WaveNet Radio Network 3065

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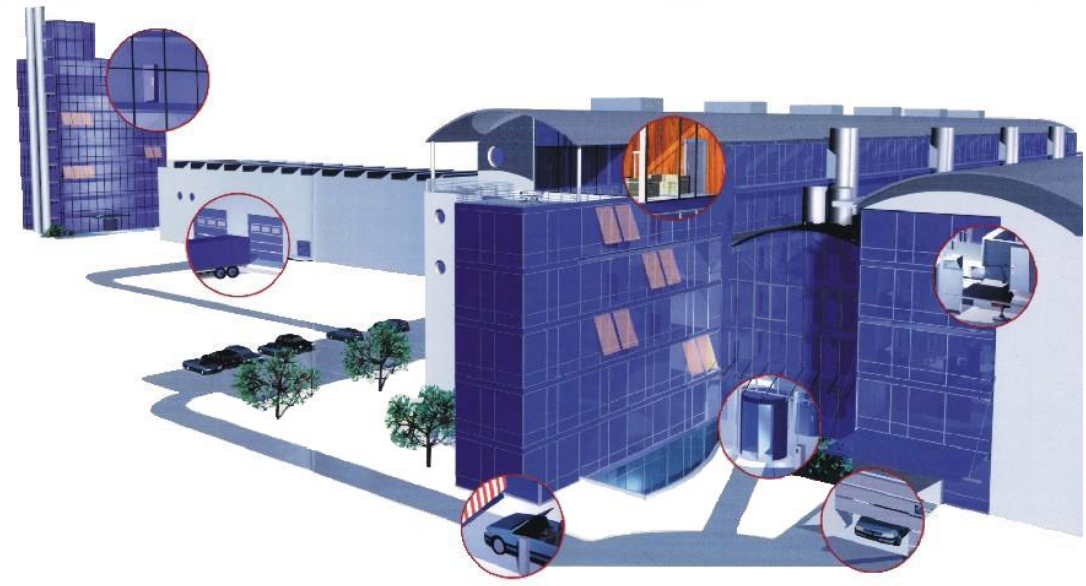
SimonsVoss technologies



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1.0 Important Information

Safety remark:

Caution! – Incorrect handling of the batteries and storage batteries used in this product can result in the risk of fire or burns. Do not charge, open or burn these batteries or heat them to more than 100 °C (212 °F).

Installation of a SimonsVoss RF Lock requires knowledge in the areas of door mechanics, door certifications, installation of electronics and the use of the SimonsVoss software. For this reason, only trained and authorized personnel should install the unit.

Compliance Statement (Part 15.19)
This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warning (Part 15.21)
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement (Part 15.105 (b))
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada Statement per Section 4.0 of RSP-100
The term "**IC:**" before the certification / registration number only signifies that the Industry Canada technical specifications were met.

Section 7.1.5 of RSS-GEN
Operation is subject to the following two conditions:
1) this device may not cause harmful interference, and
2) this device must accept any interference received, including interference that may cause undesired operation.

SimonsVoss Technologies Inc. will not accept any liability for damages caused by incorrect installation.

2.0 Introduction

In this document, the components of the System 3060 (RF Locks, Smart Relays, block locks) are commonly referred to as locks or doors. Unless stated otherwise, the descriptions also apply to all the other components of the System 3060.

For customers with only a few doors and a building which is not too large, the best way to program the System 3060 is with a laptop and a SmartCD programming tool, especially if the configuration of the locks seldom needs to be changed.

With medium to large facilities in which lost keys, new transponder allocations and organizational changes are more frequent, it makes sense to manage and maintain the locking system by means of a network. Even in this case not all the doors need to be networked and the system can also be configured for mixed operation with some doors connected to the network and some off-line.

In a networked system, all of the maintenance and programming functions can be conducted from a host computer, where it is also possible to obtain an overview of the current status of the entire network. For example, locks and door status can be requested centrally. Transactions such as door open, door closed, door locked, battery warning, access list, break-in alarm can be tracked and acted on. This enables you to respond to events directly from the central control room.

WaveNet is an easily installable 'Plug-and-Play' network for use in building automation. Because it is wireless, it is especially suitable for the online management and control of the SimonsVoss 3060 digital locking and organization system. It can be used in new and existing buildings..

The transmission of data within a WaveNet network is largely independent of the transmission medium. For instance, data can be transmitted via RS232 interfaces, RS485 ports, TCP/IP, or by radio (915 MHz).

