Amazon Web Services for Healthcare

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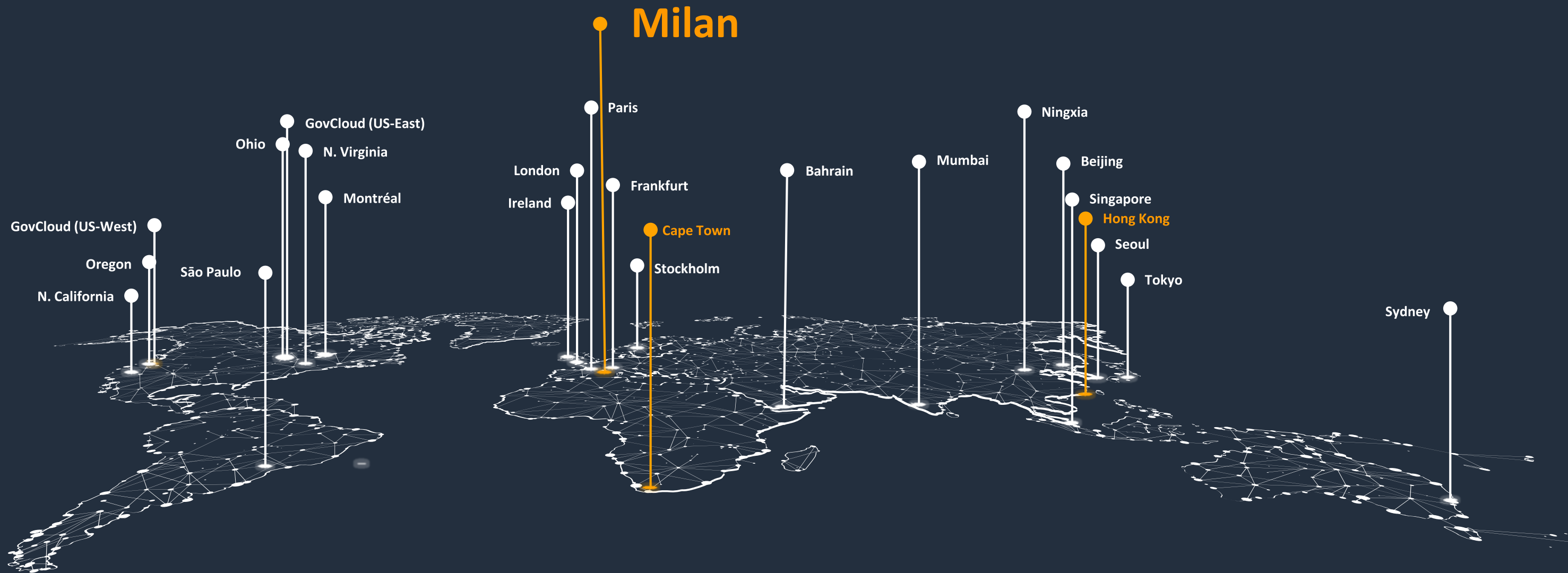
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What is Cloud Computing?

"Cloud Computing",
by definition, refers to
on-demand delivery
of IT resources and applications
via the Internet with
pay-as-you-go pricing.

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Milan

Paris

GovCloud (US-East)

Ohio   N. Virginia

London   Ningxia

Ireland   Frankfurt   Bahrain   Mumbai   Beijing

Montréal   Singapore

GovCloud (US-West)   Cape Town   Hong Kong

Oregon   Seoul

São Paulo   Stockholm   Tokyo

N. California   Sydney

22 Geographic Regions

69 Availability Zones

■ Active Regions   ■ Announced Regions

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The **broadest** and **deepest** platform for today's builders

Technical & Business Support	AWS Marketplace	Analytics	IoT	Machine Learning
Core Services	Management Tools	DevOps	Blockchain	Mobile Services
App Services	Infrastructure	Enterprise Apps	Migration	Security & Compliance

..more than 165 fully featured services

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WHY DO CUSTOMERS CHOOSE CLOUD?

Benefits of Cloud Computing
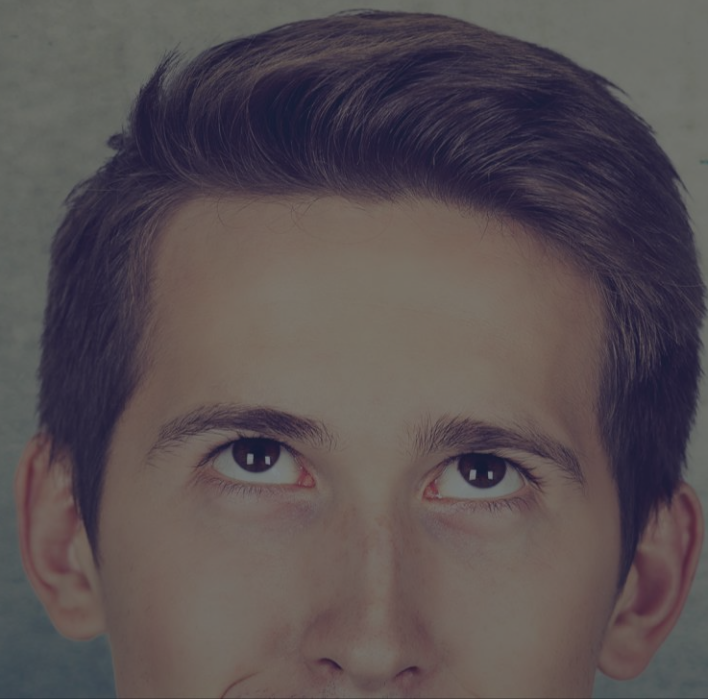
- Benefit from massive economies of scale
- Increase speed and agility
- Innovate fast Respond to citizen needs
- Stop spending money on running and maintaining data centers
- Stop guessing capacity

