

Qualcomm

| Trimble®

Achieve the Precise, Centimeter-Level Positioning that Powers Software-Defined Vehicles

A strategic collaboration between Qualcomm Technologies, Inc. and Trimble Inc.
redefines precise positioning and precise navigation

September 14, 2026



Disclaimer

© Qualcomm Technologies, Inc. and/or its affiliated companies.

Snapdragon and Qualcomm branded products are products of Qualcomm Technologies, Inc. and/or its subsidiaries. Qualcomm patents are licensed by Qualcomm Incorporated.

Note: Certain services and materials may require you to accept additional terms and conditions before accessing or using those items.

References to "Qualcomm" may mean Qualcomm Incorporated, or subsidiaries or business units within the Qualcomm corporate structure, as applicable.

Qualcomm Incorporated includes our licensing business, QTL, and the vast majority of our patent portfolio. Qualcomm Technologies, Inc., a subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of our engineering, research and development functions, and substantially all of our products and services businesses, including our QCT semiconductor business.

Materials that are as of a specific date, including but not limited to press releases, presentations, blog posts and webcasts, may have been superseded by subsequent events or disclosures.

Nothing in these materials is an offer to sell or license any of the services or materials referenced herein.

Qualcomm Legal Entity Name
5775 Morehouse Drive
San Diego, CA 92121
U.S.A.

Contents

Introduction	4
Where precisely is the vehicle right now?	4
Technical Overview	5
Why is precise positioning difficult?	5
Redefining precise positioning and precise navigation	5
Trimble: Precise GNSS positioning.....	5
Trimble: Correction service.....	6
Qualcomm Technologies: Development platforms for ease of deployment.....	7
Integration.....	8
Use Cases	8
ADAS	8
AD applications	8
Data collection and crowdsourced mapping	9
Vehicle-to-everything and e-tolling.....	10
In-vehicle systems	10
Benefits	10
Technical synergy	10
Ease of deployment.....	10
Authentication and security.....	11
Optimized performance	11
Next Steps	12
Abbreviations	13

Achieve the Precise, Centimeter-Level Positioning that Powers Software-Defined Vehicles

Introduction

The software-defined vehicle (SDV) and higher levels of autonomous driving place ever greater importance on a simple question:

Where precisely is the vehicle right now?

The answer to that question, however, is anything but simple, because precise navigation and precise positioning are closely intertwined.

Progress in developing automated driving (AD) systems demands precise positioning, but automotive developers face a technology gap. At one end, perception technologies like cameras, radar, and LiDAR can provide information about the environment, but they cannot provide an absolute location. At the other end, products based on traditional Global Navigation Satellite Systems (GNSS) offer wide geographic coverage yet cannot provide lane-level precision or information needed to drive safely.

This paper describes an integration designed to bridge that technology gap. The integration pairs Snapdragon® Digital Chassis™ solutions with precise positioning from Trimble Inc. This precise positioning solution for the SDV combines the centimeter-level accuracy of Trimble's ProPoint® Go positioning engine with its RTX® correction algorithms. This paper describes how OEMs and Tier -1 automotive suppliers can take advantage of this precise positioning integration in their own applications.

Technical Overview

Why is precise positioning difficult?

As the automotive industry evolves decisively toward the SDV and higher levels of autonomy (Level 3 and beyond), it must expand its operational design domain (ODD). But it is no longer an option to use existing architecture based on standalone vision and perception sensor stacks.

For example, cameras, radar and LiDAR are bound by line-of-sight physics. That makes them susceptible to environmental degradation such as blinding snow, missing lane markers, heavy fog, [sunglint](#) on wet roads, and dynamic occlusion. The stacks can provide information about the vehicle's environment, but they lack the means to hook the vehicle in its actual geolocation.

Zooming out, traditional GNSS options fall short. They offer data on geolocation, but they fail to provide the lane-level precision and immediate road data needed for safe driving and navigation.

To bridge that technology gap, an AD system requires a continuous, absolute, high-integrity and high-accuracy geographic anchor.

Redefining precise positioning and precise navigation

The integration between Qualcomm Technologies and Trimble addresses the needs of automakers developing SDVs. It offers them a single source of precise navigation truth for advanced driver assistance systems (ADAS), for AD, and for multiple functions in the application layer.

Trimble: Precise GNSS positioning

Trimble's precise positioning solution for automotive consists of the ProPoint Go positioning engine and the Trimble RTX GNSS corrections service.