3.0 Transmission media

WaveNet supports the following media for the transmission of data inside the system:

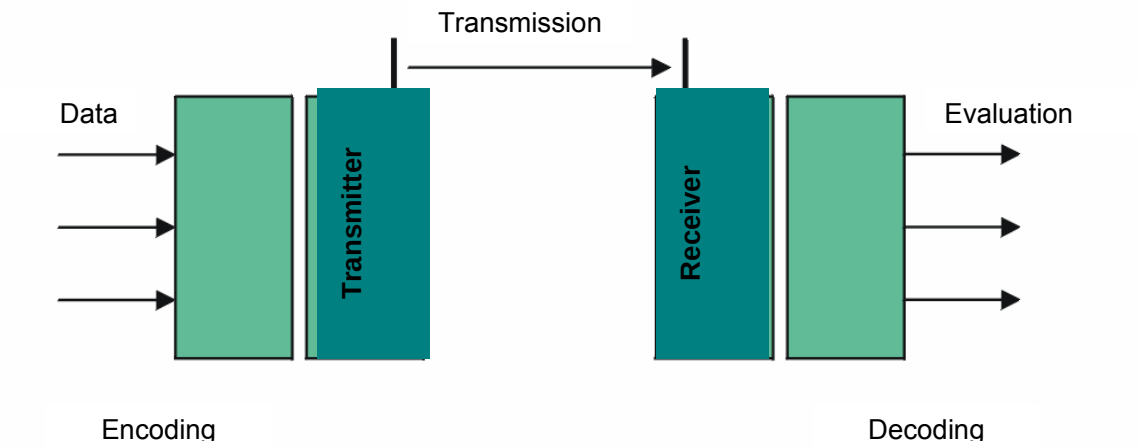
- Internet and Intranet via TCP/IP for transmitting data between different computers within a network.
- RS232, for data transmission between a computer and the WaveNet Central Node (cable length maximum 50 ft.).
- RS485 bus wiring for connecting individual WaveNet Routers functioning as network backbones (cable type CAT5, shielded, cable length maximum 2,000 ft.).
- 915 MHz radio (radio range approx. 150 ft. depending on building structure).
- B-field 25 kHz (radio range approx. 18 inches), for transmitting data between the WaveNet Lock Node and a SimonsVoss RF lock (cylindrical, mortise, SmartRelay, and furniture locks).

4.0 Usable radio wavelengths

Under the provisions of the United States Communications Act of 1934, as revised, authority for managing the use within the United States of the radio frequency spectrum is partitioned between the NTIA and the Federal Communications Commission (FCC). Therefore, to establish which radio services will be allowed to operate in the United States in a given frequency band requires that radio frequency spectrum management policies by established by both the NIA and the FCC. These bodies have declared the radio spectrum at 915 MHz ±13 MHz (902MHz to 928MHz) is designated for industrial, scientific, and medical (ISM) applications. ISM equipment operating in these bands includes wireless phones, line-of-site radio devices, and various office communications products.

The WaveNet network operates on a single frequency but that frequency may be adjusted with in the allowed 26 MHz band at the factory if needed to accommodate specific interference issues at a site.

Technical implementation



5.0 What are the factors to be aware of?

Regardless of the method, radio transmission is subject to a range of outside factors which can impede it or interfere with it. Equipment characteristics can also influence the range.

Upon what is the range dependent?

- Transmission output power
- Antennas
- Sensitivity of receiver
- Environment (air humidity, temperature)
- Position of installation

- Frequency
- Structural surroundings (walls, ceilings, gardens)

Transmission range can also be limited by obstacles. The following table provides some guidelines:

Material	Energy transmittance
Wood, plaster, plasterboard	90–100 %
Brick, particle board	65–95 %
Reinforced concrete (transmitter on metal)	10–70 %
Metal, metal mesh, aluminum cladding, in-floor heating	0–10 %

6.0 Secure message transmission

The transmission security of a message by radio in the WaveNet depends upon:

- Radio transmission security in the sense of data management.
- Potential disturbances along the transmission route.
- Intentional interference such as manipulation or sabotage of the transmission route.
- Intelligent methods of avoiding interference and finding alternative routes.

The speed of data transmission and message transfer can be influenced by a range of factors, and these can also cause a certain proportion of the messages to be lost.

These factors can include:

- High data traffic levels within the WaveNet.
- External interference in the WaveNet radio bandwidth.
- Power failure in segments of the WaveNet or the Central Node.
- Transmission failure or transmission interference in an external network..

7.0 WaveNet System 3065 Network components

WaveNet network components all have two independent ports. This enables two different network segments to be connected together through a WaveNet network component.

