

Digital health platform for regulated IoT devices

Google Cloud

Ferry Tamtoro
VP & CTO
Flex Digital Health

Pushkar Sharma
Product Manager
Google Cloud IoT



Learning objectives



- Flex Digital Health introduction
- The Landscape of the Internet of Things in healthcare
- Burning issues causing the digital transformation of Pharma and Medtech
- Overview of BrightInsight, Flex Digital Health's medical-grade IoT platform
- Overview of Google Cloud technologies powering BrightInsight

Flex driving efficient & reliable operations at scale

\$24B

Revenue

100

Sites in over
30 countries

200,000

Employees

20,000

Designers &
engineers

50M

Sq. ft. of
manufacturing &
services space

710K+

Parts
managed

14.6K+

Global
suppliers

1,000

Customers

Flex's unique view into this digital era

Revenue



\$2B

Medical



\$3B

Automotive



\$1B

Industrial



\$2B

Home appliances



\$2B

Capital equipment



\$2B

Energy



\$3B

Telecom



\$3B

Networking



\$2B

Enterprise compute



\$1B

Wearables



\$1B

Connected living



\$2B

Mobile

Flex's medical scale, reach, and knowledge

\$1.8B

Segment

100

Regulated hardware &
software medical products
brought to market

20+

Years of medical device
design experience

12

FDA registered sites

450+

Medical engineers

22

ISO 13485 facilities

60+

Digital health
software engineers

100+ leading healthcare customers globally

Laboratory diagnostic
equipment



Imaging &
monitoring



Patient mobility



Disposable devices



Consumer
diagnostics



Drug delivery



Orthopedics/
advanced surgical



Digital health



Flex's Sketch-to-Scale™ solution

Supporting regulated, connected drug, device, & combination products



Innovation
& design



Manufacturing



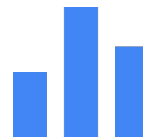
Enabling
connectivity



Regulated apps and
combination products



BrightInsight digital
health platform



Commercial scale &
revenue optimization

Flex Digital Health's vision & mission

Vision:

To digitize healthcare to improve patient experiences and outcomes globally.

Mission:

We make digital health innovation easy for pharmaceutical and medical technology customers through a scalable medical-grade platform.



1

The Internet of Things in healthcare

Healthcare data deluge



The amount of data you slough off everyday — in lab tests, medical images, genetic profiles, liquid biopsies, and electrocardiograms — combined with medical claims, clinical trials, prescriptions, academic research and more, and the yield is something on the order of 750 quadrillion bytes every day — **or some 30% of the world's data production.**¹

Proliferation of the IoT in healthcare



The number of connected medical devices is expected to be **50 billion** over the next decade¹, and the global IoT healthcare market is expected to grow to **\$405 billion by 2026**.²

2

Opportunity of IoT for pharma and medtech

Pharma and MedTech's worlds are changing

Pharma and MedTech companies are looking at how the Internet of Things can enhance their business today and solve their biggest challenges.



Accelerate pharma and medtech business objectives



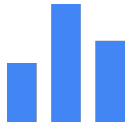
Improve adherence &
grow revenue



Improve patient engagement



Accelerate clinical
trials



Data to support value-based care
service models



Prescription management



Automated
interventions

The epidemic of medication nonadherence

Millions of patients per year do not fill their medications or take their medications as prescribed, costing the U.S. healthcare system \$300¹ billion annually.

On average, patients take only half their prescribed doses², reducing and delaying refill opportunities.

Nearly 25% of new prescriptions are never filled.²

Thirty percent of patients procrastinate on refilling their medication or do not refill their medication on time.³



