Cloud Computing

COSC 2626/2640

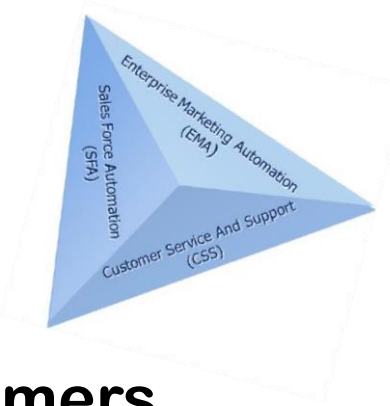
Supporting Information for Assignment 2

Where cloud is used?

- Strategic Systems (Defense / Intelligence)
- Bioinformatics
- Visualization and Graphics
- Economics and Finance
- Scientific Computing
- …many more

Case Study: Salesforce.com

- Perhaps the first truly successful "software as a service" platform
- What is the software being provided?
  - "Customer Relationship Management" (CRM) – tools for sales people to find customers, keep in contact with them.
  - Gives a bird's-eye view of customers' status, in-flight orders, order history, leads, approvals, etc.



- How it works?
  - 'Only' about 1000 mirrored machines for 55K enterprise customers, 1.5M subscribers
  - 10 Oracle databases across 50 servers
  - AJAX Web interface with various communication services

Case Study: Facebook

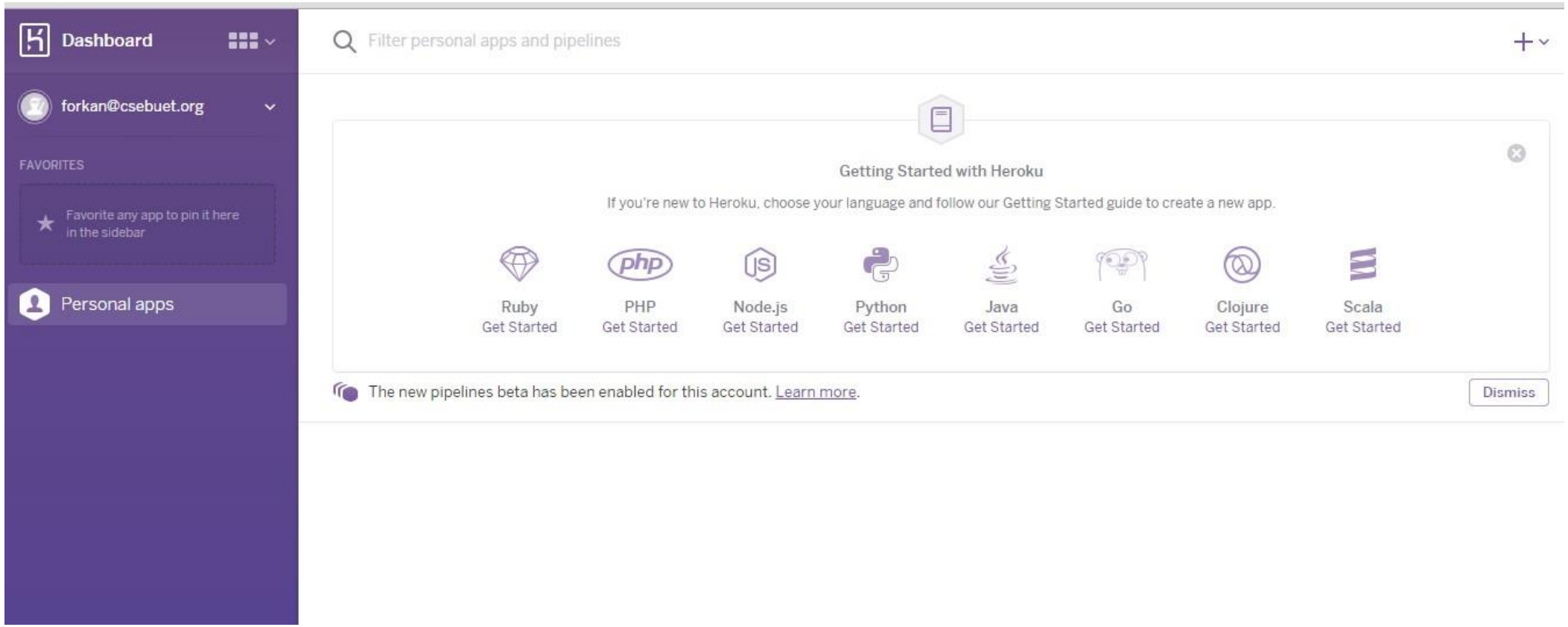
- Facebook provides some PaaS capabilities to application developers
  - Web services – remote APIs – that allow access to social network properties, data, "Like" button, etc.
  - Many third-parties run their apps off Amazon EC2, and interface to Facebook via its APIs – PaaS + IaaS
- Facebook itself makes heavy use of PaaS services for their own private cloud
  - Key problems: how to analyze logs, make suggestions, determine which ads to place

Facebook APIs

- Read data from profiles and pages
- Navigate the graph (e.g., via friends lists)
- Issue queries (for posts, people, pages, …)
- Add or modify data (e.g., create new posts)
- real-time updates, issue batch requests, …
- How you can access it?
  - Graph API
  - FQL (Facebook Query Language)
  - Legacy REST API

Heroku (PaaS)

- A new way of building and deploying web apps.



Heroku

- Instant Deployment with Git push - build of your application is performed by Heroku using your build scripts
- Plenty of Add-on services (applications, databases etc.)
- Processes scaling - independent scaling for each component of your app without affecting functionality and performance
- Isolation - each process is completely isolated from each other
- Full Logging and Visibility - easy access to all logging output from every component of your app and each process
- A simple web application written in node.js can handle around 60 - 70 requests per second.

Assignment 2

Uses Cloud platforms and technologies

Publicly available data

- City of Melbourne public data: https://data.melbourne.vic.gov.au/
- Vicroads data http://vicroadsopendata.vicroadsmaps.opendata.arcgis.com/
- Example Summarization
  - Average vehicle count in a month in a road
  - Which time of the day has most accidents
  - Average car flows in freeways
- BOM data: http://www.bom.gov.au/climate/data-services/
  - Find high temperature zones
  - Find low rainfall zones
  - Find seasons with highest rainfall in a year

More public data source

- PTV Data: https://www.ptv.vic.gov.au/footer/data-and-reporting/datasets/
- Spatial Data: https://www.data.vic.gov.au/data/group/spatial-data
- AWS Public dataset: https://aws.amazon.com/public-data-sets/
- Google book Ngram: http://storage.googleapis.com/books/ngrams/books/datasetsv2.html
- Watson Analytics: https://dataplatform.cloud.ibm.com/community
- UCI Irvine Machine Learning repository: http://archive.ics.uci.edu/ml/

Use of APIs

- Twitter API: https://dev.twitter.com/overview/api
- Twitter streaming API: https://dev.twitter.com/streaming/
- Facebook: https://developers.facebook.com/docs/apis-and-sdks
- Instagram API: https://www.instagram.com/developer/
- Youtube API: https://developers.google.com/youtube/v3/
- Soundcloud API: https://developers.soundcloud.com/docs/api/guide
- PTV API: https://discover.data.vic.gov.au/dataset/ptv-timetable-api
- Google map API: https://developers.google.com/maps/documentation/
- API for different online Games
- RIOT Game API: https://developer.riotgames.com/

Past Students' Submissions

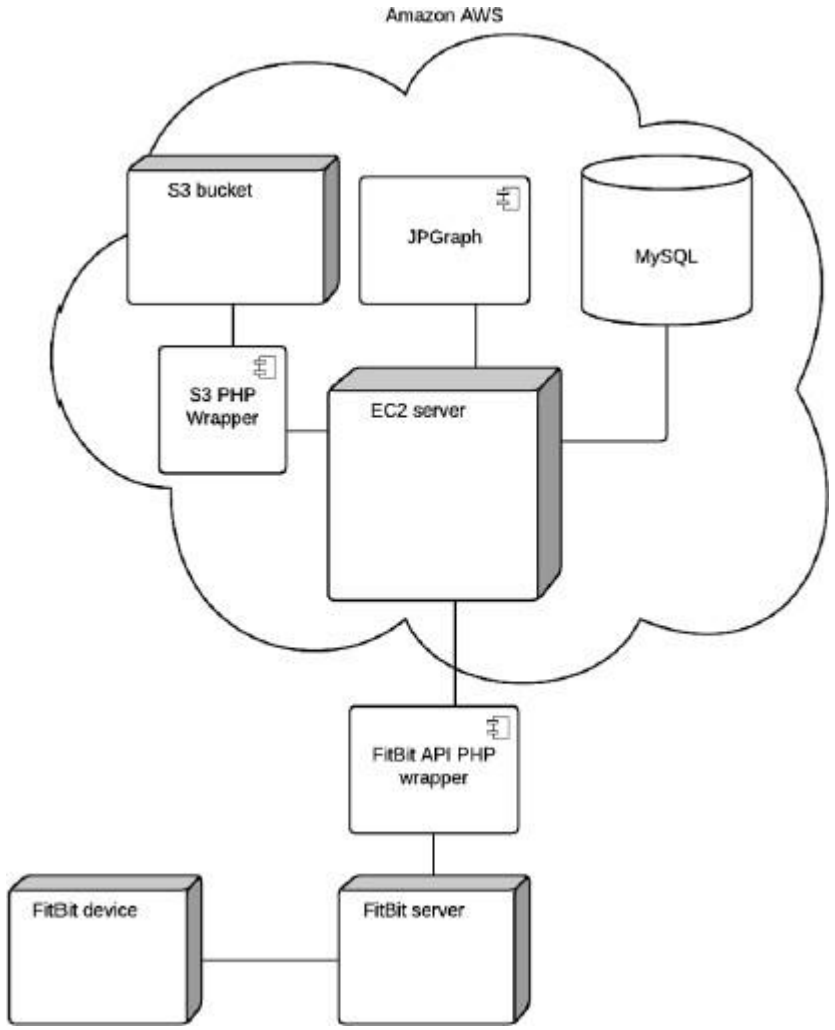
Provide you some ideas about

- ❑ **Possible cloud applications**
- ❑ **How to design cloud application architecture**
- ❑ **What cloud services you can use**

Notes:

- ❑ **Some works may not meet the current A2 requirements**
- ❑ **Some technologies may be out-of-date**
- ❑ **Some past technologies may be replaced by new advanced technologies**

Real-time analysis of FitBit Data

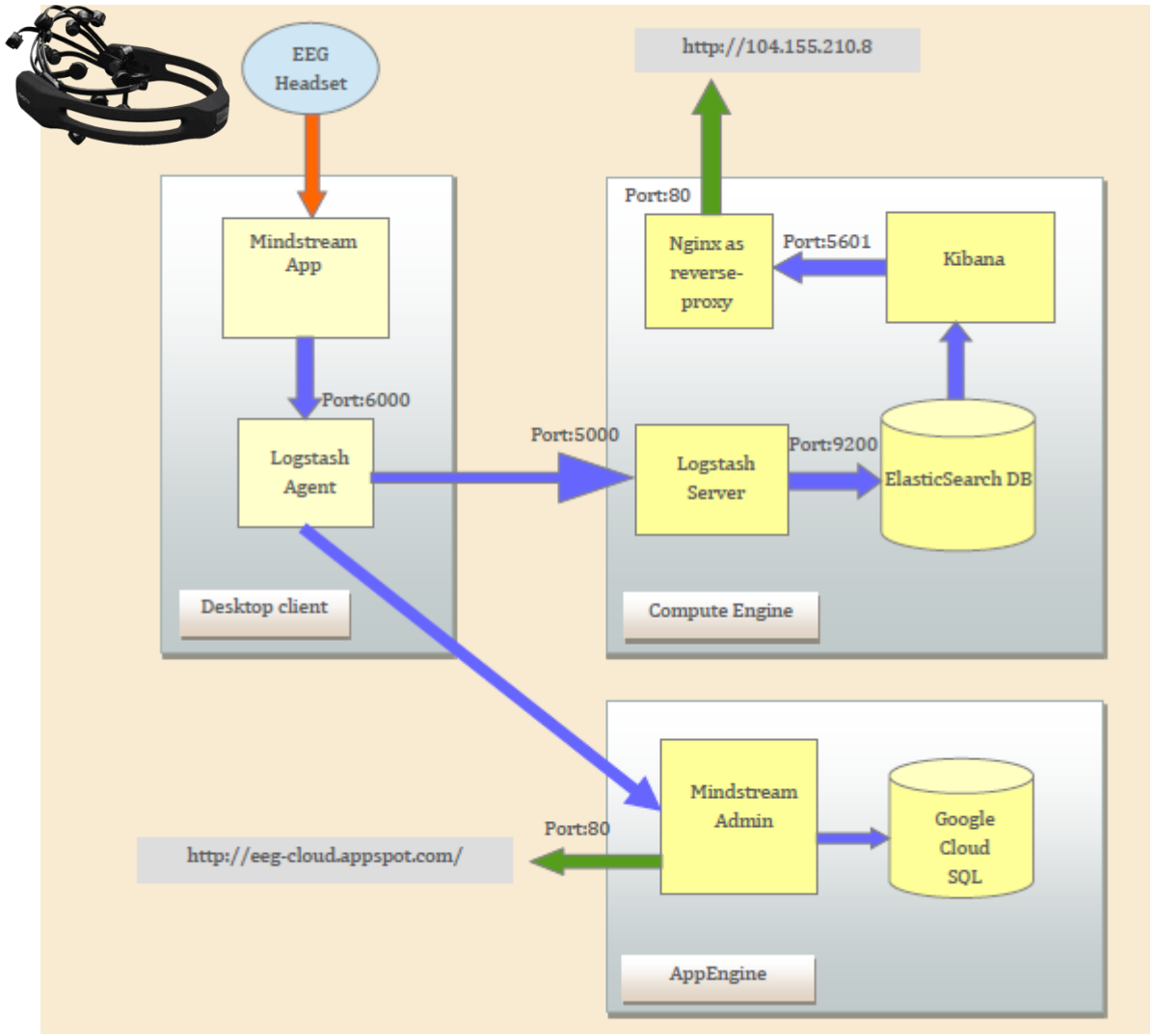


Pic. 1 - FitBit Fitness & Heart Rate Sensor

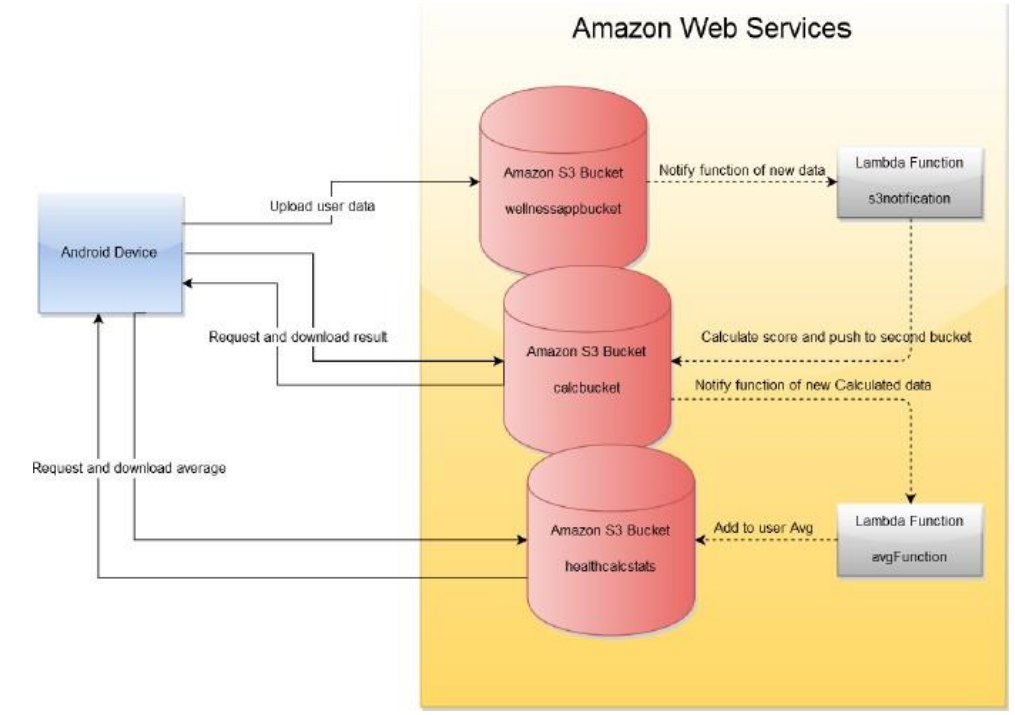
Pic. 2 - Report Created by FitBit

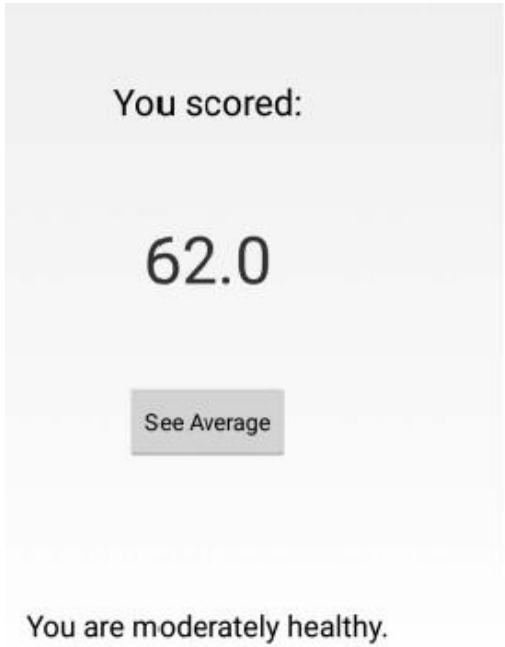
Real-time analysis of FitBit Data

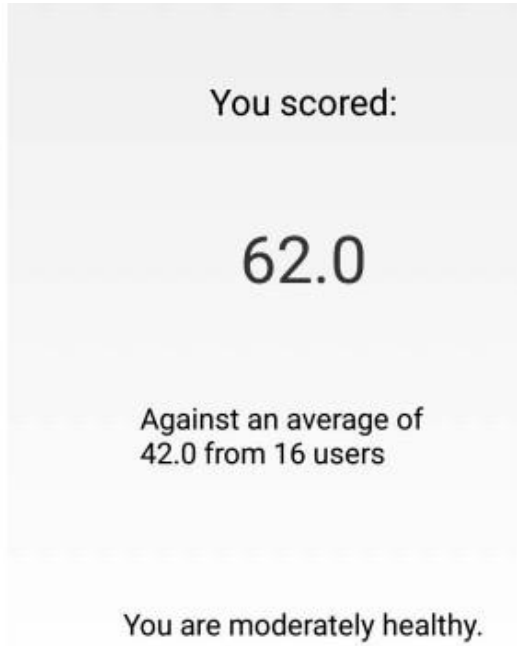
Electroencephalogram (EEG) brainwave Analysis