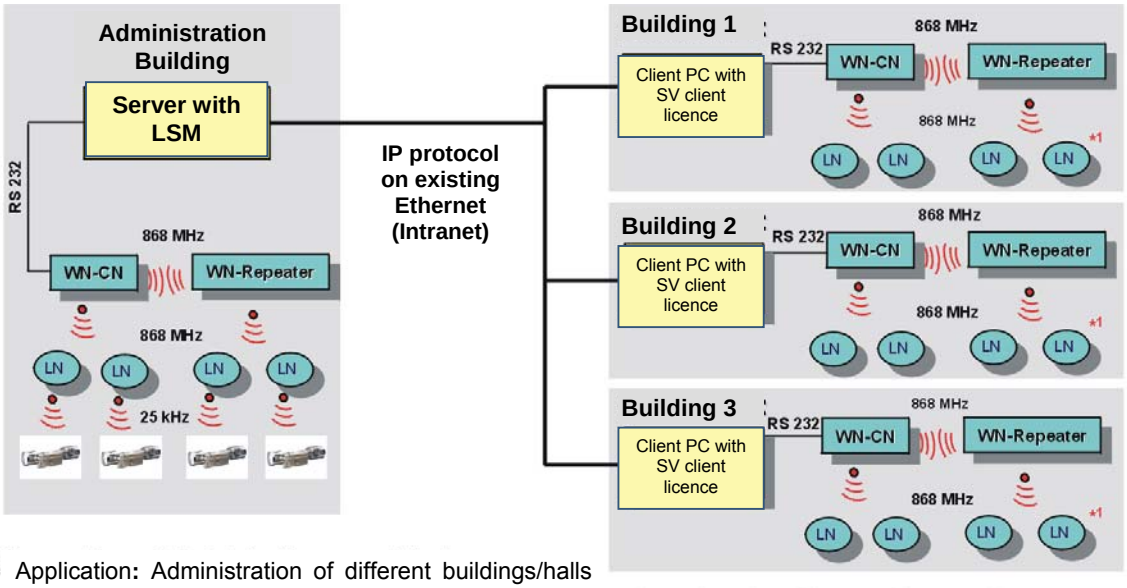
Definition: network segments are characterized on the one hand by a particular transmission medium (i.e. RS485 cable, RS232 cable, or 915 MHz radio) and on the other hand by a separate segment address (GID = GroupID).

The following SimonsVoss WaveNet network components are available:

7.1 Computers

Using special communication node software (CommNode), computers can be integrated into WaveNet:

- between the user interface and RS232 port, and
- between the user interface and TCP/IP (Internet, Intranet), and
- between TCP/IP and the RS232 port.



Application: Administration of different buildings/halls (at one location) via existing Ethernet (Intranet)

***1 = Lock Node communicates with the allocated lock via 25 kHz (see Administration Building)**

7.2 Router Nodes (general)

WaveNet Router Nodes are basically used to connect two different network segments together; these two may use the same transmission medium (i.e. RS485 to RS485), or different transmission media (i.e. RS485 cable to 915 MHz radio).

Furthermore, data streams arriving from the segments are filtered by the WaveNet Router Node so that the only data passed on to the segment downstream from the WaveNet Router Node is the data which is supposed to be processed by that segment. The WaveNet Router Node blocks out all other data from the downstream segment.

WaveNet Router Nodes are currently capable of connecting the following transmission interfaces between the segments: RS485 CAT5 cable, RS232 cable, 915 MHz radio.

7.3 Router Nodes (special versions)

WaveNet Central Nodes are Router Nodes which enable the linking of:

- computers (RS232 port) and 915 MHz radio, and
- computers (RS232 port) and CAT5 wiring (RS485).

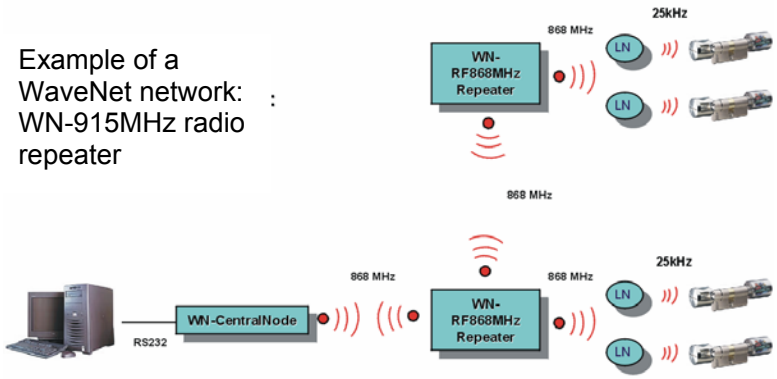
WaveNet Repeater Nodes are Router Nodes which link together two different segments that use the same transmission media, thus enabling the range to be extended. This means that if the radio transmission distance to the Lock Node achieved by the Router Node is too small, or if a cable within the network is going to exceed the maximum length, an extension can be created which complies with the system specifications using the WaveNet Repeater Node.

