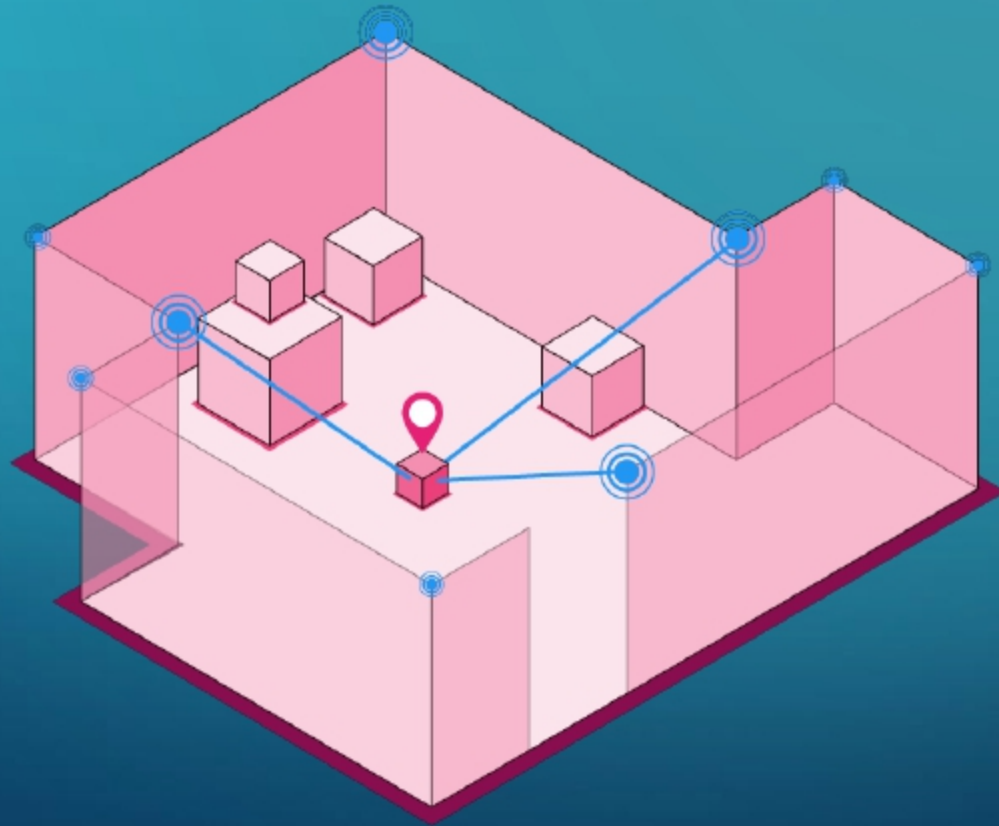


# N.EXTECHS I.NDOOR P.OSITIONING S.YSTEM

NIPS – AN ULTRA WIDE BAND REAL TIME POSITIONING SYSTEM



# WHAT NIPS IS AND HOW IT WORKS



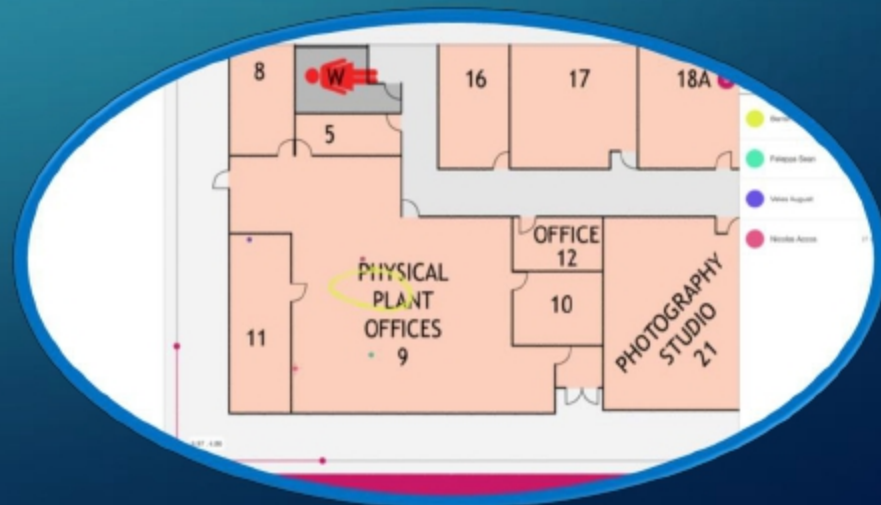
**NIPS principle of operation.** Every tag performs ranging with nodes. As soon as at least three ranging measures are available, then the X,Y,Z coordinates are computed and timestamped. High accuracy is also contributed by multipath effects automatic cancelling made by TAG hardware. Nodes network operates based on a flexible, self adapting and very fast TDMA scheduling protocol. Nodes' clocks are synchronised within a 10 microseconds accuracy.

