

# COVID-19 PASSPORT ARCHITECTURE BLUEPRINT !

USE QR CODE FOR TRAVEL

## LOGICAL & PHYSICAL DIAGRAM

COVID-19 vaccines are available for those 12 years old and above.

Vaccinations are by appointment only, so please reserve your slot by registering:

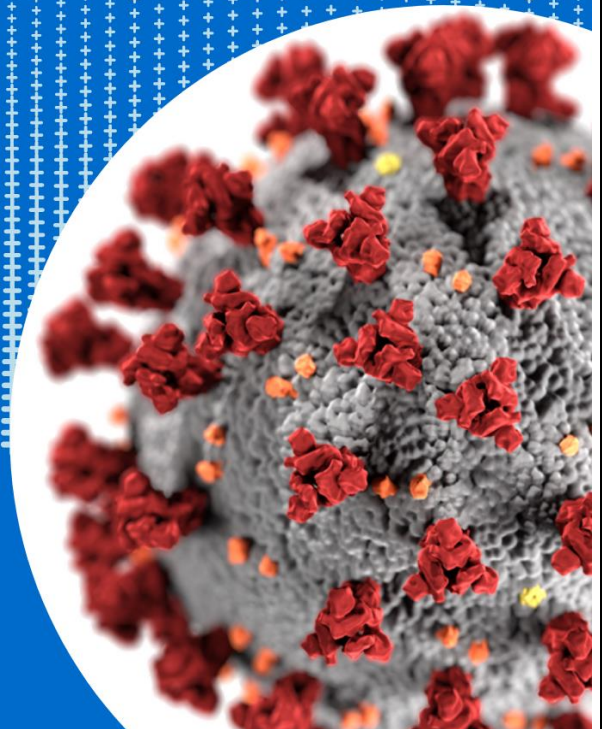
*Author : Ajit Dash*



**V-Safe**

TRAVEL PASSPORT FOR COVID

**USE QR CODE FOR  
TRAVEL**



# Abstract:

Coronavirus disease COVID-19 is an infectious disease caused by a newly discovered coronavirus. COVID-19 impacted a lot on the economy mainly the hospitality & travel industry after the lockdown of the countries border and the restrictions put by each country to travel outside. After the vaccination initiatives by each country all over the world, the COVID-19 cases are minimizing. Now countries are opening their economy and allowing the people to travel outside the countries. Although the vaccination process is in the progress so far 2.3 billion people being vaccinated all over the world. G7 and G20 countries are expecting to create a Covid Passport system where each person who can travel outside the country, they have a record check at the border control at departure and arrival. Also, these data are share daily so the border control at arrival and departure countries have the updated vaccination record for an individual. This white paper is a conceptual blueprint for the Covid-19 passport systems. Also, all the assumptions are made by the author to match the real-world requirements. The concepts are mentioned with a Logical and Physical architecture with an assumption of the few popular software tools. The main goal of the author to conceptualize the passport system in such a way that it can be modified as required. Concepts like Lakehouse and Delta Lake etc. being used and the main cloud platform is AWS.

# Introduction

Covid-19 is a deadly virus that is spreading across the world, as per the WHO

“Coronavirus disease COVID-19) is an infectious disease caused by a newly discovered coronavirus. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness.

The best way to prevent and slow down transmission is to be well informed about the COVID-19 virus, the disease it causes and how it spreads. Protect yourself and others from infection by washing your hands or using an alcohol-based rub frequently and not touching your face.

The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes, so it’s important that you also practice respiratory etiquette (for example, by coughing into a flexed elbow).”<sup>1</sup>

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<sup>1</sup> “Coronavirus” *World Health Organization, n.d.*, [https://www.who.int/health-topics/coronavirus#tab=tab\\_1](https://www.who.int/health-topics/coronavirus#tab=tab_1). Accessed June 14th, 2021.

As per John Hopkins university as of June 21<sup>st</sup>, 2021 total number of people impacted by Covid-19

**“Worldwide infected 177,758,806, Death 3,849,294 & Vaccination Administrated 2,527,339,959”<sup>2</sup>**

All over the world government, public and private institutions are encouraging all to go for vaccination as per the WHO and CDC (Age 12 and above)

“Vaccines play a critical role in preventing deaths, hospitalization caused by infectious diseases. Emerging data on effectiveness indicates that licensed COVID-19 vaccines are contributing to controlling the spread of the disease. Until widespread vaccination has been achieved, both vaccinated and unvaccinated people need to be aware of the additional protective behaviors required to control the pandemic locally”.<sup>3</sup>

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<sup>2</sup> “Covid-19 Dashboard” *John Hopkins university, n.d.*, <https://coronavirus.jhu.edu/map.html>. Accessed June 21st, 2021.