WaveNet Router Nodes as a converter from radio.... to cable....

WaveNet Repeater Nodes are used in situations such as the following:

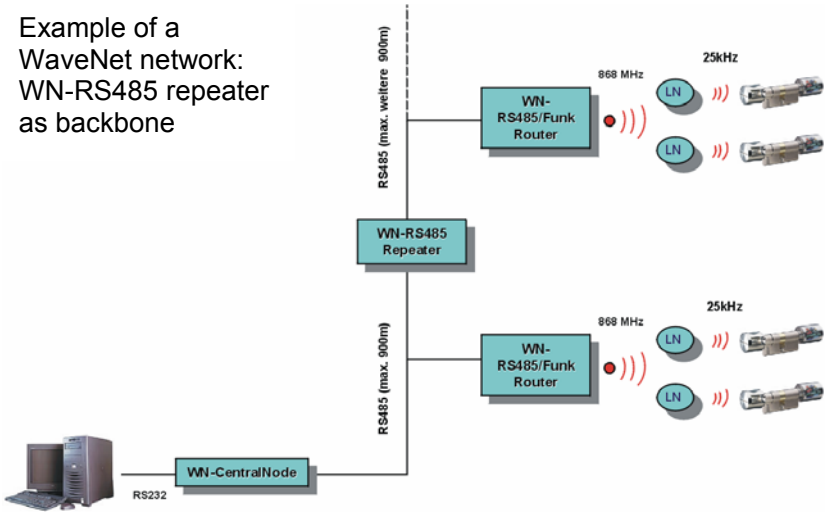
- If the radio range to a Lock Node is further than the range of a WaveNet Router Node: the radio signal is sent by the WaveNet Router Node to the WaveNet Repeater Node and from there to the Lock Node (LN).

Example of a WaveNet network: WN-915MHz radio repeater :



- To extend a network with an existing RS485 segment whose cable length is 2,000 ft (CAT5) by a further segment of maximum 2,000 ft.

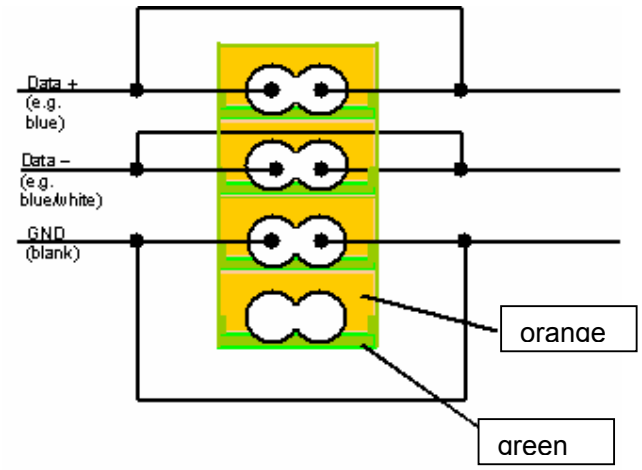
Example of a WaveNet network: WN-RS485 repeater as backbone



Backbone wiring:

A RS485 segment (backbone) is wired using a bus comprising a shielded, standard CAT5 cable. The bus line consists of two data lines (Data+, Data-) and an earth line.

This bus line is connected to every RS485 module associated with a WaveNet Router in the segment. The RS485 modules are connected to the bus line using a green and orange 8-pin plug as follows.



7.4 Lock Nodes

WaveNet Lock Nodes form the interface between WaveNet and the locks in the 3060 digital locking and organization system (locking cylinders and SmartRelays, for example).

All of them have:

- A special B-field port through which they communicate with the SimonsVoss RF locks;
- A radio port (915 MHz) for transmitting data to the WaveNet Nodes (WaveNet Router Nodes, WaveNet Repeater Nodes and WaveNet Central Nodes).

Inside the system, a WaveNet Lock Node can only be allocated to one RF lock (cylindrical, mortise, SmartRelay or furniture lock, for instance). The distance between a WaveNet Lock Node and a RF lock may not exceed 18 inches.

WaveNet Lock Nodes are **battery-powered** and can therefore be integrated into the SimonsVoss WaveNet with no wiring whatsoever. This makes the system ideal for installation in an existing building.

