CSci 245
Mobile Software Development
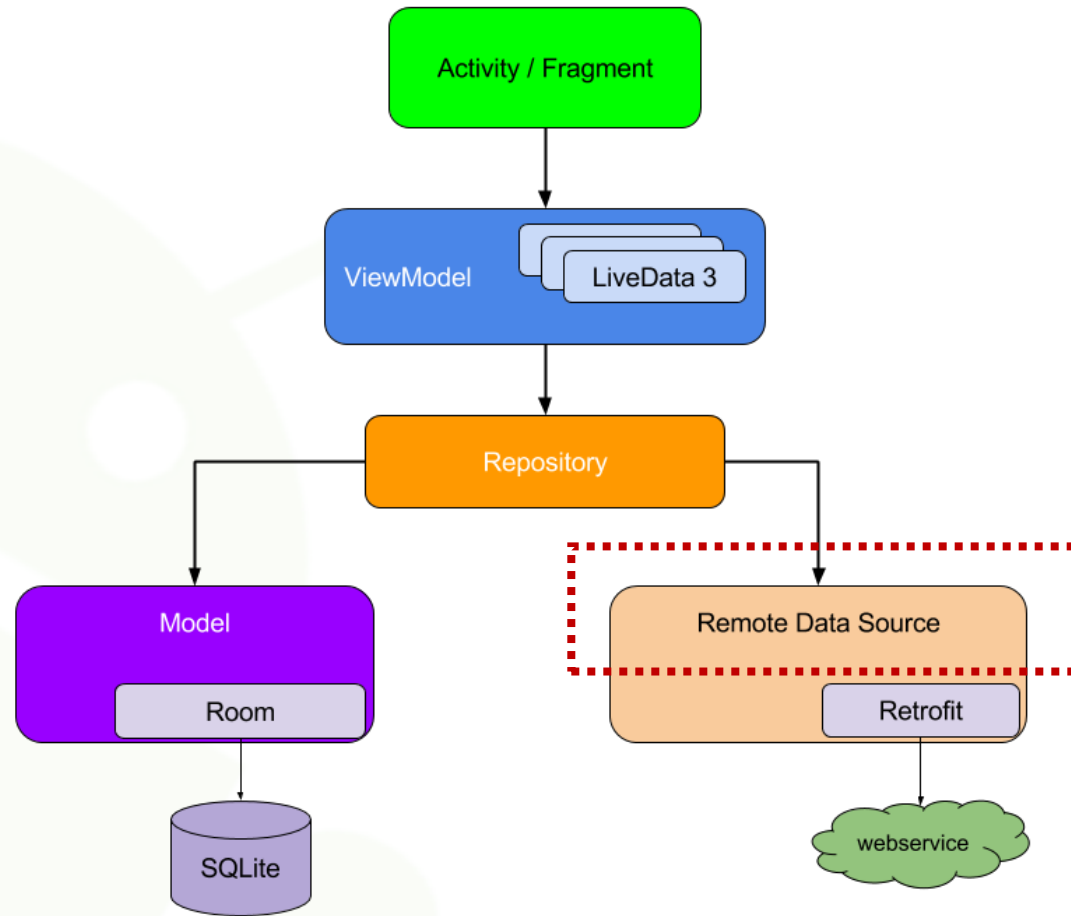
Instructor:
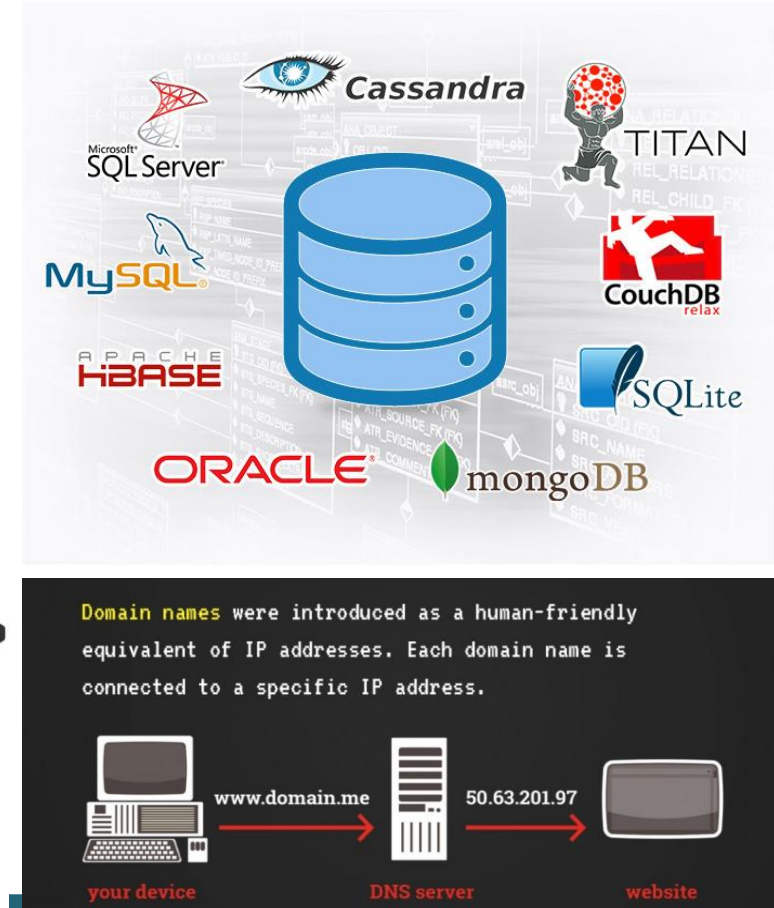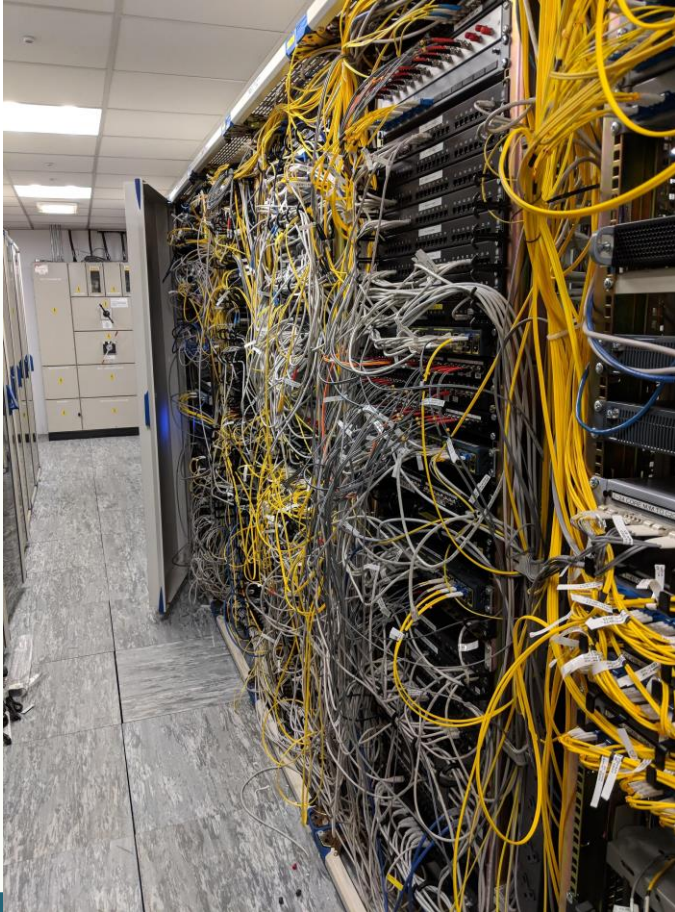
Dr. Shuo Niu (shniu@clarku.edu)

