![wavecom Technologies logo]

White Paper

Connected Bus by Wavecom
Episode 4 – Cloud Managed | Reliability and Resilience

The reliability and resilience of the **Wavecom Technologies Connected Bus** are crucial for **Systems Integrators** since **modular Gateways** relies on constant connectivity and data exchange with **IoT Manager/Multi-Tenant Platform**.

Modular Gateway Software components enable network communication and functionalities of the **Connected Bus**. Thus, to ensure reliability and resilience for **modular Gateways**, it is necessary to update and maintain software regularly and properly.

SD-WAN (Software Defined - Wide Area Network) makes the **Connected Bus** solution more flexible, automatable, resilient, and reliable. It is centrally and cloud managed by **IoT Manager/Multi-Tenant Platform**, automatable, and supports ZTP (Zero-Touch Provisioning) and VPNs.

In addition, using preventive maintenance, diagnostics, or troubleshooting allows us to detect and solve errors before they affect network functionality or availability of **Connected Bus.**

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Introduction

The reliability and resilience of the **Wavecom Technologies Connected Bus** are crucial for **Systems Integrators** since **modular Gateways** relies on constant connectivity and data exchange with **IoT Manager/Multi-Tenant Platform**.

To ensure network reliability and resilience it is necessary to update and maintain software regularly and properly for **modular Gateways**.

Additionally, using preventive maintenance, diagnostics, or troubleshooting allows us to detect and solve errors before they affect network functionality of the **Connected Bus.**

In a **Connected Bus** solution network security is critical for **modular Gateways**, as they may be exposed to a variety of threats, such as unauthorized access, data theft, malware injection, or denial of service attacks.

To ensure the reliability and resilience of the **modular Gateways** in a **Connected Bus** solution, it is necessary to secure network access and data at all levels. On the **Connected Bus**, a VPN is used to protect network access from unauthorized users or devices.

SD-WAN (Software Defined - Wide Area Network) makes the **Connected Bus** solution more flexible, automatable, resilient, and reliable. It is cloud managed by **IoT Manager/Multi-Tenant Platform** (Figure 1) and supports ZTP (Zero-Touch Provisioning) and VPNs.

Figure 1 – Cloud Managed | Reliability and Resilience

Reliability and Resilience

In a **Connected Bus** solution, to ensure reliability and resilience for **modular Gateways** there are some best procedures to follow:

- **Update and maintenance of software in modular Gateway**

    Software components of **modular Gateway** enable network communication and functionality. Thus, to ensure network reliability and resilience for **modular Gateways**, it is necessary to update and maintain software regularly and properly.

    In addition, using preventive maintenance, diagnostics, or troubleshooting enables us to detect and solve problems before they affect network functionality or availability of the **Connected Bus** solution.

- **Secure network access**

    In **Connected Bus** solution network security is essential for **modular Gateways**, as they may be exposed to various threats, such as unauthorized access, data theft, malware injection, or denial-of-service attacks.

    To ensure in **Connected Bus** solution reliability and resilience in **modular Gateways**, it is necessary to secure network access and data at all levels. In **Connected Bus**, a VPN is used to protect network access from unauthorized or malicious users or devices.

The **Connected Bus** solution's components comprise a **modular Gateway** (5G Native) installed in each bus vehicle, which is cloud managed by the **IoT Manager/Multi-Tenant Platform** (5G WAN Manager | SD-WAN), as depicted in Figure 2.
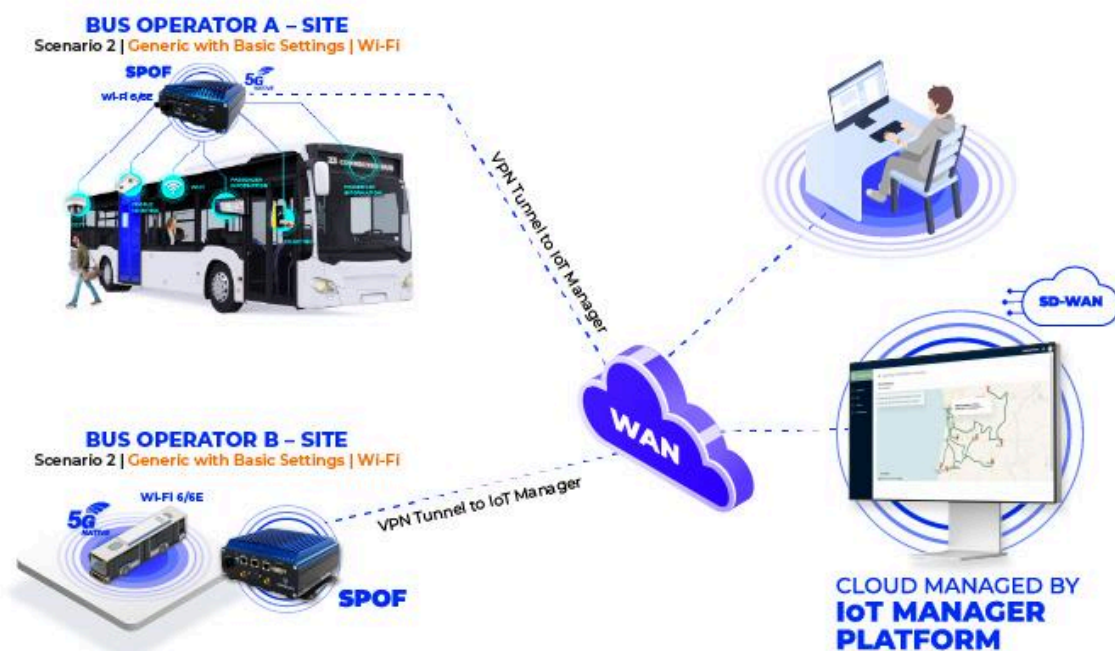

Figure 2 – Cloud Managed | Reliability and Resilience | Architecture.