For installation, the WaveNet Lock Node will fit into a standard single-gang electrical box.

Lock Node with casing

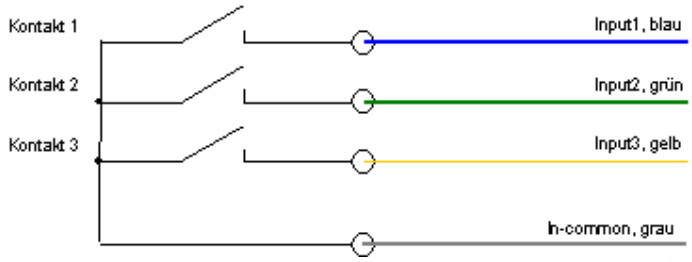
Lock Node inputs / output

Every WaveNet Lock Node has one output and three inputs (for door monitoring, for example).

The three inputs enable up to three external floating contacts to be connected. This enables the central monitoring of devices such as door and lock contacts as well as motion sensors, light barriers and so on – via the WaveNet network. The status of each connected contact can be polled by the host computer at any time, and changes to the contacts (events) can (if the Lock Node is configured accordingly) also be automatically registered by the host computer.

The output is used to send signals to external systems such as sensors, heaters, lights and so on. The output is an electronic switch (open drain) which can operate with up to 25 V and 650 mA.

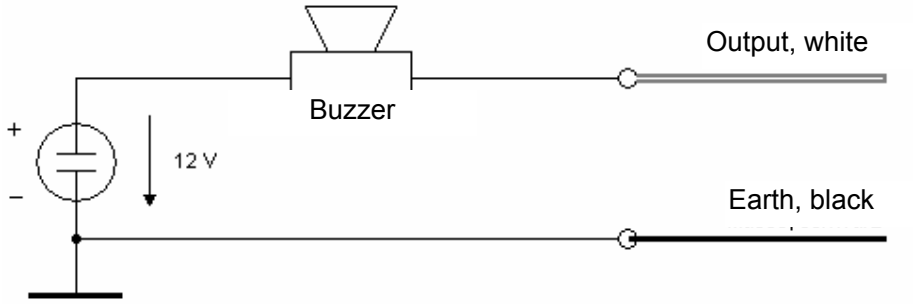
A 6-pin color-coded cable is available for the optional connection of the I/Os. The cable is plugged into the socket market ‘sensor’ on the Lock Node. For monitoring tasks, up to three floating contacts can be connected between the green In-Common line and one of the colored (blue, green, yellow) lines (see following diagram):



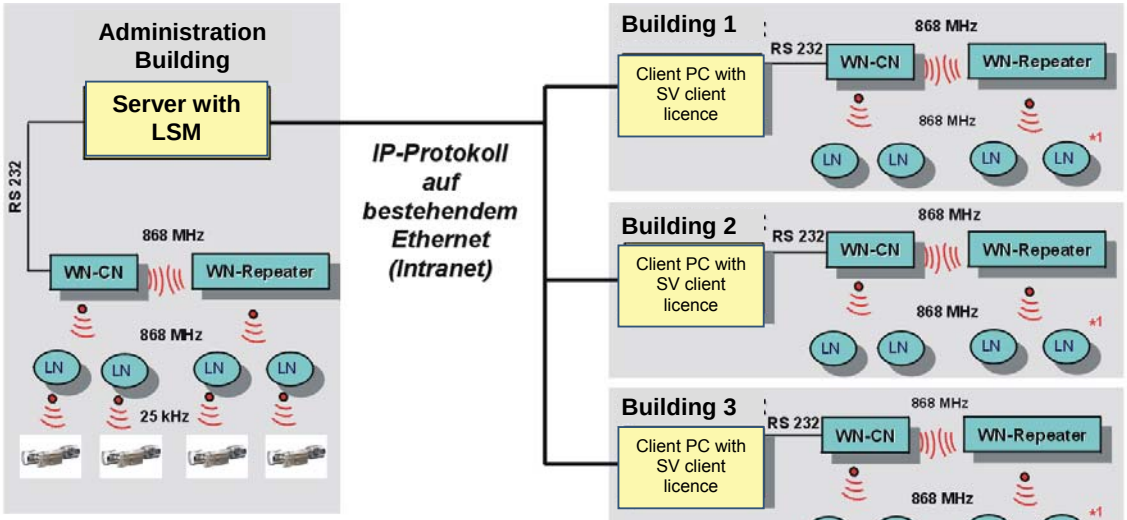
In the LDB and LSM user interfaces, an open contact has the value 0 while a closed contact has the value 1. In the diagram above, for instance, if contact 1 is used for monitoring a door, then when the door opens it will generate an event: ‘input 1 transition from 1 to 0’ (if contact 1 is closed when the door is closed and open when the door is open).

