# IBM Digital Health Pass

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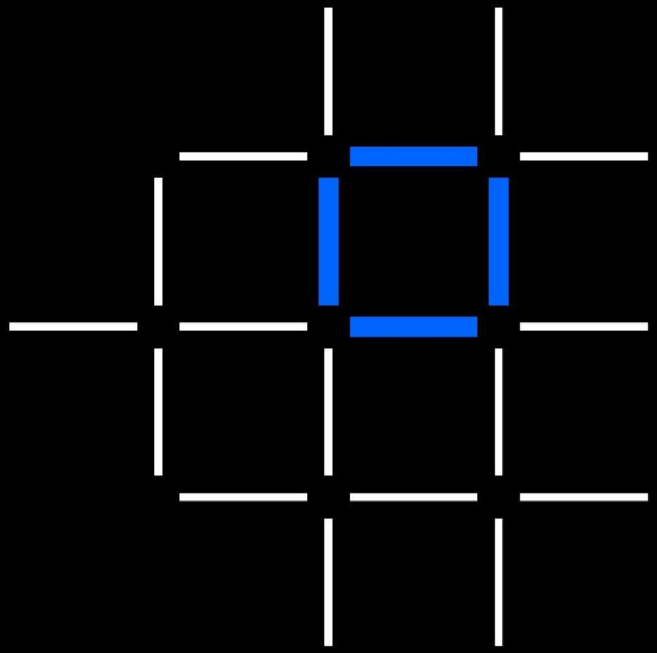
Enabling a proactive testing and clinical passport ecosystem



November 2020

IBM

According to a recent MIT study, for each recorded case of COVID-19, there are 12 that go unrecorded. Without a medical breakthrough, the total number of cases globally will climb to 200M-600M by Spring 2021.

You can catch it indoors, in crowds, or when people raise their voices. After the initial panic, many are becoming disenchanted and resistant. Masks help stop the disease, but some refuse to wear one because they see them as emasculating. Thorough hand-washing kills the virus, but who has not relapsed into bad old habits? Parties are dangerous but young people cooped up for months have developed a devil-may-care attitude. Most importantly, as the months drag on, people just need to earn some money. In Autumn, as life has moved indoors, infections are soaring.

You can contain the virus with three tactics:

- Changes in behavior
- Testing, tracing and isolation
- Lockdown

We no longer want to be chasing cases. We want to get ahead of the cases.

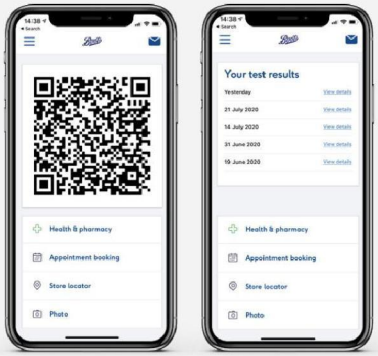
Source: MIT Management Sloan School: COVID-19 cases are 12 times higher than reported

# What is IBM Digital Health Pass?

Local governments are re-opening communities and lifting stay-at-home orders, which means people are starting to return to their "new normal". Digital health passports are emerging as a technology solution that enable individuals to present their health status so they can return to a physical location, such as a workplace, school, stadium or airline flight.

**Digital Health Pass** is IBM's platform for the integration of test certification, permissioned data sharing and analytics across multiple parties, allowing governments and organisations to manage the wellbeing of individuals and take a data-driven approach for the safe return to work, travel and entertainment.

- **Privacy-first** approach, while providing secure access, traceability and auditability
- Designed to **support proactive testing** (asymptomatic)
- Supports **multiple test types** (antigen, antibody) as well as upcoming **vaccines**
- Provides **aggregated, anonymized data** on the tested population which can be analysed in real-time, while individual data remains on personal devices
- Enables individual-controlled **consent-based data sharing** with a third-party verifier
- Allows for decision-making based on aggregated test data, allowing for **targeted management** of identified outbreaks




We are engaged with:

Technology: IBM

Airlines: United, Etihad Airways, American Airlines, Singapore Airlines, Air Canada

Airports: Abu Dhabi Airports, Changi Airport Group, Heathrow, JFK International Airport

Testing & Healthcare Providers: AstraZeneca, Quest Diagnostics, Roche, CVS, Walgreens, Nanopore, Boots, Prenetics

Industry Bodies: World Travel & Tourism Council, The Commons Project

Influencers: World Economic Forum

# The Challenge

Facilitating the return to normal requires knowledge of the status of individuals

1. Self assessment – *valid for 12 hours**
2. Temperature – *valid for 24 hours**
3. No live virus – *valid for 1-4 days**
4. Live virus antigen present – *valid for 1-3weeks**
5. Antibodies present – *valid for 3-12 months**
6. Vaccinated – *valid for 1-3 years**