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Secure, Compliant Healthcare on AWS

Security is a Pervasive Concern for Healthcare

"Healthcare institutions don't have the time and resources to devote to cybersecurity that an established cloud provider might have."

Lee Kim
Director, Privacy and Security, HIMSS North America

The **Shared** Responsibility Model

HIPAA and FedRAMP Compliance Requirements

AWS Delivers

Security Of the Cloud

Expert guidelines and resources to assist customers with compliant application development

Customer Responsibility

Security In the Cloud

Develop, validate, and secure applications based on due diligence and expert consultation

Complying with virtually every regulatory agency

Global

CSA
Cloud Security Alliance Controls

ISO 9001
Global Quality Standard

ISO 27001
Security Management Controls

ISO 27017
Cloud Specific Controls

ISO 27018
Personal Data Protection

PCI DSS Level 1
Payment Card Standards

SOC 1
Audit Controls Report

SOC 2
Security, Availability, & Confidentiality Report

SOC 3
General Controls Report

United States

CJIS
Criminal Justice Information Services

DoD SRG
DoD Data Processing

FedRAMP
Government Data Standards

FERPA
Educational Privacy Act

ISO FFIEC
Financial Institutions Regulation

FIPS
Government Security Standards

FISMA
Federal Information Security Management

GxP
Quality Guidelines and Regulations

HIPAA
Protected Health Information

ITAR
International Arms Regulations

MPAA
Protected Media Content

NIST
National Institute of Standards and Technology

SEC Rule 17a-4(f)
Financial Data Standards

VPAT/Section 508
Accountability Standards

Asia Pacific

FISC [Japan]
Financial Industry Information Systems

IRAP [Australia]
Australian Security Standards

K-ISMS [Korea]
Korean Information Security

MTCS Tier 3 [Singapore]
Multi-Tier Cloud Security Standard

My Number Act [Japan]
Personal Information Protection

Europe

C5 [Germany]
Operational Security Attestation

Cyber Essentials Plus [UK]
Cyber Threat Protection

G-Cloud [UK]
UK Government Standards

IT-Grundschutz [Germany]
Baseline Protection Methodology

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What about **GDPR** compliance?

All AWS services can be used in compliance with

the General Data Protection Regulation (GDPR)

«Navigating GDPR Compliance on AWS» whitepaper:
- Explains the role that AWS plays in your GDPR compliance process
- Shows how AWS can help your organization accelerate the process of aligning your compliance programs to the GDPR by using AWS Cloud Services

https://d1.awsstatic.com/whitepapers/compliance/GDPR_Compliance_on_AWS.pdf

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GDPR is also a "shared responsibility"

Data Subjects

Customers are Data Controllers

AWS as Data Processor

Controllers <u>and</u> Processors have obligations under GDPR

Data Controller: Titolare del trattamento
Data Processor: Responsabile del trattamento
Data Subject: Interessato al trattamento

GDPR is also a "shared responsibility"

Legal Compliance
(both **controllers** and **processors**)

System Security and Data Protection by Design
(both **controllers** and **processors**; AWS has tooling to help)

Records of Processing Activities
(both **controllers** and **processors**; AWS has tooling to help)

Encryption
(both **controllers** and **processors**; AWS has tooling to help)

Managing Data Subject Consent
(**controller** responsibility)

Managing Personal Data Deletion
(both **controllers** and **processors**; AWS has tooling to help)

Managing Personal Data Portability
(**controller** responsibility)

Security of Personal Data
(**controller** responsibility)

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What AWS Provides to You

Tools and services

Compliance framework

Partner network

Data protection terms

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Cloud Services Qualified by AgID

From April 2019, Public Administrations may only acquire IaaS, PaaS and SaaS services qualified by AgID and published in the Cloud Marketplace

The Catalog is constantly updated..
https://cloud.italia.it/marketplace/supplier/market/index.html

Qualified Cloud Service Provider Categories		
Type A	Type B	Type C
Provide Public Cloud IaaS / PaaS services (or Private / Hybrid / Community Cloud) for the Public Administration	Provide SaaS using the own Cloud infrastructure	Provide all types of services included in Type A and Type B

