



# 5G VERTICAL PLATFORM ASSESSMENT REPORT

ATIS-I-0000083  
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# ABSTRACT

The advent of 5G will fundamentally change communication service providers (CSPs) by enabling significant improvements in bandwidth, data rates, latency and the network's ability to support a vast amount and variety of devices to be supported on the network. The 5G architecture promotes network virtualization, AI and automation, and introduces new technologies such as edge computing and network slicing to enable the introduction of immersive solutions.

These 5G capabilities provide the potential for vertical industries to develop innovative new services and applications. However, implementations for these vertical industries and their applications across 5G and emerging communications services are far from optimized. This is due to the lack of enablement platforms that can deliver enabling capabilities not currently provided by 5G standards. Without such enablement platforms, CSPs have been slow to accelerate enterprise digital transformation and unlock new, 5G-enabled business opportunities.

This report's objective is to identify the vertical industry use case needs, underpinned by specific 5G platform enablement capabilities that will enable these verticals to fully exploit 5G and its capabilities. Prioritizing the collaborative needs at an industry level will provide guidance to ATIS regarding near-term opportunities. Ultimately, the goal is to spur greater appetite for, and adoption of, 5G-enabled services and applications and foster greater partnering with vertical markets.

# FOREWORD

As a leading technology and solutions development organization, the Alliance for Telecommunications Industry Solutions (ATIS) brings together the top global ICT companies to advance the industry's business priorities. ATIS' 150 member companies are currently working to address network reliability, 5G, robocall mitigation, smart cities, artificial intelligence-enabled networks, distributed ledger/blockchain technology, cybersecurity, IoT, emergency services, quality of service, billing support, operations and much more. These priorities follow a fast-track development lifecycle from design and innovation through standards, specifications, requirements, business use cases, software toolkits, open-source solutions and interoperability testing.

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# EXECUTIVE OVERVIEW

# 1 EXECUTIVE OVERVIEW

This report assesses how a variety of vertical industries and their application use cases can exploit 5G capabilities within their future business transformation strategies. The ATIS 5G Vertical Enablement Platform (5GVP) focus group created a landscape of the 5G-enabled vertical requirements. These are based on an assessment of industry data to identify cross-industry platform enablement opportunities and other 5G collaborative platform needs. This work included prioritizing the identified collaborative platform needs at an industry level to provide guidance regarding the near-term platform-enablement opportunities.

A survey of ATIS members identified seven vertical industries that were of priority interest for members. Through the outreach conducted across these seven vertical industries, ATIS was able to identify the 5G-specific use cases within each vertical that are underpinned by the specific characteristics of 5G New Radio (NR) infrastructure: Enhanced Mobile Broadband (eMBB), Ultra-Reliable Low Latency Communications (URLLC) and Massive Machine-Type Communications (mMTC).

- Connection and policy management
- Network quality and service level agreement (SLA) management
- Identity sharing and identity trust
- Data sharing, data trust, personally identifiable information (PII) and consent, and content digital rights management (DRM)
- Location and spatial awareness
- Exchange of value

Based on this report's findings, ATIS will work across several ATIS initiatives to further the understanding of these requirements for specific platform capabilities. ATIS will work with both global and industry-specific standards bodies to coordinate these platform capabilities requirements. The goal is to enable a common set of platform services that can be used consistently across any vertical industry.



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# INTRODUCTION

## 2 INTRODUCTION

The advent of 5G will fundamentally change communication service providers (CSPs) by enabling significant improvements in bandwidth, data rates, latency and the network's ability to support a vast amount and variety of devices. The 5G architecture promotes network virtualization, artificial intelligence (AI) and automation. It also introduces new technologies such as edge computing and network slicing to enable the introduction of immersive solutions. It gives IT networks, applications and underlying IT systems more opportunities to scale dynamically with guaranteed quality and security. This rapid innovation will drive the needs and opportunities to develop additional frameworks and platform capabilities to support 5G-enabled applications and services that span the ICT and vertical industries.

However, implementations for these vertical industries and their applications across 5G and emerging communications services currently are far from optimized. As a result, CSPs have been unable to accelerate enterprise digital transformation and unlock new, 5G-enabled business opportunities.

This report assesses how a variety of vertical industries and their application use cases can exploit 5G capabilities within their future business transformation strategies. The ATIS 5GVP focus group created a landscape of the 5G-enabled vertical requirements based on an assessment of industry data to identify cross-industry platform enablement opportunities and other 5G collaborative platform needs. It also prioritized the identified collaborative platform needs at an industry level to provide guidance regarding the near-term platform-enablement opportunities.

### What is an Enablement Platform?

Enablement platforms are focused on the broader needs of the telecom industry to fulfill applications across domains. In the context of this report, a platform is a standardized framework that provides functional capabilities to enable a service.

The definition of a platform within the scope of this report is:

- A set of capabilities required or strongly desired by enterprises comprising a vertical segment in order to provide services essential to that enterprise, that
- May extend beyond the boundaries of a 5G network defined by 3GPP (NG-Core, gRAN, IMS), and that
- Are grouped together such that they can be efficiently exercised by the enterprise and by the CSP, and that
- Are accessible via a set of well-understood and/or standardized interfaces/APIs.

Examples of these enablement platform services are:

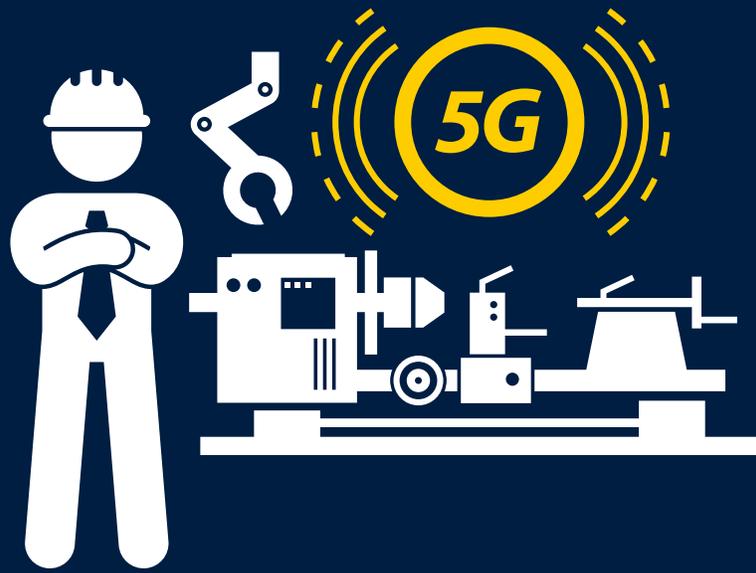
- Network quality and SLA management
- Connection and policy management
- Location and spatial awareness service
- Identity management
- Data management
- Security management

