

IoT improves Privacy for Competitive Athletes

PARADISE

Privacy-enhancing And Reliable Anti-Doping
Integrated Service Environment

EXCELL



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SUMMER SOC 2018



Bundesministerium
für Bildung
und Forschung

Doping in sports

2017 in review: the year of doping scandals

Friday, 15 December 2017



Can we ever trust athletes again? The worldwide love of sport depends on our belief that stars do not cheat. But in 2017 all that was tested by a succession of major doping scandals.

➔ What to do?

EPIX ORIGINAL DOCUMENTARY

THE DIRTY SIDE OF SPORTS DOPED
NARRATED BY NICK KROLL

ePIX WE GET BIG STORIES
PREMIERES WED SEPT 30TH 8PM #Doped

Armstrong: 'Impossible' to Win Tour Without Doping

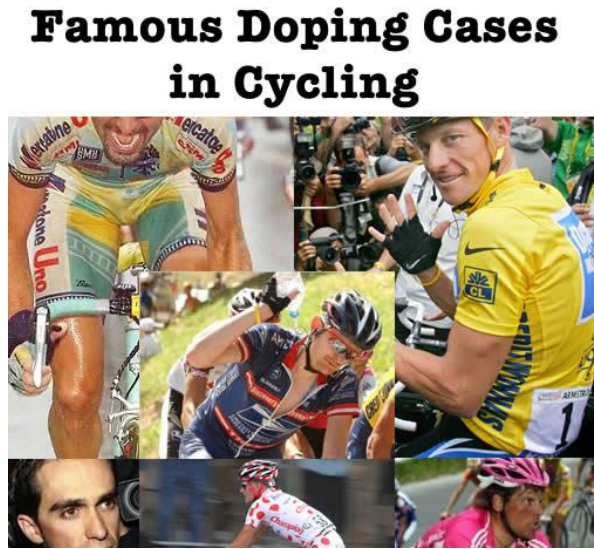
Jun 28, 2013 11:11 AM CDT

THE SUNDAY TIMES

British doctor claims he doped 150 sports stars

THE DOPING SCANDAL

PREMIER LEAGUE FOOTBALLERS, AN ENGLAND CRICKETER, BRITISH TOUR DE FRANCE CYCLISTS, A BOXING CHAMPION AND TENNIS PLAYERS ARE AMONG HIS ALLEGED CLIENTS



How is the fight against doping organized?

- Global Anti-Doping Organization Chart



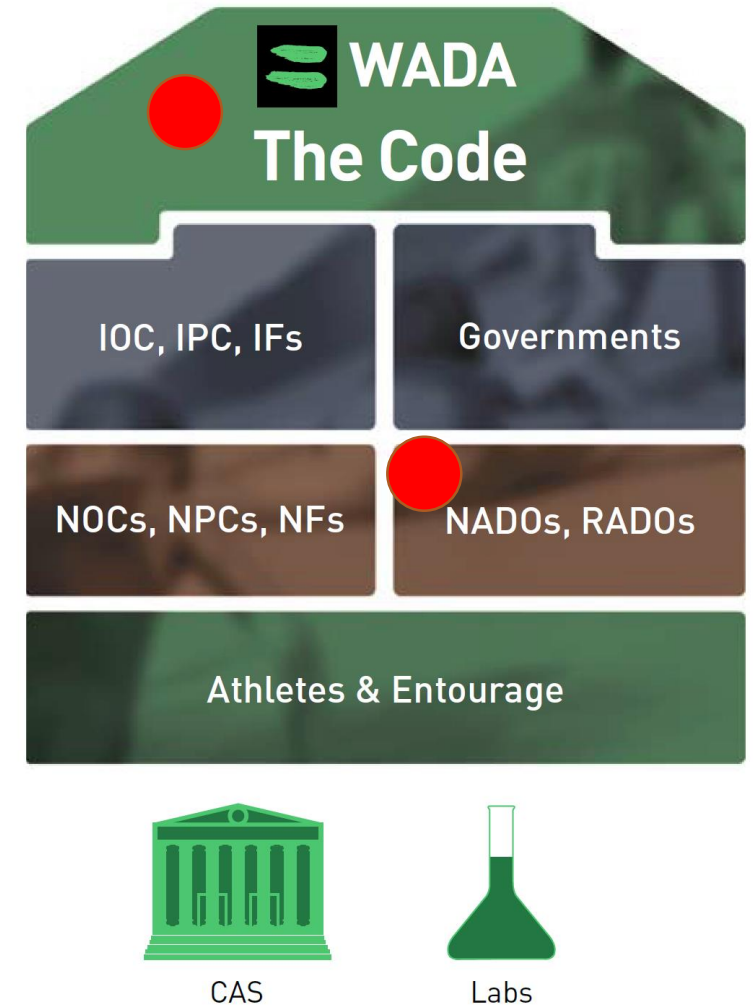
How is the fight against doping organized?

