THINK INSPIRE CREATE

developing tomorrow's technology today

ADVANCED SOLUTIONS NEDERLAND



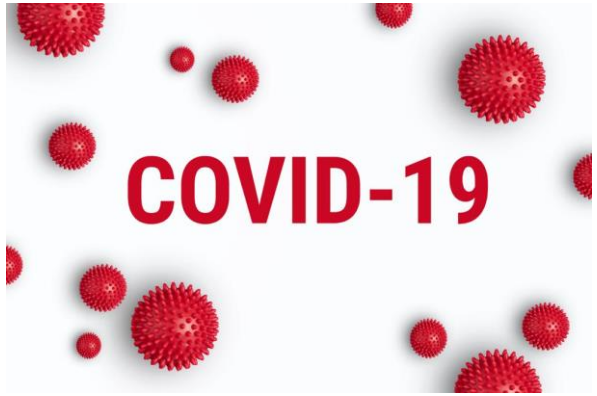

ASN medical solutions for combating the Covid-19 virus

June 2020

for public release (NLR)

Covid-19: What we know

- The Covid-19 virus has become a pandemic
- 8 million confirmed cases and more than 430,000 deaths worldwide (John Hopkins)
- All governments locked down their countries to prevent spread of virus



Impact on people

- Most cities have become ghost towns
- Social distancing and wearing of masks introduced
- Incidents of rioting, and people demanding more civil rights
- Hospitals and emergency resources stretched to the limit
- Global economy to shrink by 3% in 2020
- Worst financial outlook since the 1930s great depression (IMF)

Covid-19: What we know

The good

- Air quality has significantly improved (especially in India)
- Price of oil fell to below zero for the first time in history
- Less travel by air
- More use of bicycles (Europe)
- People are re-evaluating their lives

The bad

- Sharp increase in mental illness and domestic violence cases
- Record levels of unemployment
- Massive economic damage

Noticeable changes in society

- Major cities have seen a massive reduction in tourism
- Air quality has significantly improved (especially in India)
- Weather has significantly improved, as the ‘planet repairs itself’
- Animals seen roaming the streets
- Social distancing and wearing of masks introduced
- Working at home culture encouraged
- Less need for offices
- Video conferencing: distance learning and meetings

Social distancing

The facts and challenges

- Lockdown measures introduced in almost all countries
- Social distancing of **minimum 1.5m** has been introduced
- People advised to work at home
- Small gatherings allowed, but are discouraged
- Offices and venues are slowly re-opening but with strict social distancing controls

Challenges

- People are tired of following the rules, and want to get back their normal way of life
- Lack of discipline following rules
- Increased risk of second wave

How do we get people safely back to work?

Solutions

- All major technology vendors (Microsoft, Google, Apple, IBM) are busy with technical solutions
- ML/AI solutions currently under development, but still not ready for deployment
- 3D scans via lidar solutions are very expensive!
- Camera based (mask detection) solutions are interesting but are slow.
- Face recognition in public spaces to be banned within EU until 2025.
- Most social distancing apps are based on a Bluetooth which lacks accuracy, and the app is privacy sensitive

Protecting government assets

- Civil servants
- Restaurant personnel
- Police/soldiers barracks
- Royal palace

How do we get people safely back to work?

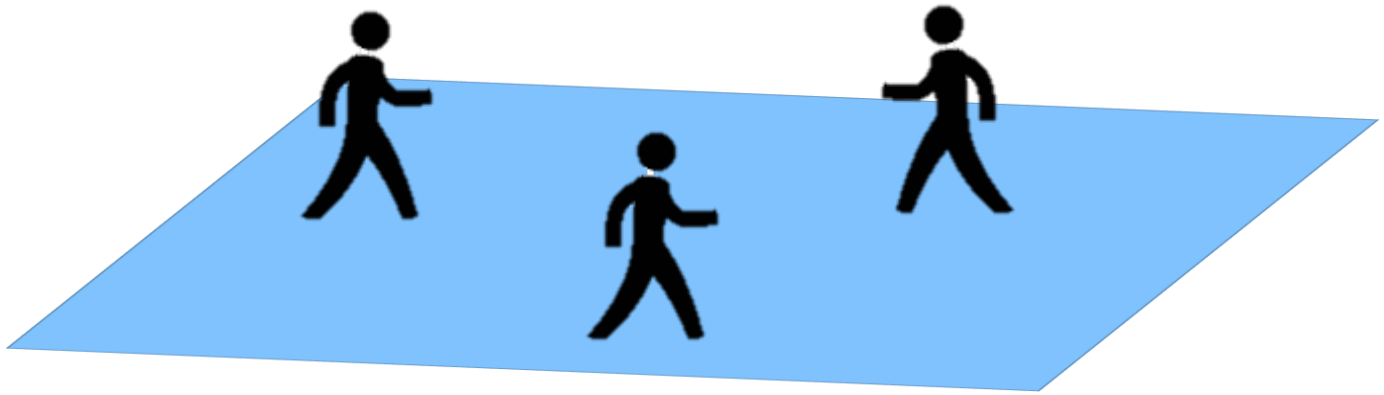
- How do we provide social distancing solutions for these situations?
- ASN works with the Dutch government and partners to provide solutions.