<sup>3</sup> “Statement for healthcare professionals: How COVID-19 vaccines are regulated for safety and effectiveness” *World Health Organization, 11 Jun 2021.*, <https://www.who.int/news/item/13-06-2021-the-act-accelerator-partnership-welcomes-commitment-of-870-million-vaccine-doses-and-calls-for-more-investment-in-all-tools-to-end-the-pandemic>. Accessed Jun 14<sup>th</sup>, 2021

G7 Leaders come together to donate 870 million doses of vaccines all over world for the low- and medium-income people this is called ACT Accelerator

“The ACT Accelerator partnership welcomes commitment of 870 million vaccine doses and calls for more investment in all tools to end the pandemic”<sup>4</sup>

This is a total investment by G7 countries around \$16 Billion USD also the Accelerator group goal to work directly indirectly with G20 countries to end the pandemic through vaccination.

## **Travel Restrictions:**

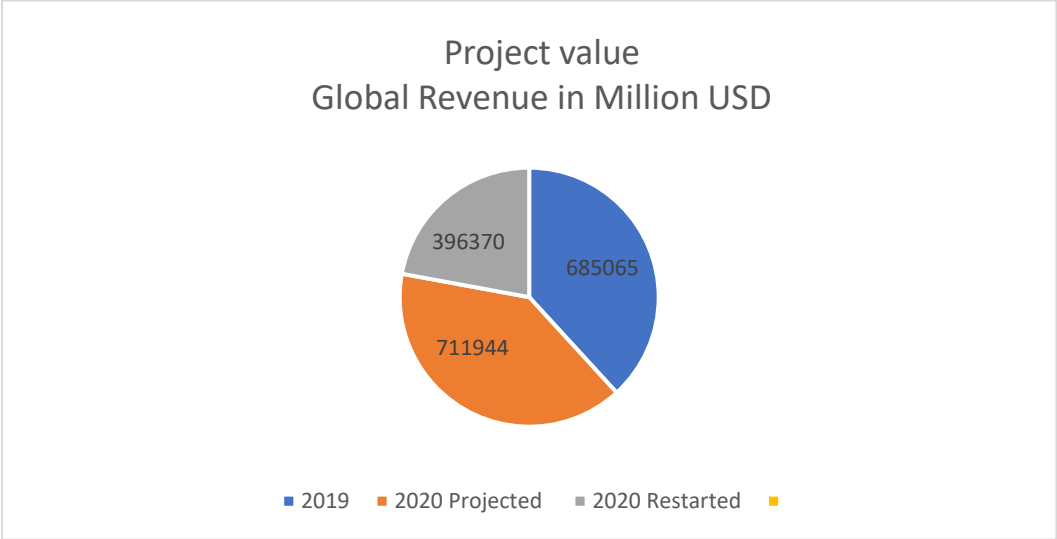
Countries all over the world have restrictions on travel and countries are taking precautions to stop the spreading of the Covid-19 and its variant. Covid already impacted the world economy and countries and citizens are facing health, emotional, and economic challenges. By taking into condition countries are planning to have a Covid passport before opening their border to overcome the travel restriction as well as the challenge from the economy.

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<sup>4</sup> “The ACT Accelerator partnership welcomes commitment of 870 million vaccine doses and calls for more investment in all tools to end the pandemic” *World Health Organization, 13Jun 2021.*, <https://www.who.int/news/item/13-06-2021-the-act-accelerator-partnership-welcomes-commitment-of-870-million-vaccine-doses-and-calls-for-more-investment-in-all-tools-to-end-the-pandemic>. Accessed Jun 14<sup>th</sup>, 2021

# Economy Impact by Covid-19

World economy impacted by 4.5 losses in the GDP due to the pandemic 5. Most impacted industry is travel and oil\*.<sup>5</sup>



<sup>5</sup> "Impact of the coronavirus pandemic on the global economy" - *Statistics & Facts* Systica.com Jun 11<sup>th</sup>, 2021., <https://www.statista.com/topics/6139/covid-19-impact-on-the-global-economy>. Accessed Jun 14<sup>th</sup> 2021

# Assumptions

**Assumption #1** Where an Individual/ Family goes to a vaccination center to get vaccinated. Vaccination center updated the information on the official website its maybe a state government-owned portal or National Portal owned by Federal Government

**Assumption #2** If the information uploaded to a State government system, then those data periodically upload to the National Portal owned by Federal Government

**Assumption #3** Vaccination center collect the information from the appointment system if it was scheduled before or it enters the individual's information such as Age, Location, Vaccination Dose #1, Vaccination Dose #2, DOB, ID, Nationality & Passport# .Data masking may require as per the guidelines of data sharing and data privacy.