- **WADA = World Anti-Doping Agency**
- international, independent organization monitoring the global fight against doping in sport
- Custodian of the **World Anti-Doping Code (Code)**.
 - rules aiming to harmonize anti-doping regulations in all sports and countries
 - Testing
 - Laboratories
 - Medical Exemptions (TUE);
 - the list of prohibited substances and methods;
 - ...
 - the Code is the primary organizing force



How is the fight against doping organized?

- **NADOs/RADOs = National/Regional Anti-Doping Organizations**
- responsible for:
 - testing national athletes in- and out-of-competition,
 - as well as athletes from other countries competing within that nation's borders
 - ...
- examples
 - NADA (National Anti-Doping Agency) Germany
 - NADA (National Anti-Doping Agency) Austria
 - USADA (US Anti-Doping Agency)
 - RUSADA (Russian Anti-Doping Agency)
- have accepted the code and are expected to act according the code



Effective Doping Controls

- Regular
- Comparable, fair
- Unannounced

→ Need to be planned, coordinated and executed

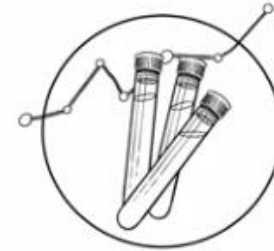
Anti-Doping Administration and Management System

ADAMS

- WADA's global information system, which NADA Germany uses as well.
- Web-based database management system
- Should simplify the daily activities of all stakeholders and athletes involved in the anti-doping system.



WHEREABOUTS
KONTROLLAUFRÄGE
KONTROLLPLANUNG



KONTROLLE DER BLUTPARAMETER
BEOBACHTUNG DER BLUTPROFILE
INTERPRETATION DER PARAMETER



PRÜFUNG DER ANALYSEERGEBNISSE
ÜBERSICHT DER ANALYSEPROFILE
VERWALTUNG DER ERGEBNISSE

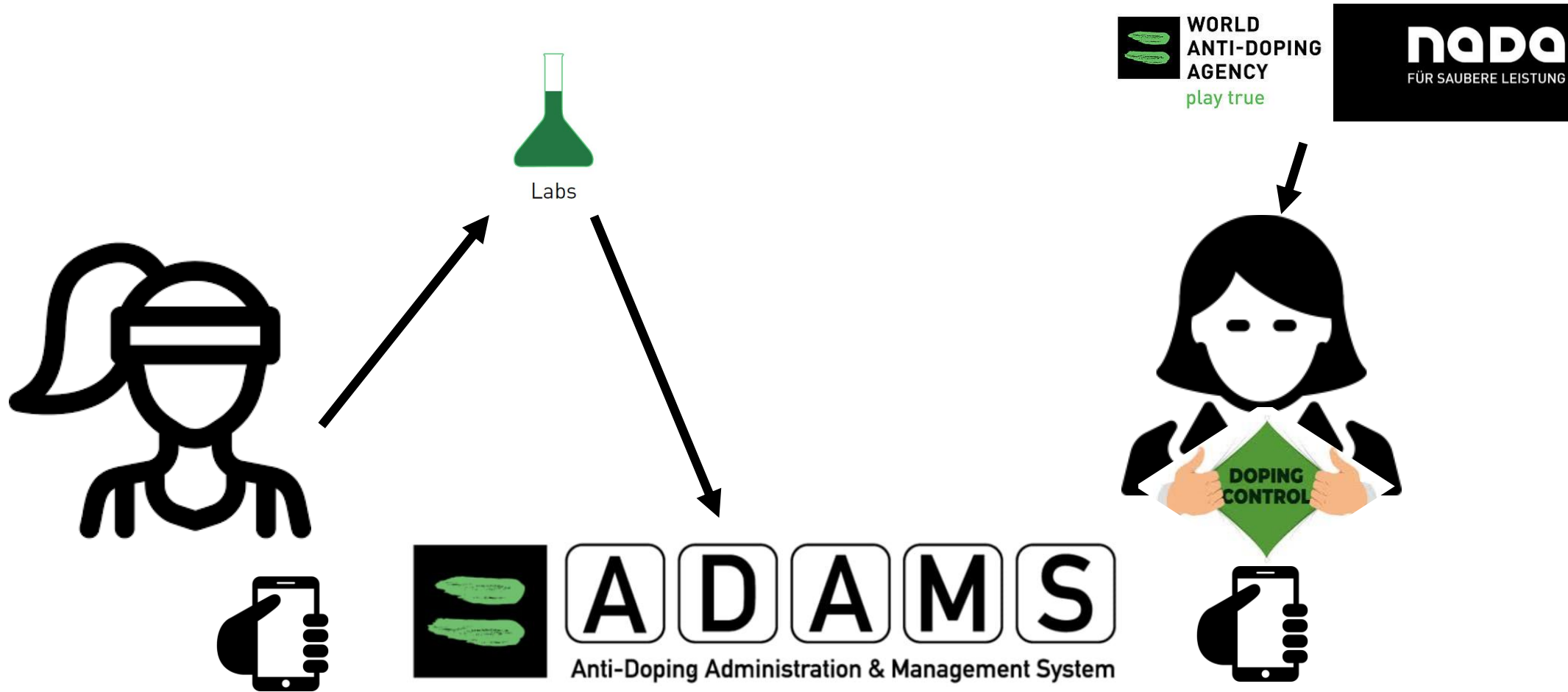
Data collected:

- athlete data (name, date of birth, sport and contact details),
- Athletes whereabouts and accessibility,
- the use of medicine/drugs for therapeutic reasons,
- doping control documents, doping test results and the biological athlete's pass.

Purpose:

“...solely for the planning, coordination and execution of doping controls.”

ADAMS Workflow Unannounced Doping Controls



ADAMS Criticism

For professional athletes, this means:

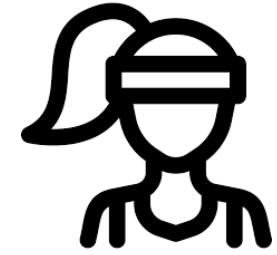
- Plan and enter their whereabouts 3 month in advance
- specify and update their location to allow unannounced doping controls
- exposing their daily lives which is a massive invasion of their privacy.
- the pure care of the reporting system is very time consuming and sometimes inflexible

“Athletes are not presumed innocent. On the contrary, they are under the pressure to prove their innocence.”

In general

- the amount and storage time of the data seems to be higher than actually necessary
- bad transparency
 - For example, it remains unclear who can access the data collected
- Insufficient security: records were stolen from ADAMS (by Russian hacker Fancy Bears)

Paradise Requirements



Athletes:

- considerable planning effort
- sensitive invasion of privacy
- holds a variety of possible sources of error

They wish:

- A technologically up-to-date system
- That lessens the load on the athletes
- That respects their privacy
- That complies with the law



DCOs:

- DCOs ask for as much information as possible about an athlete's daily
- this helps service providers plan and assign the controls to specific DCOs
- helps DCOs plan their journey to an athlete's location

They wish:

- detailed and correct whereabouts' information ensuring a quick doping control
- no waste of time, resources, and also money

Paradise Goals



Privacy

Effective
Controls

PARADISE
Privacy-enhancing And Reliable Anti-Doping
Integrated Service Environment



Usability



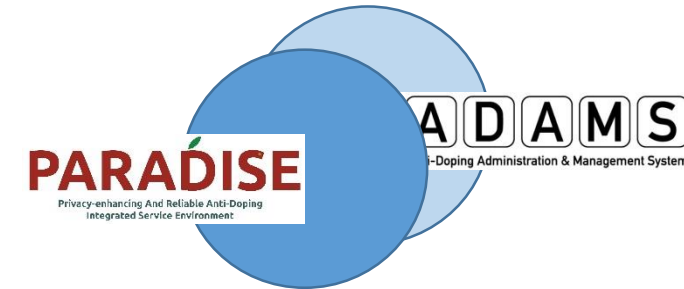
The origin of Paradise

- Or: How ADAMS motivated the rise of eves, which finally turned into PARADISE
- First ideas for localization-based Anti-Doping System “**eves**” were developed in early 2012 by 400m runner Jonas Plass.
- In the first concept, the eve was foreseen as an optional supplement to the ADAMS system, building the PARADISE system.
- Later it was decided to develop the PARADISE system so that it could also serve as a basis to replace the ADAMS system.
- BMBF-funded project PARADISE:
 - Fraunhofer AISEC & FIT, Technische Universität Berlin, ULD, Unicon and gecko
 - 2016-2018



