

# Smittestopp

How are exposures detected?

2020-11-24

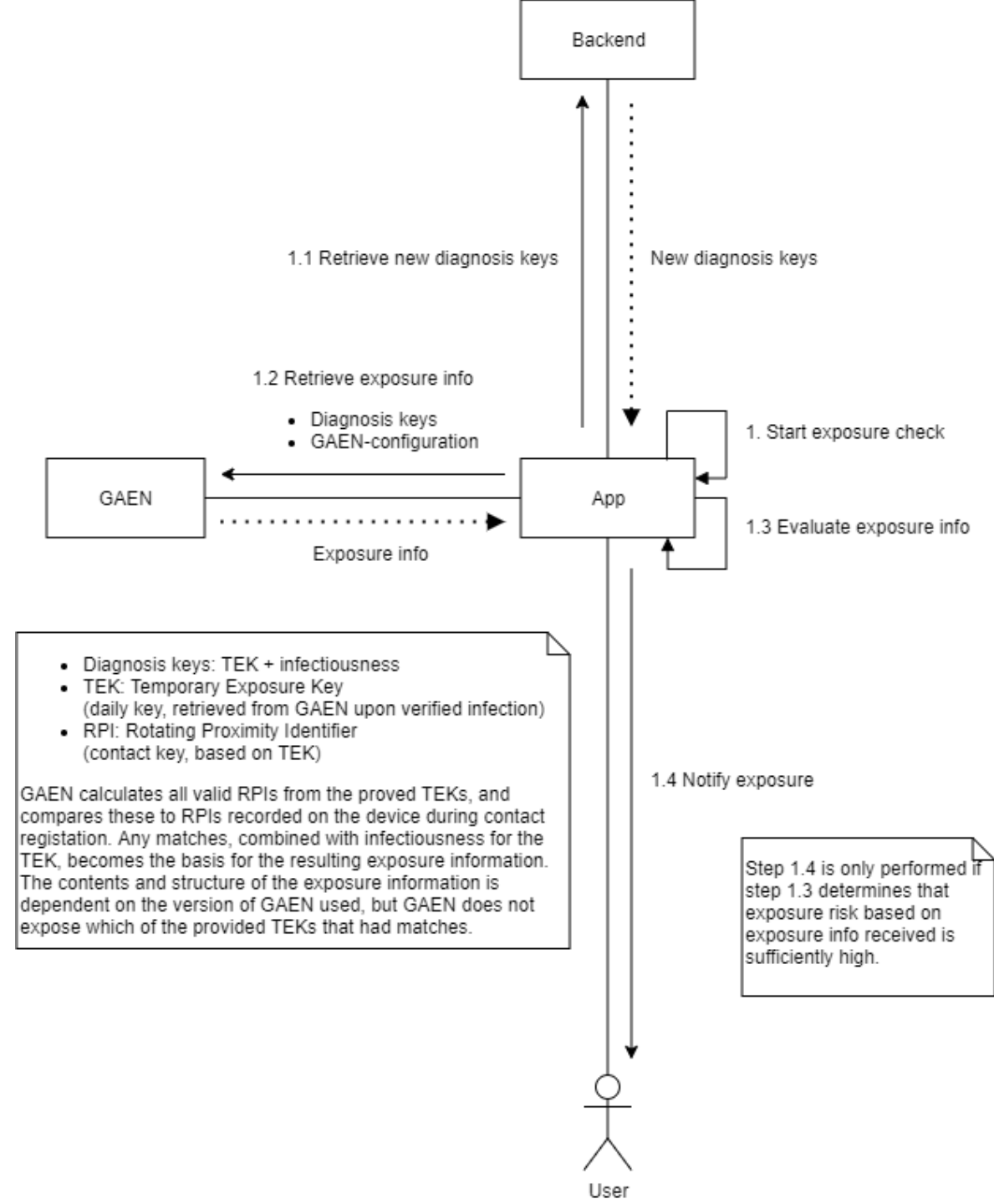
# Agenda

## ● Earlier

- Contact detection (RPI)
- Verification and upload (TEK)
- Handling and distribution (TEK)

## ● Today's agenda

- Which data and parameters are available for use in exposure detection?
- Which parameters is Smittestopp using?
- Which data does Smittestopp care about?
- Target definition:  $\leq 2m$ ,  $\geq 15min$



# Temporary Exposure Key (TEK)

- **keyData**
- **rollingStartNumber**
- **rollingPeriod**
- **reportType (v1.5+)**
- **daysSinceOnsetOfSymptoms (v1.6)**
- **transmissionRiskLevel (v1)**
  - 0: outside infectious period
  - 8: within infectious period



# Exposure Configuration

V1 mode

- minimumRiskScore
  - attenuationScores
  - daysSinceLastExposureScores
  - daysSinceLastExposureWeight
  - durationScores
  - durationWeight
  - transmissionRiskScores
  - **durationAttenuationThresholds**
- RiskScore = attenuationScore \* daysSinceLastExposureScore \* durationScore \* transmissionRiskScore

