



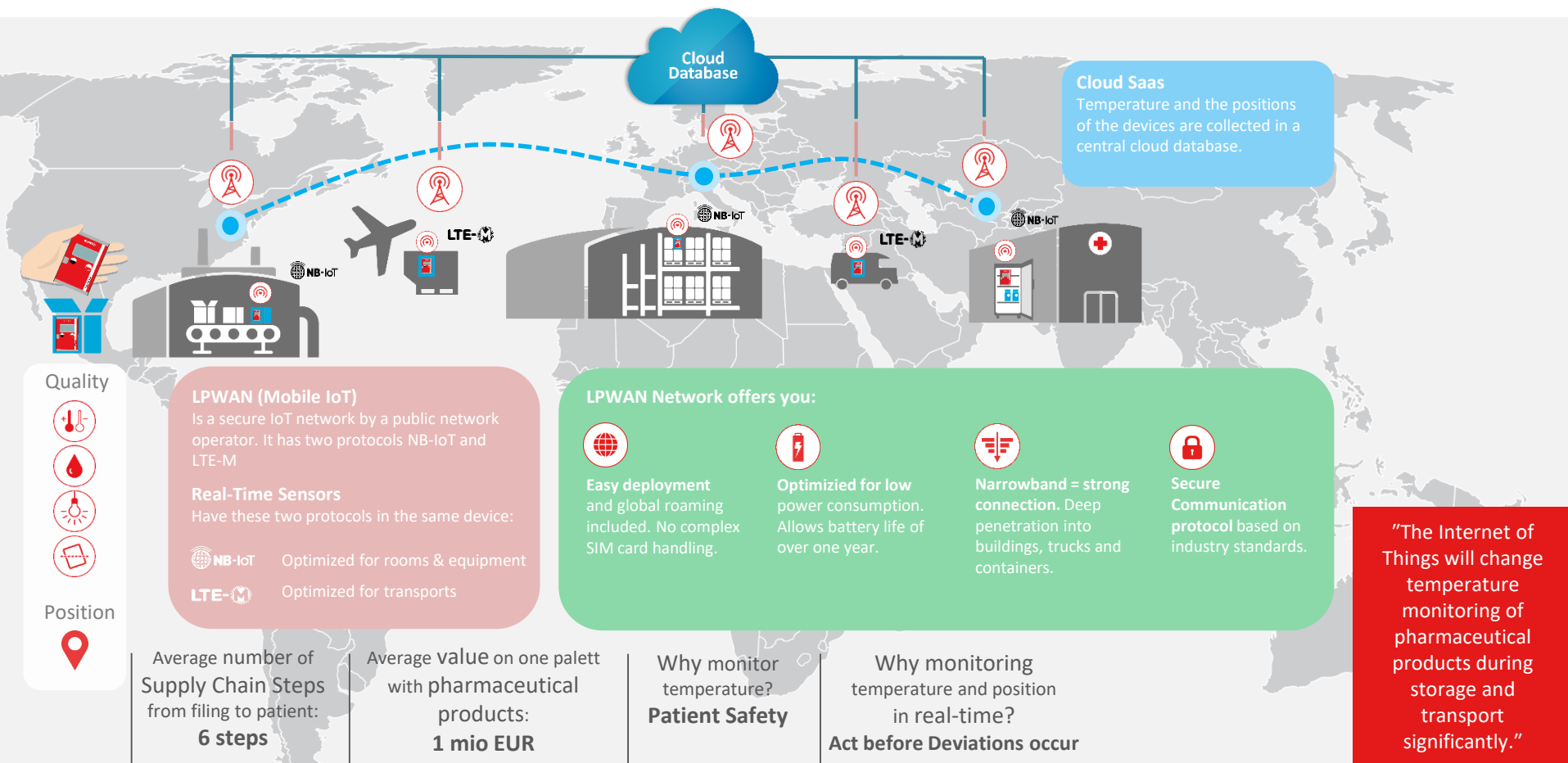
## LIBERO G Mobile IoT: Real-Time Temperature and Position Monitoring