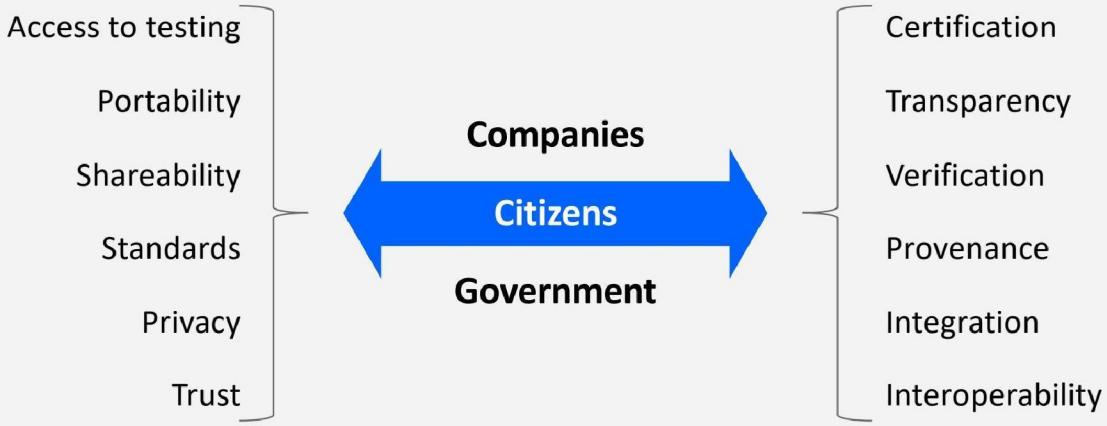
**How do you keep track of all this?**

*all purely illustrative

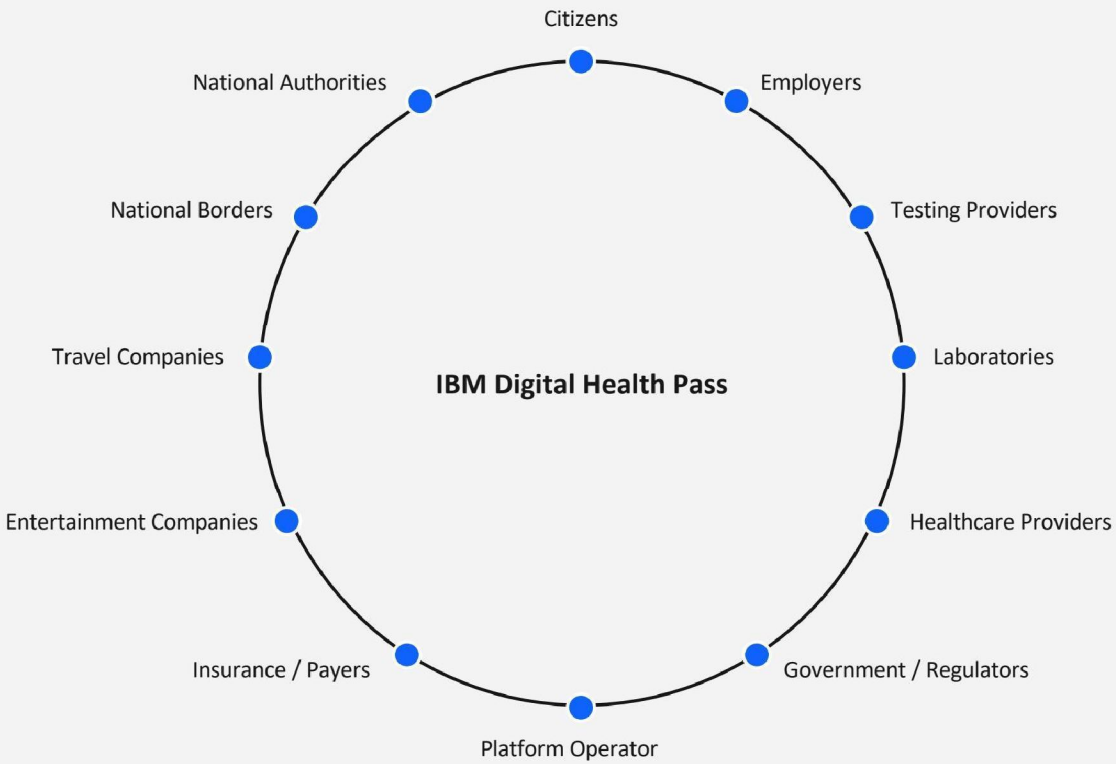
## Proposed Solution

We are proposing a **digital** smartphone user interface, with a **secure** blockchain distributed ledger backend which will provide **immutable** provenance for conducting the test, an immutable set of test records, and the ability for the holder of the test to both **view** and **share** their results using the smartphone user interface with anyone that needs to **verify** their **test certificate**.

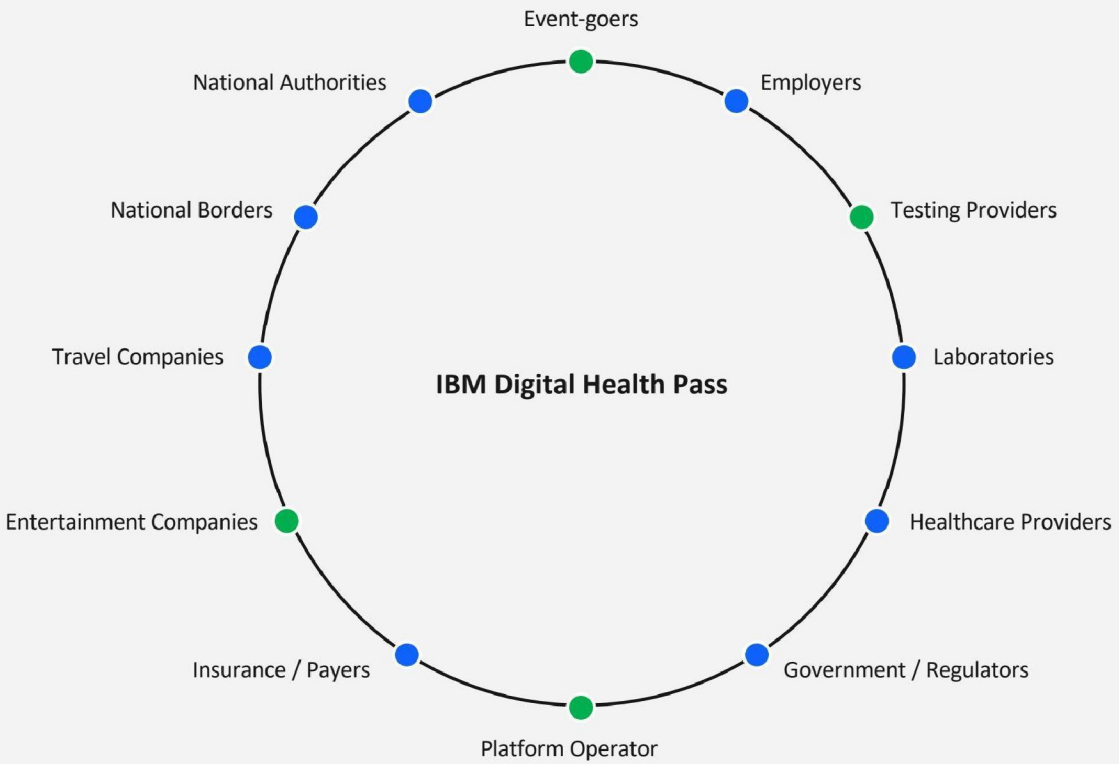
# Unmet needs and the role of technology