Incremental improvements increase revenue

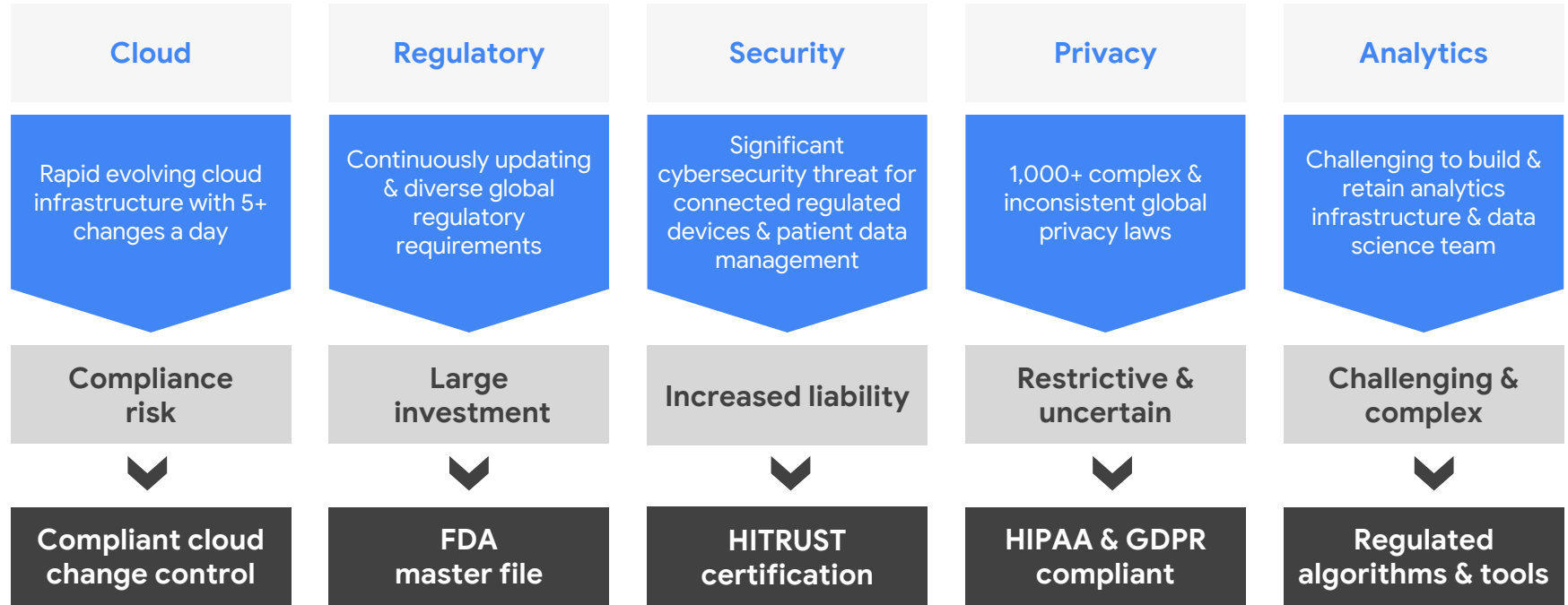


Studies show that with just a 10% increase in adherence, there is an approximately \$124 billion pharmaceutical revenue opportunity globally.

3

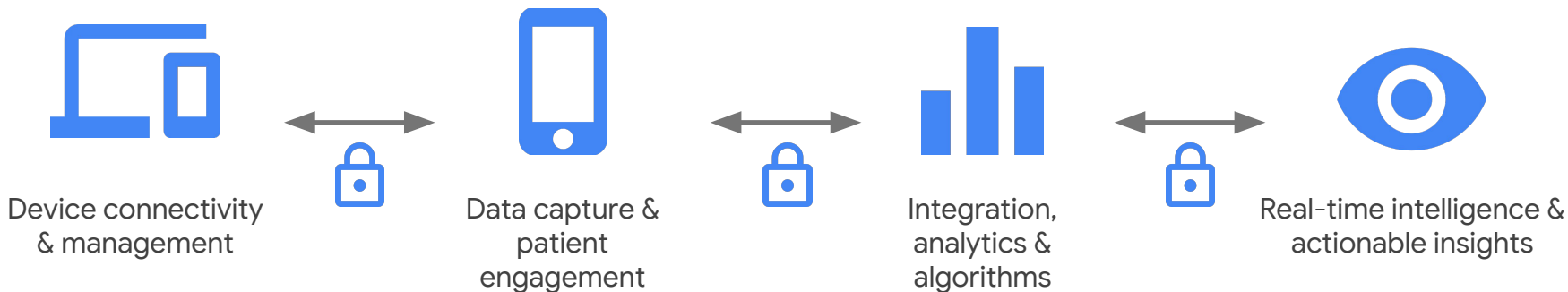
BrightInsight, a Flex Digital
health solution