**Assumption #4** All the countries have a data-sharing agreement with proper encryption in place for data security to a Global Lakehouse

**Assumption #5** For example here I have assumed AWS is the platform

**Assumptions #6** Each state have their Database, or it could be replaced by a National Database so each state will have access to their respective state

**Assumption #7 Optional:** National Database (may be optional) could be replaced by a National Covid Lakehouse (Maybe optional) but this will be a good idea for the report and data sharing globally

**Assumption #8 Optional: Not recommended:** Each vaccination clinic may have their Databases they send the records to the state or national database (not recommended)

## Definitions

**Vaccination State/ Local Database:** This Database stores the vaccination status and sent the final updates to the National Database

**National Database /Lakehouse:** Database collects data from all the states and passes data to the Global Database

**Border Control Database:** These databases unique to each country and these databases scan and verify the information for everyone coming to or going out of the country

**Global Database/Lakehouse:** Global database which is shared among all the participated countries.

**ELT:** Extraction Load and Transfer

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**API:** Application Programming Interface

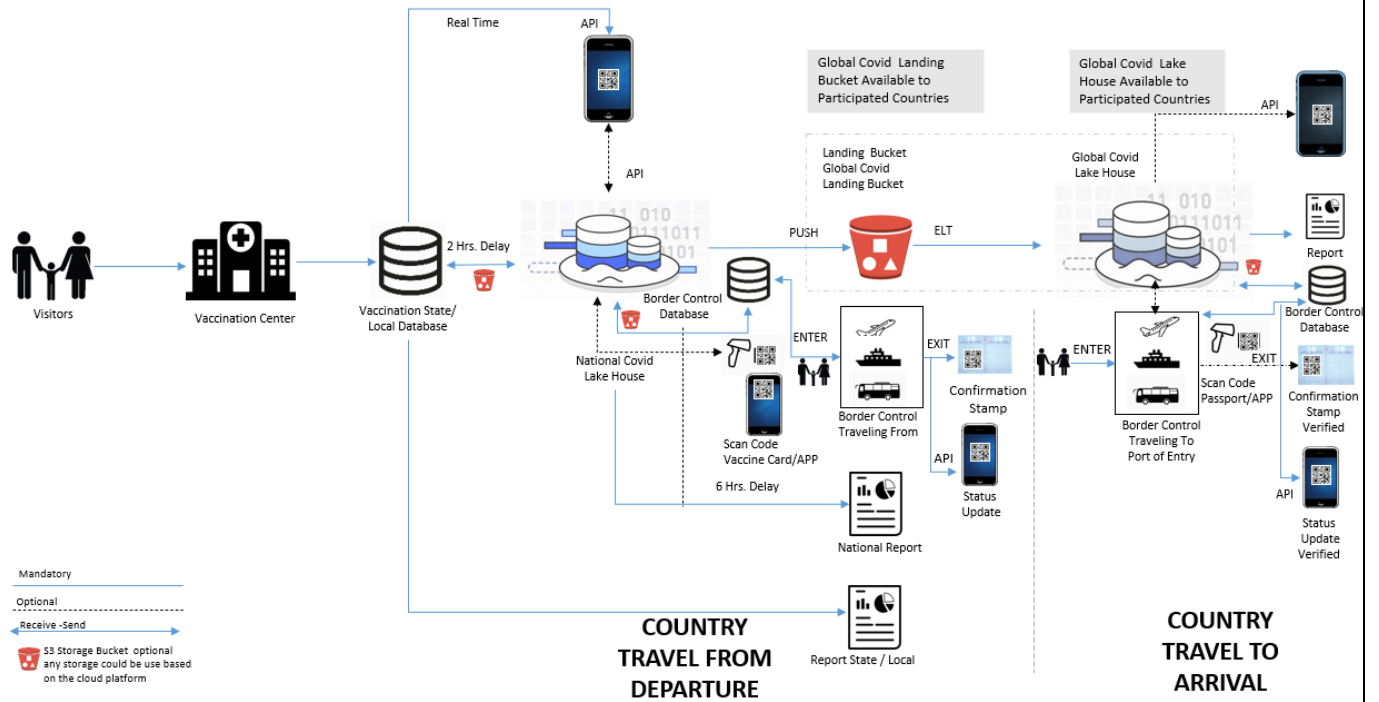
**QR Code:** Matrix Bar Code

**CDC:** Center for Disease Control & Prevention

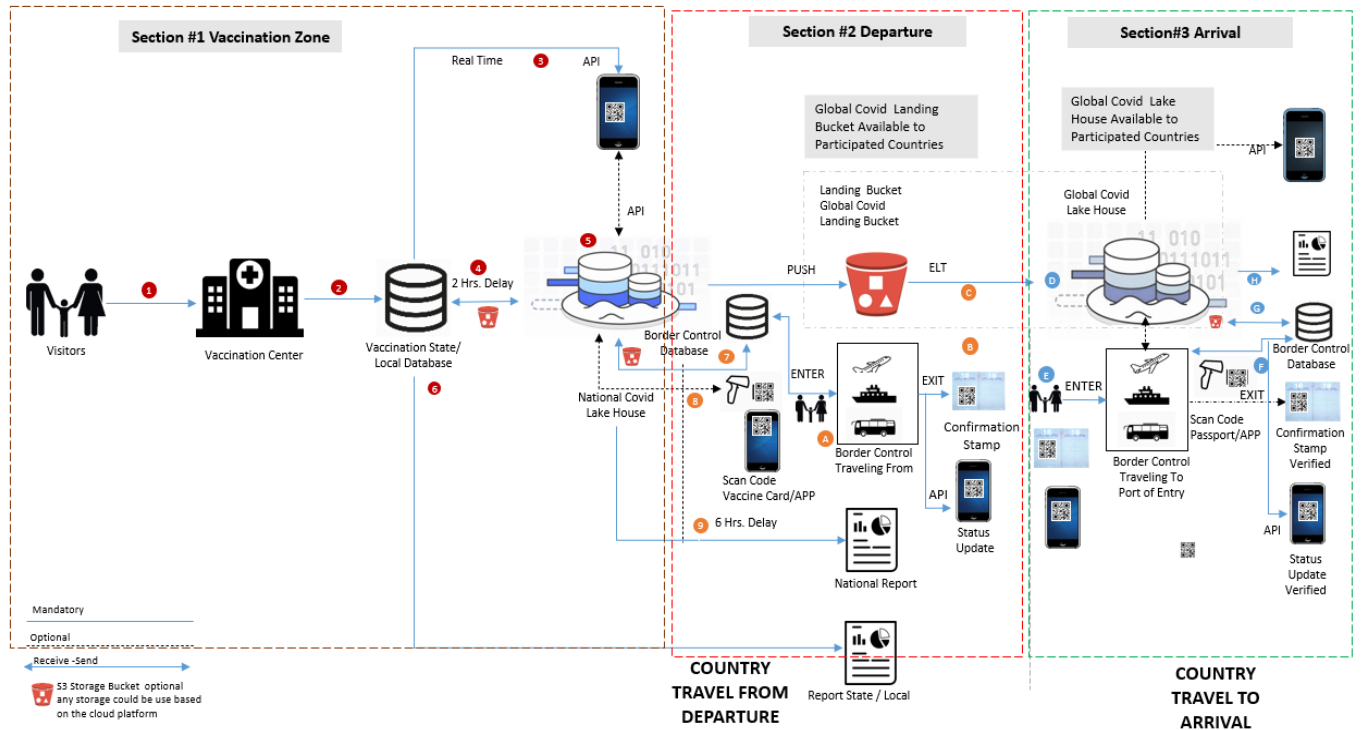


# LOGICAL ARCHITECTURE

## COVID PASSPORT- VACCIN CLINIC-STATE-COUNTRY LINK-LOGICAL ARCHITECTURE



# COVID PASSPORT- VACCIN CLINIC-STATE-COUNTRY TRAVEL LINK –LOGICAL ARCHITECTURE



## Section #1

- 1 Individual goes to vaccination center pre-registered or walk in
- 2 Vaccination center verify information or collect individual's information then enters information of the individual vaccination status
- 3 6 After the data being entered in the local system database, status get updates in the APP and a QR code generate. Also available for QR code for print or go to the email as a link user later can print the QR code
- 4 From local database , data moves to a landing bucket before moves to National Lakehouse .It is a PUSH process may be Parquet format .
- 5 Data from landing bucket moves to Lakehouse using ELT process and where the data get curated as required and move to Global landing bucket. It's a PUSH process