**Transmission Risk Parameter**

<b>Risk Level Value</b>	-	-	-	-	-	<b>7</b>	-	-
<b>Risk Level</b>	-	-	-	-	-	Diag Key Level	Phone Score	Occupation

**Risk Level Value**



7

**Duration Risk Parameter**

<b>Risk Level Value</b>	1	1	4	<b>7</b>	7	8	8	8
<b>Risk Level</b>	D = 0 min	D <= 5 min	5 < D <= 10	<b>10 &lt; D &lt;= 15</b>	15 < D <= 20	20 < D <= 25	25 < D <= 30	D > 30 min



7

**Days Risk Parameter**

<b>Risk Level Value</b>	1	2	2	4	6	<b>8</b>	8	8
<b>Risk Level</b>	>= 14 days	12-13 days	10-11 days	8-9 days	6-7 days	<b>4-5 days</b>	2-3 days	0-1 days



8

**Attenuation Risk Parameter**

<b>Risk Level Value</b>	1	<b>1</b>	1	8	8	8	8	8
<b>Risk Level</b>	A > 73 dB	<b>73 &gt;= A &gt; 63</b>	63 >= A > 51	51 >= A > 33	33 >= A > 27	27 >= A > 15	15 >= A > 10	A <= 10



1



$7 \times 7 \times 8 \times 1 =$

**Risk Score**  
**392**

**Transmission Risk Parameter - symptom onset**

1	1	8	8	8	8	1	1	
4 days or more before symptom onset.	13 days or more after symptom onset	3 days before symptom onset	2 days before symptom onset	1 day before to 2 days after symptom onset	3-6 days after symptom onset	7-8 days after symptom onset	9-10 days after symptom onset	11-12 days after symptom onset

*Transmission risk is intended to reflect the status of infection in the affected user and its effect on risk of transmission. The value is based on the affected user's symptoms, when symptoms first appeared, level of diagnosis verification, or other determination from the app or a health authority.*

**Duration Risk Parameter**

1	1	1	1	1	1	1	1
D = 0 min	D <= 5 min	5 < D <= 10	10 < D <= 15	15 < D <= 20	20 < D <= 25	25 < D <= 30	D > 30 min

*Cumulative duration of the exposure. The framework measures this value.*

**Days Risk Parameter**

1	1	1	1	1	1	1	1
>= 14 days	12-13 days	10-11 days	8-9 days	6-7 days	4-5 days	2-3 days	0-1 days

*Days since the exposure incident. The framework measures this value.*

**Attenuation Risk Parameter**

1	2	3	4	5	6	7	8
A > 73 dBm	73 <= A > 63	63 <= A > 51	51 <= A > 33	33 <= A > 27	27 <= A > 15	15 <= A > 10	A <= 10

*Minimum Bluetooth signal strength attenuation (Transmission Power - RSSI). The framework measures this value.*

# Exposure Summary

## V1 mode

- Summarizes the exposure to the set of keys associated with the same token
- daysSinceLastExposure
- matchedKeyCount
- maximumRiskScore
- **attenuationDurations**
- summationRiskScore