ANDROID

Core Modules

1. Intro to Android
2. Into to Kotlin
3. Mobile GUI
4. Activity and Fragment
5. Navigation
6. Architecture Components
7. Internet API

8. Database
9. Cloud Computing
10. Media and Animation
11. Sensors and Location
12. Background Processing

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Architecture Components

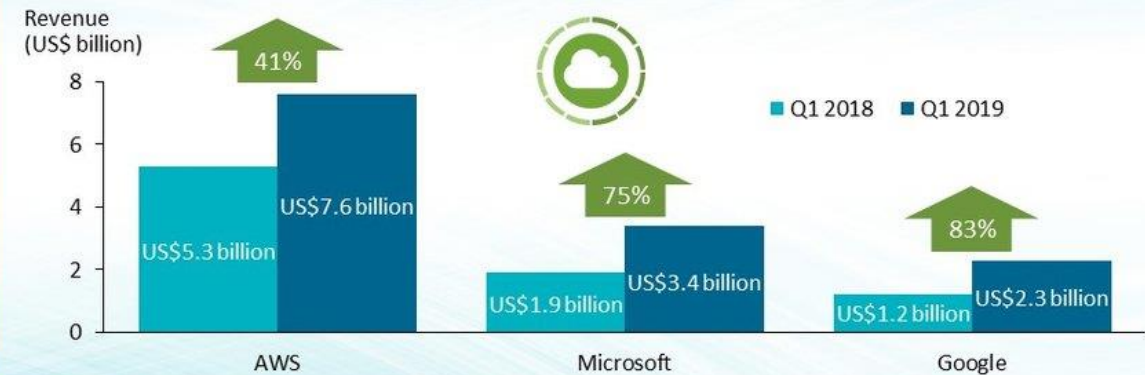# What it costs to be "online"?

Cloud Computing Providers

A Cloud is

- Datacenter hardware and software
  - that the vendors use to offer the computing and services
- A paradigm that allow on-demand network access to share computing resources


ANDROID

Why Cloud?

- Network access
  - Uses internet as a medium
- On demand service
  - You use (pay) it when you need it
- Shared resource
  - Resources are pooled together and used by multiple clients
- Scalability
  - Allows elasticity of resources