### The Approach

- **5G verticals assessment:** Identify the vertical markets that are most likely to leverage 5G networks and services.
- **Applications domains:** Applications and use cases that will operate across the ICT within the vertical domains.
- **Enablement platforms:** Develop a view of the enabling frameworks and platforms that will create value and new business opportunities.
- **Recommendations:** Prioritize the collaborative platform opportunities across vertical markets that promote 5G adoption and new services.

### The Output of this Report

This report's objective is to identify the specific platform capabilities that will enable these verticals to fully exploit 5G and its capabilities. Prioritizing the collaborative needs at an industry level will provide guidance to ATIS regarding near-term opportunities. Ultimately, the goal is to spur greater appetite for, and adoption of, 5G-enabled services and applications and foster greater partnering with vertical markets.



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# APPROACH AND METHODOLOGY

### 3 APPROACH AND METHODOLOGY

The following approach and methodology were used in the assessment of the recommended 5G vertical platform needs.

#### Identify the Vertical Industries

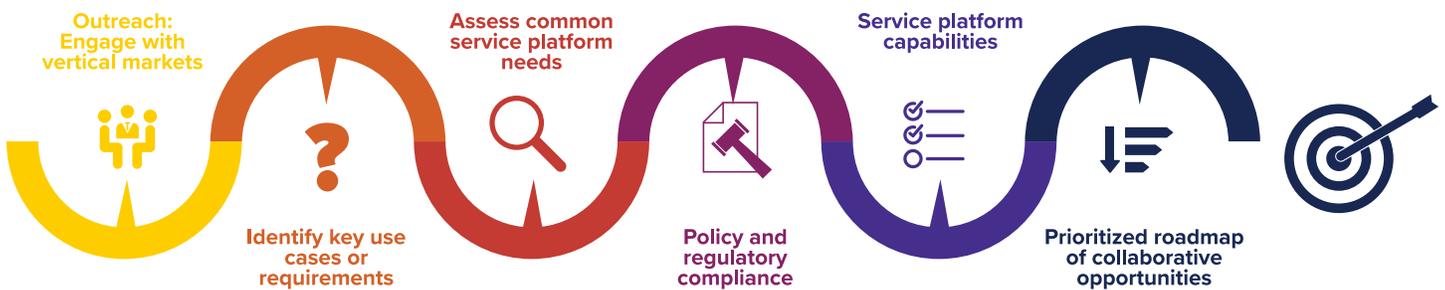
The ATIS TOPS Council members were polled to identify key industry sectors that were of significant interest to them. The collated replies from 21 respondents, across seven operators and 14 vendors, resulted in the following top six industries of priority interest:

- Industrial and manufacturing
- Connected vehicles
- Smart cities
- Public safety
- Health care
- Media and entertainment
- Education\*

*\* Due to the 2020 pandemic, education was added because remote work across all aspects of learning for primary, secondary and tertiary level education has been widely implemented.*

#### Planning the Outreach and Collating the Data

The ATIS5GVP focus group performed a structured approach to engage with the industries as follows:



## Outreach Engagement with Vertical Markets

ATIS engaged with the vertical markets to understand the specific needs and use case requirements. These sources included industry associations, industry research groups/companies, market-specific vendors and market intelligence reports.

Here is a snapshot of the organizations included in the outreach:

### Identify Key Use Case Requirements

This outreach enabled us to identify the 5G-specific capability use cases and requirements for platform capabilities.

### Assess Platform Needs

We then mapped the vertical use cases in a matrix to align common functional/service requirements across industries.

### Policy and Regulatory Compliance

Across industries, there are specific policy and regulatory requirements covering areas such as safety, privacy, security and ethics. These need to be understood to assess the platform requirements for compliance.

### Platform Capabilities

From the matrix of requirements, we made an assessment of aligned needs and an assessment of priorities for service platform needs across multiple verticals.

### Roadmap of Enablement Platform Opportunities

This report provides a prioritized roadmap of ICT/vertical collaborative platform opportunities across multiple vertical sectors. It also identifies key use cases and requirements that should be considered by ATIS and global 5G standards development venues (e.g., 3GPP) for standardization.





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# ENTERPRISE VERTICAL USE CASES

## 4 ENTERPRISE VERTICAL USE CASES

Across each vertical industry, use cases have been identified that are underpinned by the specific 5G NR characteristics: URLLC, eMBB and mMTC.

The following sections describe these use cases across the identified verticals, together with high-level requirements for their vertical enablement platform needs, which have been built out of the matrix contents referenced in Annex 1.

### 4.1 INDUSTRIAL AND MANUFACTURING

#### 4.1.1 Non-Public Network

In contrast to a 5G network that offers mobile network services to the general public, a 5G non-public network (NPN, also sometimes called a private network) provides 5G network services to a clearly defined user organization or group of organizations. The 5G NPN is deployed on the organization's defined premises, such as a campus or a factory. NPNs can be desirable for several reasons:

- High quality-of-service (QoS) requirements.
- High security requirements, met by dedicated security credentials.
- Isolation from other networks, as a form of protection against malfunctions in the public mobile network. Also, isolation may be desirable for reasons of performance, security, privacy and safety.
- Accountability. An NPN makes it easier to identify responsibility for availability, maintenance and operation.

In doing so, tight, seamless integration between the organization's IT/OT infrastructure and the 5G NPN infrastructure is key to ensure end-to-end configuration, monitoring and fault diagnosis. Therefore, the IT/OT operations support services will integrate with the 5G operation support system (OSS) APIs to make this seamless.

