ANNUAL REPORT 2025

DRIVING THE FUTURE OF CONNECTED MOBILITY SOLUTIONS TOGETHER

5GAA
Automotive Association

Cellular-V2X (C-V2X) is an umbrella term which encapsulates all 3GPP V2X technologies, including both direct) and mobile network communications, that allows vehicles to interact with their surroundings, such as other vehicles, cyclists, pedestrians, road infrastructure, or mobile networks.

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All data comprised in this report reflects
the situation until 31 December 2025.

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CHAIRPERSON FOREWORD

Christoph Voigt
Chairman of the 5GAA Board

For 5GAA, 2025 marked a pivotal year as our community advanced connected mobility to a scalable reality. Across every region, we saw the ecosystem accelerate towards mature safety services, new network capabilities, and strengthened global cooperation around the shared vision of smart, safe, secure, and efficient mobility for all road users. This Annual Report reflects the breadth of those achievements and our members' commitment to driving progress together.

A major milestone has been the updated 5GAA Strategy, built around four key clusters, among them two new areas of expansion. It brings a sharper focus to where advanced automotive connectivity can deliver the greatest value. These clusters will guide the association's priorities in the coming years, from strengthening road safety, including vulnerable road users protection, to enabling new value-added services that make business sense, advancing connectivity in all markets where our members are present, and preparing for next-generation connected services, including 6G, artificial intelligence, and software-defined mobility.

In 2025, 5GAA also showcased during real-world demonstrations the potential of connected mobility. In Paris, members delivered for the first time emergency calls using Non-Terrestrial Networks (NTN) and 5G-V2X Direct for advanced use cases like Vulnerable Road Users (VRU) protection in real traffic and road conditions. In the United States, the first 'Day One Deployment District' in Atlanta demonstrated that large-scale connected vehicle-to-everything (C-V2X) implementation is a deployable reality. In China, the Meeting Week in Shanghai highlighted rapid C-V2X advancements across vehicle-road-cloud integration for larger-scale deployment. These events underscore how global collaboration accelerates innovation and supports more consistent deployment across markets.

As part of our revised strategy, 5GAA advanced work on digital infrastructures, tolling and electronic payments, cloud-supported services. At the same time, we strengthened engagement on cybersecurity, credential management, and post-quantum readiness, which represent obstacles to the full rollout of seamless, global connectivity services. International cooperation will remain a cornerstone of the work of our association. From Europe and the Americas to China, Korea, Japan, and India, we are working closely with national authorities, standards bodies, and regional partners to foster global harmonisation. An example was the MoU renewal with IMT-2020, which will provide deeper insight into leveraging AI to enhance road security and optimise traffic flow.

None of this would have been possible without the dedication of our 110+ members across 18 countries. Your expertise, collaboration and openness to innovate continue to define what makes 5GAA unique. As we look ahead, 2026 will be a year of consolidation and acceleration under our revised strategy: reinforcing the conditions that allow connected mobility to scale while simultaneously defining the requirements and shaping the key enablers for the next generation of connected services.

Thank you for your continued trust and partnership. Together, we are building the foundation for smart, safe, secure and efficient mobility for all of us.

KEY ACHIEVEMENTS OF 2025

1. 5GAA Members and USDOT Partner for Live C-V2X Demonstrations

2. 5GAA and MSSA Sign MoU to Advance Integration of Terrestrial and Non-Terrestrial Networks

3. The Future of Connected Mobility at MWC 2025 with 5GAA

4. 5GAA Launches Exclusive Marketplace for Connected Mobility Solutions

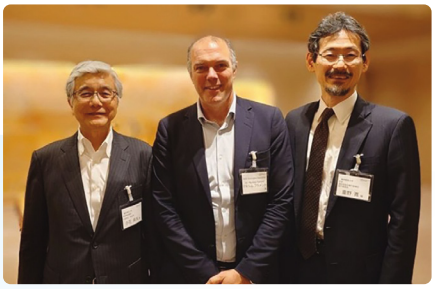
5. 5GAA Demonstrations Brings First-Ever Satellite and 5G-V2X Direct Vehicle Connectivity in Paris

6. C-V2X Technology Reaches U.S. Milestone with the First "Day One Deployment District" at the ITS World Congress 2025

7. 5GAA Statement of Intent: How Industry Should Approach the Subject of Dataspaces

8. 5GAA Demonstrations Advancing C-V2X Deployment, including 5G-Advanced, in China

9. The Renewal of an MoU between 5GAA and IMT-2020 (5G) Promotion Group



10. CTO visit to Japan and meeting with key stakeholders

Vision and Strategy

5GAA unites the automotive, telecommunications and technology industries globally, turning collaboration into real-world, scalable connectivity solutions that deliver smart, safe, secure, and efficient mobility for all road users, now and in the future.

Since its creation in 2016, 5GAA has grown into a unique global platform uniting these three industries. In 2025, the association advanced its evolution by adopting a Strategic Framework that reflects the fast-moving development of connected mobility. This framework recognises both the sector's growing maturity and the increasing need for deeper integration among vehicles, networks, digital infrastructure, and advanced services.

At the core of 5GAA's mission lies C-V2X, a technology that has evolved from its safety-driven origins into a foundation for connected mobility worldwide. The evolution of C-V2X now touches every dimension of mobility – strengthening societal impact for safer, more efficient mobility, unlocking business opportunities, overcoming barriers to seamless global connectivity, and preparing the ecosystem for next-generation connectivity, such as software-defined vehicles, automation, and 6G.

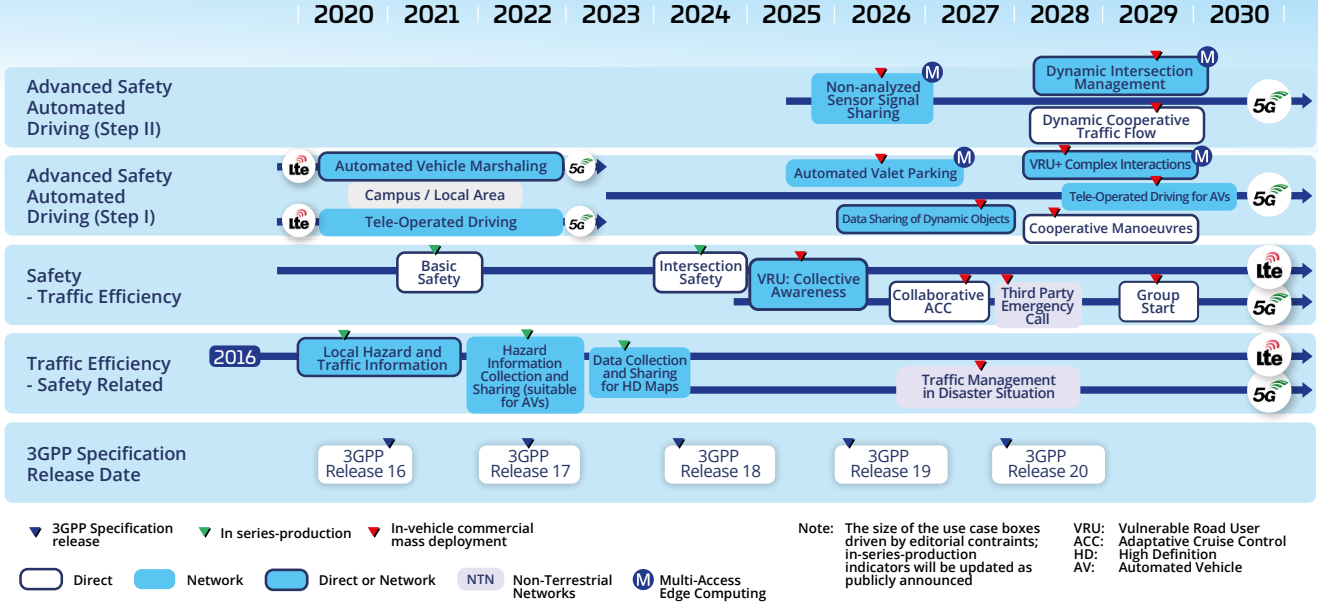
To guide this trajectory, the revised Strategic Framework structures 5GAA's priorities into four clusters, reflecting where automotive connectivity delivers the greatest societal, business, global, and next-generation impact.

> Building a Connected Automotive Future for Societal Services
> Accelerating the Connected Automotive Ecosystem for Business
> Overcoming Obstacles to Global Automotive Connectivity
> Shaping Next-Generation Connected Automotive Services

As a clear outcome of this Strategic Framework, our Visionary Roadmap 2030 continues to evolve - shaped by ongoing market developments and member input.

The roadmap is not a static document but a collaborative, member-driven, iterative process, enabling us to validate strategic directions and processes, and to align future actions with real-world expectations. To this extent, in 2025, 5GAA launched a dedicated members survey in preparation for the roadmap update in 2026, guiding 5GAA's long-term vision and implementation path.

Globally expected timelines for mass deployment of advanced connected vehicle use cases



Strategic Framework: Four Clusters, One Direction

5GAA's Strategic Framework is built around four key clusters that structure the association's priorities for the coming decade. These clusters bring clarity to how C-V2X and advanced connectivity will shape the future of mobility, enabling safer roads, new business opportunities, seamless global connectivity, and the technical foundation for next-generation vehicles.

5GAA Strategy Clusters & Priority Topics

Building a Connected Automotive Future for Societal Services	Accelerating the Connected Automotive Ecosystem to Business	Overcoming Obstacles to Global Automotive Connectivity	Shaping Next-Gen Connected Automotive Services
Safety Services ✓	Digital Infrastructure & Information Networks ✓	Non-Terrestrial Network Integration ✓	6G for automotive ✓
VRU Protection ✓	Electronic Payments ✓	Cybersecurity ✓	Sensing & Positioning ✓
Emergency Call System ✓	Commercial Fleets, Logistics & Robotaxis ↻	Streamlined Global Connectivity ✓	Automated Driving ✓
Digitalisation of Roads & Traffic Management ↻	Artificial Intelligence ↻	Network Capability Exposure ↻	Software Defined Vehicles ↻

✓ Defined ↻ To refine

Each cluster brings together priority topics that will shape the 5GAA Work Programme and provide a vision for future activities. These 16 topics serve as a guide, with some already inspiring new Work Items and others to be detailed in the next two years.

Throughout the clusters, four levers of action streamline how 5GAA activities can have a meaningful impact: innovation, standards, advocacy and deployment, and operations.

Societal Impact: Building a Connected Automotive Future for Societal Services
This cluster leverages the existing connected-vehicle technologies to enhance road safety for all, including Vulnerable Road Users, while opening pathways for new public-interest mobility services.

Business Opportunities: Accelerating the Connected Automotive Ecosystem for Business
This cluster focuses on harnessing connected automotive technologies to transform them into scalable, commercial solutions. By improving operational efficiency, enabling new service models, and expanding the business potential of connected vehicles, this cluster is seen as a strategic catalyst for market expansion of connected vehicles.

