

Koronavilkku

TUNI 8.6.2021

SOLITA

It's March 2020. Time traveller arrives!

Time traveller: *Hi, I'm Sami from 2021!*

Sami in March: *Wow! So how are things in the future? Any interesting projects going on?*

Time traveller: *It's great! We have made an app that had **1 MILLION** downloads **in first 24 hours**. At the top, almost 2,5M Finns were using it.*



A Brief History of Digital Contact Tracing

Covid Watch^[8] started as an independent research collaboration between [Stanford University](#) and the [University of Waterloo](#), and was the first team in the world to publish a white paper,^[9] develop,^{[10][11]} and open source^[12] a fully anonymous Bluetooth exposure alert protocol - the CEN Protocol, later renamed the [TCN Protocol](#) - in collaboration with CoEpi in early March 2020.^[13] This was followed by the rapid development of very similar decentralized protocols in early April 2020 like [DP-3T](#), [PACT](#),^[14] and Google/Apple [Exposure Notification](#).

Decentralized Privacy-Preserving Proximity Tracing (DP-3T), stylized as **dp^{3t}** is an [open protocol](#) developed in response to the [COVID-19 pandemic](#) to facilitate [digital contact tracing](#) of infected participants.^[4] The protocol, like competing protocol [Pan-European Privacy-Preserving Proximity Tracing](#) (PEPP-PT), uses [Bluetooth Low Energy](#) to track and log encounters with other users.^{[5][6]} The protocols differ in their reporting mechanism, with PEPP-PT requiring clients to upload contact logs to a central reporting server, whereas with DP-3T, the central reporting server never has access to contact logs nor is it responsible for processing and informing clients of contact.^[1] Because contact logs are never transmitted to third parties, it has major privacy benefits over the PEPP-PT approach,^{[7][8]} however this comes at the cost of requiring more computing power on the client side to process infection reports.^[9]

The Apple/Google [Exposure Notification](#) project is based on similar principles as the DP-3T protocol, and supports a variant of it since May 2020.^{[10][11][12]} [Huawei](#) added a similar implementation of DP-3T to its Huawei Mobile Services APIs known as "Contact Shield" in June 2020.^[13]

The DP-3T SDK and calibration apps intend to support the Apple/Google API as soon as it is released to iOS and Android devices.^{[14][15]}

Decentralized Privacy-Preserving Proximity Tracing



Developed by École Polytechnique Fédérale de Lausanne
ETH Zurich
KU Leuven
Delft University of Technology
University College London
Helmholtz Centre for Information Security
University of Torino
ISI Foundation^[1]

Introduced April 4, 2020^[2]
Industry Digital contact tracing
Compatible hardware Android & iOS smartphones
Physical range ~10 m (33 ft)^[3]

Exposure Notification

From Wikipedia, the free encyclopedia

The **(Google/Apple) Exposure Notification (GAEN)** system^{[2][3][4]} originally known as the **Privacy-Preserving Contact Tracing Project**,^{[5][6]} is a framework and protocol specification developed by [Apple Inc.](#) and [Google](#) to facilitate [digital contact tracing](#) during the [2019-20 COVID-19 pandemic](#). When used by health authorities, it augments more traditional [contact tracing](#) techniques by automatically logging encounters with other notification system users using their [Android](#) or [iOS smartphone](#). Exposure Notification is a decentralized reporting based protocol built on a combination of [Bluetooth Low Energy](#) technology and privacy-preserving [cryptography](#). It is used as an opt-in feature within [COVID-19 apps](#) developed and published by authorized health authorities.^{[7][8]} Originally unveiled on April 10, 2020, it was first made available on iOS on May 20, 2020 as part of the [iOS 13.5 update](#).^[9]

Exposure Notification

Developed by	Apple Inc. Google
Introduced	April 2020
Industry	Digital contact tracing
Compatible hardware	Android & iOS smartphones
Physical range	~10 m (33 ft) ^[1]

BlueTrace is an [open-source application protocol](#) that facilitates digital [contact tracing](#) of users to stem the spread of the [COVID-19 pandemic](#).^[2] Initially developed by the [Singaporean Government](#), BlueTrace powers the [contact tracing](#) for the [TraceTogether](#) app.^[3] [Australia](#) has already adopted the protocol,^{[4][5]} and other countries, such as [New Zealand](#), are considering BlueTrace for adoption.^{[6][7]} A principle of the protocol is the preservation of privacy and health authority co-operation.^[8]

