![wavecom Technologies logo]

# White Paper

## Connected Bus by Wavecom
### Episode 2 – Zero Touch Provisioning



ZTP (Zero-Touch Provisioning) helps **Systems Integrators** quickly and automatically provision and deploy network devices such as **modular Gateways** in a large-scale environment such as Bus Operators' fleets, eliminating most of the manual interaction involved.

On **Wavecom Technologies** **Connected Bus**, configurations are managed and provisioned from the cloud by **IoT Manager/Multi-Tenant Platform** (5G WAN Manager | SD-WAN) via templates. In deployment, **Systems Integrators**' staff may even perform configurations and updates from remote locations, such as Bus Operators' sites.

Overall, ZTP improves provision and deployment efficiency of a **Connected Bus** solution, reducing operational costs for **Systems Operators**.

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**White Paper**

**Connected Bus by Wavecom**
**Episode 2 – Zero-Touch Provision**

## Introduction

The emergence of the SDN (Software Defined Network) paradigm brought all benefits SD-WAN and ZTP (Zero-Touch Provisioning). ZTP is a tool that simplifies provisioning and configuration of equipment like **modular Gateways**, automatically without any manual intervention.

Manual configuration takes time and is prone to human error, especially if many **modular Gateways** must be configured at a scale. So, with ZTP, **Systems Integrators** can enormously reduce the time in comparison with what they spend on manual configuration.

This tool enables **Systems Integrators** to install networking devices such as **modular Gateways** without manual intervention, as depicted in Figure 1.



Figure 1 – Connected Bus Zero-Touch Provisioning with IoT Manager Platform

On **Wavecom Technologies Connected Bus**, configurations are managed and provisioned from the cloud by **IoT Manager/Multi-Tenant Platform** (5G WAN Manager | SD-WAN) via scripts. In deployment, **Systems Integrators**' staff may even perform configurations and updates from remote locations, such as Bus Operators' sites.

Thus, ZTP allows **Systems Integrators** to automatically update, pre-configure initial configuration and update scripts. This is done by pointing **Wavecom Technologies modular Gateways** (5G Native) to a configuration repository, from where they retrieve the necessary configurations.

## Zero-Touch Provisioning

Zero-Touch Provisioning helps **Systems Integrators** quickly and automatically provision and deploy network devices such as **modular Gateways** in a large-scale environment such as Bus Operators' fleets, eliminating most of the manual interaction involved.

Overall, it improves provision and deployment efficiency of a **Connected Bus** solution, reducing labor costs for **Systems Integrators**.

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

### How does Connected Bus ZTP work?

On **Connected Bus**, ZTP is implemented on **IoT Manager/Multi-Tenant Platform** (5G WAN Manager | SD-WAN), 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.

When **modular Gateways** are connected, these configurations are associated, among which the connection to the corresponding **IoT Manager/Multi-Tenant Platform** is assumed, i.e., the VPN is already configured from scratch in the equipment image (Table 1).



Figure 2 – **Diagram** | Connected Bus Modular Gateway Zero-Touch Provisioning Stages

Table 1 – ZTP stages' tasks

| Stage 1 (Connect) | Stage 2 (Enrolment) Stage 3 (Provisioning) | Stage 4 (Operation) |
|---|---|---|
| Power On and connect **modular Gateway** | Once connected, the **modular Gateways** establish a VPN to the **IoT Manager/Multi-Tenant Platform** that places them in the inventory, associated with a Bus Operator, pre-provisioned<br><br>The system image software has an identical basic configuration for all **modular Gateways** according to the requirements/functionalities initially established | Then, only final configurations are missing, such as which Bus Vehicle is installed, and which type of Bus Vehicle and **modular Gateway** is ready to work<br><br>Finally, **modular Gateway** is ready to go into Operation in a Bus Vehicle |

ZTP carries out the basic configuration, after which the **modular Gateway** can be deployed in an environment where custom configuration changes are made.

## Key Features

### Multi-tenant

A multi-tenant approach is interesting, as it allows the **System Integrator** to manage multiple **Connected Bus modular Gateways** cloud managed by one ZTP system, such as **IoT Manager/Multi-Tenant Platform.**

### Provisioning anywhere

**IoT Manager/Multi-Tenant Platform** can provision, update and configure **modular Gateways** for **Systems Integrators** wherever the Bus Operator's fleet is, if it is connected to WAN.

### SD-WAN

Until some time ago, each network asset connected to the WAN was manually configured on installation site by the **Systems Integrator**' staff. This type of operation took a long time and was error prone.

Nowadays, the use of an SD-WAN methodology has simplified the configuration of the gateways. Using a management platform like our **IoT Manager/Multi-Tenant Platform**, a set of configuration rules or changes can be implemented remotely. And they can be instantly and automatically applied to **modular Gateways** connected over the WAN.

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**.

**ZTP benefits**

ZTP fully automates provisioning and deployment on **modular Gateways**, providing many benefits, with huge savings in operational costs.

- Less time being spent on set up
    - o When hundreds of **modular Gateways** need to be provisioned and deployed, ZTP can help implement the configuration faster without requiring manual one-by-one configuration, saving time.

- Faster and easier updates
    - o Having multiple configurations across network **modular Gateways** is an operational nightmare. This can delay troubleshooting and requires the **Systems Integrator**'s staff to keep a good record of all the configurations. Thus, ZTP makes the configuration faster and updates easier.

