Before Class:

- [https://explore.qwiklabs.com/](https://explore.qwiklabs.com/)
- Create a New Account using your @stanford.edu email
- Login using your @stanford.edu email and password
- Select the Course: CS 342: Building for Digital Health (MED 253)
- Lab: Introduction to Healthcare FHIR APIs
Welcome!

https://cs342.stanford.edu

CS342/MED253 Building for Digital Health
Lecture 7A: Backend Architecture
Assignment #5: HealthKit
Adding health tracking capabilities to your clinical apps.

Rev. 11.03.2019

For this assignment, let’s put what we have learned about HealthKit into practice. Your deliverable is divided into three parts:

1. Enable background delivery for HealthKit activity types. This will add passive patient monitoring functionality to your study

Due next Code Review
Nov 13th - 18th
Overview for today

- Review of Required Trainings/Compliance (from Lecture 1B)
- Review HIPAA/BAA/DRA/PHI
- What kind of data are you collecting? Are you collecting PHI?
- Stanford Data Classification
- Approved Services
- What is do we mean by “backend”?  
  - Design choices  
    - Server vs Serverless  
    - noSql vs Sql
- ETL
- CS342 Backend Architecture
- CS342 Data Flow Diagram for DRA
- Guest Lecturer - Dharmesh Patel from Google
- Take home workshop - QwikLabs (3 hours)

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Required Compliance -
Course Requirements - Do it soon!

• SOM - Attestation and Device Enrollment
  • Encrypt all devices with SWDE
    • https://uit.stanford.edu/guide/encrypt/config
  • Revising your Attestation for already registered devices
    • https://amie.stanford.edu/attestation
    • Indicate that the device will be used for High-Risk data
    • Follow instructions / steps - not always the easiest
  • Add new devices
    • https://mydevices.stanford.edu/group/mydevices
    • Indicate devices will be used for High-Risk data
Required Trainings

Course Requirements - Do it soon!

- **STARS - HIPAA Certification**
  - Open up Axess - > Click on “STARS” - > Search “HIPAA”
  - Select the Web module
  - Complete the PRIV-2019-WEB Module (120 min)
  - Once completed, move on to the CLIN-2019-WEB Module (120 min)

- **CITI Human Subjects Research Training**
  - Go to: [https://www.citiprogram.org/members/index.cfm?pageID=50](https://www.citiprogram.org/members/index.cfm?pageID=50)
  - Complete the Group 7 - Basic Course
What is HIPAA?
What is HIPAA?

- **Health Insurance Portability and Accountability Act** (1996, President Bill Clinton)
  - Modernize flow of health information & stipulate how Personal Identifiable Information maintained by healthcare and insurance industries should be protected
- **HIPAA Privacy Rule** (Standards for Privacy of Individually Identifiable Health Information): first time national standard for the protection of certain health information.
- Issued by [U.S. Department of Health and Human Services (HHS)](https://www.hhs.gov/)
- Under HHS, the [Office of Civil Rights (OCR)](https://www.hhs.gov/ocr/) responsible for implementing and enforcing law
- **Covered Entities** and their **Business Associates** are covered under this rule (next slide)
- Privacy Rule protects all “individually identifiable health information” held or transmitted by a covered entity or its business associate, in any form or media, whether electronic, paper or oral = Protected Health Information (PHI)
- No restrictions on use or disclosure of De-Identified health information
What is a **Business Associate**?

- A person or organization, other than a member of a covered entity's workforce that performs certain functions or activities on behalf of, or provides certain services to, a covered entity that involve the use or disclosure of individually identifiable health information.
- **Examples:** Google Cloud Services, Microsoft Azure, AWS

What is a **Business Associates Agreement (BAA)?**

- A covered entity must impose specified written safeguards on the individually identifiable health information used or disclosed by its business associates
- **Example:** Stanford has a BAA with Google Cloud Platform (GCP)

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What is a **Business Associate**?

What is a **Business Associates Agreement (BAA)**?

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What is a DRA?
What is a DRA?

• Collaboration between Information Security Office (ISO) and the University Privacy Office (UPO) - unsung heros
  • Usually involves a lawyer
  • Usually involves an engineer or other tech expertise

• Required by the IRB
  • More people requiring care and fewer people paying into system

• Thorough review of the data you collect and methods of storage and transfer
  • Data flow diagram
  • Form, documentation submission
  • Interview/Meeting(s)

• Takes 2 weeks to ∞
Critical DRA Elements

• Pre-Screening Questionnaire
  • https://stanford.service-now.com/it_services?id=sc_cat_item&sys_id=a899efaf13ec3a00d3b6b3b12244b062

• Data Risk Assessment Intake Form
  • https://redcap.stanford.edu/webauth/surveys/?s=7CYLWCYK8D

• Data Flow Diagram
  • Example: https://www.lucidchart.com/documents/edit/2fde1140-2e81-4e90-b302-4a7de8dd4c65?shared=true&

• Data Classification
  • https://uit.stanford.edu/guide/riskclassifications
What is Protected Health Information (PHI)?