Wellness calculator app





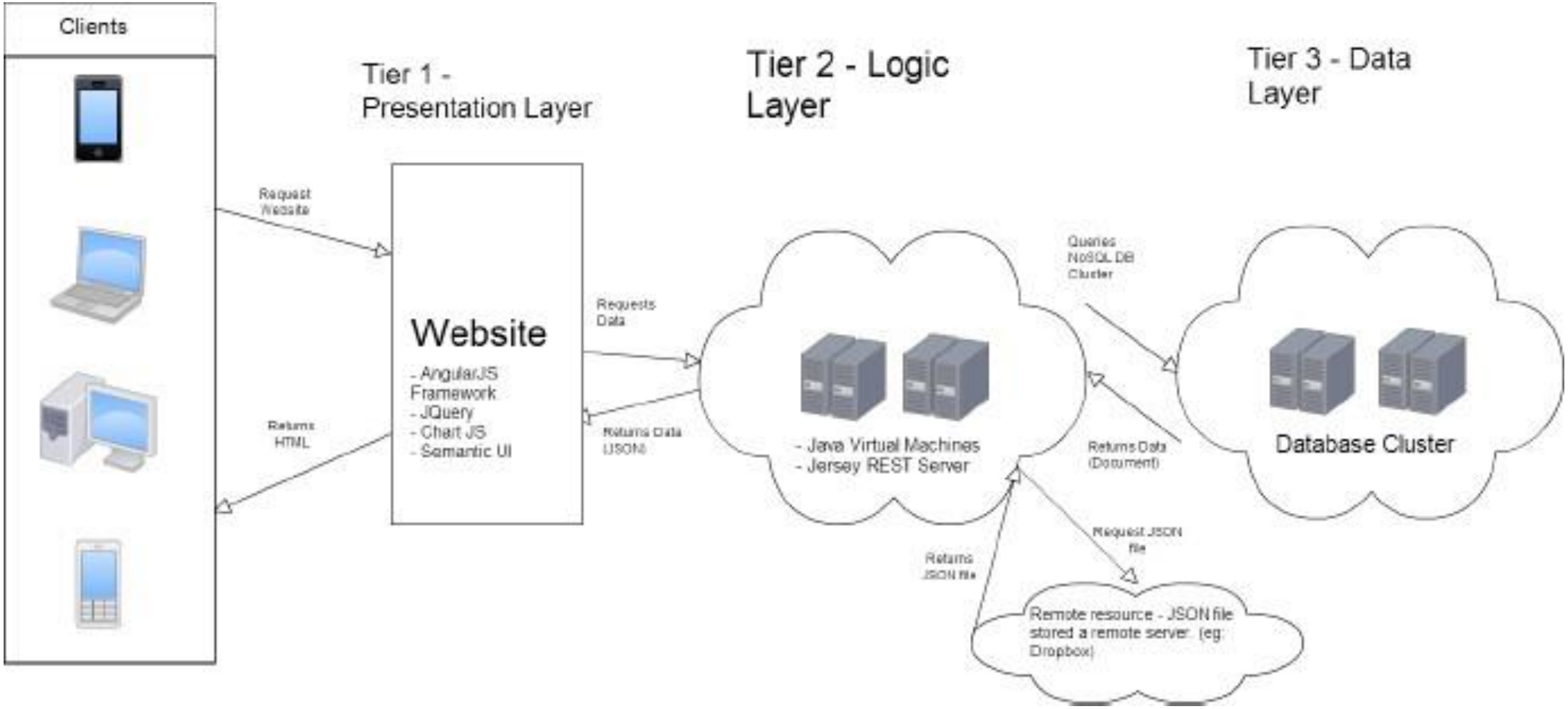


- Health wellbeing calculator (an Andriod app)
- Uses AWS Lambda

Health application

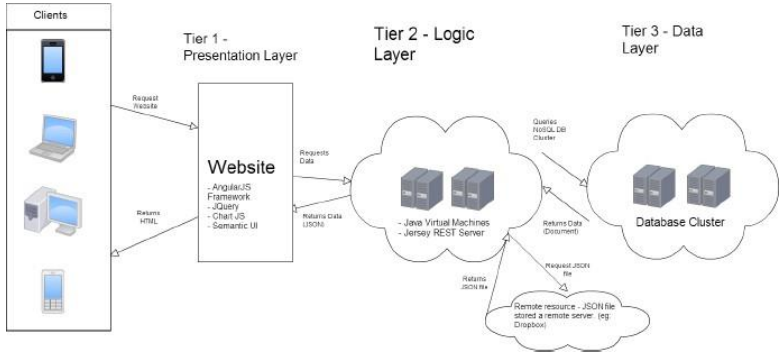
- Example: diet watcher
  - Different kind of information per user (daily intake of Food) – dynamoDB?
  - User can set a goal for calories intake
  - Compare daily intakes
  - Recommend future intakes
- Example: Sleep Quality tracker
  - Time user goes to bed, Time of wake up, total time of sleep, total time of awake, …

Road Traffic data analysis – A distributed model



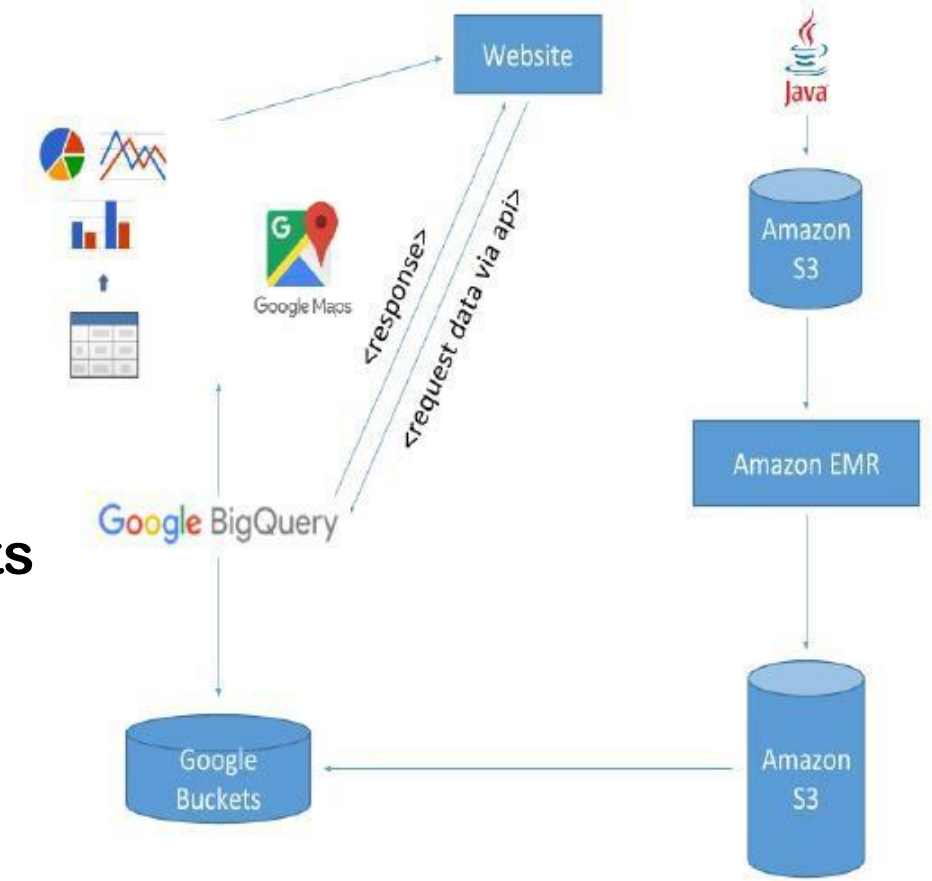
Road Traffic data analysis

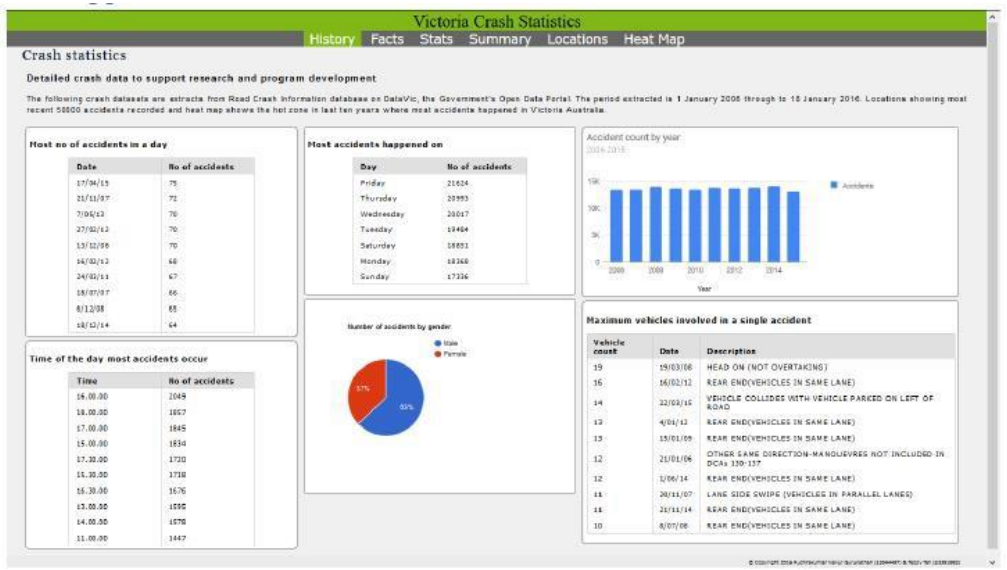
- Tier 1 – Hosted website on IBM Bluemix Server
- Tier 2 - Jersey server included as part of the IBM Java Library. Handles routing for all the API calls made in tier 1
- Tier 3 - a thirdparty MongoLab (a free MongoDB (NoSQL) on cloud database).
- Outcome: A summarized information about traffic congestions

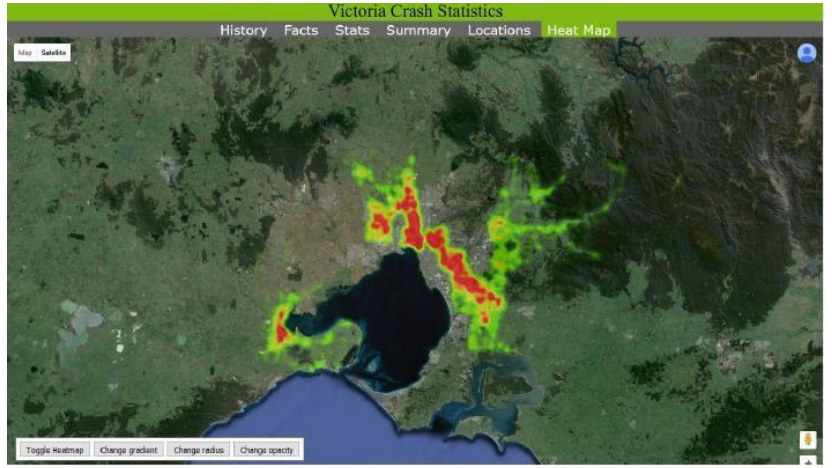


VicRoads data analysis

- Dangerous areas for accident in Victoria
- Age group causing most accidents
- Which time of the day has more accidents