Launching IoT health solutions is complex



BrightInsight, a medical-grade IoT platform

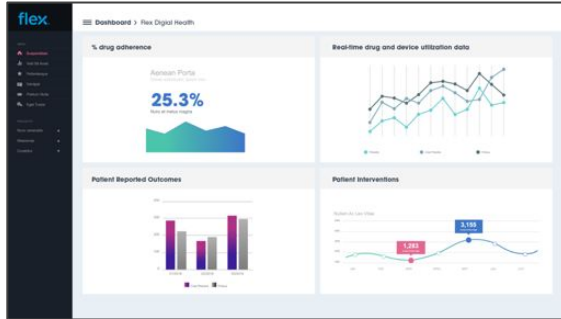
Managed services platform supporting Class I, II, III medical devices, combination products and Software as a Medical Device (SaMD)



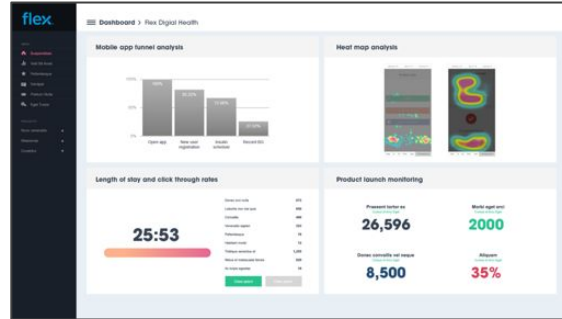
Real-time intelligence dashboards

Multiple predefined dashboards to drive increased patient adherence, patient engagement and improve business operations

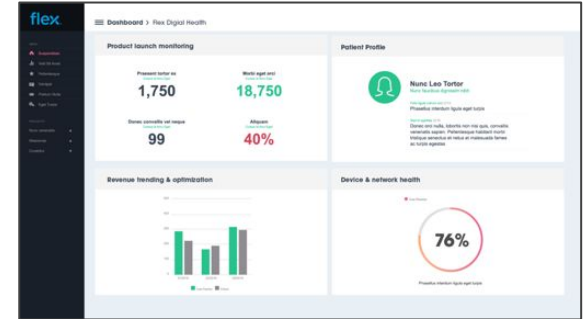
Adherence



Patient engagement



Operations



4

Our partnership
with Google Cloud

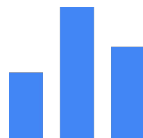
Strategic partnership

Flex Digital Health and Google Cloud's unique offering



Change control

Insight into technology roadmap and regular updates to proactively address effects on Platform master filings and support regulated software change control process.



Analytics leadership

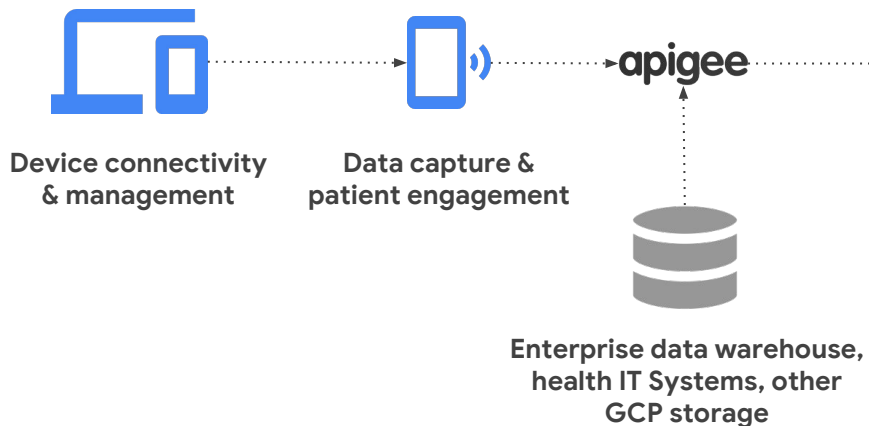
Google and Flex will develop advanced analytics and machine learning tools and support for our healthcare customers' use cases.



