



# Workforce Safety Status Tracking

April 10, 2020



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## OVERVIEW SUMMARY

This document describes how current software systems developed by Echo Messaging Systems can be used to solve immediate problems in getting Workforce safety established so that healthy uninfected people can safely work while greatly minimizing exposure to Covid-19 (or its likely mutations).

**The Question:** How can we help businesses restart safely after / during a pandemic using our Echo Messaging software?

**How we think we can help:** Use proven AI based software to define individuals and businesses that can immediately be considered SAFE. This is the opposite of contact tracing infected people. Instead, find and identify the healthy, along with specific SAFE locations where the healthy are allowed access (businesses, school, restaurants, retail, offices, food processing plants, etc.). Using AI will keep the healthy population currently identified and allow expanding the set of SAFE regions where they can go.

SAFE can be indicated by an individual having tested Antibody positive for COVID-19

SAFE can also be considered by answering the following:

- Temperature below 99 degrees
- Have not been in contact with COVID-19 infected person
- Have followed quarantine guidelines for at least 14 days

If questions are not answered yes to all, individuals must get a positive antibody test before being declared SAFE.

As Contact Tracing systems come online, this system of tracking the healthy and SAFE areas will dovetail together to further enable the marketplace and economy.

Echo Messaging Systems, Inc is an 18 years old business located in Lincoln, RI that has developed a significant number of AI based commercial applications successfully used by businesses throughout the world. With our experience with proven software, we have helped many difficult problems in many different industries. We think we can help here as well. [Link to website customers.](#)

Our systems are driven by an artificial intelligent engine that allows fast development with ease of connecting multiple diverse databases. [link to AI Engine website.](#)

Echo Messagings Systems, Inc. has participated in a number of AI conferences and has received awards for leadership and quality. [Link to website news.](#)



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This document is getting updated often as new information is added. Check back often or contact us directly with your ideas (contact information at end).

As we learn more about Covid-19 virus, it's possible mutation, capabilities of Antibody testing, asymptomatic carriers and much more, this document is updated.



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## Problem

We want the economy restarted as soon as possible, but not at the risk of a second pandemic wave.

Returning the workforce safely back to work must be done in phases, where those that are immune and healthy can safely return and take on the important work of restarting the economy. Knowing the immunity status of each worker is key to identifying those that can safely work and shop, without fear of a second wave of Covid-19 due to a wrongly executed re-entry of the workforce.

Also, people are worried that their privacy will be sacrificed beyond the needs of being safe. This plan has a built-in exit strategy based on expirations and renewal times. Once a vaccine is in place, this level of tracking is no longer needed if the vaccine provides permanent immunity for everyone.

### *Key Questions:*

- How do we identify who is immune and who are at risk to infect or be infected?
- How can we communicate specifically to workers based on their health, location, job-type, employer, and status of their family units.
- How can we connect to all the various data that holds information required to make these decisions? Also, this data is updating and changing as we know more.

### *What we know:*

Testing for Antibodies means that rather than test if you HAVE Covid-19, we can test if you HAD it and are now immune to it. Even if immunity is temporary, identifying those with Antibodies means these people can return to work, school and markets without fear of contracting or passing on Covid-19, as long as they are retested on a schedule.

Those with antibodies are not at risk to infect or be infected. Antibody status may change over time. A positive antibody test may need to be retested in the future.



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Antibody-Positive workers can return to the workforce immediately. Workers with this status will need to be easily identified as such. Talk of an 'immunity card' that people will carry is being discussed. This will take months to implement. A simple hospital grade color-coded wrist strap (white for antibody-positive, yellow for not infected/no antibodies, light blue for recovered, no antibodies, and purple for infected/infectious) with barcoded information that can provide an interim method to identify Antibody-Positive workers which are easily and cheaply made. As workers status changes, these wristbands are easily/cheaply swapped out. An Antibody test is to be made available soon, in days or a few weeks. Confirming likely candidates first, will further speed up their workforce re-entry time.

Instead of wrist straps, cards placed in wallets, or lanyards could be used. RFID tags can be embedded, as well as Bluetooth Low energy emitters. The idea is to speed up the validation process into SAFE areas, but people may not be comfortable wearing a wrist strap, even temporarily.

A Mobile app for indicating status is an option as well.