Seamless Global Connectivity: Overcoming Obstacles to Global Automotive Connectivity
This cluster addresses persistent technical, policy and market/operational issues in worldwide deployment of connected vehicle services. It focuses on creating the conditions to operate across borders by improving market interoperability and ensuring consistent performance across the 140+ countries where connected vehicles are sold.

Next-Generation Connectivity: Shaping Next-Gen Connected Automotive Services
This cluster tackles the need to define beyond 5G and 6G connectivity requirements, and establish standard approaches for future enablers and services shaping next-generation automotive services. It focuses on clarifying what the automotive ecosystem will require for upcoming network capabilities, ensuring that technologies are supported.

Together, these four clusters provide an updated structure for 5GAA's work and a clear lens through which to advance connected mobility. The following section explores each cluster in detail, highlighting the priority topics that will drive 5GAA's activities moving forward.

Society Impact: Building a Connected Automotive Future for Societal Services

Safety Services

5GAA intensifies its work on integrating V2X communication into global New Car Assessment Programmes (NCAP) to strengthen road safety.

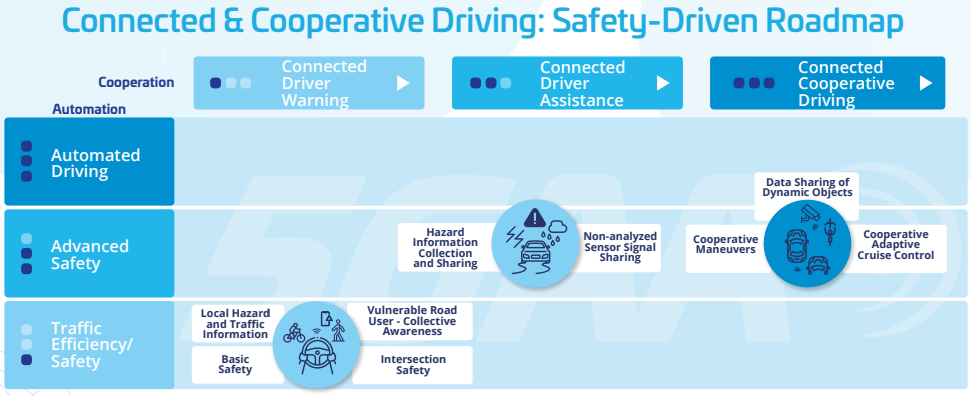
Through the Work Item V2X4NCAP, 5GAA aims to ensure that the life-saving potential of connected safety services is recognised across regions, while preserving technology neutrality and aligning with realistic automotive deployment timelines. The group engaged bilaterally with Euro NCAP, China NCAP, Korea NCAP, Japan NCAP, Global NCAP and others to understand evolving plans and provide expert input on how V2X can complement or extend existing sensor-based safety capabilities. Additional discussions helped build a shared understanding of future expectations, industry needs, and general technical considerations.

A central element of the work was assessing which C-V2X-enabled scenarios are sufficiently mature for inclusion in NCAP rating schemes. These include warnings for slow or obscured vehicles, rear-end collision risks, intersection conflicts, and VRU interactions. While many have been demonstrated in trials and OEM showcases, further validation and robust test methodologies are required before formal adoption. The group also monitored ongoing research, pilot deployments and general ecosystem developments.

Looking ahead, the group examined how NCAP frameworks may evolve from warning-based functions to intervention-oriented features, such as adaptive speed adjustments or coordinated braking support. This progression depends on advances in vehicle end-to-end architectures and reliable virtual validation methods combining real-world data, sensor inputs and V2X message flows. Work was therefore initiated on simulation-based approaches to enable efficient and credible compliance demonstration, ensuring that future assessment methods remain flexible and broadly applicable.

Regional developments were closely monitored to encourage global alignment. China NCAP's 2027 programme is exploring C-V2X-triggered warnings, while Europe's 2029 roadmap considers integrating V2X into intervention-oriented safety evaluations. These insights contribute to an emerging global V2X4NCAP roadmap, supporting harmonised, evidence-based milestones.

By aligning technology readiness, test-method innovation and international NCAP harmonisation, 5GAA advances a central societal objective enabling safety services that reduce crashes, protect vulnerable road users and deliver equitable road safety benefits worldwide. The work reinforces 5GAA's commitment to scalable, interoperable and high-impact C-V2X safety functions that can be deployed globally.



Digitalisation of Roads & Traffic Management

As part of its updated strategy, 5GAA plans to investigate how connectivity can enhance road and traffic management by leveraging connected-car data.

Drawing on real-world examples from national road operators and ministries (e.g., the Dutch Road Monitor (ROMO) programme with Mercedes-Benz) and the latest innovations (e.g., smart connected tyres), 5GAA will scope potential activities to maximise the value of connected vehicle data for predictive road maintenance, traffic management, and other applications.

Vulnerable Road User Protection (VRU)

5GAA demonstrates that C-V2X can protect vulnerable road users through successful, cross-vendor city pilots, now driving efforts to scale commercial, sustainable VRU protection services.

Vulnerable Road Users (VRU), such as pedestrians, cyclists, and micromobility users, represent a disproportionately high share of road injuries and fatalities, making VRU protection services essential to reducing accidents and improving overall road safety. 5GAA has repeatedly demonstrated the technical feasibility of VRU protection solutions through real-world pilots conducted since 2020 in cities including Atlanta (US), Malaga (ES), Detroit (US), Berlin (DE), and, in 2025, in Paris (FR), proving that C-V2X

Qualcomm "Safety & Awareness" demonstration in Sacramento (US) 2026

enables reliable VRU awareness and collision-avoidance capabilities across diverse urban environments. These demonstrations also showed successful interoperability across multiple service providers and mobile network operators, validating the maturity of the V2N2X architecture and the robustness of cross-ecosystem implementations. Building on this foundation, 5GAA has launched the VRU-AP Work Item (VRU Awareness & Protection: Value Creation & Capture) to accelerate market readiness by defining the value proposition for all stakeholders, identifying deployment barriers, and outlining scalable pathways to commercial VRU protection services. The intention is to share 5GAA's findings with city and road authorities to promote the deployment of commercial, sustainable and scalable VRU protection services using C-V2X.

Emergency Call Services

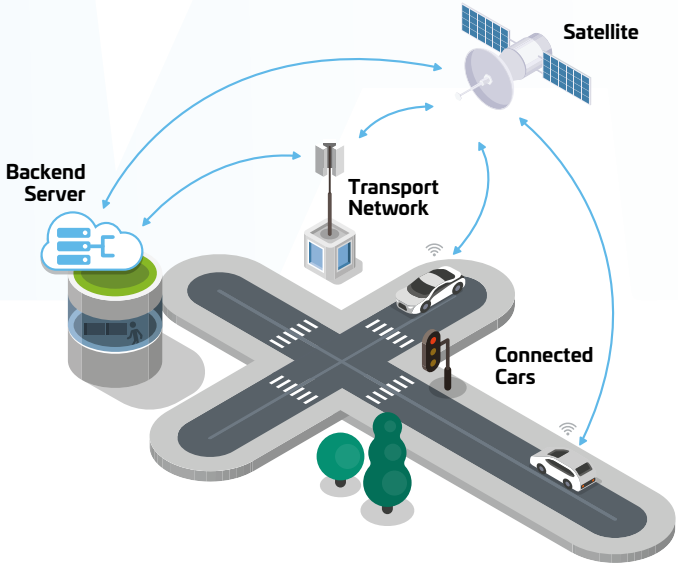
Emergency call services are evolving as Europe advances toward Next Generation eCall (NG eCall), enabling automotive emergency calls over modern 4G/5G networks.

The EU adopted a landmark decision in 2025, mandating that all new vehicle types adopt packet-switched eCall capabilities as of 1 January 2026, enabling 4G/5G-ready in-vehicle systems and preparing the market for full NG eCall adoption. Such a short transition timeline between connectivity technologies poses many hurdles. 5GAA positioned itself as a trusted advisor to policymakers to minimise disruption to members' operations and supply chains.

Another critical issue remains the legacy fleet amid the progressive sunset of 2G/3G networks. A European Commission study estimates that up to 66.8 million vehicles equipped with circuit-switched eCall may be affected, raising concerns about maintaining the continuity of emergency services during the transition. 5GAA continues to monitor and advise the Commission on its plans to mitigate these impacts, ensuring a practical, coordinated way forward that preserves road safety while remaining technically feasible.

Looking ahead, satellite connectivity integrated with 3GPP standards can complement terrestrial networks by filling coverage gaps or providing continuity during disruptions. During the 2025 Paris showcase, 5GAA members demonstrated satellite-enabled connectivity for emergency messaging, showcasing how NTN can extend life-saving services towards truly ubiquitous availability alongside 4G/5G.

Example of a Vehicle-Emergency Services Communication Architecture



Business Opportunities: Accelerating the Connected Automotive Ecosystem for Business

Digital Infrastructure & Information Networks

Digital infrastructure and information networks are essential enablers for new services and operational models in road traffic management.

5GAA's Vehicle-to-Network-to-Everything (V2N2X) work shows that modern road operations increasingly rely on interoperable systems sharing static, semi-static, and real-time information among OEMs, MNOs, service providers, and road operators. This enables service layers, such as cloud-based traffic information, digital twin road management, and federated data-sharing platforms, to improve efficiency and responsiveness. Real-world implementations such as C-Roads, Talking Traffic and Mobilidata demonstrate how these digital infrastructures strengthen coordination and enable viable business opportunities built on reliable, standardised information flows.

In 2025, 5GAA engaged with USDOT and the Federal Highway Administration (FHWA) on road digital infrastructure, presenting the V2N2X architecture to exchange views on interoperability, deployment models, and future cooperation. This cooperation is ongoing in the context of the definition of the upcoming coordinated national strategy for the development and deployment of Transportation Digital Infrastructure (TDI).

Tolling Workshop in Sacramento (US) 2026

Electronic Payments

V2X-enabled electronic transactions via both direct and network-based communications offer a 'one device, multiple applications' proposition.

In the US, discussions at the Federal Communications Commission (FCC) have raised questions about the future of legacy tolling technologies that depend on the 915 MHz band. 5GAA members are seizing this strategic opportunity through the Work Item V2X-TOLL-US to assess how C-V2X solutions can be further investigated, tested, demonstrated, promoted, and standardised to position them as viable, interoperable alternatives to the existing tolling systems.

C-V2X electronic transactions can enable more uniform, accurate and extensible transactions, while streamlining operations for road operators. Beyond tolling, the same in-vehicle C-V2X platform could support other business cases such as parking, road-user charging, and other mobility payments, while also delivering safety and traffic services. For 2026, 5GAA members will focus on demonstrating C-V2X-enabled tolling operations and engaging with US metropolitan planning organisations and tolling authorities to assess practical deployment pathways and define how C-V2X can be effectively leveraged to enhance and future-proof tolling systems.

Artificial Intelligence

5GAA increasingly explores artificial intelligence (AI) as a priority topic, reflecting its growing relevance across business trends in the mobility and telecommunications sectors.

