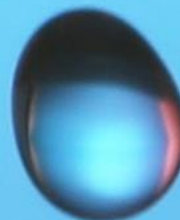




Low-cost, low-power & long-range water quality probe



**sigfox** foundation



**hacking house**  
by **Sigfox**



# Water pollution a global problem

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- Chemical pollutants in **groundwater**
- Africa, Mexico, India and China concerned
- **40% of the population** exposed in Africa
- **+3.4 million deaths** in Africa
- **+12 million people** exposed in Mexico
- Water hazariously monitored

# Kenya's water pollution crisis

7th most exposed country in the world

Population of

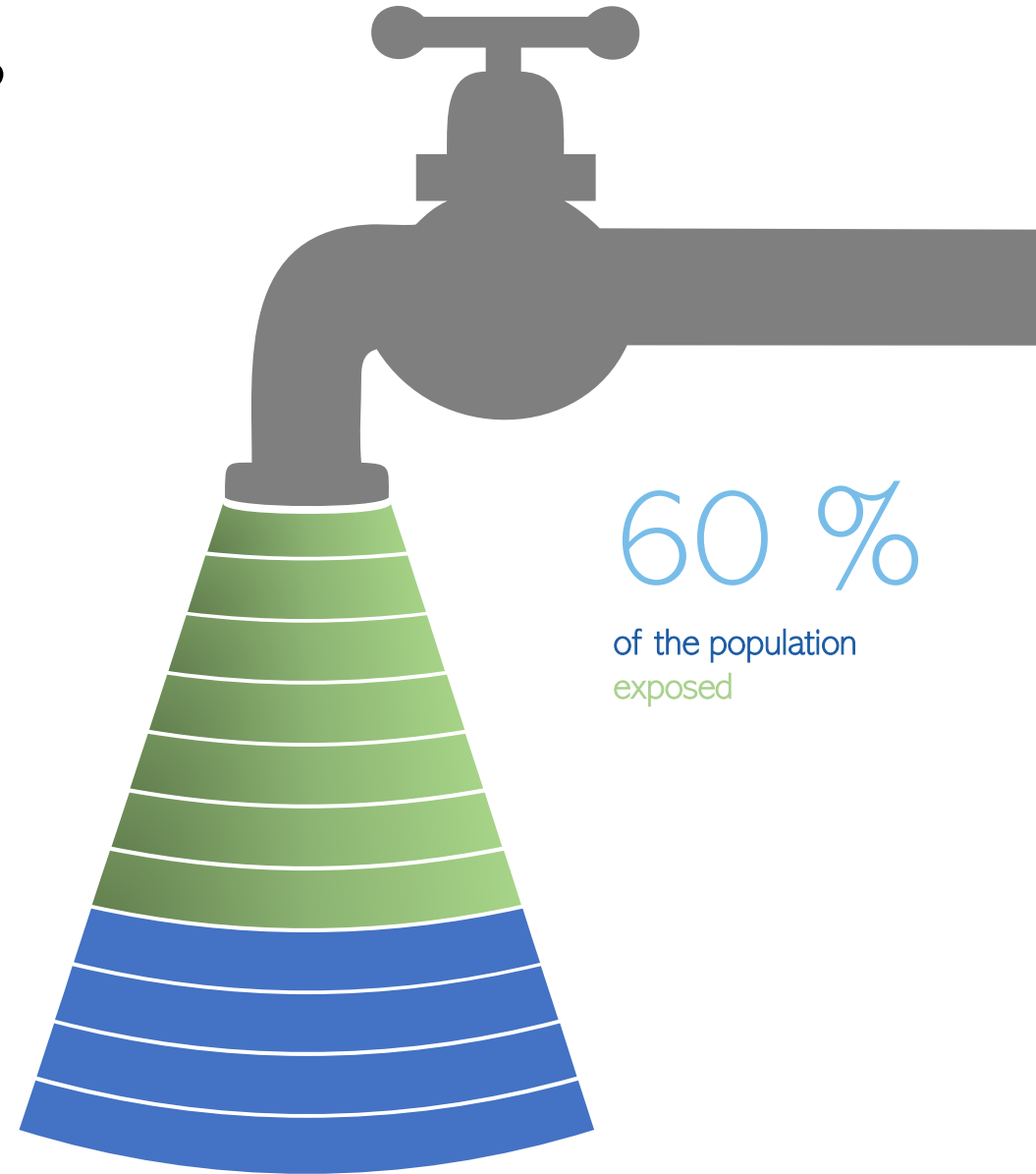
46 million

27 M

people lack access to improved  
sanitation

19 M

people lack access to safe water





# Station & Floater

water monitoring solution for wells and ponds



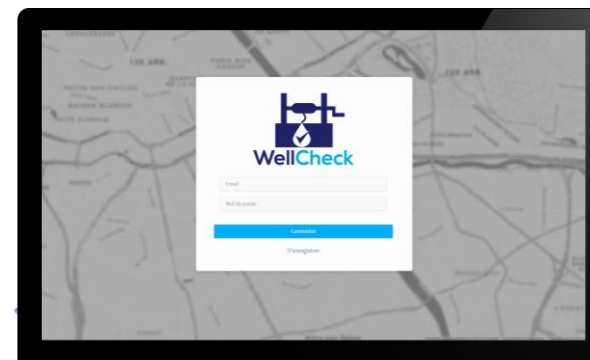
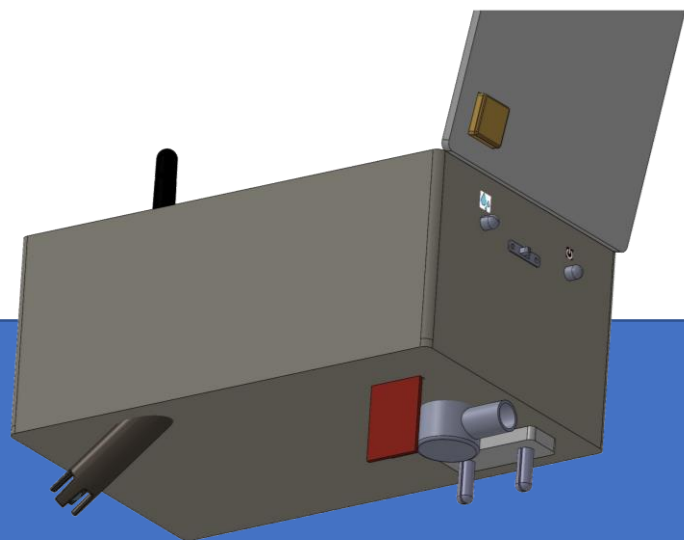
Pollution status  
LED for locals