#### 5GVP Requirements

- Integration between the organization's IT/OT OSS and the 5G OSS should be seamless.
- Methods to determine service operation quality and monitor across the virtualized infrastructure of a 5G NPN should be provided.

#### 4.1.2 Site Safety Monitoring

Aerial intelligence provides a reality-modelling platform for physical asset management, addressing business requirements in various industry sectors. It harnesses the cloud's computing power to turn aerial and ground imagery data into key actionable insights for operational and corporate asset management. It also can maximize staff safety in sensitive (remote and dangerous) areas with real-time video surveillance and automatic hazard detection.

#### 5GVP Requirements

- Provide seamless integration of sensors and device connectivity into a location- and spatial-awareness service, with restricted policy controls to ensure privacy and safety of the operating environment.

#### 4.1.3 Augmented Reality (AR)-Assisted Factory Maintenance

5G can connect previously isolated equipment and systems to gather data and insights, narrowing the time gap between data-gathering and decision-making. It will enable remote-assisted support to workers at distant locations, such as providing guidance on maintenance and repairs. This is expected to reduce downtime, increase output, improve safety and, in the long term, enable a more sustainable manufacturing process.

#### 5GVP Requirements

- Provide seamless connectivity for internal staff and third-party equipment maintenance providers to access operational process data from AR-assisted maintenance.

## 4.2 CONNECTED VEHICLE

### 4.2.1 Connected Vehicle Data Sharing

5G will support the development of telematics to improve safety, traffic management and in-car entertainment, including 4K video, real-time navigation and AR for drivers and passengers. To fully exploit this immersive experience, data derived from the vehicle, surrounding infrastructure, surrounding environment and passengers will be augmented to provide personalized services wrapped around the connected vehicle use case. This can include implementing driver and passenger preferences before they enter the vehicle, during a journey and at the destination. At its simplest level, decisions about when to travel, which routes to take and where to park will be augmented. But this can be far more, such as scheduling video meetings automatically during the journey or automatically booking lunch en route.



#### 5GVP Requirements

- The services that the vehicle can connect to, and the data that can be conveyed, should be under the control of the driver/passenger(s).
- Which data is provided, for what use and under whose consent needs to be controlled by the driver/passenger(s) and any infrastructure services or other services that are utilized.

## 4.3 SMART CITIES

### 4.3.1 Smart Traffic Management

IoT sensors generate massive volumes of data that need to be communicated to city planners and urban authorities so they can analyze it and make informed decisions. The combination of 5G network advantages, RFID transponders and cloud infrastructure make it possible to create a city traffic monitoring system that helps drivers reach their destination in an optimal time. The system will redirect drivers to avoid traffic jams and to minimize fuel consumption, and monitor and analyze traffic flows to optimize streetlight use or prevent roads from over-congestion based on rush hour schedules. In case of an electric vehicle, the system can also consider its range and battery level.



#### 5GVP Requirements

- Vehicles should be able to seamlessly connect with smart city infrastructure to share data and consume traffic management advisory information.
- Anonymity must be maintained where requested and data sharing done with user consent under permissible use terms.

### 4.3.2 Citizen Movement

By allowing more real-time data to be shared, 5G will have an immediate impact on how local authorities serve their residents, enabling them to better understand citizens and offer solutions to their problems. Being able to continuously ingest HD video streams with crowd-sourced sensor data will enable smart cities to analyze citizen movement and behavior to support several services, including traffic control, public transport, retail and commercial planning, lighting, public safety and commercial vehicles for utilities and deliveries.



#### 5GVP Requirements

- Consumer connected devices must be able to seamlessly connect with smart city infrastructure to share data and consume traffic management advisory information.
- Anonymity must be maintained where requested, and data sharing done with user consent under permissible use terms.

## 4.4 PUBLIC SAFETY

### 4.4.1 Real-Time Video Surveillance

Surveillance systems are one of the technological solutions that can improve public safety. 5G can support more real-time video, as well as additional processing resources (e.g., AI in the form of edge computing) to make sure only useful information gets transmitted immediately.

5G enables new opportunities to access a network of CCTV cameras for analyzing real-time video feeds. Video surveillance can provide collaborative intelligence that enables first responders to be better prepared and more effective in assessing a situation. Having an intelligent system that can give priority to emergency vehicles so they can move faster in a city could save many lives.

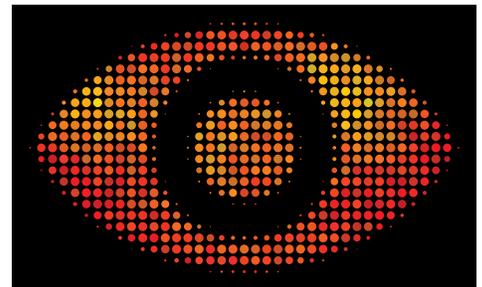


#### 5GVP Requirements

- Need to connect third-party video feeds with public safety applications dynamically.
- Need to ensure the integrity of third-party video feeds so they can be trusted.

### 4.4.2 Firefighter Augmented Reality Headset

AR headsets using thermal imaging will let firefighters see through smoke, toxic gases and darkness to find victims and colleagues, and spot falling objects and holes in floors that would otherwise be invisible. In the future, an AI-powered assistant could filter through the noise of sirens and crackling flames to listen for victims and be used to project information about the building layout, directing firefighters to the location of water hose attachments, stairwells and elevator shafts.



#### 5GVP Requirements

- Need to connect third-party information and video feeds with the AR headset based on context.
- Need to ensure the integrity of third-party information and video feeds so they can be trusted.

### 4.4.3 Wearables and Connected Vehicle Sensors

Wearables and connected vehicle sensors will enable the provision of enhanced criminal and/or patient insights. Police and paramedics will have clothing that can provide real-time video feeds and other sensor-related data about their immediate environment.

Video feeds can be used for facial recognition to provide information about a person's identity and potential criminal justice records. This information enables police officers to assess the situation more effectively and act accordingly.

Patient-related real-time video streams can be provided to ER staff, who then can provide more informed support for the paramedics attending the patient en route. Remote sensors and real-time video will enable ER staff to remotely monitor the patient for conditions that are not easily sensed, such as skin pallor and demeanor. In a more ambitious scenario, life-saving remote assistance might be required on the ambulance, supervised by a specialist located elsewhere and connected to the same platform.