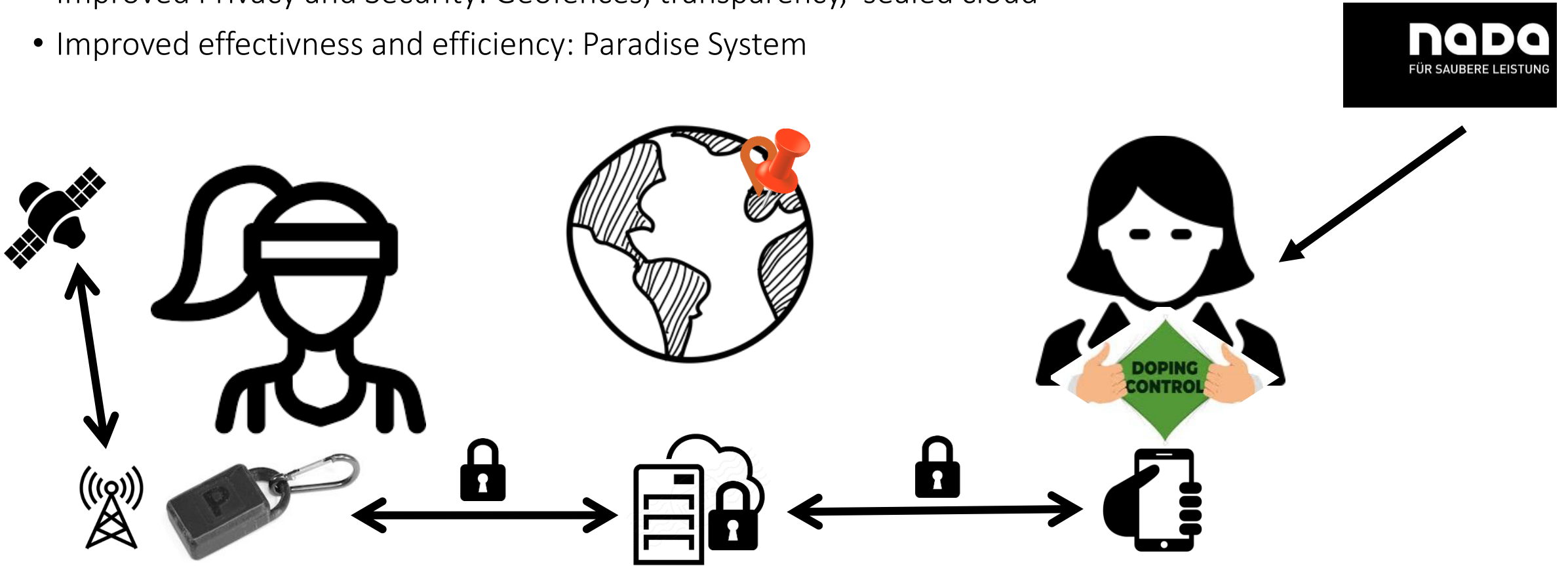
eves ↔  **A D A M S**
Anti-Doping Administration & Management System

eves +  **A D A M S**
Anti-Doping Administration & Management System
PARADISE



Paradise: a new approach

- Improved Usability: Wearable, GUI
- Improved Privacy and Security: Geofences, transparency, sealed cloud
- Improved effectiveness and efficiency: Paradise System



Wearable and Data Protection

- “eves” device to locate the athlete (unpredictable for the athlete)
- Wearable using GNSS (GPS) and GSM (Cell ID)
- All communications are wireless and AES-encrypted over the GSM network
- No other interfaces
- No data is stored, no motion profile is recorded!
- Location data only send when needed



Different prototypes eves device

Geofences - Location Information on a Need-to-Know Basis



PARADISE-Demo

Secure <https://demo.privacy-paradise.de/dco/orders/CTLI2006>

Abmelden

DCO
Julian Quandt

KONTROLLAUFRÄGE 0

HISTORIE

1. Feb 2017 - 18. Feb 2017
Kontrollzeitraum

CTLI2006
Auftragsnummer

+491779987234
Testart(en)

Urin

Weitsprung (IAAF)
Sportart und Verband

Ablehnen x

Felix Glockner

Map of Berlin showing a geofence area (orange outline) and various landmarks like the Humboldt-Universität Campus Nord, Tiergarten, and Zoo Berlin. The map includes a search bar, zoom controls, and a legend.

Position Anfragen

Position Senden

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Geofences - Location Information on a Need-to-Know Basis



PARADISE-Demo

Secure | <https://demo.privacy-paradise.de/dco/orders/CTLI2006>

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Ablehnen x

Map showing a geofence area in Berlin, centered around the Spree river and surrounding urban areas. The map includes labels for streets, parks, and landmarks. A blue line indicates the geofence boundary.