Diverse terrains and buildings

Enforcing social distancing rules

The challenges

- How do we determine the distance between people automatically?
- We need a flexible solution that doesn't require much expert knowledge to install and use
- Robust solution that works in office, shops, and all weather and lighting environments.
- Reporting violations needs to be simple



Which RF technology do we pick?

Inventor of Bluetooth says, “Bluetooth is not accurate enough for Corona apps”

tweakers Nieuws Reviews Pricewatch Vraag & Aanbod Forum Carrière Meer

Zoek naar nieuws

Bluetooth-uitvinder vindt bluetooth niet nauwkeurig genoeg voor corona-app

De Nederlandse uitvinder van bluetooth Jaap Haartsen vindt dat de draadloze techniek niet genoeg zekerheid geeft over de afstand om te kunnen gebruiken voor contactonderzoek met corona-apps.

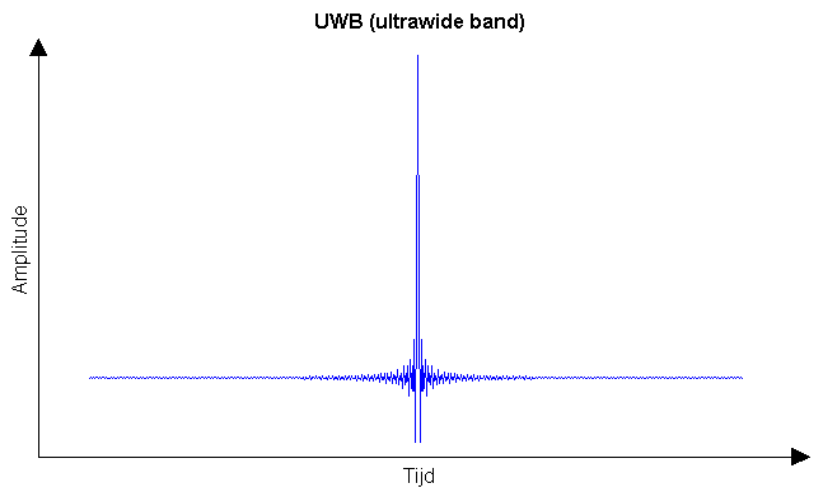
Jaap Haartsen

Haartsen noemt het in een interview met Computable 'niet gek' dat apps bluetooth inzetten, omdat het gebruik van gps privacygevoeliger ligt. Volgens hem kun je met bluetooth bijhouden wie er binnen het bereik van de radiosignalen is geweest. Daaruit is wel de afstand af te leiden, maar dat is niet erg nauwkeurig. Hij wijst erop dat meerdere variabelen van invloed zijn op de meting van het bereik, zoals het zendvermogen, de ontvangstgevoeligheid, de afstand en de aanwezigheid van obstakels die het signaal kunnen verstoren of anderszins beïnvloeden.

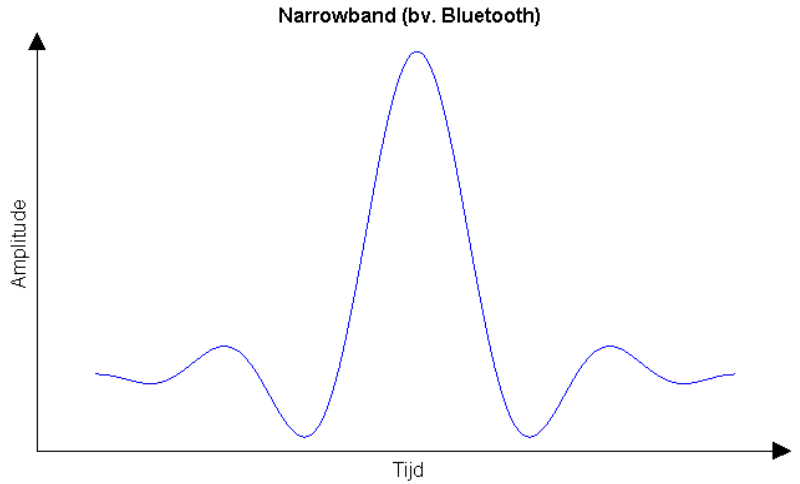
"Men is binnen de Bluetooth Special Interest Group wel bezig met afstandsbepaling, met een nauwkeurigheid van ongeveer een meter, maar dit is er voorlopig nog niet. Voordat het grootschalig in telefoons zit, zijn we wel een aantal jaren verder", zegt Haartsen. Hij verwijst daarbij naar een op fasen-gebaseerd protocol van imec dat de afstand nauwkeuriger kan meten door directe line-of-sight-metingen te scheiden van de multipathcomponenten.

