

# Building Secure & Scalable Digital Therapeutics on AWS

**\$1B**

US investment  
into DTx in 2018<sup>1</sup>

**40%**

annual growth  
of DTx<sup>1</sup>

Digital therapeutics (DTx) are evidence-based therapy interventions driven by high quality software and technology to help patients prevent, manage, or treat a broad range of conditions. DTx encompasses several subcategories:

- Smart pills and connected inhalers to support pharmacological interventions by improving compliance and generating insights into patient behavior
- Companion apps that leverage mobile technology to enhance the patient experience.
- Standalone DTx to improve health outcomes independently of drug regimens.

Amazon Web Services (AWS) offers **HIPAA-eligible** capabilities that benefit life science organizations through:



#### New data Insights

Use analytics and machine learning on diverse data sources



#### Data Security

Comply with industry regulations and keep patient data secure



#### Scalability

Build fast, low-latency patient applications



#### Personalization

Incorporate patient personalization for improved engagement and usage

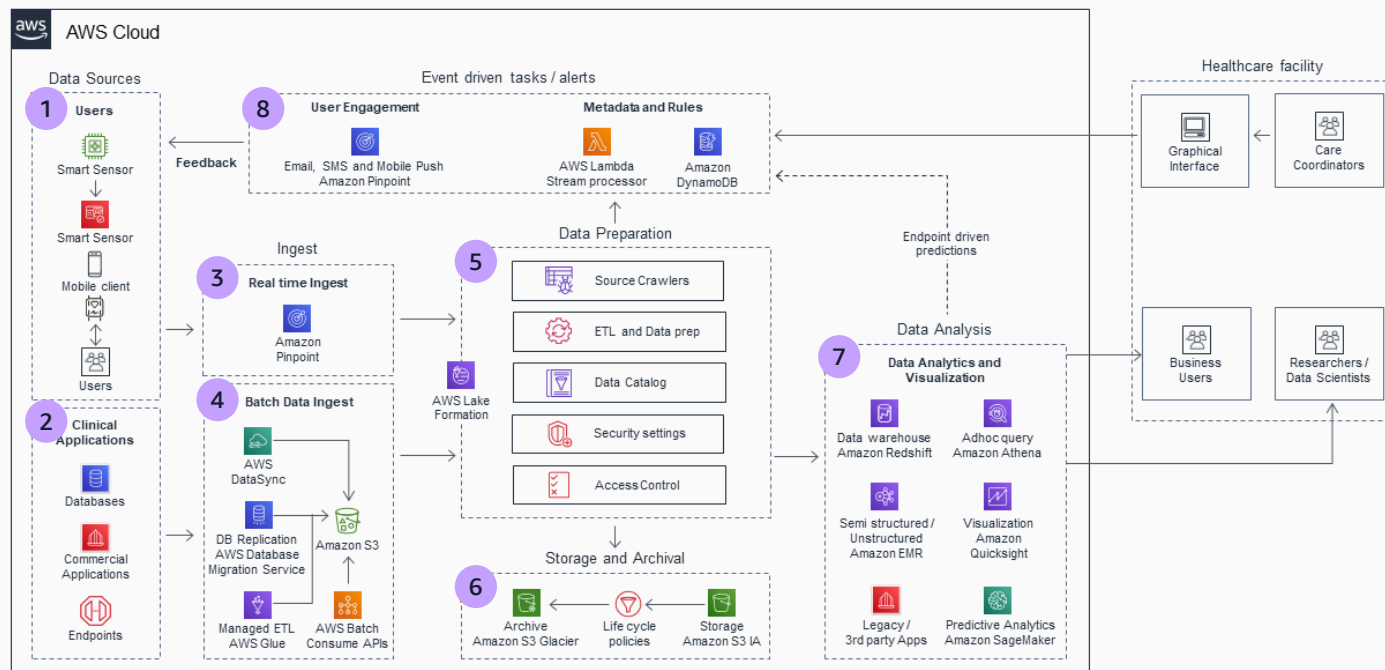


The Digital Therapeutics program at AWS is geared towards enabling life science organizations to develop, build, deploy, and optimize DTx programs using cloud-based technology. Below is a common HIPAA-eligible architecture pattern that AWS customers are using to develop DTx programs, harness data to improve patient engagement, and use analytics and machine learning to help predict patient health events.

<sup>1</sup><https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/the-promise-of-digital-therapeutics>

# Digital therapeutics and precision medicine

## AWS reference architecture



### 1 Data Sources

Patients can use personal wearables, connected with a custom mobile (lifestyle or a companion mobile) application to transfer data events. Other smart sensors can optionally be connected to the mobile application.

### 2 Clinical Applications

Data can be ingested through various clinical applications like Electronic Medical Records, health information exchanges, and customer commercial applications.

### 3 Real-time Data Ingestion

The mobile application sends data and events to [Amazon Pinpoint](#), authenticating through [Amazon Cognito](#).

### 4 Batch Data Ingestion

Data replication from relational database sources is performed through [AWS Database Migration Service](#). [AWS Batch](#) is used to consume data from public/private APIs. [AWS DataSync](#) is used to automate data movement from on-premises storage to [Amazon Simple Storage Service \(Amazon S3\)](#). [AWS Glue](#) is used for managed ETL and process the incoming data.

### 5 Data Preparation

[AWS Lake Formation](#) is used to set up a centralized, curated, and secure repository in days, for storing raw and curated data.

### 6 Storage and Archival

[Amazon S3](#) acts as the central storage layer and leverages life cycle policies to move data to [Amazon S3 Glacier](#) for archival purposes, saving costs.

### 7 Data Analytics and Visualization

[Amazon Redshift](#) is used as a data warehouse to store curated data. Semi-structured and unstructured data can be processed by [Amazon EMR](#) and [Amazon Athena](#) is used for ad-hoc querying. [Amazon SageMaker](#) is used to build custom ML driven predictive models to drive effective outcomes. [Amazon Quicksight](#) provides a rich visualization layer.

### 8 Event Driven Tasks and Alerts

[Amazon DynamoDB](#) and [AWS Lambda](#) are used for hosting a rules engine to drive effective outcomes. Custom machine learning models can be used to automatically create rules which can be reviewed by a team of care coordinators. [Amazon Pinpoint](#) is used to deliver on demand messages to patients through email, SMS, push notifications, and voice technology.

## Key AWS Partners for Digital Therapeutics

There are a number of partners building solutions on AWS to help customers establish or support digital therapeutics.



### Philips HealthSuite Digital Platform

The HealthSuite digital platform provides Philips and its partners with the cloud expertise and capabilities to connect devices, collect electronic health data, aggregate and store data securely, analyze data, and create solutions on the cloud. This makes it possible to break down data silos and facilitate the innovation required to achieve seamless, connected, and collaborative care that fulfills the 4 Ps of Digital Health: Precise, Personal, Predictive, and Proactive.



### Onica

Onica is an AWS Partner Network (APN) Premier Consulting Partner that helps life science companies adopt and modernize their digital therapeutic offerings. From connected medical devices, GxP complaint platforms, companion applications to ML powered diagnostics, Onica is uniquely positioned to offer AWS expertise across the entire life sciences technology stack. Leverage Onica's team of AWS-certified cloud architects, software engineers, data engineers, and data scientists to design, build, and optimize your solutions.



### Deloitte MyPath™ for Health

Deloitte MyPath for Health is a digital health care network that connects patients, caregivers, providers, and life sciences organizations to deliver comprehensive therapy management services across the patient journey. By transforming the patient experience, MyPath for Health can help improve outcomes and cultivates real-world data for breakthroughs in chronic and complex diseases.