AWS has been qualified as Cloud Service Provider Type C

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Healthcare & Life Sciences on AWS

https://aws.amazon.com/it/health/

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Where AWS Supports Healthcare Organizations

Storage and Archiving

Core Operations and
Business Continuity
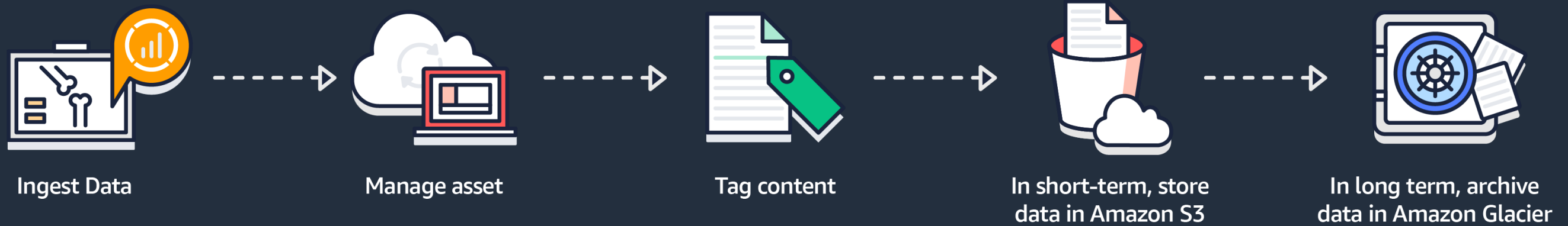
Care Coordination

Patient Engagement

Clinical and Population
Health Analytics

Clinical
Information Systems

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AWS Support for Storage and Archiving

Ingest Data → **Manage asset** → **Tag content** → **In short-term, store data in Amazon S3** → **In long term, archive data in Amazon Glacier**

Ingest Data:

- Patient records
- Imaging data
- Handwritten notes
- Backups

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AWS Support for Core Operations & Business Continuity

- Solutions that support core provider operations such as records management, accounting, and human resources.

- Restore operations when disruptions occur without the capital expense for duplicate infrastructure.

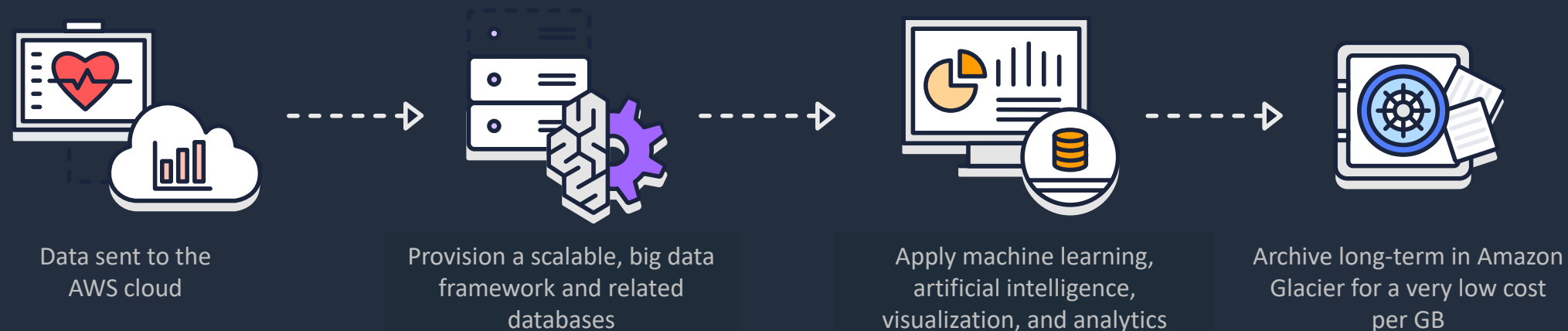Easily send backup data to AWS using AWS Import/Export Snowball

Data stored securely in Amazon S3

During disruption, data attached to Amazon EC2 and used to restore operations

AWS Support for Clinical and Population Health Analytics

- AWS lowers the barriers for healthcare organizations to perform population and clinical analytics.

- Dynamically scale analytics applications up and down, and dramatically lower the cost of using data science to help patients.

Data sent to the AWS cloud

Provision a scalable, big data framework and related databases

Apply machine learning, artificial intelligence, visualization, and analytics

Archive long-term in Amazon Glacier for a very low cost per GB

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Internet of Things (IoT) in Healthcare

Wearable Monitors

From wrist bands that track health indicators to delivery devices for insulin and drugs, wearables have become an invaluable part of the healthcare provider toolkit.

Smart Medical Devices

Pacemakers, smart pills, and other devices that are implanted inside the body can help doctors monitor and maintain health issues and possibly prevent invasive treatments

Mobile Health Applications

Patients now have real-time access to their own health records and can directly engage with their own treatment plans.

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Artificial Intelligence and Machine Learning in Healthcare

Data Analysis

Medical data is growing rapidly yet its scale, variety and messy nature make it difficult to analyze. Machine learning can help uncover valuable insights that lead to cost savings and better patient care.