# Ecosystem Parties

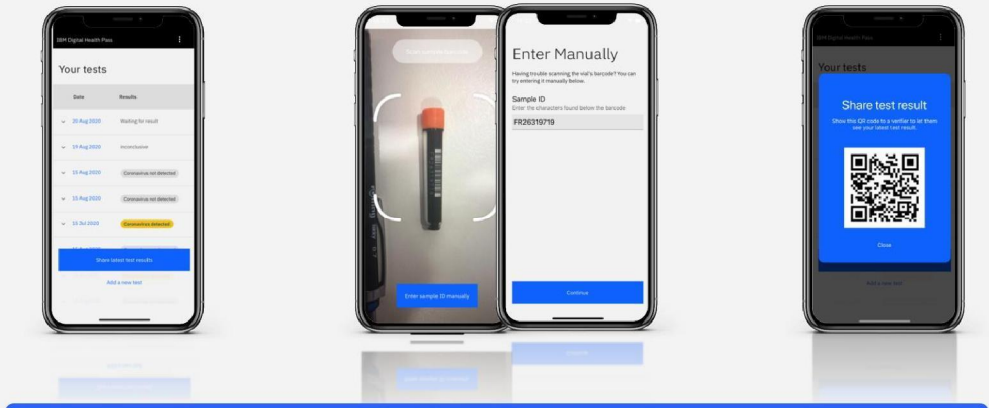


# Indicative Ecosystem for Events



# Core components of Digital Health Pass

**Passholder** **Tester** **Verifier**

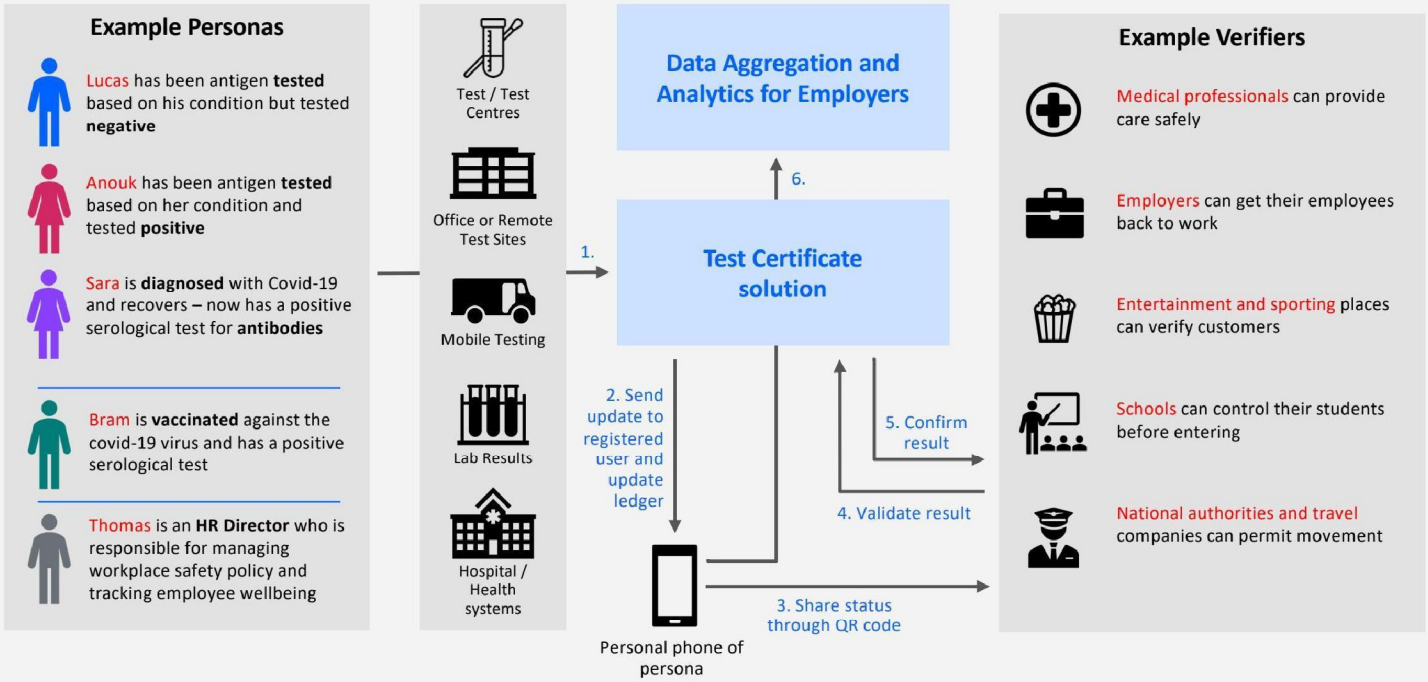



Data Platform, Integration & Analytics Layer

Flexible data model | Mobile | API-centric | Scalable | In-use today

Multiple tests / Certificates | Integrated with testers | Data Aggregation

# How the Test Certificate service works



# Example Journey

## 1 Invitation for test

Invitation includes details on test location and data, and a link to to download an app from the App Store.

## 2 Download and register

Citizen downloads the Passholder app and enters their DOB to register. Passholder QR code is available for use at a store.

## 3 Arrival for test

Testing facilitator scans the passholder QR code with the Tester app, verifying the passholder's DOB and scans the vial ID.

## 4 Give sample

Passholder gives a sample. Sample is handed off to be processed.

## 5 Sample processed

Sample is collected and collated into a batch for processing.

## 6 Results uploaded

Batch results are available as a TSV file, which can be manually uploaded.

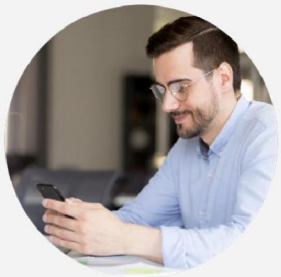
## 7 Notification of result

Citizens can view result in the Passholder app and generate a QR code to share their result

## 8 Result verified

Verifier scans the passholder QR code with the Verifier App and validates the DOB. Latest test result can be viewed.

# Our Personas



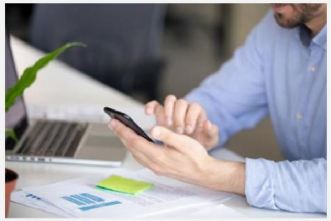
**Passholder**

**Test centre clinician**

**Lab technician**

**Verifier**

# High Level User Journey



**Invitation**

A passholder receives an invitation to be tested and downloads the testing passport app to their phone. The app generates a secure digital testing passport.

**Test**

At the testing centre, a a physical test is linked to a user's testing passport in the ledger. A test sample is taken and the passholder leaves the centre.

