Theme: Community Cooperation

Solution Title: **Aarogya Rekha™** – **IoT enabled non-removable GeoFencing Wristband for real-time Quarantine Tracking**

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Covid-19 Threats & Challenges

> ➢ In this unprecedented situation of COVID-19, it had brought modern life to a screeching halt, disrupting our healthcare, education and economic systems.

> ➢ One of the biggest challenge faced by Government is to restrict the spread of this deadly virus via Community Transmission (Stage 3) by individuals who are home-quarantined and returned from abroad.

Statistics

- On an average, **35** people break Quarantine norms/day

- **1** infected person can infect **406** people in **30** days

- **3M** cases worldwide and **207K** deaths reported globally (as on April 27)

- **60M** Quarantined in China

- Italy places **Entire** Country in Quarantine (more Countries to follow)

COVID-19: **More than 500 migrant workers** in Nepal **escape** ...
Down To Earth Magazine - 31-Mar-2020
Some 540 **quarantined workers** who migrated back to Nepal from India fled on March 23, 2020 and **escaped** from a **quarantine** centre in the ...

On an average, 35 **people break** home **quarantine** norms ...
The Hindu - 05-Apr-2020
On an average, 35 **people break** home **quarantine** norms every day ... the last **international** traveller who landed in Bengaluru will complete the ...

Business Today
Coronavirus crisis: Mary Kom breaks quarantine to attend breakfast with President Kovind
21 Mar

Covid-19: **1** patient **can infect** 406 **people** in 30 days, finds ...
The Hindu BusinessLine - 07-Apr-2020
It tells the **average number of people** who **will** catch a disease from **one infected person.** "If we take the 'R0' to be 2.5, then one positive **person** ...
With and without social distancing, **how many people can a** ...
THE WEEK - 07-Apr-2020

Challenges

- People with Foreign travel history are ordered to remain in home quarantine.

- Governments enforcing strict laws to not violate quarantine rules

- Global Economy is being hit

- High chances of Police and Health officials getting infected

Source: WHO, UN, ICMR, The Hindu, The BorderMail, LA Times

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The Need of the Hour…

STRICT QUARANTINE

How can the Government restrict Quarantined Individuals in **real-time** by enforcing a **Geofence** and remote monitor their **Health Vitals** (Body Temperature and Mental Health symptoms) to combat Covid-19 outbreak

Measures Taken So Far…

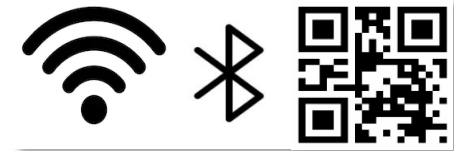| STEPS	DIFFICULTIES	
Manual Monitoring by Police & Health Officials	▪ Lot of dedicated man power needed for 24/7 surveillance ▪ High manual efforts (Barricades, Patrol vehicles etc) ▪ Likelihoods of becoming next victims	
Wi-Fi, Bluetooth & QR code	▪ Tied to mobile network (Leaving mobiles in home) ▪ Unreliable source	
Tracking home-quarantined people using mobile GPS location	▪ Tied to mobile network (Leaving mobiles in home) ▪ Mobile GPS signals are not accurate ▪ Unreliable source	

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Cognizant Solution – Aarogya Rekha

Aarogya Rekha Specifications

❖ **Wristband Material:** Non-toxic Health Silicone or similar

❖ **IoT Sensors:**
   - ✓ BHI160BP – GPS location sensor
   - ✓ MAX30205 – Body Temperature Sensor
   - ✓ EMOTIBIT – Emotion Sensor
   - ✓ Strain Sensor – Respiratory rate

