White Paper

Connected Bus by Wavecom

5G eSIM™ in Bus Transport Sector

Abstract

Communication is essential to our daily lives in our increasingly connected world. A key technology driving this change is the eSIM™.

The rapid growth of eSIM™ (embedded SIM) technology adoption is driven by businesses' growing recognition of its potential. eSIM™ technology has become a game-changer in many industries, offering a groundbreaking solution to replace conventional SIM cards, where bus transportation is no exception.

Today, eSIM™ is already a key component in the **Wavecom Technologies Connected Bus Solution**, streamlining the management of numerous connected buses within a **Bus Operator**'s fleet.

This White Paper explores the fact that **Wavecom Gateway** already incorporates eSIM™ technology, and presents the benefits of its use in the Bus Transport Sector, as a part of **Wavecom Technologies Connected Bus Solution**, for both **Bus Operators** and **Systems Integrators**.

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Connected Bus by Wavecom

5G eSIM™ in Bus Transportation

Introduction

Communication is essential to our daily lives in our increasingly connected world. A key technology driving this change is the eSIM™.

The rapid growth of eSIM™ (embedded SIM) technology adoption is driven by businesses' growing recognition of its potential. eSIM™ technology has become a game-changer in many industries, offering a groundbreaking solution to replace conventional SIM cards, where bus transportation is no exception.

Today, eSIM™ is already a key component in the **Wavecom Technologies Connected Bus Solution**, streamlining the management of numerous connected buses within a **Bus Operator**'s fleet.

Figure 1 - Wavecom Gateway is equipped eSIM™ technology

An important component of the **Connected Bus Solution is** the **Wavecom Gateway**.

The **Wavecom Gateway** is a platform that offers a range of technologies, including DBDC (Dual-Band/Dual-Concurrent) Wi-Fi 6/6E - 802.11ax (high-speed connectivity at 2.4, 5 and 6 GHz) and two eSIM 5G modems (for balancing and/or traffic segmentation), providing redundancy by using up to 7 SIM Card profiles from different MNOs (Mobile Network Operators) as presented in Figure 1.

eSIM™ technology has been transforming the way on-board **Wavecom Gateway** access 5G which offers a multitude of benefits over conventional SIM cards.

Not only for **Bus Operators**, eSIM™ technology is also an important solution for **Systems Integrators** with widespread deployments across diverse geographies, as it provides seamless connectivity and flexibility for **Wavecom Gateway**.

What is eSIM™

eSIM™, which stands for embedded Subscriber Identity Module, is a digital virtual SIM that allows devices to connect to a 5G MNO without the need for a physical SIM card. It is standardized by recognized industry bodies, including GSMA (Global System for Mobile Communications Association), ETSI (European Telecommunications Standards Institute), and Global Platform SIMalliance.

An eSIM is a virtual SIM silicon chip card, similar to other components, that is soldered directly onto the circuit board into a device, such as **Wavecom Gateways**. It stores in a secure and trusted digital format mobile subscription data, such as credentials needed to connect to a MNO.

It removes the need for a physical SIM card and offers the flexibility and freedom to switch between MNOs eliminating the need for manual insertion required by traditional SIM cards.

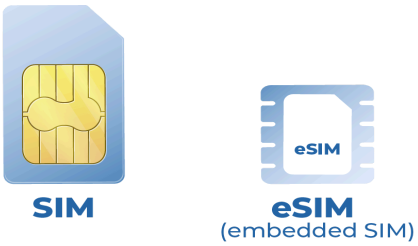

Figure 2 - SIM versus eSIM

The eSIM's ability to store multiple MNO's profiles such as data plans lets **Bus Operators** select and activate different profiles for their bus fleets. This makes it possible to switch MNO's without needing to insert or replace a SIM physical card.

An eSIM can be incorporated directly into devices, or they can be plastic eSIM cards that can be inserted into older devices that were not originally equipped with eSIM technology.

Unlike traditional SIM cards, eSIM functionality can be used with older devices.

Key features

Flexibility	An eSIM is a non-removable and non-interchangeable embedded chip within a device.
Storage Capacity	Stores numerous MNO'S profiles, enabling effortless switching between various MNOs and subscription plans.
Installation	eSIM™ technology enables **Systems Integrators** to download and activate multiple MNO's profiles digitally. This process is facilitated by OTA (Over-The-Air) updates.
Switching	Changing MNOs is easily done via the device's settings, eliminating the need for a physical SIM card replacement.

