



Empowering Trust and Security on Sharing Personal Activity Data

The Suite5 Tracker - A FutureTPM Use Case

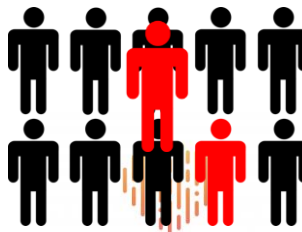
Suite5 Data Intelligence Solution



The FutureTPM project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 779391.

Motivation

- More and more individuals need constant monitoring and support, especially in their own environment.
- Sensors and modern ICTs provide health/wellbeing-relevant solutions that are not just “hype”!
- The more data collected, the better services can be offered to individuals
- Service Providers (not just of health domain) are joining the “analytics” wave. Studies and apps are constantly surfacing.



Apple Heart Study

In partnership with Stanford Medicine



Diabetes care app
One Drop



Corrie Health app
Johns Hopkins



Concussion Tracker
NYU Langone Medical Center



Oregon Health & Science University



SleepHealth
University of California San Diego,
American Sleep Apnea Association



PPD ACT
University of North Carolina, National
Institute of Mental Health

SUITE5 Data Intelligence Solutions

- Data Intelligence Technology Provider founded in the UK in 2012
- Offering Innovative Solutions based on advanced Data Analytics techniques & Machine Learning applications
 - ◆ *Energy management, Health & Activity tracking, Aviation-related services, Industrial Maintenance, Banking & Insurance*
- Two recently launched Products:



S5 Enterprise Analytics



S5 Personal Data Analytics Suite

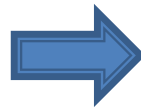
The Market situation (just for the Assisted Living domain)

The ambient assisted living market is estimated to grow to USD 3.96 billion by 2020

The total caregiver support market for the period 2016-2020 is estimated at \$20.3 billion,

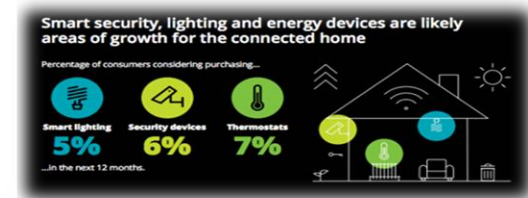


The Global Medical Alert Systems Market is poised to grow to reach approximately \$18.5 billion by 2020.



S5 Tracker is positioned in the convergence of those domains
 Offering a solution addressed to various shareholders (Caser Service Providers, Patients and Caregivers)
 Not vendor specific, exploiting Open APIs of existing installations/infrastructure

Revenue of the Smart Homes market worldwide is forecast to 58.58 billion US dollars in 2020.



Most devices are silo-based, single use cases, yet consumers will increasingly demand 'cross-functional' use cases for multiple devices

The S5 Tracker as a whole

- A cloud-based **analytics engine** acting as a data handling information environment of personalised and interlinked data streams **related to activities performed mostly by individuals**.
- Used for creating information-rich user profiles, based on activities recorded in diverse ICT communication channels and devices,
- Current information entry sources supported include APIs of specific IoT devices
 - ◆ Apple Healthkit, Fitbit, Nike+, Garmin, Smart devices, etc.
 - ◆ Web2.0 social platforms that record users activity (such as Facebook, Twitter, etc.)
 - ◆ other smart devices that could be connected to the platform such as Smart Home kits, etc.
- **Data Anonymization and Privacy preservation** service that can be used by third parties to generate aggregated **“User Personas”** which are fictional representative users.

The S5 Tracker Differentiation

- Combines various data sources from diverse domains (public and private)
- Personal data hub exploiting existing data repositories
- Not for just a single cause – ability to monitor different profiles of individuals
- Bringing together different actors of a value chain (individuals, analysts, etc.)
- Addressed to small/ medium organisations, without large analytics infrastructure/capabilities

