NAVISP Industry Days 2022

PNTCRC
Position, Navigation and Timing Cyber Response Center

Presenter: Luca Canzian
Date: 16 June 2022
Location: ESTEC

Agenda

- Project summary and team
- Project outcomes
- Impact since completion

Qascom
Trust is Nice, Control is Better.

Project summary and team

PNTCRC Objectives

- Development of a center capable of discovering, storing and distributing security threats, vulnerabilities and mitigations associated to PNT services
- Management of different types of threats:
  - Laboratory threats
  - On field threats
- A new approach to global PNT security covering all needs, from device testing to on-field detection

PNTCRC Team

- Start date: 16/04/2018 → End date: 15/12/2021

- **Qascom** (Prime)
  - Responsible for the design, implementation and management of the PNTCRC system

- **UNIPD**
  - Support to the implementation of specific functionalities and to experimentation, leading to the initial database population

- **CISAS**
  - Development of the Control Room to support the system management

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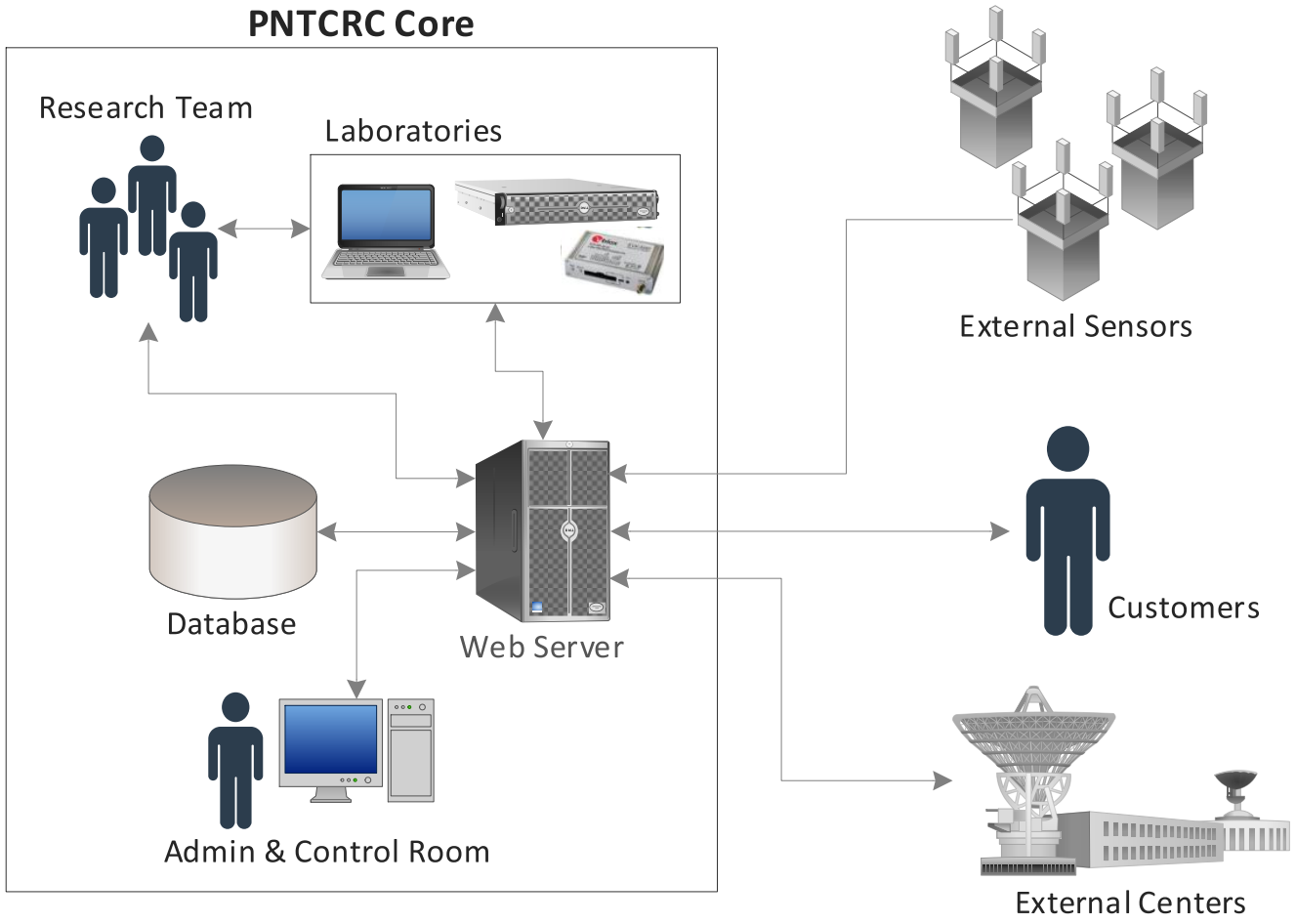
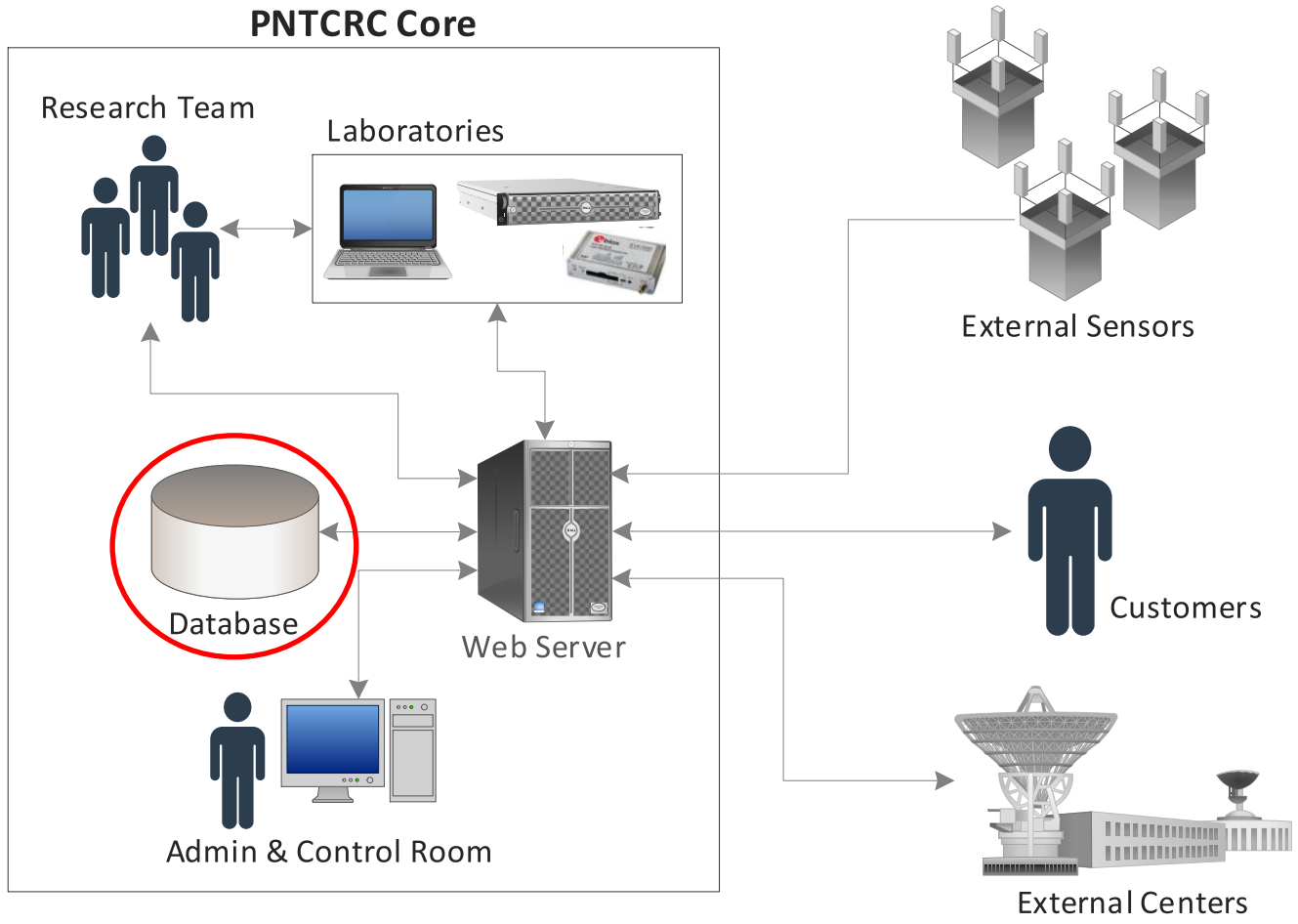
Project outcomes