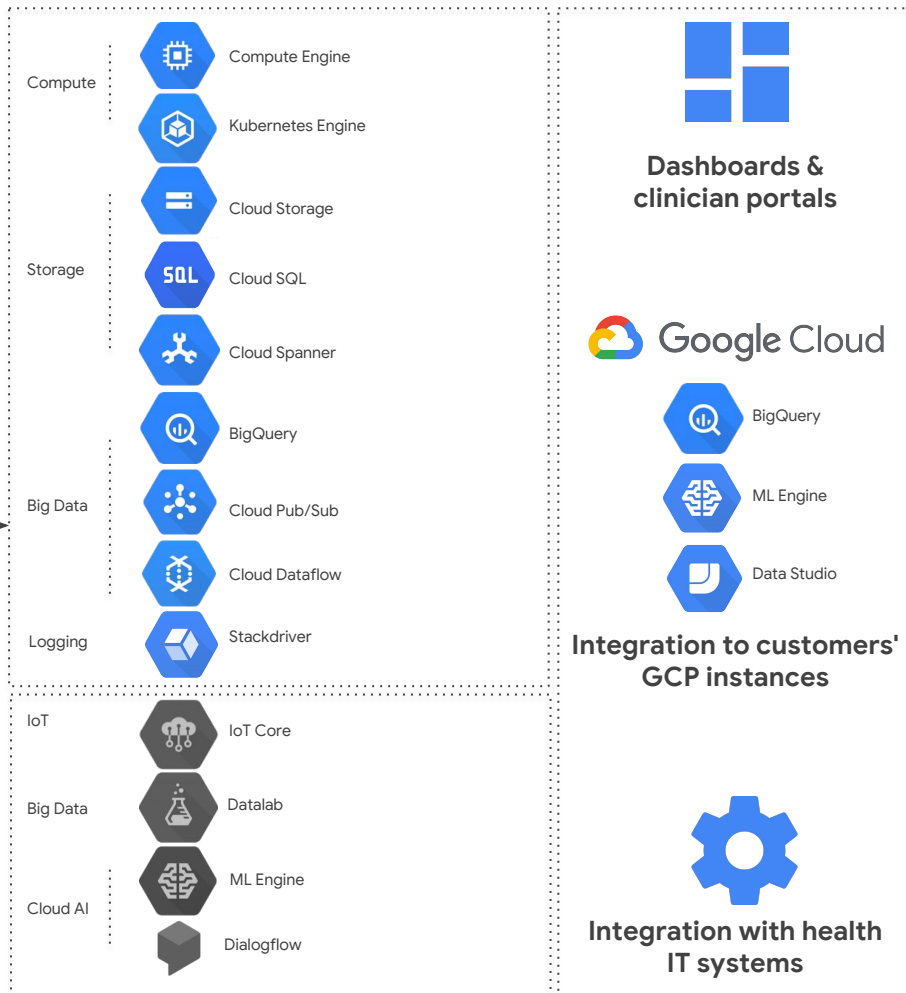
Consumer engagement

Leveraging Google's global scale and consumer expertise, Flex will develop digital health solutions that seamlessly integrate into consumers' daily lives.

BrightInsight, built on Google Cloud Platform



NEXT 



Flex Digital Health & Google Cloud Use Case

Enabling pharma and medtech to improve outcomes and brand revenue
by enhancing patient experience and adherence

Capture dosing data from
connected inhaler,
patient-reported symptoms
from app and patient
lifestyle data

Contextualize data
& apply GCP's Machine
Learning models

Automated dosing
Recommendations

Deliver contextualized
medication reminders via
Google Home



5

Google Cloud

Driving innovation in healthcare with Internet of Things, artificial intelligence and machine learning

