



Accurate and Scalable Indoor Positioning for Smartphones
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Why indoor positioning



Detect indoor location

Locate, guide, assist

Interact, influence

Measure, analyze, optimize

**Boost revenues
Reduce costs**

Consumer apps

- Detect walk-in inside a Point of Sale, grant loyalty points

- Mobile app with indoor positioning + map + PoL search + navigation
- Product search

- Location-based push and advertising leveraging proximity sensing

- Indoor location analytics: flow, behavioral analytics

Professional apps

- Monitoring of security / maintenance round
- Geofencing

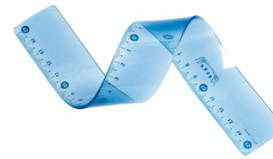
- Maintenance: show content related to the asset / task to perform

- Indoor location analytics: flow, behavioral analytics

Requirements for a commercial Indoor Positioning System

Performances

- High accuracy
- 3 dimensional
- High reactivity



Compatibility and versatility

- Different environments
- Different devices – adapt to existing mass market devices
- Work when the network is overloaded (exhibition centers) or non available (underground car parks)

Affordable

- Low cost of material
- Low cost of deployment
- Low cost of maintenance
- Reuse existing infrastructure as far as possible



Scalability

- As independent as possible from the infrastructure / lowest constraints
- Fast & easy to deploy
- Low support

Our answer: NAO Campus

Device centric algorithm for high performances

- ✘ High reactivity and accuracy
- ✘ Independent from network connection
- ✘ Device calibration independent

Multi-sensors fusion engine for flexibility

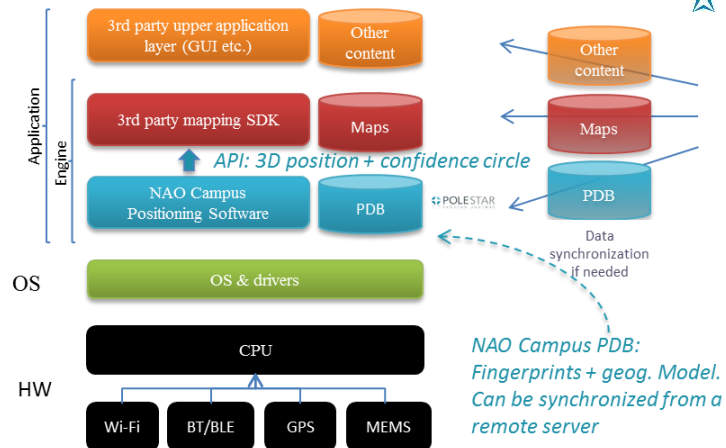
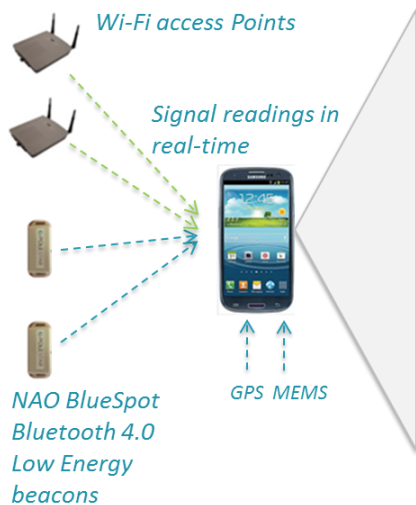
- ✘ Target best accuracy using all available information
- ✘ Reduces constraints on infrastructure (density..)
- ✘ Adaptability to various environments and devices

Fingerprinting based technology for affordability

- ✘ Can use signals of opportunity
- ✘ Does not require any specific infrastructure
- ✘ Use of low cost BLE beacons if needed

Easy deployment and maintenance tools for scalability

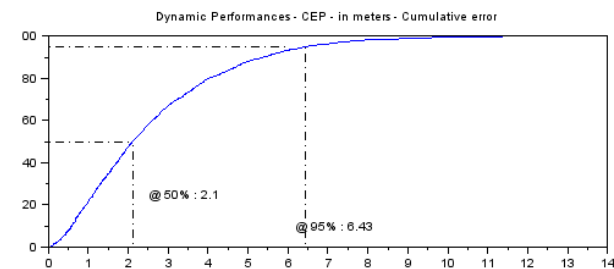
- ✘ NAO Cloud: online platform to deploy NAO Campus in a fast & easy way
- ✘ Automated tools for limited support
- ✘ Moving to a self-learning technology