Technology	UWB	BLE/LoRA	WiFi
Accuracy (m)	0.1-0.3	3-5	5-15
Immunity to interference + multipath	excellent	poor	poor
Performance in the presence of obstructions	good	poor	poor

Why UWB is the best RF technology for social distancing



- Ranging technology: ToF (time of flight)
- Performance: excellent RF performance in built up environments with metal structures and obstacles.
- Very low power: UWB Tx power is about 0.01% of a Wi-Fi router.
- **LOS location accuracy: 10-30 cm**



- Ranging technology: RSSI (received signal strength indication)
- Performance : poor RF performance in built up environments with metal structures, such as factories.
- Good for proximity detection/alerting, but not for accurate localisation.
- **LOS location accuracy: 3-4 metres**

CovidBuzzer

Highlights

- UWB (ultrawide band) + BLE (Bluetooth low energy) smart tag
- UWB used for distance measurement, BLE used for communication with smartphone app
- Real-time distance tracking + alarm (LED + vibration)
- Remote alerting via an app using BLE
- Multiple tags support
- **No privacy issues: EU privacy/GDPR requirements compliant**
- 10cm accuracy (LOS)
- 30m maximum range (LOS)

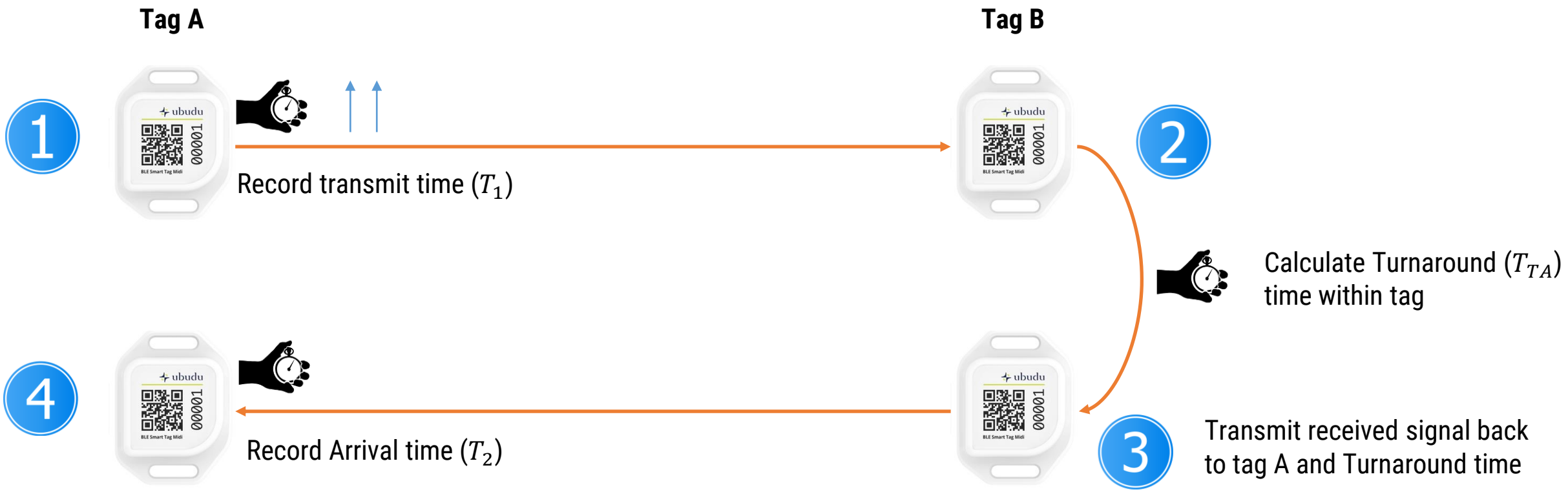
- Safe for long term human use
- **No infrastructure required: tags communicate with each other autonomously**
- Adjustable alert distance threshold
- Battery life: 24 hours (rechargeable)
- 99.97% reliability in the presence of obstacles

High precision measurement with UWB

- UWB transceiver uses transmit and receive timestamps rather than BLE's RSSI concept.
- Ultra-fine timestamp resolution (approx. 15ps)
- 10cm LOS accuracy, 30-50cm in built up areas (obstacles and lots of metal)
- **TWR (two way ranging) concept**
  - Timestamp information used for ranging calculations.
  - **No clock synchronisation required, tags determine relative distance**
  - Symmetric Double-Sided Two-Way Ranging (SDS-TWR) used for higher reliability (overcoming SoC clock drift)
- 99.97% reliability in multi-environments (office spaces, factories etc)
- Much more reliable than RSSI estimation, as effects of obstacles and multipath are minimised

TWR in a nutshell

Determining distance between Tag A and B



$$T_{TOF} = T_2 - (T_1 + T_{TA})$$ **Total time of flight time** (T_{TOF})

$$Distance_{A \to B} = \frac{cT_{TOF}}{2}$$ **Actual distance scaled by speed of light,** $c = 3 \times 10^8\ m/s$

Are people using this?