Planet scale

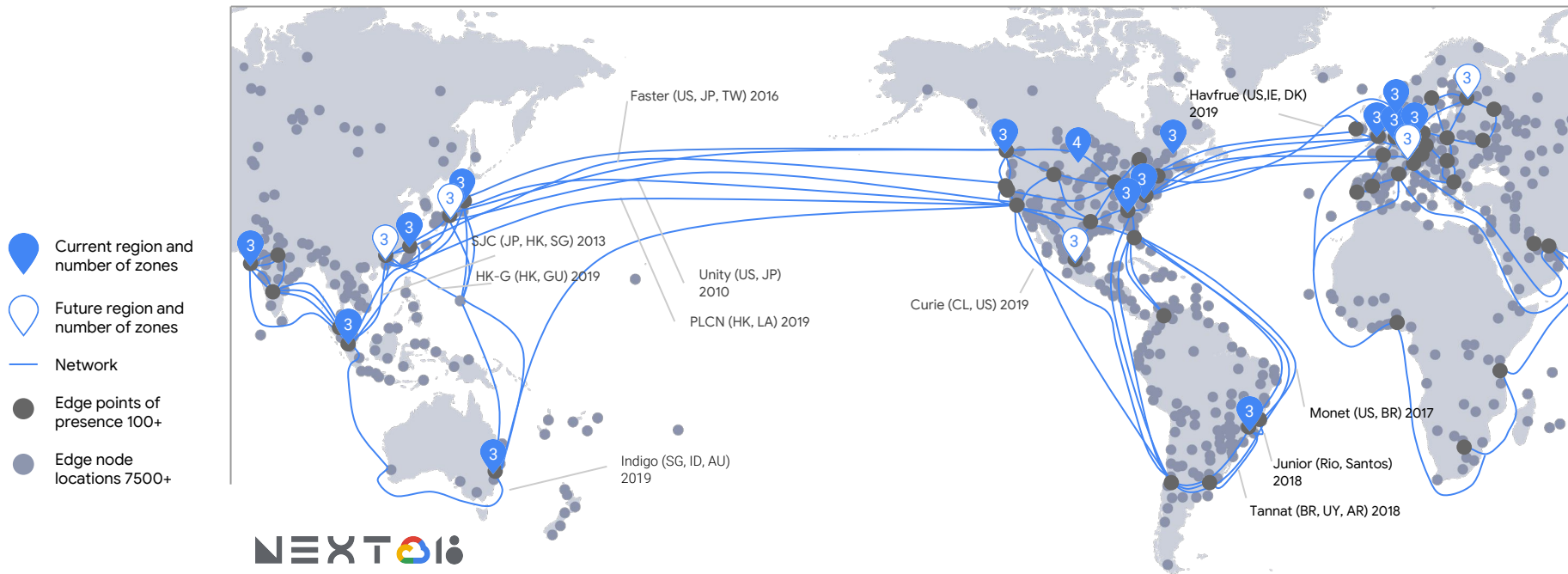
Compliance

IOT & security

Machine learning & insights

Google Cloud

Fifteen regions are connected to the largest cloud network: 100+ edge points of presence, 7500+ edge nodes, dedicated interconnect locations, 80+ CDN locations, and hundreds of thousands of miles of fiber.