As AI becomes central to digital transformation strategies, the association has sought to better understand its potential to generate new value streams across the connected vehicle ecosystem.

Through various roundtables, AI emerged as a catalyst for enhanced safety, improved operational efficiency, and the introduction of new intelligent mobility services. Promising opportunities have been highlighted, ranging from smarter in-vehicle functions to network-supported intelligence that enables richer, real-time services. These developments reinforce

Roundtables in Sacramento (US) 2026

AI's potential to reshape business models and open new revenue streams as connectivity deepens.

Yet consensus is forming around the hurdles the ecosystem must address before AI can be deployed at scale.

Members acknowledge the need for a shared understanding of AI's technological implications, including how different inference of AI models (onboard, edge-based, or cloud-assisted) interact with safety, performance and regulatory constraints. They also underline the importance of converging on clear use cases, recognising that only a subset of AI-based applications will prove technically feasible or commercially justified. Finally, agreement is needed on architecture choices, data flows, and governance frameworks to ensure trusted, interoperable solutions across sectors.

5GAA will continue refining its strategic approach to AI, towards a cohesive view of the business opportunities and foundational requirements for future implementation.

Commercial Fleets, Logistics & Robotaxis

Automated mobility is advancing globally, as seen during 5GAA's 2025 visit to Shanghai (CN), where several operators already run commercial or near-commercial robotaxi services.

While these deployments remain relatively controlled, they illustrate both the potential and limits of highly automated mobility and the growing need for robust connectivity. Their safe operation depends on resilient multi-SIM solutions, highly available connectivity and C-V2X-enabled perception extension, areas where 5GAA can help shape standards and ecosystem collaboration.

Corporate fleets, for example, account for around 60% of new EU registrations and are trending toward 70% by 2030. They are rapidly digitalising, with rising demand for secure, real-time insights into vehicle health, driver behaviour, and duty-of-care compliance. Likewise, trucking faces connectivity gaps along long-distance corridors, limiting the scalability of data-intensive services such as telematics, remote diagnostics and cooperative platooning. Defining freight-corridor performance requirements and connectivity architectures for logistics hubs offers clear opportunities for 5GAA leadership. The association will explore further opportunities to support the growth of these increasingly connected ecosystems and their specific needs and constraints.

C-V2X "Four-Cross" Demonstrations in Shanghai (CN) in 2025.
Credit: IMT-2020,SIAC

Seamless Global Connectivity: Overcoming Obstacles to Global Automotive Connectivity

Cybersecurity

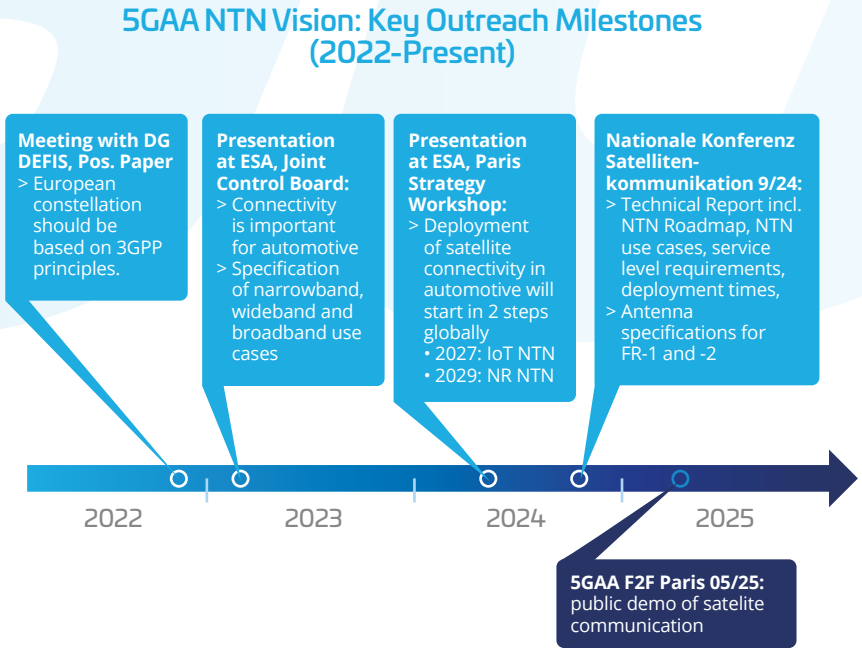
A key obstacle to global connectivity is ensuring that communication across regions and systems remains secure and trustworthy.

In 2025, cybersecurity was a focus with two 5GAA Work Items. The Technical Report on «Credential Management Supporting V2X Commercial Deployments» outlined how scalable, interoperable credential infrastructures enable secure C-V2X deployments. The White Paper on the Framework for Dynamic Trustworthiness Assessment in Cooperative and Automated Vehicles introduced a method for evaluating trust across systems. Together, they strengthen identity management, trust evaluation, and secure data exchange. To address future threats, the PQC4Auto initiative aims to tackled post-quantum cryptography for automotive systems, marking a 2025 milestone through collaboration with GSMA, a Statement of Intent at MWC Barcelona, and work with the GSMA Post-Quantum Telco Network (PQTN) Task Force. This work focuses on enabling crypto-agility and assessing post-quantum impacts on automotive use cases, such as over-the-air updates, V2X communications, and software-defined vehicles. Meanwhile, 5GAA advised the European Commission on an EU roadmap for post-quantum cryptography, to support early transitions and strengthen the security and resilience of connected vehicle ecosystems.

Non-Terrestrial Networks (NTN)

Efforts on NTN focused on defining the measures needed for successful 3GPP-based implementation, building on earlier work on NTN requirements for C-V2X.

In 2025, 5GAA advanced NTN integration by assembling the key elements for large-scale automotive adoption. The work began with realistic reference scenarios to assess future capacity needs, along with an exploration of business models and a refined NTN roadmap. As regulatory, spectrum and standardisation topics related to NTN gained importance, targeted activities positioned the automotive sector to contribute effectively to upcoming policy and standards processes.



Technical efforts addressed terminal complexity in higher-frequency bands and developed robust architectures for seamless TN-NTN interworking. Preparations for car-integrated satellite connectivity demonstrations in Paris in 2025 and in Sacramento in 2026, including bi-directional voice over 3GPP Rel-17 NB-IoT NTN via geostationary satellites and emergency messaging use cases, will have turned concepts into concrete proof points.

Complementary activities, including the NTN Consumer Survey and roadmap-based use-case assessments, evaluated market and technology readiness. Cooperation with the European Space Agency and contributions to the EU's D2D direct-to-device (D2D) consultation further ensured that automotive requirements shape future frameworks, reinforcing 5GAA's vision of resilient, standards-aligned mobility.

Global Connectivity

Ensuring truly global connectivity remains a challenge for the automotive sector, as seamless services across markets require technical, regulatory, and commercial conditions that remain inconsistent.

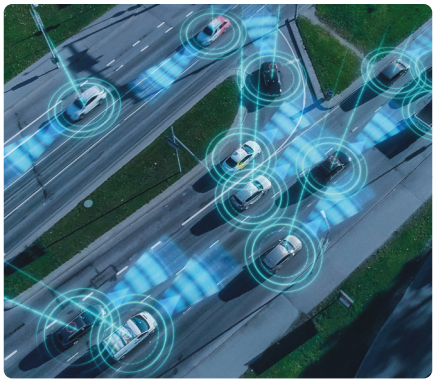
In 2025, 5GAA noted that OEMs must navigate a fragmented landscape to offer connected services worldwide. Vehicles rely on connectivity for essential functions such as remote updates, emergency support, traffic information, diagnostics, and customer-facing features like entertainment or Wi-Fi hotspots. Yet no universal approach allows these services to operate smoothly across countries, so OEMs must adapt to differing rules, infrastructure, and commercial models. In some markets, preinstalled profiles work; in others, regulations require switching to local profiles or alternative roaming arrangements. As a result, vehicles may be sold globally, but connected services remain unevenly available, and the lack of common interfaces between OEMs and MNOs limits scalability.
To address these gaps, 5GAA launched a Work Item on Global Connectivity to map fragmentation, identify shared requirements across markets and stakeholders, and explore what a more harmonised framework for global service delivery could entail. A clearer view of these obstacles and the conditions for alignment will support future discussions and help connected services scale more consistently across regions.

Credit: metamorworks

Driving Alignment on Network Features for Scalable Connected Services

Throughout 2025, 5GAA supported efforts to align expectations for how networks make their capabilities accessible for connected mobility applications.

For OEMs, predictable access to network features, such as quality-of-service indicators, location-based insights, or real-time congestion information, is essential for delivering consistent services. Yet today, these capabilities are offered differently across markets, and the lack of common application programming interfaces (APIs) or aligned service levels makes it difficult to build solutions that scale globally. Collaboration between 5GAA and the Automotive Edge Computing Consortium (AECC), initiated in 2025, will help clarify these gaps, emphasising the importance of shared technical frameworks and more transparent network behaviour. Work under the EDGETWIN collaboration is exploring how network APIs, distributed edge resources, and digital twin concepts could support richer, more predictable interactions between vehicles and the network. While this remains ongoing, initial steps to align use cases, understand deployment conditions, and validate interoperability have demonstrated the value of closer coordination across industries. These efforts underscore the need for harmonised approaches that set clearer expectations for network performance and availability for OEMs. As this work advances, it will help create a more consistent foundation for connected mobility services, enabling vehicles to benefit from the network capabilities in a scalable, reliable and adaptable way suited to both current and future applications.



Credit: gorodenkoff

Next-Generation Connectivity: Shaping Next-Gen Connected Automotive Services

Credit: 3GPP 6G

6G

5GAA is deepening its work on the journey beyond 5G, recognising that the automotive industry must begin preparing for 6G well before the technology itself takes shape.

With vehicles designed for long lifecycles and global deployment, the challenge is not simply to adopt the next generation of connectivity, but also to align its evolution with real-world automotive constraints. Building on progress in advanced V2X, non-terrestrial networks, ISAC, and AI-enabled services, 5GAA positioned the transition to 6G as a gradual, pragmatic evolution rather than a disruptive break.

Under its new Work Item on 6G Guardrails and automotive requirements, 5GAA opted to focus on core industry principles for the coming decade rather than specifications alone. These key principles include service continuity, future-compatible hardware and resilience, spectrum coexistence, and the integration of terrestrial and non-terrestrial networks. These topics were discussed throughout the year within WG4 and leadership forums.

The outcome will aim to clarify how 6G can naturally build on 5G-Advanced while respecting longer vehicle development timelines and supporting timely engagement in 3GPP 6G studies.

Automated Driving

As automated driving advances, connectivity will shift from supporting human drivers to enabling vehicles themselves to interpret and respond to their environment.