PNTCRC Architecture



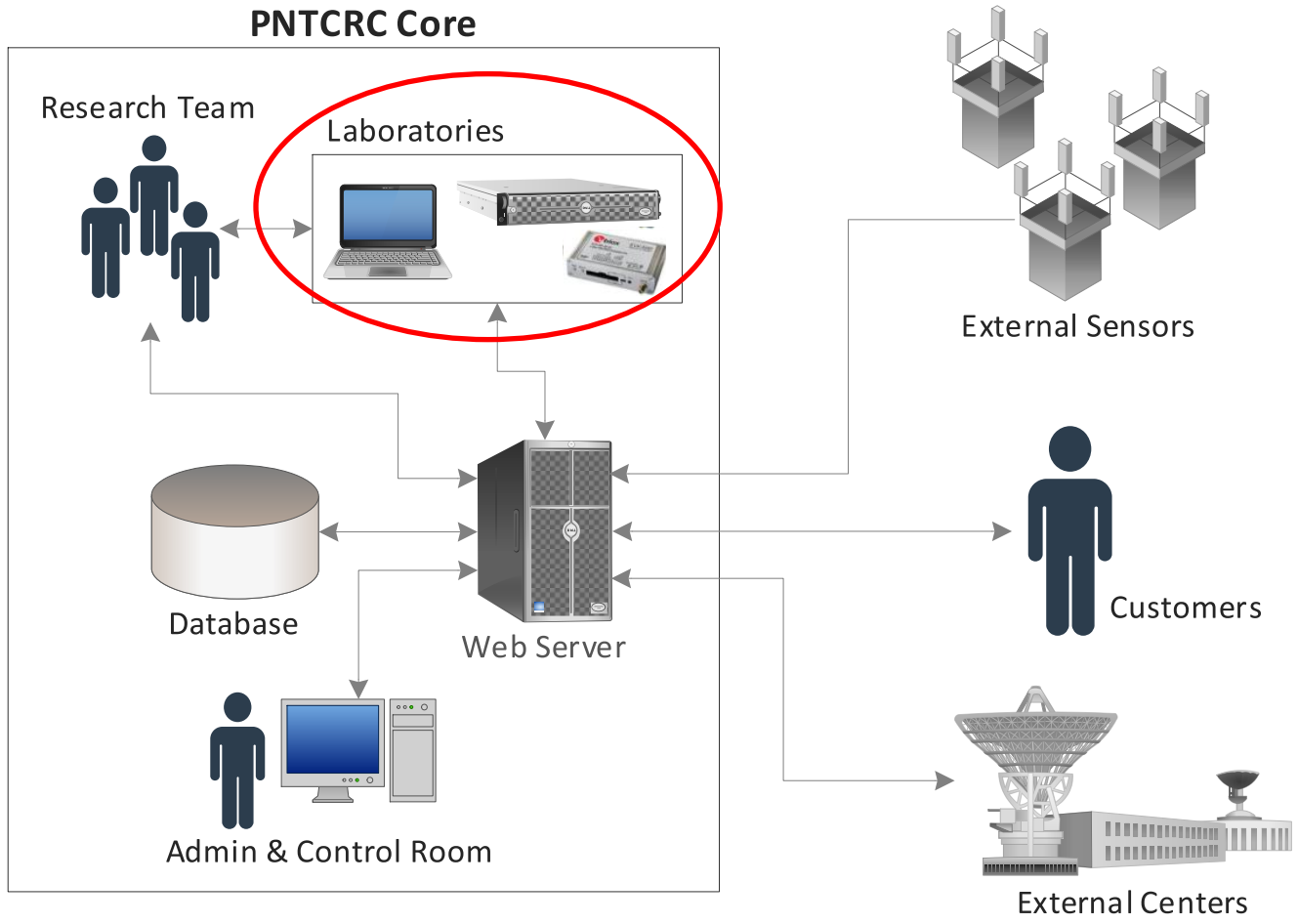
PNTCRC Architecture – Database

- **Database**: it manages the storage of data, such as laboratory threats, vulnerabilities, mitigation, geographical reports and real-time alerts