July 2020

**we prove it.**

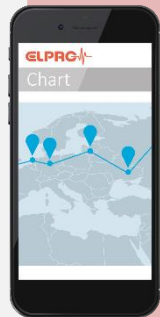
[elpro.com](https://elpro.com)

# The potential of Mobile IoT in the Pharma Supply Chain

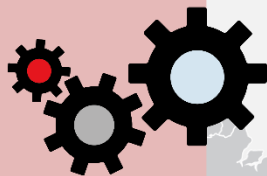


# Benefits of Real-Time Monitoring in the Cold Chain

Real-Time Visibility



Process Automation



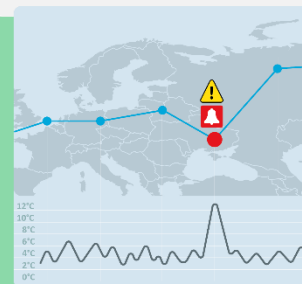
TECHNOLOGY  
ADVANTAGES



Live Monitoring



Proactive Intervention

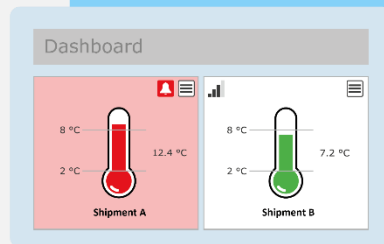


Milestone Analysis

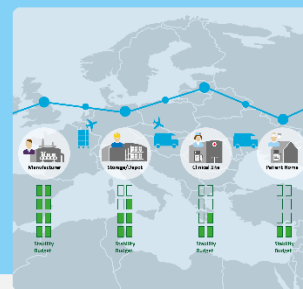
PROCESS ADVANTAGES

SYSTEM ADVANTAGES

Dashboard Overview



End-to-End Monitoring

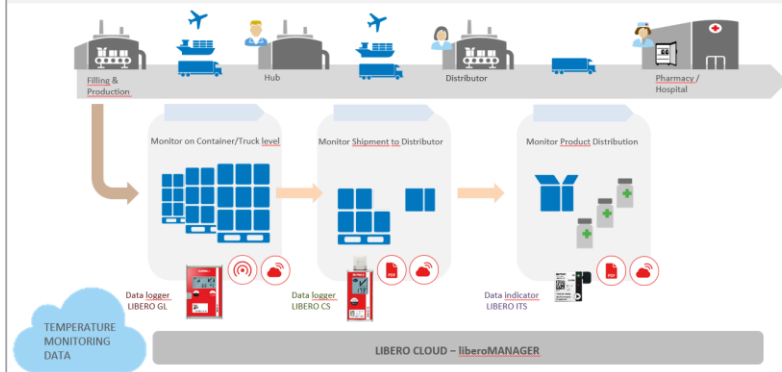


Heat-Maps & Big Data

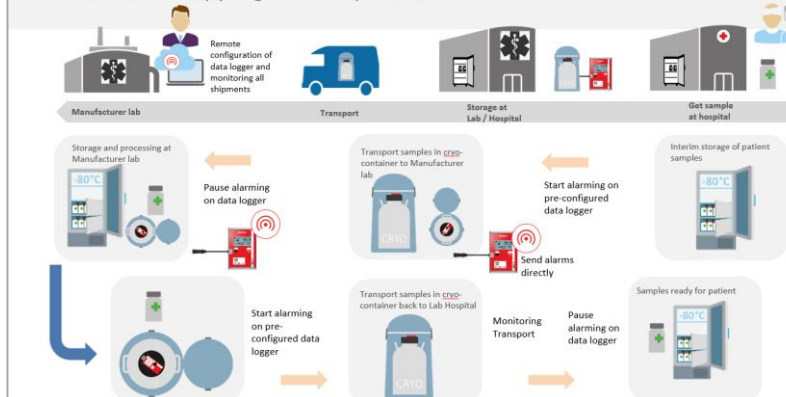


# Use Cases – 4 Examples

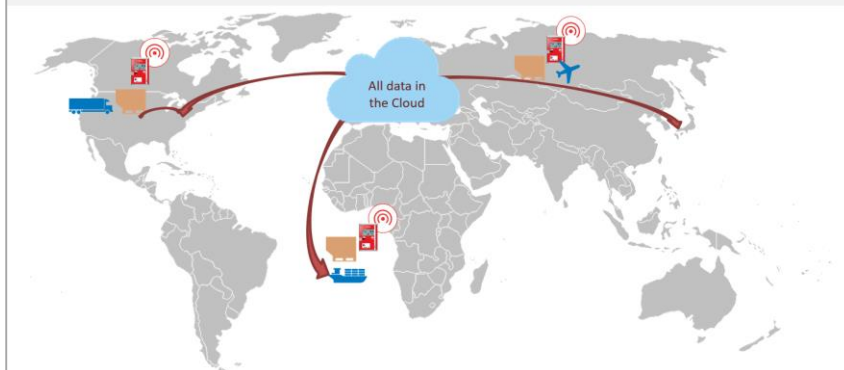
## Global Supply Chain Visibility & Insights



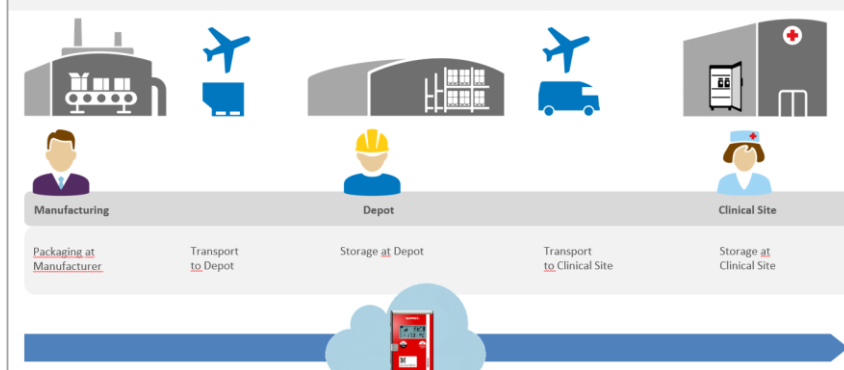
## Cell & Gene Therapy High Risk Shipments



## Asset Tracking & Compliance



## Follow your product...to the Last Mile



# Global Supply Chain Visibility & Insights

Large Pharma companies produce and distribute temperature-sensitive products across complex multi-step supply chains. From bulk API, to site-to-site shipments, and into last miles.

LIBERO family is:

- Versatile – fitting any temperature, size or value shipment. High-value real-time shipments (LIBERO GL); integrated bulk-shipments with multi-product release (LIBERO CB), and low-cost end-to-end on box level (LIBERO ITS)
- 100% compliant - Combine traditional data loggers and real-time monitoring data all in the same cloud database
- Smart – liberoMANAGER provides trend-based alarming, performance dashboards, API and more to support the advanced user in creating a proactive supply chain