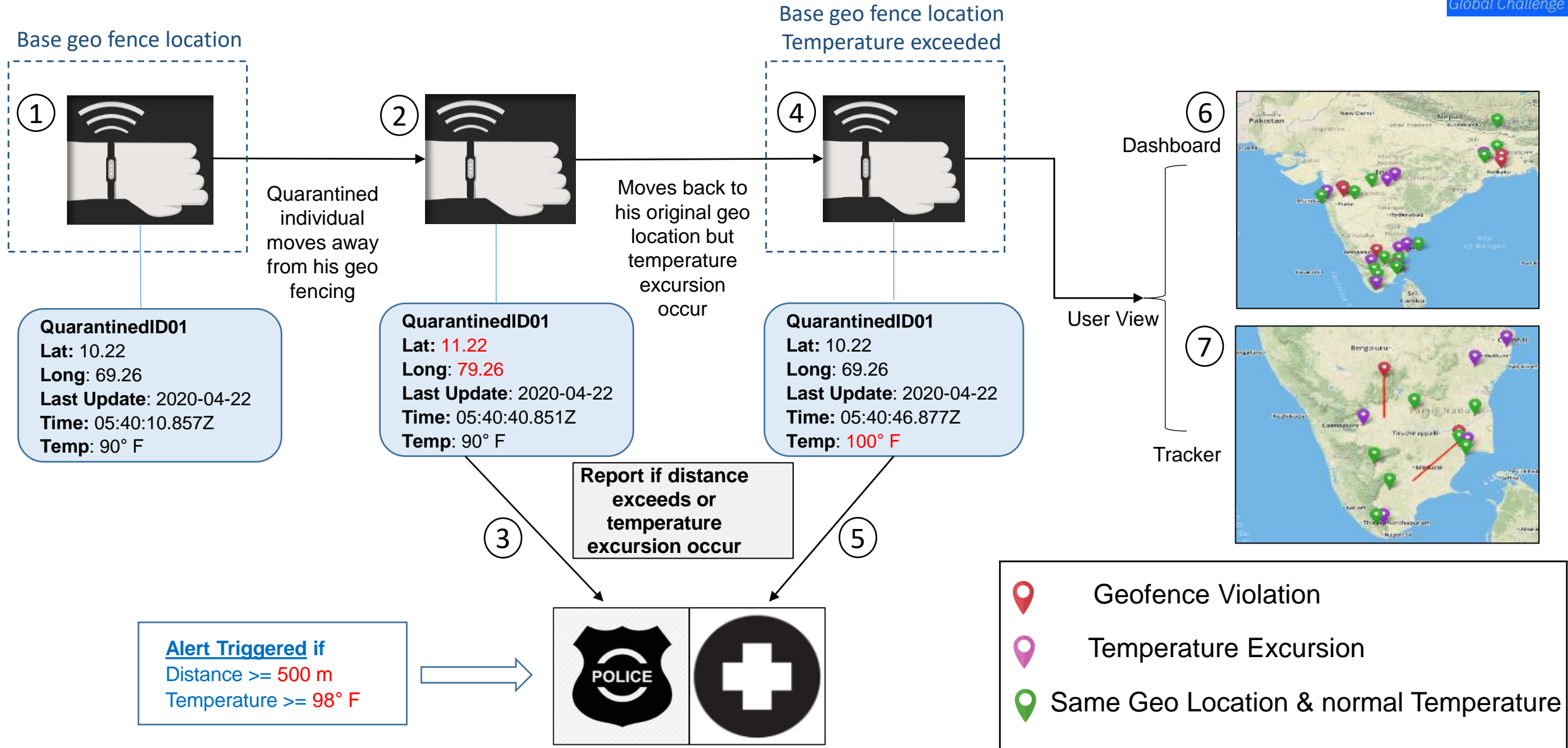❖ **IoT Device:** Arduino Nano 33 or similar

