Connectivity requirements for SIGFOX base station

Author (System Architect)	Approval (Service Delivery Manager)
Antoine Bourdeil	Florian Baudou

Table of contents

ACRONYMS AND REFERENCES

ACRONYMS

Acronym	Definition
DNS	Domain Name System
ICMP	Internet Control Message
IMSI	International Mobile Subscriber Identity
LAN	Local Area Network
MCC	Mobile Country Code
MNC	Mobile Network Code
MSS	Maximum Size Unit
MTU	Maximum Transmission Unit
RTT	Round Trip Time
SIM	Subscriber Identity Module
TCP	Transmission Control Protocol
UDP	User Data Protocol

1. GENERAL INFORMATION

1.1 Purpose of document

SIGFOX base station needs to be connected to SIGFOX cloud to ensure SIGFOX service to the clients. The connection can be provided by DSL modem, satellite modem, any kind of backhaul connection, private LAN, or cellular connectivity. Host network must match base station's connectivity requirements in order to guarantee the system nominal operation.
In order to ensure robustness of SIGFOX base station connection to SIGFOX cloud, a primary and a secondary (back-up) means of connection are required.

1.2 Revision History

Rev	Author	Date	Comments
1	Antoine Bourdeil	2019/04/15	New document created based on previous document called "Primary Connectivity Requirements for SIGFOX base station" V3.1. This new document: • Extend performance requirements applicability (section 3) to secondary (back-up) connection • Authorizes use of cellular (3G/4G) connectivity • Gathers information initially contained in "Cellular operator configuration for Sigfox equipment" document into section 4 "Configuration requirements" • Clarify Ethernet cable requirements • Update Traffic volume requirements • Add NTP as required protocol
1.1	Antoine Bourdeil	2023/07/31	Removal of OpenVPN IP address from Table 2.

2. REDUNDANT CONNECTION PRINCIPLE REQUIREMENTS:

In order to ensure connection between the SIGFOX base station and the cloud, in case of primary connection issue, a redundant means is required.
This secondary means shall be independent: it shall not have a common point of failure with the primary mean.

From practical standpoint, it means that two different types of connections are recommended for primary and secondary connections. For example, if primary connection uses a DSL modem, secondary connection should rely on satellite or cellular (3G/4G) connections.
If same type of connection is used for both primary and secondary links, it shall be ensured that network operators of the connection are independents.
Warning: when using SIM card in roaming conditions, it can occur that even if the SIM owners are different, the same cellular network operator will be used. Specific attention to this issue should be paid when having primary connectivity built on cellular network and use at the same time a foreign operator on one or both connectivity. In such case, you should either avoid using foreign SIM cards or ensure that the SIM card owner allows to choose and fix the network operator on each SIM card.

In case of cellular connection as primary means of connectivity, a 3G/4G router enabling the TCP/IP protocol shall be used and plugged on ethernet port of the base station. Use of 3G/4G dongle is not allowed for primary connection.

3. PERFORMANCE REQUIREMENTS

Primary and secondary (back-up) connectivity provides SIGFOX base station access to the public Internet and shall meet the
following service level requirements:

	DOWNLINK	UPLINK
Minimum Throughput	128 kbps	128 kbps
Maximum latency	2,5 s	

Table 1- Connectivity performance requirements

Note: This uplink requirement must be considered as minimal throughput for correct base station operation. However, above 300K messages processed per day, the required uplink throughput will be raised.

Latency is defined as the round trip time (RTT) measured using ICMP services (ping) from base station to SIGFOX cloud.
Connection between SIGFOX base station and SIGFOX cloud can be lost in cased of latency higher than value specified in Table 1.

4. CONFIGURATION REQUIREMENTS

In case of private LAN or direct Backhaul connection, the host network shall receive proper configuration in
order to allow the IP communication between SIGFOX base station and SIGFOX Cloud.