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Three basic services

- SAAS
  - Software as a Service model
  - Apps through browser
- PAAS
  - Platform as a Service model
  - Delivery of a computing platform for custom software
- IAAS
  - Infrastructure as a Service model
  - Deliver of computer infrastructure as a service
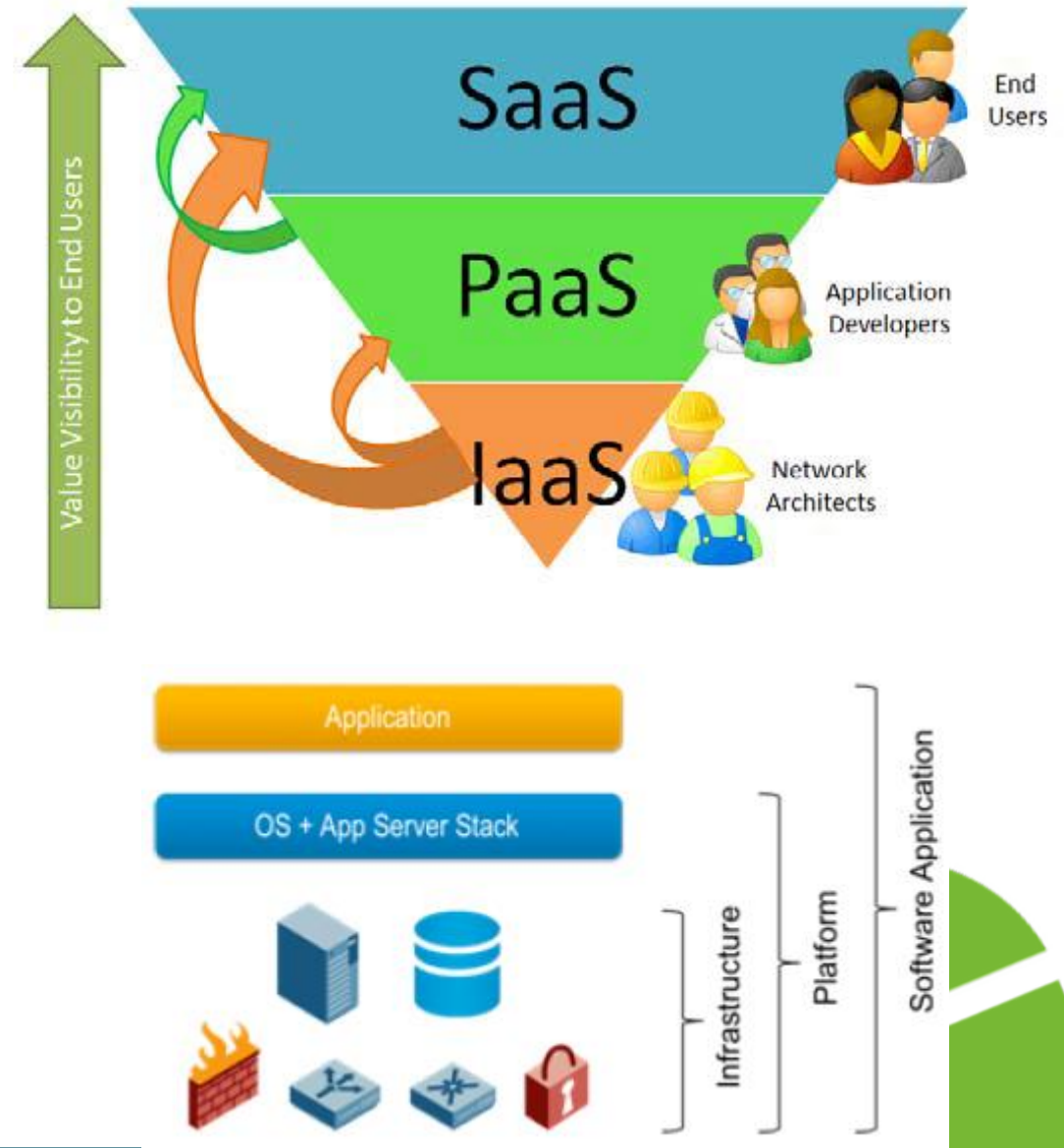
Comparison
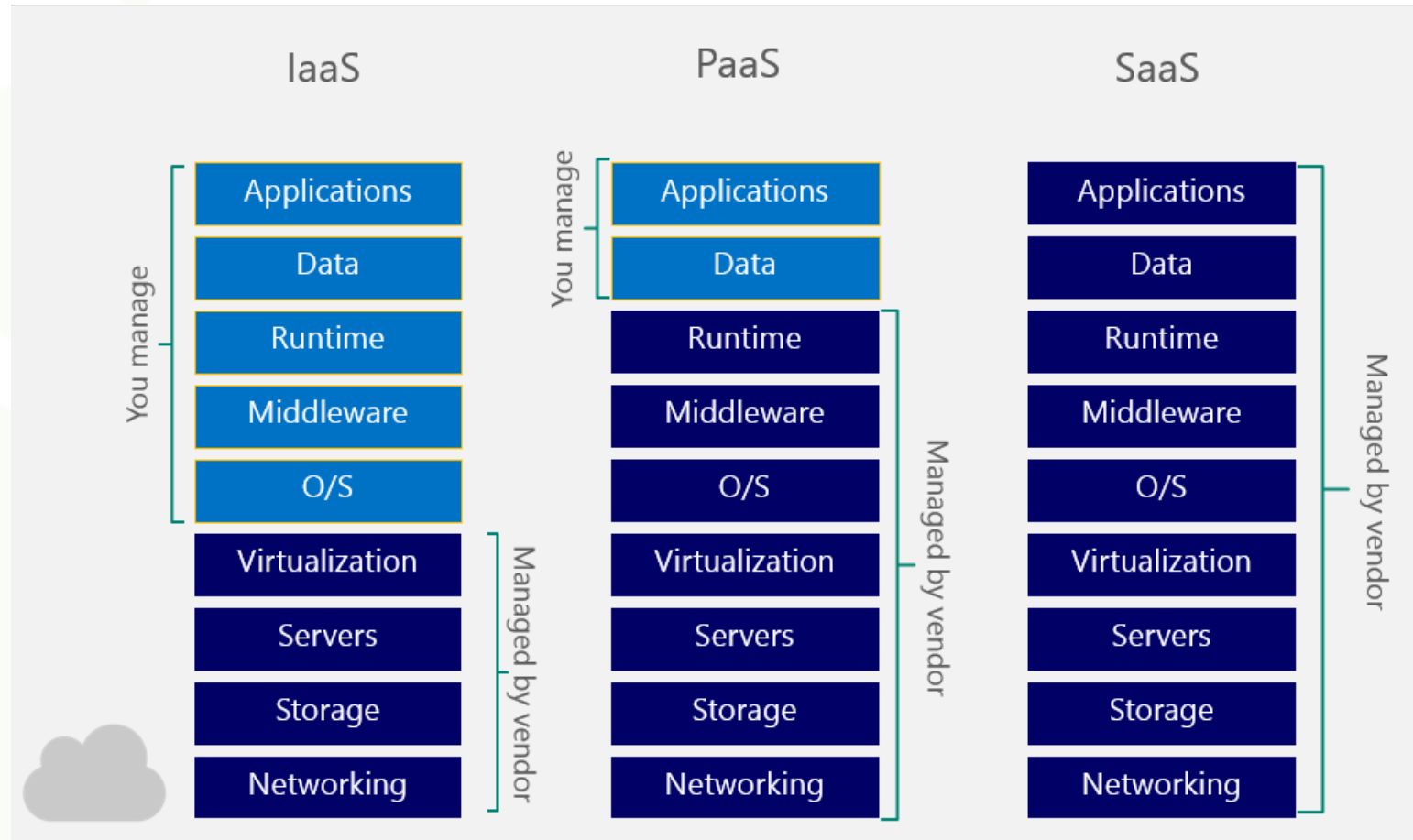
SaaS