17,000+ pieces sold!

DFW DUTCH FILMWORKS

JOHAN CRUIJFF ARENA

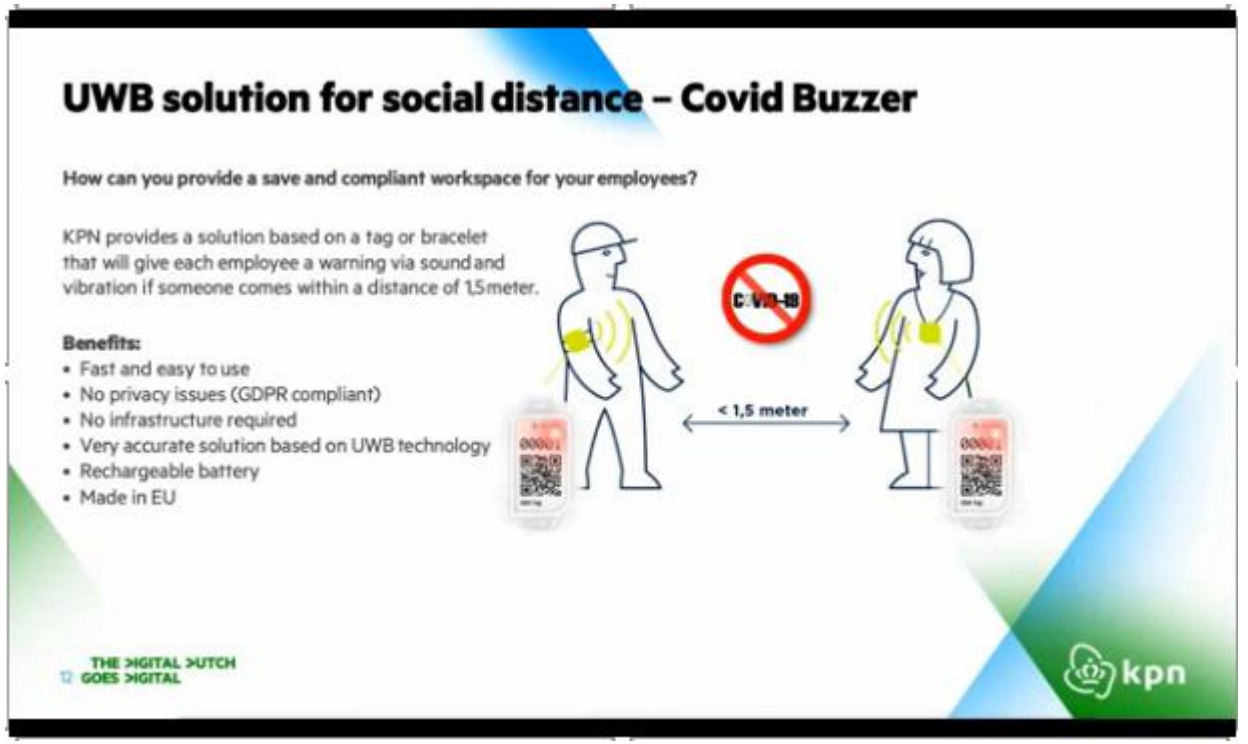
ZorgAccent

Rijksoverheid

kpn

BOSCH

The Digital Dutch TV event



More information available: www.covidbuzzer.com

Getting India safely back to work

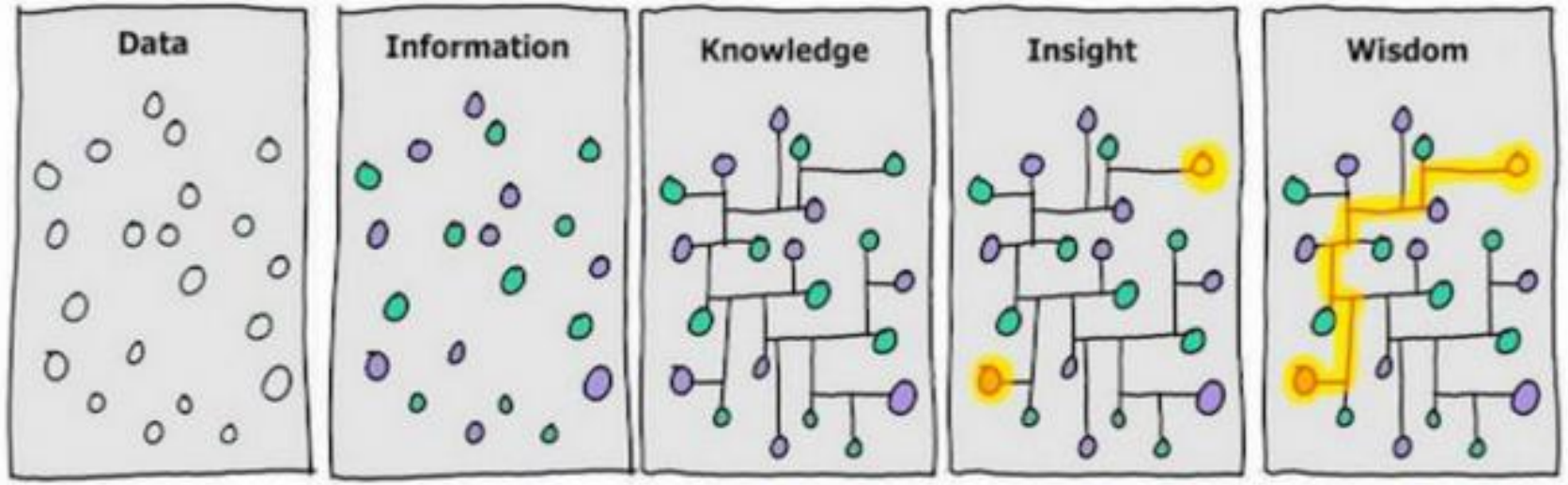
The next steps for the Indian market

Phase 1: public acceptance of the CovidBuzzer

- People are reluctant to attach tags that monitors them
- Does the technology work well enough to be trusted?
- Can the technology be easily integrated into people's way of working?