Position Anfragen

Position Senden

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Geofences - Location Information on a Need-to-Know Basis



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Auftragsnummer

+491779987234
Teststart(en)

Urin
Sportart und Verband

Weitsprung (IAAF)

Ablehnen x

Athlet
GPS: Lat: 52.542741, Lng: 13.343897, Qualität: 80m, Zeit: Thu Jan 05 2017 16:13:40 GMT+0100 (CET)
GSM: Lat: 52.542741, Lng: 13.343897, Qualität: 500m, Zeit: Thu Jan 05 2017 16:13:45 GMT+0100 (CET)
Batterie: 34
Status: FINISHED

Charité Campus
Virchow Klinikum

Position Anfragen

Position Senden

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Geofences – private Areas or privacy “Gardens”



PARADISE-Demo

Secure | <https://develop.privacy-paradise.de/athlete/fences>

Abmelden

ATHLET
Denis Giffeler

KALENDER

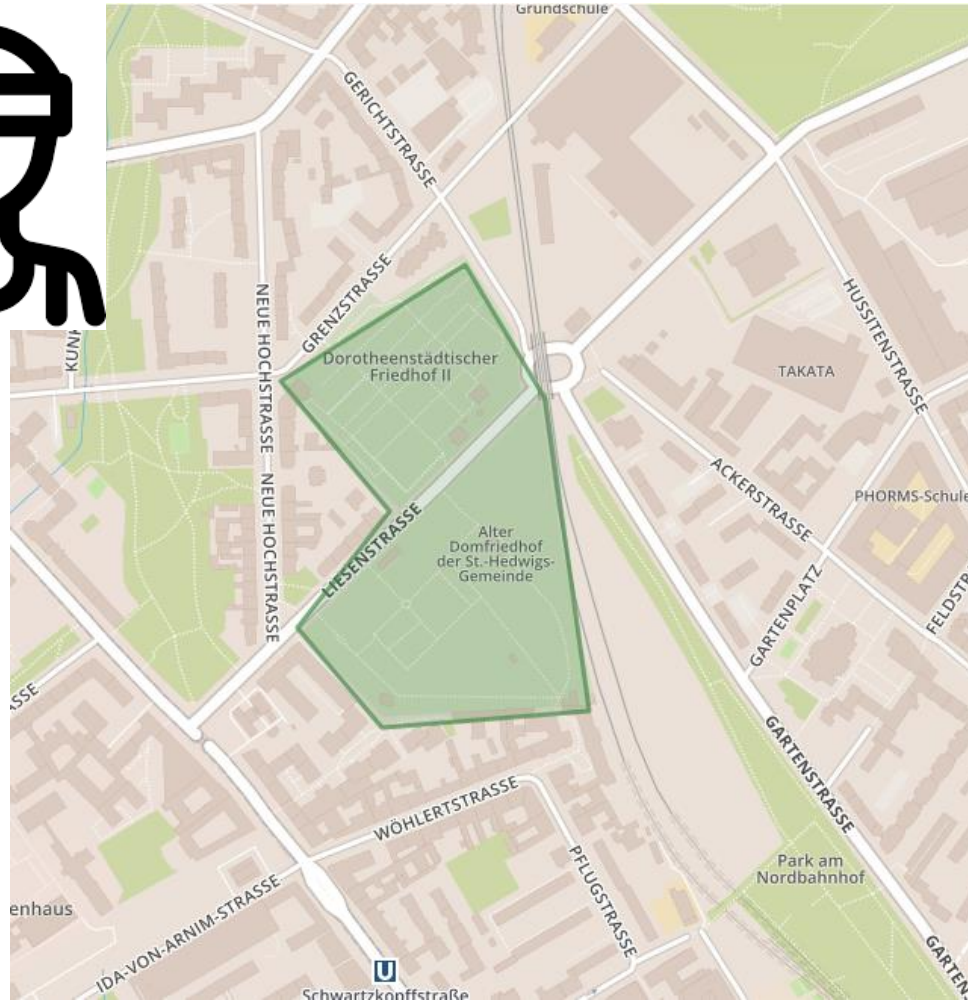
GEOFENCES

PRIVACY PROTOKOLL

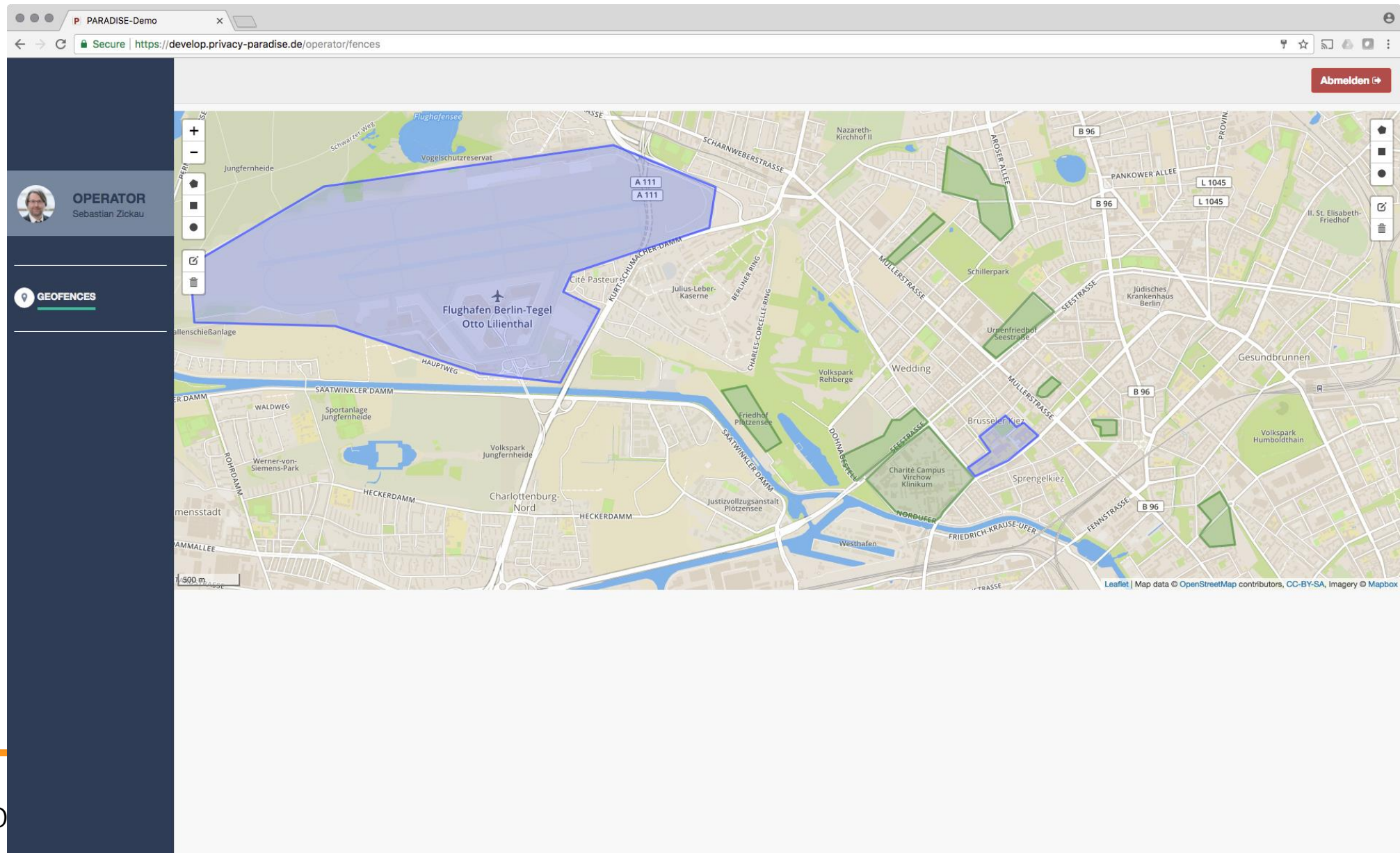