Countries	App	Interoperable - is this app potentially interoperable?	Interoperable - can this app already talk to another app?
Austria	Stopp Corona App 	Yes	 No
Belgium	CoronaAlert 	Yes	 Yes
Bulgaria	The deployment of a contact tracing app is not foreseen.		
Croatia	Stop COVID-19 	Yes	 Yes
Cyprus	CovTracer 	Yes	 No
Czechia	eRouška 	Yes	 No
Denmark	Smittestop 	Yes	 Yes
Estonia	HOIA 	Yes	 No
Finland	Koronavilkku 	Yes	 Yes
France	TousAntiCovid 	No	 No
Germany	Corona-Warn-App 	Yes	 Yes
Greece	Contact tracing app under development.	Yes	
Hungary	VirusRadar 	No	 No
Ireland	COVID Tracker 	Yes	 Yes

Italy	Immunì 	Yes	 Yes
Latvia	Apturi Covid 	Yes	 Yes
Lithuania	Korona Stop LT 	Yes	 No
Luxembourg	The deployment of a contact tracing app is not foreseen.		
Malta	COVIDAlert 	Yes	 No
Netherlands	CoronaMelder 	Yes	 Yes
Poland	ProteGO Safe 	Yes	 Yes
Portugal	StayAway COVID 	Yes	 No
Romania	The deployment of a contact tracing app is not foreseen.		
Slovakia	A contact tracing app is being developed.		
Slovenia	#OstaniZdrav 	Yes	 No
Spain	Radar Covid 	Yes	 Yes
Sweden	The deployment of a contact tracing app is not foreseen.		

 United Kingdom	 England	NHS COVID-19	September 24, 2020
	 Wales		
	 Northern Ireland	StopCOVID NI	July 30, 2020
	 Scotland	Protect Scotland	September 11, 2020
 United States	 Alabama	GuideSafe	August 3, 2020
	 Arizona	Covid Watch	May 28, 2020 (attenuation and dynamic risk testing) August 19, 2020 (released)
	 California	CA Notify	December 10, 2020
	 Colorado	CO Exposure Notifications	October 25, 2020
	 Connecticut	COVID Alert CT	November 12, 2020
	 Delaware	COVID Alert DE	September 15, 2020
	 Guam	Guam Covid Alert	September 10, 2020
	 Hawaii	Aloha Safe Alert	November 11, 2020
	 Maryland	MD COVID Alert	October 10, 2020
			October 15, 2020 (Michigan State University pilot)
	 Michigan	MI COVID Alert	November 9, 2020 (statewide)
	 Minnesota	COVIDaware MN	November 23, 2020
	 New Jersey	COVID Alert NJ	September 30, 2020
	 New York	COVID Alert NY	September 30, 2020
	 North Carolina	SlowCOVIDNC	September 22, 2020
	 North Dakota	Care19 Alert	August 13, 2020
	 Pennsylvania	COVID Alert PA	September 24, 2020
	 Virginia	COVIDWise	August 5, 2020
	 Washington	WA Notify	November 30, 2020
	 Wisconsin	WI Exposure Notification	December 23, 2020
	 Wyoming	Care19 Alert	August 14, 2020

Worldwide adoption of ENS

- ❑ Two **native apps** (iOS and Android)
- ❑ **Backend database** hosted at Kela
- ❑ **Pin code generator** used by 600 healthcare professionals
- ❑ **Integration** to Omaolo.fi
- ❑ Two **testing phases**, 2nd with PSHP and HUS
- ❑ User testing
- ❑ **UX design**
- ❑ **Co-operation** with Apple, Google, 20 European countries' community, EU eHealth network, THL, STM, Sotetigi
- ❑ **NCSC audition**
- ❑ **Whitehat hackers' co-operation**
- ❑ **Open source** publish at Github