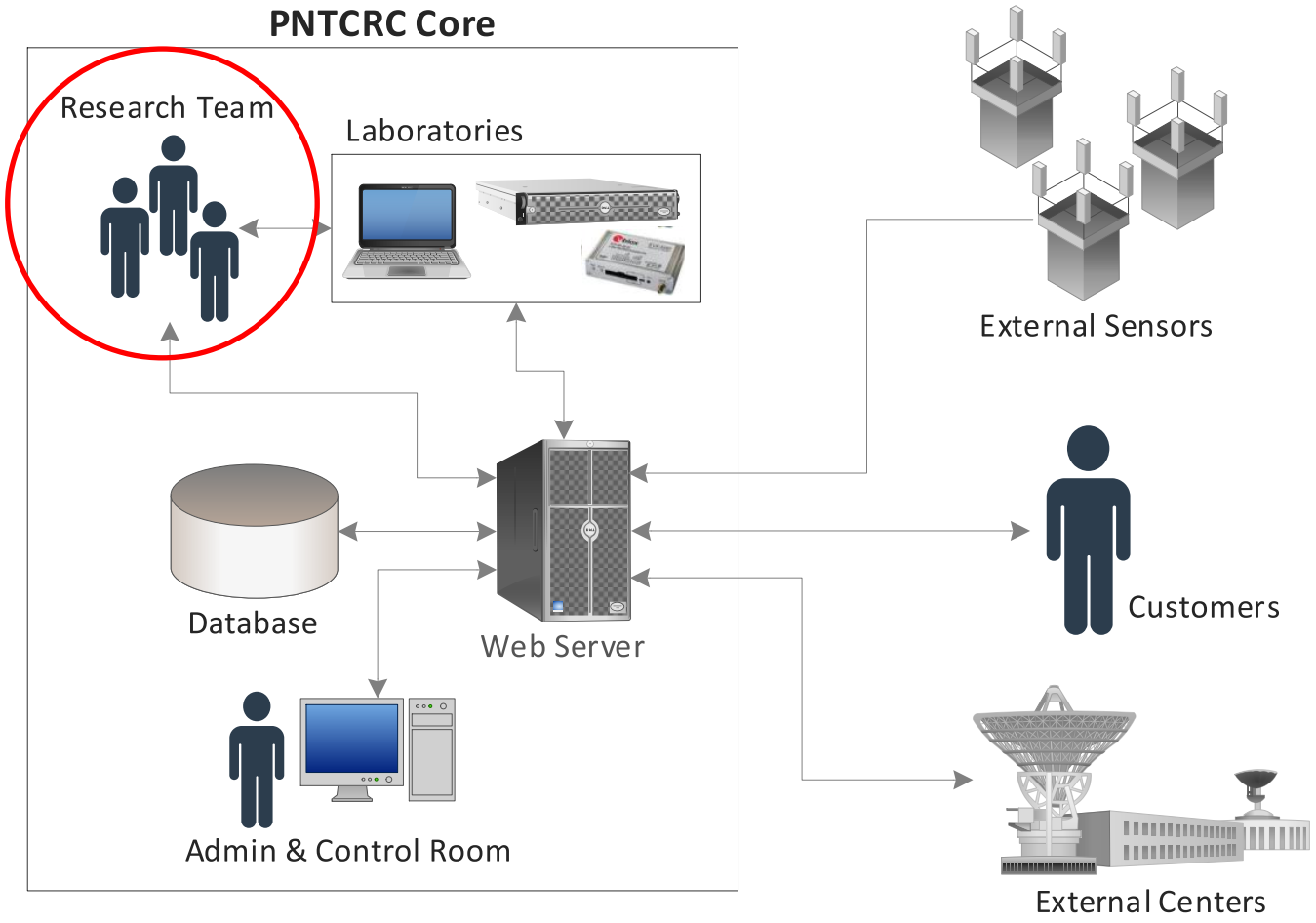
PNTCRC Architecture – Laboratories

- **Laboratories**: hardware and software tools allowing to discover and assess threats and vulnerabilities on GNSS receivers



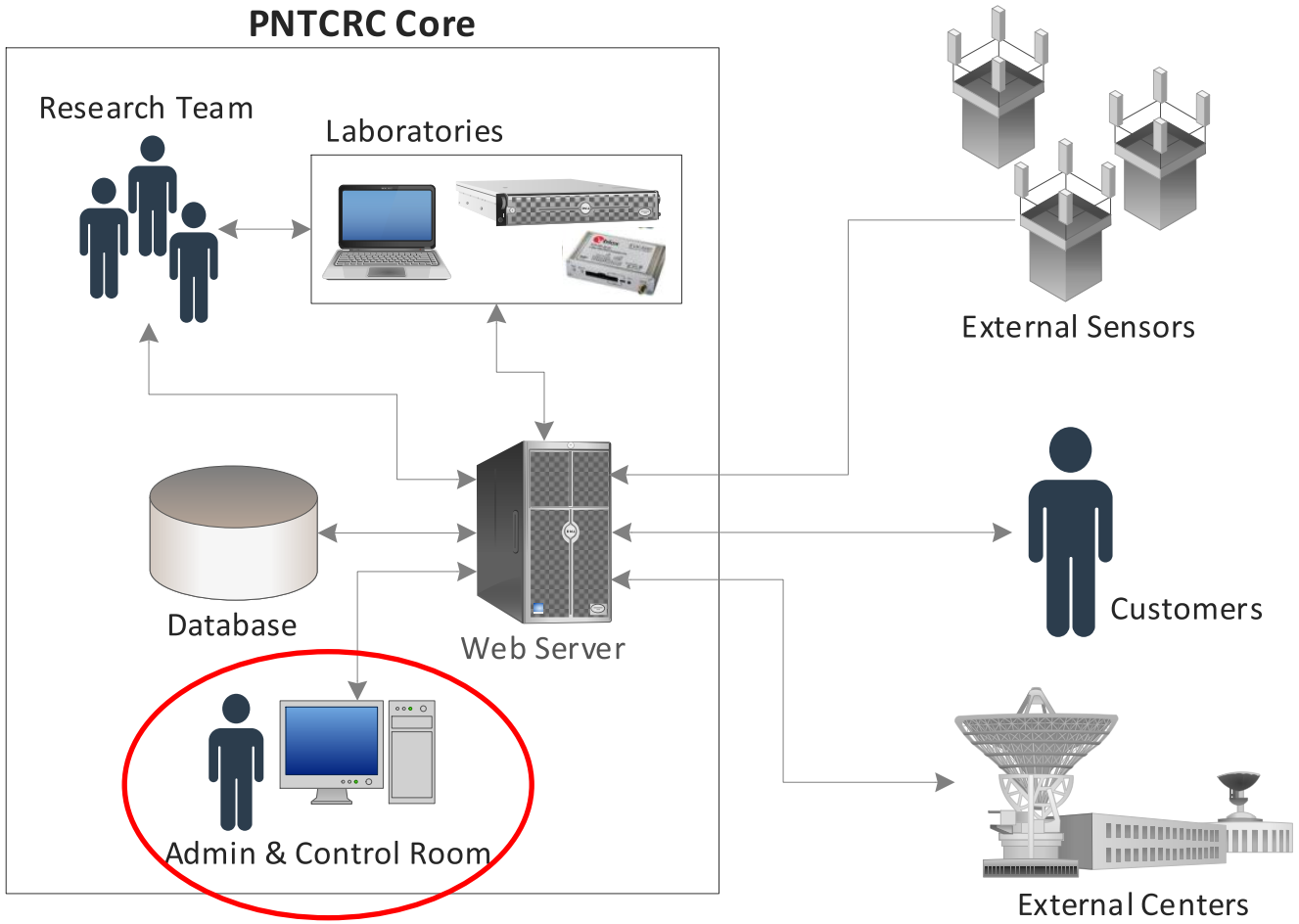
PNTCRC Architecture – Research Team

- **Research Team**: a network of experts in PNT technologies and applications, they use the laboratories and infrastructure to populate the database with new threats, vulnerabilities and mitigations



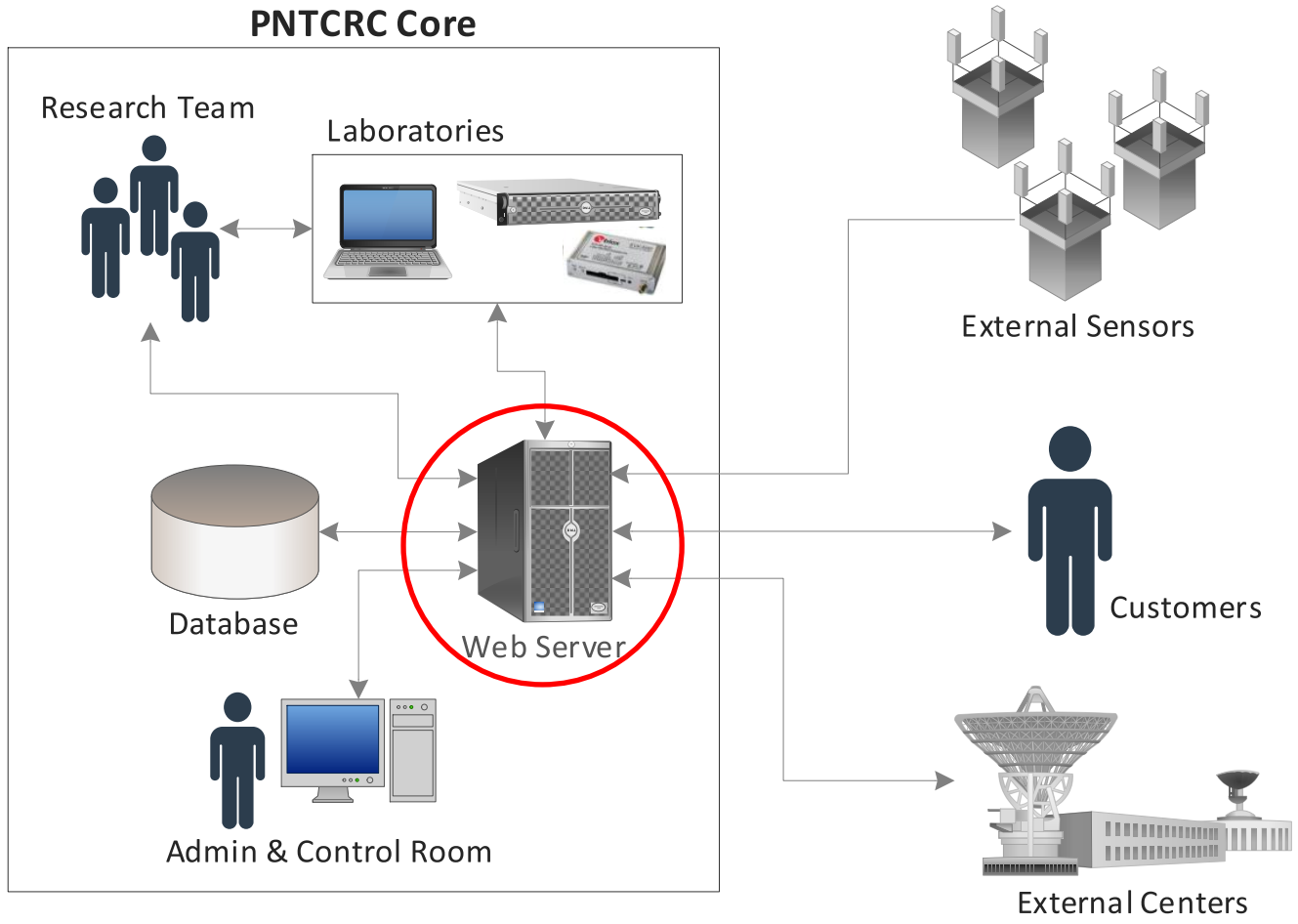
PNTCRC Architecture – Admin & Control Room