Clinical Decision Support

From predicting complications to drug adherence, from triaging medical images to analyzing patient voice sentiment, machine learning can be a powerful companion to the care team.

Personalized Medicine

Genomic sequencing opens a window into better understanding of diseases and patients' reactions to medications. Machine Learning can guide a tailored therapeutic approach for a patient's unique characteristics.

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AWS Partners for Healthcare Customers

Use cases

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AWS Healthcare Customers

Sensitive data on AWS

- **GDPR**: to leverage on AWS global infrastructure – AWS Regions in EU

- **Scalability**: use EC2 and Lambda for scalable workloads

- **Data Register**: right to erasure, data tracking

- **Security**: encryption, logs, data erasure, distribute data across many database

Transforming conversations to insights

NHS

- Amazon Connect answered 3.8 average voice requests per call, with over 75% of calls handled within 6 minutes, improving overall satisfaction

- Triaged calls to Amazon Lex to answer basic inquiries, reducing call traffic to agents by 26%

- Deployed in two weeks leading up to EHIC rollout, increased public service to 24/7

"Within the space of three days we changed from an operating model of nine-to-five, to 24/7… The Connect service is reducing the calls to the contact center by 40%, that's contributing $650,000 worth of savings per year."

Chris Suter
Lead Cloud Architect
NHS Business Services Authority

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High touch through high tech

- Digital therapeutics to support a Diabetes Prevention Program included mobile and web applications, demonstrated success in lowering risk of type 2 diabetes by 30% in 12 months
- Deployed to over 120,000 participants, delivering economic value of $2,000 net savings per participant for health plans and employers

"People who drop out don't get better ."The solution has to be working at the moment they need it… The availability and performance of AWS enables us to build a highly engaging experience that drives better health outcomes."

Adam Brickman
Senior Director
Omada Health

Benchtop to bedside through precision medicine

NAVIFY®

Digital diagnostic tool that uses analytics to match patients' tumor type so oncology care teams can quickly select the right therapy for each patient

Intermountain Healthcare
Healing for life®

Deployed APN partner Syapse solutions, to combine genomic and clinical data so oncologists can deliver precision medicine to cancer patients

American Heart Association®

The AHA Precision Medicine Platform enables researchers and clinicians to aggregate and analyze longitudinal cohorts, proteomic, genomic, and gene-expression data using a precision medicine approach

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Arterys advances cardiac visualization with deep learning

