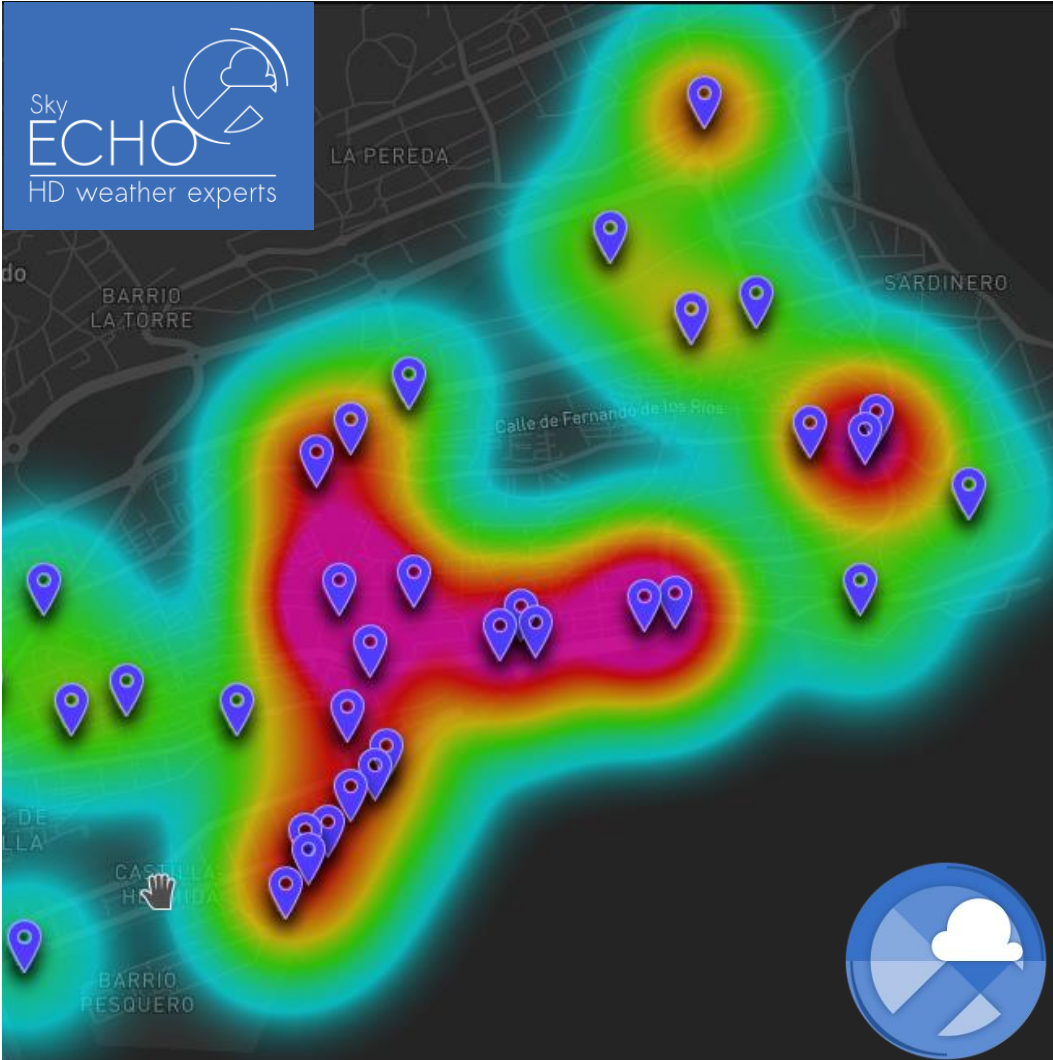# Review 6th Fed4FIRE+ open-call Medium-Experiment Project: SECTOR

Presenting: Igor Stepanov

SkyEcho v.o.f

Online project review

Rotterdam, The Netherlands; 1-4-2020

Sky ECHO
HD weather experts

Algorithm to determine a cost effective, optimal Spatial dEployment for smart-City environmenTal sensOr netwoRks (SECTOR)

WEATHER 3.0 DATA FOR SMART CITIES

Concept and objectives

SECTOR Project Ideas:

- use IoT temperature sensors from SmartSantander testbed to design and develop:

1. Interactive online framework for automated acquisition and deployment of sensors, in urban environments

2. Smart-function to decide number and area of placement of sensors

SECTOR Goals:

- Create all-in-one, adaptive **weather** web-portal, where:

- Visualizing real-time IoT measured Urban Heat Island (heatmap) is done

- Automatic decision to be made for number and location of new sensors to place, for selected city-zone

- More environment parameters can be added-on later (rainfall, air-quality)

Background and motivation 1/2

Status: *SkyECHO Weather-experts develops HD, street-level accurate, weather services.*

Our real-time data-stream (including nowcast) for rainfall is most accurate in Europe (100 meters resolution, every minute), using single, X-band radar (photo).

Challenge: while rainfall can be accurately measured with a single instrument like X-band radar, other weather-parameters can not.