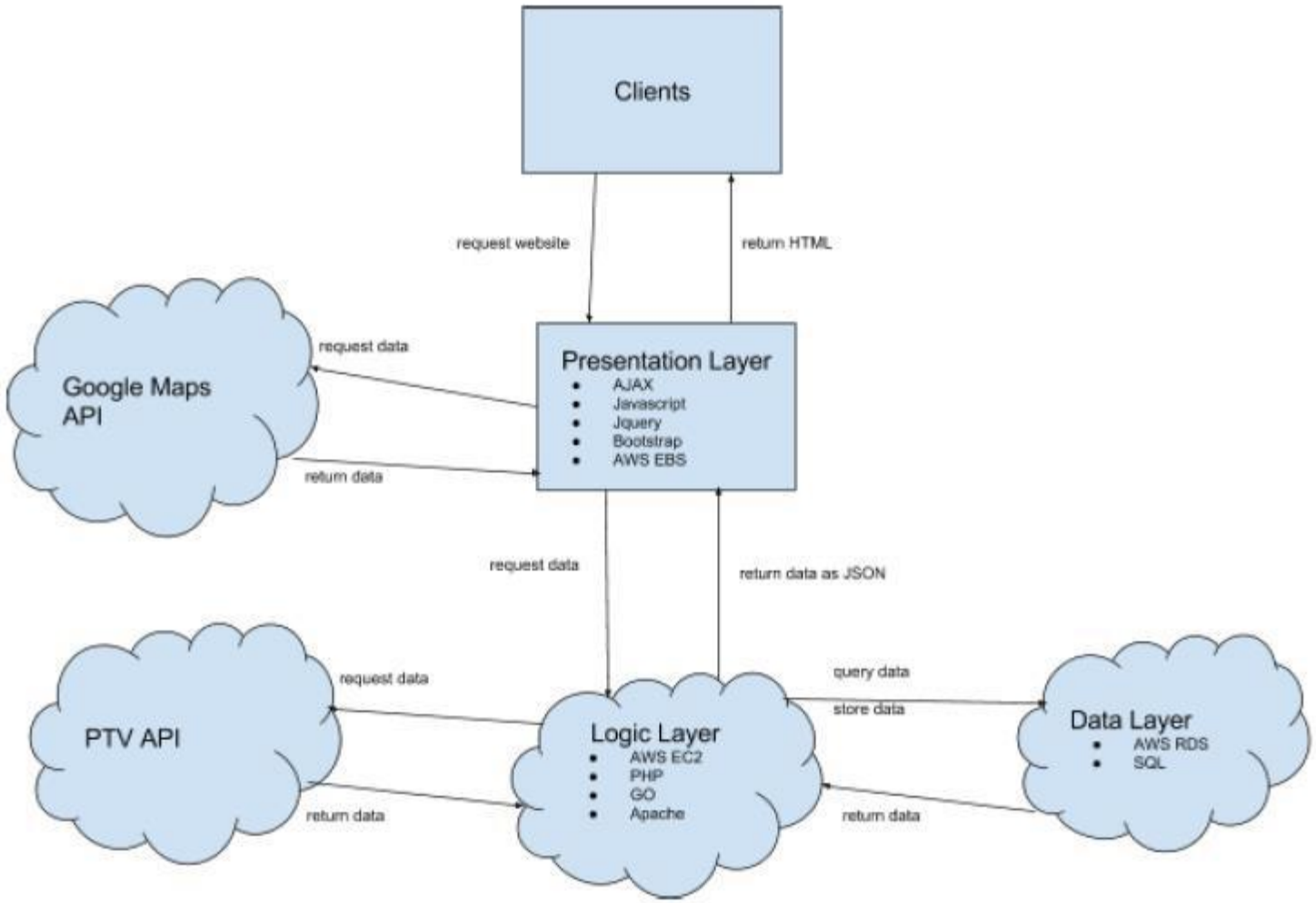




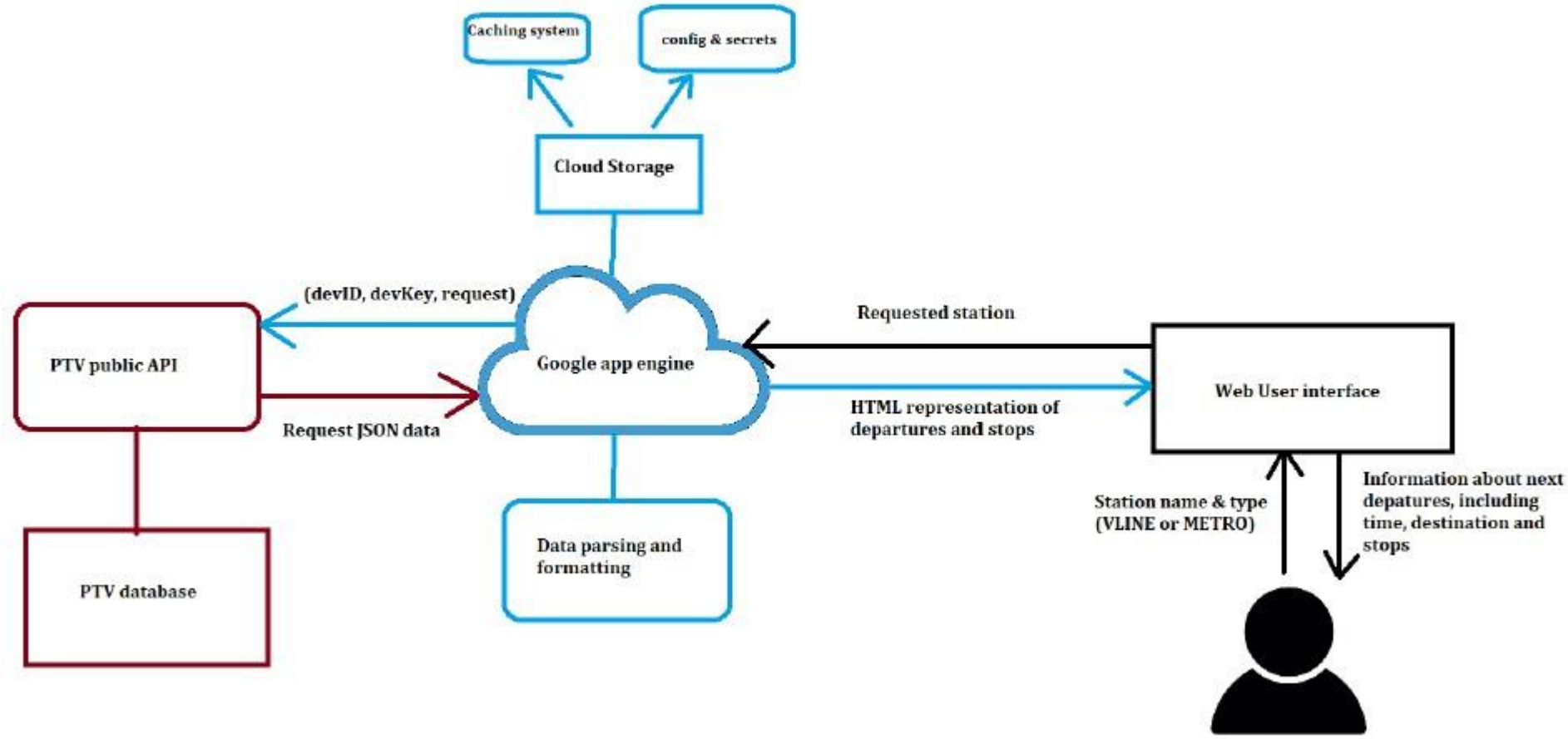


PTV API

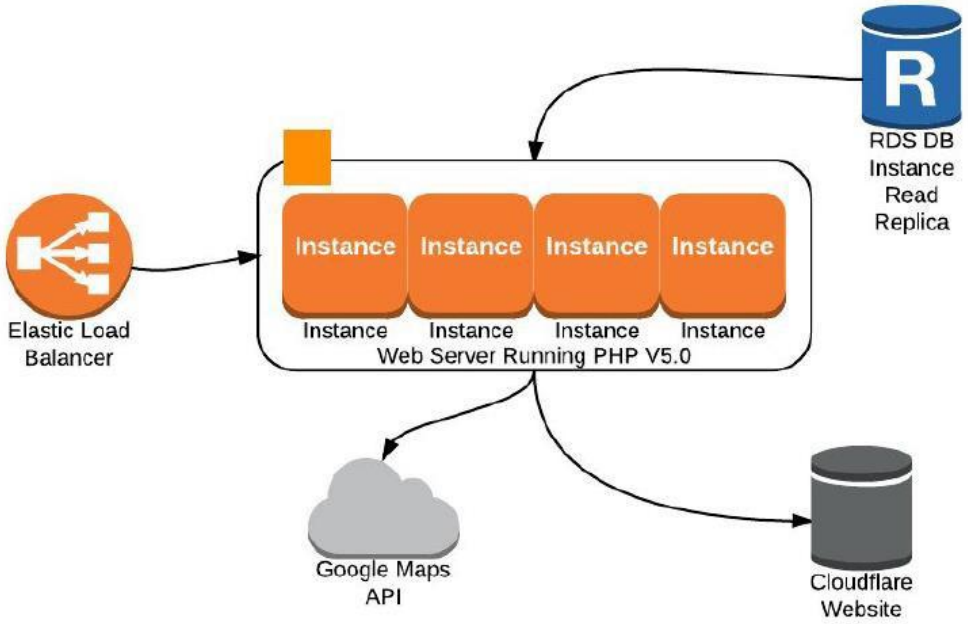
- Report train delays using PTV API
- PTV doesn't like to tell you that their trains are running late.

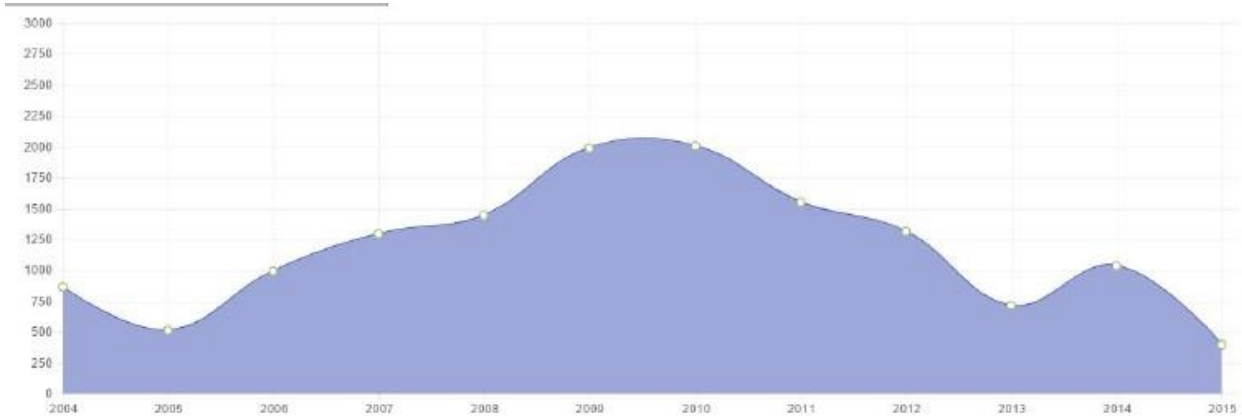


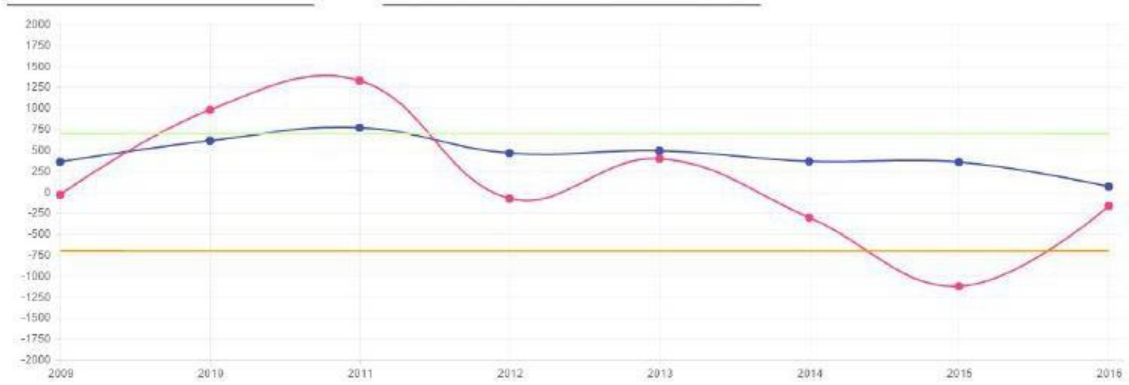
PTV API


Caching system
config & secrets
Cloud Storage
(devID, devKey, request)
PTV public API
Google app engine
Requested station
Web User interface
Request JSON data
HTML representation of departures and stops
Station name & type (VLINE or METRO)
Information about next depatures, including time, destination and stops
Data parsing and formatting
PTV database

El-nino/La-nina predictor







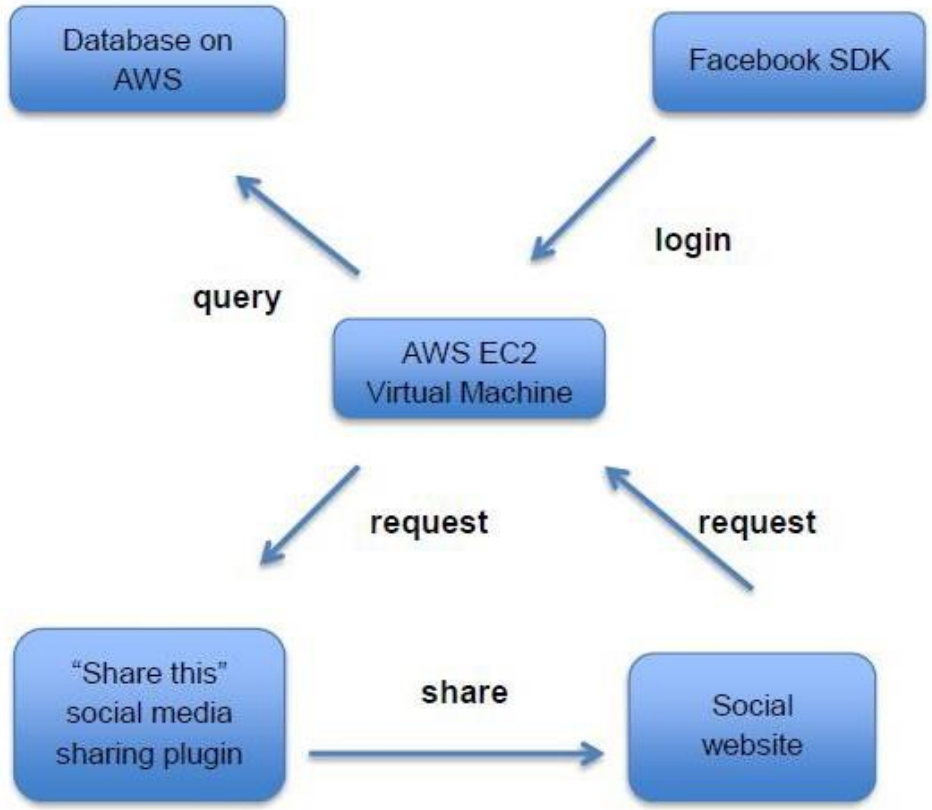
- compare the rainfall data provided for public use by the Australian “Bureau of Meteorology” to the “Oceanic Nino Index” data provided by NASA.

Weather recommendation system

- Use your calendar event (Google calendar API)
- Use any Forecast API (forecast.io)
- Recommend weather of your event day
- Static information (in cloud storage)
- Dynamic modules (in cloud hosting)
- Speed up computation (load balancing)

