



COVID Defender: Privacy-preserving contact tracing through verifiable credentials
and spatiotemporal smartphone tracking

PROBLEM CONTEXT

How to contain re-occurring outbreaks in a non-disruptive way?

Society should prepare for re-occurring outbreaks of COVID-19 as long as effective vaccines and/or therapeutics are unavailable for widespread (prophylactic) treatment. Effective containment is vital for outbreak control, but difficult to achieve without significant social-economic disruption.

**Effective containment depends on**

Timely diagnosis of infected individuals, and tracing of their social contacts to enable isolation of all involved individuals.

**Diagnostic testing is limited**

Reliable and rapid diagnostic tests are only limitedly available*. Countries are now stockpiling diagnostics to be able to supply their GPs and other healthcare practitioners.

**Contact tracing is time-intensive**

Contact tracing is very time-intensive. According to the European CDC it would take about 100 person-hours to trace the contacts of a single COVID-19 case.

* According to FINDdx.org and the ECDC, there are now 10 rapid SARS-CoV-2 antigen detection tests with CE-IVD approval for the European market, including assays by Coris BioConcept NV (Belgium), SD Biosensor Inc. (South Korea), Shenzhen Bioeasy Biotechnology Co. Ltd. (China).

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OUR APPROACH

Intelligent contact tracing to support COVID-19 containment

The technologies are available to develop a smartphone application and an underlying infrastructure architecture to **facilitate and accelerate** contact tracing in a way that preserves individual privacy.

Features of this **COVID Defender** application include:

**Location tracking**

Automatic spatiotemporal tracking of users through a smartphone application.

**Privacy-preserving storage and computation**

Working with pseudonymous decentralized identifiers (DIDs), verifiable credentials, and a Trusted Execution Environment (TEE).

**Linked diagnostic outcomes**

Outcomes of diagnostic testing by healthcare professionals (HCPs) are attributed to user DIDs.

**Interoperability between different contact tracing apps**

Overcoming fragmentation through our SafeTrace API that enables privacy-preserving data transfer between systems.

**Signaling users**

Informing users who have been in close proximity to diagnosed cases (spatio-temporal overlap).

**Targeted risk assessment**

Surveying at-risk users (e.g. those who might have been in close proximity to cases) to assess and monitor risk of infection.

**Targeted instructions**

Instructing suspected new cases e.g. to self-isolate or to come in for diagnostic validation by a HCP.

**Web-based dashboard**

Overview of selected metrics for permitted entities (e.g. HCPs, public health authorities, municipalities, employers).



Use case example



Competitive analysis

The COVID Defender application improves on available and announced solutions by building on a decentralized identity system that offers universal interoperability and assures long-term security and privacy. Our project partners combine these principles with algorithmic spatiotemporal risk prediction capabilities, working with advanced AI optimization technologies.

TraceTogether

Singaporean; First-generation solution with significant privacy issues; Gained 600K downloads in first 3 days.

The Shield / Hamagen

Israeli; First-generation contact tracer; Tracking based on tower triangulation; Data stored locally on users' smartphones; Locations of officially diagnosed patients are disclosed to smartphones.

PEP-PT

Pan-European Privacy Preserving Proximity Tracing app; Joint initiative (130 European researchers) to develop apps that log encrypted proximity history of users.

geoHealthApp

German; Uses phone's location function to determine contact with infected persons; User data is stored decentralized on the blockchain, but not clear how. Relies on crowdfunding (€2057 obtained since 4 April)

Stopp Corona

Contact journaling app by Red Cross Austria; Requires users to connect their phones when in close proximity. Users are given a universally unique identifier (UUID). 130,000 downloads

LUMC COVID Radar

Dutch; Questions users about symptoms and behavior; Matches answers to postal codes; No contact tracing. Users able to view and filter summarized data. 5-year data retention for government and academic research.



Project partners



Triall combines blockchain and document-processing capabilities with thorough understanding of the clinical research (data) management landscape.



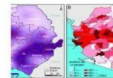
Enigma's SafeTrace API enables privacy-preserving data transfer, storage, and computation between different apps and systems.



The **W3C Credentials Working Group** is a community of technology standards developers focused on decentralized identity systems for enhanced digital security and privacy.



FutureLab develops technology solutions and collaborations in the blockchain and AI domain.



Quantum Bridge Analytics develops high-resolution spatiotemporal risk prediction algorithms using advanced AI optimization technologies.



COVID Defender Testimonial

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Joint testimonial

Emerging technologies such as those presented by the **COVID Defender consortium** will be a key component of contact tracing strategies in the global fight to control the novel coronavirus. Versions of this approach have already demonstrated their value globally, but issues of privacy have made some to question their general usefulness.

Sophisticated privacy-preserving mechanisms are key for widespread and secure implementation, and will facilitate necessary mass user adoption. With large user bases, this technology holds tremendous potential for disease containment.”



Arnold S. Monto, M.D.

Professor, Epidemiology
Professor, Global Public Health
Thomas Francis Jr. Collegiate
Professor of Public Health
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Dr. Arnold Monto is a globally recognized epidemiologist and one of the most renowned influenza experts of our time. He is a past president of the American Epidemiological Society, the 2009 recipient of the of the Alexander Fleming Award of the Infectious Diseases Society of America for lifetime achievement, and the 2012 recipient of the Charles Merieux award of the National Foundation for Infectious Diseases.



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Dr. [REDACTED] is a leading and award-winning virologist and is rated among the Top 3 of most influential coronavirus experts globally. He is known throughout the world for his work on SARS and H5N1, which was instrumental in combatting outbreaks like SARS, MERS, and avian influenza. He has (co-)authored over 1300 peer-reviewed papers, cited 70,000 times, and holds an H index of >110.



Phased development



Funding requirements



Start

Development is already underway via internal funding.



Bridge

We seek a €100K bridge investment to finalize the prototype.



First round

We seek a €1M investment to prepare and implement the pilot phase.



Subsequent rounds

We aim to leverage public-private funding mechanisms to facilitate global deployment.





Follow our project at [INSIGHTS.TRIALL.IO](https://insights.triall.io)