# Cell & Gene Therapy High Risk Shipments

High-value, time and temperature critical gene therapies, personalized medicines and biologic products present challenges to the clinical and commercial supply chains.

LIBERO G helps mitigate supply chain risks by offering:

- Peace of mind for you and the patient waiting for the therapy by tracking the location and condition of the product 24/7 to take immediate action if needed
- Control of your cryogenic materials when you use dry ice or cryo containers, with LIBERO GE to monitor temperature, location, light, shock and tilt of your sensitive biologics
- Access to your shipment data anytime, in customs or with transport partner



# Dry Ice Shipments

API, freeze-dried substances and human body samples must be transported in the glass phase at temperatures as low as possible. Suitable for this purpose are dry ice with an average evaporation temperature  $-78^{\circ}\text{C}$  or specialized cryo-containers.

LIBERO G helps with monitoring the transportation equipment:

- Thanks to the outside position of the logger, the display can be easily read, the box doesn't have to be opened to check the inside conditions
- LIBERO GE could be a fixed part of the packaging solution, being returned with the box and re-used as it is a multi-use device with a one year battery lifetime
- Measurement data is transmitted automatically and regularly – not only at the end of the shipment
- Warnings and alarm notification will automatically be sent, based on temperature, location, shock, tilt, light
- Real-time data on transports offers the possibility to intervene, especially for high-value products
- Combination of temperature and location recording offers the possibility to evaluate and manage transport risks



# Asset Tracking & Compliance

Logistics Service Providers have a responsibility to prove chain of custody to their customers, while managing their fleet of assets.