Die Zone ist inaktiv: Die gewaehlte Zone ist zu gross.

- The athletes can create, edit and delete these areas.
- Privacy Areas are limited in size and amount

Geofences – private Areas or privacy “Gardens”



Geofences - Exclusion Areas



Transparency also for the Athlets



PARADISE-Demo

Secure | <https://develop.privacy-paradise.de/athlete/log>

Abmelden

ATHLET
Jonas Plass

KALENDER

GEOFENCES

PRIVACY PROTOKOLL

KONTROLL-ID	AKTION	ZEITPUNKT
CTLI1000	POSITION	26. Januar 2017 0:00
CTLI1000	POSITION	25. Februar 2017 13:21
CTLI1000	POSITION	27. Februar 2017 22:09
CTLI1000	POSITION	27. Februar 2017 22:17
CTLI1000	POSITION	28. Februar 2017 9:11

DCOs clear Overview



PARADISE-Demo

Secure | <https://develop.privacy-paradise.de/dco/orders>

Abmelden

Name	Kontrollzeitraum	Auftragsnummer	Status
 Jonas Plass	27. Okt 2017 - 5. Nov 2017	CTLI5001	? NEU
 Denis Giffeler	29. Okt 2017 - 5. Nov 2017	CTLI5002	? NEU
 Clemens Putschli	29. Okt 2017 - 5. Nov 2017	CTLI5003	? NEU

