.

Learn More

[Groundhog Technologies Inc.](#)

[CovMo Platform](#)

[ClickHouse OLAP DBMS](#)

[Tuning Guide for ClickHouse with Intel® In-Memory Analytics Accelerator and Intel Advanced Vector Extensions 512 with 4th Generation Intel® Xeon® Scalable Processors](#)

[Intel® Network Builders](#)

[Intel® Xeon® Scalable processors](#)

[Improving Business Intelligence with In-Memory Analytics](#)

[Enhance Business with Faster Insights with Intel IAA](#)

intel.

---

[1] https://www.intel.com/content/www/us/en/content-details/787805/enhance-business-with-faster-insights-with-intel-iaa.html

[2] Performance comparisons are between Intel® Xeon® Platinum 8490H processors with integrated Intel IAA and Intel Xeon Platinum 8380 processors.

[3] Performance comparisons are between Intel® Xeon® Platinum 8592+ processors using integrated Intel IAA with support from Intel QPL compared to Intel® Xeon® Platinum 8380 processors.

Notices & Disclaimers