Blood flow imaging solutions that enables doctors to render MRI (risonza magentica) scans in multi-dimensional models and better diagnose patients for cardiovascular diseases
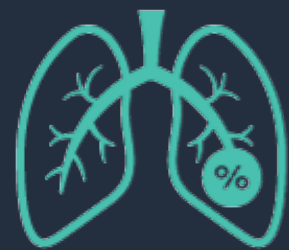
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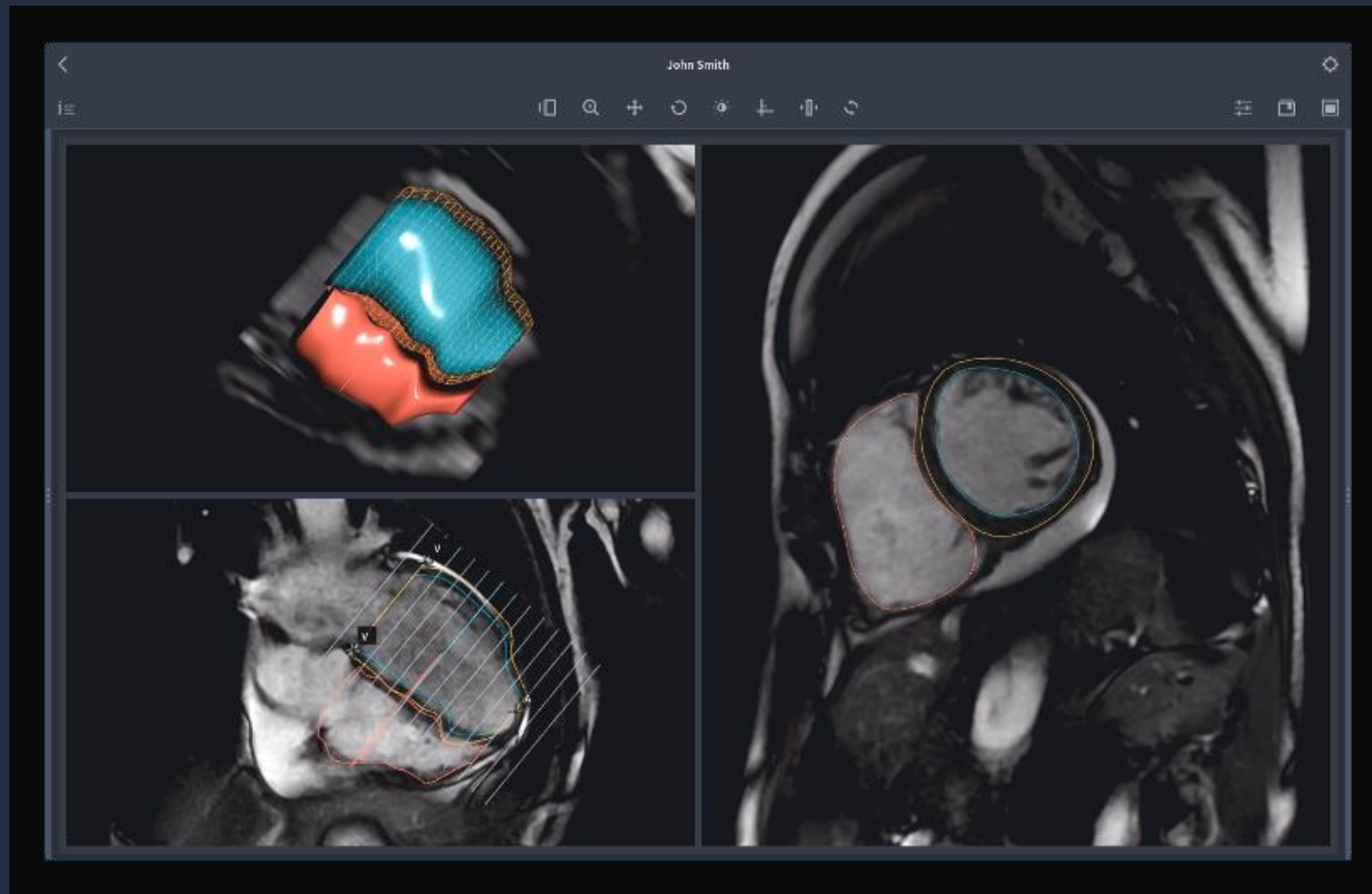
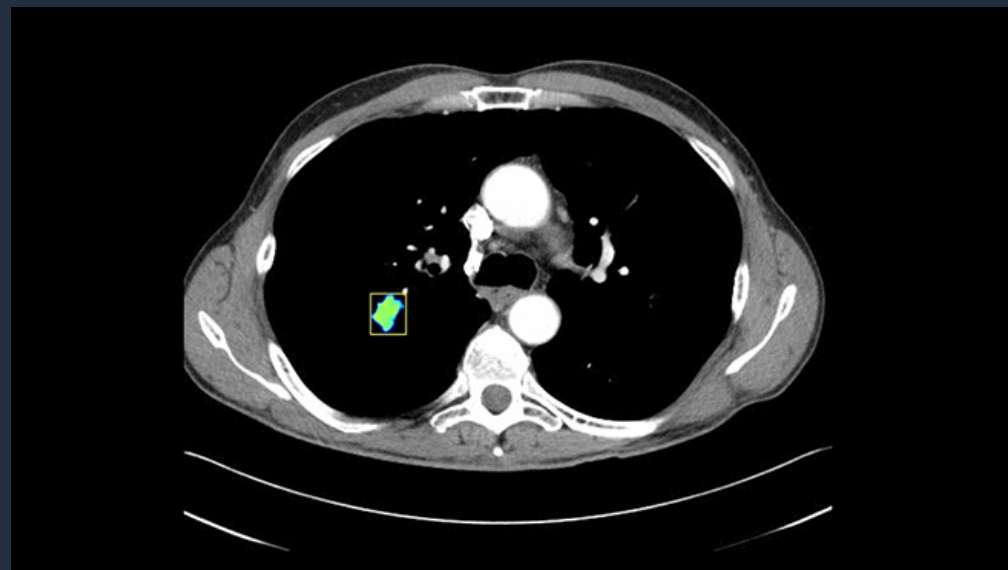# Butterfly Networks improves access to ultrasound exams

Handheld whole-body ultrasound system coupled with a cloud-based, intelligent data and analytics platform designed to make medical imaging universally accessible and affordable

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# Deep Learning for Pulmonary Nodules in Lung Cancer

- Deep learning algorithms assess the malignancy risk of pulmonary nodules based on factors such as nodule size, shape, density, volume, as well as patient demographics.

- Use AWS Deep Learning AMI and the TensorFlow machine learning framework to train computer vision algorithms for CT scans.