ANKI KARHU

Yle

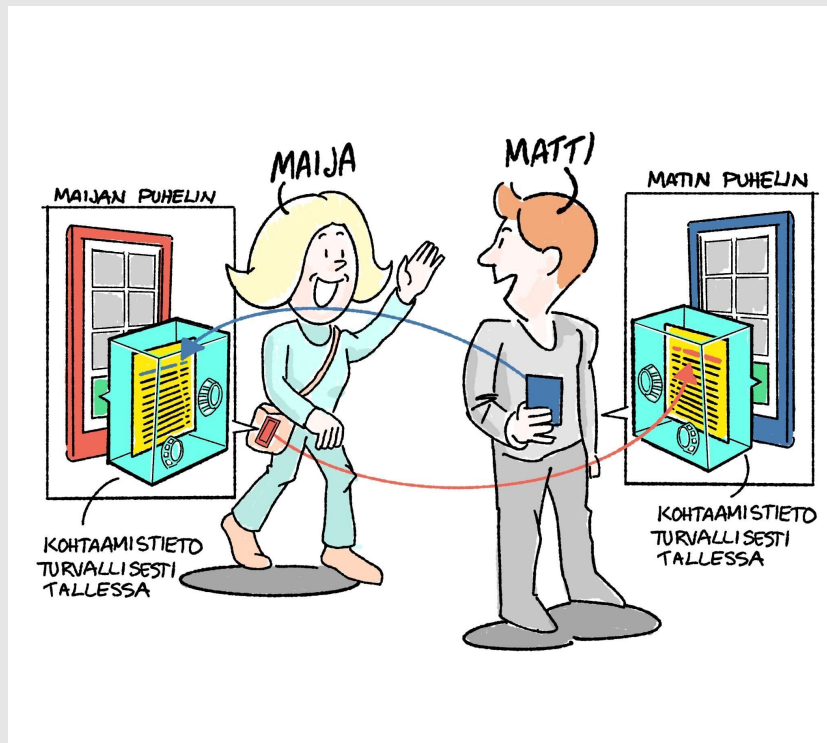
All this in 10 weeks.
During summer holiday season.
Including 2 weeks' App Review.
And one name change by ministry.
Without delays at deadline.



Background

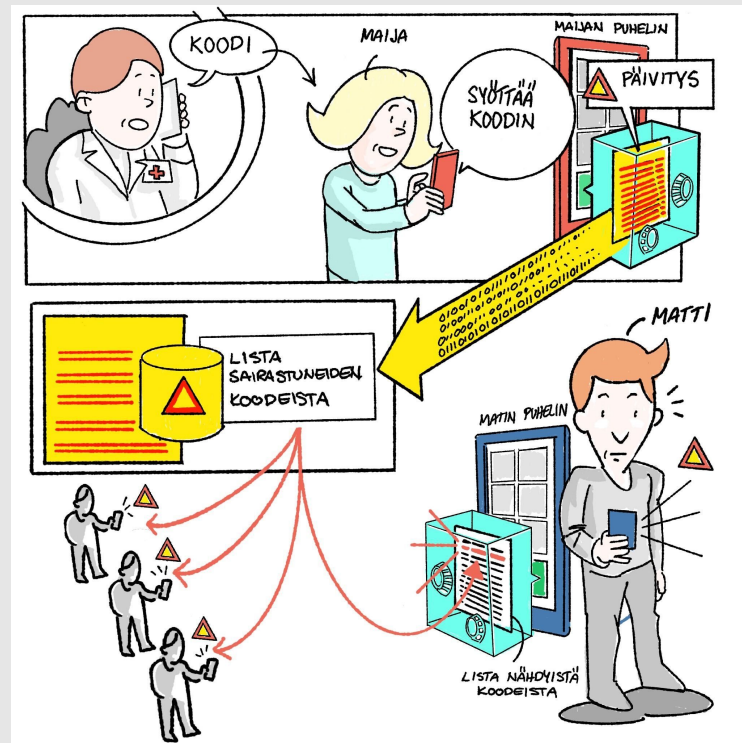
Beacon implementation with ENS

- Your phone becomes a BLE beacon which broadcasts your keycodes
 - Beacon works several times a second
- Other phones scan and save nearby keycodes
 - Scanning happens every five minutes or so
- All of this is done by the EN API



Exposure warning implementation with Koronavilkku

- When infected, the user reports infection with the app
 - App keycodes are uploaded to backend system
- Public backend system distributes infected codes
 - Each phone downloads the key list and compares locally
- Infection report is limited only to confirmed cases
 - User needs PIN code from healthcare to report





Exposure probability parameters (V1)

Transmission risk parameter

Risk level value	0	0	4	6	6	7	8	0
Onset of symptoms	> 14 days	11–14 days	9–10 days	7–8 days	5–6 days	3–4 days	-2 – 2 days	< -3 days