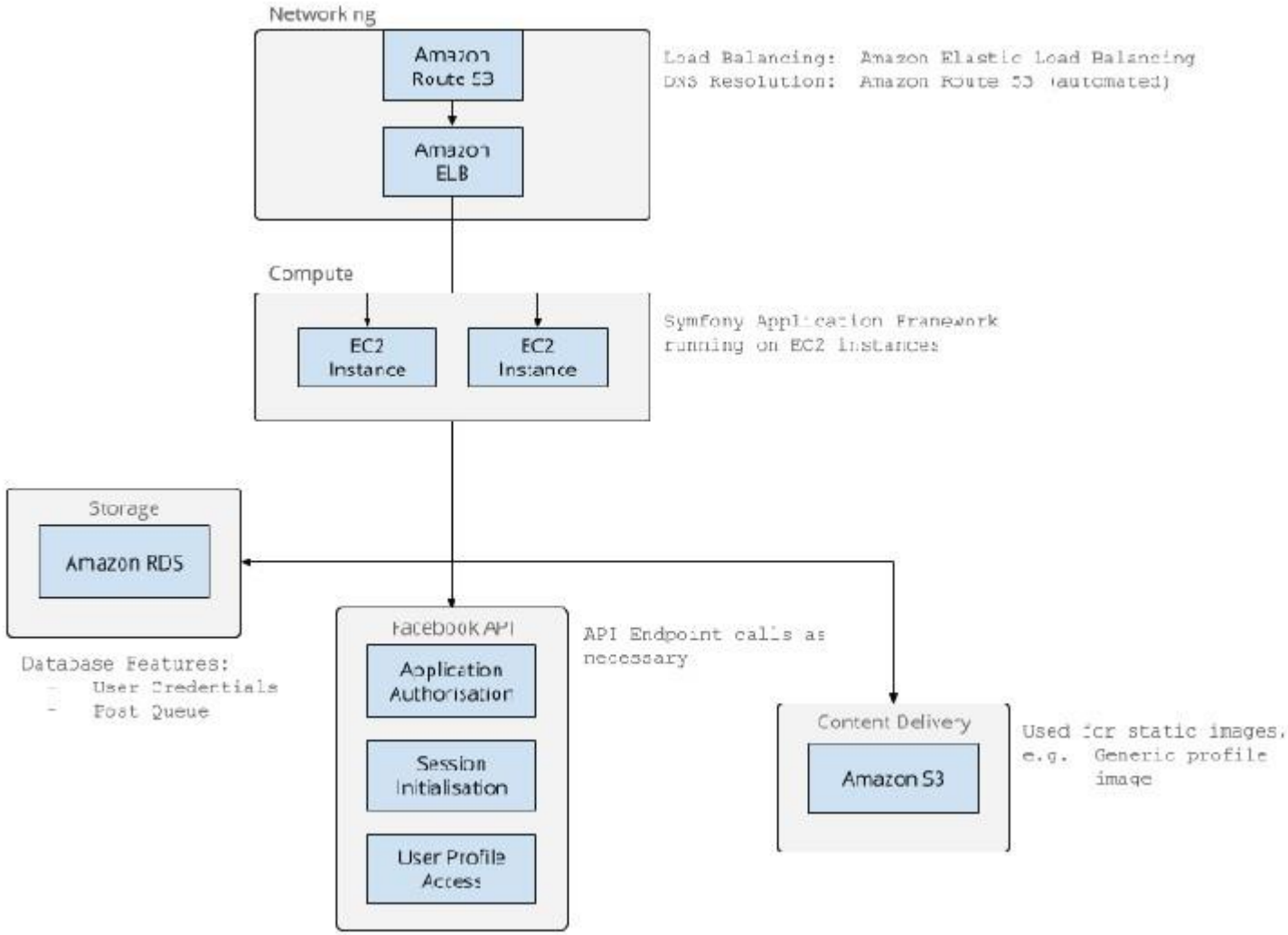
Free Rider

- Share free ride via social app to help people during trip
- Uses facebook API



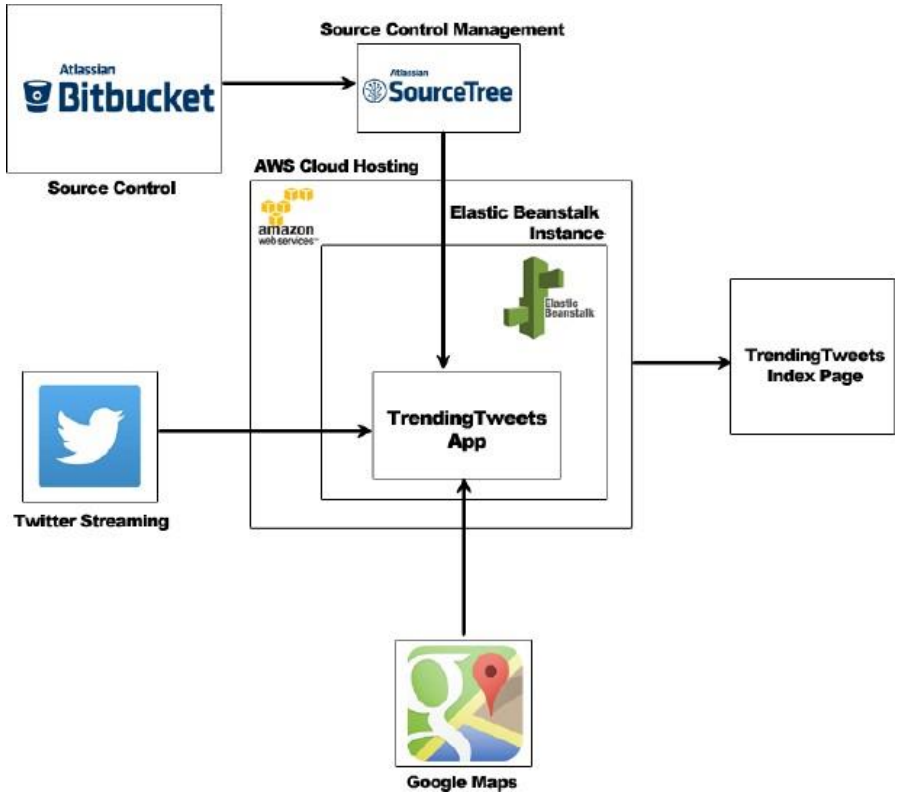
Schedule social app posting

- Provide facilities to user to schedule their post on social app
- Schedule personal post so it will appear your/your friends timeline at the time you want.
- Use of facebook API



Trending Tweets

- Which geographical locations are tweeting the most popular hashtags and words.



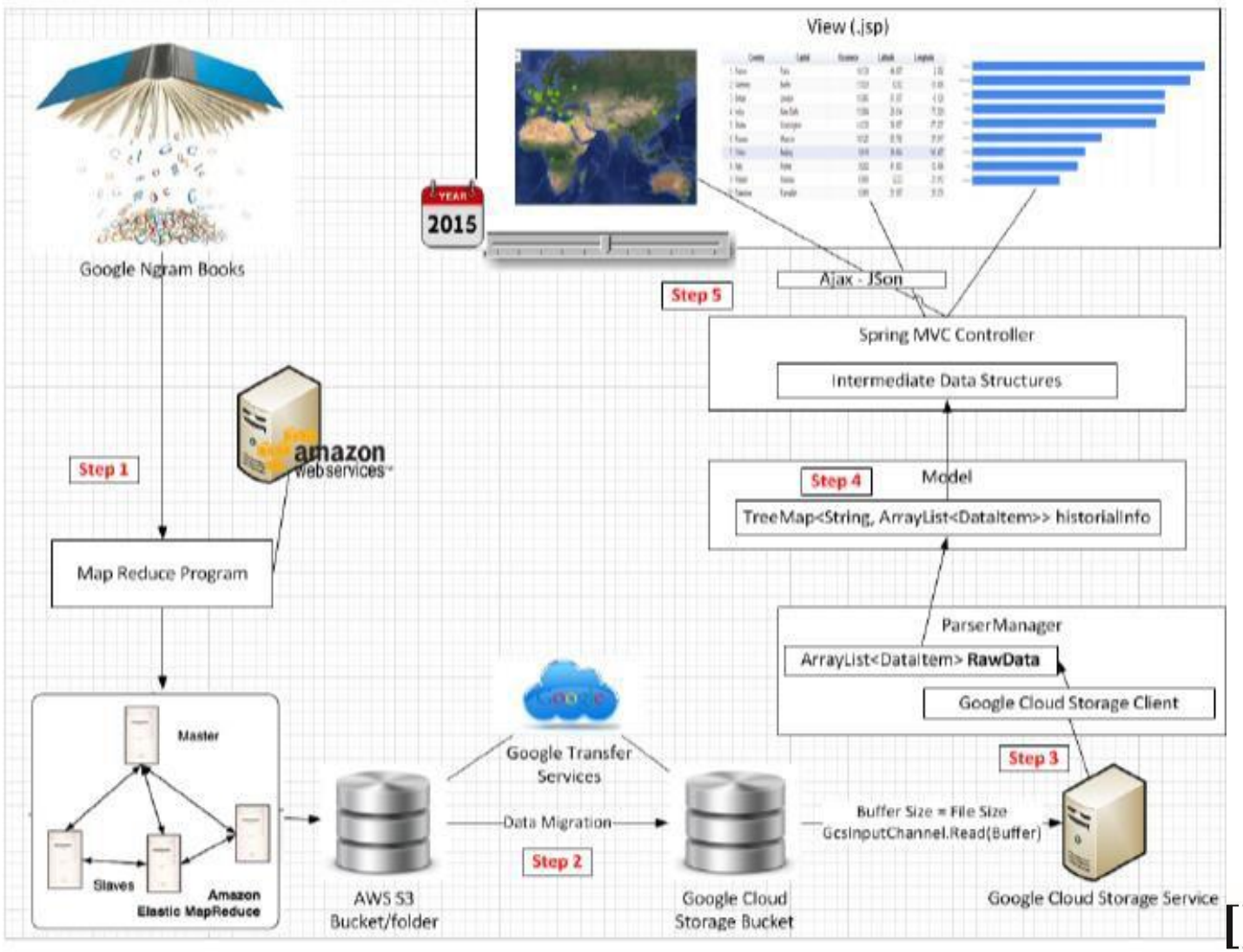
- Use of twitter streaming API and Google Map API
- Beanstalk for hosting

Restaurant finder

- Find nearby popular restaurants from instagram posts
- Uses Alchamy API and Instagram APi

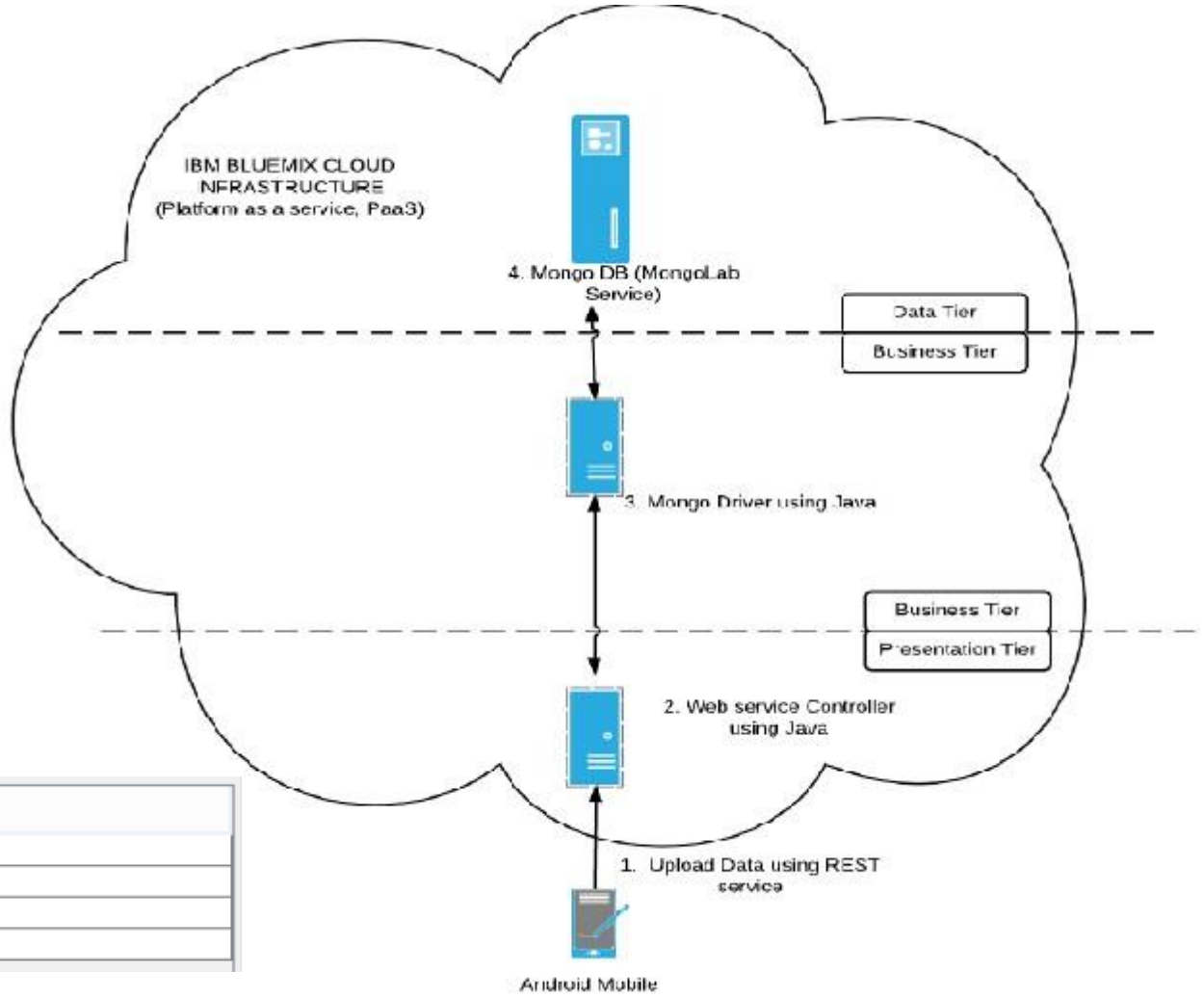
Google books n-gram data analyser

- Retrieve most popular 30 countries from Big data using MapReduce
- Show summarization using Google visualization APIs (i.e. Google Heat Map, Google Table, Google BarChart, PieChart)



Mobile Application usage tracker System

- Track usage of app of an android mobile user
- Predict: What type of person he/she is (e.g. if use of sports app is high then he is a sports lover)



No.	Label	Count
1	Entertainment	23
2	Travel, Transport and Local	12
3	News and Magazines	19
4	Sports	20

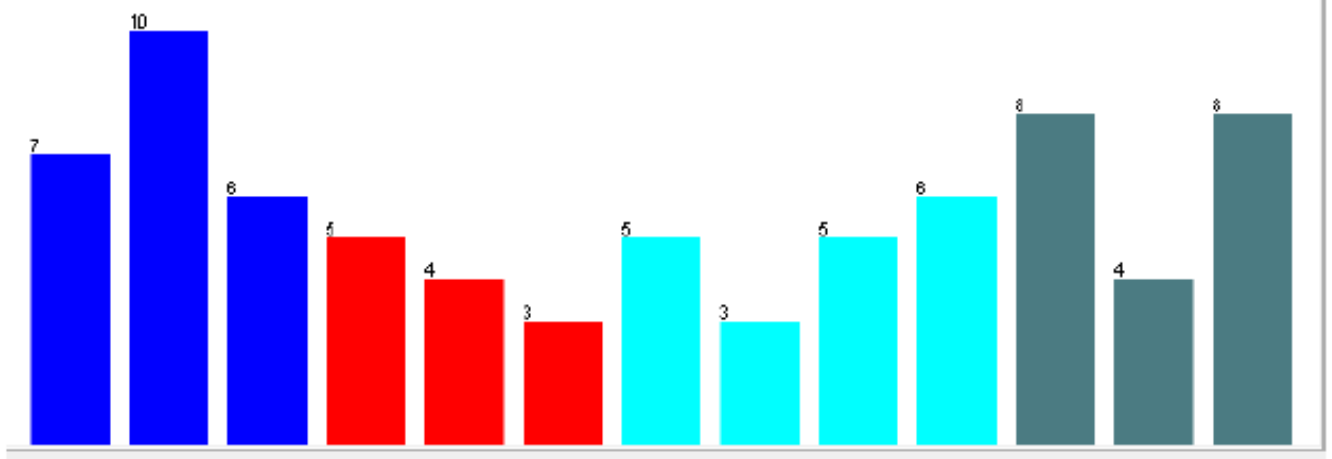
Mobile Application usage tracker System

Selected attribute

Name: app_name Type: Nominal
Missing: 0 (0%) Distinct: 13 Unique: 0 (0%)

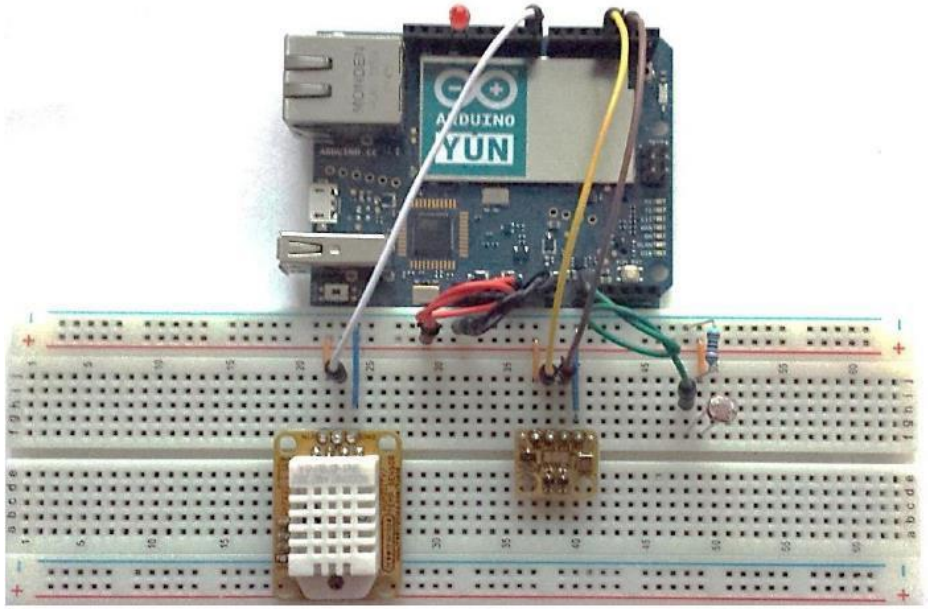
No.	Label	Count
1	com.saavn.music	7
2	com.android.youtube	10
3	com.android.music	6
4	com.gov.ptv	5
5	com.google.googlemaps	4
6	com.skedgo.tripgo	3
7	com.flipboard.magazine	5
8	com.htc.blinkfeed	3
9	com.yahoo.news	5
10	com.google.newsstand	6
11	com.espn.cricinfo	8
12	com.performgroup.goal	4