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# Deep Learning to Detect Coronary Artery Disease
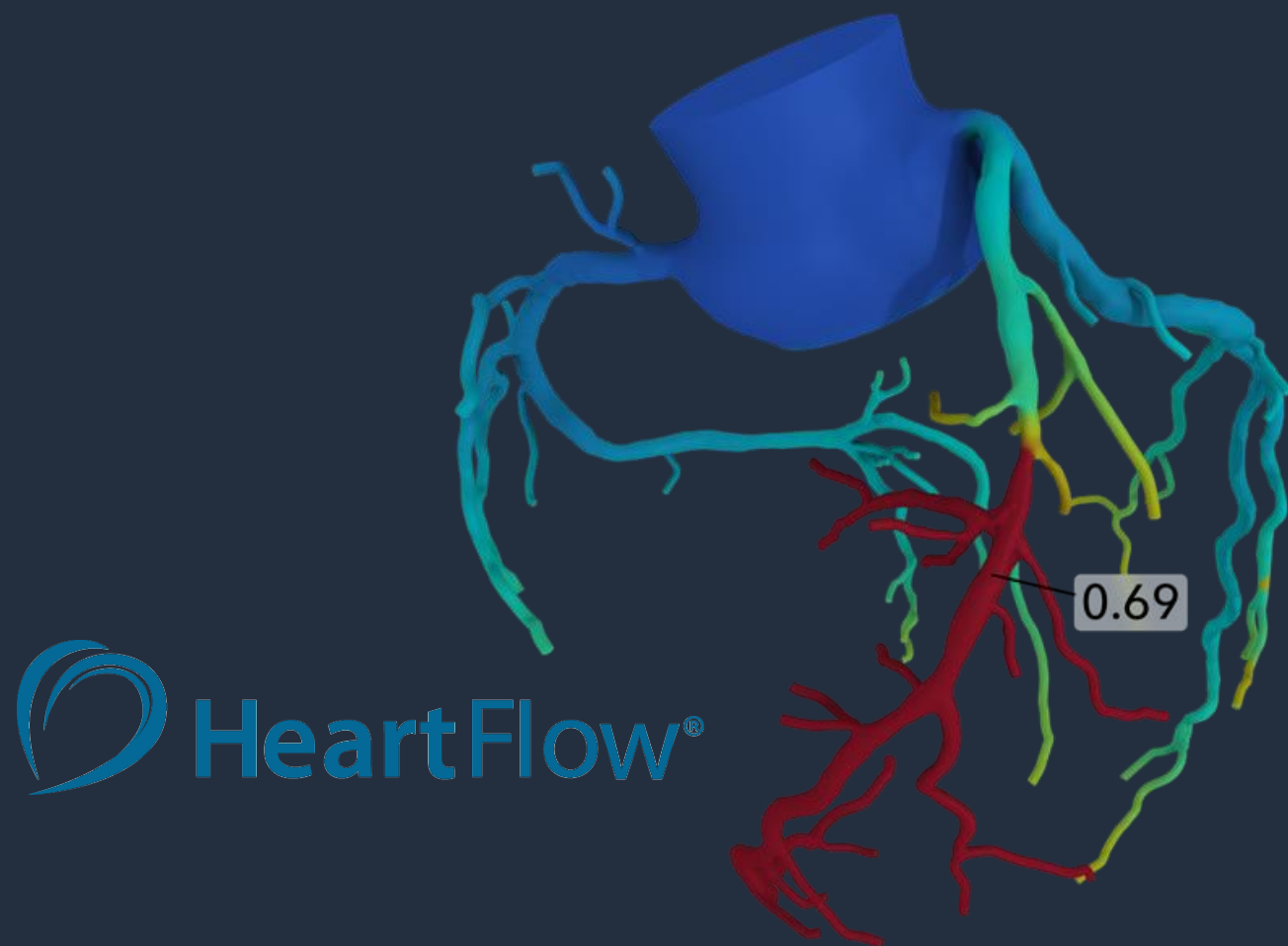
- Accelerated by GPUs, HeartFlow's solution analyzes CT scans to create a 3D model of a patient's heart and coronary arteries

- In addition to creating an accurate 3D model, the system simulates the flow of blood in each vessel

- Uses the Caffe deep learning framework on P2 instances; exploring TensorFlow on G3