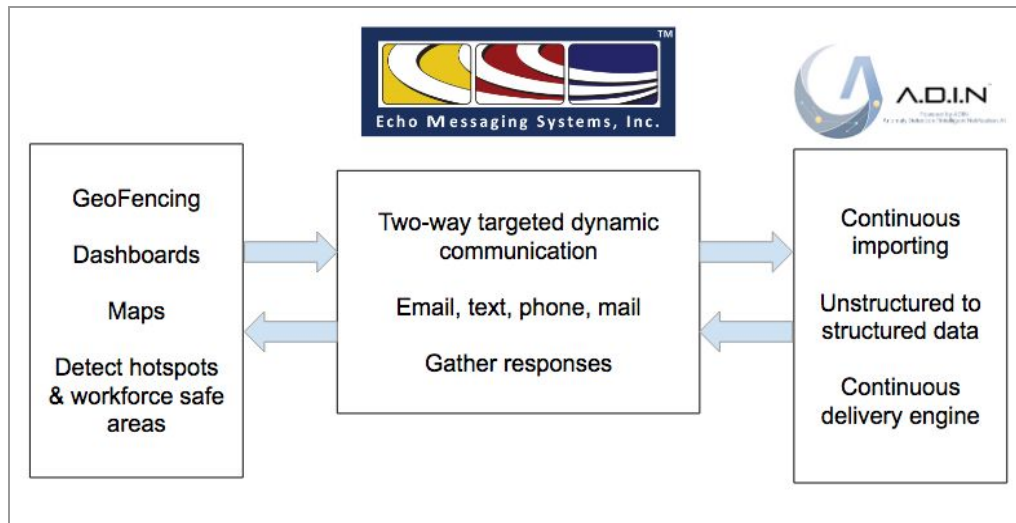
## Solution

Technology provides tools to:

- Integrate different data sources that are being updated constantly in real-time from health, government, public and other data repositories
- visual hotspots and workforce safe zones, in the community, for situational awareness and targeted communication
- automate identification and monitoring of workers as they become safe to return to the -workforcepositive ow positive
- connect to targeted groups to gather and integrate self-reported information to fill in the gaps on workers
- create workforce geofenced zones and monitor as people enter/exit and push to people's mobile devices as they enter and exit these areas.

## Technology

Echo Messaging Systems, Inc is a Rhode Island software company who, for 18 years, has developed AI-based commercial systems for automation and communication. Echo publishes its research in leading AI conferences and has received numerous awards (individual businesses etc, references at end).



*Echo has several products that together solve all the points listed above.*

Echo creates many different types of applications for business automation, safety apps, unstructured to structured data applications, geospatial, IoT and Dashboards for cognitive apps. See a complete list at the end for links to further resources.

## Dynamic targeted two-way digital communication:

### THE ECHO MESSAGING SYSTEM:

- (The original product that shares the company name) A hosted web application for bringing together data sources for contacts from other systems includes API's, csv imports, Web Services, Databases, and any other form of digital datasource.
- Communicates via email, text message, phonecall (robo-voice), mail, website for link sharing
- Form Target Groups (called dynamic groups) based on any attribute such as location, health status, jobtype, employer, age, gender, preference, etc. Any field contained in data sources can be used to filter on.
- Asks questions and remembers answers.

### *How The Echo Messaging System would assist:*

1. Connect to data sources. All data sources can be updated continually as new or updated data is added at the source. Echo's connectors monitor 24/7 in real time.
  - a. connect to health-based datasets containing individual test results which includes phone and/or email for contacts along with test results



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- b. connect to other datasets of contacts which includes phone and/or email
- c. connect to geospatial datasets containing information on hotspots and safe zones, by county, city/town, neighborhood, street
- d. connect to municipal / church datasets which includes phone and/or email if possible.
2. Connect contact by common data such as phone and/or email
3. Specify the recipient group for communication based on attributes
  - a. ex. Select all people in who attend church regularly
4. Create the messaging and question(s) for this group
  - a. ex. Ask for if they had Covid-19 systems as a Y/N question and if so, how many days since they last had a fever and/or symptoms.
5. Monitor in real-time response as people answer.
6. Specify a new recipient group based on people from answered Y and  $\geq 14$  day from previous 2 questions and send a message to this group directing them to test for Antibodies at a specific location. If they test Antibody-Positive, they will receive a white wristband indicating this. Otherwise during testing, they will receive the appropriate colored wristband.
7. Continue to create dynamic groups, send targeted messages including questions as needed.

