FHIR in the Cloud
A Cambia Story

Cambia Health Solutions
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Who is Cambia Health Solutions?

Our Cause: To serve as a catalyst to transform health care, creating a person-focused and economically sustainable system.

- Cambia Health Solutions is a nonprofit health insurance corporation based in Portland, Oregon.

- Sells health insurance through several subsidiaries, including Regence, a member of the Blue Cross Blue Shield Association operating in Oregon, Idaho, Utah, and Washington.

- Also invests in non-insurance healthcare technology and service companies.
Business Case

- Deliver Admit-Discharge-Transfer notifications (ADTs) to an external business partner for Care Management.
  
  - A standardized implementation such as FHIR enables interface reuse across business partners.
  - Advantages of a cloud based deployment are desired.
Technologies Used

- HAPI FHIR - Tomcat / Java platform
- FHIR Build - Current Version (STU3 v1.8.0)
- Infrastructure Cloud Platform - Amazon AWS
- External Authentication - Apigee, OAuth2
- Implementation Technologies - Node.js, Java, PySpark
- Infrastructure Provisioning and Deployment - Ansible
Security

- API management and security using Apigee and Apigee OAuth2 authentication/authorization framework
- Attribute Based Access Control (ABAC) model for fine-grained data authorization implemented using the XACML standard
- Data is encrypted in flight using HTTPS
- Data is encrypted at rest by AWS RDS MySQL
Infrastructure Cloud Platform - AWS

**Infrastructure Cloud Platform - AWS**

**Management and Administration**

- **Identity & Access**
  - IAM (Identity Access management)

- **Code Repo, Build & Deploy**
  - CodeCommit & CodeDeploy

- **Monitoring**
  - CloudWatch

**Application Platform Services**

- **Messaging**
  - SQS (Simple Queue Service)

- **Notification**
  - SNS (Simple Notification Service)

- **Parallel Processing**
  - Amazon EMR (Elastic Map Reduce)

**Infrastructure Services**

- **Compute**
  - EC2

- **Storage**
  - S3
  - EBS (Elastic Block Storage)

- **Database**
  - AWS RDS MySQL

- **Networking**
  - VPC (Virtual Private Cloud)
  - ELB (Elastic Load Balancer)
  - Route 53
  - DirectConnect

**Link to Amazon Products**
HIPAA Compliance Considerations on AWS

- **AWS DynamoDB** - Currently does not offer data at rest encryption. It is recommended that clients encrypt using AWS KMS key management tool.
- **AWS RDS DBs (MySQL & Oracle)** - Offer encryption of data at rest.
- **SQS, SNS, Lambda** are not HIPAA certified and should not store Protected Health Information (PHI) or Personally Identifiable Information (PII).

More HIPAA compliance details on this AWS whitepaper
Encounter API - Hybrid Cloud Solution

Facilities and Clearinghouses

HL7 V2 ADT Intake

Cambia

Xform to FHIR

FHIR Server and Repository

Encounter API

External Business Partner
FHIR Messages Paradigm

- Bundle
  - MessageHeader
    - Contained Resources
      - Organization
  - Encounter
    - Contained Resources
      - Patient
      - Practitioner
      - Organization
      - AllergyIntolerance
      - Condition
      - Account
      - Coverage
      - Location
      - Procedure
      - RelatedPerson
Resource Considerations

- Consultation with FHIR community through Zulip
  - Resource definition updated in STU3 based on Cambia’s input
    - Added Encounter.Account.Guarantor
  - Resources extended
    - Condition
    - Coverage
    - Encounter
    - MessageHeader
    - Patient
    - Procedure
Lessons Learned

- When and how to request change to a Resource’s core definition
- When and how to create extensions

Further Learning

- Understanding and authoring Profiles in HAPI FHIR
- Understanding Subscription Resource reference implementation in HAPI FHIR
- Understanding Terminology/Vocabulary Servers
Thank You