- **Admin & Control Room**: the people and tools responsible for the monitoring of the PNTCRC status



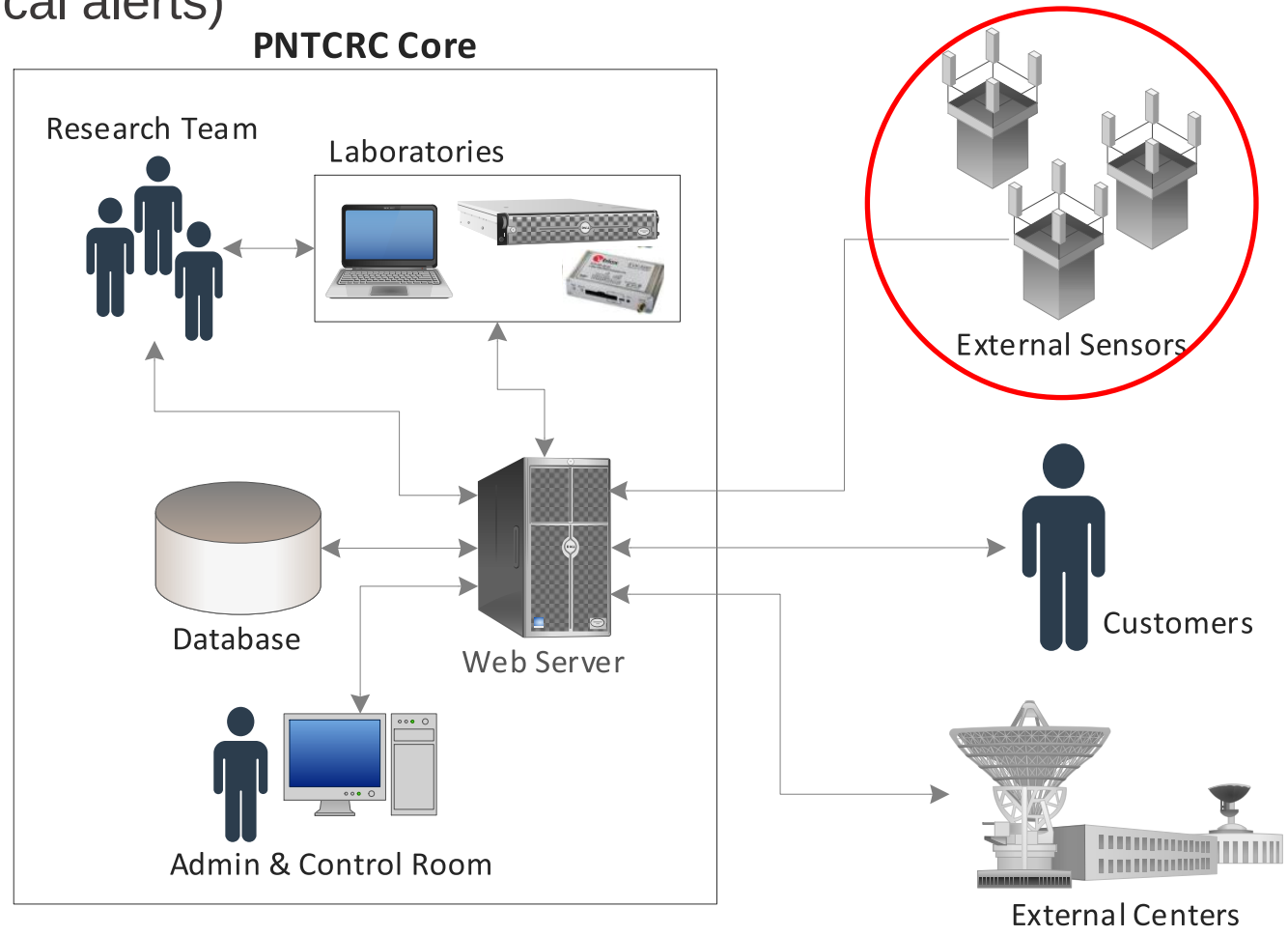
PNTCRC Architecture – Web Server

- **Web Server**: the entry point, it provides a graphical interface to the system functionalities and it replies to the user requests



