

Track-by-Phone*



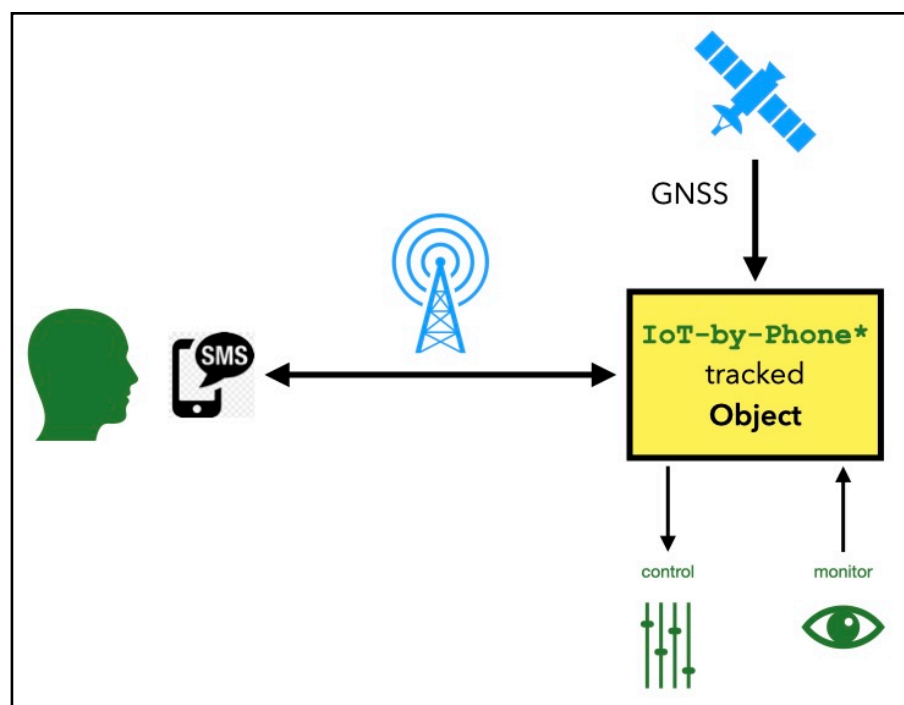
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Track-by-Phone* is a **customizable mockup** for a typical “Internet of Things” (IoT) application scenario: the **localization and/or tracking of a remote object**. Target objects are not fixed at a specific position (like a house, for example). Instead, an observed **object is (re-)movable** - either by purpose (e.g. a car) or unintentionally, e.g. because it has been stolen. For this purpose, the underlying **IoT-by-Phone*** approach takes advantage of the global reach and unmatched regional coverage of **cellular networks** like LTE, for example.

In combination with the **GNSS satellite positioning system** and **inexpensive off-the-shelf hard-**

and software ingredients, new ideas for IoT use cases are fueling the overall **IoT success story**. For smart object tracking solutions, typical target **use cases** can be found in the industrial sector

(e.g. for management of material flow or tracking of shipment containers or rental goods). But also consumers are interested to determine the actual geo position of their belongings (e.g. a



bicycle or a travel bag) - at least occasionally. Or farmers who are looking for lost sheep...

In order to avoid **extra cost and efforts related to IP-based connectivity**, the **IoT-by-Phone*** approach is counting on **IoT data transmission via SMS** to perform typical remote monitoring and device control IoT tasks. The beauty of the **IoT-by-Phone*** approach is that approx. 8 billion active 3GPP mobile phones (source: GSMA) are prepared to work as **IoT-by-Phone*** user devices right away. No extra efforts required. In fact, for many IoT use cases, our SMS-based **Track-by-Phone*** is a simple straight-forward and low-cost tracking solution with global reach.

The **IoT-by-Phone* concept** consolidates a couple of design ideas **how to build a custom IoT device** - in a most efficient way.

Track-by-Phone* is a tailored **IoT-by-Phone* sample design**, supporting a seamless

jumpstart into the world of GNSS-based object tracking.

Track-by-Phone* is offered as a ready-to-use package containing all required hard- and software incl. a **powerful cellular network interface module with integrated GNSS receiver**, two antennas and a power supply. It even contains a SIM card and associated subscription plan (for temporary use).

On top of that, a **sample application program** is included



allowing users to perform a real-world verification of major functions like GNSS-based remote object monitoring incl. SMS-based device remote control. This built-in demo allows a user to trigger his/her sample **Track-by-Phone*** device by sending an SMS to the device which will retrieve it's actual geo position and return it to the user's SMS address.

The **IoT-by-Phone*** concept is particularly aiming at IoT enthusiasts with similar focus but different objectives:

- **Students or IoT novices** asking for a hands-on tutorial about embedded system design, cellular network connectivity and satellite positioning.
- **Makers**, i.e., the **DIY community** who are interested to build their own equipment to address their private needs and ideas.
- **Industrial professionals** who are looking for assistance or some inspiration how to turn an IoT idea into a commercial IoT object tracking solution. For this purpose, **Track-by-Phone*** works as an **evaluation and design kit incl. a fully functional mockup**. The **Track-by-Phone*** mockup can be used as a starting point for development of a customized GNSS-based tracking device to address application-specific needs.

But, prior to device design, **Track-by-Phone*** can also be used to **evaluate IoT components** (e.g. modem chips) and/or **mobile networks** (e.g. LTE vs. NB-IoT) and service providers (MNO vs. MVNOs). For professionals, it is a particularly remarkable fact that **Track-by-Phone*** is fully **vendor-independent**, i.e. IoT project owners will not have to narrow their short-listing activities for suitable suppliers of key components or services too early. In particular, this applies to the **selection of a network interface module (modem)** which are widely proprietary (electrical, mechanical, software API) with no second source offered. Network interface modules are key components for each IoT device

design, **selecting the most appropriate candidate is a critical task which has substantial impact.** In fact, taking a related design decision is risky because it will be **difficult to reverse** as designers cannot move to another modem chip later on: in this case they would have to revise most of their previous work. In order to mitigate this risk, our **Track-by-Phone*** design kit offers **generic hard- and low-level software support** for all major network interface modules, e.g. from Quectel, Sierra Wireless, SIMcom, Telit or u-blox. With our **Track-by-Phone*** tool, designers can spend some time to take a closer look first, and perform an initial low-level evaluation (module functions, command options, overall performance) of some candidates by means of the **Track-by-Phone*** platform. Afterwards, a sustainable short-listing decision can be taken - **based on own analysis and with an improved level of confidence.**

The **Track-by-Phone*** platform is based on a **RaspberryPi ("RPi") Zero**, a popular out-of-the-box embedded system for hardware-minded people incl. pragmatic professionals who are counting on **reusable building blocks incl. off-the-shelf libraries, low-level OS scripts and Python programming.** Core functions are implemented as reusable **Track-by-Phone* middleware functions** which are handling critical interface aspects incl. cellular network control and GNSS downstream data handling. On top of this, each **Track-by-Phone*** platform comes with a comprehensive **hard- and software documentation** allowing users to **design a tailored mockup** in no time. In combination with **optional custom hardware**, specific **edge computing tasks** can be added. Based on this, a **Track-by-Phone*** mockup can be used for feasibility tests, evaluation purposes, for demonstration or as a starting point for a commercial product design.

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