## Automated Importing from DataSource and Automated Notification:

### ADIN - Anomaly Detection and Intelligent Notification

- AI-based system using Autonomous Agents to perform specific automated tasks, including:
  - connecting to as many data sources as needed
  - importing data from all connected data source
  - converting unstructured data to usable structured data
  - continuously monitoring all data sources for new/updated data
  - delivering dynamic messages created by the Echo Messaging System

## Visualizing in Real-time:

### Dashboards, GeoSpatial Web Services:

- AI-based system using Autonomous Agents to perform specific automated tasks, including:
  - connecting to as many data sources as needed

## Geo-fenced Workforce Zones:

### GEO-FENCED PUSH NOTIFICATION

- AI-based system using Autonomous Agents to define geo-fenced areas that represent hotspots and/or workforce safe zones.
- Mobile App that receives push notifications to various public and private channels that can be tied to moving into/out of geofenced areas

## GEO-TAGGED PHOTOS

- To promote and maintain integrity of workforce safe zones, scanning the wrist strap at checkpoints, such as transportation hubs (subway, trains, airports) where white, yellow and blue can move freely.
- Photos with phone location enabled are taken of people's wrist straps where scanning technology is not online. This information will identify the person, time, place (gps lat/lon) and immunity status.



*Prototype of color-coded wrist strap with barcode was made in under 5 minutes using widely available components. NOTE: Cards and Lanyards are options too with RFID or BLE emitters*



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Color Code	Card / Lanyard / WristStrap Meaning
white	antibody positive - Access
yellow	not infected, no antibodies - Access
blue	recovered, no antibodies - Access
purple	infected / infectious - No Access
no card/strap	No Access

*NOTE: Eliminating purple is possible. Assume infectious unless you have an unexpired SAFE card or wrist strap, with or without RFID or BLE emitters*

## Multimodal Communication

**All Echo Messaging product communicate in multiple formats including:**

- email
- text message
- phone call
- push notification
- websites
- social media
- mapping applications

## Implementation

The following describes 3 Tracks over 3 Phases to use the technology described above to bring the economy back running immediately to its maximum extent while remaining safe for people to work, learn and shop.

The 3 track focus on the following:

**1) Population** - The key for this track is communicating what people need to do, when and where. People need to provide basic information about themselves and comply with instructions on how to get tested for antibodies and in some cases Covid-19. Key concepts are : communication, instructions, self reporting





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**2) Workforce Zones** - The key is to identify Workforce Zone at each of the 3 phases (Phase 1 - first set, municipal workplaces (police, fire, local government), shopping centers, business offices, schools, transit hubs, common public facilities, malls, office buildings, food processing plants, where perimeter can be monitor and has a centralized entry points. Phases 2 & 3 expands by growing areas from Phase 1 outward to expand into larger and larger areas where people can safely move about.

**3) Testing** - testing for Antibodies and in some cases Covid-19 will be ongoing as currently antibodies do not guarantee permanent immunity. Repeated testing will be required on a regular schedule, until a vaccine proves long term immunity.

## Phase 1 - GETTING STARTED ASAP

### 1P - Population

Identify and import population dataset with email, phone, street address

**Comm1** - initial comms with public to self organize into Workforce Health Status

Recipients: All people

Message: "We need people to indicate what they know of their Workforce Health. This to get the largest set of healthy people tested for antibodies. Antibody positive people can not be under 'Stay at Home' orders and can travel while their Antibody Positive status does not expire. Retesting extends Antibody Positive status."

(Link to website with questions - if clicked thru, will include their email and will connect to unique record based on email)

Questions - Check the one that best applies to you:

- A - I was not tested for Covid-19, I have not been near anyone who tested Covid-19 positive, and I feel good now.
- B - I was tested for Covid-19 over 2 months ago, I have not been near anyone who tested Covid-19 positive, and I feel good now.
- C - I was tested for Covid-19 within the past 2 months, I tested negative, I have not been near anyone who tested Covid-19 positive, and I feel good now.



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- D - I was tested for Covid-19 within the past 2 months and I tested positive. I quarantined for 14 days, I have no fever and no symptoms, and I have not been near anyone who tested Covid-19 positive.
- E - I was tested for Covid-19 within the past 2 months and I tested positive. I haven't quarantined for 14 days.
- F- none of the above

Phone calls will direct people to a website where they can enter their State Issued ID and self report from a website. Groups from A, B, and C are candidates for Antibody Test. Groups from D and F are candidates for Covid-19 Test. Group E must remain under self-quarantine.