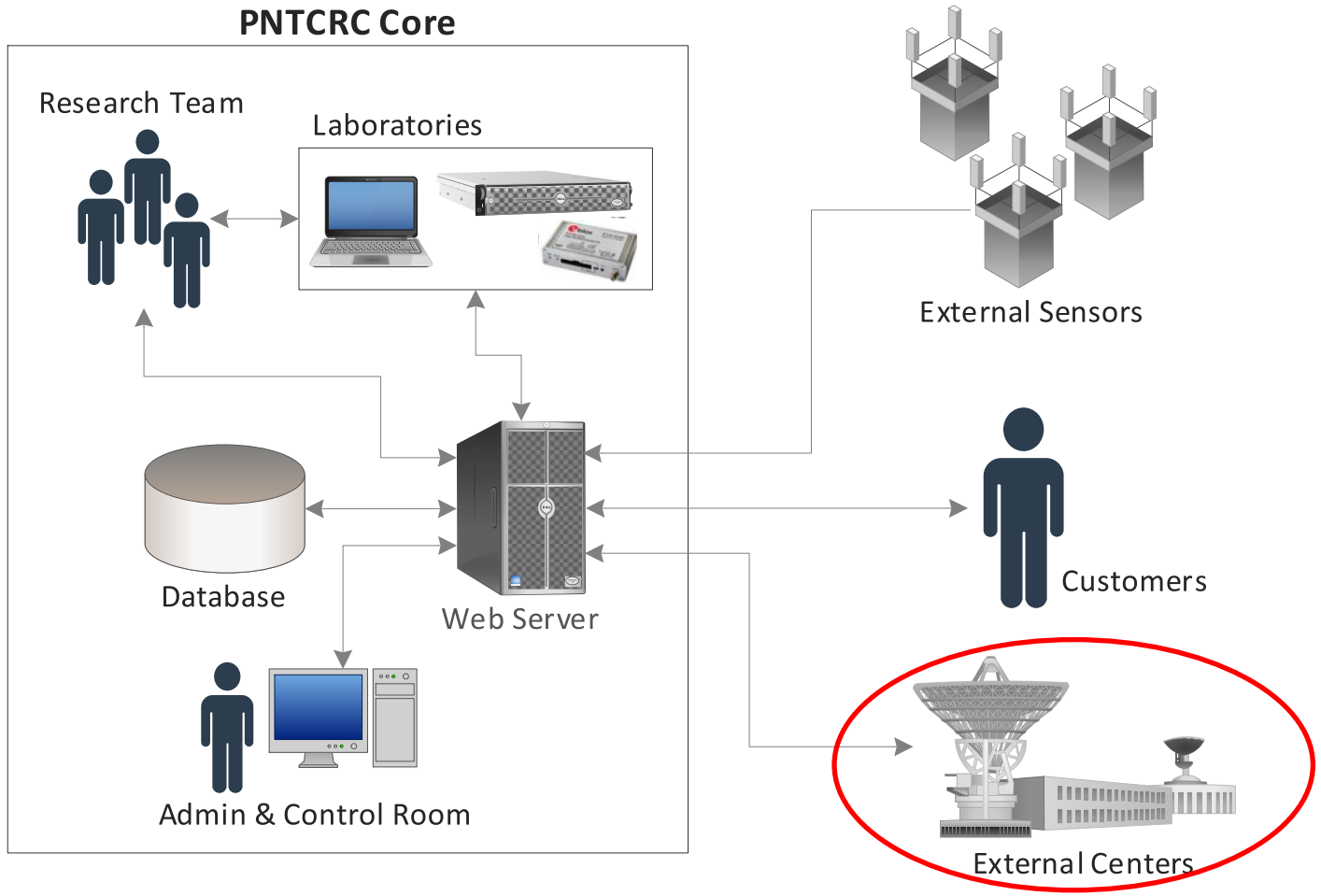
PNTCRC Architecture – External Sensors

- **External Sensors**: interference monitoring stations that are deployed in order to detect and report to the PNTCRC possible threats occurring within the monitored geographical area (geographical alerts)



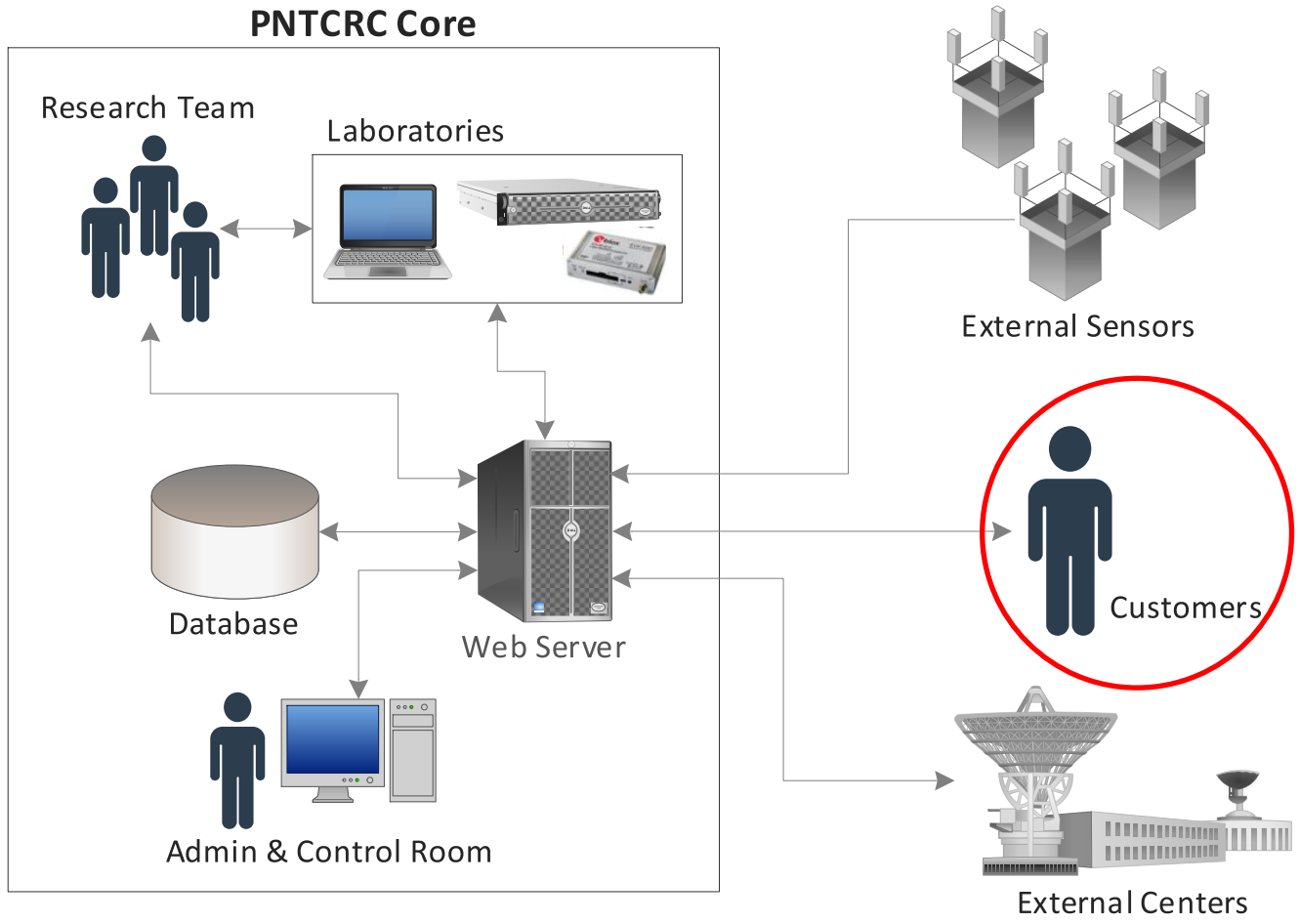
PNTCRC Architecture – External Centers

- **External Centers**: reliable research centers that can collaborate with the PNTCRC in order to provide new threat reports



PNTCRC Architecture – Customers

- **Customers**: the users that are subscribed to one of the PNTCRC services, they interact with the website, hosted in the web server, or through a QA707



PNTCRC Website – Laboratory Threat

PNT Cyber Response Center

Dashboard

SEARCH

REPORT

PROFILE

researcher

Search Threats

This page allows to search the available threat scenarios inside the Cyber Response Center database.