#### 5GVP Requirements

- Ensure trusted identity of the public safety officer accessing citizen health records or criminal justice records. Access to record data should be provided only to authorized public safety officers, or in some cases health-related data only with the consent of the patient.

## 4.5 HEALTHCARE

### 4.5.1 Telemedicine and Remote Patient Monitoring

5G eMBB will potentially reduce the number of in-person doctor visits by making virtual care more effective and lifelike. This alternative is particularly valuable for patients who cannot easily travel to their health care providers

With 5G-enabled devices, health care providers can monitor patients remotely and gather real-time data that can be used for preventative care and other individually tailored plans. Over 85 percent of doctors say that internet-connected wearables increase patient engagement with their own health, decreasing hospital costs by 16 percent over the next 5 years.



Innovations in medical device technology will also provide more patients with devices that enable them to measure and monitor their health from home. These sensors and other devices will generate data that can then be transmitted and analyzed by a variety of medical and health care professionals. This data could help identify emerging problems so they can be treated early on, thus reducing the need for hospitalization.

#### 5GVP Requirements

- Need to connect third-party sensors with health care provider systems in a trusted and secure manner without compromising those systems.
- Ensuring the integrity of sensor data, patient information and video feeds so they can be trusted.
- Ensure trusted identity of the doctor accessing patient sensor data and that any required consent has been obtained.

## 4.5.2 Connected Ambulances

A 5G-connected ambulance is a vehicle equipped with advanced multi-technology and communication services that use a 5G network and dedicated communication to receive specialized remote support in real time via HD video while caring for the patient aboard.

The ambulance has a camera located inside where medical emergency professionals care for the patient. It can be remotely activated by emergency medical technicians, physicians and/or nurses when needed. A double image is sent in real time via a tablet: a view of the patient, along with the monitor showing the patient's vitals and electrocardiogram. This system also facilitates a conversation between the ambulance team and the physician, who provides instructions to assist in the patient's care.

The ambulance also has two exterior cameras: one in front and the other in the back. These can record outside images in situations where it is important, such as in a terrorist attack or at a traffic accident scene.

A 5G-connected ambulance also can facilitate specialized remote support for health and medical emergency professionals when dealing with complicated medical emergencies or when a certain level of specialization is needed (e.g., birth, a patient with a complex critical illness, a suspected heart attack or stroke). An example is a vascular surgeon using HD video in real time to assess the patient and provide advice to the ambulance team.



### 5GVP Requirements

- Ensure trusted identity of the doctor accessing patient sensor data and that any required consent has been obtained.

## 4.6 MEDIA AND ENTERTAINMENT PRODUCTION

### 4.6.1 Broadcast Virtual Network Operator

A new need is arising in broadcasting: a complete set of cloud-based toolkit and media application services, from audience management and contribution to live video production, including asset management and video mixing, to application and internet streaming and distribution. The customer now becomes a broadcast virtual network operator (BVNO) that will use the 5G network to acquire all the resources it needs for TV production within a limited timeframe for a live program broadcast. The BVNO model also is a good fit for pandemic and post-pandemic hybrid workflows, where many producers now work from home over 5G low-latency networks.



The CSP's new opportunities will cover a wide range of new business models (e.g., different QoS classes, regionalization, bandwidth sharing, live feed, cloud edit, cloud production) that broadcasters can take advantage of by activating the media services on demand.

### 5GVP Requirements

- The NSP or media service provider (MSP), through API configuration, should be able to deploy media services to the 5G edge service dynamically across a 5G infrastructure scheduled ahead of the event, ensuring a service that can be accessed by the operators for the event duration.
- Live ingest, video mixing, preview and cloud edit should be deployable on the edge cloud, close to an event location, while file-based operations and media workflows can be centralized in regional or central data centers. Those functionalities will leverage the 5G enablement platforms as it relates to "policy and regulatory compliance" for protection and right management of content across multiple platforms.
- Ensure that the service's quality of experience (QoE) across the 5G infrastructure during the event is maintained.

## 4.6.2 Mobile and Social News Gathering

When editors and broadcasters are looking for new ways to engage with their audience and broaden it with social engagement — going over the top (OTT) — they may be looking at new technologies (social media, analytics and automatic metadata) for innovative programs. With social media networks encouraging everyone to share their own content, the number of reporters has increased tremendously as consumers become part of the information and entertainment chain. In this scenario, a new style of news production is happening, mostly based on the cloud systems used as-a-service.



In this new landscape, shaped by the two dynamics detailed above, journalists and TV program creators want to virtually reach their audience and engage with them on live TV, connecting to contributors, professionals and others to reach high visibility, as well as enable editors to easily find the right person to be in contact with.

### 5GVP Requirements

- A media company, a broadcaster or an MSP should be able to deploy dynamically across a 5G infrastructure, based on the position and granularity of the online contributors, ensuring the quality and the ingestion of the videos.
- Providing seamless connectivity to reporters and contributors with their preferred device.
- Ensure that the service's QoE across the 5G infrastructure during the live contribution is maintained.

## 4.7 MEDIA AND ENTERTAINMENT CONSUMPTION

### 4.7.1 Off-Site Major Event Immersive Experience

5G networks will be able to broadcast at scale to millions of consumers concurrently, providing an 'At Event' fully immersive interaction from a remote viewing location through mobile devices, 4K TVs or AR/VR glasses and headsets. These live, interactive media streams need to be dynamically deployable and support the media interaction capacity, ensuring that the distribution and interaction across millions of viewers nationwide will not overwhelm the 5G infrastructure.



### 5GVP Requirements

- The media broadcaster can deploy an 'At Event' service dynamically across a 5G infrastructure, scheduled ahead of the event and ensuring the service can be accessed by consumers nationally (and potentially globally).
- Providing seamless connectivity of consumers to the 'At Event' service with their preferred device.
- Ensure that the service's QoE across the 5G infrastructure during the event is maintained.