**Results**

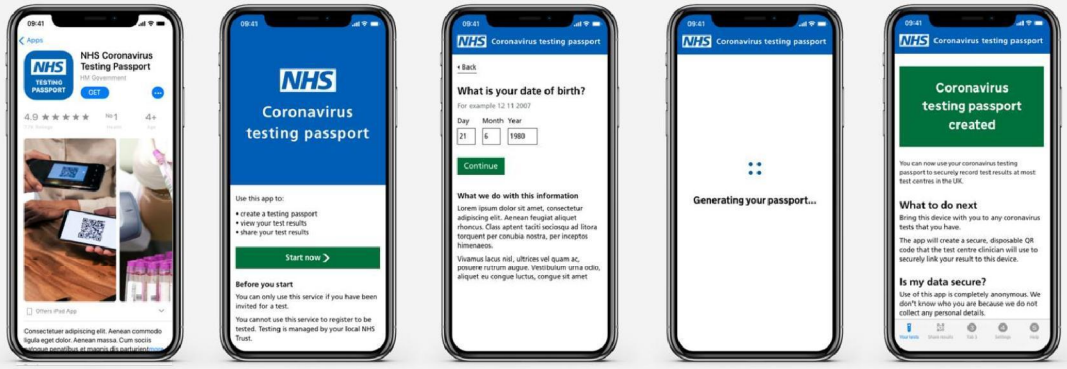
When the test is complete, it is scanned and the results are written to the ledger. The passholder receives a notification that their new results are ready.

**Verification**

Passholders can create secure, one-time QR codes within the app. A verifier scans one of these codes to see verified test results, enabling the passholder to return to work.

# Invitation

John receives an invitation to get tested. The invitation includes instructions for visiting the testing centre and an app to download.




**The invitation**

The invitation explains that the app will be used as a passport to hold and view his test results, and to notify him when new results are ready.

**Getting the app**

John downloads the app. He provides his date of birth but no other identifying information. Only his date of birth and a unique private key are sent to the ledger.

**Creating the testing passport**

The app talks to the ledger and generates a testing passport for him to store his test results. He now has a secure place to store his results.

# Test

John arrives at the testing location. Staff check his photo ID and use an existing process to check his eligibility to be tested.


**Identification**

John uses his testing passport app to generate a one-time QR code. This code allows his testing passport to be linked to the test that's about to be performed.

**Security**

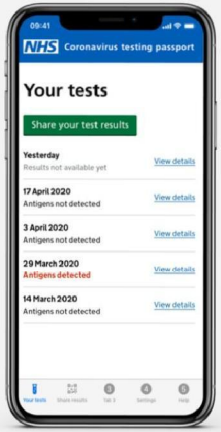
A clinician who's signed into the system scans John's one-time code and enters his date of birth. These are checked against the ledger to ensure authenticity. The clinician prints and attaches a unique ID to a new testing kit.

**The test**

A sample is taken from John. He leaves the test centre and goes home. The test sample follows its normal process through the lab.

# Results

John is eager to receive his result as soon as it's ready so he can get back to work.



**Logging the result**

Lab staff conduct the tests following their normal process. Once a result is available, a technician signs into the system, scans the test and enters the result, securely and permanently writing it to the ledger.

**Notification**

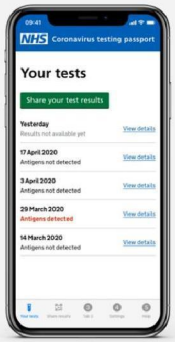
John instantly receives a notification telling him that a new test result is ready. He uses Face ID to unlock the app and view his latest test result.

**Test details**

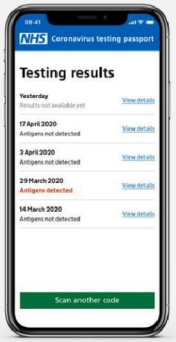
John can see a history of all the tests that have been attached to his anonymous ID. He can view more details about any of the tests.

# Verification

To ensure workplace safety, John's employer needs to verify test results for every employee.








**Returning to work**

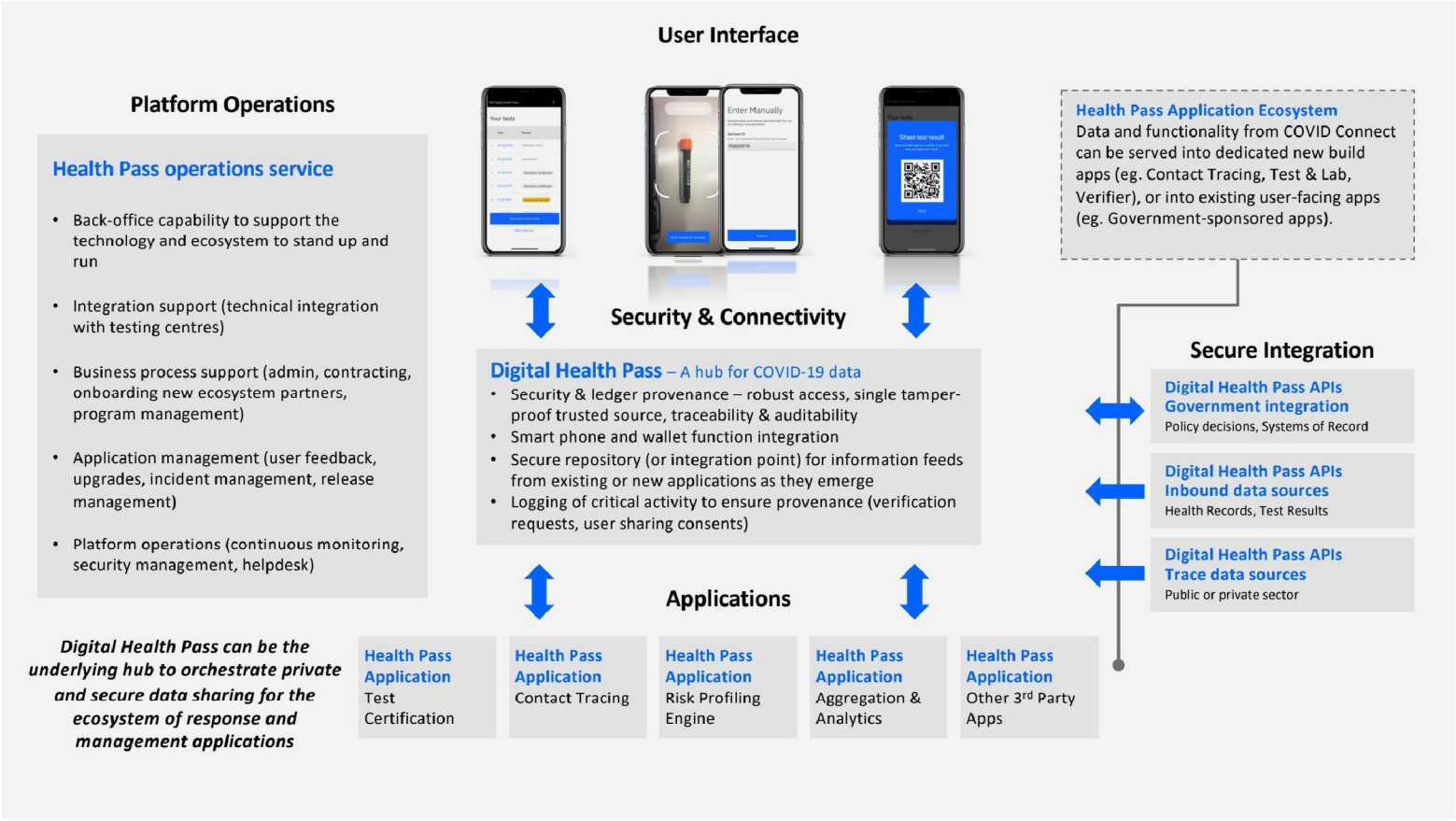
When John arrives at work, he's asked to share his test results. He uses the app to generate a secure, one-time QR code that's written to the ledger. He shows this to the verifier along with his photo ID.