[ProPoint Go](#) is Trimble's automotive-grade, high-precision GNSS positioning and sensor fusion engine engineered specifically for mass-market ADAS and automated vehicles. As shown in Figure 1, it is hardware-agnostic, integrating smoothly into primary vehicle computing environments like the Snapdragon Ride™ Platform.

The multi-frequency satellite measurements of ProPoint Go are made to blend continuously with real-time Trimble RTX corrections (see below), dead reckoning based on six degrees of freedom and an inertial measurement unit, and vehicle wheel odometry. The result is uninterrupted, centimeter-level accuracy and reliable spatial protection levels, even inside dense urban canyons and long highway tunnels. Moreover, ProPoint Go is the first positioning software in the industry to achieve ASIL-C functional safety certification (ISO 26262).

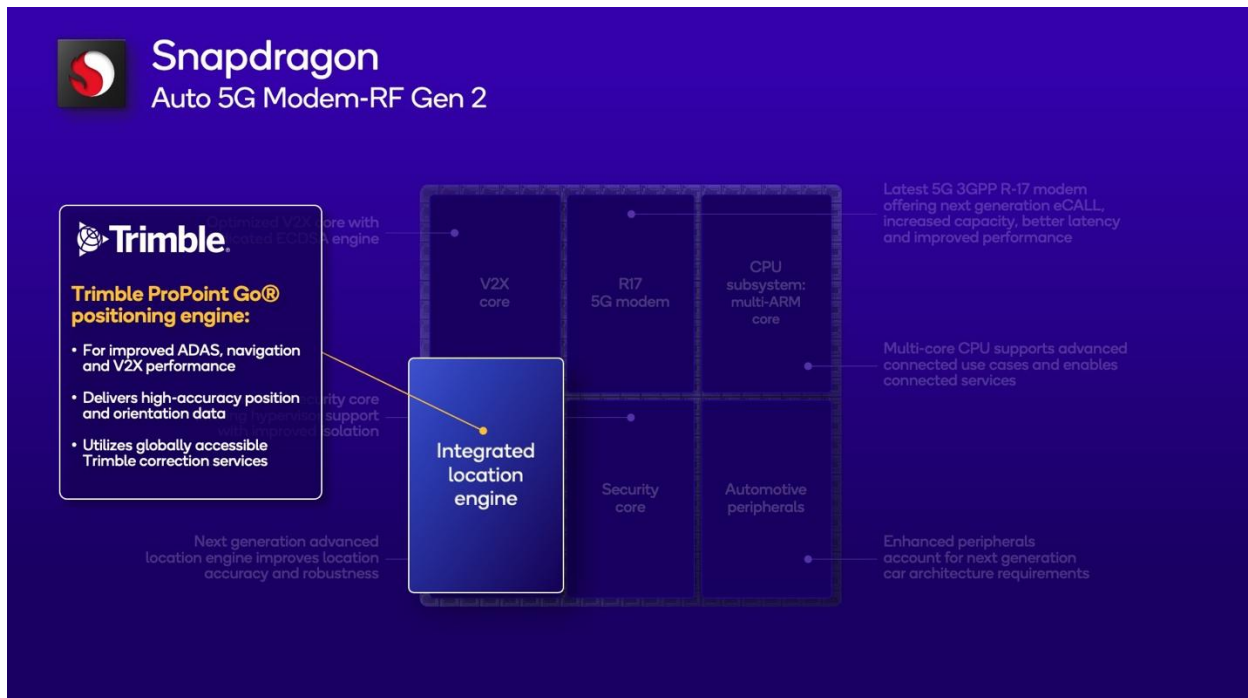


Figure 1: ProPoint Go integration with Snapdragon Ride

Trimble: Correction service

[Trimble RTX](#) is a premium, automotive-grade Precise Point Positioning (PPP) correction service designed to give ADAS and automated vehicles global, lane-level accuracy. RTX uses a proprietary, global network of GNSS reference stations to model errors (for example, orbit, atmosphere, satellite clock) then delivers stream-optimized data via IP cellular or L-band satellite.