# WHAT NIPS IS AND HOW IT WORKS



**NIPS as a Web based solution.** Positions and tag generated telemetries are real time relayed to the server. An easy to use as well as complete web interface is available for objects monitoring.

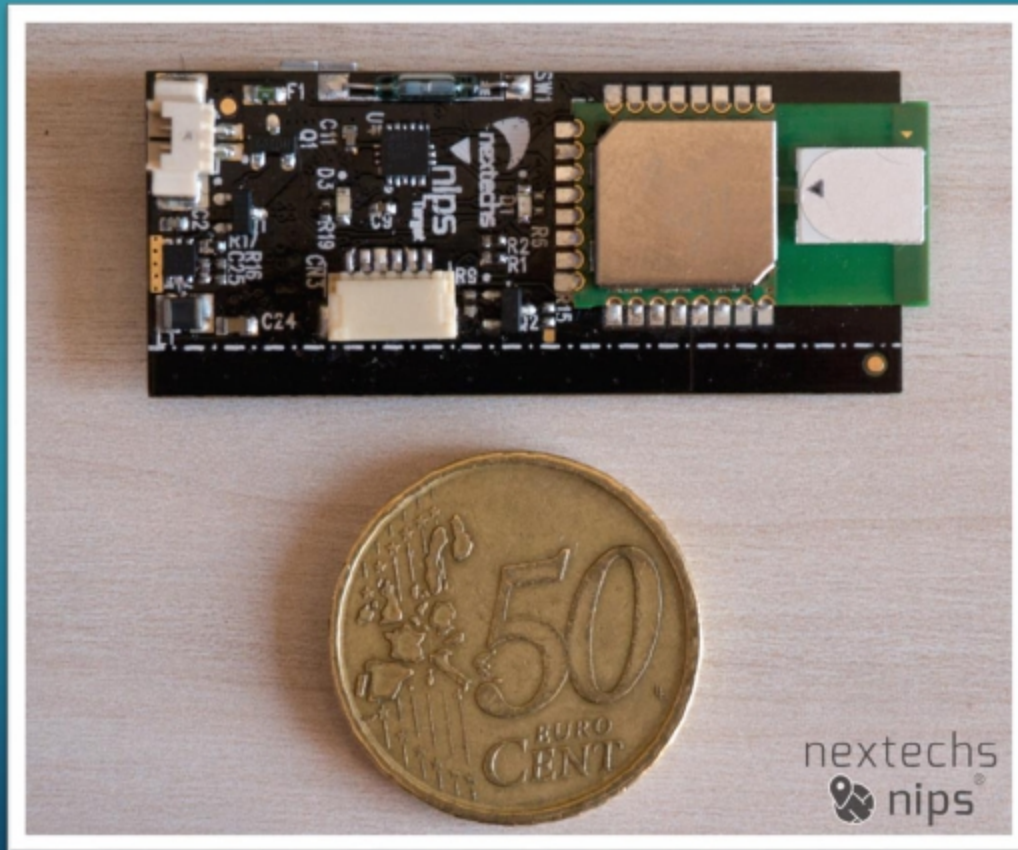
NIPS is also open to third parties software integration through Java, JavaScript and Python libraries.



# WHAT NIPS IS AND HOW IT WORKS



**NIPS NODE and TAGS**



**NIPS TAG as compared to a coin**

# WHAT NIPS IS AND HOW IT WORKS



**NIPS WIFI NODE for in field test and demos**



**NIPS TAG encased in a plastic box with a 6400 mAh Lithium battery**

# NIPS AS A TECHNOLOGICAL INNOVATION

NIPS is a brand new RTLS solution engineered by Nextechs.

It is specifically designed to support large scale, 3D, indoor and local outdoor localization of objects in industrial as well as in everyday life environments and applications.

The innovation introduced by NIPS spans over multiple points:

- **Localization method**: NIPS is based on signal time of flight (tof) direct measurement when traveling from reference devices ('anchors' or 'nodes') to the object bearing the target electronics (the 'tag'), as opposed to the existing, traditional, indirect methods (e.g. proximity or fingerprinting).
- **Localization speed**: two way anchors-tag rangings are executed in few milliseconds, allowing fast localization and tracking even of fast moving objects. Traditional approaches provide very slow convergence times, of the order of seconds, and are very much dependent on signals quality (e.g. signal strength stability).
- **Localization resolution**: NIPS electronics embeds a 64 GHz oscillator that allows theoretically  $< 1$  cm resolution on estimated coordinates, as opposed to traditional methods delivering  $> 1$  m resolutions. In fact, time marking resolution is as low as 15 pico seconds, and radio waves travel not more than 4.5 mm.