High precision with low infrastructure: hybrid fusion engine

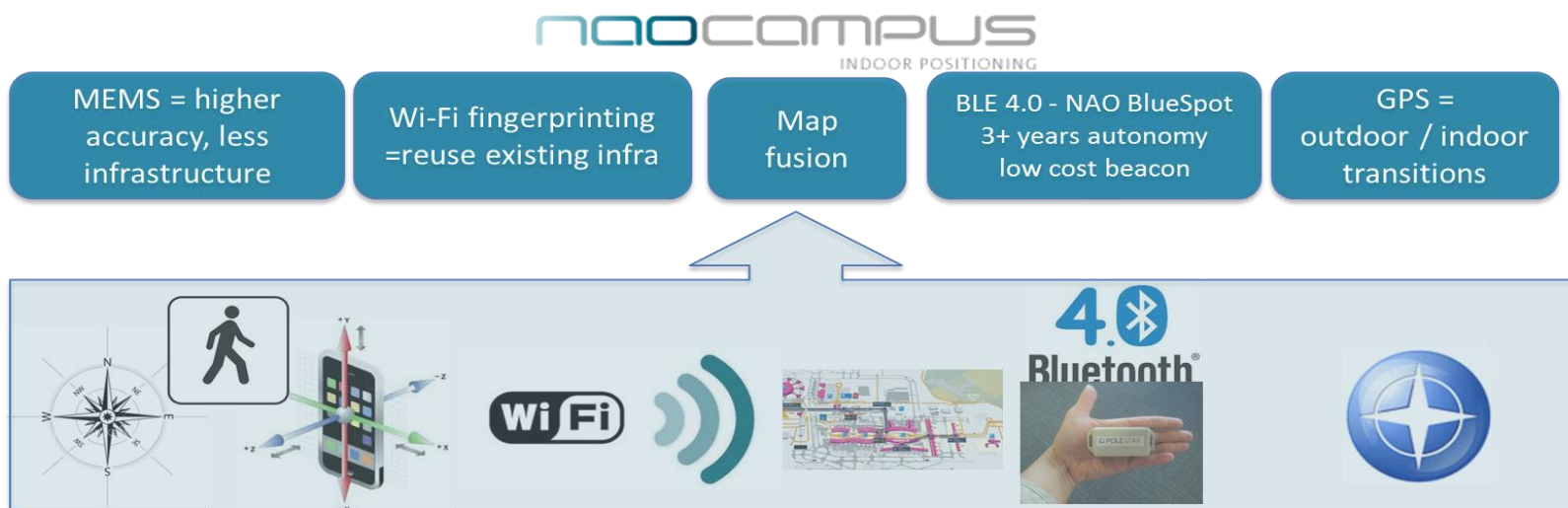
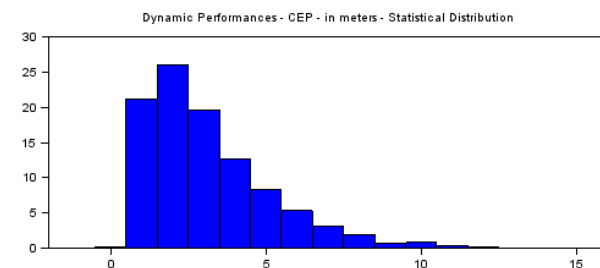
⊕ Generic fusion framework

- Uses the most of sensors available on every device for best accuracy
- Automatically adapts to the environment or to the device model
- Motion sensors and map data improve accuracy when Wi-Fi or BLE density is low
- Motion sensors + map can even deliver accurate positioning after a few steps even if no Wi-Fi/BLE signals are available
- Can easily integrate new sensors



⊕ From a technical point of view

- Proprietary Bayesian algorithm
- RF measurements (Received Signal Strength) enable to compute first location fixes, then continuously refine them
- Inertial measurements propagate current location fixes with a map based motion-model, whatever the phone attitude



Scalability: making setup easy with NAO Cloud

Your indoor map



Raster

Or



...



Setup tools:
do-it-yourself!



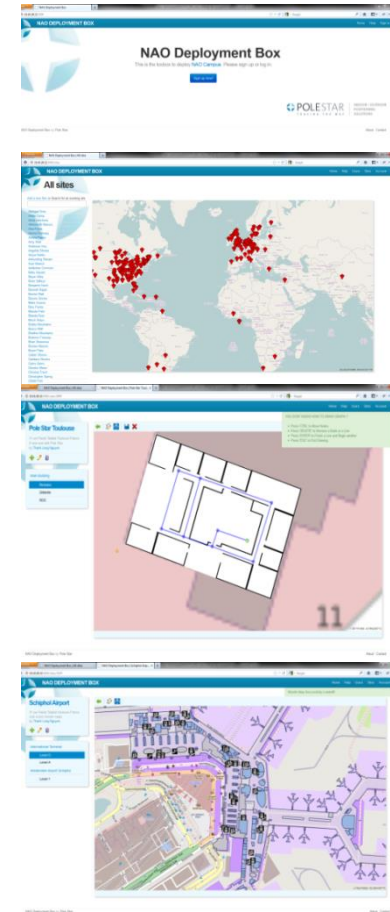
Sync of positioning
databases for ww
coverage