To meet the strict safety demands of high-level autonomy, RTX consists of three ASIL-B-certified elements:

- Core correction data stream
- Client Library decoder
- Post-Broadcast Integrity Module that validates data integrity in real time

The combination of ProPoint Go and Trimble RTX resolves ionospheric errors to achieve highly repeatable, horizontal accuracy—measurable in centimeters—in less than one minute. For OEMs and Tier-1s that means automated steering systems with an absolute, resilient spatial anchor unaffected by factors like rain, snow, or poor visibility that can blind camera- or radar vision.



Figure 2: Trimble RTX correction services

Qualcomm Technologies: Development platforms for ease of deployment

As part of the [Snapdragon Digital Chassis](#), the Snapdragon Ride™ Gen 4 Development Platforms are built around system-on-chips (SoCs) from Qualcomm Technologies. The platforms provide scalable, production-like environments for developing, integrating, and validating ADAS and AD solutions. They encompass automotive-grade [SoCs and peripherals, an open architecture, middleware, SDKs, AI toolchains, and simulation infrastructure](#).

Developers with OEMs, Tier-1s, and ecosystem partners like Trimble can use the platforms to rapidly evaluate sensor configurations and integrate AI-based perception and planning software. They can integrate their own or third-party software, rapidly prototype new capabilities, and scale development from one vehicle program to the next. The platforms allow for software reuse, feature expansion, and continuous updates throughout the vehicle lifecycle.



Figure 3: Snapdragon Ride Gen 4 Development Platform

Integration

Validated on more than 500 million miles of hands-free driving, the Snapdragon Ride Platform is now pre-integrated with the most advanced Trimble solution for automotive precise navigation.

Trimble ProPoint Go integrates into Qualcomm Location Framework using Qualcomm Technologies defined APIs. Connectivity capabilities from Snapdragon Auto Connectivity platform within the Snapdragon Digital Chassis are utilized to feed the precise positioning engine with the GNSS corrections from Trimble RTX service. As a result, the platforms deliver accurate, robust location and navigation capabilities to multiple vehicle application domains in the higher layers of the SDV.

The architecture enables OEMs and Tier-1s to integrate positioning without performing any integration work themselves, thereby reducing adoption complexity, shortening time to commercialization, and optimizing costs. The development platforms come fully validated and ready to operate.

Use Cases

Integrating Trimble's precise positioning with the Snapdragon Digital Chassis provides a single geospatial source of truth that overcomes the line-of-sight limits of standalone perception sensors. The integration enables physical AI, safety-focus, and high performance in five main areas.

ADAS

Precise positioning can provide an absolute geographic anchor in modern ADAS offerings that enable hands-free highway autonomy through intelligent speed assistance and predictive adaptive cruise control, like [Snapdragon Ride Pilot](#).

As noted above, standalone perception sensors and vision stacks are constrained by line-of-sight physics and can degrade in conditions like snow, heavy fog, and missing lane markers. Precise positioning provides continuous, exact, absolute data for localization, lane assignment, and redundancy to vision-based perception. Vehicles equipped with this true geographic anchoring and AI path planning can navigate discontinued or merged lanes and anticipate upcoming obstacles without a line of sight. They can also avoid severe miscalculations, such as dangerously slamming on the brakes because the system incorrectly assumes the car has drifted onto a restricted-access road.

AD applications

In AD applications at Level 3 and up, the need to anchor perception sensors drives the need for establishing absolute, accurate location. Standalone perception systems map the immediate environment, but they lack the means to hook the vehicle to its actual geolocation.

By supplying a continuous, exact coordinate, precise positioning functions as an independent system to verify geolocation and lane assignment, separate from the perception stack. Highly accurate spatial anchoring is beneficial for lighter urban navigation and enables open-sky parking autonomy, extending to complex operations like optimal routing for vehicles in large-scale distributor warehouse loading docks. Ultimately, if the autonomous driving system is rooted in a precise, absolute location, this

integration provides the continuous, high-integrity geospatial ground truth required to back up perception sensors in advanced AD. Supplying safety-rooted data also equips the AD system with the critical context needed to appropriately weigh this positioning information for automated navigation .

Data collection and crowdsourced mapping

Precise positioning can be a valuable tool in turning large collections of decentralized observations into universally synchronized datasets, such as in data gathering for the ingestion of physical AI models.

AI systems can tie collected perception data—lane markings, lane-level traffic, road hazards, etc.—to an exact coordinate, then ingest and process it without the noise and uncertainty of relative positioning errors. When incoming sensor data is already anchored to an absolute location, the AI systems require fewer observations to confidently identify map updates or conditions like roadwork, potholes or crashes. Ultimately, by feeding perfectly anchored, real-world location data directly to vehicle applications, precise positioning streamlines the ingestion of sensor data for real physical AI . The result is an efficient, trustworthy mapping architecture.