- Application is licensed to a customer as a service on demand
- Software delivery model
    - Hosted on the vendor's web servers
    - Downloaded at the consumer's device and disabled when on-demand contract is over

PaaS

- Delivery of an integrated computing platform
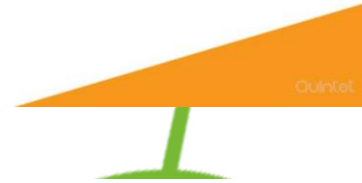 - to build/test/deploy custom apps
- Deploy your applications & don't worry about buying & managing the underlying hardware and software layers

IaaS

- Delivery of computer infrastructure (typically platform virtualization environment) as a service

- Virtualization Technology is a major enabler of IaaS
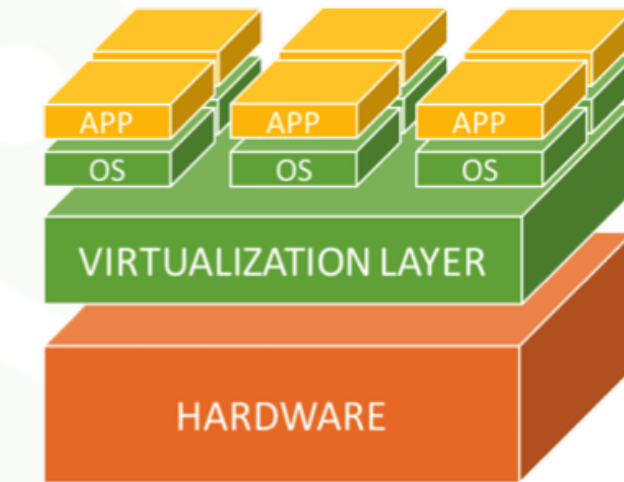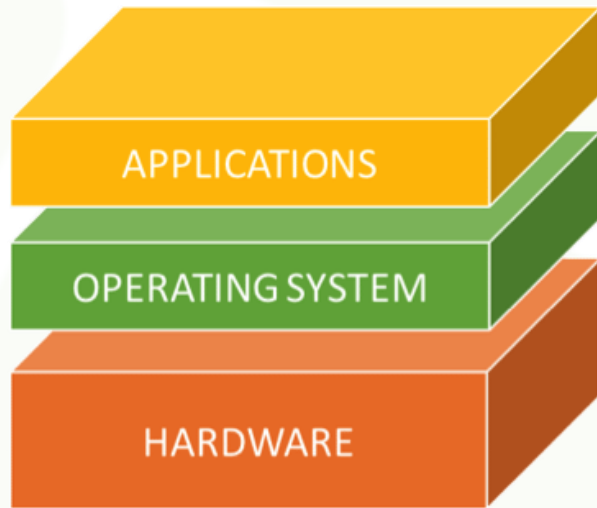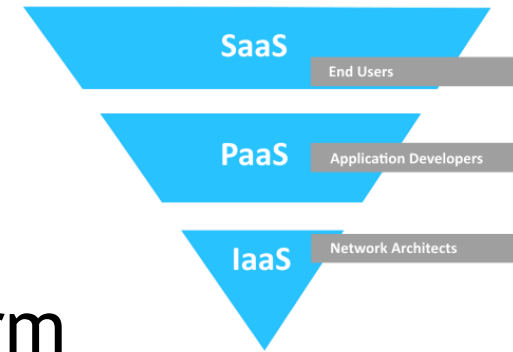
Mobile and Cloud