Sends measures  
every 30 minutes



Informs the  
authorities

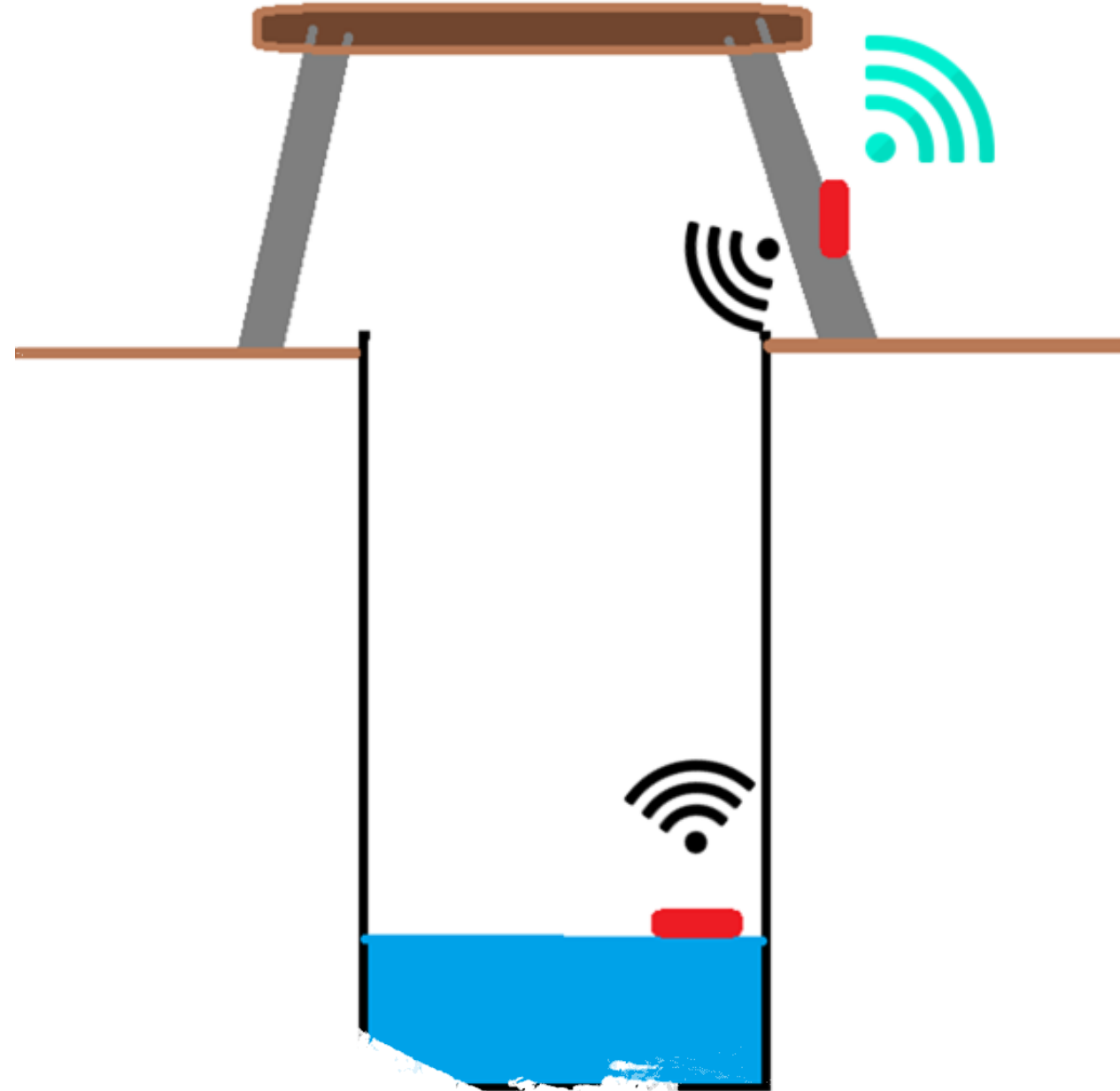


# WellCheck in wells

- 2.4 billion people access water through boreholes
- WellCheck uses an **antenna / floater** pair to communicate the water measures out of the wells
- 433Mhz for long range communication with deep wells



**sigfox**foundation



# Targets & benefits

Governments & NGOs

- ✓ Track companies endangering country's water
- ✓ Locate water pollution to know where to act
- ✓ Reduce care costs by targeting most exposed places
- ✓ Increase the standard of living of the inhabitants
- ✓ Monitor pollution even for wells



**Ministry of Water and Environment**  
REPUBLIC OF UGANDA



Republic of Kenya

**Ministry of Water and Sanitation**



# Customer journey



NGOs or governments easily install the monitoring boxes in water sources



Locals check the boxes LED to see if the water is polluted before drinking it



NGOs or governments can get a near-real time heatmap of the pollution of the country