Aarogya Rekha is an **IoT** enabled **real-time GeoFencing** & Quarantine Tracking Platform which transmits the **Latitude, Longitude, Body Temperature and Human Emotions** via **Non removable wristband** to the Government Control Room Dashboard/Mobile app for taking necessary actions to combat **Covid-19 Outbreak**
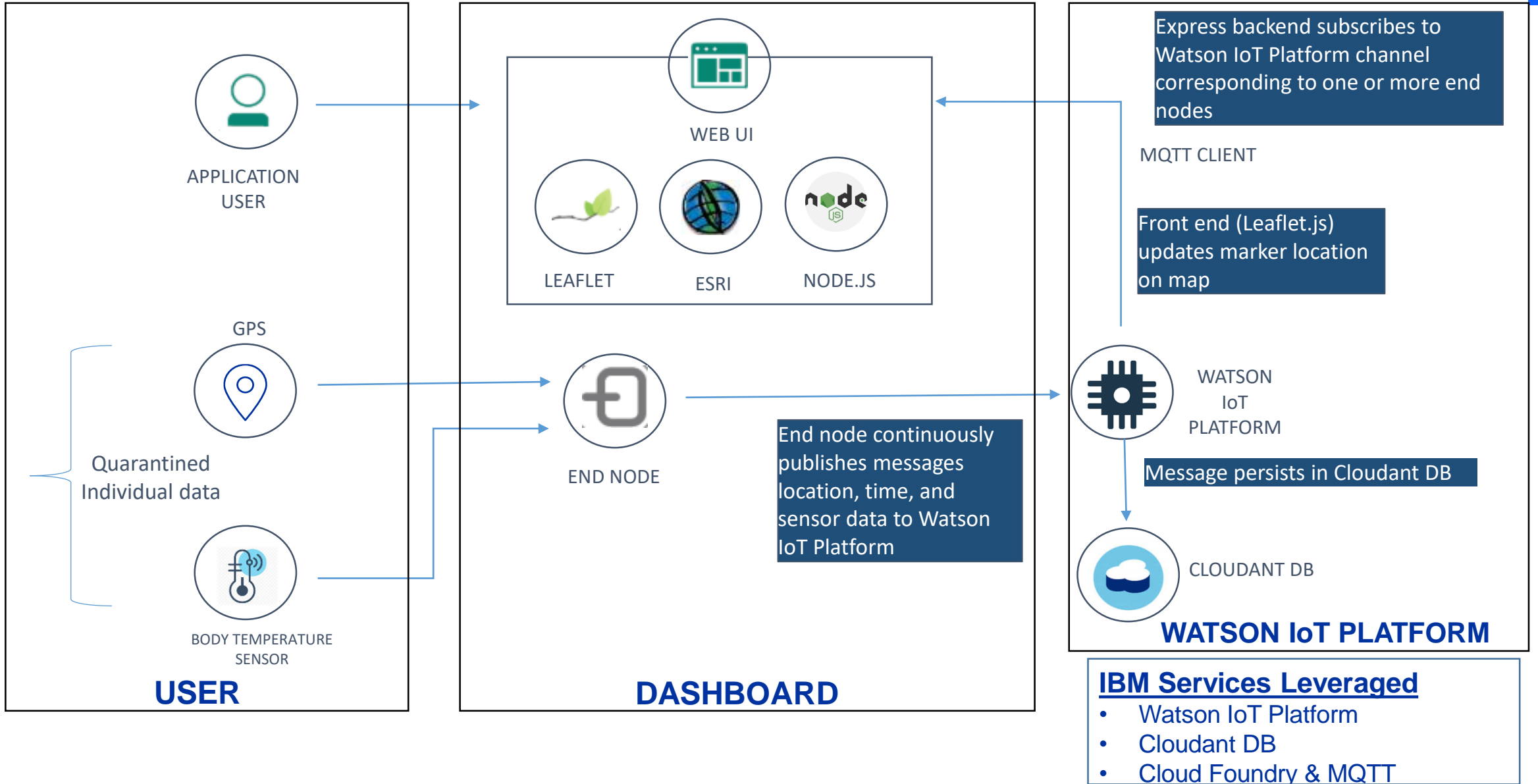
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Aarogya Rekha - Solution Process Flow

Base geo fence location

Base geo fence location
Temperature exceeded

① Quarantined individual moves away from his geo fencing ②

Moves back to his original geo location but temperature excursion occur

④

⑥ Dashboard

User View

QuarantinedID01
Lat: 10.22
Long: 69.26
Last Update: 2020-04-22
Time: 05:40:10.857Z
Temp: 90° F

QuarantinedID01
Lat: 11.22
Long: 79.26
Last Update: 2020-04-22
Time: 05:40:40.851Z
Temp: 90° F