Threats | Scenarios | Impacts

Search the simulation impacts available

Reset filters

RECEIVER MODELS

IMPACTS

APPLICATIONS

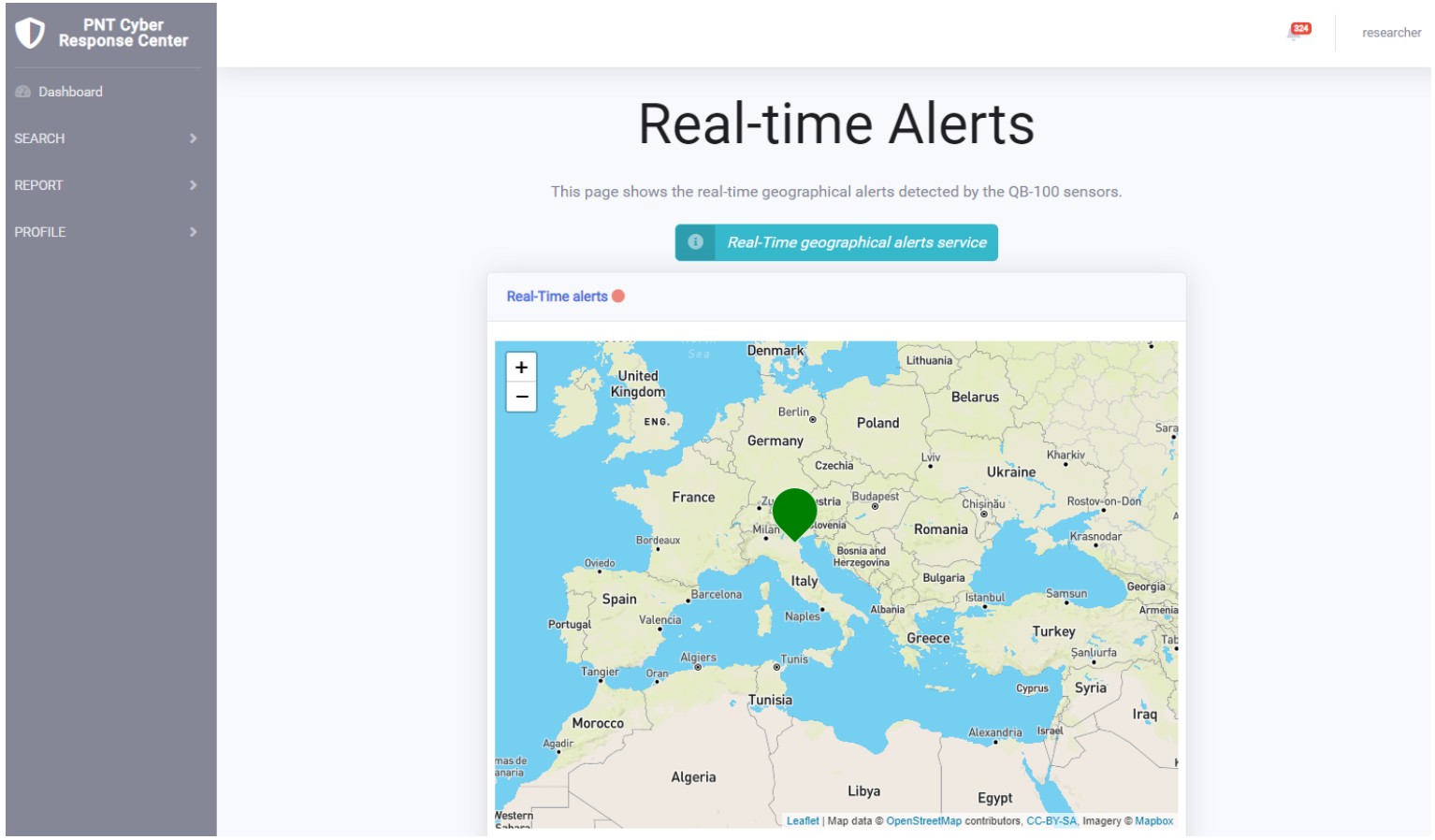
ENVIRONMENTS

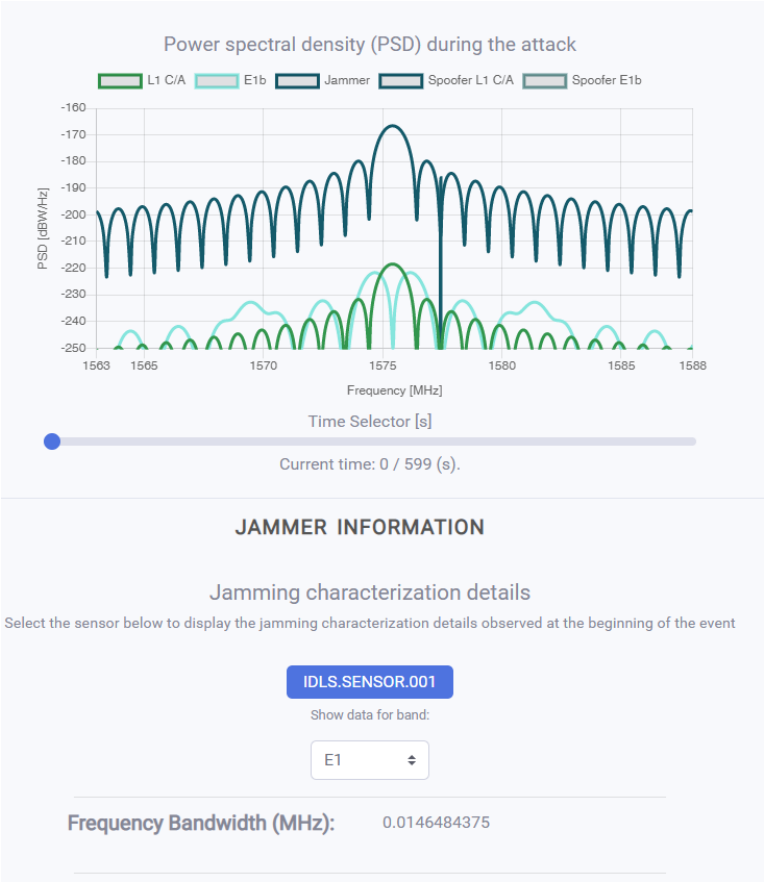
SIGNALS

THREAT CATEGORY

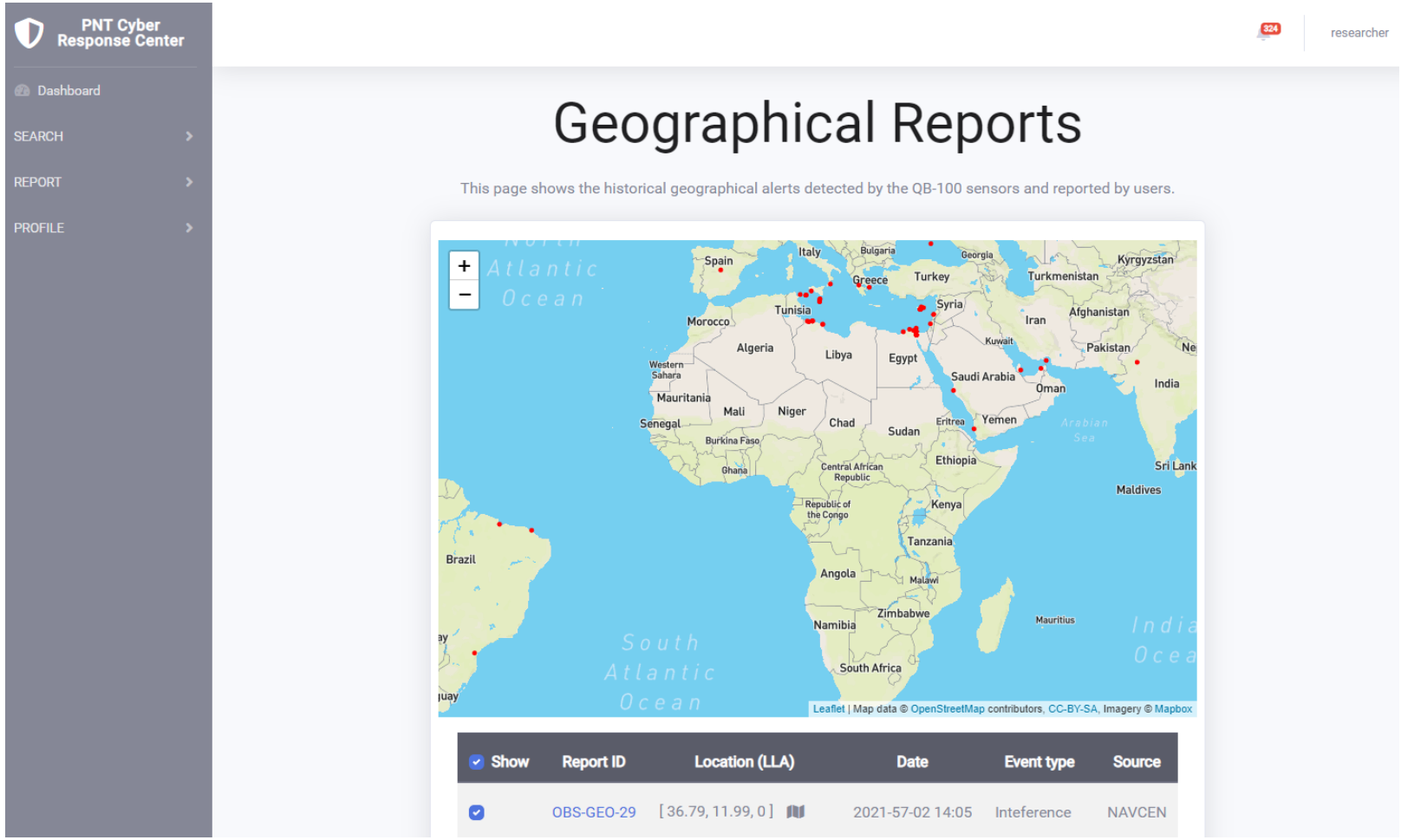
Impact ID	Model	Impacts	Application	Environment	Positioning Systems	Signals
RES-SCN-1	RX-test	Denial of service	Reference Station	Open Sky	Galileo	E1b
RES-SCN-2	RX-test	Denial of service	Reference Station	Open Sky	GPS	L1 C/A
RES-SCN-3	RX-test		Reference Station	Open Sky	GPS	L1 C/A
RES-SCN-4	RX-test		Reference Station	Open Sky	1) Galileo 2) GPS	1) E1b 2) L1 C/A
RES-SCN-5	RX-test	Denial of service	Reference Station	Open Sky	GPS	L1 C/A