- Do people feel happy to use the technology?
- Do people feel safer with the solution?

Getting India safely back to work

The next steps for the Indian market



Algorithms and data analytics joins behavioural science

Getting India safely back to work

The next steps for the Indian market

Phase 2: contamination reports

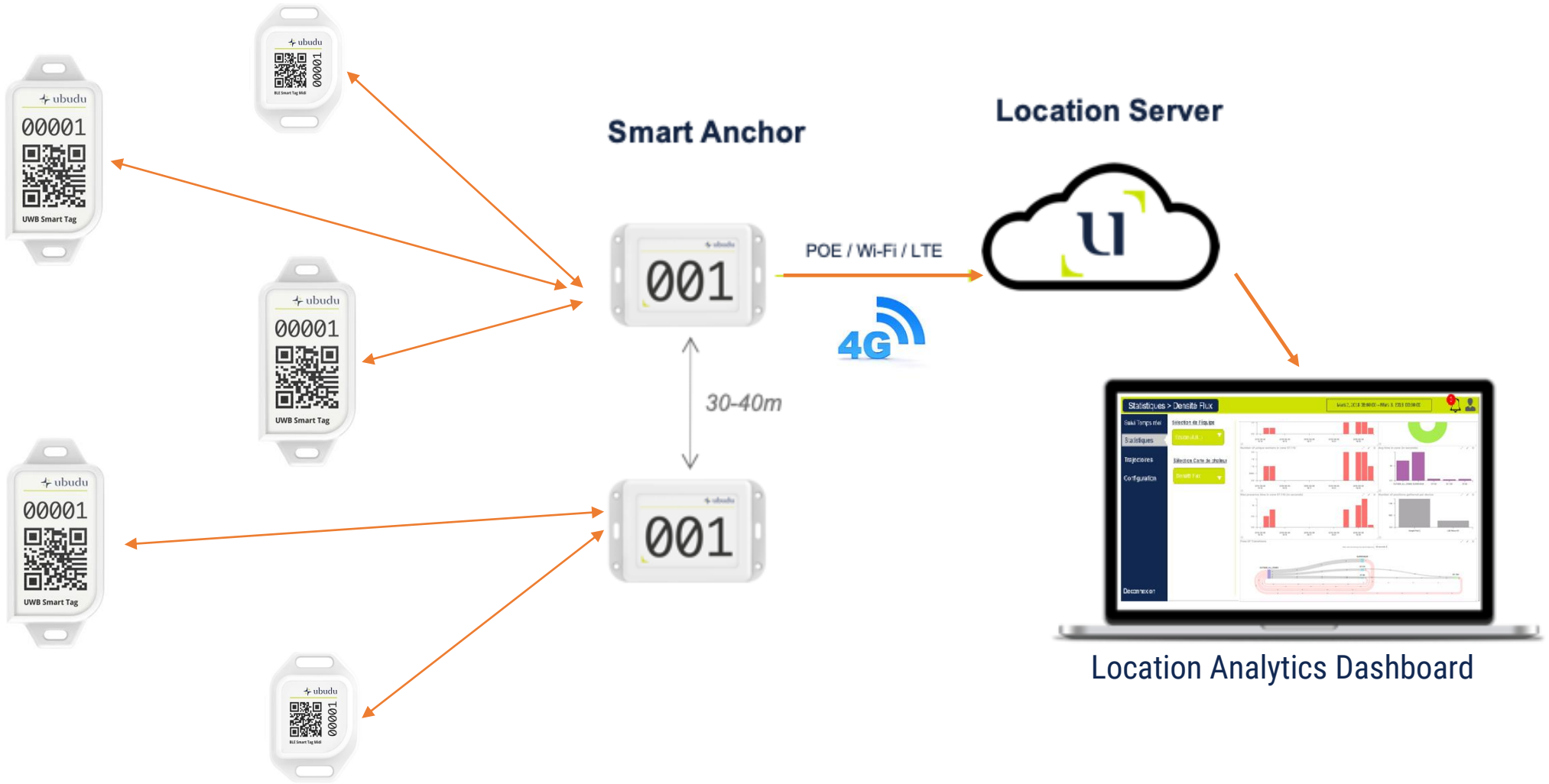
- CovidBuzzer solution may be expanded to provide track and trace functionality
- Data analysis and analytics
- Prevent more deaths by quickly acting when someone falls ill