Advantages for Systems Integrators

Adaptability is a key benefit of eSIM™. The eSIM can be reprogrammed with the new profiles information, allowing to switch MNOs without physically changing the SIM card. Operational costs, such as deployment, labor, downtime, and MNO switching, can be significantly reduced.

Reduced time, deployment, and labor costs

eSIM™ technology is very important for **Systems Integrators** with widespread bus fleets deployments across diverse geographies, as it provides seamless connectivity and flexibility for **Wavecom Gateways**. **Systems Integrators** can remotely configure new profiles.

In this way, **Systems Integrators** can reduce labor and logistics costs by eliminating the physical installation of SIM cards. Tasks such as troubleshooting, network updates, and MNOs changes that once took hours can now be completed in minutes.

For instance, a fleet of thousands of buses equipped with its own **Wavecom Gateway** can have its eSIMs activated remotely, saving thousands of hours each year.

"The eSIM can be reprogrammed with the new profiles information, allowing to switch MNOs without physically changing the SIM card. "

Benefits for Bus Operators' Fleets

So far, switching MNOs required physically removing and replacing SIM cards within the gateway onboard the bus. This was not feasible in scenarios such as a **Bus Operator**'s fleet with thousands of vehicles, each equipped with its own onboard gateway.

On the other hand, accessing the in-vehicle gateway was restricted and service interruptions were not acceptable.

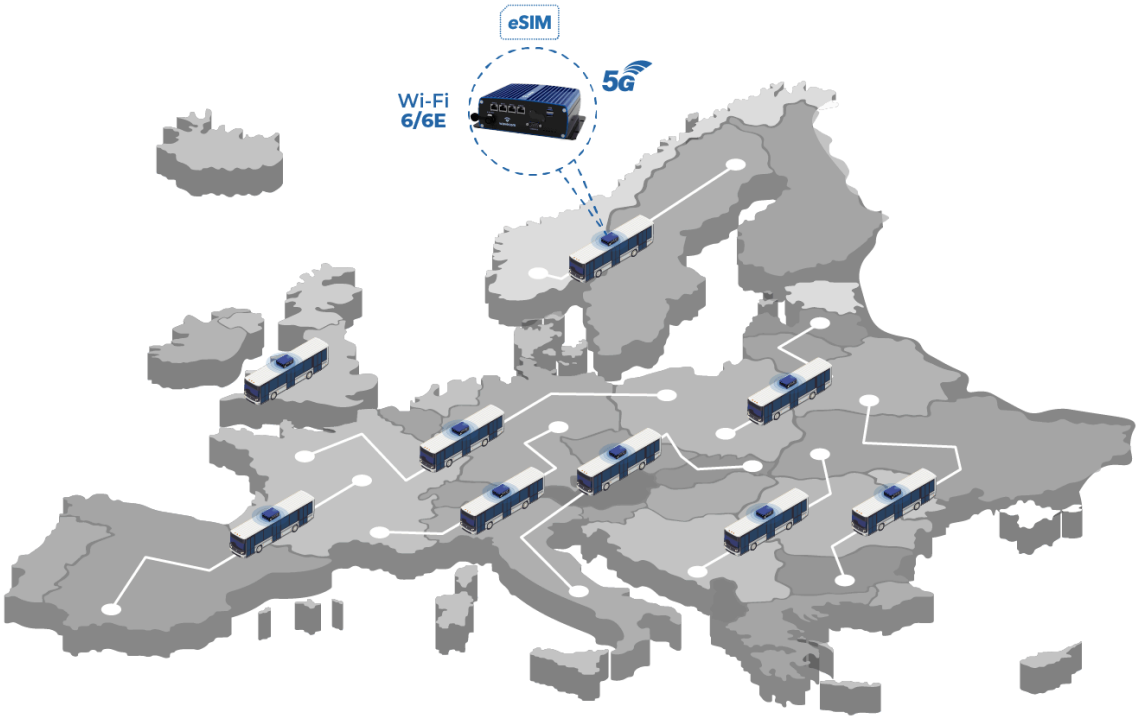

Figure 2 - Bus operator's fleet travelling across different European countries

"Tasks such as troubleshooting, network updates, and MNOs changes that once took hours can now be completed in minutes."