Duration risk parameter

Risk level value	1	2	2	4	5	5	7	8
Exposure duration	0 min	<= 5 min	<= 10 min	<= 15 min	<= 20 min	<= 25 min	<= 30 min	> 30 min

Days risk parameter

Risk level value	0	0	0	1	1	1	1	1
Days since exposure	>= 14 days	12–13 days	10–11 days	8–9 days	6–7 days	4–5 days	2–3 days	0–1 days

Attenuation risk parameter

Risk level value	1	2	3	4	5	6	7	8
Average of Attenuation	> 73 dB	> 63 dB	> 51 dB	> 33 dB	> 27 dB	> 15 dB	> 10 dB	<= 10 dB
	FAR	MEDIUM	NEAR	IMMEDIATE				

Buckets

100 %	50 %
<= 50 dB	<= 70 dB

Minimum combined bucket duration

15 min

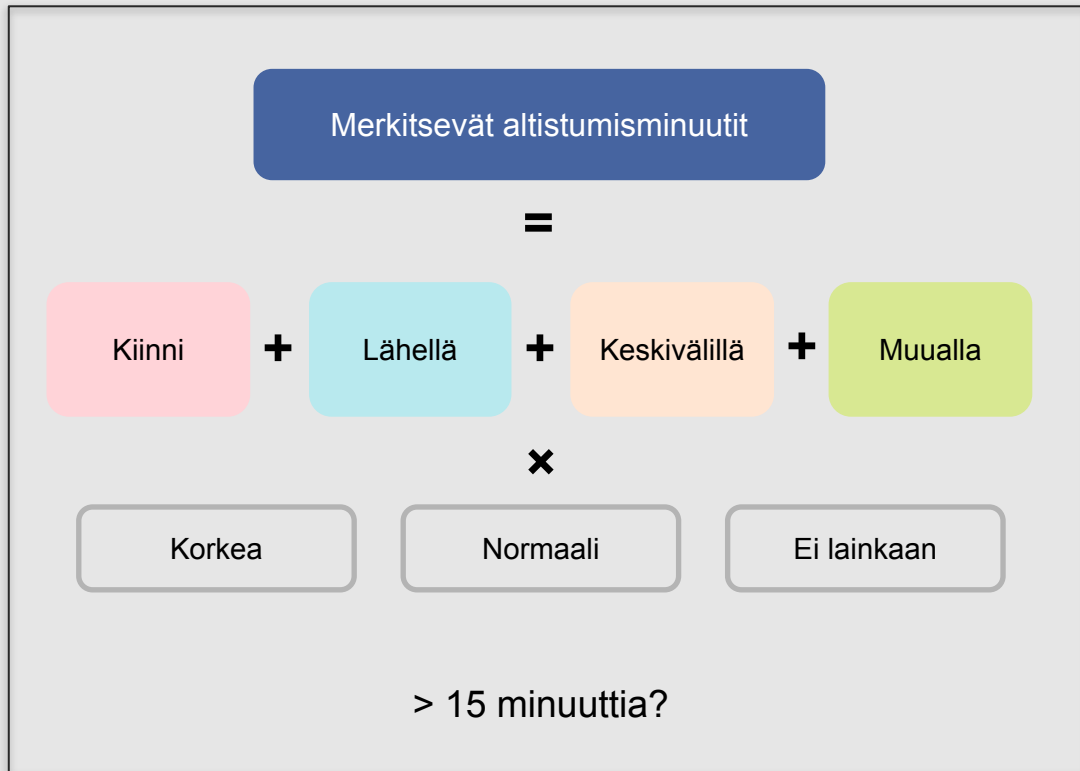
OR

Minimum risk score

72



Exposure probability parameters (v2)





Yhteenveto

Etäisyys ja kesto

	Kiinni	Lähellä	Keskivaiheilla	Mualla
Vaimentuma	≤ 51 dB	≤ 63 dB	≤ 70 dB	> 70 dB
Painoarvo	125 %	100 %	50 %	0 %

Tartuttavuus

-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
E	E	E	E	E	E	E	E	E	E	E	E	K	K	K	K	K	K	K	K	K	K	N	N	N	E	E	E	E

Korkea	100 %	Normaali	62,5 %	Ei lainkaan	0 %
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Altistumisilmoituksen rajan ylittävät kohtaamiset