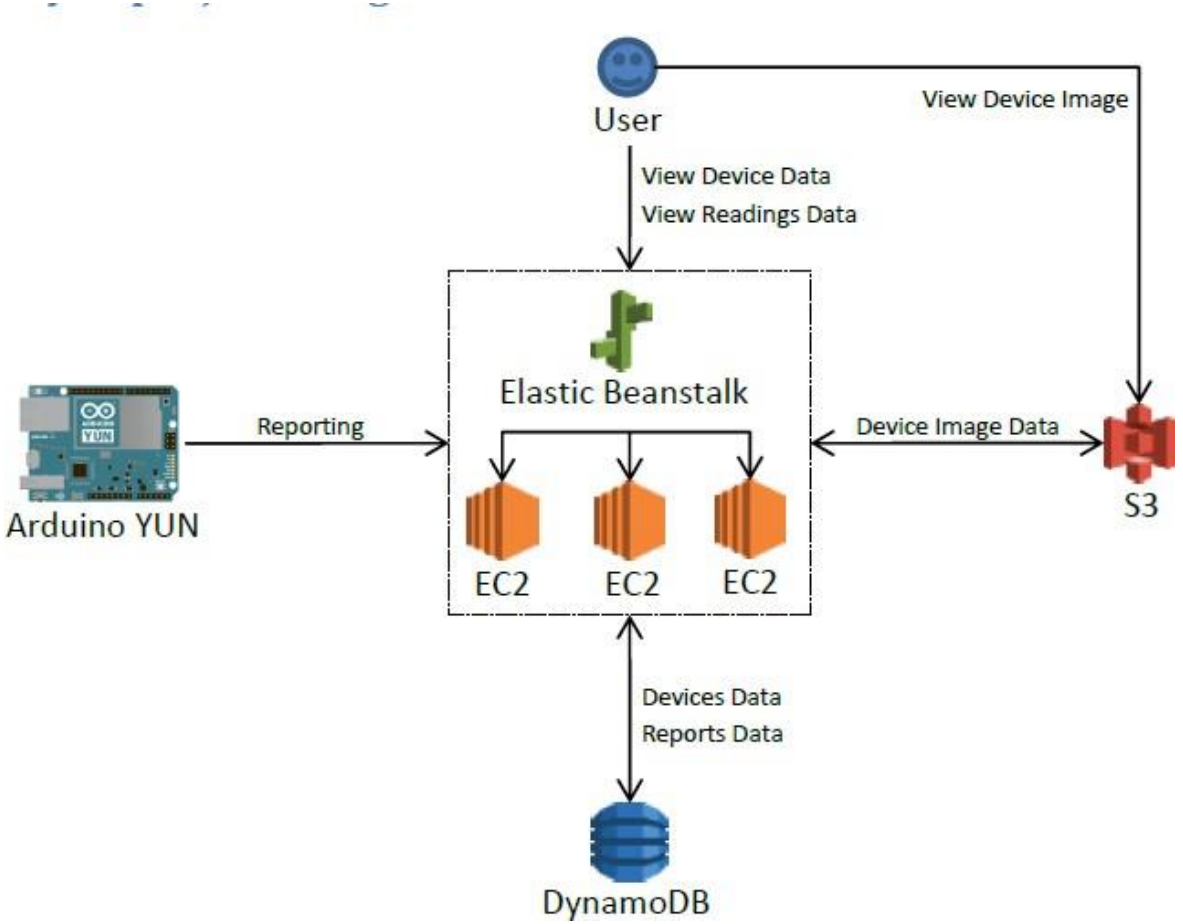
Class: Category (Nom) Visualize All



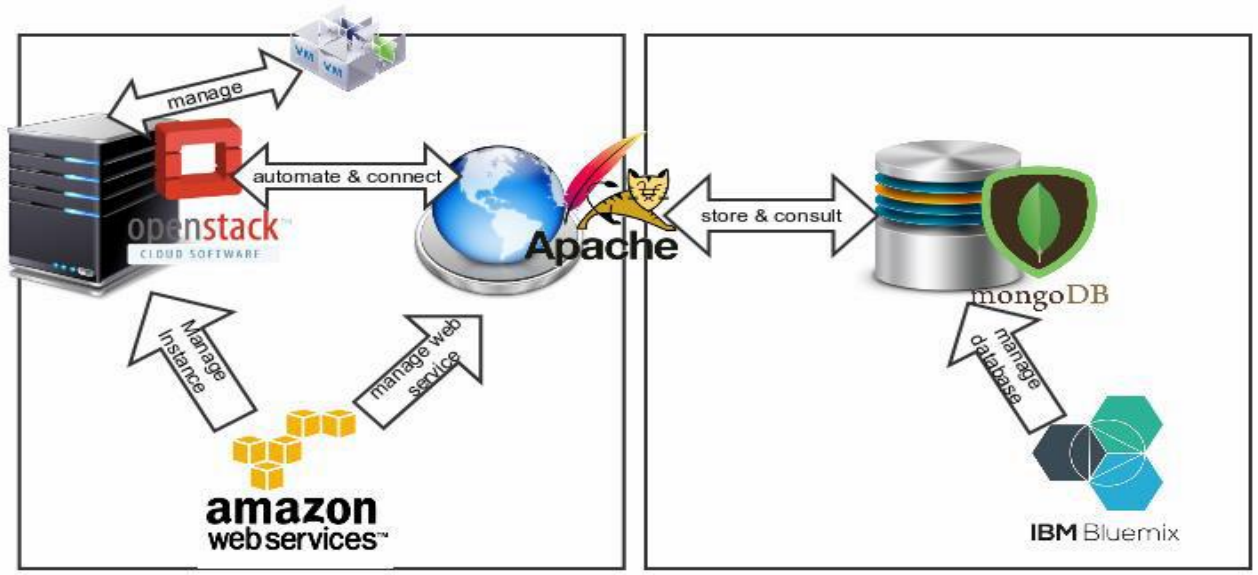
IoT: Processing sensor data in real-time

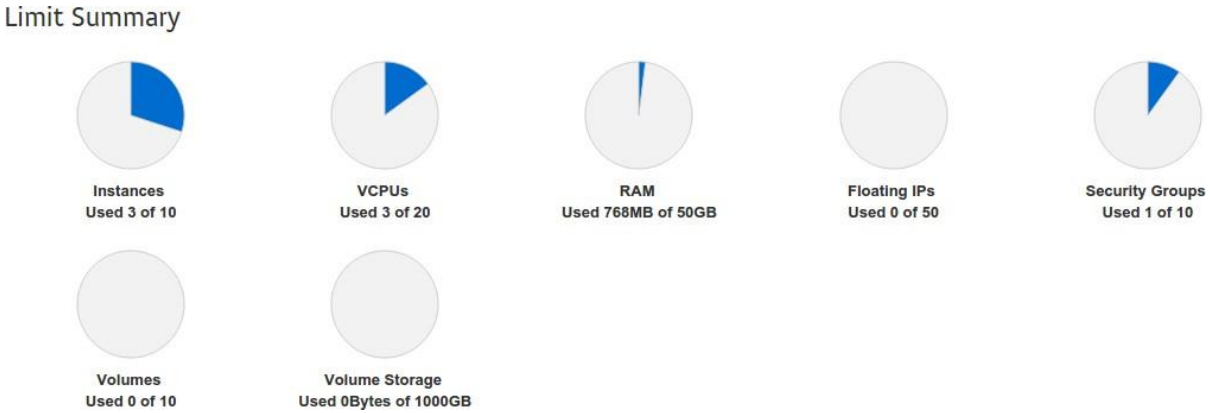
- Real-time data processing of distributed sensor network





Data centre provisioning

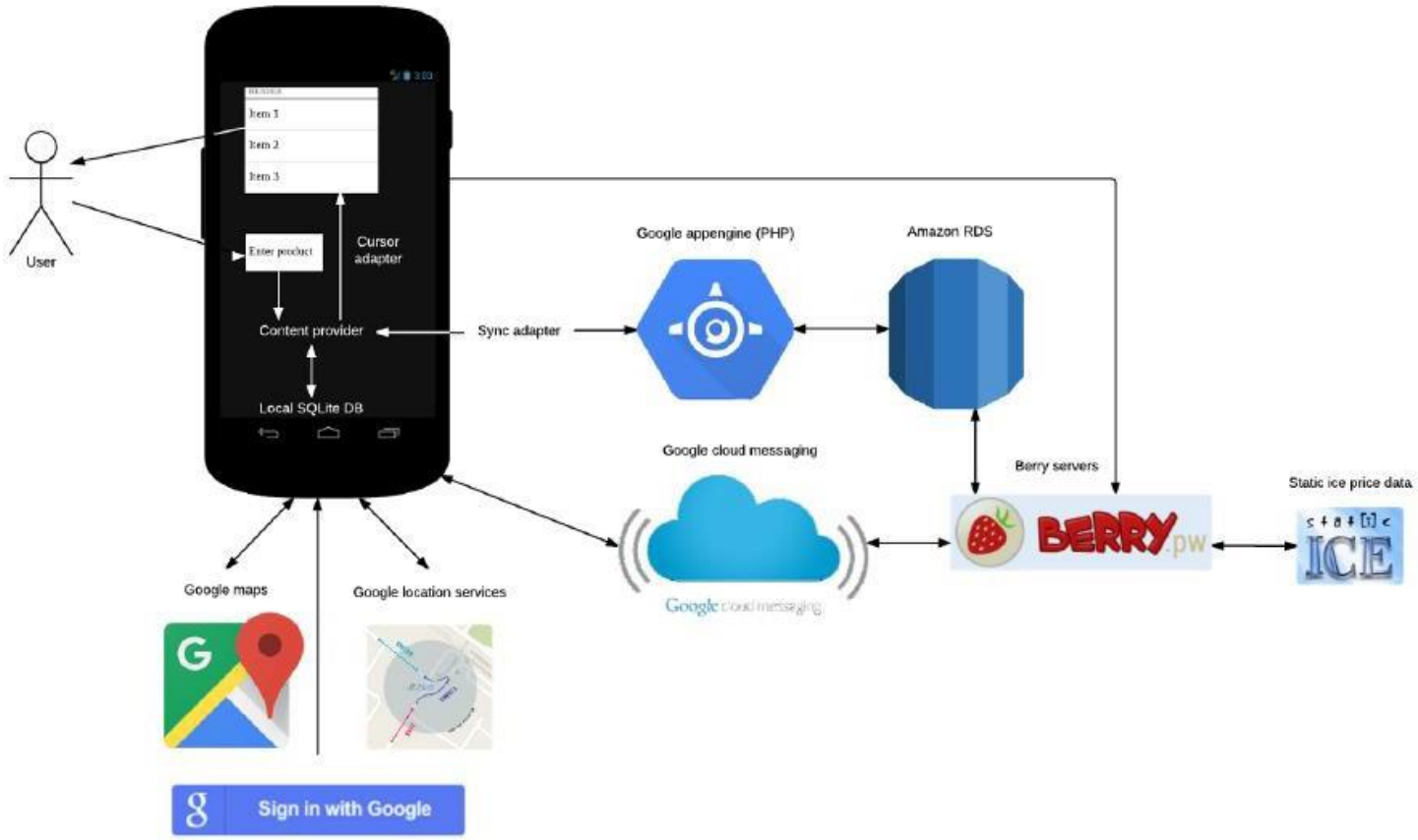




- Allows users to register and provide virtual machines to new users so that they can access from a graphical interface via an web application

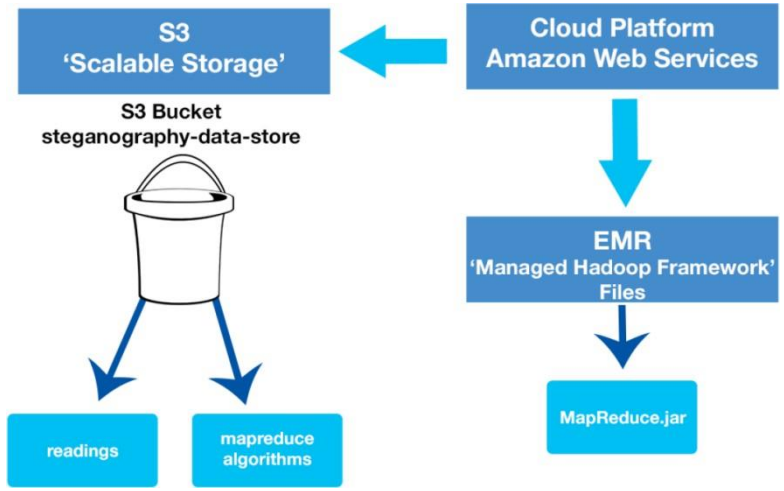
Shop Alert

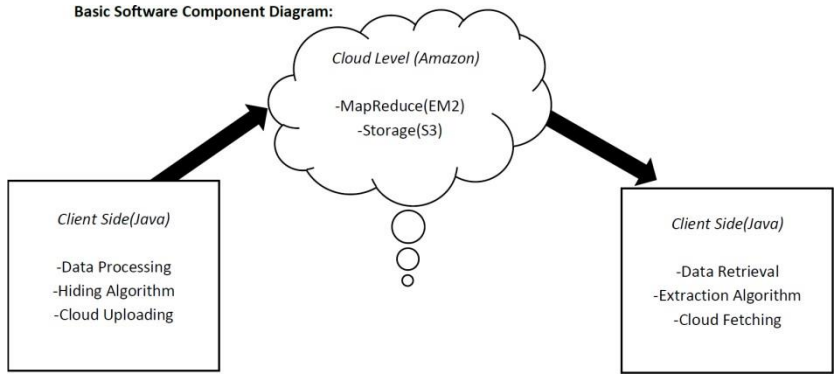
- User makes a list of their desired product list
- Alert users when nearby products in their whish-list are available in nearby shops

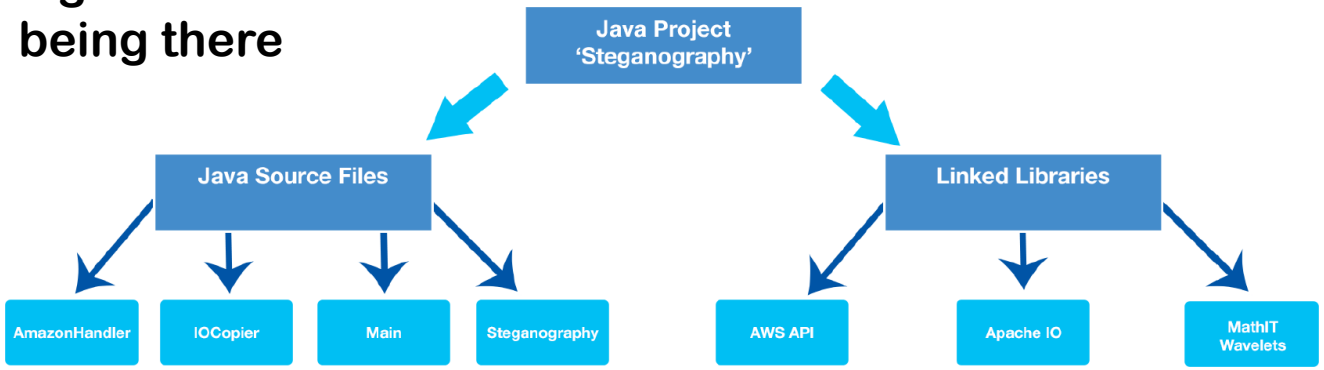


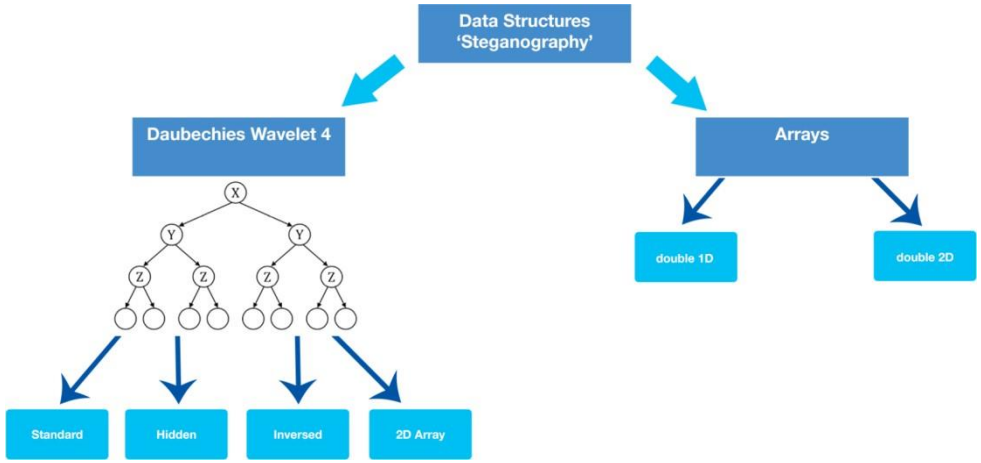
Steganography

- hiding of secret data within exposable data
- Example: we can take the readings of a house meter from a particular individual and conceal secretive details such as their date of birth, name, address and so forth, without ever showing signs of this data being there