- Computing engine and cloud storage
  - Auto scale to support more users
- Broadcasting and notifications
  - Sending updates to your users
- Social integration
  - Email, FB, Twitter, etc.
- Analytical tools
  - Usage, feedback, errors
- Advanced technology
  - AI, ML, IoT
- And so on...

Google Cloud Platform

- API Management
  - Define your own API
- Storage
  - Firebase
- AI and Machine Learning
  - Speech-to-text, vision, translation

GOOGLE CLOUD PLATFORM

AI and Machine Learning
Speech-to-Text · Vision · Translation · More

API Management
Apigee API Platform · Cloud Endpoints · More

Compute
Compute Engine · Cloud GPUs · More

Hybrid and Multi-cloud
Anthos · Migrate for Anthos · GKE · More

Data Analytics
BigQuery · Cloud Datalab · More

Databases
Cloud SQL · Cloud Firestore · More

Developer Tools
Cloud Build · Cloud Code · Cloud SDK · More

Migration
Data Transfer · VM Migration · More

Networking
DNS · CDN · Virtual Private Cloud · More

Security and Identity
Shielded VMs · Cloud IAM · More

Serverless Computing
Cloud Run · App Engine · Cloud Functions · More

Storage
Cloud Storage · Persistent Disk · More

MORE CLOUD PRODUCTS

G Suite
Gmail, Docs, Drive, Hangouts, and more

Google Maps Platform
Build with real-time, comprehensive data

Cloud Identity
Easily manage user identities

Chrome Enterprise
Get Chrome OS devices and browser

Android Enterprise
Intelligent devices, OS, and business apps

See all products (100+)

ANDROID

Google Cloud Firebase

- Store and sync data between users and devices - at global scale

- Live synchronization and offline support

- A cloud-hosted, NoSQL database

Firebase

- Realtime database that converts JSON tree to storage
- *Firebase Database paths must not contain '.', '#', '$', '[', or ']'

```
[
  {
    "id": 1,
    "first_name": "Agnesse",
    "last_name": "Savill",
    "email": "asavill0@tripod.com"
  },
  {
    "id": 2,
    "first_name": "Alfie",
    "last_name": "Duligall",
    "email": "aduligall1@dedecms.com"
  },
  {
    "id": 3,
    "first_name": "Cassius",
    "last_name": "Toffolo",
    "email": "ctoffolo2@github.com"
  }
]
```

weighty-wonder-258306

- 0
  - email: "asavill0@tripod.com"
 - first_name: "Agnesse"
  - id: 1
  - last_name: "Savill"
- 1
  - email: "aduligall1@dedecms.com"
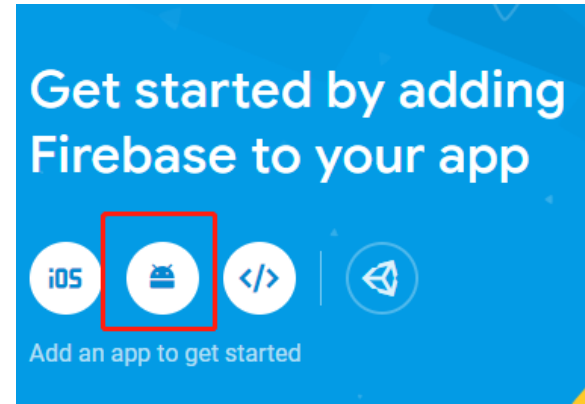 - first_name: "Alfie"
  - id: 2
  - last_name: "Duligall"
- 2
  - email: "ctoffolo2@github.com"
  - first_name: "Cassius"
  - id: 3
  - last_name: "Toffolo"