QuarantinedID01
Lat: 10.22
Long: 69.26
Last Update: 2020-04-22
Time: 05:40:46.877Z
Temp: 100° F

⑦

Tracker

Report if distance exceeds or temperature excursion occur

③   ⑤

Alert Triggered if
Distance >= 500 m
Temperature >= 98° F

POLICE

📍 Geofence Violation

📍 Temperature Excursion

📍 Same Geo Location & normal Temperature

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Technical Architecture

Express backend subscribes to Watson IoT Platform channel corresponding to one or more end nodes

MQTT CLIENT

WEB UI

LEAFLET   ESRI   NODE.JS

Front end (Leaflet.js) updates marker location on map

APPLICATION USER

GPS

Quarantined Individual data

END NODE

End node continuously publishes messages location, time, and sensor data to Watson IoT Platform

WATSON IoT PLATFORM

Message persists in Cloudant DB

BODY TEMPERATURE SENSOR

CLOUDANT DB

USER

DASHBOARD

WATSON IoT PLATFORM

IBM Services Leveraged
- Watson IoT Platform
- Cloudant DB
- Cloud Foundry & MQTT

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What's In It For The Stakeholders

	Stakeholder	Benefits
	Quarantined Individual	• Helps to be Geo fenced • Helps to monitor Health Vitals like Body Temperature
	Community	• Visibility of Wristband to People • Avoid getting Infected • Restricting Community Spread (Stage 3)
	Health Department	• Real-time alert for Health Vital Excursion • Reducing huge manual efforts for Health Frontline workers • Prioritize Covid-19 Pandemic work effectively for needed patients
	Police Department	• Real-time alert for Geo fencing Violation • Reducing huge manual efforts (Barricades, Patrol vehicles etc) • Prioritize Covid-19 Pandemic work effectively for monitoring
	Government	• Real time Monitoring Control room Dashboard • Lot of manpower saved • Reduction in huge Cost Expenditure in Quarantine Control

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Solution Benefits

Real Time Geo Fencing & Body Temperature

Trace real time Geo Location and Body Temperature of the Quarantined Individual

IoT Enabled Automated Monitoring

Reduction in Manual Efforts by Health and Police Officials

Reduce in Community Spread

Control in the spread and hence avoiding Community Transmission (stage 3)

Future Scalability Features

Respiratory rate Monitoring

Real time monitoring of Respiratory rate

Contact tracing using Watson Assistant

Determine Quarantine's potential victim connects (Local & International History and Social Media Connects)

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Caveats & Assumptions

Health Department	▶	Providing Internet facility to all the Hotspot
Initial Geo Location & Temperature Data	▶	The datasets has to be updated for every new Quarantined Individual's Geo Location
Real Sensors	▶	For Actual Solution Deployment, we will use the real sensors like Location and Temperature Sensors
Privacy Data Storage	▶	The required datasets will be stored only for the Quarantined period (28 days). No personal information like Name, Address will be stored.
Simulators	▶	MVP solution is using IBM's IoT Watson Simulators