Internally, the output is formed by a transistor wired as an Open Collector. The white and black wires are available for connecting up external devices (such as buzzers). Note: out = white; earth = black.

Wiring example:



8.0 Network structure



Application: Administration of different buildings/halls (at one location) via existing Ethernet (Intranet)

In the network structure depicted above, different users with different rights can access a common server using the SimonsVoss WaveNet communication node software (CommNode) and a GUI (Graphical User Interface) via the Internet/Intranet. This server acts as a communication node and is connected to the WaveNet Central Node via an RS232 cable.

In the example shown above, the WaveNet Central Node connected to the server communicates via radio (915 MHz) directly with a Lock Node, which in turn exchanges data with the digital component (locking cylinder), also by radio (25 kHz).

In this example, all of the other Lock Nodes are outside the radio range of the WaveNet Central Node, and are therefore contacted indirectly via a WaveNet Repeater Node.

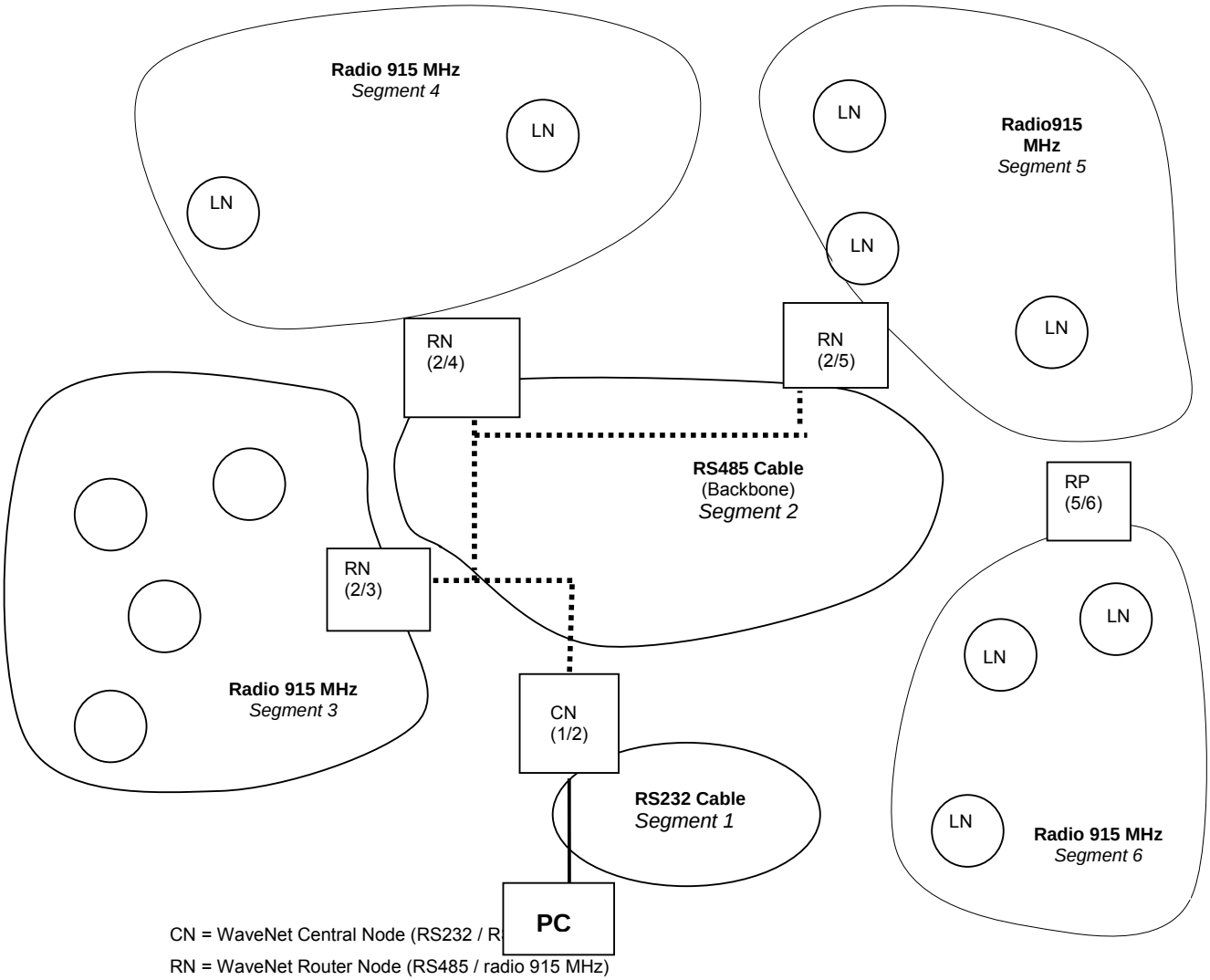
The structure above can be set up nicely using the multi-user and client-compatible database application known as the SimonsVoss LSM locking system management software. However, in the example above there is only one single CommNode, and thus only one single Central Node with a local subnetwork. In reality, almost any number of CommNodes can be connected via the Intranet or Internet. This enables what is known as ‘branch operation’; that means any number of branch offices with local Central Nodes and associated subnetworks can be linked to a central office via the Intranet/Internet.