LIBERO G makes it easy to provide customer assurance by offering:

- Low energy Mobile IoT technology allowing for more than 1 year battery life
- 24/7 real-time visibility and alarms on temperature, humidity, light and position
- Uninterrupted monitoring using a GAMP 5 validated monitoring solution for high-value pharma
- Automated processes to support your asset management





# Follow your product...to the Last Mile

Some products are critical to monitor into the last miles, certainly to the patient and sometimes the consumer. Clinical trial products, medical devices and high-value consumer goods often require end-to-end monitoring.

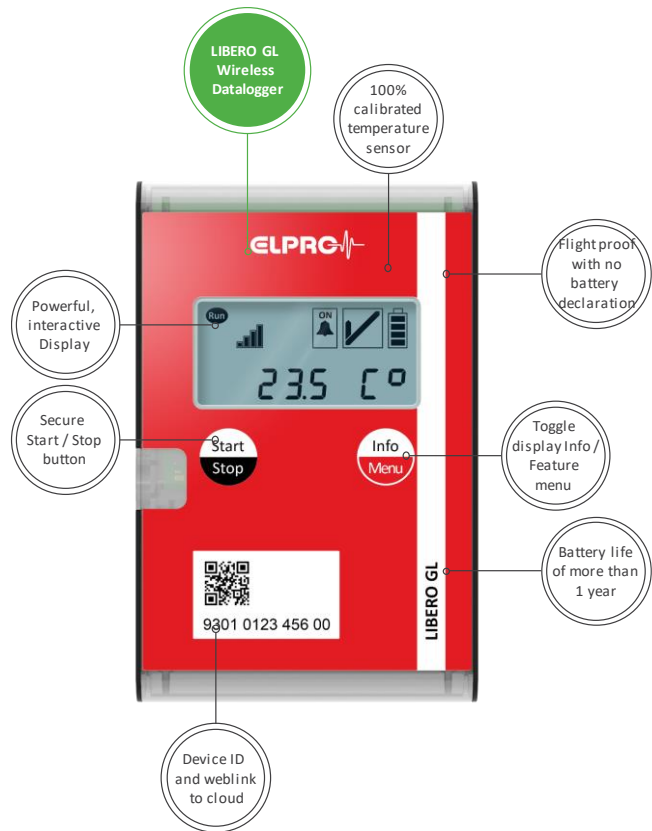
LIBERO family of products offers:

- Monitoring that stays with the product from product packaging or filling; to the patient or into a storage unit
- Long battery life of 1 year for real-time monitoring; or up to 4 years for long-term indicator (LIBERO ITS)
- Proactive stability budget management by using multi-level alarming



# LIBERO G Data Logger: Highlights

- Fully compliant with industry guidelines and 100% calibrated
- Battery life of minimum 1 year (110 days for single-use)
- Wireless communication in real-time, using public infrastructure
- Cloud based, simple and safe in use and application
- Compatibility with existing ELPRO Software und Hardware