**Viewing the results**

The verifier at John's workplace scans the one-time code and enters John's date of birth. These credentials are checked against the ledger and if they match, the verifier is shown John's test results. The one-time code is invalidated so it cannot be used again.

**Making a decision**

The verifier is shown a version of John's results that has come directly from the ledger, so they can be confident that the data is verified and complete. They make a decision based on the latest government guidance.


User Interface
Platform Operations
Health Pass operations service
• Back-office capability to support the technology and ecosystem to stand up and run
• Integration support (technical integration with testing centres)
• Business process support (admin, contracting, onboarding new ecosystem partners, program management)
• Application management (user feedback, upgrades, incident management, release management)
• Platform operations (continuous monitoring, security management, helpdesk)
Enter Manually
Share test result
Health Pass Application Ecosystem
Data and functionality from COVID Connect can be served into dedicated new build apps (eg. Contact Tracing, Test & Lab, Verifier), or into existing user-facing apps (eg. Government-sponsored apps).
Security & Connectivity
Digital Health Pass – A hub for COVID-19 data
• Security & ledger provenance – robust access, single tamper-proof trusted source, traceability & auditability
• Smart phone and wallet function integration
• Secure repository (or integration point) for information feeds from existing or new applications as they emerge
• Logging of critical activity to ensure provenance (verification requests, user sharing consents)
Secure Integration
Digital Health Pass APIs
Government integration
Policy decisions, Systems of Record
Digital Health Pass APIs
Inbound data sources
Health Records, Test Results
Digital Health Pass APIs
Trace data sources
Public or private sector
Applications
Digital Health Pass can be the underlying hub to orchestrate private and secure data sharing for the ecosystem of response and management applications
Health Pass Application
Test Certification
Health Pass Application
Contact Tracing
Health Pass Application
Risk Profiling Engine
Health Pass Application
Aggregation & Analytics
Health Pass Application
Other 3rd Party Apps

# Multi-application source of input

***The aggregated data model enables combined COVID risk information and pan application warnings with appropriate anonymity***

**Testing Application**

| Field | Value |
|---|---|
| Id | 38656088564 |
| Test type | PCR |
| Test code | NR-9973 |
| Sample type | nasopharyngeal |
| Sample time | 2020-05-17T10:06:45.000Z |
| Result time | 2020-05-18T10:06:45.000Z |
| Test center | 5967847 |
| Result | Positive |

**COVID Connect aggregated data model** (superset of all source application data input)

**Self Reporting Questionnaire**
Risk exposure

**Contract Tracing App**
Exposure score

**Risk Analysis Engine**
Reports

Personal and private information

# Secure Aggregated Data Model


**Secure data store**
Test results
Calculated risk scores
Contact tracing reports
Self assessment results

Hash link provides secure permissioned access & enables 'right to forget'

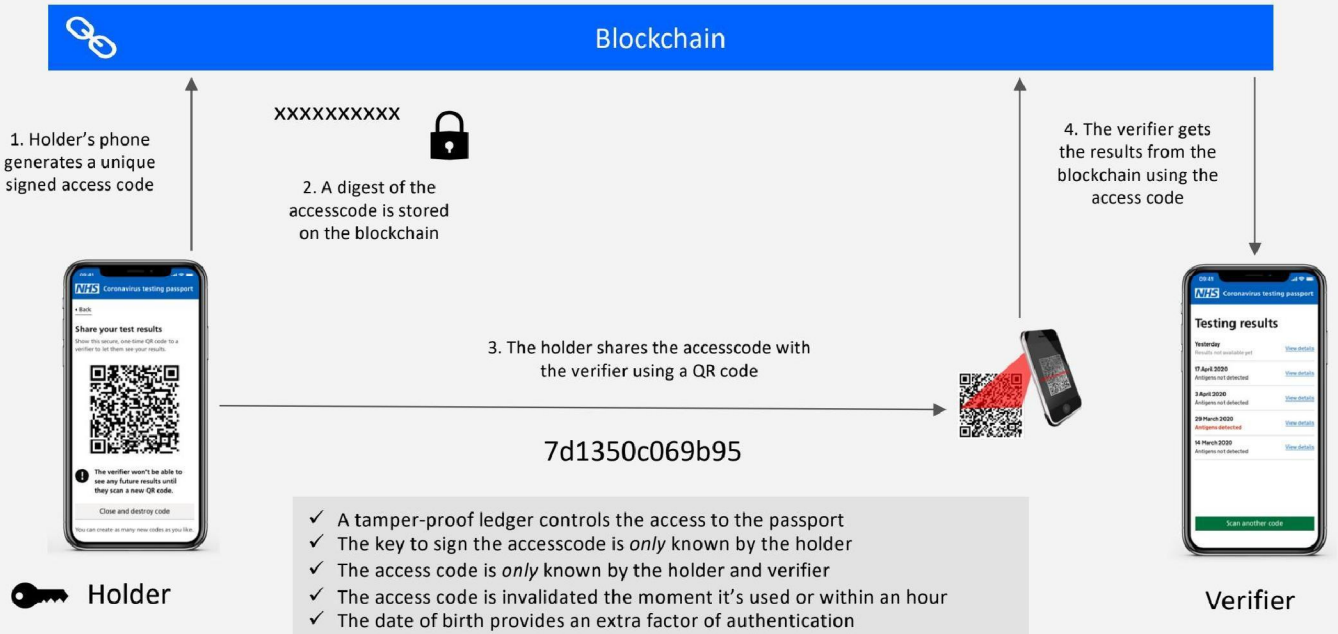
**Blockchain**
Anonymous record
Cryptographic integrity verifier
Consent & access management
Audit log