Today, 5GAA members focus on delivering warnings about roadworks, hazards, emergency vehicles, and so on, but highly automated systems will process such information directly, reducing the need for driver-facing cues. Connectivity will instead ensure that automated vehicles exchange intent, negotiate manoeuvres, and synchronise with infrastructure. However, reaching higher automation levels will take time. As a first step, 5GAA decided to focus on Automated Vehicle Marshalling (AVM), which illustrates the benefits of connectivity for low-speed automation in logistics for vehicle production (or manufacturing) environments. As automation scales, these use cases show how next-generation connectivity will underpin coordinated, machine-level decision making across driving environments. In parallel, 5GAA also continues to explore Automated Valet Parking (AVP), demonstrating how driverless operations depend on secure coordination among vehicles, infrastructure, and backend systems, and how interoperability, security and safety considerations shape scalable deployment.

OEM introducing Automated Plant Marshalling in Production Facilities
Credit: BMW AG.

Software-Defined Vehicles

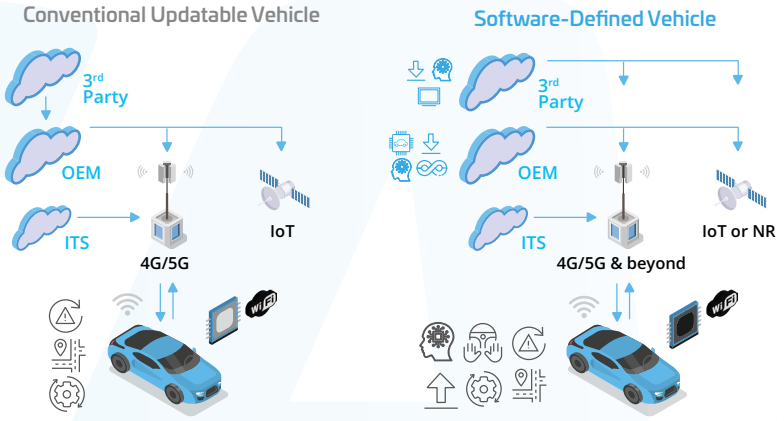
Software-Defined Vehicles (SDV) mark a fundamental shift in how connectivity underpins innovation, safety and long-term value in next-generation mobility.

As the industry moves toward SDVs, connectivity becomes central to how vehicles evolve, operate, and deliver digital services throughout their lifetimes. Unlike conventional vehicles, SDVs depend on continuous software improvements, cloud-supported functionalities and seamless integration with an expanding ecosystem of services. This shift elevates the importance of predictable, trustworthy and consistent network performance across markets. A key insight is that SDVs introduce new expectations for consistency across markets and operators, from reliable access to cloud capabilities to the ability of applications to adapt intelligently to changing network conditions. The growing importance of cybersecurity, regulatory compliance, and mixed-criticality data flows further underscores the need for coherent approaches across the ecosystem.

5GAA explored these developments through a dedicated Work Item, clarifying which connectivity requirements will be essential for SDVs as software becomes the primary driver of vehicle functionality.

These findings underscore that connectivity cannot remain a background component of automotive innovation. Understanding how SDVs rely on communications systems is essential to ensuring that future mobility is safe, interoperable and resilient. By clarifying these requirements, 5GAA contributes to a broader industry understanding of how next-generation connectivity must evolve to support the transition towards vehicles increasingly defined by software, data, and continuous digital services.

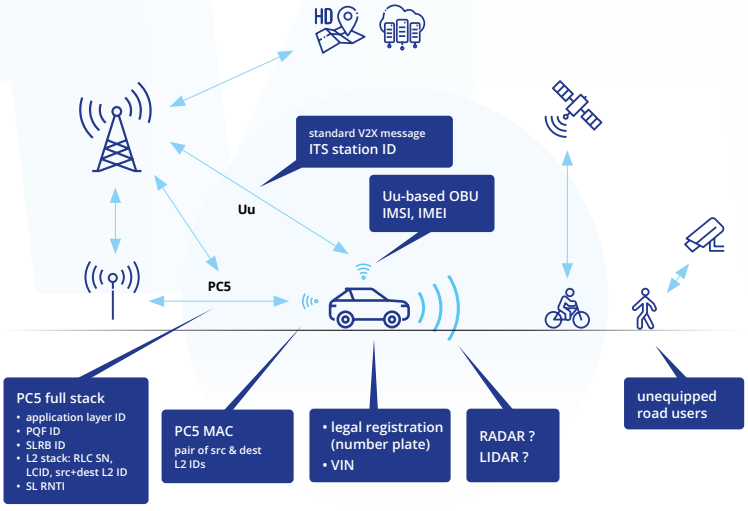
Understanding Software-Defined Vehicles



Sensing and Positioning

Sensing and positioning are becoming core components of next-generation connectivity, enabling vehicles to build a more accurate and coherent view of their surroundings.

In 2025, 5GAA advanced its work on how these technologies can strengthen safety and awareness in connected mobility. The ConSens Work Item showed that combining vehicle-based sensors with cooperative data exchanged through the network can significantly enhance situational awareness, improving the detection of vulnerable road users and the consistency of environmental understanding. In parallel, 5GAA's study on Integrated Sensing and Communication (ISAC) examined how sensing and communication functions can be integrated into a single automotive system. The analysis covered use cases such as parking-lot management and automated valet parking, where sensing performance benefits from communication-supported coordination.



Road User Identity Management - Identifiers and Methods used

↘ Scan the QR code to read the ConSens Work Item report.

These studies show that sensing and positioning go beyond the capabilities of individual vehicles. By enabling cooperative sensing and leveraging the network to support consistent performance, they will be key enablers of safer, more predictable, and more responsive C-V2X services.

In addition, 5GAA's UWB-IMT Work Item defined an internal evaluation framework to assess potential interference between automotive UWB applications and future IMT-2030/5G Advanced deployments in the 7-9 GHz range, supporting coexistence and regulatory clarity.

Shaping future automotive connectivity standards

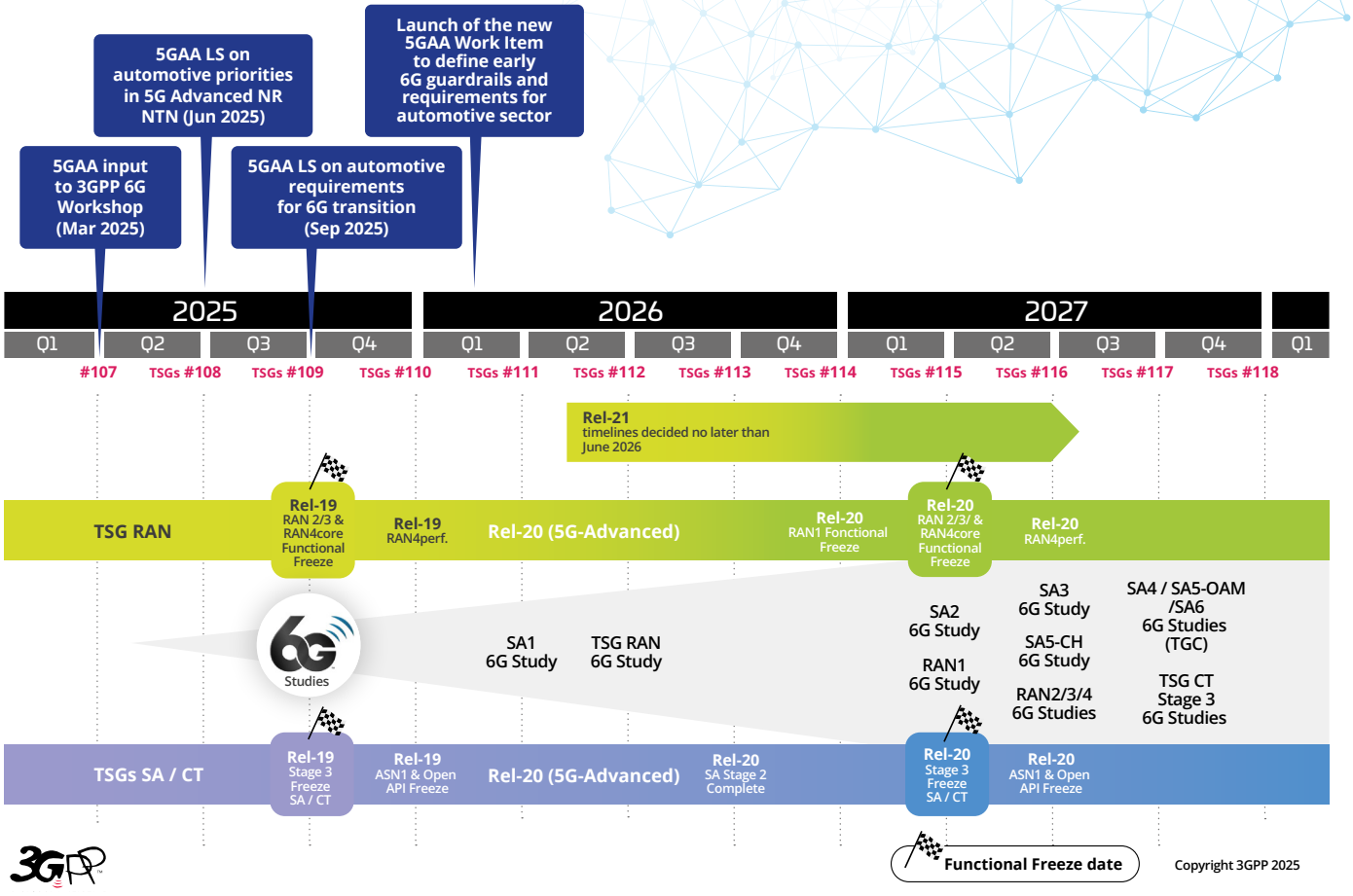
3GPP Future releases and 5GAA input

5GAA remained closely engaged in 3GPP activities around 5G-Advanced and the first steps towards 6G, with a clear objective: ensuring that future releases reflect the realities of the automotive sector. As connectivity evolves, 5GAA advocated for an orderly transition that supports long vehicle lifecycles and the continuity of services entering the market.

Throughout 2025, 5GAA reiterated the importance of service continuity, limited disruption, future-compatible hardware and resilient system architectures, and ensuring that emerging technologies, such as AI-enabled features and the integration of Terrestrial and NTN, are introduced in a way that remains compatible with automotive deployment timelines. Looking ahead, these efforts will be consolidated through the new 6G Guardrails Work Item, with the aim of delivering a scoping paper in 2026.

In 2025, 5GAA also underlined to 3GPP its priorities for 5G-Advanced NR-NTN in Release-20, focusing on compact satellite terminals, seamless mobility between terrestrial and non-terrestrial networks, and the continuity of connected services.

5GAA monitored and contributed to 3GPP discussions on strategic topics relevant to the automotive industry, including NTN enhancements, sensing, positioning, and vehicular device types. Building on earlier inputs to the Release-19 and IMT-2030 workshops, this work reinforced longstanding messages on backward compatibility and alignment with automotive deployment timelines.



Regional standards

5GAA actively supports regional standardisation efforts to promote global consistency in automotive connectivity.

Europe

In Europe, 5GAA continued its engagement with key standardisation and technical regulatory bodies. As part of its contributions to relevant standards bodies, 5GAA provided input to ETSI ISG ISAC in relation to the launch of its new ISAC II Work Item focusing on implementation aspects, value assessment, and channel modelling for automotive applications. This work complements ETSI's ongoing ISAC activities and supports alignment between telecom and automotive perspectives.