We are often asked if it is **possible to measure accurately temperature with IoT-sensors** in the city, to monitor heat-stress locations and carry out *heat-stress TEST*.

Background and motivation 2/2

Motivation to use FED4FIRE:

- access to already deployed SmartSantander IoT-sensors; **requirenments:**

✓ Temperature-sensors with valid LOCATION and high frequency of update

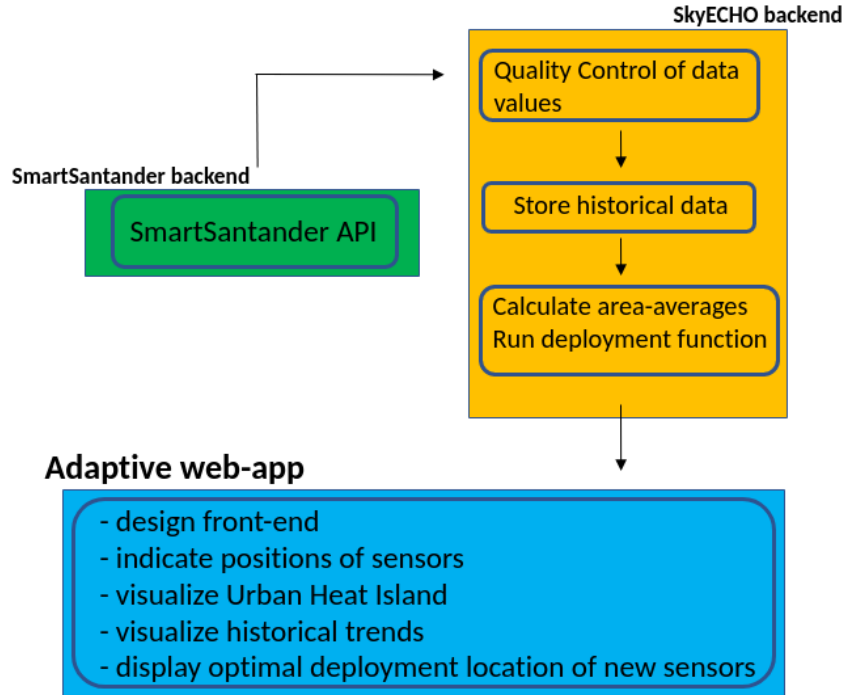✓ Minimum of 30 active (valid) sensors for visualization

✓ Deployed hardware in urban environment

Motivation for SkyECHO:

-> Learn about IoT sensors for weather use (SmartSantader)

-> Extend SkyECHO line of products

Experiment setup

Adaptive web-app
- design front-end
- indicate positions of sensors
- visualize Urban Heat Island
- visualize historical trends
- display optimal deployment location of new sensors

Web-app frontend:

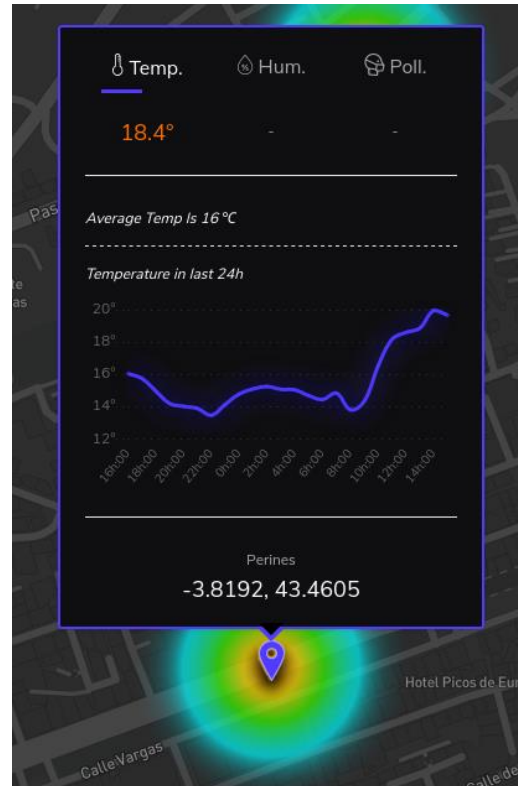Available live at: https://sector.sky-echo.space

Project results – measurements (1-Visualization)

✓Temperature (phenomenon) fetched via API subscription

-> Visualized for all (static and mobile) locations as heatmap

-> Accurate temperature trend shown as historical data

-> Individual station measurement are accessible in real-time

Project results – measurements (2-Sensor deployment)

-> Real-time data can be processed

-> **Existing IoT sensor location (stationary & mobile) is used** to make automatic deployment function

-> **LoRa network coverage** maps can be used to evaluate available location for new IoT sensors-location

Project results – lessons learned

Can existing wireless sensor networks be used to create automatic distribution function?

-> **Yes**, **SECTOR** can now be also applied for other cities which are becoming equiped with IoT technology

-> This tool can be made user-friendly for use by non-highly technical departments

https://sector.sky-echo.space

Impact on our business 1/2

HOW DID FED4FIRE+ HELP US?