Phase 3: other technologies

- State-of-the-art medical technologies for combating Covid-19
- VLS (vital life signs) tracking in quarantine centres
- Contactless temperature scanning

Getting India safely back to work

Tracking contamination in buildings



Getting India safely back to work

Contamination chain

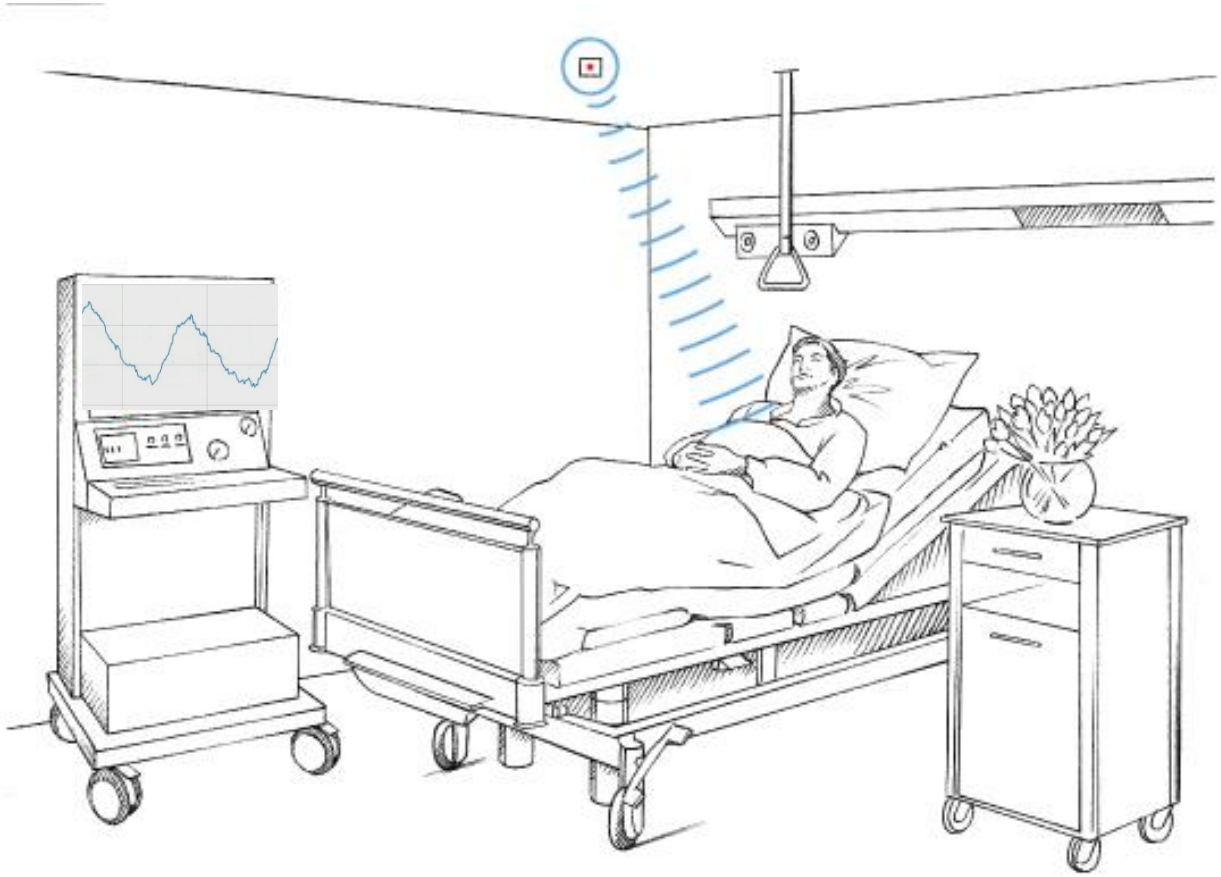
Equipment Tags, mobile app & wristband:

Trajectories replay to visualize contamination chain:

Getting India safely back to work

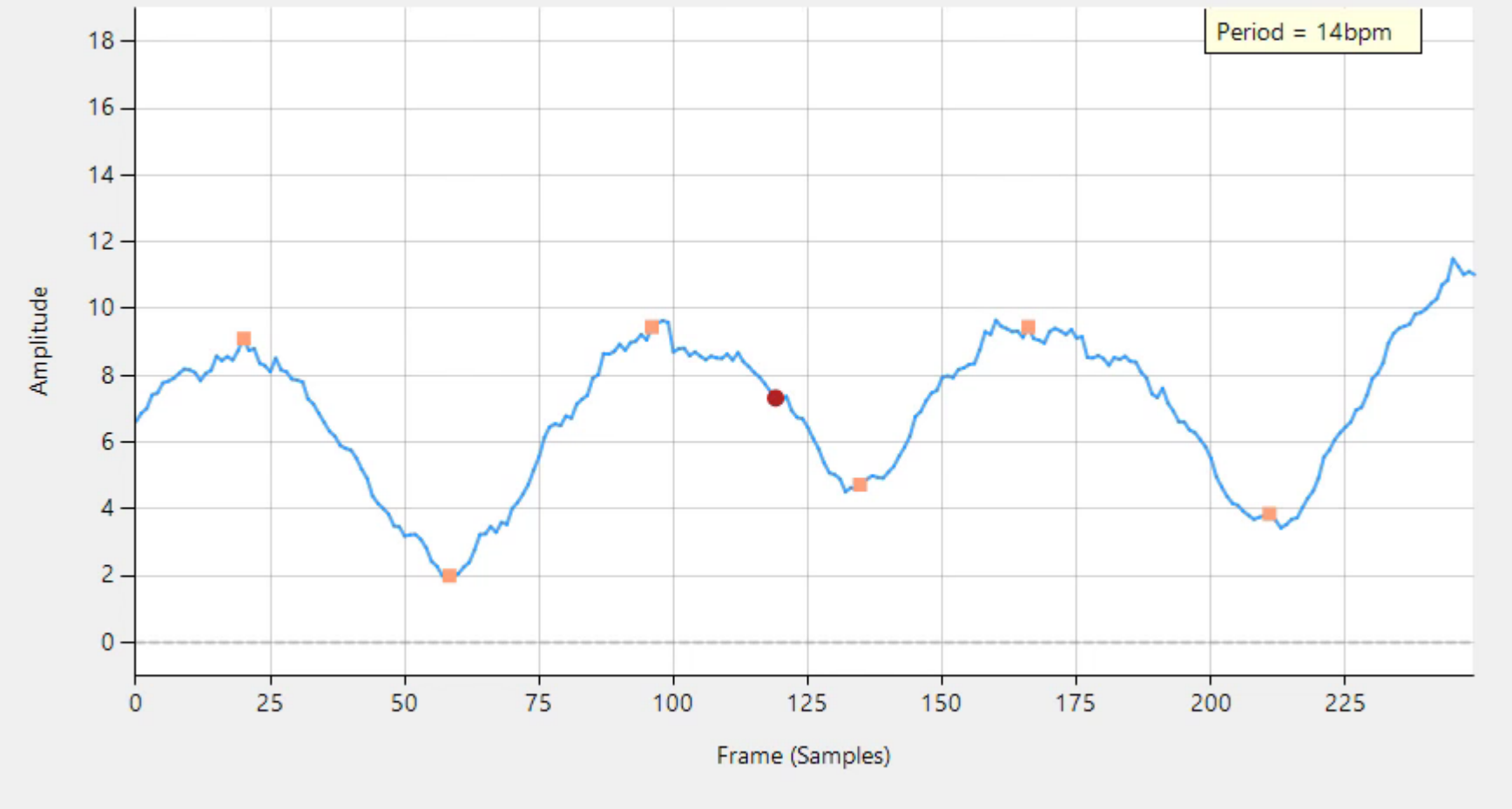
Contactless vital life signs (VLS) monitoring in quarantine centres

- Contactless monitoring of **heart beat** and **respiration** rate
- Sleep pattern tracking
- Works through duvets, clothes and blankets
- Automatic setup – no user interaction required!
- Very low power: radar doesn't affect performance of other systems and is very safe for human health