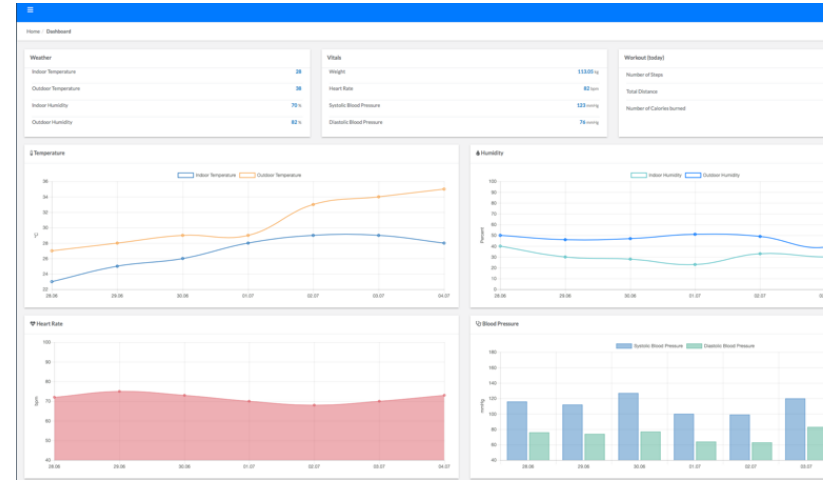


The Solution



Mobile App

- Acts as an intermediary data collector
- Retrieves data from smart devices
- Automatically collects and uploads their data to SHAL
- Receives notifications



Web App

- Creates "dynamic" Personas for undisclosed personal analytics
- Performs Analyses
- Displays easily to comprehend graphs
- Distributes Data

Data Recorded (Sample)

Measurements Model

Measurement Group	SHAL Types	SHALL Units
Device	Source	String
Measurement Duration	StartDate	datetime
	EndDate	datetime
Body Measurements	Weight	grams
	Height	centimeters
	Body fat percentage	%
	N/A	N/A
Blood Pressure	Systolic Blood Pressure	mmHg
	Diastolic Blood Pressure	mmHg
Body Temperature	Body Temperature	Celsius
Insulin	N/A	N/A
Fragility	Number of times fallen	Number
Oxygen Consumption	Oxygen Intake	Number
Heart Rate	Heart rate variability	Number
	Resting heart rate	Number
	Walking heart rate	Number
	Heart rate per minute	Number
Distance	Distance	meters
	Distance	meters
	Distance	meters
	Distance	meters
	N/A	N/A
	N/A	N/A
Geolocation Point	Geolocation Point	Double

Activity Model

SHAL Types	SHALL Units
Activity Type	String
Steps	Number
Distance	meters
Duration	seconds

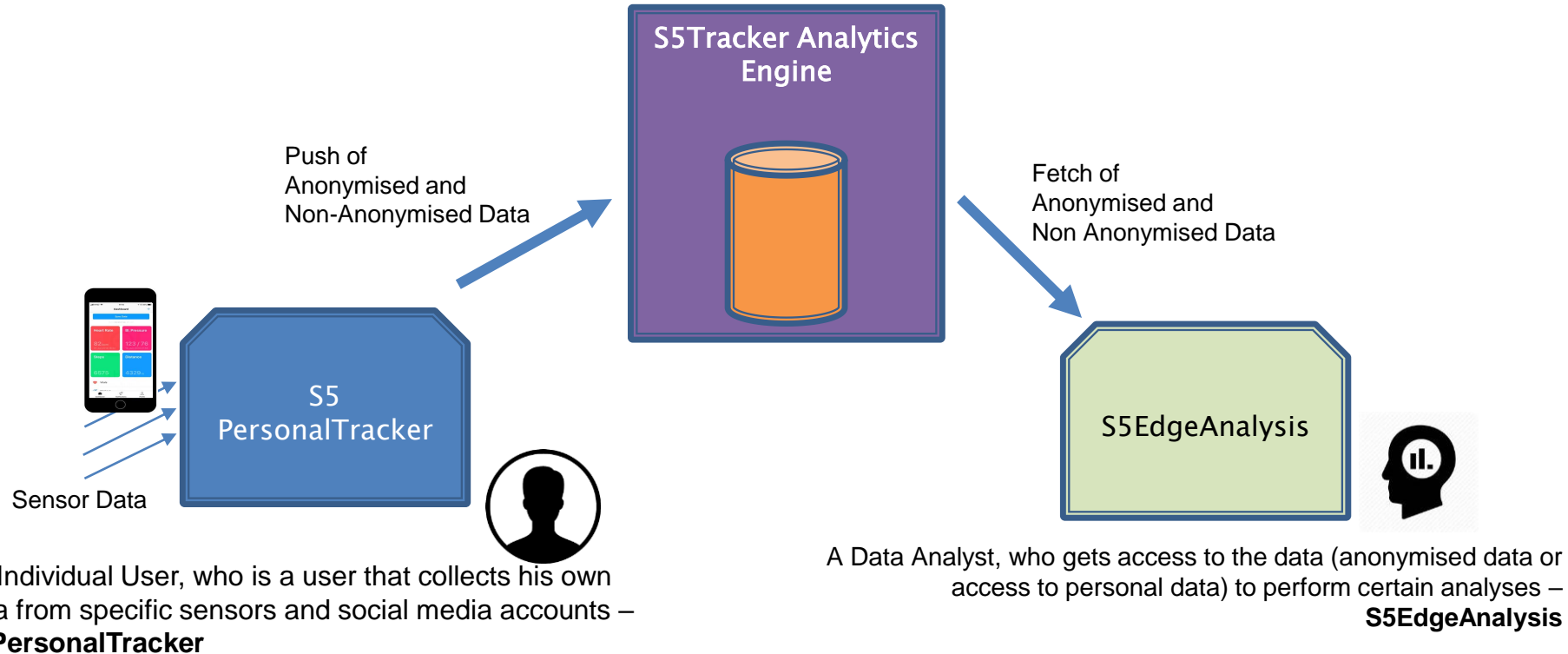
SHAL Types	SHALL Units
Temperature	Degrees Celsius
Humidity	Degrees Celsius
Relative Humidity	% (Relative Humidity)
Outdoor Humidity	% (Relative Humidity)
VOC	PPM
PIR Motion	Integer 0/1
Luminance	Lux
Lights Dimming Level	0-256 (Min = Off, Max = Full brightness)
Lights Status	Integer (0/1)
HVAC Status	Integer (0/1)
HVAC Mode	String (HEAT/COOL/FAN)
HVAC Setpoint	Degrees Celsius