5GAA also closely monitored developments in ETSI TC ITS, particularly those affecting C-ITS evolution and future multi-technology approaches. This is highly relevant in view of ongoing discussions on the future of V2X Direct in Europe and the preparation of a potential 5GAA technical activity on Dual-Technology Vision for Europe.

On spectrum matters, 5GAA followed the work of CEPT, including WG SE, on the coexistence of road ITS and urban rail ITS in the 5.9 GHz band, ensuring that road safety applications remain adequately protected.

USA

In the United States, 5GAA focused on monitoring and supporting standardisation activities relevant to connected and cooperative mobility, with particular attention to SAE work and emerging deployment needs. Building on the USDOT National V2X Deployment Plan, 5GAA engaged stakeholders to assess standardisation gaps in digital transportation infrastructure.

In 2025, 5GAA facilitated exchanges with SAE experts on ongoing V2X and network-based services, including tolling, AVM standards, and road-usage charging.

China

In China, 5GAA strengthened its engagement with key national standardisation initiatives and organisations, including, IMT 2020 (5G) Promotion Group, China SAE (C-SAE), and CIC. The association continued to monitor developments related to vehicle-road-cloud integration, cooperative perception, and cloud-based services, which are central to China's V2X strategy.

A key milestone in 2025 was the 5GAA Meeting Week in Shanghai, which included a dedicated workshop with IMT 2020, enabling exchanges on V2X evolution, NTN, AI, and longer term 6G perspectives. Through its WG6 China subgroup and partners in China, 5GAA maintained visibility on national standards, pilot programmes, and research priorities, supporting mutual understanding and contributing to global alignment of automotive connectivity standards.

Global

In 2025, 5GAA engaged with the UNECE WP.29 survey on vehicular communications to support ongoing discussions on global regulatory coherence. The contribution focused on clarifying the interpretation of vehicular communication use cases, highlighting regional differences in implementation, and underlining the importance of a technology-agnostic approach. Attention was given to the distinction between communication technologies and functional requirements, and the need to define common assumptions when assessing connected vehicle services at a global level.

Engaging with Policy Makers and Local Ecosystem

Asia

China

China significantly accelerated its ICV standardisation framework across multiple fronts. The first half of the year saw the release of China's first national standard (GB/T 45315-2025) for LTE-V2X Direct and strengthened regulatory oversight on software upgrades and incident reporting. The latter half focused on critical safety mandates, with increased emphasis on requirements, including approvals for emergency call systems and autonomous emergency braking systems, alongside the launch of ADS safety research and vehicle-road-cloud integration pilots to coordinate policy, standards, and demonstrations.

During its Meeting Week in October, 5GAA hosted a workshop in cooperation with IMT-2020 (5G) Promotion Group, featuring four focused sessions that brought together members from both organisations. The workshop also featured a renewal of the MoU between the organisations. C-V2X Implementation in China and the International Cooperation 2025 Forum was jointly hosted by SIAC and 5GAA.

The forum was an efficient communication platform for governments, enterprises and research institutions to showcase the latest achievements in technological research and development, standards formulation, and commercial implementation in thwe field of the Internet of Vehicles. It has laid a solid foundation for subsequent industrial coordination and international cooperation. In 2026, WG6-China will further deepen cooperation with the IMT-2020 (5G) Promotion Group, C-SAE, and CIC, and explore additional areas for collaboration.

South Korea

Korea launched an LTE-V2X corridor deployment project between Daejeon and Sejong, covering around 50 km of highway and testing 12 services. It aims to establish LTE-V2X communication between vehicles and infrastructure, implement and assess ITS services for local traffic, and carry out rigorous testing through pilot site operations.

ITS Korea revised four key ITS standards, marking significant progress toward enhancing intelligent transportation systems. Notably, in February 2025, V2X technology was added as an additional point in the Korean NCAP accident prevention category, reflecting its growing importance in vehicle safety evaluations. The revision of the TP-SS-9 protocol introduced an initial incentive for vehicles equipped with V2X technology by awarding one additional point within the category, which has a maximum score of 100 points. At this stage, the point is not yet a core scoring element and is based on self-declaration by vehicle manufacturers, as a detailed testing procedure has not yet been defined. Further work is expected to establish appropriate testing methods and procedures, with the possibility of increasing the points allocated to V2X and making it a standard scoring item in future updates.

During the second half of the year, the country's Ministry of Science and Information Technology (MSIT) established a C-V2X Study Group. The group includes participants from MSIT, the Radio Research Agency, the Korea

5GAA members at the 5GAA Conference in Shanghai (CN) 2025.
Credit: IMT-2020 and SIAC

Radio Promotion Association, the Korea Expressway Corporation, and several 5GAA members. The group's scope of work includes monitoring the deployment of LTE-V2X services and pilot programmes. In addition, MSIT is interested in gathering input on 5G-V2X deployment plans, including considerations related to spectrum allocation and whether deployment should occur in parallel with LTE-V2X.

5GAA will focus its efforts on establishing a strong presence at the ITS World Congress in October 2026 and continue to monitor the growing importance of V2X within K-NCAP. 5GAA members will continue to engage with Korean ministries, particularly through participation in the MSIT C-V2X Study Group.

Japan

5GAA further strengthened its engagement with national authorities and standardisation stakeholders as work on next-generation ITS and V2X continued to advance. Throughout the year, the association closely followed discussions within the Ministry of Internal Affairs and Communications (MIC) Next-Generation ITS Study Group and related technical forums, where robust and reliable connectivity was consistently recognised as a key enabler for automated and connected mobility. 5GAA welcomed the official allocation of the 5.9 GHz band for V2X as a significant milestone for the Japanese ecosystem and an important foundation for harmonised deployment. Looking ahead, 5GAA will continue to contribute to implementing the full V2X technology stack, including system architecture, interoperability, and operational aspects. This engagement was reinforced by the visit of 5GAA's CTO to Tokyo, including his participation in the MSC Seminar organised by the ITS Forum. The seminar provided a valuable opportunity to share global perspectives on C-V2X deployment, spectrum usage, and standardisation, and to support alignment between Japanese initiatives and international developments.

C-V2X "Four Cross" Demonstrations in Shanghai (CN) 2025.
Credit: IMT-2020 and SIAC

India

5GAA continued to support the rapidly growing momentum around ITS and C-V2X through its WG6-India activities and sustained engagement with national stakeholders. During the year, the association closely followed the work of the TEC ITS Task Force, including the conclusion of spectrum allocation in the 5.9 GHz band and ongoing discussions on adopting an ETSI-based ITS stack, together with an associated security and PKI framework. These elements represent important building blocks for scalable, interoperable, and secure V2X deployment in the Indian context. 5GAA noted with strong interest the mandate announced by the Ministry of Road Transport and Highways (MoRTH) to advance V2V communications as a key road-safety measure, and is keenly following the next regulatory, certification, and implementation steps that will stem from this initiative. This evolving policy and standardisation landscape is particularly relevant as 5GAA prepares for its F2F meeting planned in 2026 in New Delhi, which will provide a timely opportunity to deepen engagement with Indian authorities and ecosystem stakeholders, and support alignment with global C-V2X developments.

EU Policy

In 2025, the EU policy landscape for connected and automated mobility combined strong ambition with persistent fragmentation across Member States and policy files. Europe is investing in 5G corridors and cross-border testing, yet uncertainty remains on key enablers such as 5.9 GHz spectrum conditions, the future EU framework specific to Cooperative ITS, and the transition of safety services like eCall as 2G/3G networks are in sunset stage. In this context, 5GAA's EU engagement in 2025 focused on three goals: defending technology-neutral rules that enable innovation, accelerating deployment as maturity emerges, and reducing investment risk by improving alignment between automotive and telecom stakeholders.

A major policy challenge in Europe is the shift from 'technology choice' debates to 'coexistence and continuity' questions. With Euro NCAP timelines (2029/2032) serving as a catalyst and the ITS Directive facing uneven implementation, stakeholders increasingly seek solutions that keep markets open, avoid stranded investments, and enable progress in C-V2X deployments. 5GAA's strategic direction reflects this reality: continue scaling V2N-based services where coverage and platforms are increasingly mature, while working with the ecosystem to establish a clear path for V2X in Europe.

Against this backdrop, 5GAA laid the groundwork for a potential

Dual-Technology activity for Europe, including exploratory cooperation with the broader ITS community. The association is now examining how adjacent channels in the 5.9 GHz band could be used in an interoperable way (i.e., which message sets and services should run on which channels) and how options should be evaluated against bandwidth needs, duty-cycle implications, regulatory constraints, and compatibility with existing deployments. The aim is to boost market confidence, preserve continuity with deployed basic safety services, and enable a credible roadmap for advanced use cases. This work is designed as a phased approach, starting with internal alignment and progressing towards structured cooperation with the European ITS community on requirements, use cases, and coexistence models.

In parallel, during the year, 5GAA tracked the evolving EU policy pipeline for ITS and automated mobility. The lack of harmonised progress on V2X Direct has reinforced the importance of pragmatic levers, including upcoming milestones for Safety-Related Traffic Information (SRTI) services and the European Commission's intention to launch further work on C-ITS specifications and cross-border testbeds for automated vehicle deployments. These initiatives are relevant to ensuring that investments in in-vehicle connectivity translate into scalable, interoperable services.

Spectrum and market-access certainly remained central to 5GAA's work. In 2025, 5GAA closely followed CEPT activities, including within WG SE, on coexistence between road ITS and urban rail ITS in the 5.9 GHz band, with a focus on protecting safety-critical road applications. This work supported CEPT conclusions enabling the use of wider 20 MHz channels for road-safety ITS, strengthening regulatory certainty while addressing coexistence through defined technical conditions. At the EU level, 5GAA also tracked discussions under the Radio Equipment Directive (RED) affecting ITS equipment, such as reference standards. The revision of the EU Decision on 5.9 GHz, expected to start in 2026, shapes the practical conditions for deploying ITS devices across Member States. Standards engagement remained a core lever, and 5GAA monitored ETSI TC ITS discussions that influence the evolution of ITS and the broader debate on how multiple technologies may coexist in Europe.

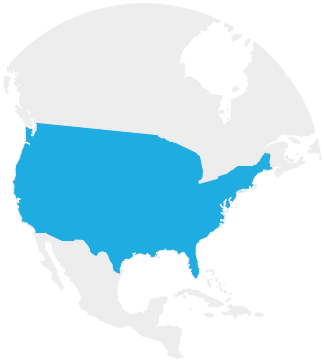
5GAA is also engaged in the EU investment narrative for connectivity and automated mobility. Commission exchanges on CEF Digital and 5G corridors highlighted why early funding calls saw slower uptake: insufficient maturity of both technology and business plans, and a high administrative burden. Later calls showed improved momentum as ecosystem readiness increased. 5GAA's discussions with DG CNECT also noted the scale of long-term infrastructure investment needs and the importance of aligning public funding with credible business plans.