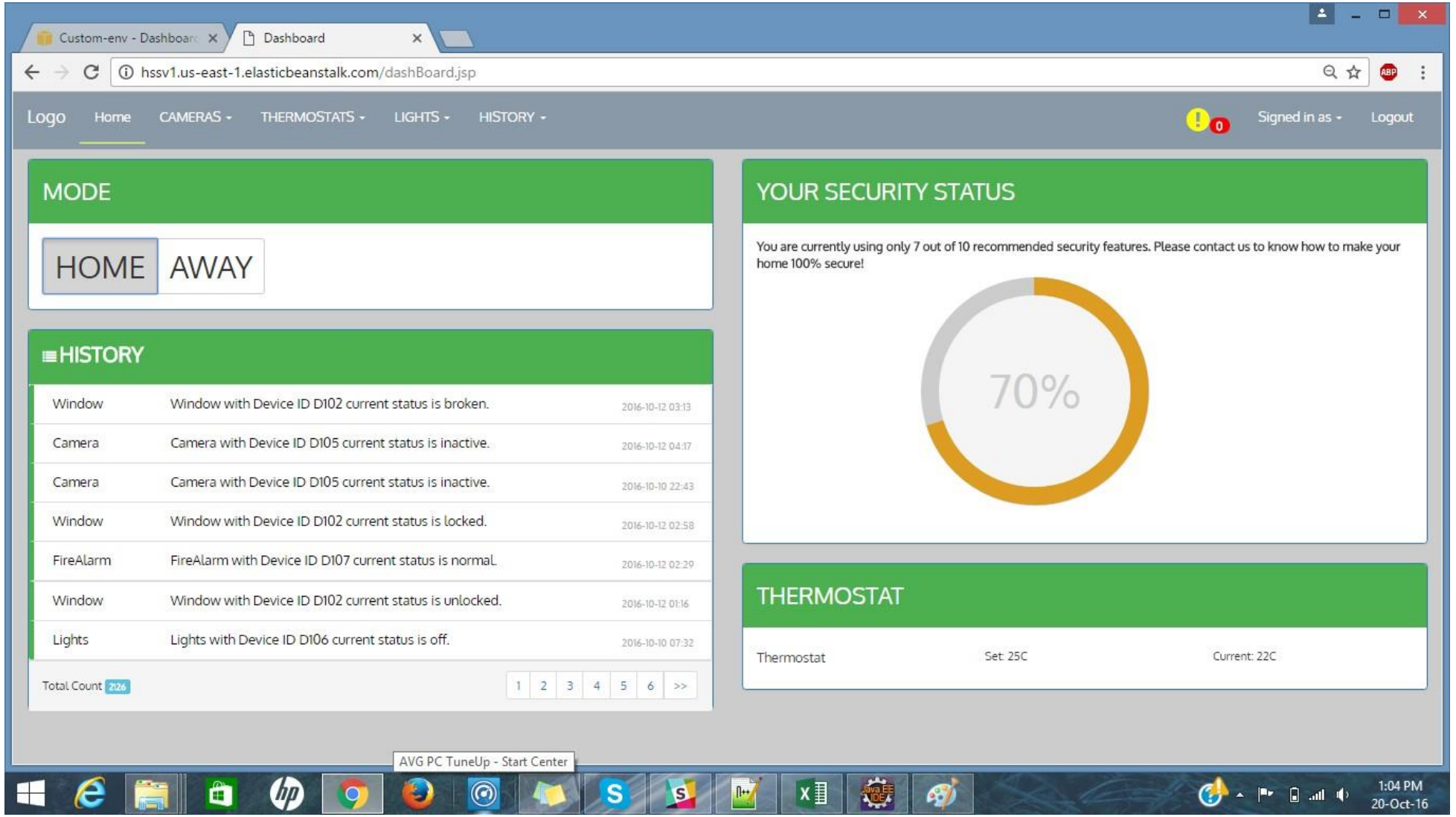




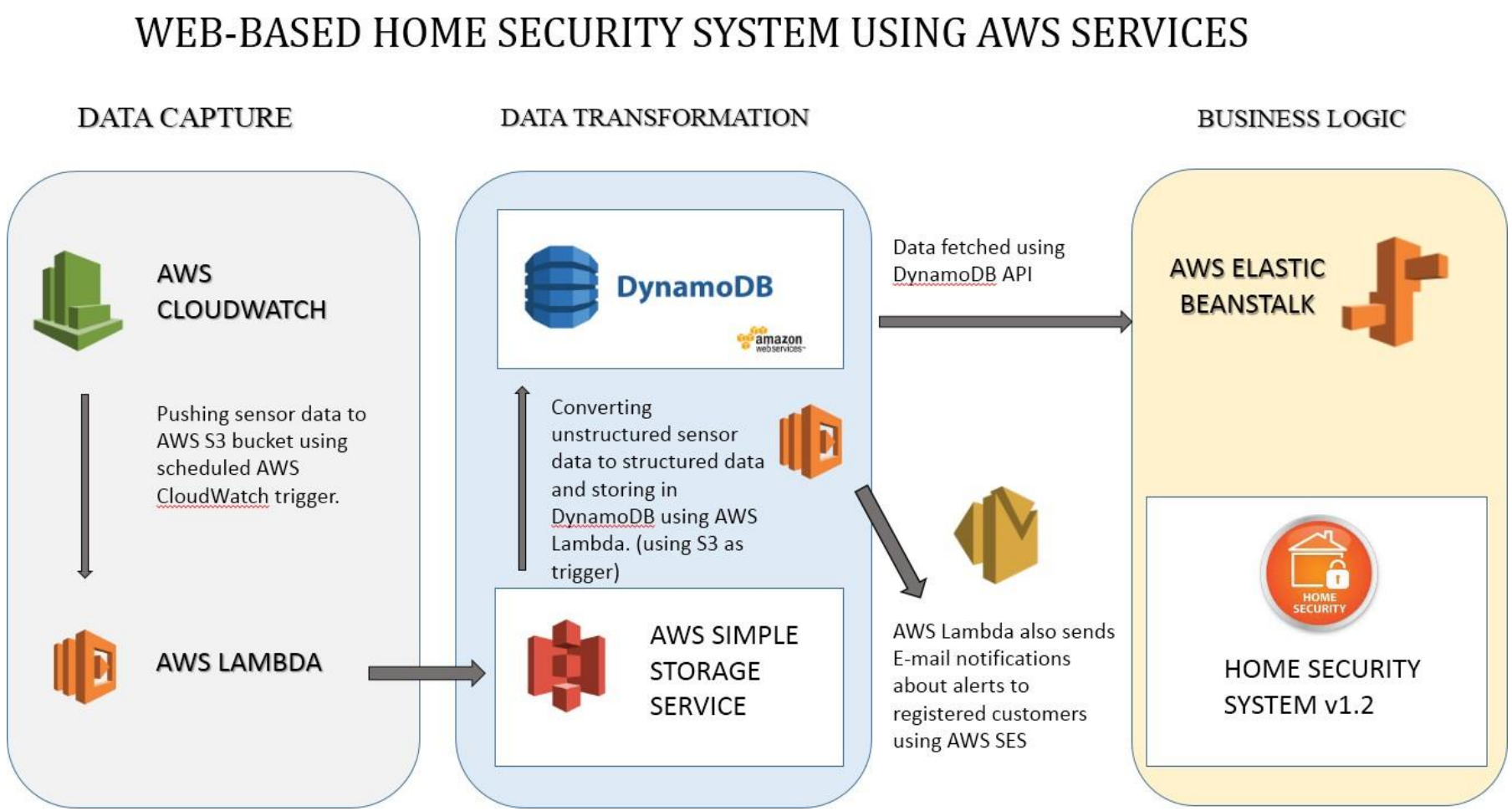




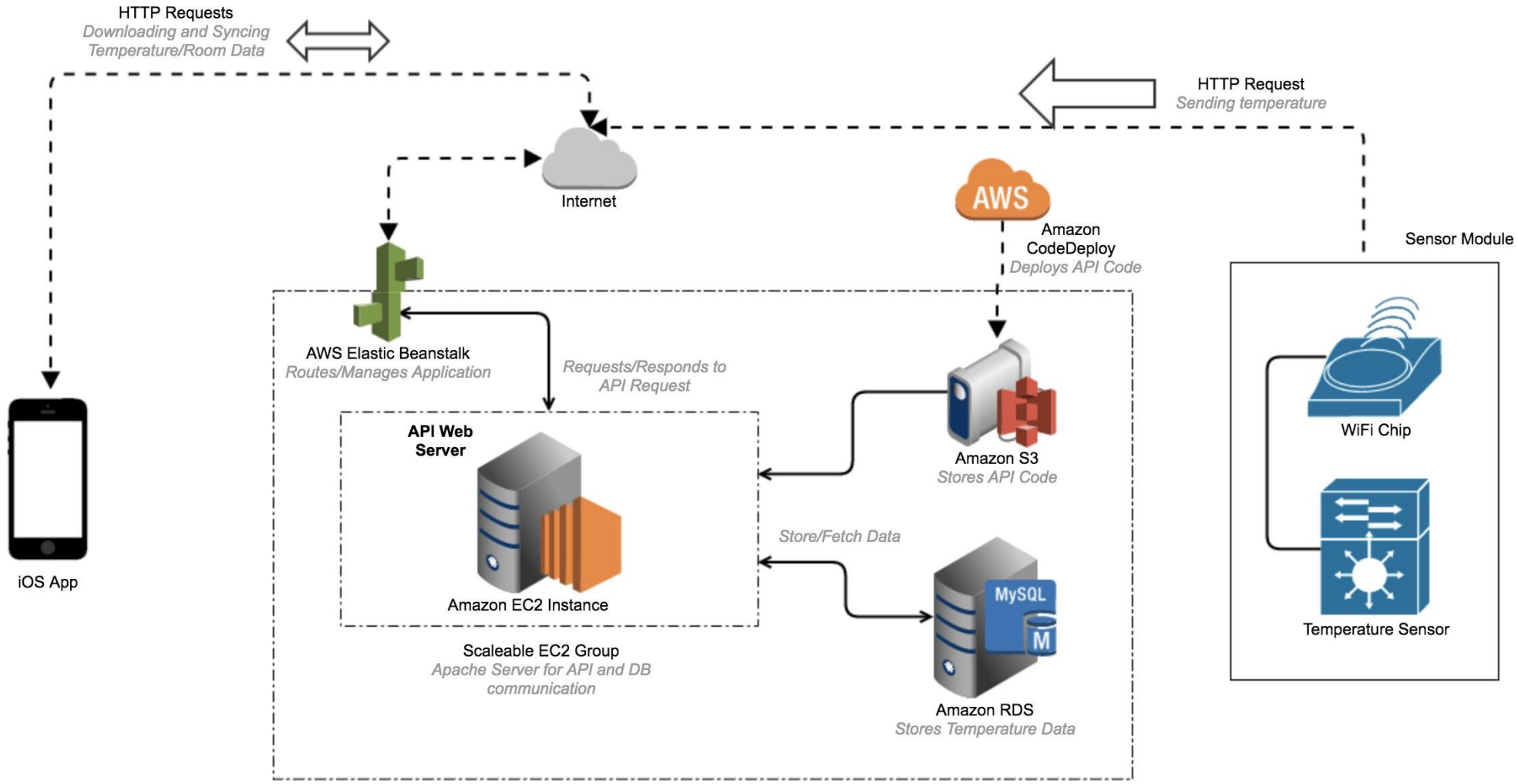
Home automation



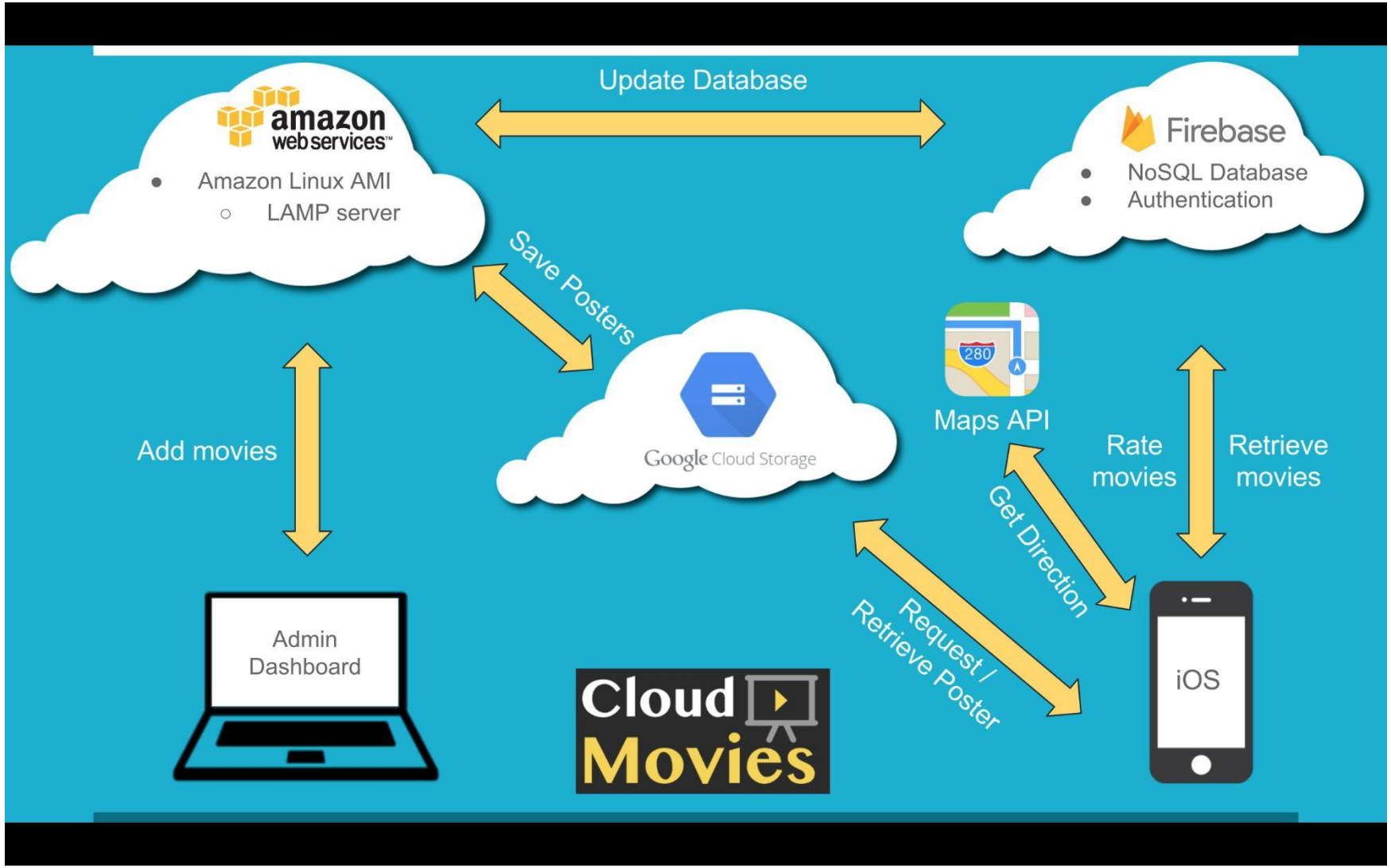
Home automation



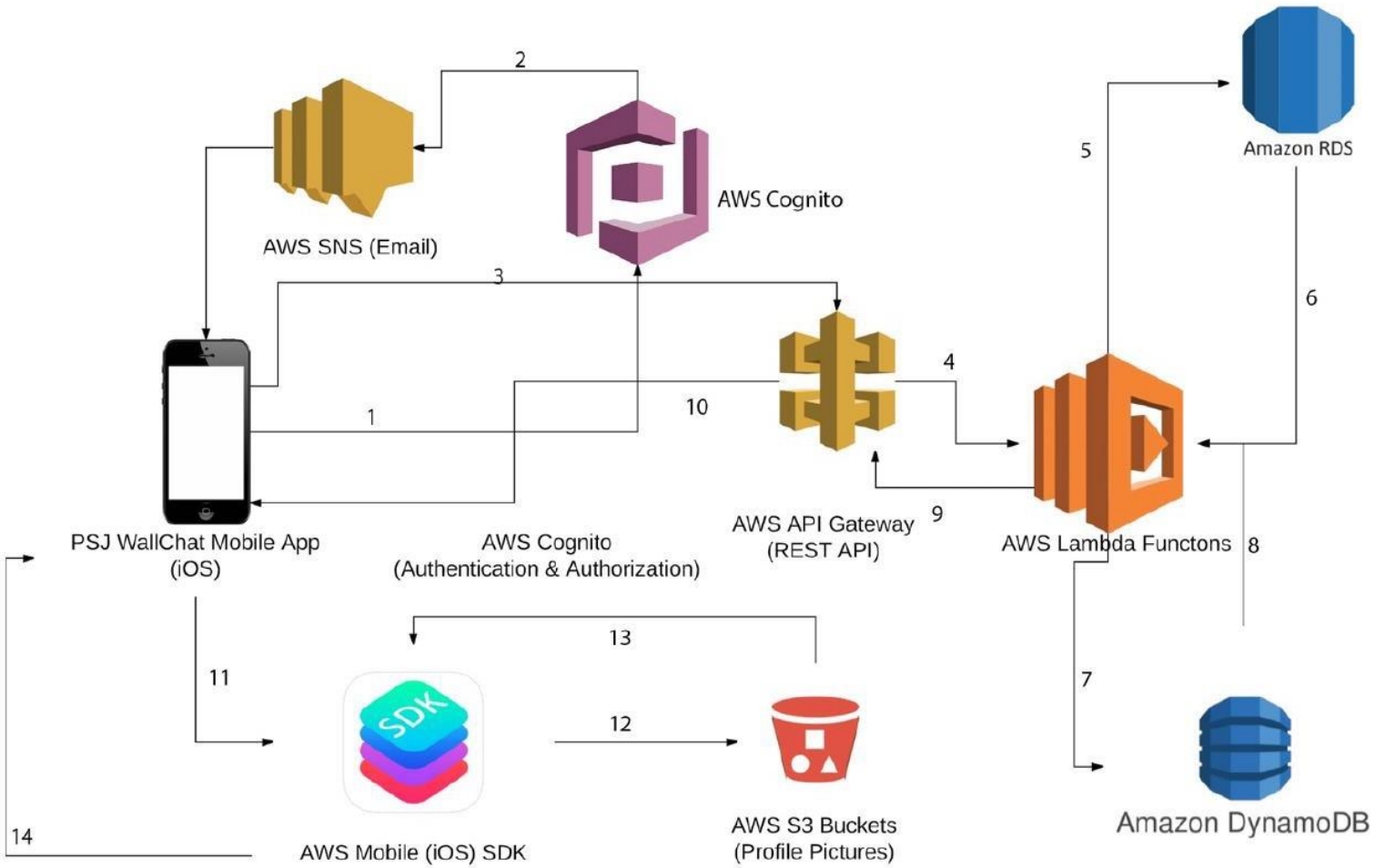
Temperature sensor logger



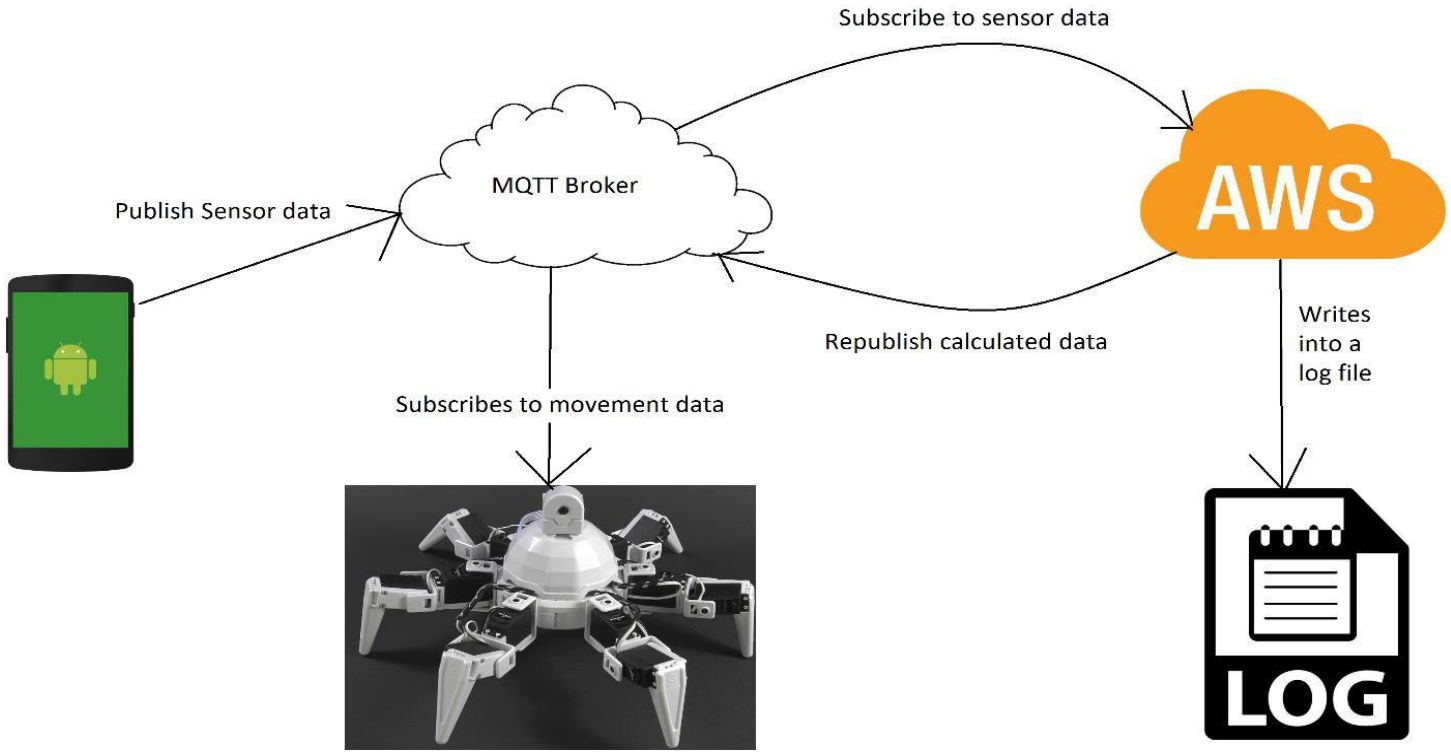
Finding nearby movies



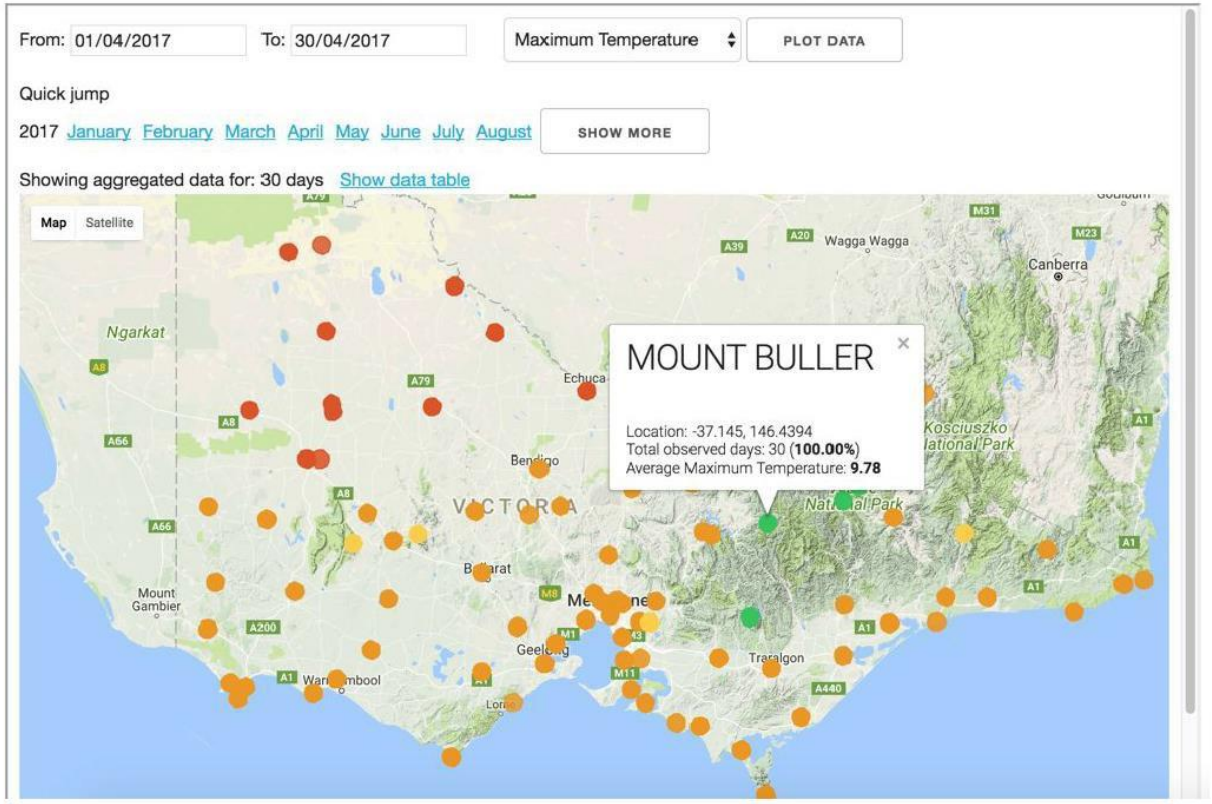
Location based public wall chat application

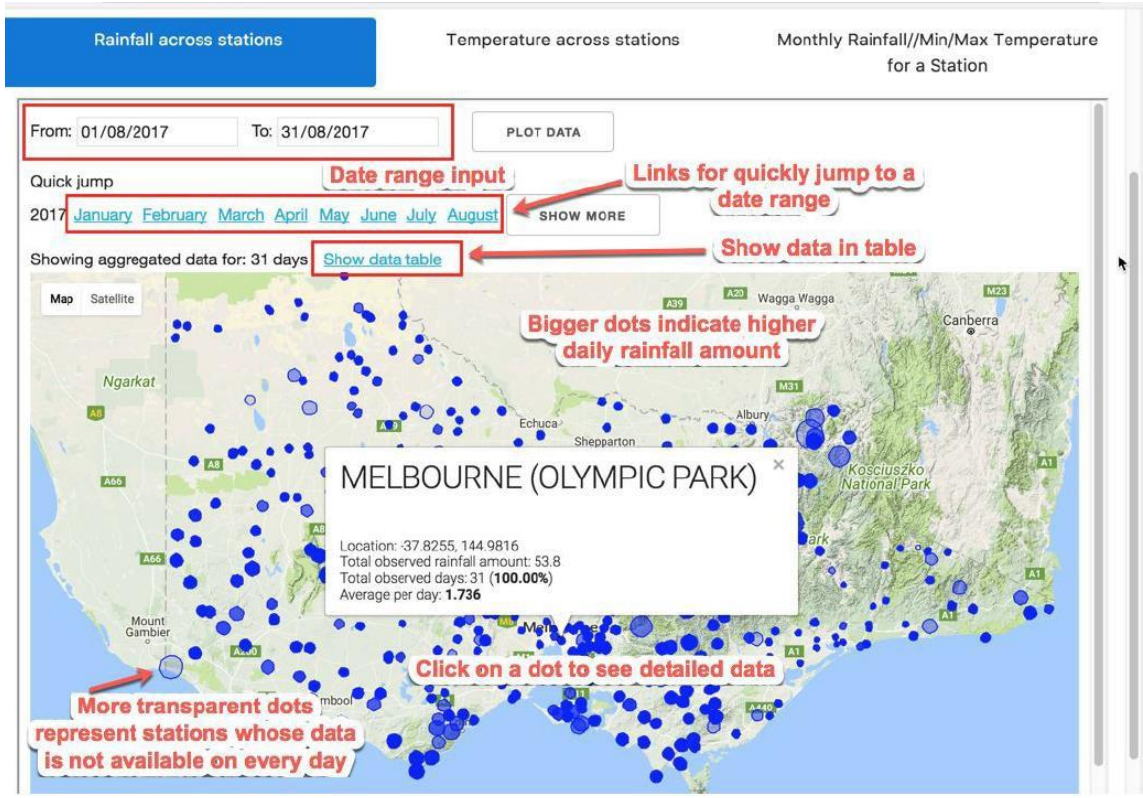


Android Remote Controller App for Robot



Weather data analytics





Video encoding

- Encode a video file into another format using ffmpeg.
- Normally takes long time if encoding is done in one machine
- Different chunks of the video file will be processed on several VM instances/nodes in a cluster simultaneously and then reassembled.
- Saved the generated file in cloud storage.
- Makes the process faster

Event scheduler