## 4.7.2 On-Site Live Event Experience

Large-scale event venues, such as theaters, stadiums and ballparks, are increasingly being connected to a network to provide customers with a variety of options, such as instant replay, choosing a camera feed and AR. Content will be distributed locally using edge technology to localize media and immersive content interactions between the event and the customers.



### 5GVP Requirements

- The event owner will be able to deploy interactive media services to the 5G edge service dynamically across 5G infrastructure. This will be scheduled ahead of the event, ensuring that consumers can access the service at the venue.
- Providing seamless connectivity between the consumer's device and the event location service.
- Ensure that the service's QoE across the 5G infrastructure during the event is maintained.

## 4.7.3 5G Subscription-Less Sponsored Service Bundles

These enable consumers without a 5G subscription to connect with a sponsored service bundle (i.e., advertisement content) in return for 5G service/access connectivity via a CSP. The sponsored content will allow these subscription-less consumers to access a network of choice and engage with the sponsored content for the agreed terms of the sponsored bundle (i.e., access for one day). Typically, the content provider will do this in exchange for access to information about the consumers and their preferences to profile them for further engagement.



### 5GVP Requirements

- Enable consumers to access 5G network services for the sole purpose of the sponsored content engagement. Access controls policies will restrict access for the terms of the content engagement.
- Enable the content provider to assign or transfer credit to the subscription-less subscriber in return for engagement with the content.

## 4.8 EDUCATION

### 4.8.1 Immersive Lessons with AR and VR

#### VR and Education

5G-powered AR/VR services can include education use cases, such as virtual tours of the human body where students interact with anatomical models and move through the different layers of the body. These services can make the learning process more fun and much more interesting. This also can bring new experiences for distance learning, enabling the virtual presence of students.



#### AR and Education

Immersive AR can enable new ways of learning and teamwork in education through services such as virtual classroom and virtual presence together with teachers and other students. Enhancing the learning experience is not the only possible use case for AR. It can also help teachers to get necessary information about each student and be aware of their needs and capabilities.

### 5GVP Requirements

- Schools and students might not have IT departments able to support the complexities of connectivity and policy management. As a result, simple assisted connectivity and policy management services need to be available to enable schools, teachers and students to connect their haptic devices to secure education services.

## 4.8.2 Virtual Classroom with Tactile Interaction

### Tactile Internet and Skillset Communication

This will create new ways of tele-teaching and tele-mentoring, especially for manual training and skill development. Education can use tactile internet to bring new definition and experience for distance learning and distance teamworking, including a natural haptic interaction.



### Walled-Off Classrooms and More Flexible Learning

By combining tactile internet with AR/VR, future teaching and learning experiences could go far beyond those of today. This can remove the physical location constraint for experimental practices, and facilitate sharing of resources between larger numbers of students irrespective of their current location. The impact would be even more significant if it included virtual hands-on access to remote facilities and expensive equipment.

### 5GVP Requirements

- Schools and students might not have IT departments able to support the complexities of connectivity and policy management. As a result, simple assisted connectivity and policy management services need to be available to enable schools, teachers and students to connect their haptic devices to secure education services.

## 4.8.3 Personalized Assisted Learning

### Personalized Learning, Categorization and AI

Individual access to a mobile device holds the promise to connect each learner to intelligent, personalized systems. These can suggest learning pathways, enable aggregated analysis and, through better data capture of learner experiences, enable much better decision-making about all aspects of a student's education.



### Greater Assistance for Students with Special Needs

Advances in mobile technology and robotics can create new opportunities to assist students with special needs, making learning easier for them. Cloud-based robots can be considered as full-time assistants for disabled students, helping them interact with the education environment and their peers, rather than having to call a teacher over for help.

### 5GVP Requirements

- Devices and/or AI robotics that are not under education department control and that are critical to assisted learning should be able to be connected with the education service to provide feedback and context of the student.

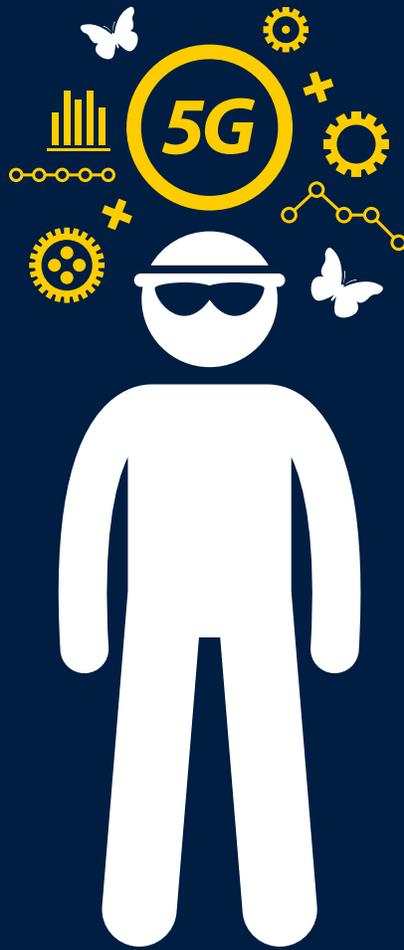
#### 4.8.4 Smart Classroom

With 5G-enabled IoT, students can connect with equipment within the education facility, such as whiteboards, printers and locks. With a plethora of connected devices, setting up devices and gathering feedback in class takes time even when everything works perfectly. Being able to seamlessly connect devices and share information between teachers, students and the education infrastructure will be critical to enabling a smart classroom.



#### 5GVP Requirements

- Simple ways to identify the type of device, authenticate it and connect it to the classroom service will be essential for the education service.



5

# **SPECIFIC PLATFORM CAPABILITIES**

## 5 SPECIFIC PLATFORM CAPABILITIES

Verticals comprise enterprises, public entities and application providers, and the various end users (which may be persons or things) that connect to the services and applications that they need to use as part of a particular vertical segment. The term “entities” is used as a shorthand way of saying “enterprises, public entities, application providers and networks.” The set of capabilities required by verticals have been grouped into a set of platforms.

Within the scope of this report, a platform is defined as:

- A set of capabilities required or strongly desired by entities comprising a vertical segment in order to provide services essential to the members of that entity, that
- May extend beyond the boundaries of a 5G network defined by 3GPP (NG-Core, gRAN, IMS) and that
- Are grouped together such that they can be efficiently exercised by the entity and by the CSP, and that
- Are accessible via a set of well-understood and/or standardized interfaces/APIs.