Korkea tartuttavuus (päivät -2–7 oireiden alkamisesta)

	0 min	3 min	6 min	9 min	12 min	15 min	18 min	21 min	24 min	27 min	30 min
Mualla	0	0	0	0	0	0	0	0	0	0	0
Keskivälillä	0	1,5	3	4,5	6	7,5	9	10,5	12	13,5	15
Lähellä	0	3	6	9	12	15	18	21	24	27	30
Kiinni	0	3,75	7,5	11,25	15	18,75	22,5	26,25	30	33,75	37,5

Normaali tartuttavuus (päivät 8–10 oireiden alkamisesta)

	0 min	3 min	6 min	9 min	12 min	15 min	18 min	21 min	24 min	27 min	30 min
Mualla	0	0	0	0	0	0	0	0	0	0	0
Keskivälillä	0	0,9375	1,875	2,8125	3,75	4,6875	5,625	6,5625	7,5	8,4375	9,375
Lähellä	0	1,875	3,75	5,625	7,5	9,375	11,25	13,125	15	16,875	18,75
Kiinni	0	2,34375	4,6875	7,03125	9,375	11,7188	14,0625	16,4063	18,75	21,0938	23,4375



Exposure
> Symptom check
> Contact request

Koronavilkku

- Exposure checking
- Exposure warning information and forward to local authorities
- Share the warning

Omaolo

- Symptom evaluation
- Contact request
- PIN code generator views
- Handling process for symptoms and contact requests

KELA backend

PIN code for infected



Design process

Design by international benchmarks

How to design the first version before a permission to start the work with end users

...or to start work at all.

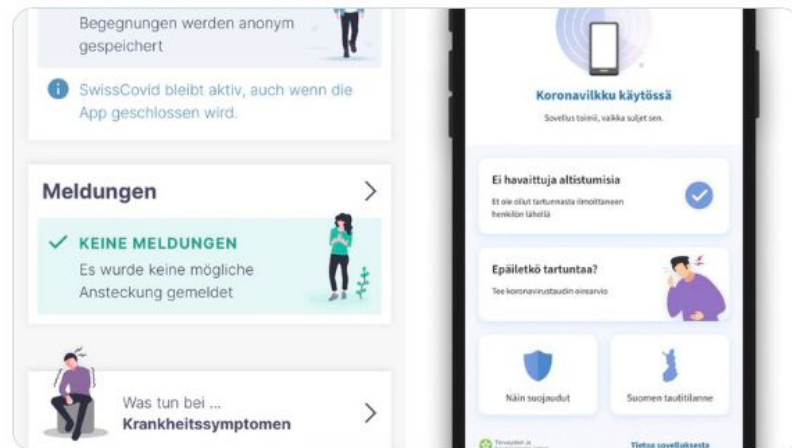


Veera Juvonen
@VeeraJuvonen

The same guy with a headache, wearing a purple shirt is starring the [#COVID-19](#) apps in [🇨🇭](#) Switzerland and [🇫🇮](#) Finland. He must've been traveling despite the strict travel restrictions.

[#koronavilkku](#) [#swisscovid](#) [@hsfi](#) [@SwissCovid](#)

Käännä twiitti



SwissCovid

8.44 ap. · 28. elok. 2020 paikasta [Walenstadt, Schweiz](#) · [Twitter for iPhone](#)

2 uudelleentwiittausta 1 twiitin lainaus 46 tykkäystä





Designing against immature APIs

The process of building the app against ever-changing Exposure Notification API and ever-changing OS requirements.



~~User-~~ Law-centered design process

Do what the ministry and law says.

What is the law interpretation changes inside the project?



App plus a medical device

App anonymity vs. strict user authentication of healthcare

What happens if MDR-process complying medical device will be updated during the holiday period, with a new target group and differing requirements for data handling...



Koronavilkku as a medical device?

Could Koronavilkku give medical-device-level information about exposure severity to guide user treatment options?