# NIPS AS A TECHNOLOGICAL INNOVATION

- **Localization accuracy**: NIPS accuracy ranges from 20 cm (static) to 40 cm (dynamic) depending on operating conditions, and system setup. Traditional methods deliver  $> 100$  cm in accuracy when in optimal, static conditions.
- **Scale**: NIPS is a high density, large scale tracking, scalable system. Hundredths up to thousands of objects can be correctly localized even in small environments, thanks to the very high speed at which the system operates. Traditional methods allow much lower objects density because of the intrinsic methods adopted, that bring to a fast resources saturation (e.g. WiFi, B/T).
- **Fault tolerance**: NIPS is a self-configuring system. It recognizes nodes' new entries as well as nodes' faults, or changes in the signal propagation (e.g. due to environmental changes), and self adapts by triggering the network discovery procedure in a few seconds.
- **Power efficiency**: NIPS tags are typically battery operated. The high operational speed allows very small duty cycles (e.g. only 3 milliseconds powered on over 5 seconds, or 5000 milliseconds, of a typical refresh time). When object are not moving the drained current is just few microamps. Short data packets with high noise immunity require lower transmission power as compared to traditional systems (WiFi, B/T). Months to years is the typical time before recharging.
- **Wireless sensor network**: NIPS provides, on top of localization capabilities, a high speed (up to 6.8 Mbps) data transportation layer, that can be used to integrate a Wireless Sensor Network.