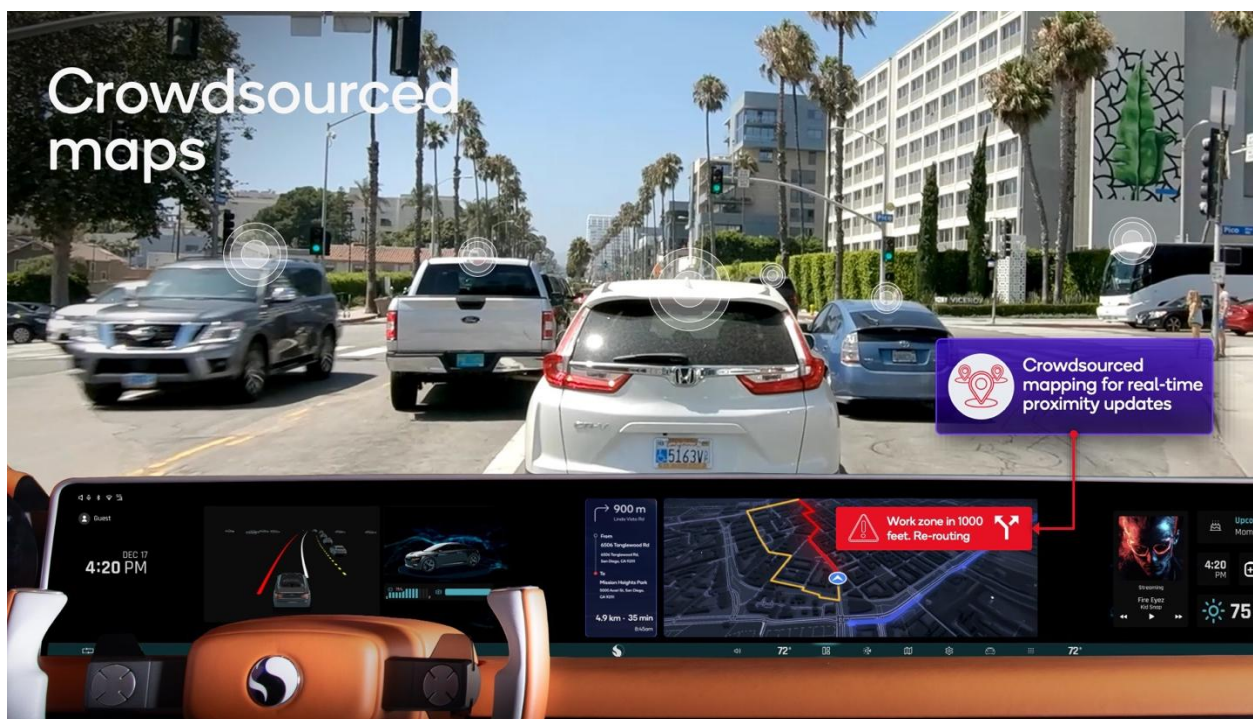


Figure 3: Data collection and crowdsourcing

Vehicle-to-everything and e-tolling

Precise positioning enables V2X and dynamic e-tolling applications to share spatial data and verify travel events among vehicles, road infrastructure, digital toll gantries, and pedestrians.

With an exact, universally synchronized location, connected platforms can execute cooperative cruise control, lane-level electronic toll calculation, and intersection movement assistance. Spatial anchoring is especially vital for e-tolling and collision avoidance in urban environments, where onboard cameras and radars cannot reliably resolve parallel frontage roads or detect approaching threats. Systems tied to an absolute coordinate can verify virtual gantry traversals, broadcast the location of stalled vehicles, and make vulnerable road users (VRUs) easier to detect and protect.

In-vehicle systems

In IVS, the more precise the positioning, the more precise the navigation. By tying the IVS to an exact geographic coordinate, vehicles can deliver reliable navigation indications.

Precise positioning allows the system to guide the vehicle into the correct lane long before an exit or intersection enters the field of view of the camera or radar. If every navigation prompt is rooted in a precise, absolute location, this integration elevates the in-vehicle driving experience beyond the physical constraints of a set of sensors.