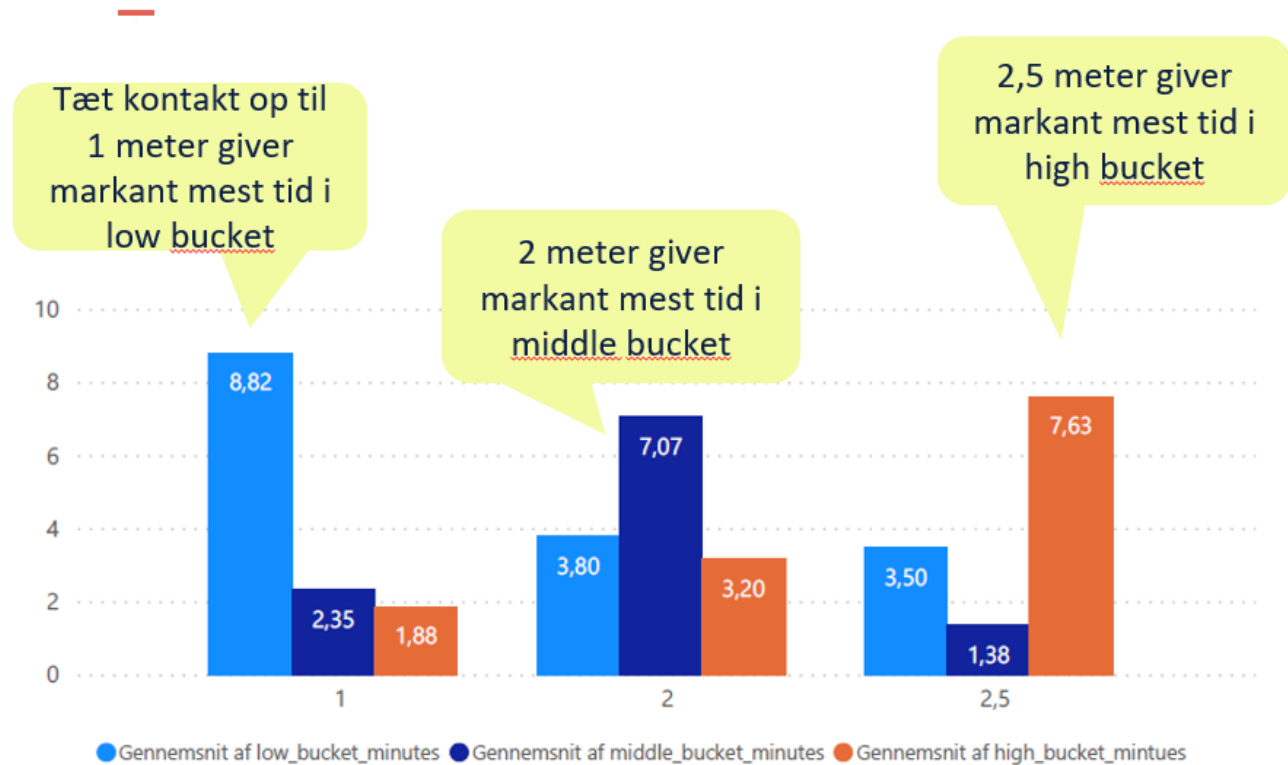
# Attenuation duration

- Based on durationAttenuationThresholds

- Low: 0-57 dBm
- Medium: 58-63 dBm
- High: > 63 dBm

- 3 buckets

- Low (close), Medium, High (far)
- Duration per bucket in minutes



Fordelen her er, at dBm grænser giver mulighed for bedst mulig afstandsestimering



# Risk evaluation?

- Target definition:  $\leq 2m$ ,  $\geq 15min$
- Configuration
  - ExposureTimeThreshold (T) = 10
  - LowAttenuationDurationMultiplier ( $m_{low}$ ) = 2.5
  - MediumAttenuationDurationMultiplier ( $m_{medium}$ ) = 1
  - HighAttenuationDurationMultiplier ( $m_{high}$ ) = 0
- Input
  - Attenuation durations ( $d_{low}$   $d_{medium}$   $d_{high}$ )
- Exposure
  - $d_{low} * m_{low} + d_{medium} * m_{medium} + d_{high} * m_{high} \geq T ?$

# Norwegian configuration

10 minutes threshold

250 %  
weight on low bucket

100 %  
weight on middle bucket

0 %  
weight on high bucket

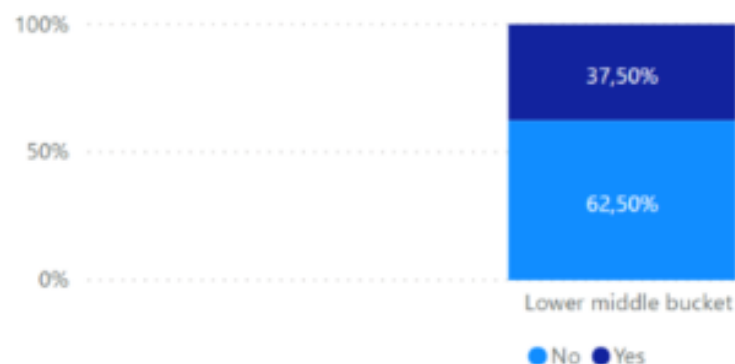
### Notifications sent on new configurations for 1 m\*



### Notifications sent on new configurations for 2 m



### Notifications sent on new configurations for 2,5 m



### Notifications sent on new configurations (Supermarket scenario)



#### Pros:

- For bucket-configuration "Lower middle bucket" the number of false positives fall with increased distance
- Supermarket scenario still has number of false positives

#### Cons:

- When increasing the weight of low bucket, there is a change that short encounters will get a notification
- When increasing the weight of middle bucket there is a change that fleeting encounters will get a notification

\* Highest percentage we are able to catch at 1 meter using the test sample is 72,22% for Lower Middle Bucket. This is due to some tests only counting time in high or middle bucket.

# Exposure Window mode vs Legacy mode

- DaysSinceOnset.. + ReportType
- DailySummary
- ExposureWindow
- DailySummariesConfig
- TransmissionRiskLevel
- ExposureSummary
- ExposureInformation
- ExposureConfiguration

# References

- Google API for Exposure Notification  
<https://developers.google.com/android/exposure-notifications/exposure-notifications-api>
- Apple Exposure Notification  
[https://developer.apple.com/documentation/exposurenotification/enexposureconfiguration/exposure\\_risk\\_value\\_calculation\\_in\\_exposurenotification\\_version\\_1](https://developer.apple.com/documentation/exposurenotification/enexposureconfiguration/exposure_risk_value_calculation_in_exposurenotification_version_1)  
<https://developer.apple.com/documentation/exposurenotification/enexposureconfiguration>
- Current exposure configuration  
<https://github.com/folkehelseinstituttet/Fhi.Smittestopp.Backend/blob/d58f8fee07c619f835fbb4e2674657ecac433b62/DIGNDB.App.SmitteStop.API/appsettings.json#L54>