Use Firebase in Android Project

- Set up Firebase project

- Import Firebase dependencies

- Add configuration file
  - A JSON file downloaded from GCP console
  - Specify authentication keys, application name and URL
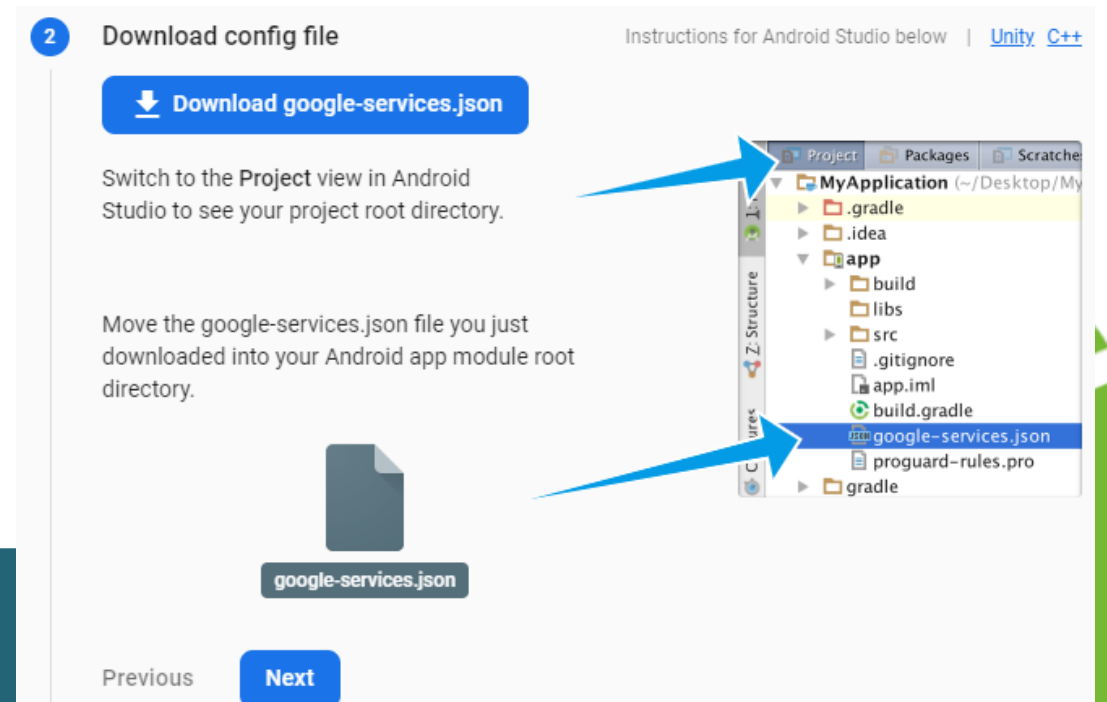
Use Firebase in Android Project

- Build Firebase reference
- Register callbacks

```
database = Firebase.database.getReference("")
database.addValueEventListener(valueEventListener)


ValueEventListener {

    override fun onDataChange(snapshot: DataSnapshot) {

    }

    override fun onCancelled(error: DatabaseError) {

    }
}
```