- All content is stored in secure stores of trusted data
- Enables use of both anonymised data, & ability to support GDPR needs
- Steward organizations, only accessible when permissioned through the blockchain

- The user controls access to their anonymous record, using the blockchain as a tamper-resistant consent management system

***Meeting the information needs of citizens with blockchain provenance for auditability and security***

# Secure Data Encryption




- ✓ A tamper-proof ledger controls the access to the passport
- ✓ The key to sign the accesscode is *only* known by the holder
- ✓ The access code is *only* known by the holder and verifier
- ✓ The access code is invalidated the moment it's used or within an hour
- ✓ The date of birth provides an extra factor of authentication

# Functional Scope

- Develop a **decentralised** technology platform, with **centrally managed governance**, to scale TTT quickly whilst ensuring security and privacy.
- Establish an **assured process for employee testing** to minimise risk of fraud and allow for commercially viable scaling to a national level.
- **Enable permission-based data sharing** including test and trace between employees and employers, and other external 'verifiers'.
- **Aggregate anonymised data** on the workforce population to allow for employer health tracking, while individuals' data remains on phones.
- **Enable analytics and 'next best action'** aligned with Government policy and advice to generate personal risk scores.
- Develop a **front-end which drives engagement** – considering gamification of risk scoring and enabling individuals to self-serve relevant care information.
- Enable a **service that supports the digital infrastructure** to manage user and organisational engagement, integration and technical support.
- Establish **clear governance principles** for the platform and all participants (IBM, diagnostics companies, technology companies, Governments, etc.)

## Emerging requirements from Employers

- **Daily risk scoring** mechanism ("Am I safe to come to work today?")
- **Workforce analytics** to monitor and track wellness of employees over time
- **Proximity tracing** within the workplace (both between employees and customers / clients)
- Ability for employees to share **test data** to inform risk scoring
- Government **'code of conduct'** to employers for how to apply risk scoring fairly
- **Consent management** for data sharing between employee-employer
- **Data privacy and GDPR compliance** (personal data or health data not to be held on employer systems)

# Secure Data Encryption

**Core MVP Delivery Team**

An experienced team that has been working on delivery of Digital Health Pass for the past 6 months.

**Leveraging IBM's Knowledge of T&T**

Interlocking with our T&T colleagues will help us to accelerate design, architectural, people or policy issues as we progress.

**Program Governance**

We will govern MVP and post-MVP scaling through existing programme governance we have put in place for T&T.

**MVP** – Speed, agility & alignment

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**Mobile Development** | **Integration** | **DevOps** | **Security** | **Test**

IBM can scale from a pool of technology delivery expertise to support specific feature, platform or infrastructure requirements.

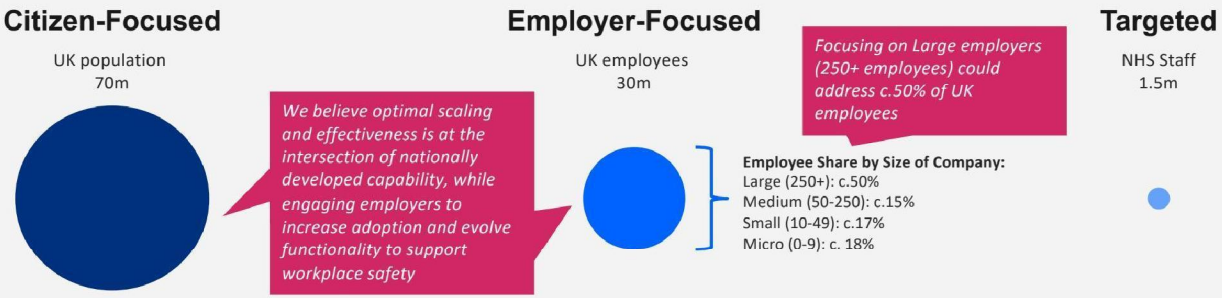
**Platform Operations and 24/7 Support**

Support for Digital Health Pass at scale can be integrated into IBM's wider support model.

**Post-MVP** – Scale, expertise and support

# Reference: Scaling National Return to Work solution in the UK

Enabling return to work with technology could be addressed 'Top Down' (Gov-led) or 'Bottom Up' (Industry-led). We see that engaging industry can be an accelerator in terms of data collection and adoption but Bottom Up has scaling challenges.




**Opportunity**
- Develop nationwide digital platform (trace, test, risk scoring, analytics) to be used by all citizens
- Harmonise policy, data and guidance to adapt alongside scientific endeavours
- Interconnect Gov, NHS and other public technology and data capabilities
- Faster speed to market through 'centralised' governance and roadmap

**Risks / Limitations**
- Solution focused on individuals, without employer access to analytics
- Perception of government-led solution

**Opportunity**
- Allow larger employers, or a consortium, to develop employer-specific return to work technology
- Leverage private sector innovation and scale to develop solutions

**Risks / Limitations**
- Potential for 'balkanised' solutions with limited interoperability or data sharing
- Data capture limited to workplace and 'office hours', dependent on self-reporting
- Enterprise GDPR and data privacy concerns
- Enterprise consortia typically slow

**Opportunity**
- Develop domain-specific employer technology enablers
- Focus on highest-risk or most critical sectors to manage employee safety
- Potential to use as a pilot group from which to expand out a Bottom-Up approach

**Risks / Limitations**
- Smallest addressable audience
- Additional development effort to deliver

# Reference: Scaling National Return to Work solution in the UK

In all scenarios, it is foreseen that Government provide the majority of Return to Work applications (and supporting guidance) although employers could choose reduced-functionality tracing capability if employees don't opt-in to a national solution

## Top Down

*Government Led*

Government provides a suite of applications and tools to support return to work, that is appropriate for both citizens and employers

## Bottom-Up

*Employer Led with Gov't Endorsement*

Employers develop workplace-specific trace (and in a few cases testing) solutions to help manage their own workplace safety.