Much easier to install (and correspondingly easier to manage) is the file-based LDB locking system administration software from SimonsVoss, which, unlike LSM, does not allow a direct integration of the Intranet/Internet transmission medium. Instead, a host computer is connected directly to the Central Node of the WaveNet network.

There are, however, some interesting solutions which also allow ‘branch operation’ using devices such as a modem or external software (PC Anywhere, for example). Networks are divided up into segments. A WaveNet Central Node can serve up to 253 segments, while each segment can have up to 253 WaveNet Lock Nodes / WaveNet Router Nodes.

Note: If you are using the LSM software, the network can be divided up between 1021/62 and 253/253 (segments / Lock Nodes per segment). When planning the system, this means you can decide whether each segment should have more segments or more Lock Nodes.

Examples of a WaveNet network structure:



CN = WaveNet Central Node (RS232 / R

RN = WaveNet Router Node (RS485 / radio 915 MHz)

RP = WaveNet Repeater Node (radio 915 MHz)

LN = WaveNet Lock Node

9.0 Security

Since WaveNet gathers and records critical data, it has to be reliably protected against unauthorized access. This places the highest demands on the system with regard to information and manipulation security.

9.1 Secure communication between the WaveNet network nodes

The radio communication across the WaveNet wireless network is protected against tapping and data-monitoring by means of advanced cryptography.

9.2 Automatic testing of individual system components

Some facilities require that alarms generated from a break-in attempt or other alarm condition be reported in real-time to the host computer. The WaveNet wireless network brings this capability to the SimonsVoss system.

Important: if a door is to be fitted with a break-in alarm function, then it must be equipped with at least one door contact which can recognize if the door is open or closed.

All of the Lock Nodes can report to the controlling computer at configurable intervals of time. These intervals may be variable during particular periods; for example, critical doors may need to be monitored more frequently at night.

9.3 Alarms

Alarms are messages which require an immediate response (i.e. break-in or fire). If the same type of alarm is sent repeatedly, it is only reported once in order to retain a better overview and not to burden the central alarm office unnecessarily.

10.0 Battery warning

If the voltage of the battery used to supply the Lock Node drops below a certain level, this can cause communication problems between the Lock Node and its associated RF Lock, and also between the Lock Node and a Central or Router Node.

If this type of fault occurs, then the ‘N’ behind the affected lock in the host software display is shown in red (communication fault). If after repeated synchronization attempts the red N does not disappear, then you should check whether the battery requires replacement.

9.1. Changing the Lock Node batteries

To change the batteries of a Lock Node, remove the node from its place of installation and remove the cover on the back by removing the two Philips-head screws.

The position of each battery is clearly marked in the battery compartment. You should only use batteries approved by SimonsVoss.

Please watch the LED while inserting the new battery. It should flash (2 times) briefly immediately after you have placed the first new battery into the empty battery compartment. The node is then ready for operation (power-up reset). If the LED does not light up, please take out the battery, short-circuit the battery contacts in the Lock Node, then replace the battery.

11.0 Installing WaveNet Lock Nodes

The WaveNet Lock Node should be installed at the same height from the floor as the RF Lock. Ideally it is installed in a standard electrical box with a flush cover.

The distance from the RF Lock must be kept as small as possible, although there should be at least 1.5 inches (3 cm) between the Lock Node and a metal door frame.

The maximum distance between the WaveNet Lock Node and the RF Lock is approximately 14 inches (35 cm).

The optimum radio signal range of Router Nodes and Lock Nodes is generally achieved by fitting the Router Nodes so that their antennas point vertically upwards or downwards, and the Lock Nodes are fitted such that the lettering is horizontal, enabling you to read it normally.