HIGHLY SENSITIVE DATA

More than 2.000 rows per day (with limited devices/activity tracked)

More than 1.400 rows per day

The S5 Tracker FutureTPM Use Case - Overview



Use Case Needs

- I. **Privacy**, confidentiality and security at the edge (user side)
 - I. Privacy when uploading data (between S5PersonalTracker and S5Tracker Analytics Engine)

- II. **Data Integrity**
 - I. Trust in edge (data-push) devices (S5PersonalTracker)
 - II. Trust in cloud-based repo (S5Tracker Analytics Engine)

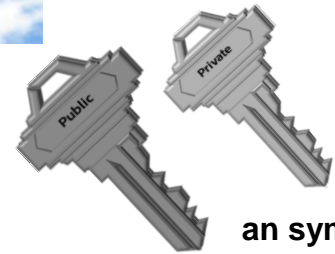
- III. **Secure data sharing**
 - I. No data leakage (from S5EdgeAnalysis)

Conventional Signature

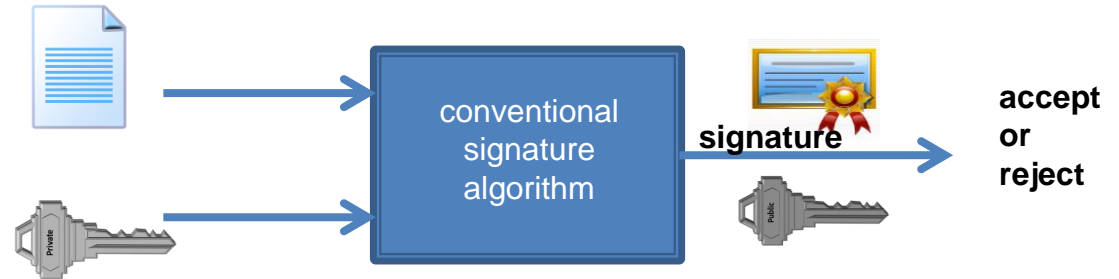
A privacy issue:

A signature reveals the signer's identity, since a public key is bound with the signer uniquely;

when a public key is introduced using a certificate, the certificate also reveals the signer's identity