Benefits

Technical synergy

- **Hardware prowess:** Qualcomm Technologies provides high-performance, low-power platforms built for development around heterogeneous computing engines like custom automotive Qualcomm® Oryon™ CPUs, Qualcomm® Hexagon™ NPUs, and integrated multi-frequency, multi-constellation GNSS baseband receivers.
- **Trimble's geospatial domain expertise:** Trimble brings decades of precise positioning expertise and dedicated infrastructure through its global network of reference stations and advanced software positioning libraries.

Ease of deployment

- **Simple integration:** Trimble's software library is natively hosted on the Snapdragon Digital Chassis, so OEMs and Tier-1 suppliers do not need to stitch together fragmented, standalone positioning stacks.
- **Turnkey global scalability:** Vehicle manufacturers can deploy identical ADAS architectures worldwide. Trimble's broadcast-formatted RTX corrections are delivered globally over IP/cellular data streams and satellite bands, removing any roadblocks due to local infrastructure.

- **Pre-integrated development environments:** Snapdragon Ride SDK toolchains incorporate the integration directly, cutting validation testing cycles and shortening time to commercialization.
- **Reduced BOM costs:** The integration eliminates the added expense of external firmware and hardware modules, lowering bill-of-materials costs.

Authentication and security

- **Hardware-isolated safety layers:** The Trimble framework executes within securely isolated cryptographic and processing zones on the development platforms, preventing hostile code injection and unauthorized access.
- **Spoofing and jamming mitigation:** By matching real-time, multi-constellation telemetry with Trimble's trusted, authenticated correction broadcast streams, the integration detects and filters anomalous GPS/GNSS signals and localized spoofing attacks. Trimble's capability adds to Qualcomm Technologies' robust location capabilities for addressing GNSS jamming and signal spoofing.
- **Strict automotive compliance:** Trimble has hardened its positioning stack into the Trimble RTX Auto software library, certified under automotive functional safety (ISO 26262 ASIL-C) and cybersecurity (ISO 21434) protocols.

Optimized performance

- **Lane-level accuracy in chaotic environments:** The integration supercharges standard GNSS, cutting satellite drift from the typical range of multiple meters to within 10 centimeters of horizontal accuracy. The result is robust lane-keeping, highway pilot execution, and merging in adverse traffic conditions.
- **Edge sensor fusion synergies:** Trimble's centimeter-level correction layers feed directly into Qualcomm Technologies' hardware-accelerated fusion engine, blending satellite data with camera vision, LiDAR point clouds, and IMU metrics.
- **Zero-latency compute:** The Trimble library runs natively on tightly coupled digital signal processors/neural processing units inside Snapdragon Ride. That eliminates the network latency, processing overhead, and thread bottlenecks associated with running positioning corrections on a separate, electronic control unit (ECU).

Next Steps

The integration between Qualcomm Technologies and Trimble fuses the ProPoint Go positioning engine and RTX correction technology directly into the Snapdragon Digital Chassis. Automotive manufacturers can now enjoy a standardized software abstraction layer that minimizes cost by eliminating the need for external hardware modules. The integration optimizes performance and provides continuous, lane-level tracking, hardware-rooted authentication, and end-to-end cryptographic security compliant with automotive standards. It unlocks advantages for Tier-1s and OEMs building applications in domains like ADAS/AD and real-time navigation with crowdsourced mapping and traffic safety alerts.

Contact us at [Qualcomm Technologies](#) or [Trimble](#) to learn more about how your automotive applications can benefit from this integration and [Snapdragon Ride Gen 4 Development Platforms](#).

Snapdragon and Qualcomm branded products are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

Abbreviations

6-DoF	Six degrees of freedom
AD	Automated driving
ADAS	Advanced driver assistance systems
AI	Artificial intelligence
ASIL	Automotive Safety Integrity Level
CPU	Central processing unit
DSP	Digital signal processor
ECU	Electronic control unit
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
IMU	Inertial measurement unit
ISO	International Organization for Standardization
IVS	In-vehicle system
LIDAR	Light detection and ranging
NPU	Neural processing unit
ODD	Operational design domain
OEM	Original equipment manufacturer
PPP	Precise point positioning
SDK	Software development kit
SDV	Software-defined vehicle
SoC	System on chip
V2X	Vehicle-to-everything
VRU	Vulnerable road user

Qualcomm |  Trimble®