5GAA continued its engagement with DG GROW on next-generation eCall and the legacy-fleet challenge posed by 2G/3G shutdowns. Priorities include agreeing on minimum requirements for aftermarket solutions, ensuring standardised deployment for third-party service approaches, and providing clarity on technical inspection validation and implementation readiness across Member States, with particular attention to public safety answering points (PSAPs).

Finally, the policy environment increasingly links connectivity to broader 'strategic autonomy' topics, such as data access, cybersecurity, and supply-chain resilience. 5GAA tracked discussions on the European Connected and Autonomous Vehicle Alliance (ECAVA) and monitored EU work on cybersecurity risk assessments and emerging supply-chain mechanisms, alongside the implications of horizontal data rules (including Data Act guidance for in-vehicle data). These files will influence how future connected services are governed, trusted, and monetised.

Beyond EU policy, 5GAA contributed to global alignment by responding to UNECE WP.29's survey on vehicular communications, providing clarifications on use cases, regional differences, and technology-agnostic considerations. Looking ahead, 5GAA will continue to try to steer Europe towards technology-neutral policy, secure spectrum, and standards certainty, while promoting deployment paths that enable connected mobility services, whether V2N-based or V2V in order to scale safely and across borders.

US policy



In late 2024, the FCC published the second Report and Order (R&O) for the 5.9 GHz band, establishing the technical framework for transitioning ITS from DSRC to C-V2X. To help stakeholders, 5GAA released a comprehensive Q&A document at the start of 2025, offering practical guidance on implementation and compliance.

In January, the US BIS issued its Final Rule to secure the connected vehicle supply chain. The rule largely mirrored the September 2024 Notice of Proposed Rulemaking (NPRM), to which 5GAA submitted feedback. Notably, the scope of supply chain restrictions was subsequently narrowed, thereby easing compliance requirements for the automotive sector.

5GAA members played a pivotal role in the ITS World Congress held in Atlanta in August. The event marked a significant milestone for the US connected vehicle ecosystem, as Atlanta became the country's first Day One Deployment District for C-V2X technology, made possible through the guidance provided by the 5GAA Day One Deployment Guide, which served as a practical resource. Four demonstrations led by 5GAA members showcased the diverse applications of C-V2X, illustrating its real-world benefits for communities and end customers.

In September, in response to an RFI on Surface Transportation Priorities for 2026 by USDOT, 5GAA urged the USDOT to sustain the positive momentum behind C-V2X deployment in the US and advocated expanded programmes and sustained funding to support scalable deployments. 5GAA highlighted the need for cooperative funding models for smart infrastructure and data sharing, and for broader deployment of connectivity technologies. It also emphasised that closer cooperation between DOTs and MNOs can enable faster 5G infrastructure roll-out.

Also in September, 5GAA joined forces with other associations to submit a letter to the FCC on proposed updates to the Covered List of communications equipment deemed to pose security

risks in the US. The letter raised concerns about the applicability and timing misalignments with the BIS Final Rule regarding restrictions on connected vehicles, while also noting that unnecessary compliance complexities could impede innovation and deployment.

Going forward, 5GAA will prioritise collaboration with USDOT to review and update the V2X National Deployment Plan, originally published in August 2024, and paused in 2025 due to changes in administration. 5GAA will also continue its engagement with USDOT on Transport Digital Infrastructure, particularly on how C-V2X communications should be integrated. Lastly, 5GAA will also engage with US stakeholders on advancing C-V2X technology for tolling and other

↘ Scan the QR code to read the 5.9 GHz Second Report and Order Document.

Map of Deployment

North America


© Jairo Mesa

First Responders Arrive Faster and Safer in 2024 with More Than 4.3 Million Green Lights Provided by Applied Information's


© metamorworks

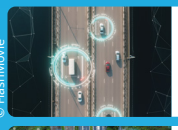
Verizon Business Inks 5G Connected-Vehicle Deal with Teledriving Car-Share Company Vay

© Prapat Aowsakorn

Applied Information Launches Solar Powered V2X School Beacon Device


© Vladyslav Horosheyth

Audi Unveils Vision for V2X Tolling in North America


© FlashMovie

INTEGRITY Security Services™ and HAAS Alert Demonstrate Industry-First Hybrid V2X Interoperability


© metamorworks

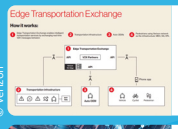
Microsec's SCMS V2X PKI Service Independently Validated for Production-Ready, Secure V2X Deployments


© Qualcomm

All-New BMW iX3 Equipped with Qualcomm Technologies' V2X 200 Chipset


© jamesteohart

Intelsat, Cubic³ Complete Vehicle Satellite Connectivity Test, Advancing Ubiquitous Connectivity Vision



© Verizon

Verizon Business Launches Vehicle-to-Everything Connected-Driving Platform with Multiple Customers


© metamorworks

LG Innotek Unveils 5G Broadband Satellite Module for Vehicles


© Kitti Suwaneakkasit

City of Fairlawn Deploys Ohio's First 100% Connected Vehicle Corridor


© EunikaSopotnicka

Ettifos V2X-AIR Now Fully Build America, Buy America Compliant, Strengthening U.S. V2X Deployment

South America


© DedMityay

Viasat and Partners Deliver First-of-its-Kind Direct-to-Device Demonstration for the Automotive Sector

Europe

BMW is Introducing Automated Plant Marshalling in Production Facilities


© BMW AG.

Vodafone Enhances Road Safety in the Netherlands

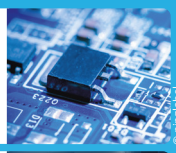

© Paweł Bednarski

HARMAN Presents Ready Aware at MWC: A New Vehicle-to-Network (V2N) Solution Providing Real-Time Contextual Insights for Safer Driving Decisions


© metamorworks

Asia

Ettifos To Receive Government Backing for 5G-V2X Modem Chipset Development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SDV-Enabled V2X Paves the Way for Autonomous Vehicles


© gorodenkoff

SAESOL Tech to Spearhead Virtual SCMS Interoperability Testing


© metamorworks

Ettifos Secures USD 11 Million in Series B Funding Round for Global V2X Expansion


© anyaberkut

BMW Launched All New BMW 5 Series with V2X Technology in China, Cooperating with JOYNEXT to Build Smart Cities


© BMW Group

Voices, Visibility and Impact: 5GAA's Communications in 2025

What Our Members Say About the 5GAA Community Building Sessions

It was a pleasure to present BMW's Vision on V2X in China in the 5GAA Community Building Session in Paris. We had the opportunity to share BMW's vision for the future of mobility as a fully connected, intelligent transportation network. V2X offers valuable active safety features, such as real-time alerts for potential collision risks. With BMW's V2X-equipped vehicles in China, drivers can enjoy safer and smarter travel experiences while also improving the overall traffic efficiency. In line with 5GAA's V2X roadmap the session showed that 5GAA members are supporting the ecosystem actively. This was highly perceived by the audience." — **Georg Schmitt, BMW**

The 5GAA Meeting Week in Paris highlighted how critical infrastructure innovation is to unlocking the full potential of connected and automated mobility. The Community Building Session provided a meaningful forum to align across industries and move from discussion to execution. Miovision is proud to play a role in advancing that ecosystem." — **Kurtis McBride, Miovision**

Participating in the 5GAA Community Building Session in Paris was a genuinely valuable experience. It gave us the opportunity to showcase our work on ubiquitous connectivity and NTN solutions alongside some of the industry's most forward-thinking players. What struck me most was the spirit of collaboration in the room. These sessions are where real partnerships take shape, and for Cubic³, that is precisely where our work gains momentum." — **André Schlufter, Cubic³**

5GAA brings together the full automotive connectivity value chain in a way few forums can. The Community Sessions, alongside other 5GAA initiatives, highlight how rapidly the industry is advancing towards truly ubiquitous connectivity. For Viasat, it's an opportunity to demonstrate how NTN is enabling narrowband services today while laying the foundation for a future where in-cabin connectivity seamlessly transitions between terrestrial and satellite networks, ensuring resilience, coverage, and global mobility at scale." — **Kevin Cohen, Viasat**

The Community Building Session in Paris was a great opportunity to present ideas and discuss with peers from across the industry. Gaining insights into what other 5GAA members throughout the ecosystem are building to shape and secure the future of connected mobility makes this format incredibly valuable." — **Tobias Siegel, Mercedes Benz**

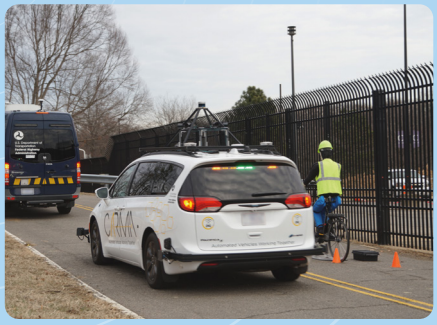
North America

Driving US leadership in Connected Mobility

The United States accelerated connected mobility in 2025 with landmark C-V2X demonstrations and the nation's first Day One Deployment District. These achievements highlighted strong public-private collaboration and reinforced the US as a leading hub for safer, smarter connected vehicles.

Showcasing 360° Road Safety: USDOT & 5GAA Demonstrated C-V2X in Action

5GAA's Meeting Week in Washington DC, in February 2025, gathered members, policymakers and industry leaders for a rich programme complemented by a conference, technical sessions and C-V2X demonstrations. The event focused on accelerating C-V2X deployment in the US, with strong emphasis on VRU protection, state-led initiatives, and strengthening nationwide C-V2X readiness.



C-V2X partnered with 5GAA members to demonstrate how C V2X Direct and network communications complement each other at the Turner Fairbank Highway Research Center. The demos showed strong safety and efficiency gains, including better VRU protection and smoother traffic flow. Insights will inform the National V2X Strategy and reinforce joint industry government commitment.

Speakers explored key themes including digital road infrastructure, interoperability, deployment roadmaps, and scalability. USDOT and State DOT representatives shared deployment progress and lessons learned nationwide, while the Mayor of Chattanooga highlighted the city's forward thinking use of C-V2X to advance its mobility goals.

C-V2X Technology Reached US Milestone with the First Day One Deployment District at ITS World Congress 2025

The US connected vehicle ecosystem took a major step forward as Atlanta became home to the nation's first Day One Deployment District for C-V2X technology. The 5GAA Vehicle-to-Infrastructure Communications Day One Deployment Guide was instrumental as a benchmark for C-V2X roadside infrastructure installations, such as those earning the spotlight at the ITS World Congress 2025 for the Georgia Department of Transportation (GDOT) and the permanent enhancements for the downtown district.

As noted by 5GAA Executive Director Americas, John F. Kwant, *"Atlanta's Day One Deployment District proves that C-V2X is ready for prime time. As the global cross-industry association for connected vehicle technologies, 5GAA has worked with its members, public agencies, and technology leaders to turn C-V2X deployment guides into reality. This milestone shows what is possible when standards, infrastructure, and industry commitment are aligned."*

During the ITS World Congress, 5GAA members showcased ready-now C-V2X applications operating in live urban traffic, demonstrating how these solutions can be scaled across other US states. From real time situational awareness that protects drivers and vulnerable road users, to smarter traffic coordination enabled by both V2X Direct and cellular communications, the demonstrations illustrated clear safety, efficiency, and sustainability gains, including reduced congestion, emissions, and fuel consumption.