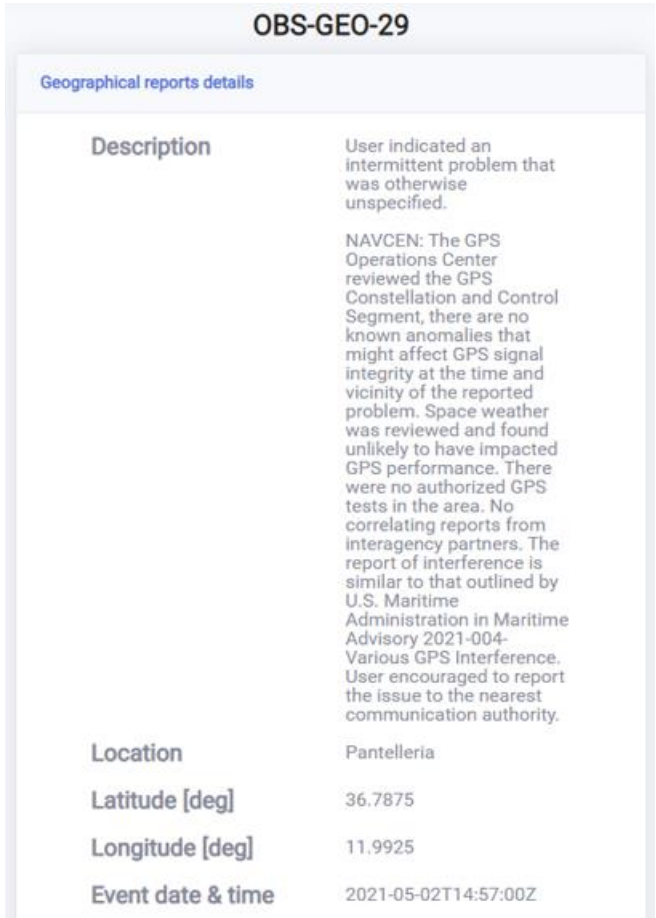
PNTCRC Website – Real-time Alerts





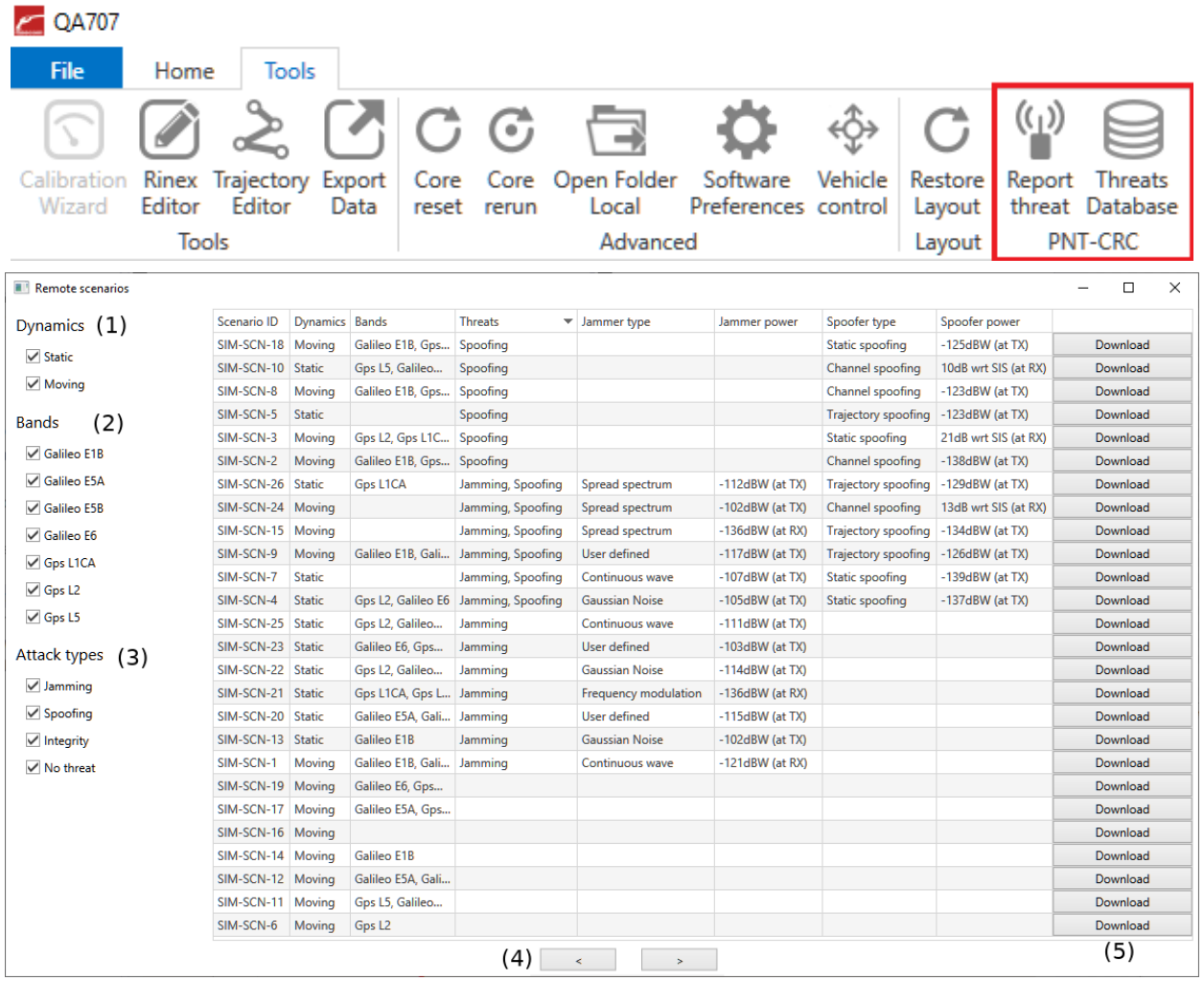
PNTCRC Website – Geographical Reports





PNTCRC Plugin for QA707

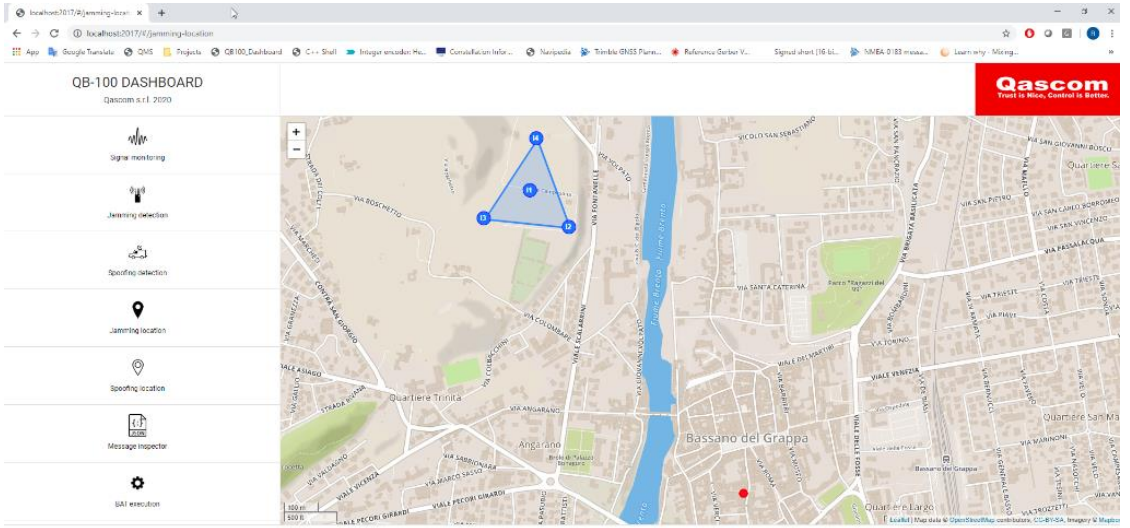
- QA707 is the RFCS of Qascom, allowing to design and assess threats (e.g., jamming and spoofing) on GNSS receivers

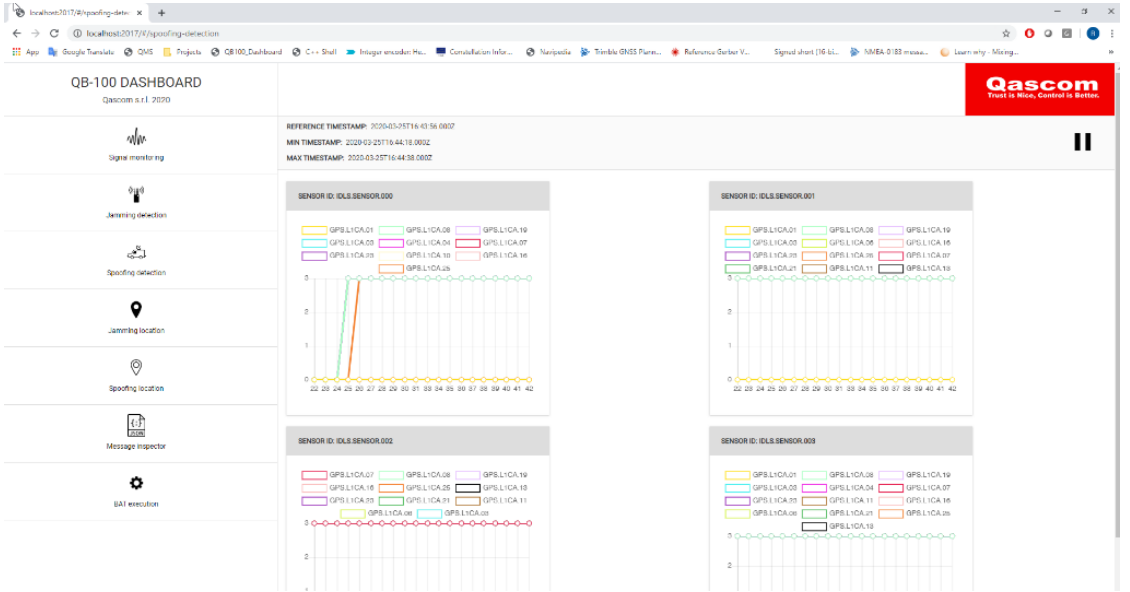


Scenario ID	Dynamics	Bands	Threats	Jammer type	Jammer power	Spoofer type	Spoofer power	
SIM-SCN-18	Moving	Galileo E1B, Gps...	Spoofing			Static spoofing	-125dBW (at TX)	Download
SIM-SCN-10	Static	Gps L5, Galileo...	Spoofing			Channel spoofing	10dB wrt SIS (at RX)	Download
SIM-SCN-8	Moving	Galileo E1B, Gps...	Spoofing			Channel spoofing	-123dBW (at TX)	Download
SIM-SCN-5	Static		Spoofing			Trajectory spoofing	-123dBW (at TX)	Download
SIM-SCN-3	Moving	Gps L2, Gps L1C...	Spoofing			Static spoofing	21dB wrt SIS (at RX)	Download
SIM-SCN-2	Moving	Galileo E1B, Gps...	Spoofing			Channel spoofing	-138dBW (at TX)	Download
SIM-SCN-26	Static	Gps L1CA	Jamming, Spoofing	Spread spectrum	-112dBW (at TX)	Trajectory spoofing	-129dBW (at TX)	Download
SIM-SCN-24	Moving		Jamming, Spoofing	Spread spectrum	-102dBW (at TX)	Channel spoofing	13dB wrt SIS (at RX)	Download
SIM-SCN-15	Moving		Jamming, Spoofing	Spread spectrum	-136dBW (at RX)	Trajectory spoofing	-134dBW (at TX)	Download
SIM-SCN-9	Moving	Galileo E1B, Gali...	Jamming, Spoofing	User defined	-117dBW (at TX)	Trajectory spoofing	-126dBW (at TX)	Download
SIM-SCN-7	Static		Jamming, Spoofing	Continuous wave	-107dBW (at TX)	Static spoofing	-139dBW (at TX)	Download