# Wired LIBERO Gx specifications



COMING  
SOON Q4/20



LIBERO GS	LIBERO GF	LIBERO GL	LIBERO GE	LIBERO GH
Wireless realtime data logger with 1 internal temperature sensor, cellular data transmission	Wireless realtime data logger with 1 internal temperature sensor, cellular data transmission	Wireless realtime data logger with 1 internal temperature sensor, cellular data transmission	Wireless realtime data logger with 1 internal/external temperature sensor, cellular data transmission	Wireless realtime data logger with 1 internal temperature/humidity sensor, cellular data transmission
<b>LTE-M / NB-IoT</b>	<b>LTE-M / NB-IoT</b>	<b>LTE-M / NB-IoT</b>	<b>LTE-M / NB-IoT</b>	<b>LTE-M / NB-IoT</b>
Data logger has a display and internal memory so that all data is available.	Datalogger has a display and internal memory so that all data is available.	Data logger has a display and internal memory so that all data is available.	Data logger has a display and internal memory so that all data is available.	Data logger has a display and internal memory so that all data is available.
Alkaline Battery (one-time). <b>IATA compliant</b>	Lithium Battery (one-time). UN3091	Alkaline Battery (one-time). <b>IATA compliant</b>	Alkaline Battery (one-time). <b>IATA compliant</b>	Alkaline Battery (one-time). <b>IATA compliant</b>
Runtime: 110 days	Runtime: up to 14 months	Runtime: up to 14 months	Runtime: up to 14 months	Runtime: up to 14 months
Internal buffer memory: 16'000 measured values	Internal buffer memory: 16'000 measured values	Internal buffer memory: 16'000 measured values	Internal buffer memory: 16'000 measured values	Internal buffer memory: 16'000 measured values
Single-use Shipping 2-8 °C, 15-25 °C	Multi-use Shipping -20 °C	Multi-use Shipping 2-8 °C, 15-25 °C	Multi-use Container, Dry-ice, Cryo	Single-use Shipping 2-8 °C, 15-25 °C
Size (LxWxH): 100 x 65 x 19 mm	Size (LxWxH): 100 x 65 x 19 mm	Size (LxWxH): 100 x 65 x 19 mm	Size (LxWxH): 100 x 65 x 19 mm	Size (LxWxH): 100 x 65 x 19 mm

# LIBERO Gx Software Options

## EasyStart



## ELPRO Cloud



## LIBERO Cloud



	The easy-to-use out of the box solution – order your LIBERO and take off.	The compliant and secure live monitoring solution for your rooms, equipment and shipments.	Take your supply chain process to the next level – with the flexible, customizable database solution.
Hardware compatibility	LIBERO Gx	LIBERO Gx ECOLGO-PRO xG ECOLOG-PRO RBR & Sensors	LIBERO Gx LIBERO Cx LIBERO ITS
Compliance	GAMP 5 validated	GAMP 5 validated 21 CFR Part 11	GAMP 5 validated 21 CFR Part 11
Visualization / Alarming	Live	Live	Live / Retrospective
Stability Budget Management	(✓)	✓	✓
Account and User Management		✓	✓
Secure Cloud Archive (SaaS)		✓	✓
Integration		REST API	REST API
Multi Workflow			✓
End-to-End Monitoring			✓
Auto Assessment			✓



# Characteristics of Mobile IoT



## Easy deployment and global roaming

- Integrates into cellular system (global technology standard by 3GPP)
- reusing existing cellular infrastructure (2G / 3G)
- Low data rates allows for >10k devices / cell



## Industry standard based, **secure** communication protocol

- Mobile IoT networks use dedicated spectrum bands
- Operating in licensed, secure mobile network (LTE)
- Redundant VPN tunnel
- Roaming via protected GRX network (independent from "internet")

## Mobile IoT



## Optimized for **low power** consumption

- low data rates compared to 3G/4G/5G
- No constant network connection (PSM / eDRX)
- For mobile (LTE-M) and stationary (NB-IoT) applications