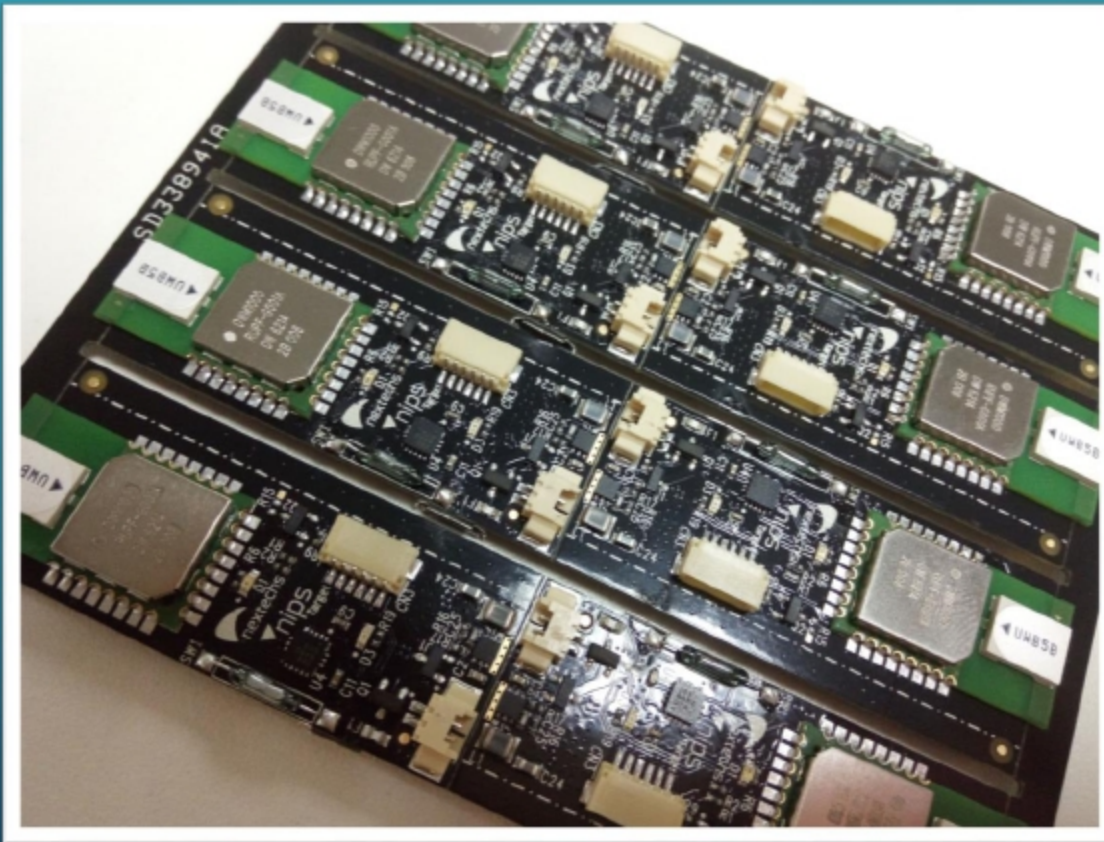
# WHAT NIPS IS AND HOW IT WORKS

**NIPS** is an infrastructure based RTLS system. The major components that make up the solution are:

- The **ANCHORS**, or **NODES**, are devices placed in a fixed position. They actively perform two way rangings with the TAGS. The nodes are distributed across the environment where the objects to be located are placed, either indoor or outdoor. The nodes are available in two versions, the cabled (POE option) and the WIFI. The cabled version is recommended for high density applications and/or fast tracking.
- The **TAGS** are small devices attached to the objects to be localised. The tags asynchronously request access to nodes' resources in order to do rangings that allow accurate coordinates computation.
- The **SERVER**, where all the mathematics is done and data are stored. System monitoring, new software releases broadcasting, data delivery through API, are all activities carried out by the software running at server side.



# WHAT NIPS IS AND HOW IT WORKS



# WHAT NIPS IS AND HOW IT WORKS

FEATURE	NIPS	OTHERS(WIFI,B/T,...)
<b>Methodology</b>	TimeofFlight(preciseanddirect distancemeasurement)	SignalStrength(indirectmethod)
<b>BestResolution</b>	0,5cm (theoretically)	>100cm
<b>BestAccuracy</b>	Typical: Static: 20cm Dynamic: 40cm	>100cm
<b>Convergentimetoposition</b>	milliseconds	seconds
<b>Scalabilityofnumberoftagsthat canbelocatedconcurrently</b>	10 <sup>4</sup>	10 <sup>2</sup>
<b>Powerefficiency</b>	VeryHigh	VeryLow
<b>Setupandcalibration</b>	Easyandfast	Complexandslow

**NIPS comparison to existing technologies**

# APPLICATIONS, A MARKET PERSPECTIVE

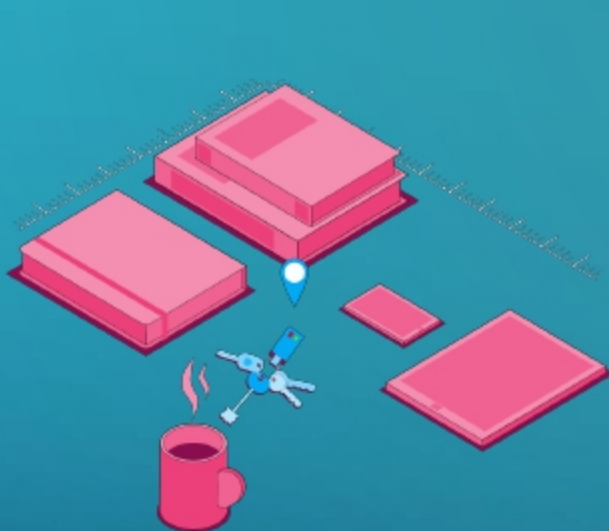
**NIPS** can be considered an “enabling technology”. It is a kind of technology that will dramatically change the way we navigate indoor and also outdoor, but not only. Precision, accuracy, scale and cost are such that a wide number of applications can be devised to improve, when not completely change, aspects spanning from everyday life to production processes in industrial environments.

From logistics in warehouses to monitoring production flows or rapidly identifying the position of life safety related equipment, children or dementia patients, NIPS lends itself to a vast variety of applications involving life safety, production or simply amusement.

The NIPS base technology can be adapted, when not directly plugged into, to allow easy and fast integration to third parties h/w and s/w.

We strongly believe that high precision indoor positioning is a pivotal point to actually leverage the next generation IoT, smart buildings and smart cities.

# APPLICATIONS, A MARKET PERSPECTIVE



**Easy finding of objects**



**Objects and staff  
location / tracking**



**Sports applications**

## COMPETITORS

**NIPS** represents a remarkable step in indoor positioning. It is not worth comparing it to traditional, yet inefficient and expensive approaches, where available technologies have been adapted to do the job without great success. Those technologies, like **Wifi** or **Bluetooth** for example, were not born for that purpose and as such were unable to match adequate level of requirements.

# CERTIFICATIONS

NIPS is CE marked and fulfils all main EMC requirements and specs prescribed for human health safety.



**Distributore e integratore autorizzato**

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