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Deep Learning in Medical Imaging for Radiologists
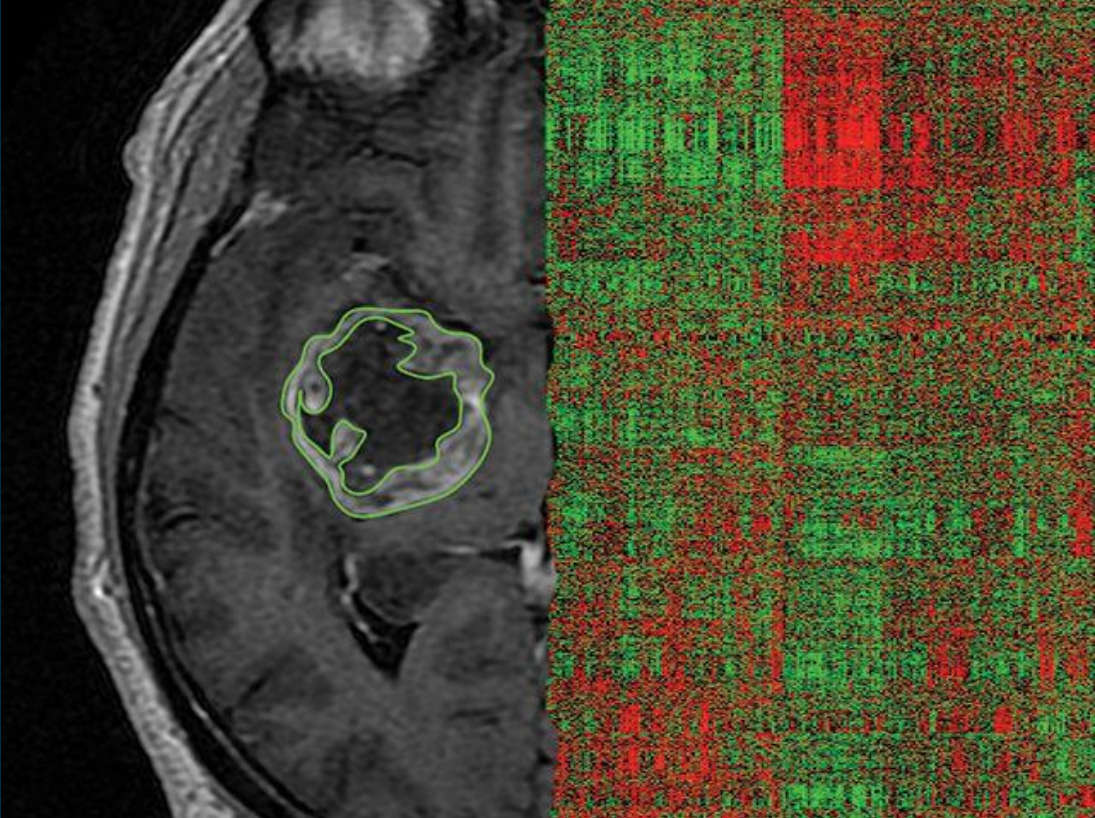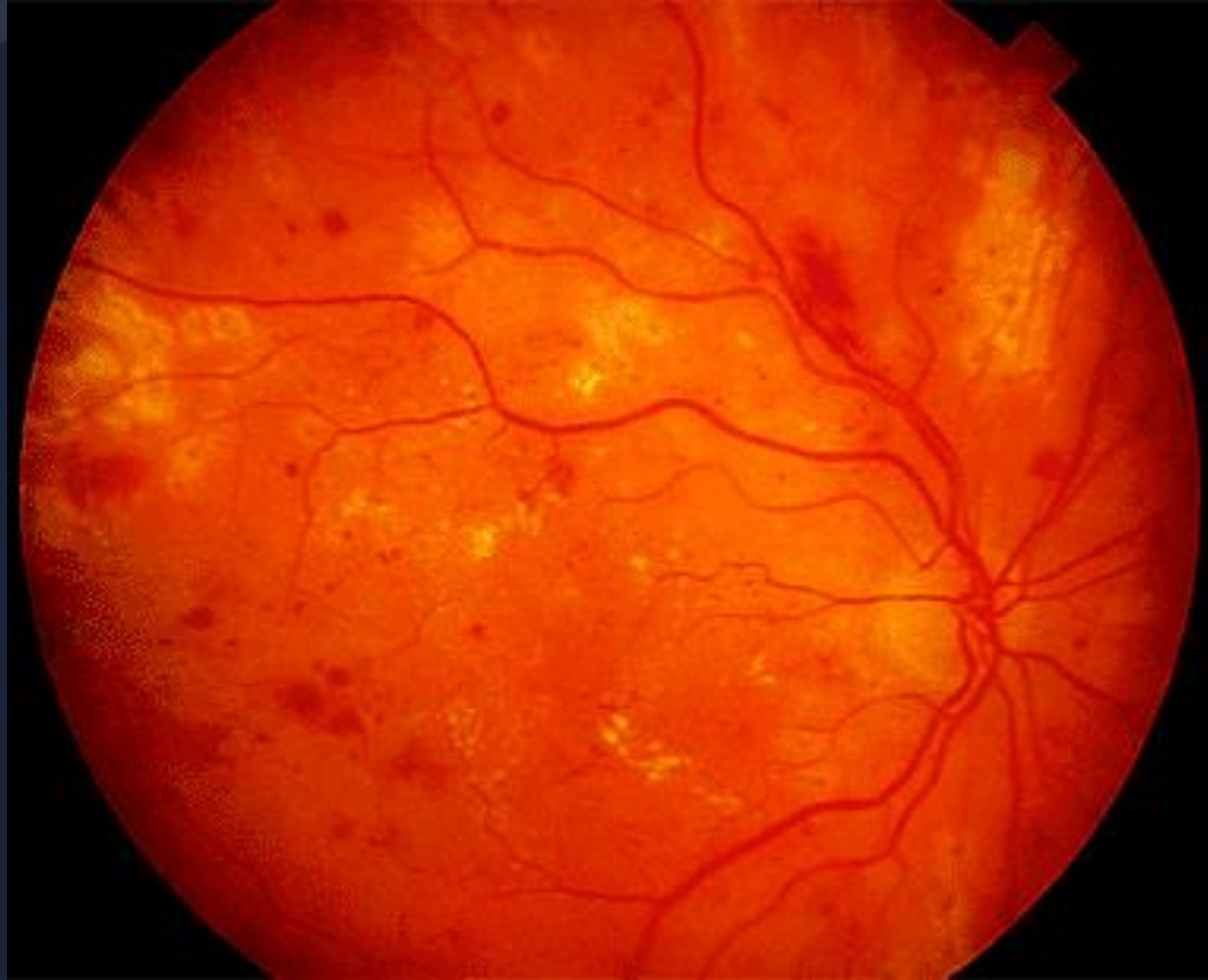
How to enable **Connected care** with **AWS**