Product Cost

Aarogya Rekha™ (IoT enabled)
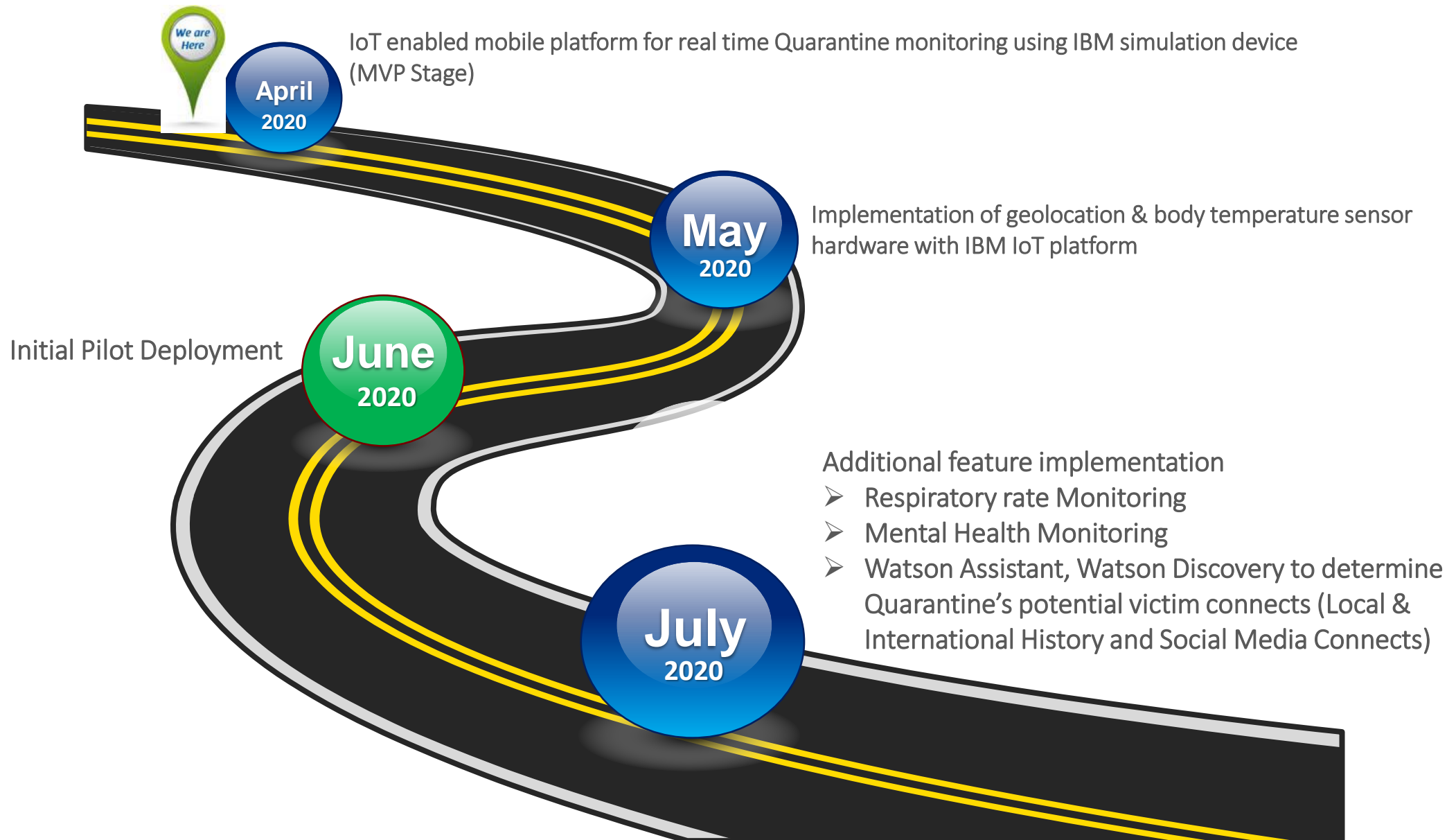
Aarogya Rekha™

- ➤ Estimated Cost to be ~ Rs 1500/piece (Inclusive of IoT sensors & devices, wristband)
- ➤ Aarogya Rekha is re-usable for all crisis situations
- ➤ One time investment for community cooperation

Existing Measure Cost

- ➤ Huge Cost for dedicated Police Officials 24/7 Surveillance
- ➤ Barricades, Patrol vehicles cost expenditure etc
- ➤ Requires Huge Man Power in involving Home Quarantine Seals, Health Authorities Travel expenditure etc

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Product Road Map

We are Here

April 2020 — IoT enabled mobile platform for real time Quarantine monitoring using IBM simulation device (MVP Stage)

May 2020 — Implementation of geolocation & body temperature sensor hardware with IBM IoT platform

Initial Pilot Deployment — **June 2020**

July 2020 — Additional feature implementation
- Respiratory rate Monitoring
- Mental Health Monitoring
- Watson Assistant, Watson Discovery to determine Quarantine's potential victim connects (Local & International History and Social Media Connects)

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