Indoor Location
Analytics



Self-learning with
“Blind” Crowd
Sourcing: remote
setup and
maintenance

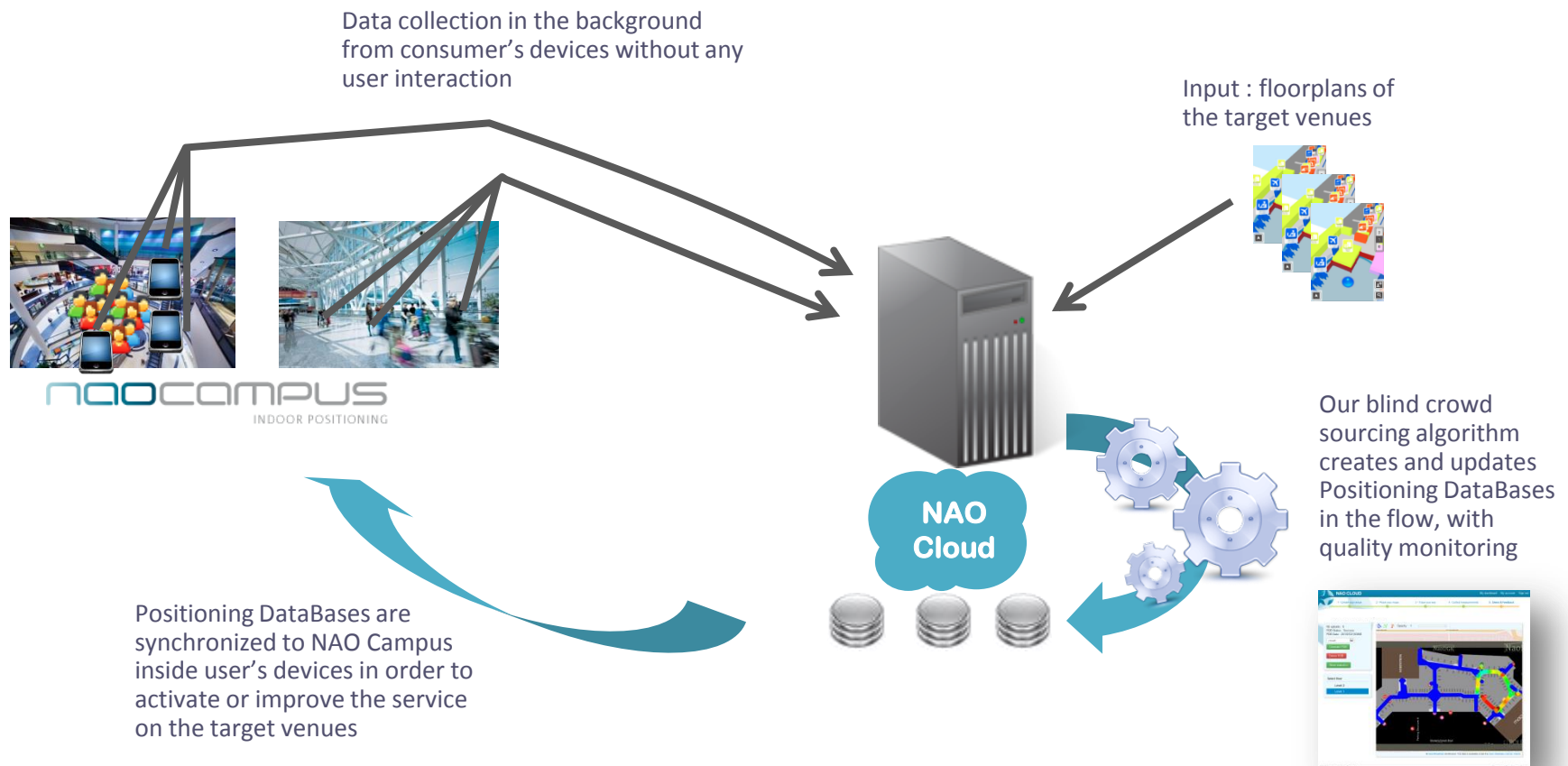


<https://www.nao-cloud.com/>

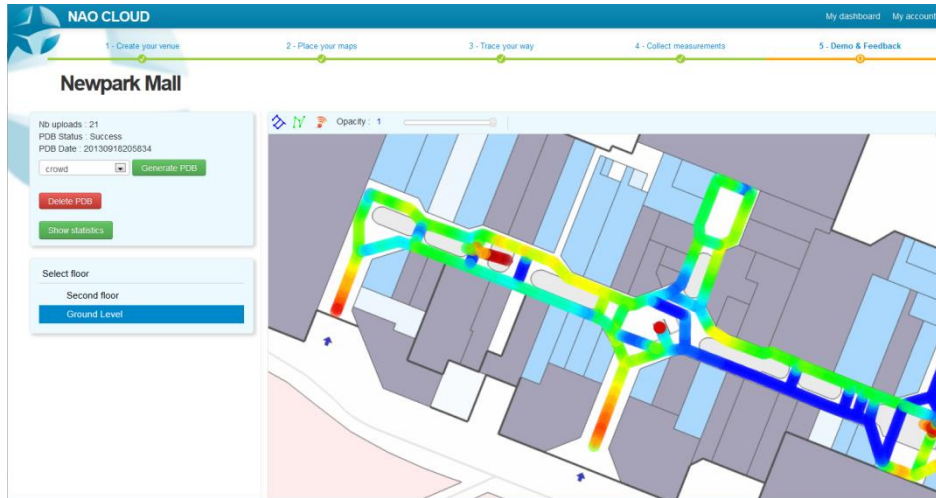
Scalability with Blind Crowd Sourcing: self-learning technology

Fingerprinting by users without interaction with them

- ✧ Traditional location technologies require field staff for their setup and maintenance
- ✧ Crowd sourcing technology enables to setup and maintain our NAO Campus location service with no field staff



Inside Blind Crowd Sourcing



Indicators about measurements use rate

- ✦ Designed for receiving a lot of input data
- ✦ Tries to take the most out of each measurement

Scalable implementation

- ✦ Computation time linear with the amount of data
- ✦ Independent from loop closure

Database generation in real-time

- ✦ Quality of Service indicator
- ✦ All the computations are automatically started as a new measurement is available
- ✦ Resulting database available immediately

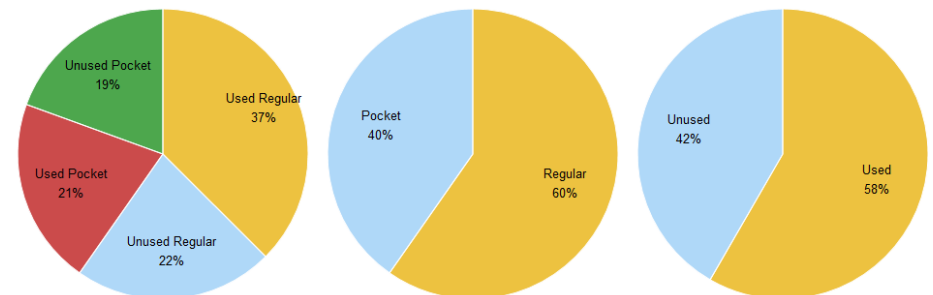
Iterative algorithm

- ✦ The positioning is enabled even if the full site is not covered