5GAA members and State Departments of Transportation (DoTs) highlighted the role that they play in advancing deployment through multiple on-site showcases.

Cohda Wireless Booth at ITS WC 2025. Credit: Coha Wireless

Across the country, State and local agencies continue partnering with infrastructure owners and operations (IOOs), and OEMs to enable roadside deployments, programmes, and long-term investment in connected infrastructure. These efforts underscore the US commitment to leveraging C-V2X as a foundation for the future of mobility.

ITS WC 2025. Credit: Etiffos

↘ Scan the QR code to read the Guidance for Deployment of C-V2X Day 1 Safety Services

↘ Scan the QR code to read the 5GAA Brochure "5GAA Members innovations"

Europe

New Milestones for Global C-V2X in France

In May 2025 in Paris, 5GAA delivered the world's first showcase of connected vehicles using non-terrestrial networks for emergency messaging and 5G-V2X Direct for advanced VRU detection in real traffic. Live demonstrations also highlighted the maturity of V2N services, proving how satellite, 5G-V2X Direct, and commercial networks can support next-generation automotive connectivity.

5GAA Brought First-Ever Satellite and 5G-V2X Direct Vehicle Connectivity to Life

In a global premiere, 5GAA members, BMW Group, Stellantis and technology partners, including Anritsu, Cubic³, Deutsche Telekom, HARMAN, LG Electronics, Qualcomm, MediaTek, Rohde & Schwarz, Skylo, VEDECOM and Viasat, demonstrated connected vehicles using NTN to complement 4G and 5G networks, supported by parallel test equipment measurements.

Public road demonstrations continued with V2N technology to enhance road user protection. 5GAA members, including Nokia, Orange, Stellantis, Valeo and VEDECOM Institute, showcased interoperable C-V2X platforms linking vehicles, apps and smart intersections. HARMAN and u-blox also demonstrated near real time EEBL alerts to prevent hard braking events.

For the first time on the road, 5GAA member Valeo, in collaboration with Marben, demonstrated 5G-V2X Direct, in which two vehicles shared sensor data, triggering a warning of a pedestrian crossing at an obstructed intersection.

"These live demos underscore how OEMs can meet evolving safety standards and deliver more intuitive connected vehicle experiences for drivers and passengers alike," says **Pascal Peguret**, Senior Vice President, SBU Connectivity, HARMAN.

"We are honoured to join the 5GAA and take a leadership role as the Association works to build a standards-based foundation for satellite connectivity that the automotive industry can adopt," said **Parth Trivedi**, CEO and Co-Founder of Skylo Technologies.

"Cubic³ is proud to be at the forefront of global innovation for connected vehicles. At the 5GAA event in Paris, alongside Skylo and other partners, we're excited to unveil the world's first automotive-grade eSIM that delivers seamless connectivity across both terrestrial cellular and non-terrestrial networks (NTN)." **André Schlufter**, Director of Automotive Connectivity Innovation, Cubic³.

"Through these developments and demonstrations, VEDECOM confirms its ability to implement innovative technologies in the service of road user safety, for the benefit of the entire mobility ecosystem." says **Mohamed-Cherif Rahal**, Automated and Connected Mobilities Department Manager, VEDECOM Institute.

↘ Scan the QR code to read: What Our 5GAA Members Say.

Global Visibility and Thought Leadership at Flagship Industry Events

5GAA strengthened its global visibility and leadership in connected mobility through a strong presence at two flagship industry events: Mobile World Congress 2025 (MWC) in Barcelona (3-6 March) and the ITS European Congress in Seville (19-21 May).

At the Mobile World Congress 2025 in Barcelona, 5GAA hosted a dedicated booth and contributed to the conference programme, with CTO Maxime Flament speaking across four high-level sessions on Europe's digital infrastructure, post-quantum cybersecurity, and the future of smart mobility. A key highlight was the annual 5GAA Press Tour, which featured a keynote presentation by BMW and visits to member booths showcasing cutting-edge solutions across the value chain, including HARMAN, Deutsche Telekom, Ericsson, Huawei Technologies, Qualcomm, MediaTek, Nokia, Keysight Technologies, Anritsu, and Rohde & Schwarz.

5GAA CTO, Maxime Flament, at the Mobile World Congress 2025

At the ITS European Congress 2025 in Seville, 5GAA hosted the Special Interest Session Emergent technologies: data and services for mobility, which brought together automotive OEMs and public road authorities to explore how vehicle-generated data, enabled by advanced cellular connectivity and structured data exchange frameworks, is already delivering tangible benefits for traffic management, road operations, and emergency services.

These activities underscored 5GAA's role as a trusted convener and thought leader at the intersection of automotive, telecommunications, and digital infrastructure.

Asia

In October 2025 in Jiading, Shanghai, 5GAA and SIAC co-hosted the C-V2X Implementation in China and International Cooperation Conference and Live Demos, bringing global experts together for strategic discussions. The event showcased China's progress in C-V2X and highlighted new capabilities powered by 5G-Advanced.

Advancing C-V2X Deployment, including 5G-Advanced, in China

"Shanghai's conference and demos underscored China's leadership in advancing C-V2X and its impact on global innovation," say 5GAA Director General **Christof Schmidt**.

"As China's first national pilot zone, SIAC is sharing its practical experience and driving international alignment on connected mobility," added **Gang Chen**, SIAC Chairman.

© IMT-2020, SIAC

SIAC, AUMOVIO and China Unicom also demonstrated 5GAA-Advanced based C-V2X networking, enabling cross operator sensor sharing and dynamic data exchange between vehicles and infrastructure. With end to end latency below 20 ms, the system supports front object detection, blind spot alerts and emergency collision avoidance.

© IMT-2020, SIAC

Attendees witnessed advanced C-V2X showcases by China IMT-2020 (5G) Promotion Group C-V2X Working Group and SIAC, featuring sudden cut-outs, work zone alerts, and connected-assisted driving. These demos showed how onboard units receive real-time data from multiple vehicles ahead and maintain awareness even in challenging weather conditions.

© IMT-2020, SIAC

Workshop Insights: Shaping the Next Phase of C-V2X in China

© SIAC

The 5GAA-IMT2020 Workshop provided firsthand insights into China's C-V2X deployment progress, policy trends and 5G-Advanced evolution, highlighting lessons from large-scale rollouts and future opportunities.


© SIAC

Experts explored China's rapidly advancing C-V2X ecosystem, sharing experiences from national pilots, deployment models and early CNCAP developments, offering guidance for international alignment.

Discussions highlighted the benefits of 5G-Advanced, including lower latency and enhanced reliability, supporting next-generation C-V2X services that will inform 5GAA's ongoing Roadmap IV work.


© SIAC

The workshop strengthened collaboration between 5GAA, SIAC and IMT-2020 PG, identifying concrete areas for joint innovation and knowledge exchange to accelerate global C-V2X deployment and interoperability.

© SIAC

Strengthening Collaboration in Japan

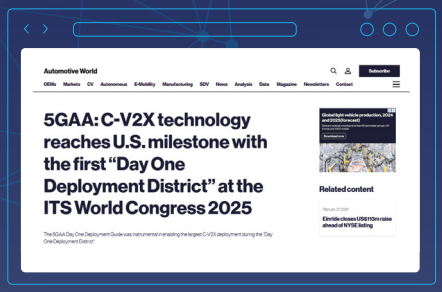
In 2025, 5GAA's CTO Maxime Flament travelled to Japan for a series of strategic engagements aimed at deepening cooperation with the country's leading connected mobility stakeholders. The visit included participation in the high-level MSC Annual Seminar organised with the ITS Information Communications Forum, where he presented 5GAA, the global state of play and the association's vision for the next phase of C-V2X deployment. His intervention highlighted the importance of aligning international standards, strengthening interoperability, and accelerating the adoption of advanced safety services across global markets.

Throughout the week, the CTO engaged with members, partners, and institutional counterparts to exchange insights on Japan's evolving ITS landscape, including progress on 5.9 GHz spectrum planning, next-generation 5G-V2X development, and early integration of sensor-based perception technologies.

The trip further reinforced 5GAA's commitment to supporting regional innovation by identifying opportunities for joint testing, knowledge exchange, and collaborative demonstrations. These dialogues strengthened long-standing partnerships and opened avenues for deeper engagement in areas such as future NCAP considerations, large-scale deployment models, and interoperability testing. The visit underscored Japan's key role in advancing global ITS progress and confirmed 5GAA's dedication to fostering a coordinated, international approach to connected mobility.

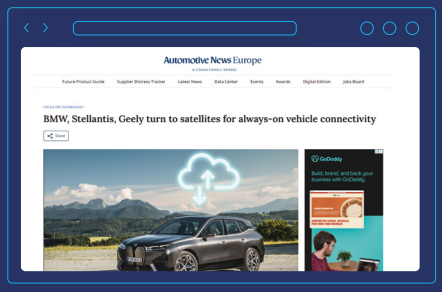
CTO Maxime Flament participated in the 2025 Mobility and Safety Communications (MSC) Seminar in Tokyo, Japan, where he presented "Accelerating V2X: 5GAA's Vision, Roadmap, and Impacts for Japan".

Highlights from the Media



At the **ITS World Congress in Atlanta**, 5GAA's Day One Deployment Guide was instrumental in enabling the largest C-V2X deployment during the Day One Deployment District. This effort was picked up by global and US media outlets following a press release from 5GAA.

At **Mobile World Congress 2025,** 5GAA's CTO Maxime Flament was interviewed by TelecomTV about 5GAA's partnership with the GSMA, as well as the importance of network APIs, and the industry and technology progress driving the future of connected mobility.



This article, facilitated by 5GAA, highlighted the importance of the Paris technology demonstration, which presented connected vehicle technology using NTN for emergency communications and 5G-V2X Direct, illustrating how satellite and terrestrial networks can work together.

This three-page highlight on NTN-enhanced connectivity emphasized the role of 5GAA in coordinating multistakeholder alignment in the global telecommunication ecosystem, and advocating for future developments in automotive satcom to be based on the 3GPP global mobile standards.

After the 5GAA press release was published, national and global outlets highlighted the Conference and demonstrations that took place in Shanghai (CN).

5GAA Impact in 2025

Expertise

+110 members

13 OEMs

9 MNOs

24 Active Work Items in 2025

10 Completed Work Items

7 New Work Items launched in 2025

9 Technical Reports

3 White Papers

2 Position Papers

25 global ecosystems partners

153 sessions during 5GAA Meeting Weeks

Communication

+26k Followers LinkedIn and X

6 5GAA Events (3 technology showcases & 3 conferences)

35 5GAA's Speaking Opportunities Across Industry Events

+2900 Mentions in Media

+474k Social Media Impressions

Who we are, **how** we work

5GAA is comprised of members, an Executive Committee, Board, General Assembly, and Working Groups that together ensure the successful governance and operation of the Association. We also partner with many other organisations working on connected mobility.