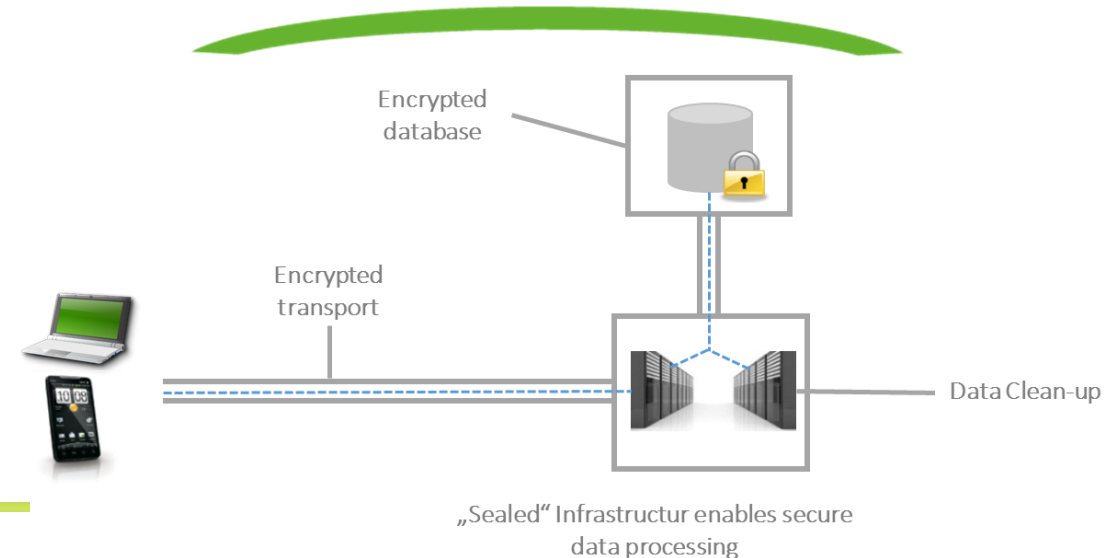
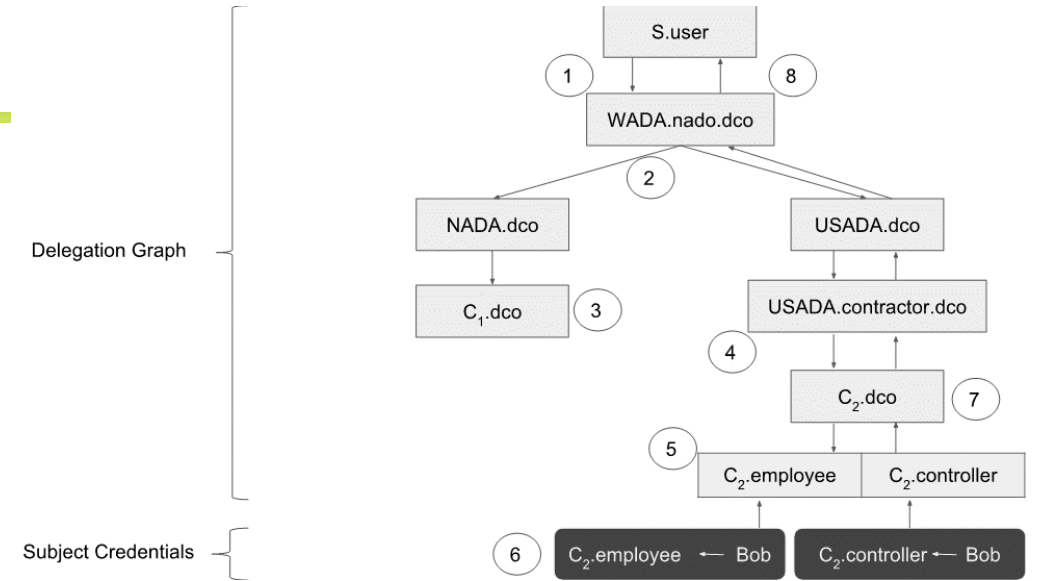
DCO
Sebastian Zickau