## Section #2

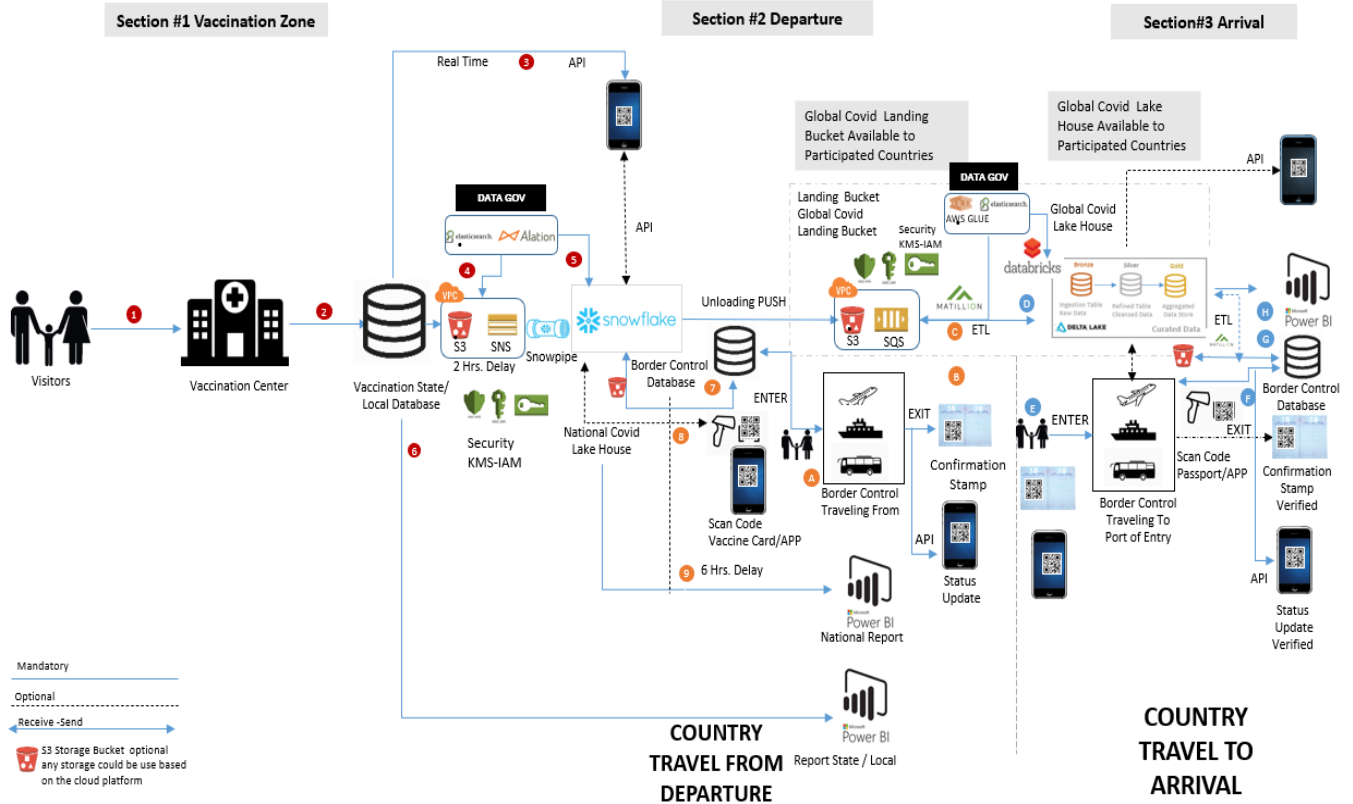
- 7 Border control database populated from the National Lakehouse data pushed to a S3 bucket then moved using the ETL to the local border control database periodically
- 8 A When someone arrived at the border control departure point( custom) to travel outside the country individual's QR code which is available either in the app or in a Covid card (QR CODE stamped) check against the Data in the National Lakehouse or Border Control database for verification
- B After scanning completed then the system get update and the individual receives a COVID vaccine confirmation stamp
- C Periodically the updated records about the Covid passes from the National or Border control Database to the Global Lakehouse through a S3 landing bucket
- 9 Reports are available from either National Lakehouse or Border control database