12.0 Technical specifications

12.1 WaveNet power supply

Order number	WN.POWER
Description	Externally regulated 120V AV / 6V DC plug-in power supply for WaveNet Central Nodes, WaveNet Repeaters & WaveNet Routers.

12.2 WaveNet Central Node RS232 connection cable

Order number	WN.CN.RS232.CABLE
Description	RS232 connection cable between computer and WaveNet Central Node
Length	6 ft (2 m)

12.3 WaveNet Central Node with integrated RS485 port

Order number	WN.CN.RS232.RS485
Description	WaveNet Central Node for connecting to a computer/server. Central Node with integrated RS485 port for backbone.
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm)
Voltage supply (for all Routers)	6 V ... 12 V DC
Power (for all Routers)	Min. 3 VA (250 mA at permanent load*) * - current peak if both ends are terminated on the backbone

12.4 WaveNet Central Node with 915 MHz radio module

Order number	WN.CN.RS232.RF915
Description	WaveNet Central Node with 915 MHz radio interface and external antenna
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm) or 3.9 x 2.6 x 5.1 inches (100 x 65 x 130 mm) with antenna
Voltage supply	6 V ... 12 V DC
Power	Min. 3 VA (250 mA at permanent load)

For all routers with radio modules:	
Maximum transmission output	5 dBm (3.16 mW) to antenna socket
Sensitivity	-90 dBm at 19.2 kBaud
Frequency	915 MHz
Current consumption in receive mode	12 mA at 3.3 V

12.5 WaveNet Router Node as RS 485 Repeater

Order number	WN.RN.RS485.RS485
Description	WaveNet Router Node as RS485 Repeater with two RS485 ports, including connection terminal for external plug-in power supply
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm)

12.6 WaveNet Router Node as 915 MHz Repeater

Order number	WN.RN.RF915.RF915
Description	WaveNet Router Node as Repeater with 868 MHz radio module. Includes connection terminals for external plug-in power supply and external send and receive antenna.
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm) or 3.9 x 2.6 x 5.1 inches (100 x 65 x 130 mm) with antenna

12.7 WaveNet Router Node with RS 485 / 915 MHz Converter

Order number	WN.RN.RS485.RF915
Description	WaveNet Router Node as a converter between the RS-485 “backbone” and a 915 MHz wireless segment to support lock nodes or other wireless components including connection terminals for an external plug-in power supply and an external send and receive antenna
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm) or 3.9 x 2.6 x 5.1 inches (100 x 65 x 130 mm) with antenna

12.8 WaveNet Router Node with 915 MHz / RS-485 Converter

Order number	WN.RN.RF915.RS485
Description	WaveNet Router Node as a converter between 915 MHz and the RS485 port for using the Router Node as a backbone, including connection terminals for an external plug-in power supply and an external send and receive antenna
Dimensions (L*W*H)	3.9 x 2.6 x 1.6 inches (100 x 65 x 40 mm) or 3.9 x 2.6 x 5.1 inches (100 x 65 x 130 mm) with antenna

12.9 WaveNet Lock Node

Order number	WN.LN.RF915
Description	Battery-powered WaveNet Lock Node (node for networking computer with digital components) with 3 inputs and 1 output
Dimensions (H x ∅)	1.46 inches x 2.1 inches (37 mm x 53 mm)
Voltage supply	Two CR2/3AA batteries, lithium 3.6 V
Current consumption	Radio transmission: 25 mA; Radio reception: 15 mA;

	Power consumption with no data traffic: approx. 40 µA Note: dependent on data traffic and HF interference density
Maximum transmission power	approx. 1 mW
Sensitivity	-95 dBm
Frequency	915 MHz
Input (3x)	Floating (current pulse approx. 35 µA for 1ms every 0.5 sec)
Output (Open Drain)	Maximum switching voltage: 25 V DC Maximum switch-on current: 2 A Continuous current: 650 mA Internal resistance (AN): 0.5 Ω
Battery lifespan	approx. 3 years

Order number	WN.LN.RF915.NOIO
Description	WaveNet Lock Node with integrated battery, without inputs and output (node for PC networking of the digital components
Dimensions (H x ∅)	1.46 inches x 2.1 inches (37 mm x 53 mm)
Voltage supply	2 Batteries CR2/3AA, Lithium 3,6 V
Current consumption	Radio transmission: 25 mA; Radio reception: 15 mA; Power consumption with no data traffic: approx. 40 µA Note: dependent on data traffic and HF interference density
Maximum transmission power	ca. 1 mW
Sensitivity	-95 dBm
Frequency	915 MHz
Battery lifespan	approx. 3 years