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Connected Care implements the new models for taking care of chronic/fragile patient and supports the continuity of care
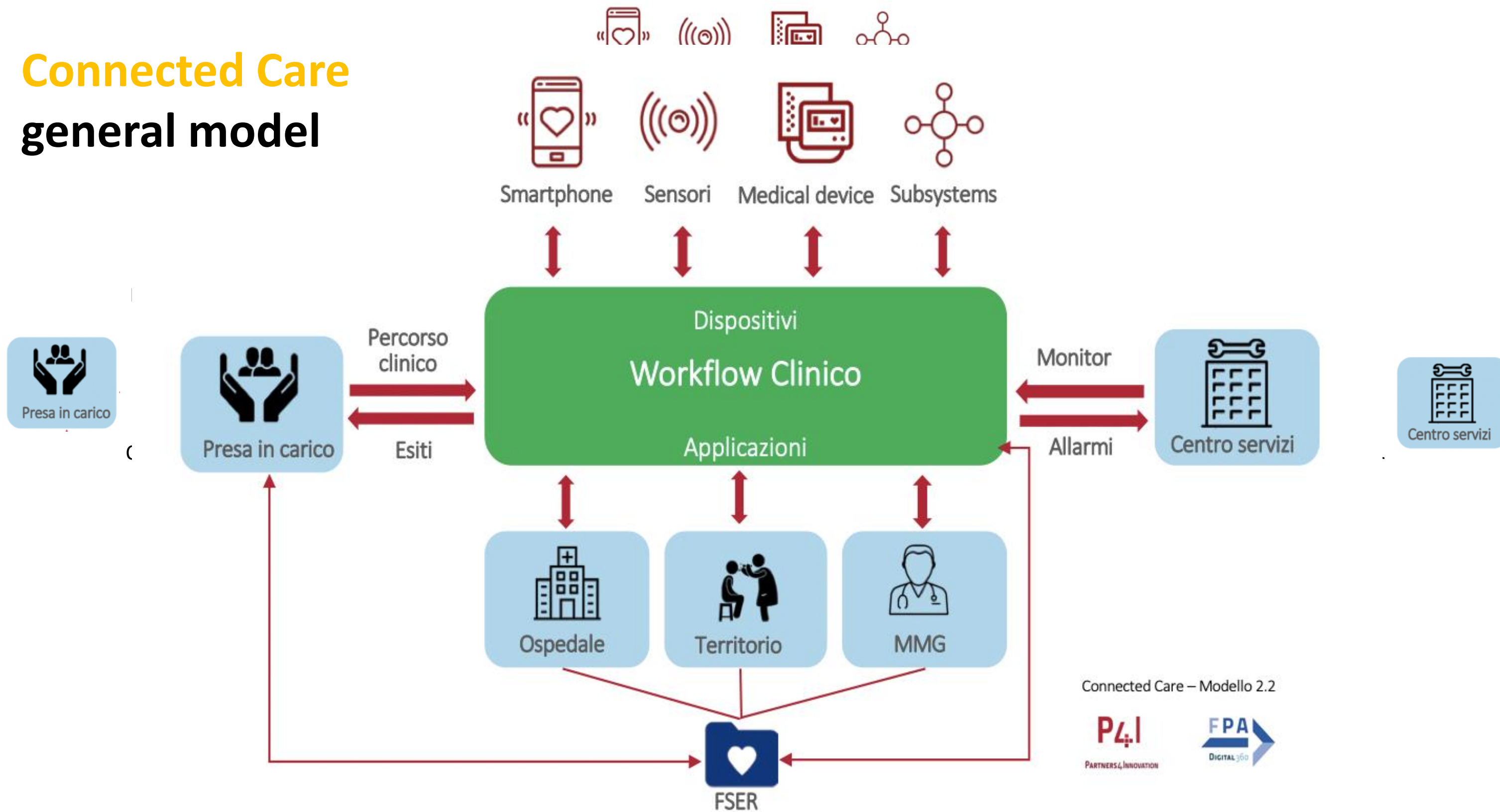

Piano di cura

Servizi clinici/medici

Rilevazione e verifica

Valutazione

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Connected Care
general model

Smartphone Sensori Medical device Subsystems

Dispositivi
Workflow Clinico
Applicazioni

Presa in carico

Presa in carico

Percorso clinico

Esiti

Monitor

Allarmi

Centro servizi

Centro servizi

Ospedale Territorio MMG

FSER

Connected Care – Modello 2.2

P4I — PARTNERS4INNOVATION

FPA — DIGITAL360