- Schedule information from different apps
- The events only you are interested
- Birthday reminder
- Send you reminder

More ideas about application

- Multi-Server online Game / Multiplayer game
- Play the most popular music of a city using GPS tracking
- Menu Planner: Organise cooking menu and plan meals based on ingredients and diets for the upcoming days.
- Game matchmaking
- Many more……

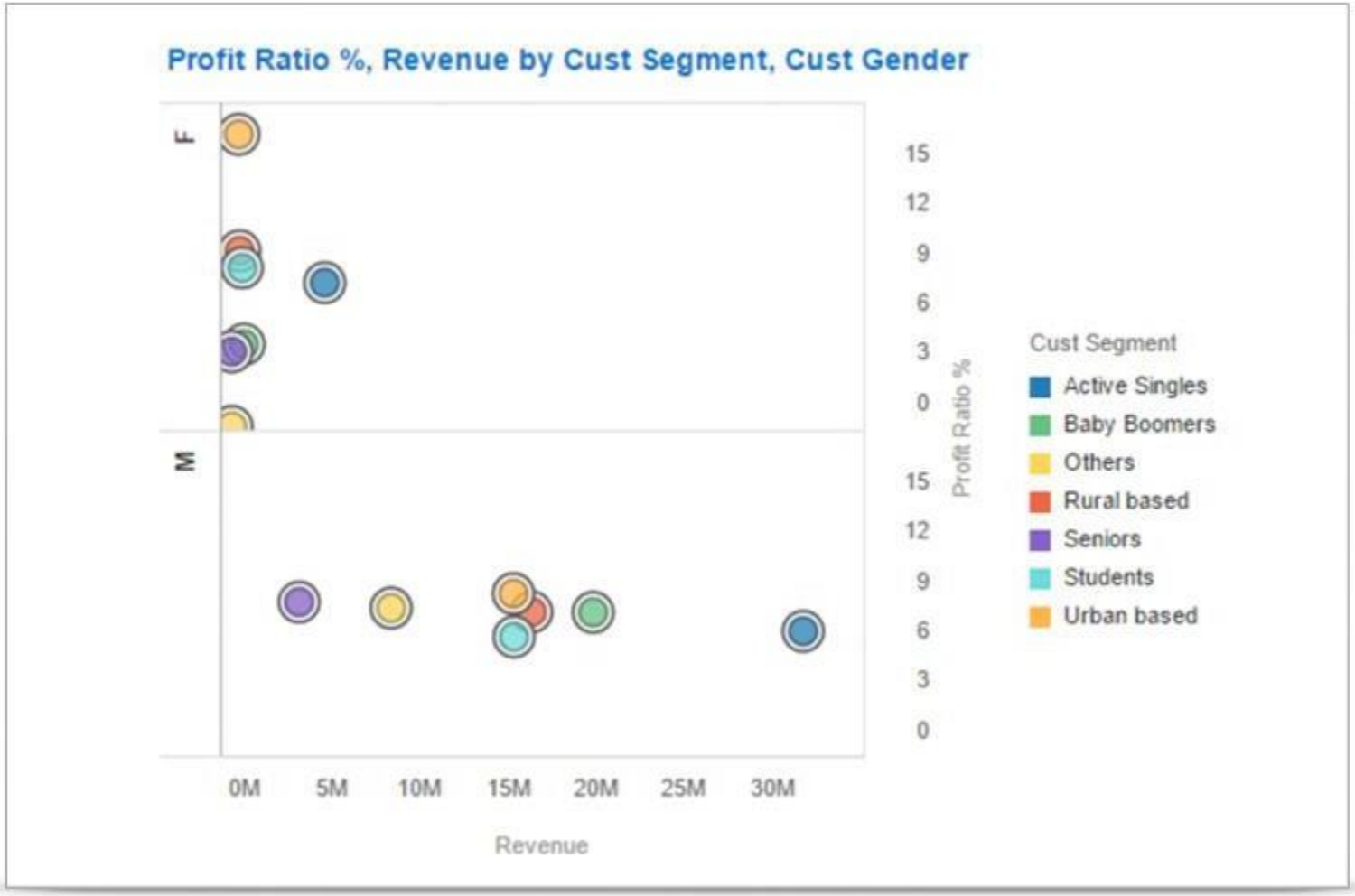
About data visualization

- Making data visual is a big part of making it understandable and useful.
- For all the excitement about novel data sources like social computing or the Internet of Things (IoT), data analysis will eventually flow into a report or dashboard where someone must make sense of it.
- For better judgement you need tools for building clearer and sharper visualizations.
- Spend more time working on visualizations because someone else is taking care of the infrastructure