Increase of SkyEcho's HD weather **service portfolio**

Sector Web-app prototype

1- Direct integration as used-case for new product to market fit analysis with HD Temperature

Front-end Visualisation service

Assistance tool for Temperature sensor deployment

2- Used developed technology for increase of business scale-up potential

- Deployment in new cities
- Front-end scale – vizualisation of new HD weather parameters
- Use of backend architecture for new future service applications

Impact on our business 2/2

HOW DID FED4FIRE+ HELP US?

Benefit from expanding our product into B2B and B2G markets:

1. SECTOR **enables use-cases for many municipalities in Europe**, which want to use sensors data for policy decisions (heat-waves)

2. SECTOR makes a very appealing **marketing tool** for any weather-data we already provide

3. Our startup SkyECHO HD *Weather-Experts* has **gained experience of incorporating another HD weather parameter**

Value percieved 1/2

WHY DID YOU COME TO FED4FIRE+?

Smart IoT deployment - SECTOR project required:

✓SmartSantander provided a network of unique temperature IoT sensors and a stable data-stream (city-permits for hardware are complicated for startup with regulation and privacy, as well as maintenance)

✓good documentation and understanding of the testbed (for QC)

We gained experience how to:

✓architect the complete web-app platform-framework

✓make original design for user-friendly access

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Value percieved 2/2

WHY DID YOU COME TO FED4FIRE+?

SkyECHO Weather-Experts is in the *phase of product development.*

✓We are a **weather-software company**, **but require access to well-maintained hardware (IoT sensors, weather-radar)** to make better weather-services and applications. FED4FIRE+ has provided this value!

✓**We also need crucial funding for such development**, as well as extending network of future partners, working with IoT and other wireless networks.

Feedback – used resources and tools 1/2

SMART SANTANDER

Resource: IoT API asynchronous endpoint for temperature sensors phenomenon

Acess: jFed credentials

Initially only stationary IoT sensors were used, extended mobile sensors also added later *(after discussion with testbed Patron)*

HEALTHY IOT SENSORS
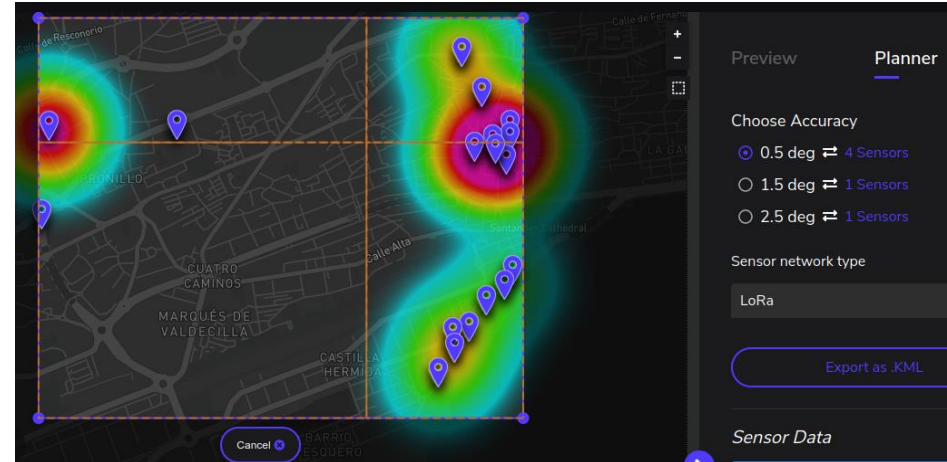
Feedback – used resources and tools 2/2

SMART SENSOR DEPLOYMENT

Resource: IoT API asynchronous endpoint, *sensors geo meta-data*

Data: Real-time Lat;Lon of stationary and mobile sensors

These values are used to calculate number and location of new sensors (together with selected temperature accuracy and area network-coverage)

RESULTING NEW SENSOR LOCATION

Feedback – added value of FED4FIRE+ 1/2

INSTRUMENTS HARDWARE

- **Stations with temperature sensors were provided**

- Quick discussion resulted in **activating a number of mobile sensors** (better area-coverage)

- **Negative point: a lot of sensors were not working or had invalid range of values**

DEPLOYED IN URBAN ENVIRONMENT

-> **Already deployed sensors in city environment** (solves issue of municipal permissions and privacy issues)

-> **Sensors were online during the entire experiment**, we did not have to carry out inspection in the field

Feedback – added value of FED4FIRE+ 2/2

LARGE NUMBER OF SENSORS

-> **Scale of sensors:** Even though many sensors needed to be filtered out (invalid measurement range), there was plenty of correct ones to use (30 stationary and 80 mobile)

-> **Frequency of data update:** SmartSantander has near real-time temperature sensor measurements

COMMUNICATION AND MANUALS

-> Testebed Patron was joining group discussion (chat or calls)

-> Provided documentation was up-to-date

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