FHIR vendors and solutions

Overview and comparison

June 2022

Players reviewed

- Cloud solutions
  - AWS
  - Azure
  - Google
- Intersystems
- Firely
- HAPI / SmileCDR

Cloud solutions – common pros

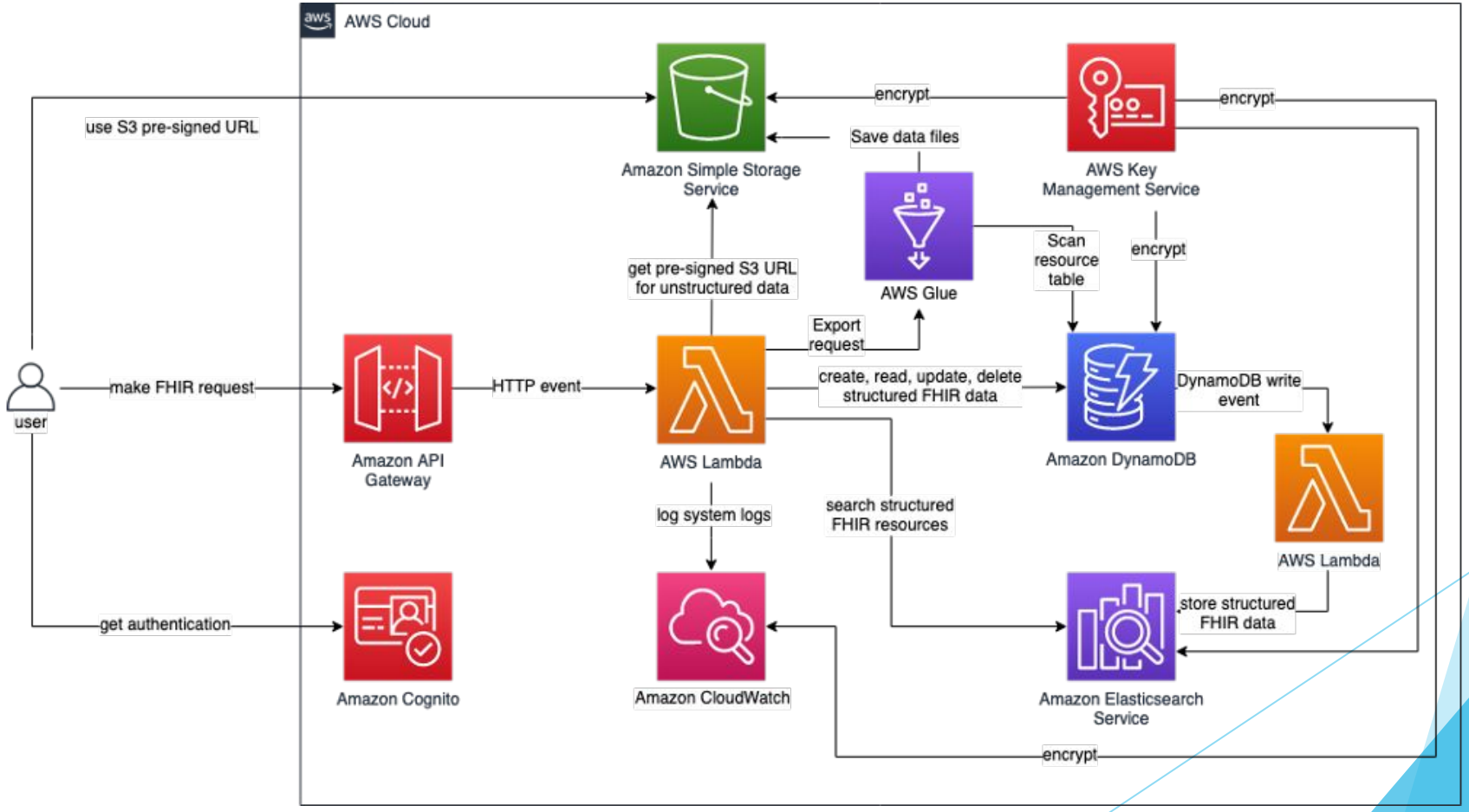
- HIPAA compliancy
- Scalability
- Monitoring
- Integration with other cloud offerings

Cloud solutions – common cons

- Locked to specific auth/datastore solutions
- Requires good skills in the cloud vendor environment
- Often limited FHIR features support
- Relatively little customization options

Cloud – AWS FHIR Works

- Set of existing AWS services behaving like a basic FHIR server.



Cloud – AWS FHIR Works

- Setup, config and serverless code is opensource, AWS has an OOTB version to deploy.
- Coupled with Cognito, DynamoDB, S3 for binaries.
- All serverless, cost-effective in low loads.

Cloud – AWS FHIR Works

- OOTB – R4 FHIR CRUD and basic search, limited export. No patch, no conditional operations, no validation, no subscriptions.
- The OS project is active and offers multiple customizations for more goodies, like STU3, batch bundles, even validation (with HAPI…☺)
- CloudWatch for audit – many AWS services, complex to consolidate.
- Roadmap – managed service, unified pricing.

