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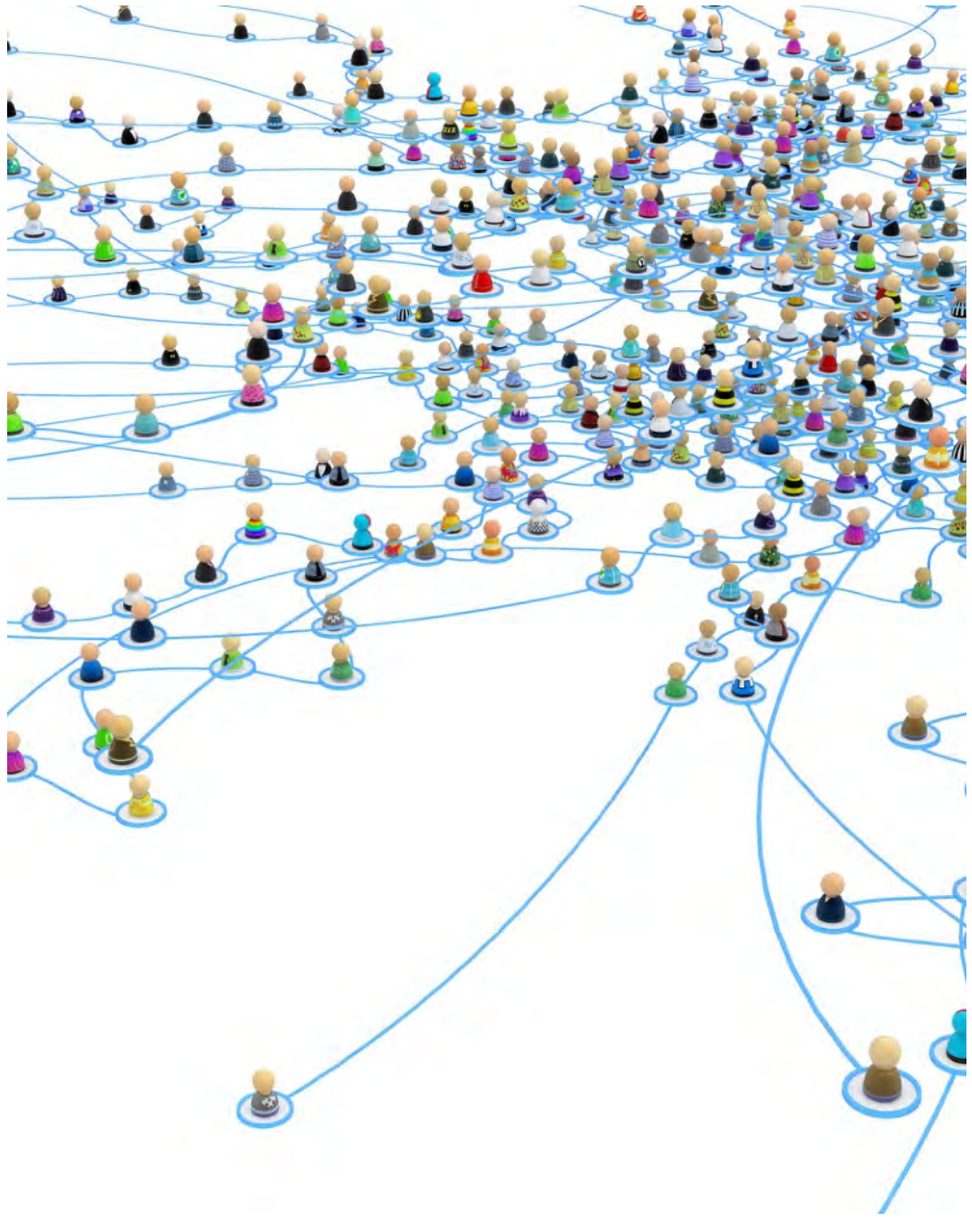
LoRaWAN at High altitude

Refuges on the Mont Blanc

alt 3000m - 4400m



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- Founded in 2006
- Software vendor
- Resource Management -> Smart Meters, Smart Buildings, Smart Energy
- Service Portals for distributed systems : Monitoring, Control, Optimization
- Multi communication protocols: LoRa, ModBus, IP, …

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Goals

- Security
  - Cameras with images for actual weather visualisation
  - Temperature and weather measurement with LoRa devices
  - Presence monitoring (LoRa)
- Smart Energy and Smart building
  - Energy monitoring and optimisation
  - Remote access to building management systems

Challenges

LoRa at the Mont Blanc

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LoRa In the Lab

REQUEA testing and development station for Multitech gateways.