KONTROLLAUFRÄGE 3

HISTORIE

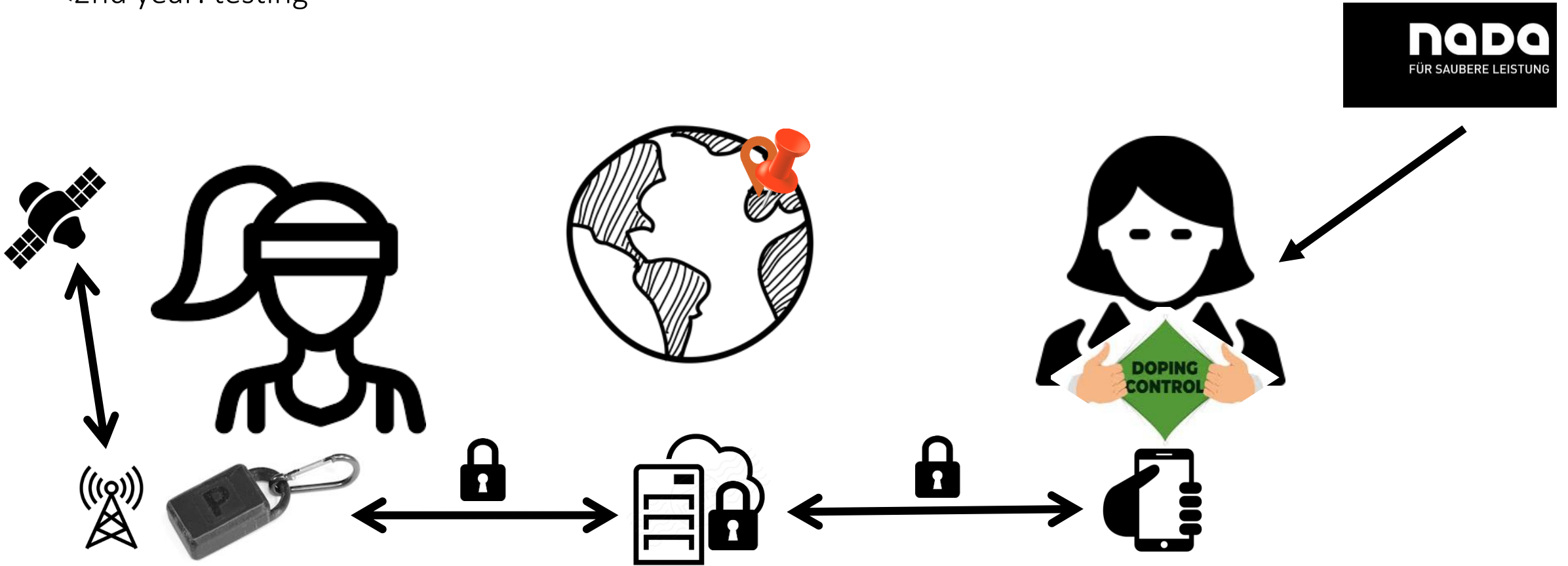
Security Aspects

- Attribute-based Access Control
- Attribute-based Delegation
- Privacy-preserving Location-based Access Control using geofences
- Encrypted text messages
- No 3rd-party services necessary
- Sealed-Cloud technologies
 - Data Cleanup Areas
 - No administrator access



Paradise: Evaluation

- >1st year: iterative system development
- <2nd year: testing



Improvements - Usability



- ✓ Automatically collected data
- ✓ Fewer data input for athletes
- ✓ Data input required less often
- ✓ Spontaneous whereabouts changes
- ✓ More intuitive interface and interaction



- ✓ More intuitive interface and interaction
 - ✓ Up-to-date location information
 - ✓ Could be used together with a car navigation system
 - Including: privacy navigation ideas
- They still prefer having also historical data

Improvements - Privacy



- ✓ smaller invasion of privacy
- ✓ Can influence the “meeting point”
- ✓ Transparency

Improvements – effective controls



- ✓ More flexibility for athletes and their daily whereabouts



- ✓ More accurate whereabouts data
- ✓ less dependency on the entries of the athlete
- ✓ Better planning



- ✓ Unpredictable controls
- ✓ Time can be reduced between phone call and meet-up

Paradise Achievements



Privacy



Effective
Controls



PARADISE
Privacy-enhancing And Reliable Anti-Doping
Integrated Service Environment

Usability



PARADISE OUTLOOK

- Positive results, but
- **risks and interferences** for a wearable-based system have been identified, e.g.:
 - wearable may be lost or destroyed, without the athlete even noticing it
 - wearable may be used by an unintended user, such as another athlete
 - DCS may be used in all kinds of weather and environments
 - DCS may be polluted by sweat, saliva, mud, dust, water, blood, and other pollutants
 - Other devices present in the environment may cause radio or communication interference
 - GNSS signal coverage may be missing for long periods
 - Wearables may be stolen or come into the possession of individuals who misuse them
 - DCS may not be able to deal with changes in the doping control process or in the athletes' lifestyle.
 - DCS may have unexpected legal and ethical implications or may be used for purposes other than doping control
- However, the further implementation of the idea is **currently failing due to political hurdles**

Thank you for your attention!



Contact data

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Phone: +49 2241 141562