Compliance for healthcare



Google Cloud

Your strategic partner in your data journey

Ingest

Manage and optimize
your IoT device data

Secure device connections



Process

Clean and store data

On-demand solutions
that scale



Analyze

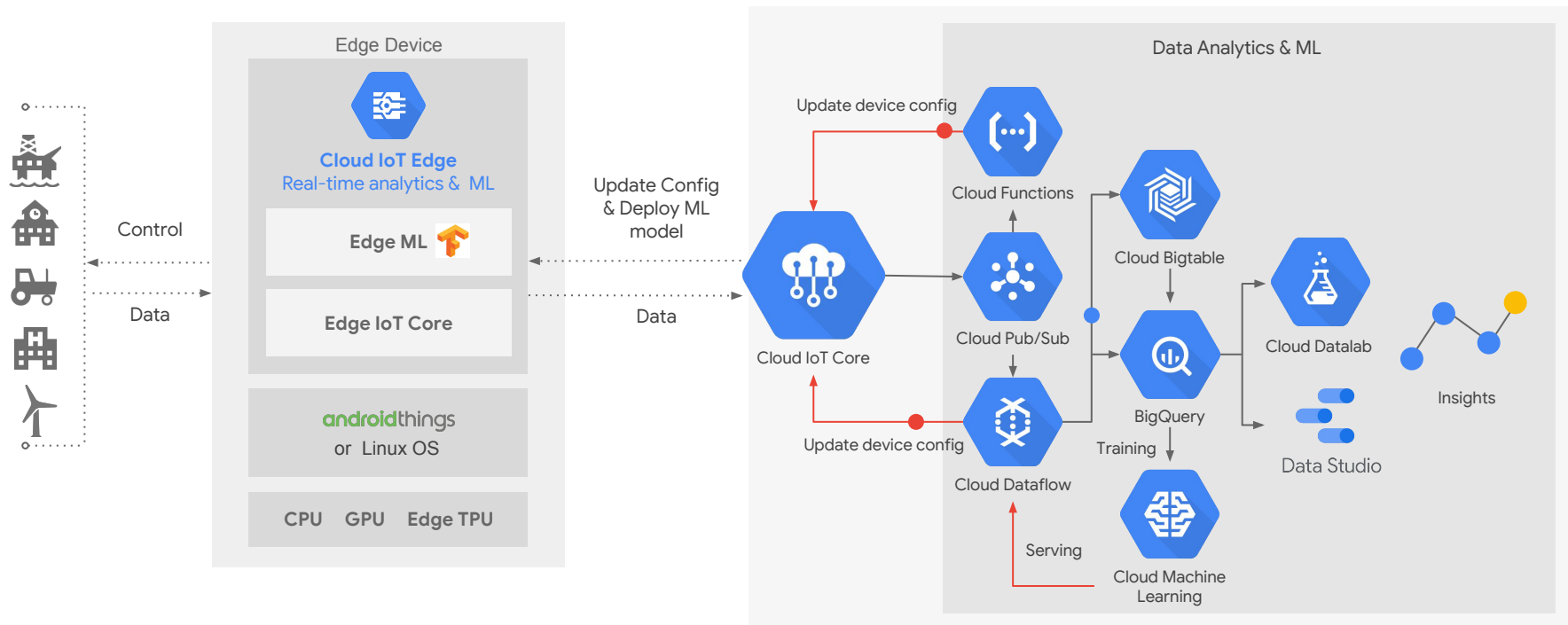
Visualize and predict
outcomes

Generate actionable insights



Google Cloud IoT platform

Accelerate business agility and decision making with IoT data



Devices
partners

Application
partners

Service
partners



Google Maps Platform

100% managed service



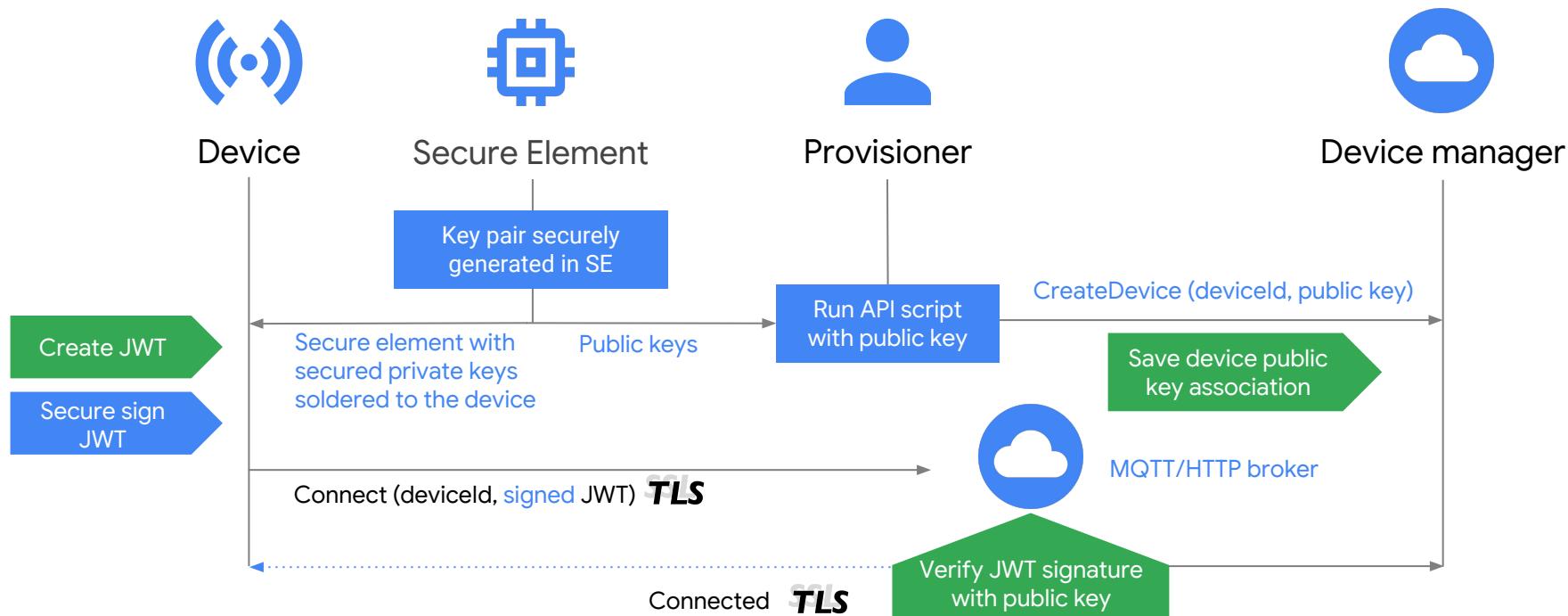
Protocol Bridge

- MQTT , HTTP protocol endpoints
- Automatic load balancing
- Automatics scaling (up and down)
- Planet scale ingestion
- Planet scale consumption with Pub/Sub