The major platform capabilities required by the verticals examined can be grouped into the following list:

SPECIFIC PLATFORM CAPABILITY	VERTICAL USE CASE NEEDS	PLATFORM CAPABILITY SUPPORT
<b>Connection and Policy Management</b> <b>Network Quality and SLA Management</b>	Those verticals that require 5G infrastructure as an extension of the existing internal IT/OT infrastructure management.	<b>5G IT and OT Integration</b> Deploy connectivity service. Seamless connectivity for devices. Policy controls and monitoring.
<b>Identity Sharing</b> <b>Identity Trust</b>	Those verticals that require federated identity for interoperability access by devices and people to access network connectivity, applications or services.	<b>Federated Identity</b> Device, Person, Application Identity Reputation
<b>Data Sharing</b> <b>Data Trust, Content DRM and Reputation</b> <b>Personally Identifiable Information (PII)/ Consent on Data Use</b>	Those verticals that require third-party data from devices or people with agreed consent, that will be used in delivering services.	<b>Third-Party Data Marketplace</b> Publish Discovery Access control Reputation score Preferences and consent management
<b>Location and Spatial Awareness (L&amp;SA)</b>	Those verticals that require location and spatial awareness of the surroundings including objects, devices and people to enable their services to be self-aware and provide proactive notification/warning to people and other applications.	<b>Location and Spatial Awareness AAS</b> L&SA platform provider Brokerage service for CSP Available as a service for verticals
<b>Exchange of Value</b>	Those verticals that require exchange of value between multiple parties. The value can be between non-subscription parties and may be for tokenized value not currency.	<b>Direct Value Exchange</b> B2P/P2B/P2P exchange of value Subscription-less CSP reconciliation

## 5.1 CONNECTION AND POLICY MANAGEMENT

The connection between the entity user/device and the application/user/device may span multiple providers (e.g., 3GPP-compliant service providers and non-3GPP compliant networks, cloud application providers/hosts). The Identity and Connection Management Platform is responsible for allowing users/devices to connect to what they need, and to establish the characteristics of that connection. At a high level, its capabilities include the following functions:

- Seamless onboarding of entity users/devices.
- Authentication of entity users/devices using entity native credentials.
- Establishment of logical connections/pathways based on entity and service provider policies, including (but not limited to) 5G network slices.
- Authorization and segmentation according to entity and service provider policies.
- Access control and selection.
- Multipath control.

The Policy Discovery, Propagation and Enforcement Platform capabilities include:

- **Discovery:**
  - Allow entity to discover capabilities of networks, including slicing, in order to select networks and to modify authorizations per connection based on network capabilities.
- **Propagation:**
  - Allow entity to specify required/desired policies regarding connection characteristics, including required bandwidth, priority, path segregation, segmentation/authorization, need for data path segregation and more.
- **Enforcement:**
  - Allow entity to monitor performance of path segments through various networks that form part or all of a connection to determine the extent to which desired policies have been realized.

## 5.2 NETWORK QUALITY AND SERVICE LEVEL AGREEMENT (SLA) MANAGEMENT

5G network slicing can provide logically isolated, quality assurance and end-to-end networks/network slice instances with a set of customized network capabilities, including access network, transmission network and core network. Network slicing enables operators to partition an entire network into different slices, each with its own configuration and QoS requirements.

Each vertical industry and each individual application within an industry may need an independent slice with its own functions and features. All these applications open new business opportunities, which may require new business models. Therefore, every single slice needs its own individual SLA.

In a scenario where the vertical application spans both the 5G network and its own IT infrastructure, it is important to extend network quality monitoring to the 5G network slice at the edge connection. The 5G network will need to provide the vertical with APIs to enable monitoring functions using the same tools used to deploy and manage the virtual network slice. A vertical can determine end-to-end network performance across the 5G network slice. This performance data can be combined with the vertical's own service-layer monitoring tools and analytics. Together, they can provide a reliable picture of how well the network services are performing relative to expectations and SLA commitments.

This platform includes:

- API to provide fault management monitoring and notification of a 5G network slice.
- API to provide performance/QoS management and analytics reporting for a 5G network slice.
- API to provide SLA management for a 5G network slice.

### 5.3 IDENTITY SHARING

5G network capabilities open the possibility for verticals to extend their services to connect many more things, people and applications about which they have no prior knowledge. For example, students may bring their own devices to school or for remote learning. Connected vehicles may connect with smart cities, while medical devices may connect to health care record systems. The vertical will require an identity-sharing service that will provide the ability to identify, verify and authenticate a connecting thing, person or application with their 5G-enabled service.

This platform includes:

- Discovery of the connecting entity identity, person, device or application.
- Verifying the identity with the entity's identity provider.
- Resolving the entity's profile for policy control.
- Authenticating the connecting entity for access control.

### 5.4 IDENTITY TRUST

For certain vertical applications, determining the trustworthiness of the device, person or thing connecting is critical for the integrity of the service being provided or consumed. For example, is the blood pressure monitor being used from a trusted supplier and certified? In these situations, it is important to understand not only the identity of the connecting entity, but also the integrity and trust of it to support the service. If the integrity of the device is questionable, the vertical can manage the connection of the entity accordingly. For example, rather than not allowing the connection, the connection could be isolated from the main service with restricted access and/or limited service.

This platform includes:

- As part of the identity discovery, establishing the trust and security posture of the entity's identity to establish an identity trust.
- Establishing access rights and policy controls based on the identity trust discovered.

### 5.5 DATA SHARING

With 5G mMTC, the potential for billions of connected things, and generating data that can be under the control of people or commercial entities, can create new business models for verticals. Sharing of data between devices and people with vertical services and applications will necessitate controlled mechanisms to ensure that the vertical has the right to use the data and then only under agreed terms of use.

This platform includes:

- Providing a mechanism to discover data attributes and context from a third-party data marketplace or directly from a connected device.
- Establishing terms of use and commercial terms for sharing data.
- Establishing agreement for right to use data.
- Exchanging data within the agreed terms.