SIM-SCN-4	Static	Gps L2, Galileo E6	Jamming, Spoofing	Gaussian Noise	-105dBW (at TX)	Static spoofing	-137dBW (at TX)	Download
SIM-SCN-25	Static	Gps L2, Galileo...	Jamming	Continuous wave	-111dBW (at TX)			Download
SIM-SCN-23	Static	Galileo E6, Gps...	Jamming	User defined	-103dBW (at TX)			Download
SIM-SCN-22	Static	Gps L2, Galileo...	Jamming	Gaussian Noise	-114dBW (at TX)			Download
SIM-SCN-21	Static	Gps L1CA, Gps L...	Jamming	Frequency modulation	-136dBW (at RX)			Download
SIM-SCN-20	Static	Galileo E5A, Gali...	Jamming	User defined	-115dBW (at TX)			Download
SIM-SCN-13	Static	Galileo E1B	Jamming	Gaussian Noise	-102dBW (at TX)			Download
SIM-SCN-1	Moving	Galileo E1B, Gali...	Jamming	Continuous wave	-121dBW (at RX)			Download
SIM-SCN-19	Moving	Galileo E6, Gps...						Download
SIM-SCN-17	Moving	Galileo E5A, Gps...						Download
SIM-SCN-16	Moving							Download
SIM-SCN-14	Moving	Galileo E1B						Download
SIM-SCN-12	Moving	Galileo E5A, Gali...						Download
SIM-SCN-11	Moving	Gps L5, Galileo...						Download
SIM-SCN-6	Moving	Gps L2						Download

PNTCRC Interface for QB100

- QB100 is the RF monitoring sensor of Qascom, allowing to detect, characterize and locate RF threats on GNSS bands





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Impact since completion

Impact since Completion

- Trial with a GNSS chip manufacturer
  - Including usage of QA707 with the PNTCRC plugin
  - Received feedback remarks the appreciation and interest of the trial customer
  - Trial still going on
- Consolidation of collaborations with University of Padova and CISAS
- Growth of the internal PNT team (in number and technical competences)
- Participation to other PNT activities

Thank you!