Device Manager

- Configure individual devices
- Bidirectional communication with devices
- Role level access control
- Logical device representation
- Console and APIs for device deployment and monitoring


Best in class security (hardware root of trust)




6

Insights and machine learning


Machine learning challenges in healthcare



Healthcare data
is stored in
disparate
systems and
formats




Data often exists
as “unstructured
notes” or images
of faxes



Data must be
“de-identified” in
order to share or
aggregate for
training models



Privacy
agreements and
patient consents
block many data
use cases



Medical
diagnoses are
subjective so
quality labels for
ML are scarce

ML: unlocking insights in healthcare data

Data ingestion



Enterprise

Hospitals, labs,
clinics, etc.



Consumer

Health, fitness, and
wellness



IoT devices

Asset tags, sensors,
wearables

Data analytics



Pub/Sub



Dataflow



Bigtable



BigQuery



Datalab



Cloud ML



Data Studio

Google Cloud

Cloud data and analytics

Data usage



Analytics for
device makers



IoT app
marketplace



Mgmt console for
enterprise

Three flavors of machine learning

Custom ML models



TensorFlow



Machine
Learning Engine

Customizable ML solutions



AutoML

Pre-trained ML models



Vision API



Speech API



Jobs API



Natural
Language API

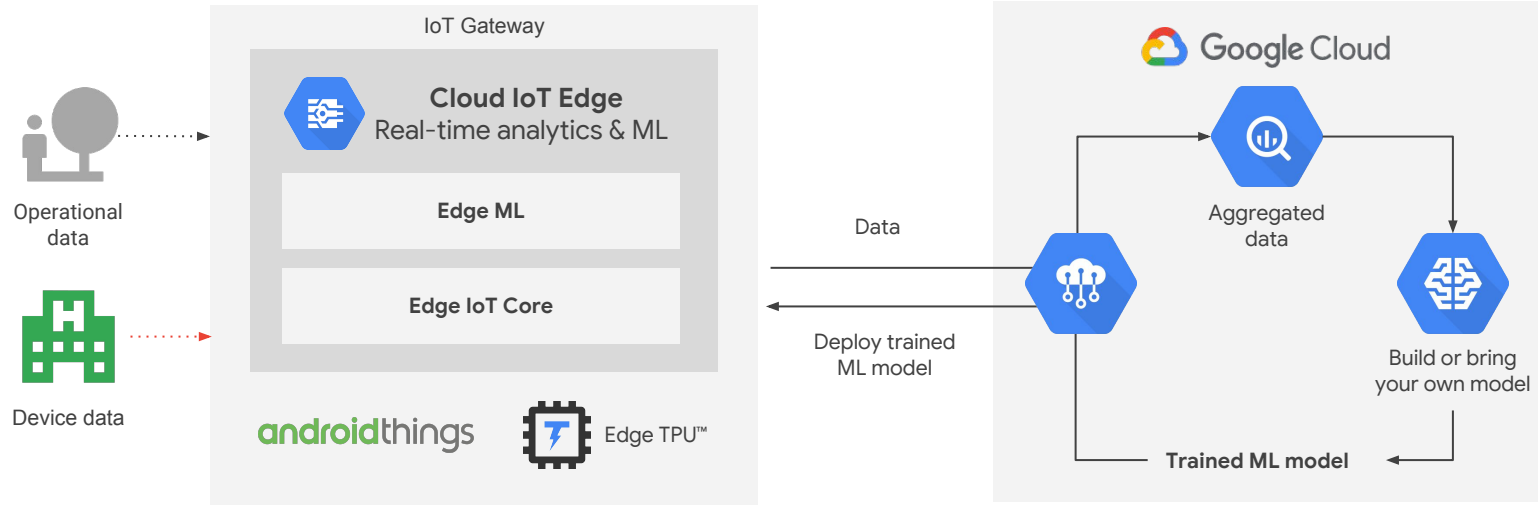


Translation
API



Video
Intelligence API

Cloud IoT Edge | deploy & run ML at the edge



Thank you.

Google Cloud