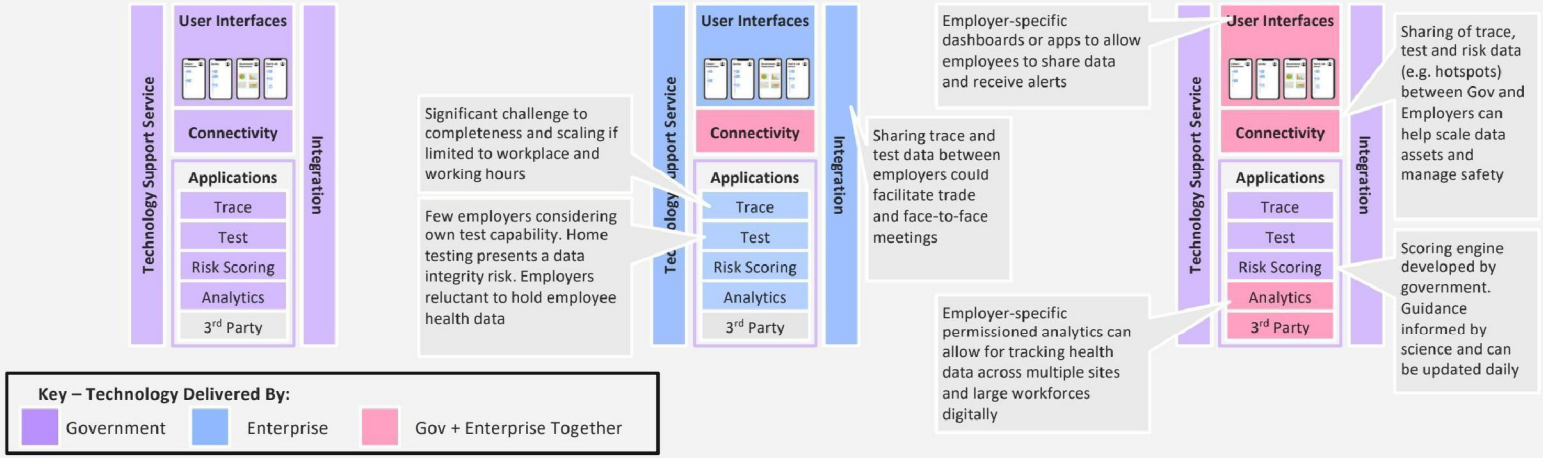
Connectivity between employers and NHS (e.g. test certificates) could increase test integrity.

## Collaborative Top Down

*Gov't Led, with Employer Engagement*

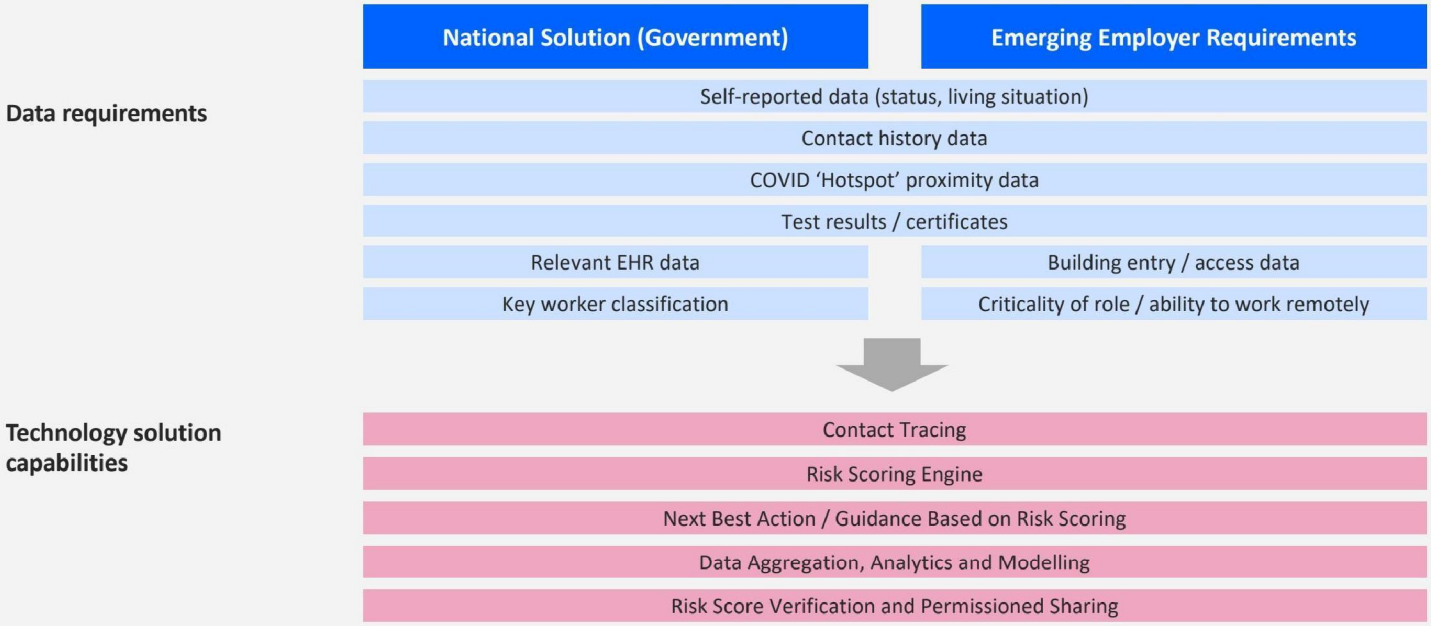
National trace, test and analytics applications form the basis of the solution set, but with specific applications developed for employers (e.g. trace only during working hours)

Multi-national companies could support interoperability with other countries.



# Government and Employer Requirements

There is significant **overlap of the data and technology enablers** that can support both Government and employer management of the Return to Work – an 'employer solution' could be a sub-set of the functionality deployed for citizens.