IoT Manager/Multi-Tenant Platform

IoT Manager/Multi-Tenant Platform (5G WAN Manager | SD-WAN | Virtual Networks | Link aggregation | Security) provides a cloud managed ZTP system multi-tenant approach, as it allows the **System Integrator** to manage multiple **Connected Bus modular Gateways**.

Wavecom Technologies provides a ZTP (Zero-Touch Provisioning) tool cloud managed by **IoT Manager/Multi-Tenant Platform** that improves the efficiency of provisioning and deploying of a **Connected Bus** solution.

This platform can provision, update and configure **modular Gateways** for **Systems Integrators** wherever the Bus Operator's fleet is, if it is connected to WAN.

In terms of reliability and resilience issues, tunnel protocols (SD-WAN), security policies and other mechanisms are used to prevent possible attacks to the network.

On the other hand, at **IoT Manager/Multi-Tenant Platform** it is ensured ZTP server is secure and system image software is tested before being deployed, as a vulnerability in a ZTP setup is likely to affect many **modular Gateways**.

SD-WAN

SD-WAN is a software-based approach to creating and operating a wide area network. It virtualizes network functions so that the network can be used over a variety of heterogeneous physical and logical network connections and protocols, such as Wi-Fi and 5G.

SD-WAN makes a **Connected Bus** solution more flexible, automatable, resilient, and reliable. It is centrally cloud managed by **IoT Manager/Multi-Tenant Platform**, automatable, and supports ZTP and VPNs.

It provides some benefits for **Systems Integrators** such as:

- **Cost Savings**

    SD-WAN overlays existing network infrastructure and is transport agnostic. It also allows them to freely use any combination of available private or public networks, including Wi-Fi and 5G, to route **Connected Bus** traffic.

    Furthermore, the use of SD-WAN technology allows for multiple VPNs for separate Bus Operator Sites' networks.

- **Easy Setup**

    With SD-WAN, the **Connected Bus** solution can be quickly and easily deployed by less-skilled staff. ZTP removes much of the manual work of provisioning network nodes by automating configuration. So, instead of sending an Engineer to the Bus Operator Site, using an SD-WAN can rely on Technician to physically install, power, and cabling **modular Gateways**.

    This adds reliability and security to the **Connected Bus** SD-WAN network, as ZTP configuration is less prone to misconfigurations caused by errors that occur due to repetitive manual tasks typed in the CLI (Command Line Interface) in the installation Bus Operator Site.

- **Cloud Management**

    In **Connected Bus** Solution, SD-WAN are provisioned, and cloud managed centrally by **IoT Manager/Multi-Tenant Platform**, that offer a GUI-based dashboard providing real-time status and performance metrics.

In addition, SD-WAN provides smarter traffic routes based on centralized priorities, security and requirements, managed in the cloud by a platform such as the **IoT Manager/Multi-Tenant Platform**.

Zero Touch Provisioning

ZTP supports **Systems Integrators** scale the secure and easy way, thanks to automation provided by system image software installed in **modular Gateways**. They no longer need to manually configure so many resources, and they can instead count on virtually hands-free provisioning.

While the physical installation, powering, and cabling will continue to require personnel on Bus Operator Site, ZTP enables the remaining tasks, including establishing connectivity, device configuration or software upgrade, to be automated.

The deployment of the **Connected Bus** solution can be completed by less-skilled **System Integrator**'s staff.

On **Connected Bus**, ZTP is implemented on **IoT Manager/Multi-Tenant Platform**, which is the top tier of SD-WAN service, as shown in Figure 2. The basic ZTP's requirements include the following:

- **Modular Gateway** with ZTP
- **IoT Manager/Multi-Tenant Platform**

In the definition of a **Connected Bus** Project/Delivery/Purchase, the basic requirements/functionalities are defined, which will be configured in the **Wavecom Technologies** environment.

The system image software has an identical basic configuration for all **modular Gateways** ready to go into operation, according to the requirements/functionalities initially established.

Wavecom Technologies provides two type of system image software for two different scenarios:

- **Customized** for a specific Project/Delivery/Purchase, already defined according to requirements and functionalities ordered by the Bus Operator. This includes pre-configuring the cellular network and ports, ensuring secure connectivity both outbound and locally.
- **Generic** with a set of basic configurations, that enables the **modular Gateway** to work at least as a Wi-Fi Router.

In any of the scenarios, the system software images already have the configuration of the VPN tunnels that connect the equipment to the **IoT Manager/Multi-Tenant Platform**, as illustrated in Figure 2.

Conclusion

At the end of **Episode 4**, it is expected you as a **Systems Integrator** to know:

- we provide a cloud managed by **IoT Manager/Multi-Tenant Platform** that improves the reliability and efficiency, when deploying a **Connected Bus** solution.

- how we improve reliability and efficiency when deploying a **Connected Bus** solution.

Acronyms

4G	Fourth Generation Mobile Network
5G	Fifth Generation Mobile Network
CLI	Command Line Interface
IP	Internet Protocol
LTE	Long Term Evolution
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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