### **Comm2** - based on Comm1 responses:

Recipients: Answered A, B, C

Message: "Schedule an Antibody Test by going to (website) to find nearest location and get a time/date". Use your State issued ID when scheduling this. Message includes barcoded information to be used at the testing site to expedite."

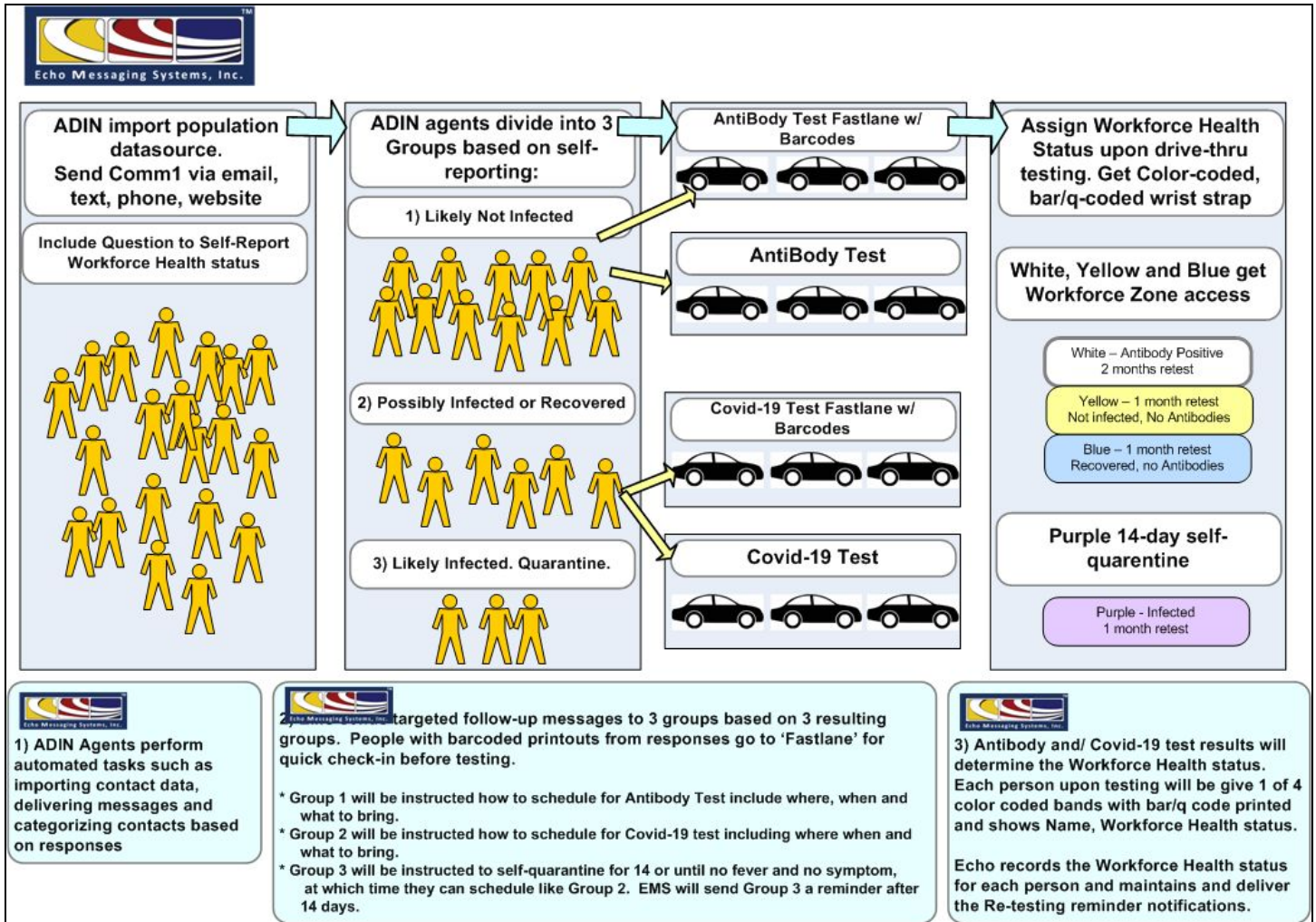
Questions - If you aren't able to schedule for an Antibody Test, please indicate why: (text box) and (dropdown - I'm a caretaker and can't get away for example.)