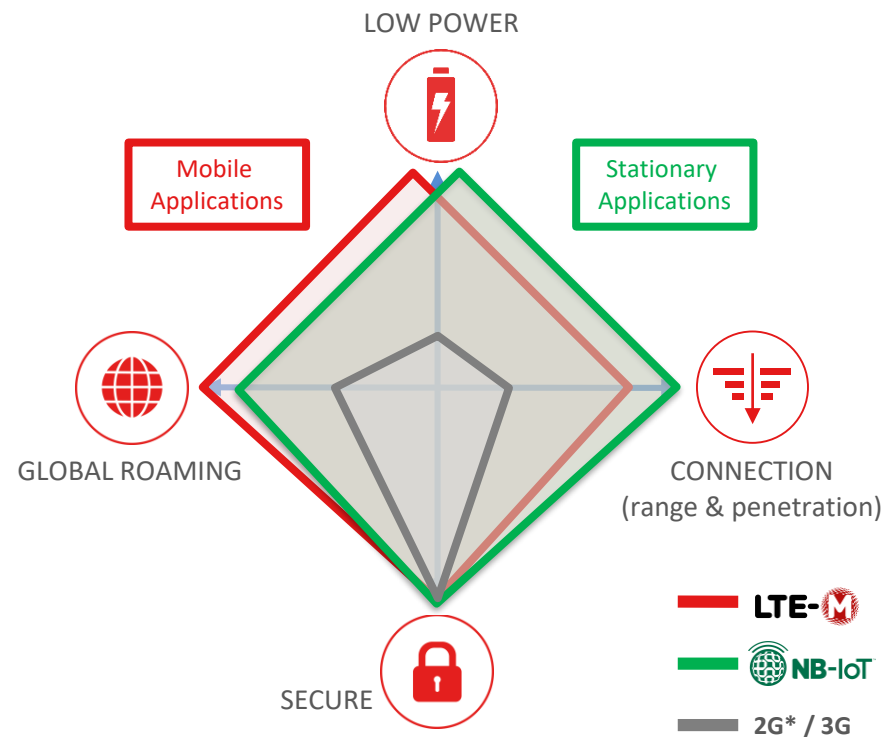
## Deep penetration and **long range** coverage

- Good coverage both indoors and outdoors
- Cellular positioning without GPS

3GPP    3rd Generation Partnership Project (Standards Organization)  
PSM    Power Saving Mode  
eDRX    Extended Discontinuous Reception

GPS    Global Positioning System  
GRX    GPRS Roaming exchange

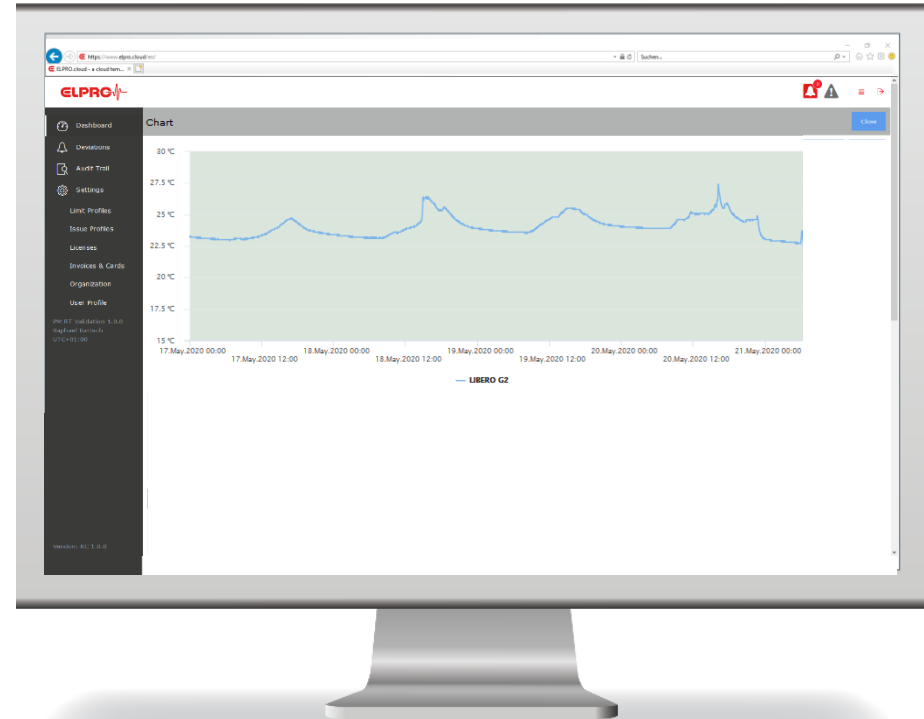
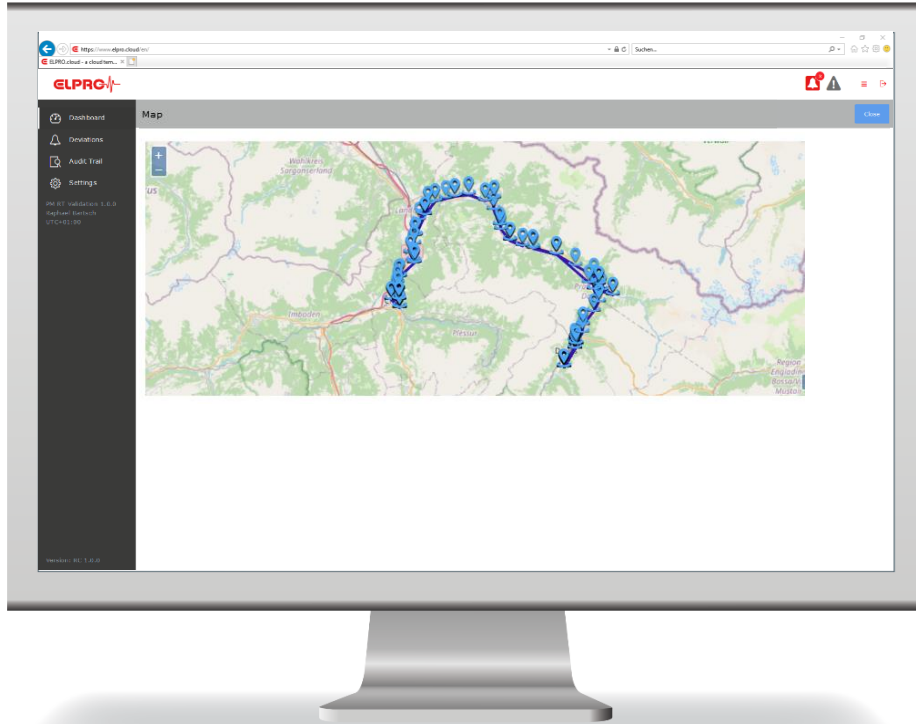
# Mobile IoT outperforming 2G/3G