an symmetric key pair



DAA

- Anonymity
- User-controlled-linkability
- Rogue TPM detection



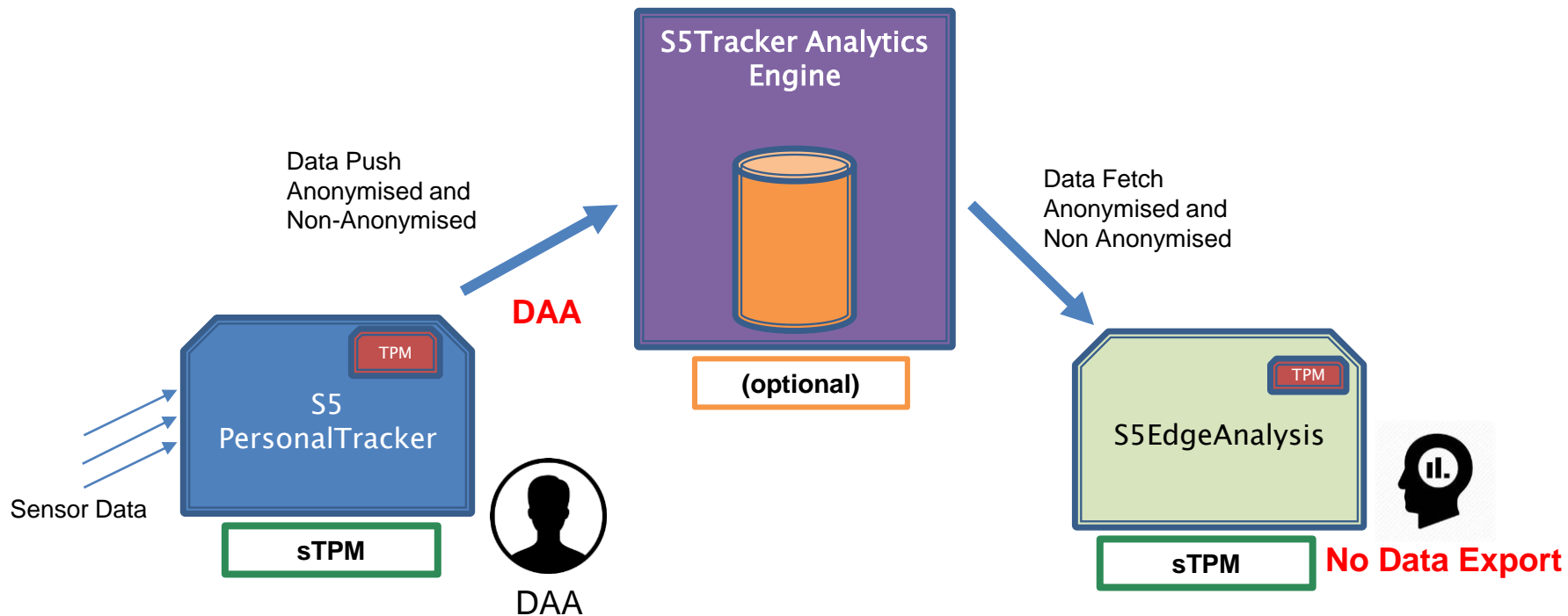
principal
signer - TPM

semi-trusted helper – Host:

- handle privacy but not security under the condition that the TPM is trusted
- do most of the signing operation



S5 Tracker Use Case – TPM Environment



Main Needs (as User Stories)

- *S5.IU.4 - As an Individual User, I want to be sure that **the S5Tracker Analytics Engine I want to connect to is trusted**, so that I can provide my data without issues.*
- *S5.IU.6 - As an Individual User I want to **upload data from the S5PersonalTracker to the S5Tracker Analytics Engine keeping my anonymity**, so that I cannot be traced back through the analysis of "personas"*

- *S5.DA.1 – As a Data Analyst, I want to be able to **have access to the data of individuals without being able to transfer them**, so that I can be trusted to perform my analyses in a privacy preserving manner*
- *S5.DA.2 - As a Data Analyst, I want to **be sure that the S5Tracker Analytics Engine I want to connect to is trusted**, so that I can get data without issues.*
- *S5.PL.3 - As the S5Tracker Analytics Engine I want to **acknowledge that a device used by an Individual User is trusted**, so I can allow information exchange*

- *S5.PL.4 - As the S5Tracker Analytics Engine I want to **acknowledge that a device used by a Data Analyst is trusted**, so I can allow information exchange for non-obfuscated data coming from an Individual User.*
- *S5.PL.5 - As the S5Tracker Analytics Engine I want to **prove that as a platform I have not been compromised** regarding my initial configuration, so that I am trusted by other entities*

FutureTPM Grant Agreement No. 779391

“The FutureTPM project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 779391.”

If you need further information, please contact the coordinator:

TECHNIKON Forschungs- und Planungsgesellschaft mbH

Burgplatz 3a, 9500 Villach, AUSTRIA

Tel: +43 4242 233 55 Fax: +43 4242 233 55 77

E-Mail: coordination@futuretpm.eu

The information in this document is provided “as is”, and no guarantee or warranty is given that the information is fit for any particular purpose. The content of this document reflects only the author’s view – the European Commission is not responsible for any use that may be made of the information it contains. The users use the information at their sole risk and liability.