## Section #3

- D From landing bucket data move to the Global Lakehouse
- E Port of entry at arrival validation check for vaccination using Covid QR code card /QR Code in the passport / Phone App
- F Border control verify the Covid vaccine at entry (on arrival)either by scanning the passport or scan card in the APP and update the database
- G Border control and the Lakehouse get data loaded through a bucket

# PHYSICAL ARCHITECTURE

## COVID PASSPORT- VACCIN CLINIC-STATE-COUNTRY TRAVEL LINK-PHYSICAL ARCHITECTURE



## Assumptions & Steps #

1. National Lakehouse is Snowflake and ETL tool is Snowpipe 5
2. Global Lakehouse is Databrick-Delta Lake ETL Matillion C
3. SNS is used for the notification service to trigger the Snowpipe whenever there is a change in the objects in S3 landing bucket (National) from National Database which ultimately consume the data to the internal stage/table/DB of the Snowflake National Lakehouse (part of AWS –VPC) 4
4. Whenever National Lakehouse –Snowflake Unload the data to the S3 bucket of the (Global landing bucket) then the SQS message que get the new message que and based on the preschedule ETL (Matillion) jobs runs, and it checks the new messages in the que in the SQS and then push the new objects from S3 to the Delta Lake . C D
5. Delta Lake then curate the message (Bronze, Silver and Gold) and then the data is ready for the further consumptions for the Border Control Database . D G
6. Also Border Control Database messages communicated via a S3 bucket F
7. PowerBI is used as a reporting tool
8. QR code is the standard two dimensions code scanned and records are updated accordingly in border control databases and theses updated may push to the National and Global Lakehouse
9. National System uses the Elastic Search & Alation as the Governance tool
10. Global System uses the AWS Glue and Elastic search as the data Governance tool
11. KMS& AIM is used for the security

## **CONCLUSION:**

It is good to know that countries are trying to collaborate and planning to go for a global vaccination passport system. Also, G7 countries are donating around 870 million vaccines is equivalent to USD 16 billion to helps those countries that could not afford it or do not have the resources to produce their own. Having this Global Passport system will help control the spreading of the Covid-19. Tracing of the vaccinated people could be managed easily through the Global Lakehouse.

## About the Author

**Ajit Dash** has spent more than 24+ years in data and analytics in various capacities, led various projects as a Sr. Director Data / Cloud Advisor/ Solution Architect / Cloudy data strategy manager/Advance Analytics/Data Scientist Lead, Pre Sales Lead providing Enterprise and Cross platform integration solutions to various corporations.

His expertise includes strong hands-on analysis and design of Enterprise Solution Architecture, Cloud Advisor, Data Lake, Bigdata, Data Sc, Data warehouse and Data mining, Database Management/Integration, BI Reporting, and Cross-Platform

**Domain Expertise:** Telecommunication, Biotech, Finance, Banking, Media, Aerospace, Insurance and Technology etc.: (Clients: Fox, Oshkosh, Otis, Travelers, Apple, Qualcomm, IBM, LPL Fin. etc.)

### **Education:**

Ajit Dash holds a master's degree in General Management from Harvard University

Master's in Computer Information Systems from University of Phoenix

Bachelor's Degree in Electrical Engineering from India

**Blog:** <http://www.thedataworld.org>





## #StopTheSpread

Proper hygiene stops the spread of the virus.

# Handwashing 101

*Source:*  
World Health  
Organization

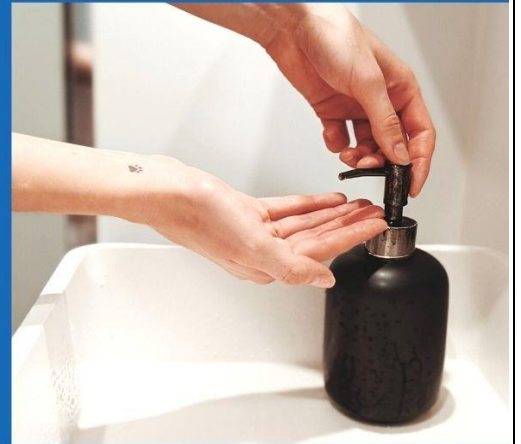
### 01

Wet your hands before applying soap.



### 02

Bring your palms together and rub soap all over the palms and backs of your hands, including between the fingers.



### 03

Wash your hands for at least 20 seconds.



### 04

Wipe your hands with a clean towel or paper towel and avoid rubbing too vigorously.





Vaccination  
Center

# STAY INFORMED ABOUT THE COVID-19 VACCINES

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