LoRa in the Wild

Refuge du Gouter alt 3835m - view from our cameras

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Technology at high altitude

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- Rule number 1: Everything cannot fail
- Rule number 2: Everything will fail

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Extreme Weather

Refuge du Gouter

alt 3835m

A LoRa Antenna

-30C / 200km winds.

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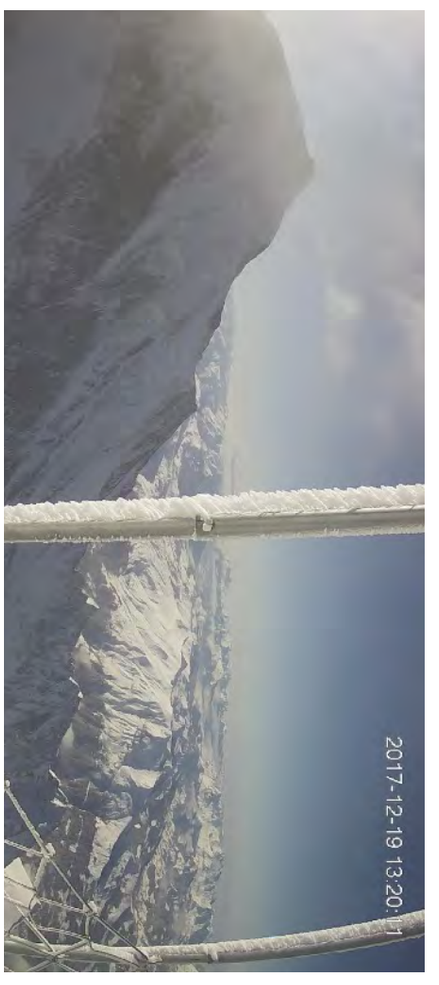
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Accessibility Challenge

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Accessibility challenge

Getting there is complex and expensive

Need for remote monitoring and remote control

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Problematic IP Backbone

IP coverage is problematic:

- Satellite: ping 1200ms

- 3G / 4G: when there is coverage, may not be reliable

(4G antenna covered by ice)

Electrical Power

Off grid electricity not reliable

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LoRa is magic

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Abri Vallot (alt 4362m)

Refuge du Club Alpin Francais
Sur la “voie normale” du Mont Blanc
Abri de secours pour alpinistes en détresse
Non gardé - Posé sur un éperon rocheux
Equipé d’une balise de secours

Objenious
by Bouygues Telecom

Objenious network

Mesures with Adeunis FTD testers

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LoRa network coverage at 4400m

Public LoRa networks

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cnrs
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- “LoRaWAN est l'acronyme de *Long Range Wide-area network* que l'on peut traduire par « réseau étendu à **longue portée** ».

- “La **courbure terrestre** — nommée aussi *dépression* — définit *l'horizon visuel apporté par la rotondité ou sphéricité de la Terre*. Elle limite la vision (théorique) lointaine par exemple sur la mer. Plus **l'altitude du point d'observation**, ou d'émission dans le cas des émetteurs de télévision ou FM, est élevé, **plus la distance de vision est importante**. On parle aussi de **ligne d'horizon visuelle ou hertzienne**.” Wikipedia

Show time

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LoRa is disruptive

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- LoRa solves problems that could not be solved AND with a low cost

- Accessibility : Long range Radio Transmission OR Deep in the building
- Weather: Device stands extreme weather relatively easily
- Electricity: Battery powered - no need for external power
- Network: LoRa gives many possibilities to architecture the network

CIRCUIT
CHARGE BALLON ECS (P4)
POMPE 1
POMPE 2
CIRCUIT
CAPTEURS SOLAIRES (P5)
POMPE 1
POMPE 2
BALLON
ECS
6KW
DM5
DM6
DM7
DM8
D5
AS.I/O
COMX1
192.168.0.32

Temperature monitoring at Vallot (4400m)

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LoRa remains a challenge (especially at high altitude)

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WARNING

May Work != Should Work != Will Work != Must Work

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Do not assume that everything will work !