### **Comm3** - based on Comm1 responses:

Recipients: Answered D, F

Message: "Schedule a Covid-19 Test by going to (website) to find nearest location and get a time/date. Use your State issued ID when scheduling this. Message includes barcoded information to be used at the testing site to expedite."

Questions - If you aren't able to schedule for a Covid-19 Test, please indicate why: (text box) and (dropdown - I'm a caretaker and can't get away for example.)



Workflow using Echo Messaging tools - ADIN agents and Echo Messaging System to mass communicate and auto group for Antibody and Covid-19 testing to get each person's color-coded Workforce Health status

## Comm4- based on Comm1 responses:

Recipients: Answered E

Message: "When your 14 day quarantine is completed and you have no fever and no symptoms, schedule a Covid-19 test by going to (website) to find the nearest location to get time/date."

## 1W - Workforce Zones

Identify phase 1 Workforce Zones - perimeter can be maintained, entry points will check for white, yellow and blue wrist straps. People with no wrist straps will not be allowed entry. Phase 1 Workforce



Workforce Zones start at specific buildings. With automation, zones expand to more buildings in Phase 2. Regions are connected to form larger regions in Phase 3, where check-ins are automated via a Mobile app and Geo-fenced monitoring using ADIN. Zone candidates are municipal buildings (police, fire, local government), transit hubs (subway, bus, train stations, airports), office building with front lobbies, schools w/ front lobbies, malls with designated entry points, larger stores and food processing plants. Places where people can easily show their wrist straps and can be monitored on central access points to allow smooth movement of people to work, shop and learn.

Workforce zones are represented at Geo-fenced regions by geometric shapes based on lat/lon indices.

## 1T - Testing

Identify Phase 1 testing - Antibody testing, Covid testing, population given color coded barcoded wrist straps based on workforce health status

Predetermine testing locations for Comm2 Recipient Groups (answered A,B,C from Comm1). People arrive with their barcoded printout that can be used to quickly check them in before testing.



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## **Administer Antibody test:**

Positive Result: issue a white color wrist strap. Print Name, Date/Time, Result: Antibody Positive, Expires: (today + 2 months), State Issued ID, State ID type, ID Issued Date, ID Expiration Date. Encode this date into a bar or Q-code. PPrint onto a White Wrist strap. Secure onto a person's wrist. The Indicated meaning of Workforce Health Status is 'Antibody positive'. Exempt from Stay at home order until expires (2 months) they will need to be retested for Antibody to get another wrist strap.

Note: the exact time to retest will be determined in conjunction with a Medical Public Health official. The expiration time for all status can be adjusted as we better understand the nature of Antibody immunity.

Negative/Inconclusive Result: The person must take a Covid-19 test. If they test negative then issue a yellow color wrist strap with the same printed information as white but Workforce Health status is 'not infected/no antibodies'. which expires in 1 month. If they feel ill or come in contact with an infected / infectious person, they must discard the yellow wrist strap and schedule a Covid-19 test.

Predetermine testing locations for Comm2 Recipient Groups (answered D, F from Comm1). People arrive with their barcoded printout that can be used to quickly check them in before testing.

## **Administer Covid-19 test:**

Negative Result: Administer Antibody Test:

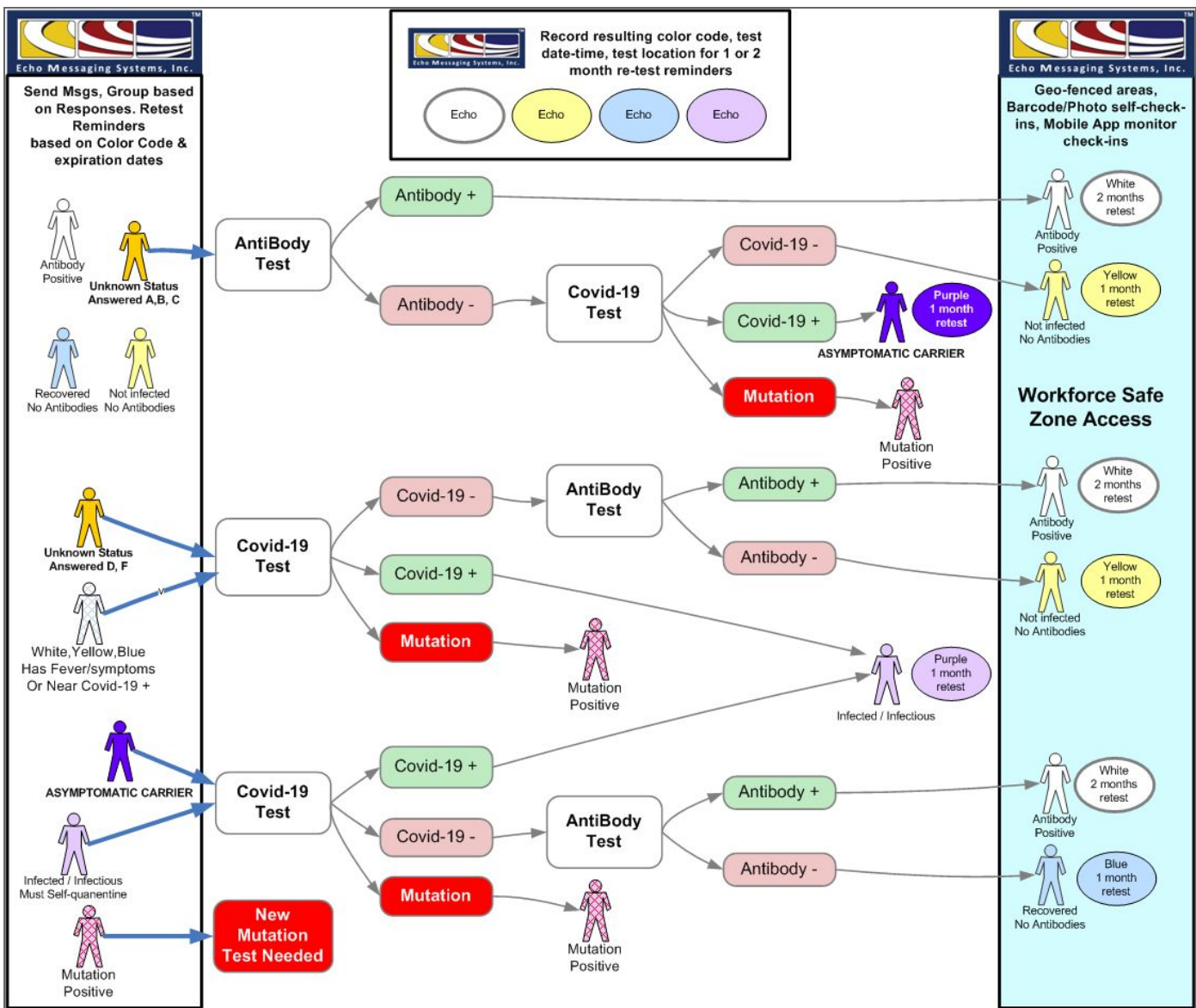
Positive Result: issue a white color wrist strap with the same printed information as above. Workforce Health Status is 'Antibody positive' and expires in 2 months.

Negative/Inconclusive Result: Person must take an Antibody Test. If they test positive, issue a white color wrist strap. If they test negative, issue a yellow wrist strap.

Positive Result: issue a purple color wrist strap with the same printed information. Workforce Health status is 'infected / infectious'. Expires in 1 month. They can

retest after 15 days. They must self quarantine from all yellow and blue wrist strap people. White wrist straps have antibodies and will be immune.

