

COMP5216 Assignment Project Exam Help

Week 04

Semester 2, 2020

<https://eduassistpro.github.io/>

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Announcements

- It's great that you are talking...!
- What should be in the proposal?
 - App: background, related work, significance, requirements, and etc;
 - Solution: explaining how you are going to implement your solution describing the proposed workflow of the app and technical approaches that are required;
 - Plan: the implementation plan, distribution among the group, how to develop collaboratively;
 - Potential setbacks: identified risks, oposed solutions;
 - References

E.g. Workflow of the app

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E.g. Technical approach

- How you going to technically realize your app?
 - Do you need server support?
 - Are you going to rely on external libraries?

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e API that you going to
<https://eduassistpro.github.io/>

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Outline

- User Quality of Experience
 - What to avoid ?
- Challenges in Mobile computing
 - Structure of the course
- E.g. Challenges in
 - Option 1 <https://eduassistpro.github.io/>
 - Option 2
- Google Play Services
- Internet Protocol Basics

User Quality of Experience (QoE)

- The main challenge
- Extremely difficult to measure – why ?
 - It is highly personal

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- Perception
- Culture
- Age
- Mood
- Gender
- Profession

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User Quality of Experience (QoE)

- How users react to apps also depends on...
 - Time of the day
 - Check weather in the morning vs checking whether at night
 - Season **Assignment Project Exam Help**
 - Rainy vs Summer
 - Current activity **https://eduassistpro.github.io/**
 - Sitting in a **ded train**

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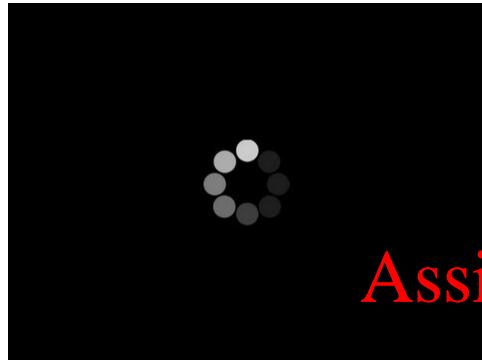
Understand your customer

- Target a specific customer segment at the beginning
 - Snapchat → Teenagers
- What are the common things that annoy us?
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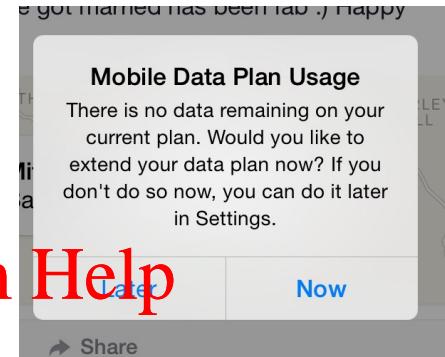
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What to avoid ?



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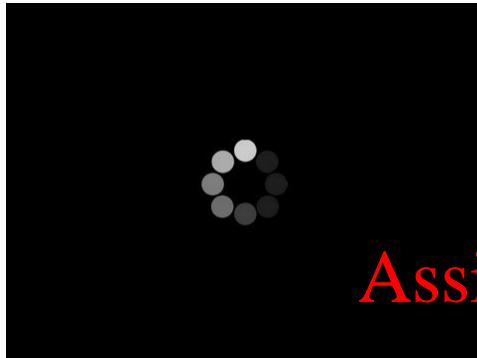
User perception t

Trewin, S., Swart, C., Koved, L., Martino, J., Singh, K. & Ben-David, S. (2015). User perception of biometric authentication on a mobile device: a study of user effort, error and task disruption. In Proceedings of the 10th International Conference on Pervasive Computing and Communications (pp. 159-168). ACM.

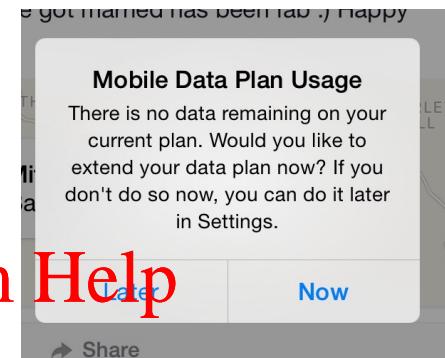
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etric authentication on a mobile
mputer Security Applications

What to avoid ?



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- Potential causes
 - Faulty battery or device
 - Network issues
 - High speed mobility
 - Trying to download too much data
 - Not the right data flow
 - Too complex data processing
 - Not the right network for communication
 - Too frequent communication
- Add WeChat edu_assist_pro**
- 
 - **Network**
 - **Computing**
 - **Energy**

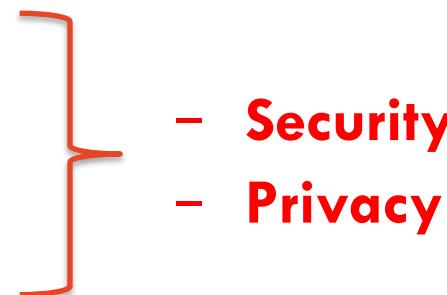
What to avoid ?