Getting India safely back to work

Test results on a human in bed



Real-time VLS respiration data tracking

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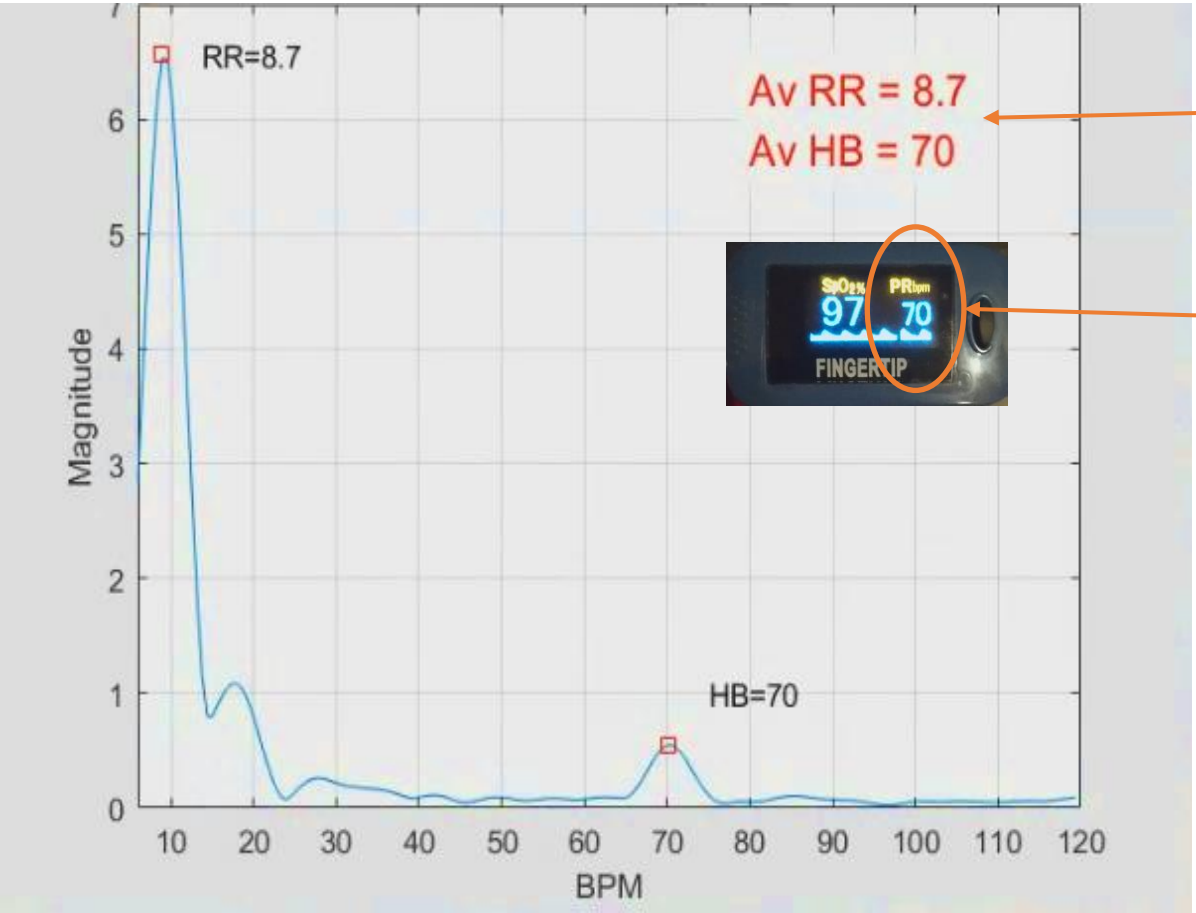
Test results on a human in bed



Algorithm averaged estimates

True HB from clip on Pulse Oximeter attached to subject's finger

Algorithm's HB estimate is accurate to ±1 bpm of the Pulse Oximeter's estimate!

Heart beat (HB) and respiration rate (RR) estimation algorithm

Getting India safely back to work

Contactless temperature scanning

- Contactless temperature scanning (hold hand up to sensor for 2 seconds)
- 30 people per minute (ideal for airports and busy reception areas)
- Real-time temperature detection and on-screen display
- High temperature voice alarm and visual warning:
- Temperature range: 30°C-45°C (0.1 °C accuracy)
- Built-in infrared thermoelectric sensor.

Amsterdam Airport Schiphol

Schiphol
Amsterdam Airport

ASN IoT solution partners

ubudu

arm

PHILIPS
Healthcare

Decawave

Texas Instruments

kpn

Our world over the next few years

- A vaccine will eventually be discovered
- Social distancing rules will stay with us well into 2021
- Mask wearing will be advocated (compulsory if second outbreak occurs)
- Attention to hygiene will remain paramount
- Fewer big social gatherings (concerts, football and exhibitions)

Our world over the next few years

- Reduction in mass tourism
- low cost hotel booking sites and airlines will be forced out of business
- Major cities will have to reinvent themselves for attracting tourists
- Businesses will become more entrepreneurial: restaurants in Europe have already moved their tables onto the street or squares
- Less travel in general (air and road)
- The need for offices will be reviewed, as more people work from home
- Video conferencing: distance learning (students) and meetings will become the norm
- More emphasis given to environmental issues

Let’s work together to defeat Covid-19

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ADVANCED SOLUTIONS NEDERLAND

ASN medical solutions for combating the Covid-19 virus

Contact us to discuss how we can help you:

Tel: +31 6 24939718

info@advsolned.com

www.advsolned.com