Cloud – Azure

- Naming mess:
  - Microsoft FHIR Server for Azure – opensource FHIR server. Datastore – CosmosDB or SQL server.
  - Azure API for FHIR – the managed GA version of the FHIR Server.
  - **Azure Health Data Services** – recent evolution of API for FHIR, with DICOM, MedTech and FHIR service inside one workspace. Another pricing and a few technical differences.
- Auth: Azure AD, no AD B2C, can't turn off.
- Datastore – CosmosDB, no direct access to data
- Built-in autoscale

Cloud – Azure FHIR Service

- STU3, R4
- Beyond basics, supports profile validation, patient $everything, conditional operations
- Search has some unsupported parameters (good documentation)
- $convert-data from C-CDA, HL7v2, JSON + custom converters (with another dive to Azure)
- $export/$import to Azure storage - need to configure managed identity for the FHIR service, define storage, permissions, etc.

Cloud – Azure FHIR Service

- No subscriptions
- No terminology
- Not very configurable
- Limited support of SMART (from Azure AD side, only root scope)
- Cloud for Healthcare: FHIR Service + Healthcare-specific configurations, connectors, and applications, tech support.
  - Text Analytics for Health (part of Cognitive Services) – developed in Israel

Cloud – Google Healthcare APIs

- FHIR STU3, R4, HL7v2, DICOM
- Datastore – Spanner (relational), no direct access
- Authentication – through Google Service Account.
- Transformation – DICOM, CCD, HL7v2 messages to FHIR (configurable mappings) – can be used separately. Mapping tools (Protobuf, OMOP)
- De-identification – removing/modifying PII for analytics.
- Intergation with Google Cloud Pub/Sub notifications

Cloud – Google Healthcare APIs

- Good FHIR feature coverage:
  - Conditional operations
  - Profile validation
  - Batch and transactional bundles
  - Bulk import/export, including streaming (to BigQuery)
  - Useful set of operations, like Patient$everything, Observation$lastn, etc.
  - $translate using ConceptMap
  - Search – fullest among cloud vendors, can add custom parameters (e.g. for search in specific extensions)
- FHIR viewer – UI to browse FHIR data
- Healthcare Data Engine (Transform + FHIR + stream to BiqQuery + …)
- Benchmark*

Intersystems

- The company is a veteran in the health industry
- Proprietary DB (IRIS), used by EPIC. Hybrid (OLAP+OLTP)
- The FHIR server is not a separate product - part of IRIS for Health:
  - OAuth server
  - API manager
  - Auditing, user management (LDAP/SSO)
  - data explorer with SQL UI
  - CLI
  - Task Manager/Scheduler
  - VS Code extension for working with DB & code (ObjectScript + other languages support)
- Message/API conversion + logic, very comprehensive and extendable.

Intersystems

- Although FHIR support is not bad, many features are not OOTB, require custom code or community solutions, e.g.:
  - Subscriptions
  - Validation
  - Terminology
- Bulk import (with some limitations)
- SMART – only 1.0, can do 2.0 scopes through custom code
- PAAS offering on AWS, devops support
- SQL projection – normalized data view
- Deployment/scalability – a bit monolithic, all included
- Has a SaaS offering – FHIR Accelerator Service

HAPI / SmileCDR

- HAPI is opensource and free, SmileCDR is the commercial product.
- Java implementation of the FHIR standard – probably fullest OOTB
- Data store
  - HAPI – default in-mem, simple file (H2), postgreSQL, SQL server, Oracle
  - SmileCDR – several more (MySQL, MariaDB)
- Full SMART on FHIR 2.0 support (SmileCDR)

HAPI / SmileCDR

- Simple to spin up, has basic data browsing UI and Swagger UI
- Highly configurable and customizable, good documentation
- Interceptors as a way to inject custom code in many places
- Façade through custom implementation of external data access
- GraphQL, CQL support

HAPI / SmileCDR

- Full set of FHIR features
- Bulk and batch operations, Custom search parameters
- Subscriptions
  - HAPI – rest, email and websocket types
  - SmileCDR – also message (with ActiveMQ/Kafka broker)
- Terminology
- Validation
- More perks in SmileCDR: Can receive and translate HL7 v2 messages, supports CDA document templates, OpenID connect, etc.

Firely

- .NET – based FHIR implementation
- Develops and supports c# client SDK, as well as simplifier.net
- Datastore: SQL Server or MongoDB (SQLite for test environments)
- STU3, R4
- Highly configurable and customizable, good documentation
- Plugins – custom code to the data pipeline (write or buy) - façade.
- Microservice-oriented (possible separate component deployment)

Firely

- Good coverage of the FHIR specifications, with a few limitations
- Validation, Terminology, Custom search parameters
- Subscriptions – to a special endpoint, rest-hook only
- Batch, transactions (except for MongoDB)
- Some search limitations (no _text, _content, :in, :not-in, etc.)
- Bulk export, but only CLI tools for import to both DBs (roadmap/beta)
- SMART 2.0 support (recommended to use external IdP)

General considerations

- Local representation:
  - Intersystems – local office,
  - Firely – none,
  - SmileCDR – Yael Software is the official rep
  - Azure – FHIR-related R&D is local
  - AWS, Google – general-purpose local contacts
- Multiple FHIR products are possible: façade and narrow-purpose servers, HAPI + SmileCDR, Firely validator with Intersystems, etc.
- Adoption: Cloud is used more by apps, Maccabi chose Firely, several hospitals work with Intersystems.
- On-prem solutions are very customizable, with a learning curve. Mind the language!
- Cost implications of architecture

Thank you!