### 5.6 DATA TRUST

When data is being shared by devices and people with the vertical service, the vertical needs to know that the data being shared can be trusted to ensure integrity of the business using the data. This means it is critical to have a platform that can provide the vertical with information to determine if the data provider can be trusted and that the data being shared has integrity.

This platform includes:

- Establishing the reputation of the data supplier, third-party marketplace or device and its security posture and trustworthiness to supply data with integrity.
- Establishing the data ontology for the service context.
- Monitoring the exchange of data to the agreed ontology and terms.

## 5.7 CONTENT DIGITAL RIGHTS MANAGEMENT (DRM)

DRM refers to the process where content producers restrict or otherwise limit the use of copyrighted digital materials. DRM tools are designed to protect the rights of the copyright holder and prevent unauthorized modification or distribution of content. DRM access control technologies restrict the use of proprietary copyrighted works and include systems within devices that enforce these policies. To this end, the vertical must comply with the DRM enforcement policies applied when distributing copyrighted content.

This platform includes:

- Preventing piracy of valuable intellectual property.
- Controlling access to content so only authorized individuals/parties use it.
- Applying various content controls to restrict the terms of the content use and redistribution.

## 5.8 PERSONALLY IDENTIFIABLE INFORMATION (PII) AND CONSENT FOR DATA USE

When people share their data with a vertical entity, this sharing will need to conform with state and/or national regulations. These typically indicate that processing personal data is generally prohibited unless it is expressly allowed by law or the data subject has consented to the processing. To this end, the vertical must comply with the regulations for PII and consent.

This platform includes:

- Ensuring consumer consent is provided for exchange of data to agreed terms of use.
- Allowing data to be exchanged that will not expose any PII.
- Removing all data, and data to be forgotten, as requested by the consenting party.

## 5.9 LOCATION AND SPATIAL AWARENESS

Spatial awareness refers to the ability to be aware of objects in space and the location position in relation to other objects, specifically people. Location- and spatial-awareness services provided to a vertical can turn visual and sensor data into current and predictive spatial location information.

- **Location:** Spatial awareness gives context to the location of an object, such as knowing where machines, buildings and people currently are.
- **Movement:** Having spatial awareness can provide information about how people and objects move through an environment. This can help users navigate their surroundings.

This platform includes:

- Collecting visual and location data to determine spatial intelligence.
- Enabling applications to subscribe to the service to define special awareness context for their application use. This can include proximity zoning and alerts.

## 5.10 EXCHANGE OF VALUE

5G creates new business models for vertical services: consumer-to-consumer, consumer-to-business or business-to-business. In some cases, these transactions are between two entities that have no prior trading arrangements (e.g., subscription-less services). The exchange of value for services, content or data sharing could be compensated with monetary equivalents, free or discounted service, access rights and more. The vertical will need platform capabilities that enable the exchange of value to create new service economies of 5G.

This platform includes:

- A mechanism to convey the value and the terms between two parties.
- Discovering identities for the value exchange.
- Agreeing on terms for the exchange of value (e.g., completion of provision, quality of provision).
- Transferring value between entity and service provider (inter-carrier settlement).
- Exchanging of value, which may be content/context information in return for services.
- Reconciliation and settlement of value exchange between parties.

## 5.11 PLATFORM CAPABILITY LAYERS

The platform enablement capabilities identified in this report provide separate functional service layers. These service layers can be independent and provided as different technology standards but are required collectively to facilitate an individual use case. The platform capabilities can be grouped into the following service layers:

- **Deploy:** Enable the vertical to deploy the network connectivity and manage it.
- **Connect:** Enable the vertical to define the access and manage the connectivity based on identity verification.
- **Exchange:** Enable the vertical to exchange data and content with people, things and their own applications that can be trusted.
- **Enrich:** Enable the vertical to enrich information from sensors, people or video feeds to create new services.
- **Incentivize:** Enable the vertical to incentivize participation and influence consumer behavior through fungible tokenized value.

Across each of these layers, the vertical will require platform capabilities to configure, control and monitor the platform capability service. These layers of platform capabilities are not dependent upon each other, but when combined will enable the identified use cases outlined in Section 4.

<b>INCENTIVIZE</b>	Define Service / Incentivized Value	Exchange Value	Reconciliation of Value
<b>ENRICH</b>	Define Location and Spatial Data Context	Location Data Exchange service	Sensor Data SLA monitoring
<b>EXCHANGE</b>	Define Data Sharing Terms & Policy	PII and Consent granted to exchange data	Establish Data reputation and trust
<b>CONNECT</b>	Define access and policy controls	Identify connecting party and apply access policy	Determine Identity for Authentication
<b>DEPLOY</b>	Define and Deploy network connectivity	Policy management over connectivity	Monitor network connectivity
	<b>CONFIGURE</b>	<b>CONTROL</b>	<b>SUPERVISION</b>



6

# SUMMARY AND CONCLUSIONS

## 6 SUMMARY AND CONCLUSIONS

By surveying ATIS members, seven vertical industries were prioritized for this report:

- Industrial and manufacturing
- Connected vehicle
- Smart cities
- Public safety
- Health care
- Media and entertainment
- Education

This report was developed through outreach to these industry organization and working through our member organizations, subject matter experts in these seven priority verticals have identified several use cases within each vertical that are underpinned by the specific characteristics of 5G NR infrastructure: eMBB, URLLC and mMTC.

Analyzing these use case, the report was able to identify a set of platform capabilities that were not currently within the scope of 3GPP but are required to implement these use case identified across a 5G infrastructure. These platform capabilities identified were consistently required across all verticals, if not the majority of these verticals' use case needs. The platform enablement capabilities identified are:

- Connection and policy management
- Network quality and SLA management
- Identity sharing and identity trust
- Data sharing, data trust, PII and consent, content DRM
- Location and spatial awareness
- Exchange of value

At the time this report was written, not all of these capabilities are within 3GPP's scope because they transcend 3GPP network boundaries. Other platform capabilities could be requirements for a future 3GPP release. Some of these platform capabilities have already been worked on by other industry bodies and could be adopted by 3GPP to facilitate these platform needs. For some verticals, policy and regulation stipulate that these capabilities be part of the industry-specific standards.