- 18 identifiers

1. Names
2. All geographical identifiers smaller than a state, except for the initial three digits of a zip code if, according to the current publicly available data from the U.S. Bureau of the Census: the geographic unit formed by combining all zip codes with the same three initial digits contains more than 20,000 people; and the initial three digits of a zip code for all such geographic units containing 20,000 or fewer people is changed to 000
3. Dates (other than year) directly related to an individual
4. Phone Numbers
5. Fax numbers
6. Email addresses
7. Social Security numbers
8. Medical record numbers
9. Health insurance beneficiary numbers
10. Account numbers
11. Certificate/license numbers
12. Vehicle identifiers and serial numbers, including license plate numbers;
13. Device identifiers and serial numbers;
14. Web Uniform Resource Locators (URLs)
15. Internet Protocol (IP) address numbers
16. Biometric identifiers, including finger, retinal and voice prints
17. Full face photographic images and any comparable images
18. Any other unique identifying number, characteristic, or code except the unique code assigned by the investigator to code the data

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Data Risk Classification

Data Risk Classification Examples

Use the examples below to determine which risk classification is appropriate for a particular type of data. When mixed data falls into multiple risk categories, use the highest risk classification across all.

View Minimum Security Standards: Endpoints

<table>
<thead>
<tr>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research data (at data owner's discretion)</td>
<td>Unpublished research data (at data owner's discretion)</td>
<td>Health information, including Protected Health Information (PHI)</td>
</tr>
<tr>
<td>SUNet IDs</td>
<td>Student records and admission applications</td>
<td>Health Insurance policy ID numbers</td>
</tr>
<tr>
<td>Information authorized to be available on or through Stanford’s website without SUNet ID authentication</td>
<td>Faculty/staff employment applications, personnel files, benefits</td>
<td>Social Security Numbers</td>
</tr>
</tbody>
</table>

Source: [https://uit.stanford.edu/guide/riskclassifications](https://uit.stanford.edu/guide/riskclassifications)
## Approved Services

This table indicates which classifications of data are allowed on a selection of commonly used Stanford University IT services.

### Stanford Service

<table>
<thead>
<tr>
<th>Service</th>
<th>Low Risk</th>
<th>Moderate Risk</th>
<th>High Risk</th>
<th>Very High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio and Video Conferencing: BlueJeans, WebEx, Zoom</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Backups: CrashPlan/PROe</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Calendar: Office 365</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Cardinal Fax</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Cardinal Print</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Cloud Infrastructure: AWS</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Cloud Infrastructure: Microsoft Azure, Google Cloud Platform</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Content Management: Drupal (Stanford Sites), Wordpress</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Database Hosting: MySQL</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Document Management: Box and Office 365 OneDrive</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Document Management: Google Drive and Google Shared drives</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Document Management: Google G Suite: Docs, Sheets, Forms and Slides</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Document Management: Google G Suite: All others (Sites, Photos, etc...)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
<tr>
<td>Document Management: Medline Box</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>❌</td>
</tr>
</tbody>
</table>

Source: [https://uit.stanford.edu/guide/riskclassifications](https://uit.stanford.edu/guide/riskclassifications)
Google BAA / HIPAA Approved Svcs.

The Google Cloud Platform BAA covers GCP’s entire infrastructure (all regions, all zones, all network paths, all points of presence), and the following products:

**Google Cloud Platform:**

- Google AI Platform Training and Prediction
- Google App Engine
- Google Cloud AI Notebooks
- Google Cloud Armor
- Google Cloud AutoML Natural Language
- Google Cloud AutoML Tables
- Google Cloud AutoML Translation
- Google Cloud AutoML Vision
- Google BigQuery
- Google BigQuery Data Transfer Service
- Google Cloud Bigtable
- Google Cloud Build
- Google Cloud Composer
- Google Cloud Console
- Google Cloud Data Fusion
- Google Cloud Data Labeling Service
- Google Cloud Data Loss Prevention

[https://cloud.google.com/security/compliance/hipaa/](https://cloud.google.com/security/compliance/hipaa/)
BAA or non-BAA?

- Google Analytics
- Google Drive
- DialogFlow
- Cloud AutoML Vision
- Gmail

https://cloud.google.com/security/compliance/hipaa/
What is a “backend”?
What is a “backend”? 

- database / persistence layer
- server-side logic - (scheduling, pre-processing, triggers)
- ETL - extract/transform/load piping
- dashboard / admin GUI
- authentication
- hardware / compute + networking
Client-Server Model vs Serverless

TRADITIONAL vs SERVERLESS

TRADITIONAL

SERVERLESS
(using client-side logic and third-party services)

https://www.gocd.org/2017/06/26/serverless-architectu-continuous-delivery/
We Chose Serverless

• Because Managing Servers……
  • sucks
  • is expensive
  • is inefficient
  • a distraction
  • less secure
  • not necessary
noSql vs Sql

• structured query language (SQL)
  • examples: MySql, Oracle, Sqlite, Postgres and MS-SQL

• not only structured query language (noSQL)
  • examples: MongoDB, BigTable, Redis, RavenDb, Cassandra, Hbase, Neo4j and CouchDb

• Key-Value vs Tabular

• Horizontal vs. Vertical scaling
noSQL now -> SQL later

noSQL + discipline + schema design =
Let’s Create a Firestore/Firebase Instance

1. Go to http://firebase.google.com
2. Click “Go To Console” (top right)
3. “Create Project” - pick creative name
4. Disable Google Analytics (not in BAA)
5. Wait 30 sec……
6. Click “continue” -> “develop” ->”database”->”create database”
7. Select “test mode”
8. Pick bucket and GO!
9. “Start Collection” -> name it “users”
10. Add your first document / user w/name+phone
Let’s Create a Firestore/Firebase Instance

NEXT: Add it to your iOS project

1. Click “Project Overview”
2. Select the iOS icon.
3. Follow instructions
ETL - Extract/Transform/Load
ETL - Extract/Transform/Load
CS342 Backend Architecture
Proposed Mobile / Backend Architecture - CS342 - ResearchIT
Attendance

- [https://tinyurl.com/cs342-attendance](https://tinyurl.com/cs342-attendance)

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