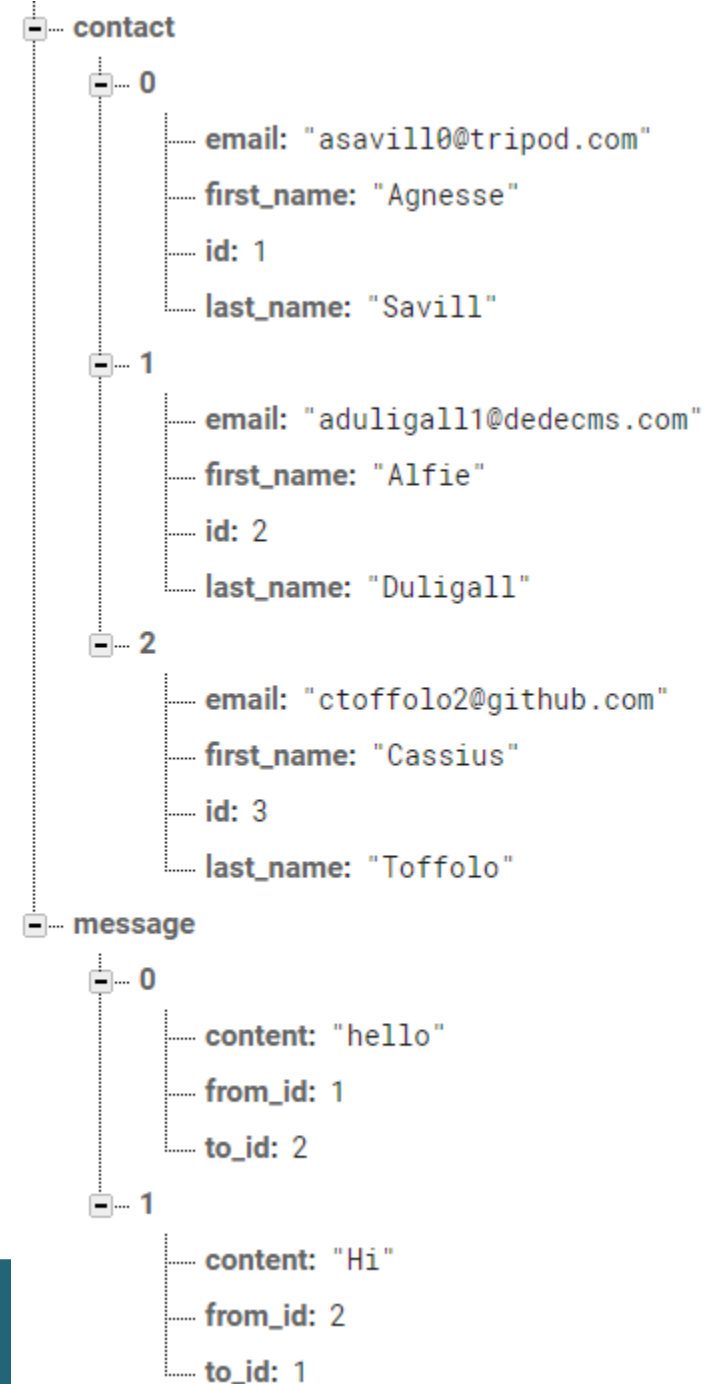# Build reference

- Application ID
- API Key
- Database URI

```kotlin
val options = FirebaseOptions.Builder()
    .setApplicationId("<App url>")
    .setApiKey("<API key>")
    .setDatabaseUrl("https://<project>.firebaseio.com")
    .build()
```

Modify the data

- Read
  - firebase?child("contact").child("0")?.child("first_name")
- Read array
  - firebase?.child("contact")?.chidren.forEach{}
- Write value
  - firebase?.child("contact")?.child("0")?.child("email")? .setValue("agnesse@tripod.com")
- Write object
  - firebase?.child("message")?.child("2")?.setValue(Message())
- Delete object
  - firebase?.child("message")?.child("1")?.setValue(null)

```
contact
    0
        email: "asavill0@tripod.com"
        first_name: "Agnesse"
        id: 1
        last_name: "Savill"
    1
        email: "aduligall1@dedecms.com"
        first_name: "Alfie"
        id: 2
        last_name: "Duligall"
    2
        email: "ctoffolo2@github.com"
        first_name: "Cassius"
        id: 3
        last_name: "Toffolo"
message
    0
        content: "hello"
        from_id: 1
        to_id: 2
    1
        content: "Hi"
        from_id: 2
        to_id: 1
```

Questions?

Setup Firebase Account

- Goto https://firebase.google.com/