From this study, ATIS will work across several ATIS initiatives to further the understanding of these requirements and define specific platform capabilities. Additionally, ATIS will work with both global and industry-specific standards bodies to coordinate these platform capabilities requirements so a common set of platform services can be used consistently across any vertical industry.

### COORDINATION WITH ATIS INITIATIVES

#### 2021 Innovation Agenda – Identity for Privacy and Trust

- To further investigation and understanding and needs relating to the area of identity management as it relates to data sharing privacy and trust, ATIS has initiated a new Innovation Agenda work item to study 'Identity for Privacy and Trust.' This work item will examine how identity underpins the requirements for sharing trusted data between consumers and their devices with third-party services, with consent controls.

#### Multi-Network Enterprise Solution (MNES) focus group

- The ATIS MNES working group is focusing on a solution to provide seamless access across multi-network technologies for people, devices and applications.

#### DLT Focus Group

- The ATIS Enterprise Identity Distributed Ledger Network (EIDLN) provides enterprise callers with a vetted digital identity to enable anyone in the call path to authenticate that enterprise. The EIDLN distributed identity service could support several identity/authentication use cases for people, device and content services.

## **5G Operational and Regulatory Requirements Group (5GORR)**

- As 5G becomes more integrated by network operators, 5G service types, integration with vertical industries, and new regulations will mean that mobile operators are going to face a wealth of new regulatory requirements that must be fulfilled across the 5G ecosystem.

## **Next G Alliance**

- The ATIS Next G Alliance is focused on North American leadership for 6G and beyond across the full lifecycle of research, development, manufacturing, standardization and market readiness. It will be important to integrate the future needs of verticals and adjoining industries to the vision of the 6G ecosystem being developed by the Next G Alliance, including a National 6G Roadmap.

## **Smart Cities Data Exchange - An ATIS/US Ignite Initiative**

- ATIS/US Ignite Smart Cities Data Exchange provides a blueprint for this secure and interoperable exchange of data beyond city operational boundaries. Current work is assessing data governance policies that will be needed to meet future smart city data-sharing applications. The 5G vertical platforms addressed in this report provide additional insight into the future developments that will impact smart city data policies.

## **RELEVANT ACTIVITIES IN OTHER STANDARDS BODIES**

### **3GPP**

- 3GPP has expanded its 5G standards activities by launching a range of 5G initiatives to address the needs of vertical industries. These include providing standardization of new vertical applications within the 3GPP ecosystem, using new common APIs, service enablement layers and application layers. Another example is promoting the adoption of 3GPP 5G technology across vertical specific enablers, such as V2X, unmanned aerial vehicles/systems (UAV/UAS) and smart factories.

### **5G ACIA - Exposure of 5G Capabilities**

- Provides functional requirements for exposing the capabilities of non-public 5G systems to connected industries and automation applications. Via exposure interfaces, industrial applications can access 5G capabilities for factory and process automation, production IT, logistics and warehousing. Industrial applications also have access to communication service monitoring and network management capabilities.

### **National Association of Broadcasters – Next Gen TV**

- Next Gen TV lets TV stations better personalize their broadcasts with information and interactive features so viewers can get the content and features most relevant to them. For broadcasters, this means a more compelling and interactive way for consumers to engage with content. Next Gen TV is based on IP, so users can expect more innovation and new services, bringing the best combination of online and broadcast television.

### **APCO International – Next Gen Public Safety**

- APCO International is the world's oldest and largest organization of public safety communications professionals and supports the largest U.S. membership base of any public safety association. It serves the needs of public safety communications practitioners worldwide — and the welfare of the general public as a whole — by providing complete expertise, professional development, technical assistance, advocacy and outreach. ATIS is working with APCO to provide insight into emerging technologies and use cases that can enhance public safety services by utilizing 5G capabilities.

### **GSMA – North America Vertical Applications (NAVA) Task Force**

- NAVA TF was created in late 2020 in response to a standardization gap identified during the deployment of UAV/UAS (a.k.a. drones) that necessitated the development of a common “aerial profile” to facilitate interoperability. NAVA TF will strive to identify vertical applications nearing commercial deployment to define corresponding application layer enablers as specified in 3GPP SA6. The result may take the form of a white paper or other guidance, as well as interaction with other industry groups supporting specific verticals.

## ANNEX 1: VERTICAL USE CASE AND CAPABILITY MATRIX

<https://www.atis.org/wp-content/uploads/2021/03/5GVP-Use-Case-Matrix-v14.xlsx>

## ANNEX 2: EXTERNAL REFERENCES

5G-ACIA, 5G Non-Public Networks for Industrial Scenarios white paper, Published July 2019, <https://www.5g-acia.org/publications/5g-non-public-networks-for-industrial-scenarios-white-paper/>

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5G-PPP, 5G and Media and Entertainment white paper, Published January 2016, <https://5g-ppp.eu/wp-content/uploads/2016/02/5G-PPP-White-Paper-on-Media-Entertainment-Vertical-Sector.pdf>

Jisc report on 5G and Education, [https://community.jisc.ac.uk/sites/default/files/Education-VM\\_Extended.pdf](https://community.jisc.ac.uk/sites/default/files/Education-VM_Extended.pdf)

## ANNEX 3: DEFINITIONS, ACRONYMS & ABBREVIATIONS

For a list of common communications terms and definitions, visit the ATIS Telecom Glossary at <https://glossary.atis.org>

### ACRONYMS & ABBREVIATIONS

5GORR	5G Operational and Regulatory Requirements	NAVA TF	North America Vertical Applications Task Force
5GVP	5G Vertical Enablement Platform	NPN	Non-Public Network
AR	Augmented Reality	NSP	Network Service Provider
BVNO	Broadcast Virtual Network Operator	OTT	Over the Top
DRM	Digital Rights Management	PII	Personally Identifiable Information
EIDLN	Enterprise Identity Distributed Ledger Network	QoS	Quality of Service
L&SA	Location and Spatial Awareness	SLA	Service Level Agreement
MNES	Multi-Network Enterprise Solutions	VR	Virtual Reality