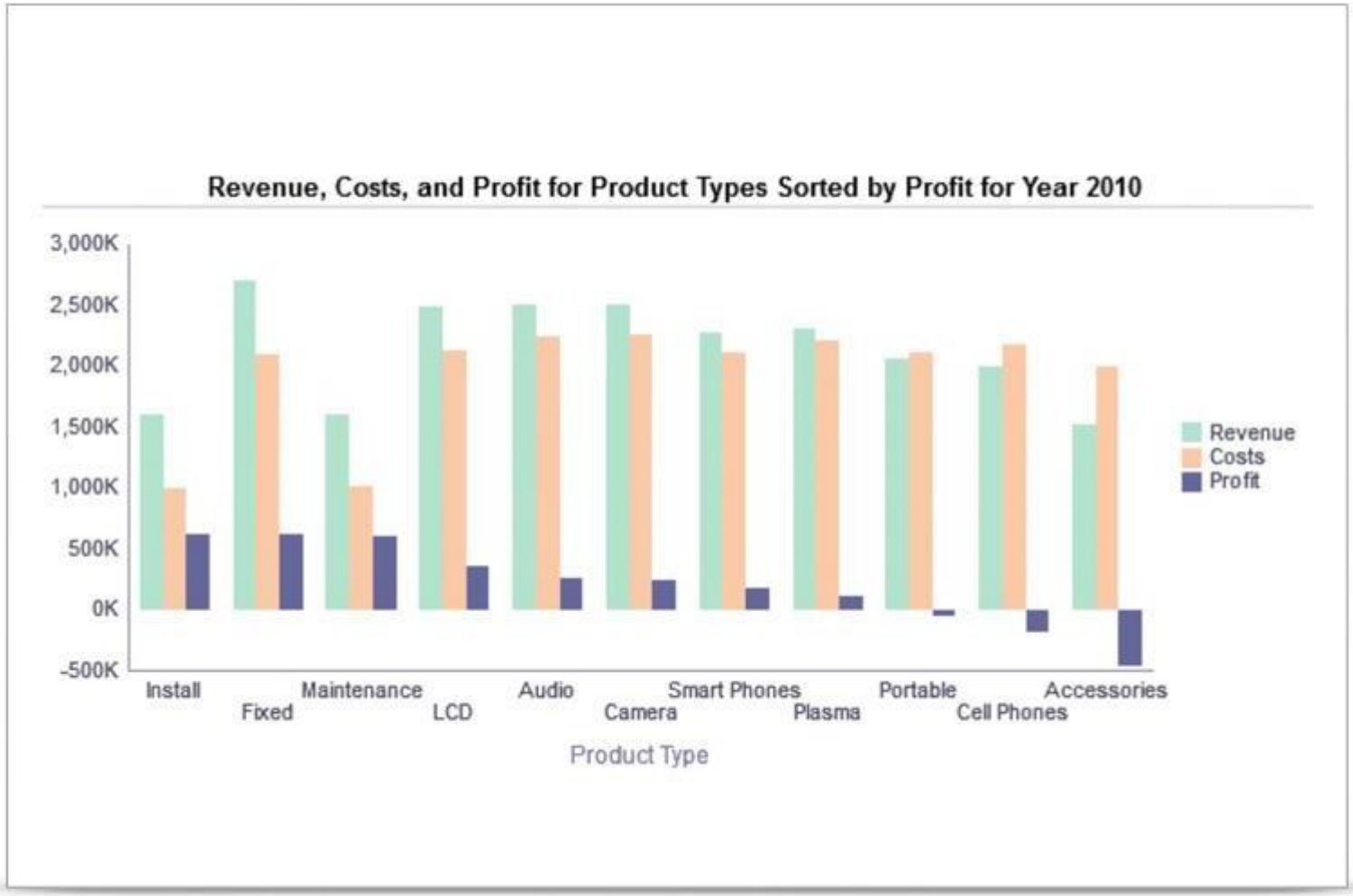
About data visualization

- Instead of spending their time optimizing SQL queries or data warehouse configuration you can consider whether a bar, line, or pie graph is the best way to convey information.
- when it makes sense to stick with a tabular presentation but use typography and white space to make data easier to scan.
- Hadoop, which make it possible to store very large volumes of information without users knowing in advance how they'll query it. But how you will show the query result to the user?

Sample visualization



Sample visualization



Sample visualization

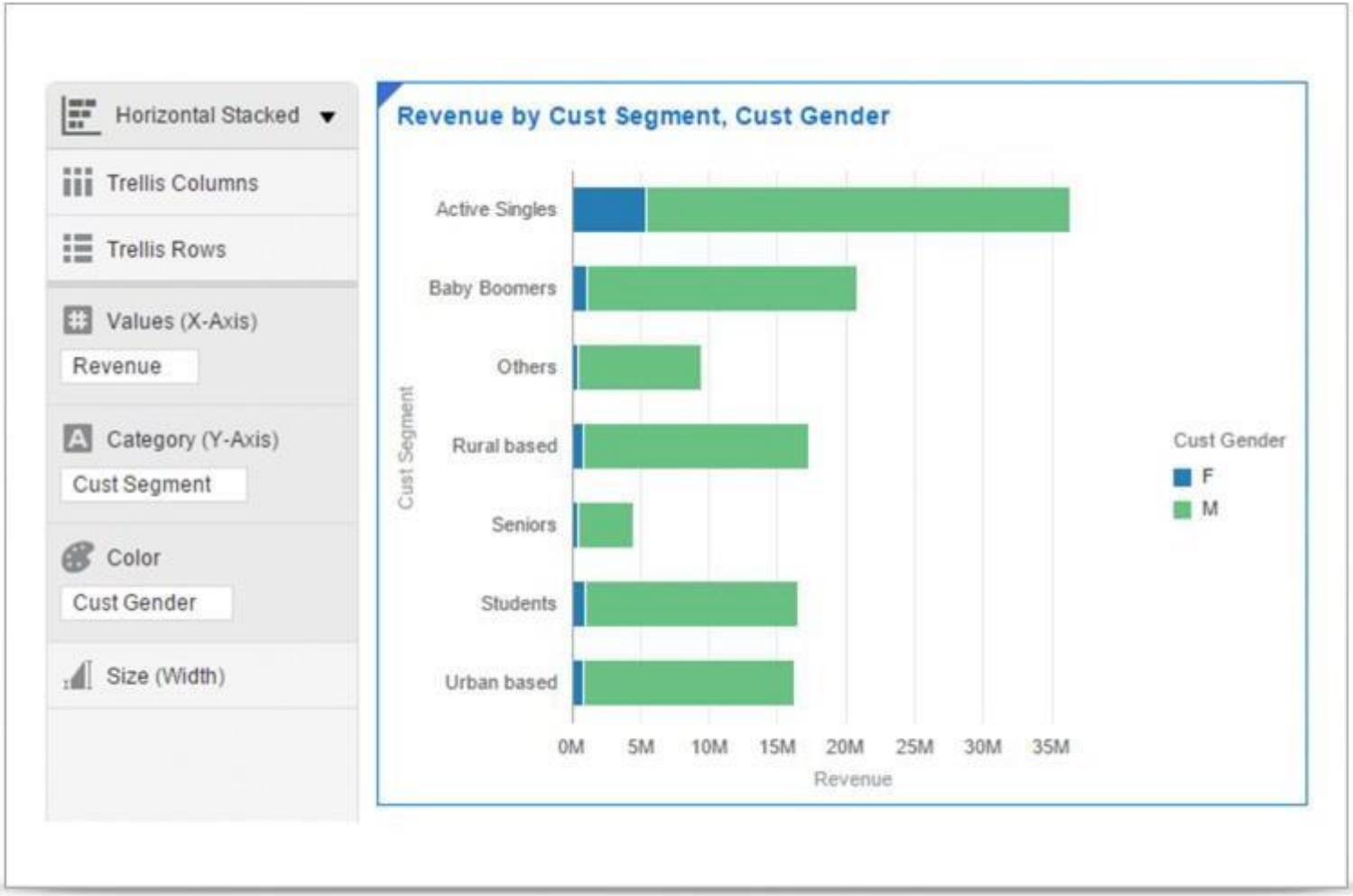
Pivot Table Heat Map Sorted by Totals

Revenue

	Total	Games	TV	Communication	Electronics	Services	Digital
Figueroa Office	**3,842,965**	914,919	729,827	681,779	701,456	407,920	407,063
Guadalupe Office	**3,724,738**	862,509	693,366	664,895	707,271	406,200	390,496
Madison Office	**3,716,987**	825,543	779,601	739,156	611,711	446,598	314,378
Spring Office	**3,709,601**	858,957	717,341	667,680	685,668	422,951	357,004
Eiffel Office	**3,686,867**	823,021	728,796	676,905	682,543	405,856	369,746
Morange Office	**3,641,190**	811,880	721,387	665,290	663,009	418,864	360,760
Perry Office	**3,619,594**	855,657	683,563	644,817	665,727	409,440	360,390
College Office	**3,585,286**	819,320	694,641	651,727	657,580	405,023	356,995
Copper Office	**3,580,742**	839,249	687,280	646,662	635,787	410,720	361,046
River Office	**3,492,153**	818,434	680,537	623,381	619,210	407,934	342,656
Montgomery Office	**3,408,846**	759,058	682,715	645,204	577,288	448,329	296,251
Mills Office	**3,403,256**	781,354	642,268	626,036	605,521	404,171	343,906
Sherman Office	**3,403,022**	755,788	664,182	657,178	600,829	418,831	306,213
Blue Bell Office	**3,380,918**	736,522	663,799	674,691	586,770	417,274	301,861
Casino Office	**3,375,543**	748,233	667,623	650,517	585,016	427,787	296,367
Eden Office	**3,339,510**	736,813	647,644	675,784	559,951	424,380	294,938
Foster Office	**3,314,839**	739,522	658,719	638,517	570,502	416,799	290,780
Tellaro Office	**3,295,579**	739,662	664,369	632,993	558,082	409,520	290,953
Merrimon Office	**3,267,581**	736,803	636,912	623,936	568,729	407,793	293,408
Glenn Office	**3,210,784**	722,649	626,495	613,791	556,409	412,547	278,893
Total	**70,000,000**	**15,885,895**	**13,671,062**	**13,100,940**	**12,399,060**	**8,328,938**	**6,614,105**

Top 10
Top 20
Top 30
Top 40
Top 50

Sample visualization



Sample visualization

	◁ 2010	◁ 2011	◁ 2012 Q1	◁ 2012 Q2	◁ 2012 Q3	◁ 2012 Q4	▽ 2012	▽ Total Time
▷ Communication	4,261,025	4,290,952	692,816	1,239,957	1,741,109	875,081	4,548,963	13,100,940
▷ Accessories	1,520,911	1,757,673	303,959	533,432	645,621	400,102	1,883,113	5,161,698
▷ Audio	2,495,506	2,414,546	349,357	723,386	795,165	459,402	2,327,310	7,237,362
△ Electronics	4,016,417	4,172,220	653,316	1,256,818	1,440,786	859,504	4,210,423	12,399,060
△ BizTech	**8,277,442**	**8,463,172**	**1,346,132**	**2,496,774**	**3,181,895**	**1,734,585**	**8,759,386**	**25,500,000**
▷ Digital	2,491,178	2,385,484	319,214	506,429	533,419	378,381	1,737,442	6,614,105
▷ Fixed	2,695,011	2,812,974	617,151	815,655	1,037,949	829,014	3,299,769	8,807,753
▷ Portable	2,049,810	2,102,436	602,042	704,171	836,930	782,754	2,925,896	7,078,142
△ Games	4,744,821	4,915,410	1,219,192	1,519,826	1,874,878	1,611,769	6,225,665	15,885,895
△ FunPod	**7,235,999**	**7,300,894**	**1,538,407**	**2,026,254**	**2,408,297**	**1,990,149**	**7,963,107**	**22,500,000**
▷ Services	3,207,163	2,840,560	308,138	616,070	954,317	402,689	2,281,214	8,328,938
▷ TV	4,779,396	4,395,374	595,737	1,121,429	1,972,781	806,346	4,496,292	13,671,062
△ HomeView	**7,986,559**	**7,235,934**	**903,875**	**1,737,498**	**2,927,098**	**1,209,035**	**6,777,507**	**22,000,000**
△ **Total Value**	**23,500,000**	**23,000,000**	**3,788,413**	**6,260,527**	**8,517,290**	**4,933,770**	**23,500,000**	**70,000,000**

RMIT UNIVERSITY

Google cloud DataLab

- A powerful interactive tool created to explore, analyze and visualize data with a single click on Google Cloud Platform.
- It runs on Google App Engine and orchestrates multiple services automatically so you can focus on exploring your data.
- Cloud Datalab **enables analysis of your data on Google BigQuery, Google Compute Engine, and Google Cloud Storage** using Python, SQL, and JavaScript.
- Once you are satisfied with your transformation and analysis models, deploy them to BigQuery with the click of a button.
- Use Cloud Datalab to **gain insight from your data**. Interactively explore, transform, analyze, and visualize your data
- https://cloud.google.com/datalab/

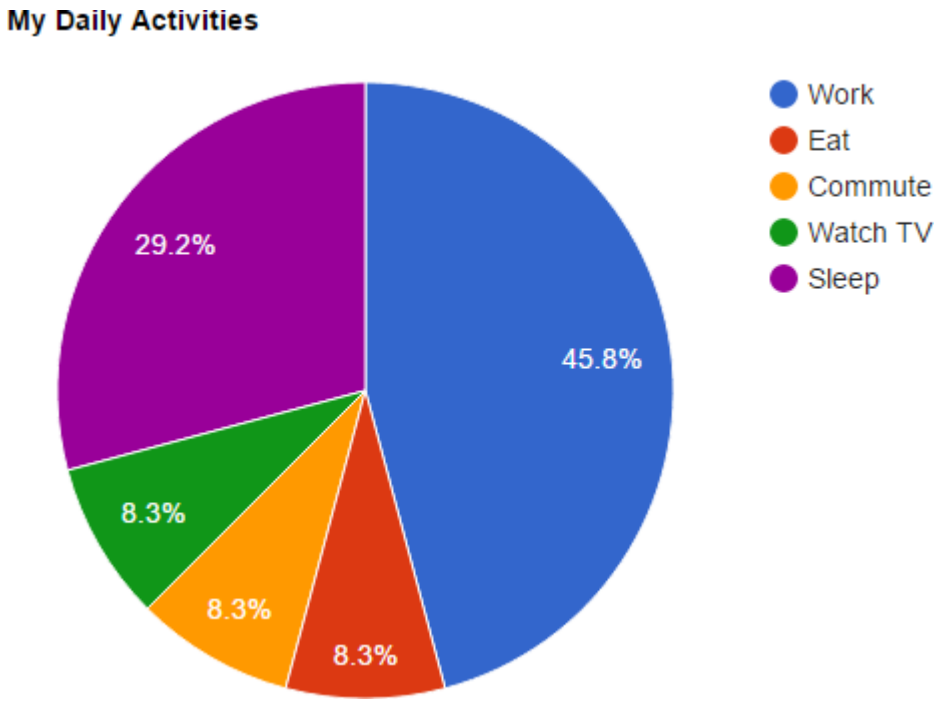
Amazon Quicksight

- https://aws.amazon.com/quicksight/
- You get very fast, easy to use business intelligence for your big data at low cost

Tools for Data visualization

- Google chart API: https://developers.google.com/chart/
- Jgraph: http://jpgraph.net/
- Chart JS: http://www.chartjs.org/
- Angular Chart JS: http://jtblin.github.io/angular-chart.js/
- Kibana: https://www.elastic.co/products/kibana

Google chart API




```
<html>
 <head>
  <script type="text/javascript" src="https://www.gstatic.com/charts/loader.js"></script>
  <script type="text/javascript">
    google.charts.load('current', {'packages':['corechart']});
    google.charts.setOnLoadCallback(drawChart);
    function drawChart() {

      var data = google.visualization.arrayToDataTable([
        ['Task', 'Hours per Day'],
        ['Work',     11],
        ['Eat',      2],
        ['Commute',  2],
        ['Watch TV', 2],
        ['Sleep',    7]
      ]);

      var options = {
        title: 'My Daily Activities'
      };

      var chart = new google.visualization.PieChart(document.getElementById('piechart'));

      chart.draw(data, options);
    }
  </script>
 </head>
 <body>
  <div id="piechart" style="width: 900px; height: 500px;"></div>
 </body>
</html>
```

Google Map

- Geocoding http://www.findlatitudeandlongitude.com/batchgeocode
- Google Fusion Table: https://www.google.com/fusiontables
- Google MAP API: https://developers.google.com/maps/documentation/javascript/examples/

Google MAP API