5GAA: a global cross-industry association

10 of the top 15 OEMs

8 of the top 10 MNOs

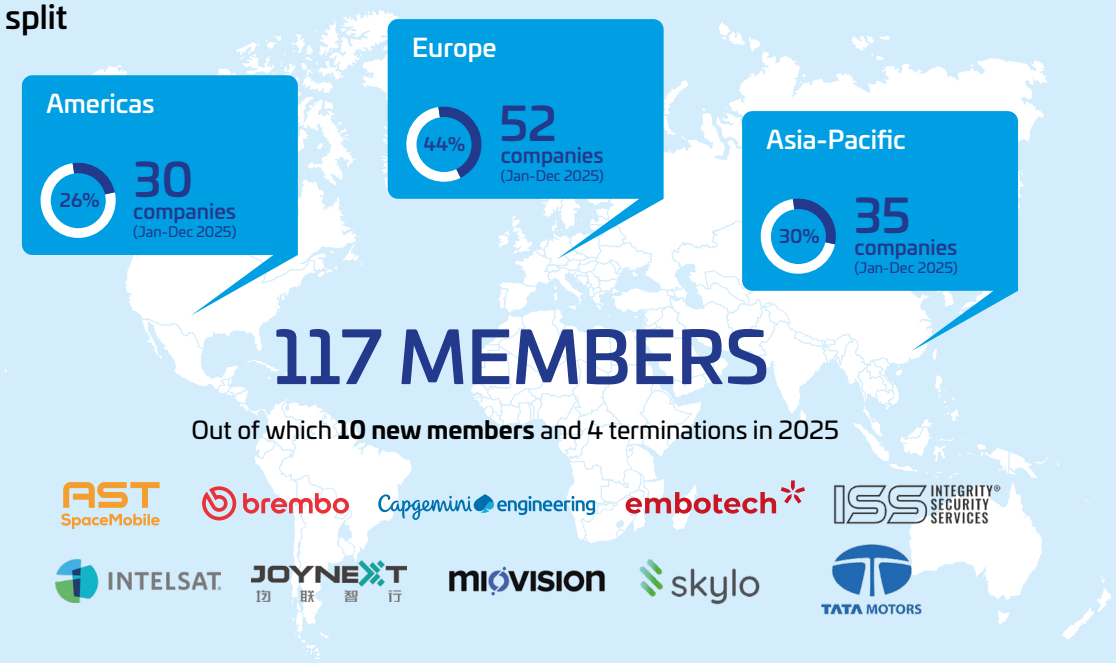
2 top smartphone vendors

Sept. 2016
In September 2016, **8 companies** teamed up to create 5GAA to help develop, test, and promote 5G standards.

2025
Today, 5GAA unites **+110 members** from around the world working together on all aspects of C-V2X.

5GAA membership evolution in 2025

Regional split

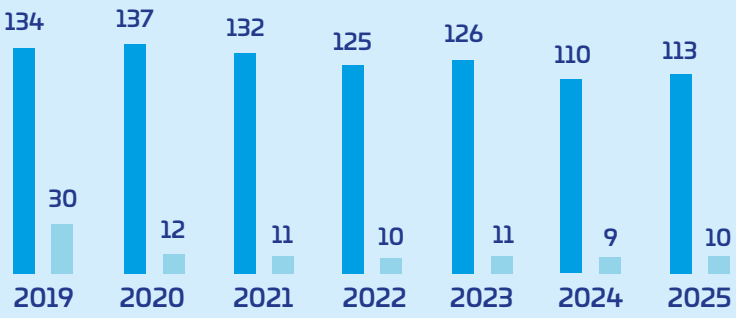


117 MEMBERS

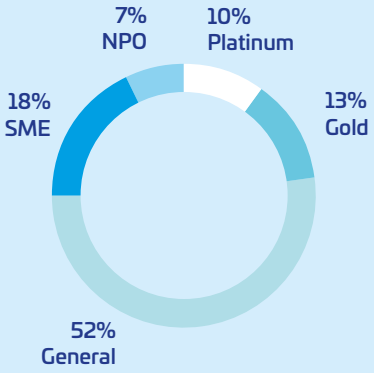
Out of which **10 new members** and 4 terminations in 2025

Membership overview

Membership Dynamics



Members by category



Structure and Governance

GENERAL ASSEMBLY

BOARD 2025-2026

CHAIRMAN
Christoph Voigt

VICE CHAIR
Tim Leinmüller

- 5GAA Board supervises and advises the Executive Committee in all material respects, in particular regarding strategic considerations.
- The Board is composed of 18 members (up to 12 Platinium and 6 Gold Members), elected by the General Assembly every year.
- Remaining platinum seat has been filled by Cubic[3].

AT&T		BMW	BOSCH ★	大唐电信科技产业集团 ★	DENSO ★	ERICSSON	Ford
Usman Z. Chaudhary Arnold Liu	Christoph Voigt Jörg Plechinger	Joachim Göthel Georg Schmitt	Andreas Schaller Frank Hofmann	Jinling Hu Li Zhao	Tim Leinmüller Lutz-Peter Breyer	Friedhelm Ramme Thomas Nylander	Ivan Vukovic Todd Konet

HUAWEI	JLR ★	Mercedes-Benz	NOKIA	Qualcomm	SAMSUNG ★	STELLANTIS ★	verizon	vodafone
Yingpei Lin Chan Zhou	Collin Lee Clara Gutierrez Echeverria*	Rainer Krumrein Osman Aydin	Berthold Panzner Stephan Miller	Jim Misener Vince Park	Suman A. Sehra Amine Taleb	Antonio Fernandez Nick Russell **	Thomas J. Fox Jyoti Sharma	Luke Ibbetson Tony Sammut

* Clara Guitirrez was replaced by Subhamoy Gosh
** Nick Russel was replaced by Gurudutt Venkatesh

EXECUTIVE COMMITTEE 2025-2026 AND CTO

Executive Committee is the legal representative body of the association and is responsible for the day-to-day management of the 5GAA.

The Executive Committee reports to the Board.

* non-statutory member of EXEC

DIRECTOR GENERAL
Christof Schmidt
T · ·

SECRETARY
Markus Dillinger
HUAWEI

TREASURER
Ryan Dickens
Viasat

CTO*
Maxime Flament

WORKING GROUPS 2025-2027

verizon	NOKIA AUMOVIO	HARMAN Qualcomm	BOSCH HUAWEI	verizon Viasat	Qualcomm VOLVO
WG1	**WG2**	**WG3**	**WG4**	**WG5**	**WG6**
Use Cases and Technical Requirements	Security & System Architecture	Evaluation, Testbeds and Pilots	Standards and Spectrum	Business Models and Go-To-Market Stategies	Regulatory and Public Affairs **US (2019)** **EU (2019)** **Japan (2020)** **China (2021)** **Korea (2021)** **India (2024)**

Partnerships with Organisations

Partners

In addition to its internal activities, 5GAA invests a considerable amount of time in working with different partners to explain and promote the benefits of C-V2X technologies.

Ecosystem Partners - formal collaboration

SDOs

3GPP
ETSI
ISO
SAE China
SAE International
ITS Info-communications Forum

Certification Bodies

GCF
OMNIAIR Consortium

Regional 5G/ITS Organisations

6G Forum
6G SNS IA
IMT-2020
ITS Korea
ITS America
ITS India
GCF
CAR 2 CAR Communication Consortium
XGMF
XG Mobile Promotion Forum

Public Administration

ESPO
esa

Industry Associations

AECC
GSMA
ATSSA
MSSA
CAMP
IAM Institute of Automated Mobility
one6G
Connected Motorcycle Consortium
NGMN
NEMA

Ecosystem Partners - Informal collaboration

SDOS

ARIB

Public Administration

U.S. Department of Transportation Federal Highway Administration
KETI Korea Electronics Technology Institute
Die Autobahn
Ministry of Infrastructure and Water Management
VAS Elektroniskie sakari
Vlaanderen
TRAFICOM
national highways
Vejdirektoratet
MINISTÈRE CHARGÉ DES TRANSPORTS
TRAFIKVERKET

Industry Associations

CAMARA
COAI
GTI
iATL
CONEBI
SCMS MANAGER
acea
VDA Verband der Automobilindustrie
Connect Europe
ctia

Partnerships agreements signed in 2025

MSSA (Mobile Satellite Services Association)

In January 2025, 5GAA signed a MoU with MSSA to enhance global collaboration in integrating Terrestrial and Non-Terrestrial Networks (NTNs). The agreement was formalised during the Closing Ceremony of the 5GAA Meeting Week in Washington, D.C. The scope of the MoU focusses on NTN and space Connectivity, TN/NTN integration, implications on spectrum to meet requirements for mass market applications and push for standardisation, especially in 3GPP.

GSMA

In February, 5GAA renewed its MoU with GSMA, specifically to cooperate on post-quantum cryptography (PQC) and identify its impact on connectivity in the automotive sector, as per the 5GAA Work Item PQC4AUTO. The collaboration would also cover C-V2X standardisation and spectrum activities, eCall and Next generation eCall, and GSMA FUSION Open Gateway, an initiative aimed at creating a common, interoperable, and federated network with open standard interfaces to enable seamless universal connectivity.

ITS Info-communications Forum

At the Opening Plenary of 5GAA Meeting Week in Paris, France, in May, 5GAA signed a Letter of Intent with ITS Info-communications Forum to strengthen commitment to fostering synergies between connected mobility stakeholders and advancing cooperative ITS solutions. 5GAA was then invited to the 2025 Mobility & Safety Communications Seminar in Tokyo, organised by ITS Forum to present the global status of V2X deployment.

one6G

In December 2025, 5GAA and one6G signed a Letter of Intent to establish a framework for closer collaboration on next-generation wireless technologies and their application to connected and automated mobility. The intention is to cooperate across a range of strategic technology areas expected to play a central role in future 6G systems and services, including digital twin, integrated sensing and communication, and 6G empowered robotics.

XG Mobile Promotion Forum (XGMF)

5GAA reconfirmed its intent to cooperate with XGMF by renewing a Letter of Intent to cooperate on next-generation mobile communications and automotive developments, including research into 5G/5G-A/6G mobile communications and 5G/5G-A/6G automotive.

5GAA MEMBERS - DECEMBER 2025

2025 WAS A LANDMARK YEAR MADE POSSIBLE BY YOU: OUR MEMBERS.

5GAA unites the automotive, telecommunication, and technology industries globally, turning collaboration into real-world, scalable connectivity solutions that deliver smart, safe, secure, and efficient mobility for all road users, now and in the future. Created in September 2016, 5GAA has rapidly expanded to include key players with a global footprint in the automotive, technology and telecommunications industries. This includes automotive manufacturers, tier-1 suppliers, chipset/communication system providers, mobile operators and infrastructure vendors.

FOLLOW US

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