# More Materials


## Micro-site

High level overview of the IBM Digital Health Pass proposition, value statement, and legal-approved go-to-market narrative.

https://www.ibm.com/products/digital-health-pass


## Blog

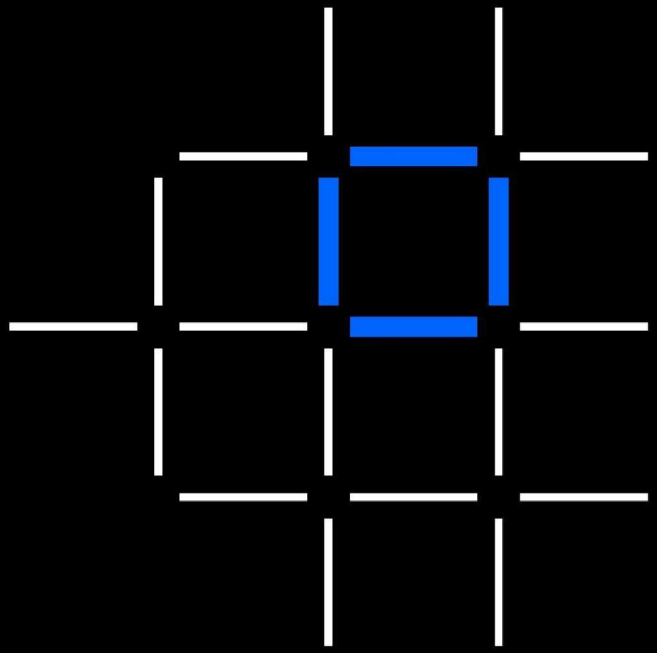
Social-ready overview and description of why Health Pass and IBM are the right partner to work with in this space.

https://www.ibm.com/blogs/watson-health/health-pass-puts-privacy-first/

# We are using this technology to deliver similar capabilities

| Who | What | Ecosystem | Scale |
|---|---|---|---|
| TRADELENS | Cargo **Certification** | Maersk, CMA CGM, MSC, Hapag-Lloyd, Ocean Networks Express | • 60% of global container volume<br>• **1.5B** transactions in 12 months |
| IBM Food Trust™ | Food **Provenance** & Safety | Walmart, Carrefour, Nestle, Sucafina | • 270 members worldwide<br>• **17,000** individual products tracked |
| we.trade more trust. more trade. | Trade Finance **Integration** | Rabobank, HSBC, KBC, Santander, UniCredit, Nordea, Société Générale | • 14 Global banks<br>• **High value,** cross-border transactions |

# Thank you



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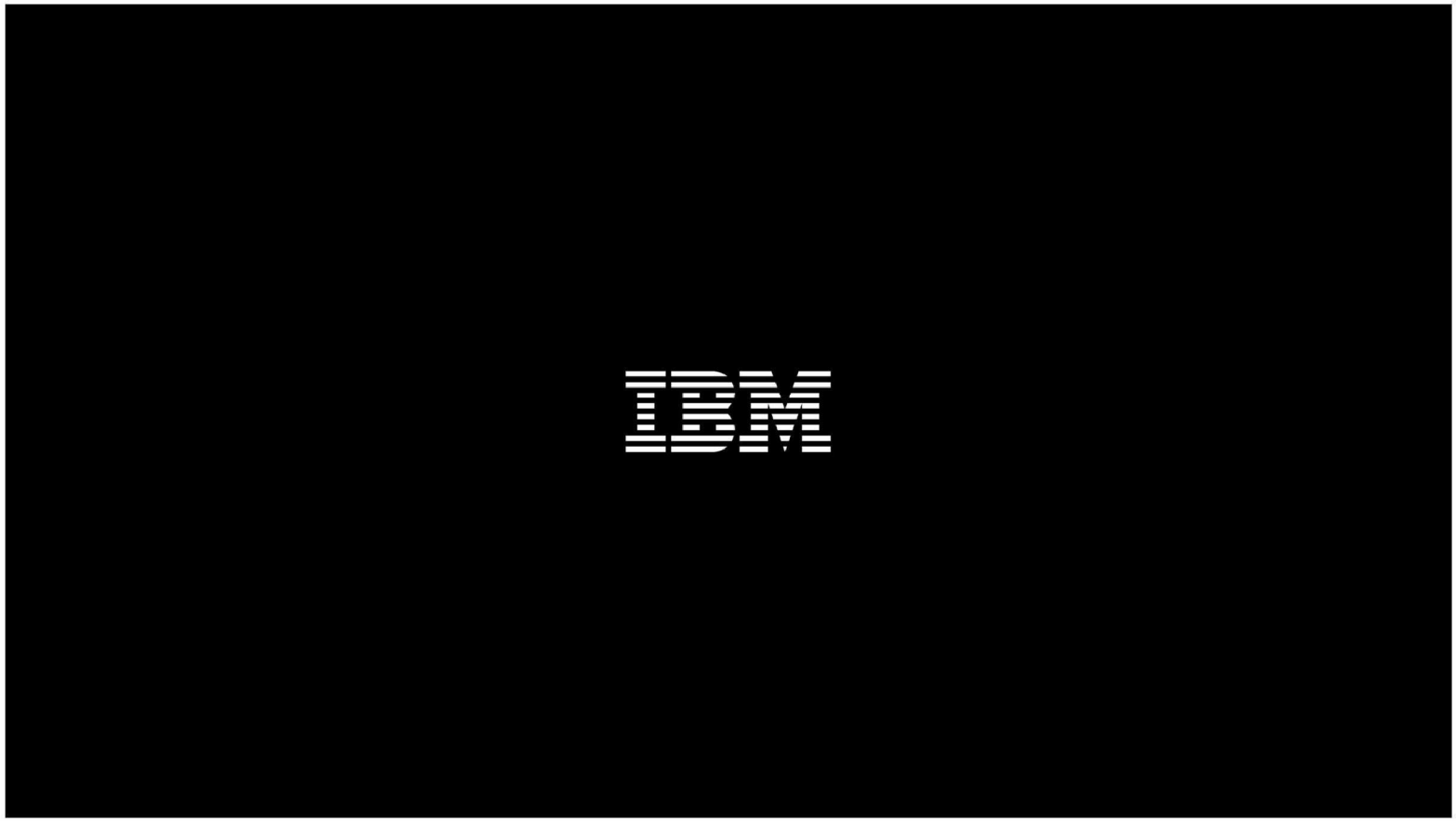
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