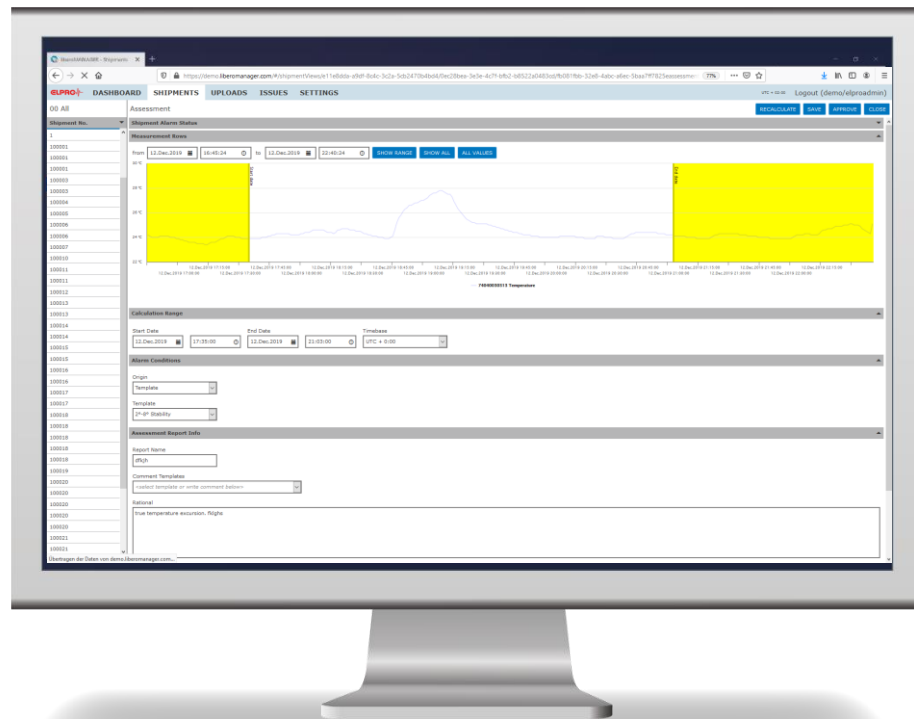
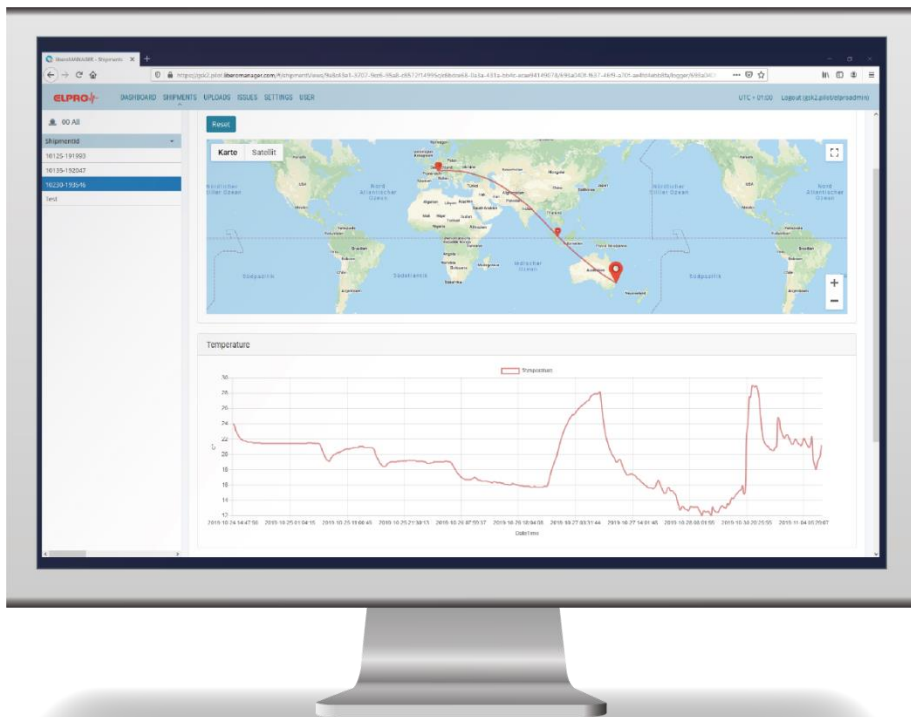
- Compared to 2G\*/3G, LTE-M/NB-IoT have a much stronger performance in all key performance indicators
- **Mobile IoT** (LTE-M/NB-IoT) is for transmitting low amounts of data volumes (machine-to-machine) on long ranges with low power consumption.
- **LTE-M** facilitates an energy-efficient handshake between antennas for mobile applications  
=> LIBERO G will normally operate under the LTE-M
- **NB-IoT** is the "sister" of LTE-M. Its focus is on deep penetration (in buildings, through walls) of fixed application typically communicating with the same antenna.  
=> ECOLOG-PRO G will normally operate under NB-IoT
- LIBERO G and ECOLOG-PRO G talk both "languages" (protocols) LTE-M and NB-IoT and are able to switch