NGOs or governments can target action campaigns for water purification

# What is water pollution ?

Bacterias

+

MeST + DCO + pH + DBO5



Total suspended matter

Chemical oxygen demand

Hydrogen potential

Biochemical oxygen demand  
for 5 days



# Detecting the risk of bacteria



Bacteria are prone to develop in water over 20°



Legionella is the most common water bacteria in water



Our thermometer allows to prevent the risk

# Monitoring water pollution

MeST + DCO + pH + DBO5

Total suspended matter

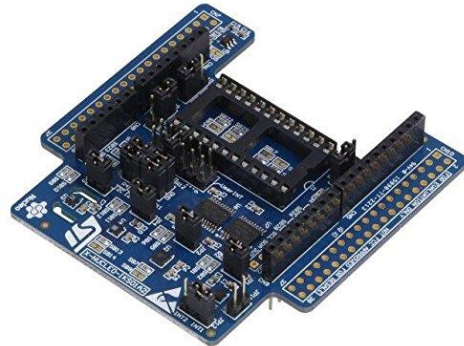
Chemical oxygen demand

Hydrogen potential

Biochemical oxygen demand  
for 5 days



- Water clarity



- Temperature
- Pressure
- Movements

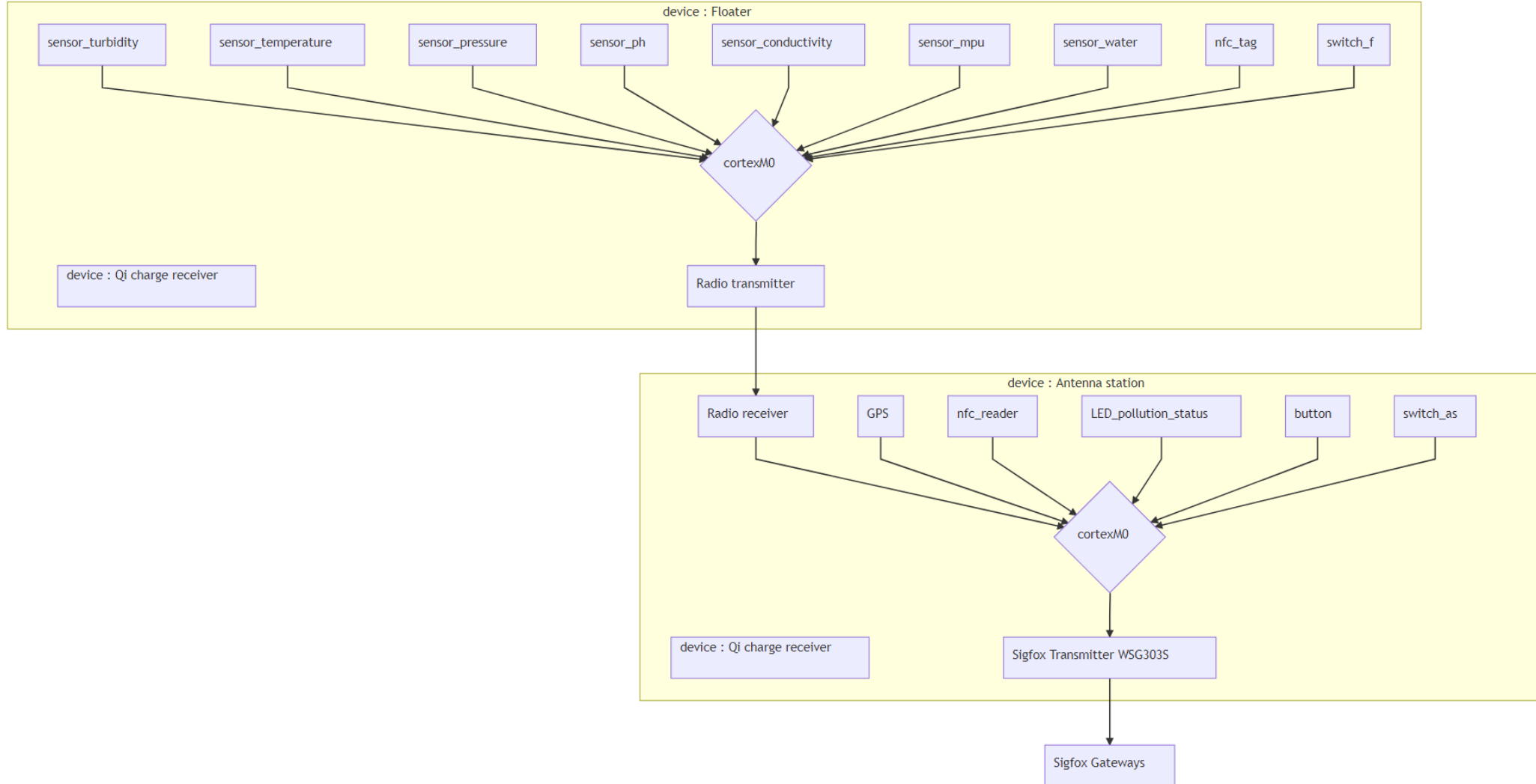


- pH probe



- Conductivity probe

# Hardware topology



# Message encoding

12 bytes per message over the Sigfox network

Downlink flag (int(1)) // 1	(1 bit) max 1
<b>Turbidity</b> (FLOAT(1,2+)); // (999X) * 2 / 10	(11 bit) max 2047
<b>GPS_lat</b> (FLOAT(3,3+)); // 180,000X * 4 / 10	(20 bit) max 1048575
<b>Acceleration</b> (INT(1)); // 7 => 70%	(3 bits) max 7
<b>GPS_long</b> (FLOAT(2,3+)); // 90,000X * 4 / 10	(19 bit) max 524287
<b>GPS_long</b> sign (BOOL) // 1	(1 bit) max 1
<b>GPS_lat</b> sign (BOOL) // 1	(1 bit) max 1
<b>pH</b> (FLOAT(2,1)); // 128	(7 bits) max 127
Inner water flag (int(1)) // 1	(1 bit) max 1
<b>Pression</b> (INT(4)); // 105000 = 87000 + (2000X) * 2 / 10	(13 bits) max 8191
<b>Conductance</b> (FLOAT(1,2+)); // (999X) * 2 / 10	(11 bit) max 1023
<b>Temperature</b> (FLOAT(2)); // 99	(7 bits) max 127
Outer water flag (int(1)) // 1	(1 bit) max 1