- ✦ New measurements can be added to an existing database

Newpark Mall Statistics

Coverage : 53% | Number of devices : 3 | PDB generation : 4 min

	Regular logs			Pocket logs			Total		
	Number	Duration (min)	Distance (m)	Number	Duration (min)	Distance (m)	Number	Duration (min)	Distance (m)
Used	7	27	1749	4	15	1003	11	42	2752
Total	13	43	2888	8	29	1977	21	72	4865



About Pole Star

Background

- ✦ Founded in 2002; 17 FTE (13 in Toulouse, France and 4 in Palo Alto, US)
- ✦ Management and employees own 42.6%

Offering

- ✦ **NAO Campus:** Flagship indoor positioning offering
- ✦ **NAO Micro:** Proximity detection offering (to be released by end of March 14)

Technology

- ✦ Hybrid positioning technology: innovative Wi-Fi/BLE/GPS/MEMS/map fusion
- ✦ Cloud service platform and advanced blind crowdsourcing technology enabling rapid and scalable deployment

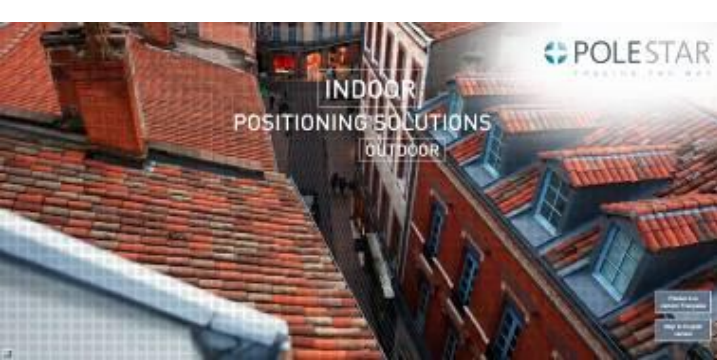
Customers

- ✦ More than 6 million sqm. covered in more than 20 countries



Revenue


- ✦ Revenue Model: setup + annual license fee model



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Thanks for your attention



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