\*2G will be shut down in many countries by 2020

# ELPRO Cloud – a live monitoring solution for your rooms, equipment and shipments



# LIBERO Cloud – get to the next level with the flexible, customizable database solution





# 100% data integrity (completeness) & insusceptibility to manipulation is given

## B) Mobile IoT Network

- Licensed, secure mobile network (LTE)
- Dedicated spectrum bands
- Secure APN with dedicated IP's for ELPRO devices
- Redundant VPN tunnel (IPsec & IKE)

## D) REST API

- Secure REST API
- Authentication with tokens
- Tokens have time limited validity



## A) LIBERO G

- GAMP 5 validated device
- Not exchangeable soldered SIM
- Firmware is checksum protected
- Roaming via protected GRX network (independent from «internet»)

## C) ELPRO Cloud

- FDA 21 CFR Part 11 compliant and GAMP 5 validated Cloud
- Hosted in highly secure, redundant, EU based data center (Germany)
- Manipulation is impossible by architecture
- Denial of service (DoS) protected

## E) LIBERO Cloud

- FDA 21 CFR Part 11 compliant and GAMP 5 validated Cloud (SaaS)
- Hosted in highly secure, redundant, Swiss based data center (ISO 27001 certified)
- Any manipulation is detected
- Denial of service (DoS) protected

GRX: GPRS Roaming exchange  
IKE: Internet Key Exchange  
IPsec: Internet Protocol Security  
APN: Access Point Network