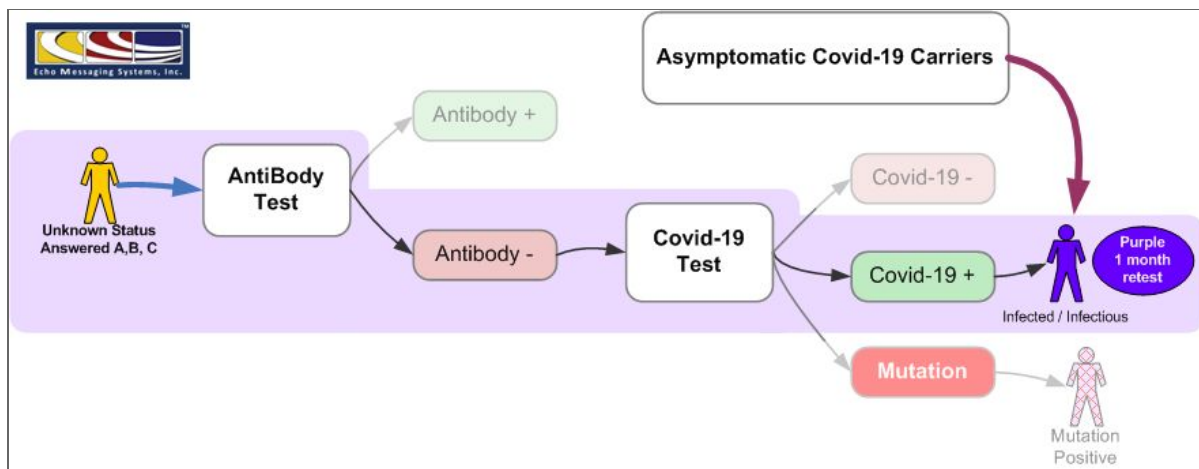
**Mutation Result:** the person being tested showed that they have a mutated version of Covid-19. Guidance from a Medical Public Health official will be needed to determine if they get assigned a special 'Red/Black' wrist strap, what their quarantine instructions are, and how their case will be specifically handled.



Color-coded wrist strap from Testing workflow coordinated with Echo Messaging Dynamic grouping, test & re-test reminder scheduler

Re-Testing - All people with purple wrist strap after their quarantine must retest for Covid-19. If they test negative issue a blue color wrist strap with same printed information, but Workforce Health status is 'recovered, no antibodies' and expires in 1 month. they will need to be retested for Antibody to get another wrist strap

## Identifying Asymptomatic Carriers



*Antibody and Covid-19 testing workflow from previous diagram shows a path to identifying asymptomatic carriers*

Testing continues in this manner through all phases as shown above.

## Phase 2 - SELF-CHECKING AND EXPANDING WORKFORCE ZONES

### 2P - Population

Automated individualized communication with people based on their Workforce Health status and expiration date, to keep their status current. If Antibodies are detected in yellow, blue or purple wrist straps, they are swapped for white wrist straps with 2 month expiration.

If Covid-19 positive (purple) no longer test positive, but don't indicate antibodies, they are issued a blue wrist strap.

These communications continue through Phase 3.



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## 2W - Workforce Zone

Identify Phase 2 Workforce Zones as expanded versions of Phase 1.

People with White, Yellow and Blue Workforce Health status will self checkpoint as they enter Workforce zones thereby allowing Workforce Zones to expand in size. A college building can expand to a campus, an office building can expand to a cluster of buildings, a school can include surrounding parks. More subway, train, bus and airport access.

This will be done two way:

1. Scanning devices at entry points where people will scan their barcode wrist strap to be 'beeped-in' The bar/q code is read, and the peoples status is checked at a central datasource. The location of the scanned point is logged along with the date/time stamp.
2. People with phones can take a picture (with phone location enabled) and upload the picture of their barcoded wrist strap to via a web app. The app will extract the location lat/lon and date/time stamp from the photo and log the information same as the scanning devices.

## 2T - Testing

Same as phase 1. Retesting of all Workforce Health statuses as they expire.

## Phase 3 - FULLY AUTOMATED AND EXPANDED WORKFORCE ZONES

**3P** - A Mobile app that fully automates the checkpoint process will let people run the app and register their Workforce Health status as they cross into Geo-fenced areas. The location (lat/lon) date and timestamp is recorded as they enter a geo-fenced area. White, yellow and blue can freely enter geofenced area. Purple will require self-quarantine until the testing changes their status to White, Yellow or Blue. Covid-19 may cause some White, Yellow or Blue people to be reinfected and go to Purple. They must retest until they are cleared and go to White, Yellow or Blue - again with an expiration date.

**3W** - Workforce Zones can expand further to the entire college campus, cities blocks, commerce area, etc.





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**3T** - Testing for both Antibodies and Covid-19 will continue until a vaccine shows full immunity, at which point expired Workforce Health status will no longer require renewal as a way to exit this Workforce Health Status tracking.

## Timeline

This system can start with small population data sources and add larger population datasets as testing sites are ramped up. Imported contacts will be matched on email and/or phone number to avoid duplicates from multiple data sources. We also match on SSN, or various state-issued ID's. Echo generated notifications will not be sent multiple times to the same person for the same notification. Any number of data sources can be used for importing contact information.