Loppupäätelmä

- Kaksitasoisen altistumisen malliin liitetty jatkohoidon visio on merkityksellinen lääkinnällisten laitteiden lainsäädännön näkökulmasta
- Koronavilkun teknologinen viitekehys soveltuu mahdollisten altistusten tunnistamiseen, mutta sitä ei voida pitää riittävän tarkkana diagnosoimaan, ennakoimaan tai ennustamaan sairastumista **lääkinnällisen laitteen vaatimalla tarkkuudella**
- Tästä seuraa se, että Koronavilkku ei myöskään voi tosiasiallisesti käyttää em. käyttötarkoituksissa lääkinnällisten laitteiden lainsäädännön vaatimusten mukaisesti
- Käytännössä tämä tarkoittaa sitä, että Koronavilkun tuottamien lähtötietojen perusteella ei voida tehdä diagnosoimaista hoitoonohjausta tai ohjaamista eri palvelupoluille siten, että mahdollisesti altistunut henkilö saa eri poluilla kiireellisyydeltään tai tasoltaan erilaista hoitoa/hoitoonohjausta

Designing for trust

How to design an app that the internet commenters have decided to be *Yet Another Government Conspiracy for Spying and Oppression*

Telia FI 4G22.21yle.fi60 %

yleValikko

🔍👤

Pelkäätkö Koronavilkkua? Vielä keväällä ammattihakkeri Benjamin Särkkä sanoi, ettei asentaisi koronasovellusta – 5 syytä miksi mieli on nyt muuttunut

"Moni taskulamppukin vaatii enemmän oikeuksia kuin Koronavilkku", tietoturva-asiantuntija sanoo.

Tietoturva 2.9.2020 klo 15.34



Kuva: Jarno Paldanius / Yle



Professional users, where art thou?

How to design with professional users - who have not been chosen yet in municipalities because of the Covid-situation.



Committee co-operation

How do the exposed choose their home municipality?

How to test Koronavilkku+Omaolo prototypes with Kela?

Who provides the translations for healthcare professionals' UI?

Thank god for Slack. And Figma.



Masked usability

Observing user tests with a mask and disinfectant, maintaining social distance.

Design via Confluence

Using wiki to design, translate, test and maintain quality of texts.

Toiminnon tavoite	Suomi 1. vaihe	Suomi 2. vaihe	Ruotsi 1. vaihe
Yleiset tekstit			
Nimi	Koronavilkku ✓		Coronablinkern ✓
Navigaatio	Koti Ilmoita tartunnastasi Asetukset ✓ 		Hem Meddela din smitta Inställningar ✓
Tietoa sovelluksesta -painike päänäkymän alareunassa	Tietoa sovelluksesta (iOS) Näin sovellus toimii (Android)		Så här fungerar appen (i)
Sovelluksen käyttöönotto, "onboarding"			
Intro	Kiitos, että latsit Koronavi Koronavilkku 		du laddade ern är en app hälsa o d appen idninger uset. Appen sky din identitet. Så här fungerar appen Coronablinkern följer me din närhet, på vilka appe installerad. Om en perso tidigare mött meddelar o coronavirusinfektion via får du ett meddelande or utsatt (exponerad) för sm test visar att du bär smitt meddela om det här ano appen. Se mer information om C

Hei,

Kelan viestintäyksikössä syntyi idea ilmoittaa Koronavilkku ehdokkaaksi [Vuoden selväsana 2020](#) -kilpailuun (ilmoittautuminen auki 4.9. asti). Tunnen itseni vähän jääväksi edistämään tätä asiaa, mutta lupasin kuitenkin kysyä, onko teillä mitään kilpailuun osallistumista vastaan.

Koronavilkku seuraa lähelläsi olevia puhelimia, joihin on asennettu sama sovellus. Jos aiemmin kohtaamasi henkilö ilmoittaa tartunnastaan Koronavilkun avulla, saat ilmoituksen altistumisesta. Jos sinulla todetaan tartunta, voit ilmoittaa siitä sovelluksella nimettömästi.

Katso lisätietoa Koronavilkusta (linkki)



Where are we now



Situation now

The usage statistics show that Finland has **world-leading adoption and usage rate**.

- There are now over 3 million unique devices that have downloaded the application and at best over 2,3 million devices contacting background service daily which represented nearly 40% of Finnish population. The adoption rate has gone somewhat down with improving pandemic situation.
- Number of delivered exposure warnings is not known due to the privacy-preserving nature of ENS
 - However, we do know that each week several hundred people use the Omaolo symptom check functionality after receiving the warning
 - Note that Omaolo is used only in selected Finnish cities - for example, HUS district uses Koronabotti instead.

End-of-life for Koronavilkku will happen once the pandemic situation allows it, and is being planned already.

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