- Configuration consistency
    - o With ZTP, the configuration across **modular Gateways** will be consistent rather than site-specific configuration.

- Avoids opportunities of human error
    - o Manual configuration is prone to human error. If errors occur during provisioning, the launch of the **Connected Bus** may be delayed causing constraints in the Bus Operators' operation. Thus, ZTP can help eliminate it by removing human errors that occur due to repetitive typing in the CLI (Command Line Interface).

- Saves time and costs
    - o Configurating many **modular Gateways** in the Bus Operator' fleet with hundreds or thousands of bus vehicles to be deployed, the use of ZTP can help to set up faster without requiring one-on-one manual intervention.

## Connected Bus | Zero Touch Provisioning

Most Bus Operators' fleets have a high number of bus vehicles. Thus, **Systems Integrators** deploying a **Connected Bus** solution, will have tens or hundreds of **modular Gateways** to provision and configure, taking significant time.

If **modular Gateways** are configured individually, it will take more time and effort to connect. This means that **Systems Integrator**'s staff must spend more time at a CLI, configuring each **modular Gateway**.

Let's assume that a **Systems Integrator** has a set of Bus Operator Sites (each with a fleet composed of a large number of bus vehicles), as illustrated in Figure 3.
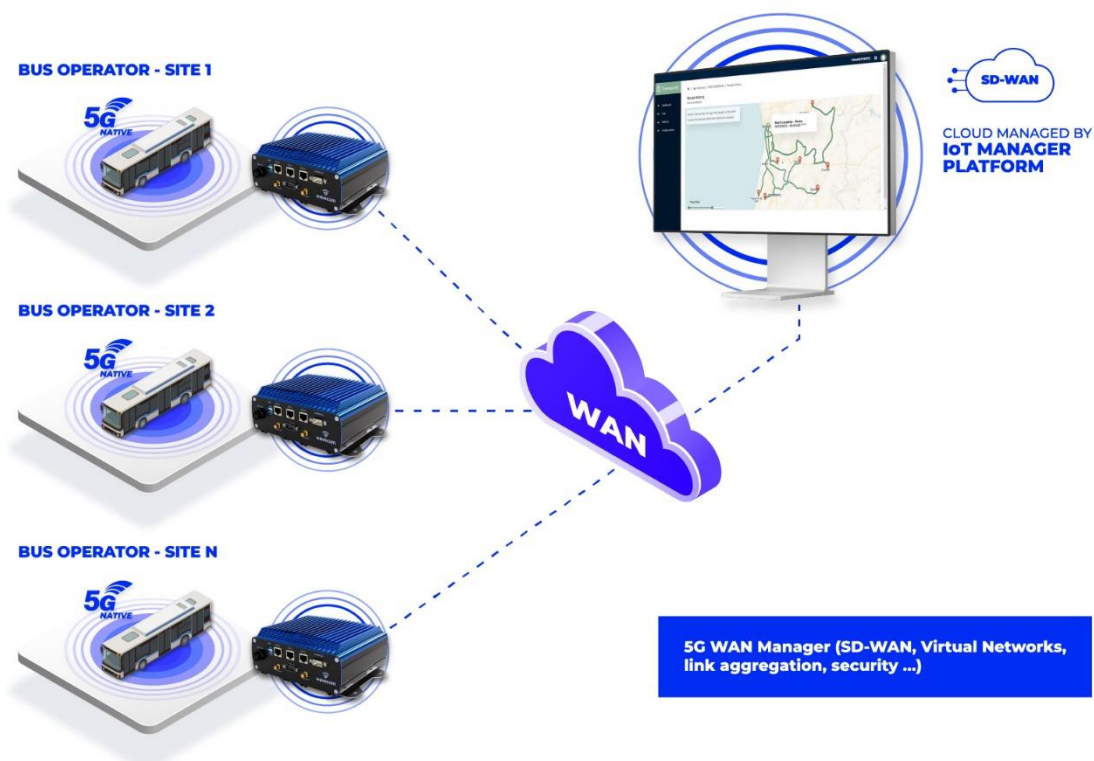


Figure 3 - **Diagram** | Connected Bus Zero-Touch Provisioning Scenario for Systems Integrators

In a **Connected Bus** solution, each bus vehicle needs the installation of its own **modular Gateway**. On the other hand, we have the **IoT Manager/Multi-Tenant Platform**.

Thus, by adding multiple **modular Gateways** at once to a Bus Operator Site, ZTP makes this task easier, saving time and money for **Systems Integrators**, by automatically provisioning them.

Likewise, if each of these **modular Gateways** needs upgrading, then ZTP would also be the most efficient choice for **Systems Integrators**.

## Conclusion

At the end of **Episode 2**, it is expected you as a **Systems Integrator** to know:

- what is Zero-Touch Provisioning and how can this tool/installation benefit configuration tasks in terms of operation and costs.

- we provide a 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.

- how our Zero-Touch Provision tool can be used in a real-world operation scenario of Bus Operators' fleets sites.


The next White Paper, **Episode 3 - Minimal Time and Reduced Operating Costs**, will cover how to minimize time and reduce operating costs when deployment a **Connected Bus** solution in a fleet of a Bus Operator.

It's coming, so stay tuned.

## 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

For more information about Connected Bus, feel free to contact us.

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