Costs and time savings

Consider a scenario where a **Bus Operator** manages a fleet of hundreds of buses that travels across different European countries, as depicted in figure 2.

So far, each bus had a gateway that required a physical SIM card for connectivity. The logistical challenges were substantial. Before, someone must physically insert SIM cards into every gateway. Additionally, if the **Bus Operator** decides to switch to a different MNO, each SIM card would need to be replaced. Given that different countries have different MNOs, managing and coordinating these tasks could quickly become overwhelming.

There is no need to change the physical SIM card in the **Wavecom Gateway**, as it was before. Simultaneously, maintenance is simplified due to remote and bulk access.

eSIM™ technology allows **Bus Operators** to remotely manage all of their connections, eliminating the need for physical SIM cards. This results in decreased downtime, reduced costs, and increased efficiency, productivity, security, and convenience for **Bus Operators**.

Scalability and Network Optimization

The ability to switch MNOs more easily and quickly with the installation of a **Wavecom Gateway** with eSIM in each vehicle of the bus fleet can foster healthy competition among **Bus Operators**.

Eliminate the physical SIM card

The absence of a physical SIM card provides distinct benefits. The advantage of the eSIM module is that it does not require an unreliable socket connector like a regular SIM card does. The eSIM is soldered directly onto the circuit board, and as a result cannot be removed, which increases security and prevents misuse.

The elimination of SIM card production, distribution, and physical management through the implementation of eSIM™ technology results in significant savings in human resources.

Improved Security

eSIM technology provides enhanced security against cyber threats, protecting sensitive data and communications. Unauthorized access is prevented by IT solutions, ensuring data and communication integrity between the bus vehicle and landside systems.

Remote Management

Downtime and maintenance requirements are reduced because eSIMs can be remotely provisioned and managed. Connectivity profiles can be remotely updated, network performance can be monitored, and issues can be troubleshooted from **Wavecom IoT Manager/Multi-Tenant Platform**. An eSIM can store multiple MNO profiles, providing cost-effective global roaming capabilities for international MNOs.

The use of eSIM™ technology in **Wavecom Gateway** will enhance operational reliability and system dependability while decreasing long-term maintenance expenses.

Profiles can be remotely activated, deactivated, and reprogrammed with the eSIM. Subscriptions can be managed effectively by MNOs without the physical removal or installation of a SIM card by a technician.

This leads to a significant reduction in the costs associated with traditional management.

Environmental Sustainability

The adoption of eSIM™ technology not only enhances operational efficiency and cost-effectiveness but also brings a multitude of benefits for environmental sustainability.

This sustainability approach promotes more environmentally friendly mobility practices and elevates the reputation of **Bus Operators** by mitigating greenhouse gas emissions, conserving natural resources, reducing electronic waste, and curbing waste generation.

Conclusion

eSIM™ technology allows **Bus Operators** to remotely manage all of their connections, eliminating the need for physical SIM cards. This results in decreased downtime, reduced costs, and increased efficiency, productivity, security, and convenience for **Bus Operators**.

For **Bus Operators**' fleets, eSIM™ technology provides unparalleled convenience and flexibility. It streamlines communication during international trips, significantly reducing roaming costs and ensuring a bus is connected wherever it is travelling.

Not only for **Bus Operators**, eSIM™ technology is also an important solution for **Systems Integrators** with widespread deployments across diverse geographies, as it provides seamless connectivity and flexibility for **Wavecom Gateways**.

The **Systems Integrators** can reduce labor and logistics costs by using remote provisioning to eliminate the physical installation of SIM cards. Tasks such as troubleshooting, network updates, and MNOs changes that once took hours can now be completed in minutes.

Acronyms

4G	Fourth Generation Mobile Network
5G	Fifth Generation Mobile Network
DBDC	Dual-Band/Dual-Concurrent
eSIM	embedded Subscriber Identity Module
ETSI	European Telecommunications Standards Institute
GSMA	Global System for Mobile Communications Association
IP	Internet Protocol
IT	Information Technology
LTE	Long Term Evolution
MNO	Mobile Network Operator
SD-WAN	Software Defined – Wide Area Network
SDN	Software Defined Network
VPN	Virtual Private Network
WWAN	Wireless Wide Area Network
ZTP	Zero Touch Provisioning

Contacts

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