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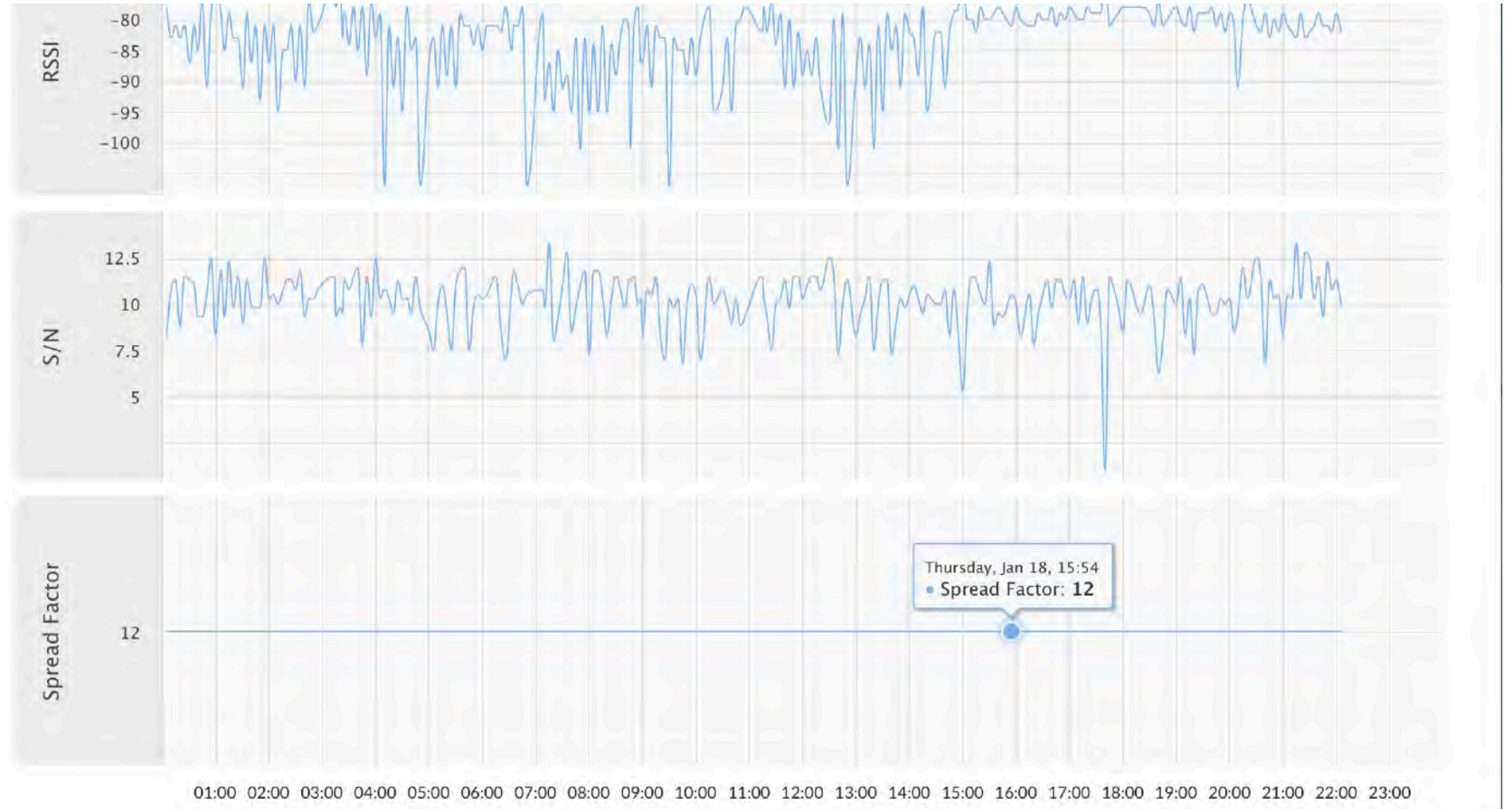
RSSI
-80
-85
-90
-95
-100
S/N
12.5
10
7.5
5
Spread Factor
12
Thursday, Jan 18, 15:54
Spread Factor: 12
01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00

Number of Messages per day
350
300
250
200
150
100
50
0
20/12 22/12 24/12 26/12 28/12 30/12 01/01 03/01 05/01 07/01 09/01 11/01 13/01 15/01 17/01

Questions

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