Ethernet connectivity on an RJ45 port:

Following cable characteristics are required to ensure normal operation of the base station:

- At least Cat5
- Shielding SF/UTP (recommended) or F/FTP or SFTP.
- Straight-through cable (recommended)
- Operating Temperature -20°C to +55°C

DHCP addressing, with leases containing the following options:

- default route
- valid DNS resolver

IP connectivity:

- Outbound ports configuration defined in Table 2
- MTU=1500 on the local link. If WAN MTU is different from 1500, router shall apply TCP-MSS clamping.

The following table lists communication ports (incoming and outcoming) that shall be open on the host network enterprise firewall:

Origin IP	Origin IP	Origin port	Destination IP	Destination IP	Dest. Port incoming & outcoming	Connection protocol	Purpose	Action
<SIGFOX BS IP>	<sigfox>	<random>	IP provided by DHCP lease	DNS pool	53	UDP	DNS	Permit
<SIGFOX BS IP>	<sigfox>	<random>	0.0.0.0	Everyone	123	UDP	Time synchronization	Permit
<SIGFOX BS IP>	<sigfox>	<random>	185.110.96.0/22	SIGFOX Cloud pool	443	TCP	Initialization communication with SIGFOX Cloud	Permit
<SIGFOX BS IP>	<sigfox>	<random>	185.110.96.0/22	SIGFOX Cloud pool	500	UDP	Separate VPN	Permit
<SIGFOX BS IP>	<sigfox>	<random>	185.110.96.0/22	SIGFOX Cloud pool	4500	UDP	Separate VPN	Permit
~~<SIGFOX BS IP>~~	~~<sigfox>~~	~~<random>~~	~~185.110.96.0/22~~	~~SIGFOX Cloud pool~~	~~1194~~	~~UDP~~	~~Separate VPN~~	Obsolete
<SIGFOX BS IP>	<sigfox>	*	0.0.0.0	Everyone	*	*		Deny
0.0.0.0	Everyone	*	<SIGFOX BS IP>	Xxxx SIGFOX	*	*		Deny

Table 2- Primary connectivity configuration requirements

In case of connectivity based on 3G/4G (secondary means of connectivity), the SIGFOX base station needs to be configured to ensure communication between the base station and SIGFOX cloud. To this end, SIGFOX base station operating system must receive a firmware configuration.

This configuration consists in providing a description of operator and SIM related parameters as per SO provider plan, for the base station to be granted service by the operator. The form that has to be filled is available in ANNEX – 3G/4G configuration form.

The form has to be filled by the SO at least 7 weeks before delivery of the base station, to ensure availability of the updated firmware. Once the form has been completed, Sigfox is assessing the feasibility of the firmware update.

As indicated in section 2, note that primary connection based on cellular network is only possible if 3G/4G router is used and plugged on Internet port of the base station. In this case the 3G/4G form does not need to be filled.

5. TRAFFIC VOLUME REQUIREMENT

Primary and secondary connectivity provider shall not apply traffic volume limitation policies.

As an indication, aggregated traffic volume associated to one SIGFOX base station operation according to number of frames received is shown in the table below:

Frame / Month	200 000	1 000 000	5 000 000
Aggregated Traffic Volume by Month	< 720 MB	< 2,5 GB	<11,5 GB

Note that volume of data is directly dependent to quality of connectivity. For example, on cellular network the amount of data transferred can be significantly above the figures provided above due to potential retransmissions.

ANNEX – 3G/4G CONFIGURATION FORM

Item	Acceptance Criterion	Description to be filled by SO
Operator Name (optional)	-	
Operator MNC (optional)	-	
National MCC (optional)	-	
APN	Same for all	
APN login (if any)	Same for all	
APN password (if any)	Same for all	
SIM PIN activated?	Same for all	
SIM PIN code (if any)	Same for all	
Roaming to be deactivated?	Same for all	

Request date	Action	Date available
	Request form received by SO	
	Request Form complete received by sigfox	
	Feasibility assessment by sigfox	
	Release availability estimate	