Phase	Task	Owner	Week
0	Datasets of population containing name, email, phone, street address, unique ID (SSN, State issued ID, Student ID, etc)	Gov Agency	1
0	Automate importing population dataset into ADIN	Echo	1
0	Identify Test locations (use current at parking lot, etc)	Gov Agency	1
0	Source barcode printers and plastic color coded wrist straps for each testing location.		1
0	Source bar/q code scanners for phase 2.		
0	Finalize all Comm messages wording.	Gov Agency	1
0	Setup web site form for people to self-schedule based on Comm1 responses	Echo	1
0	Identify Workforce Zones for phase 1. Municipal buildings, travel hubs, schools, office buildings. For each Ph1 WZ, identify personnel to monitor entry point checking wrist straps. This can be phased further as people are assigned to buildings for checkpointing	Gov Agency	1
1	Send out Comm1 message	Echo	2



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1	Based on Comm1 responses, prep test locations to administer tests for Antibodies and in a separate area for Covid - 19 candidates	Gov Agency	2
1	Send out Comm2, Comm3, Comm4 messages	Echo	2
1	Get as many ppl as possible tested and assigned a color coded wrist strap. Open identify Workforce Zones with central checkpoints	Gov Agency	2
1	Monitor via real-time maps how the 4 Workforce Health statuses are moving about. Assess problems.		
2	Install Bar/Q code scanning devices into all Workforce Zones to expand zone coverage without expanding manual checkpoints		
2	For all white, yellow and blue Workforce Health people, instruct how to self-check in rather than scan wrist strap or check at checkpoint via 'self-check in web site' where they take a picture of of their wrist strap (w/ phone location enabled) and upload from webpage 'take pick and upload' button.		
2	Monitor via real-time maps how the 4 Workforce Health statuses are moving about. Assess problems.		
3	For all white, yellow and blue Workforce Health people, offer an app to install on their (Android) phone where they enable Location and the app will check them upon entry into a geofenced area. This allows for further expanded Workforce zones without requiring more personnel.	Echo	

## Conclusion

The goal is to identify, create and grow Workforce Zones where people with white, yellow and blue wrist straps can move freely to work and shop.

Then the goal is to grow these zones by monitoring, identifying and limiting movement of those with purple wrist straps. Wrist straps and bar codes include when the immunity expires if antibody tests have to be taken every few months. As infected change status when they are tested, they will get a new color wrist strap based on if they have antibodies after they are no longer infected.



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## Examples:

Dashboard showing unstructured-to-structured data updated 24/7 visualized via interactive Gun Laws vs Mass Shootings Dashboard and map with click-able points

- <http://echo.echoware.net/DashGunLaws.html>
- <http://arcg.is/brqTf>

Sample Map with click points showing workforce health status

Push Notification

Echo Messaging System

## Contact Info

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**Information on ADIN AI System:** [www.echoaisystems.com](http://www.echoaisystems.com)

**One page summary:** <https://echo.echoware.net/EchoMessagingOnePager.pdf>



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## Research Summary

### Published Tech Papers:

- <https://echo.echoware.net/FullerDeaneIntelliSys2019.pdf>
- <https://echo.echoware.net/EchoFICC2018.pdf>
- <https://echo.echoware.net/FullerDeaneFTC2016.pdf>
- <https://echo.echoware.net/FullerDeaneSASO2015.pdf>
- [https://echo.echoware.net/FullerDeaneSasoMITposter\\_2015.pdf](https://echo.echoware.net/FullerDeaneSasoMITposter_2015.pdf)

### Articles, White Papers, Executive Summaries:

- [https://echo.echoware.net/EchoADIN\\_Cluster.pdf](https://echo.echoware.net/EchoADIN_Cluster.pdf)
- [http://echo.echoware.net/ADIN\\_2\\_Turns\\_Containers\\_into\\_Intelligent\\_Agents.pdf](http://echo.echoware.net/ADIN_2_Turns_Containers_into_Intelligent_Agents.pdf)
- [http://echo.echoware.net/ADIN\\_2\\_Introduced\\_in\\_Singapore.pdf](http://echo.echoware.net/ADIN_2_Introduced_in_Singapore.pdf)
- <https://echo.echoware.net/EchoWareAgents.pdf>
- <https://echo.echoware.net/EchoWareIoTPlatform.pdf>
- <https://echo.echoware.net/EchoWarePushNotification.pdf>