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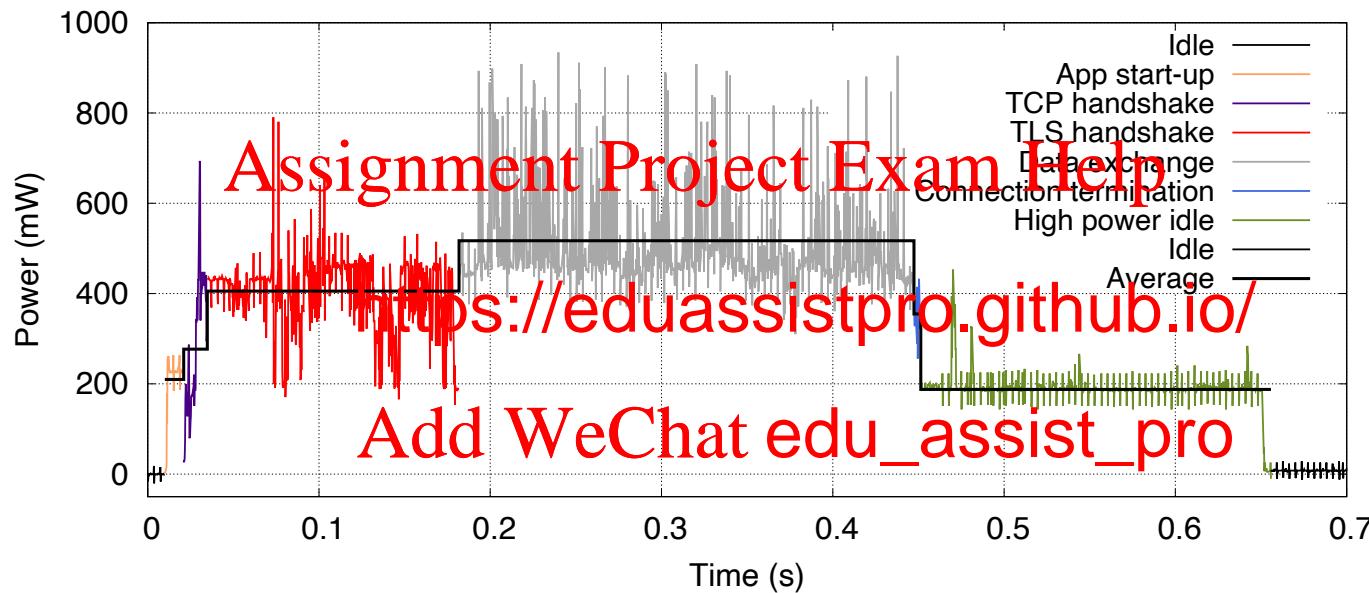
<https://eduassistpro.github.io/>

- **STRIDE threat list**
 - Spoofing, Tampering, Repudiation, Disclosure, Denial of Service , Elevation of Privileges
- **Potential causes**
 - User mistakes
 - Unsecure communication
 - Unsecure storage of user data
 - Malicious ad library



E.g. Power vs Communication

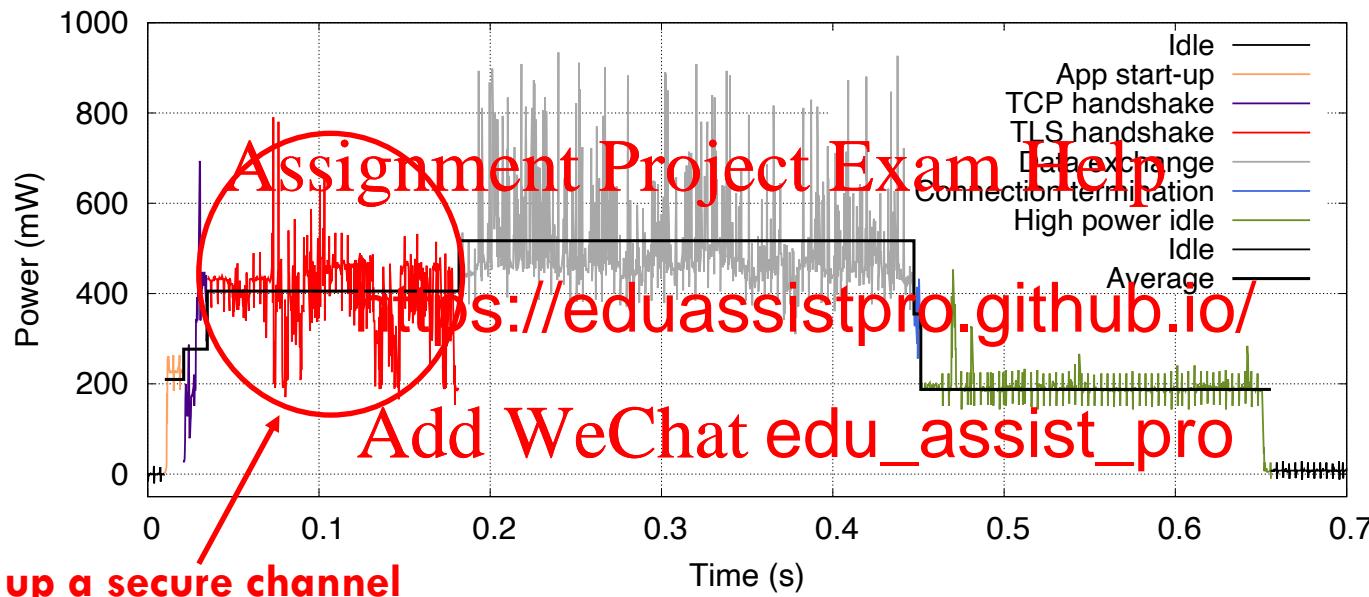
- Power consumption for HTTPS data transfer



- You design your app to transfer 1KB of data to your app server at every one 10 seconds.
 - What are the consequences ?

E.g. Power vs Security

- Power consumption for HTTPS data transfer



- Every action has consequences

Course Schedule

- We are going to have one lecture for each challenge

Week	Lectures	Labs/Tutorials
5	Mobile Networking	Media Access
6	Mobile Security	VR
7	Mobile Cloud	User management

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- There are other challenges:
 - User Interaction (did talk about them a bit on Week 2)
 - Policies and regulations
 - Advertising
 - App analytics
 - Monetization

Challenges in determining device

location

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Week 4, COMP52

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Challenges in determining device location

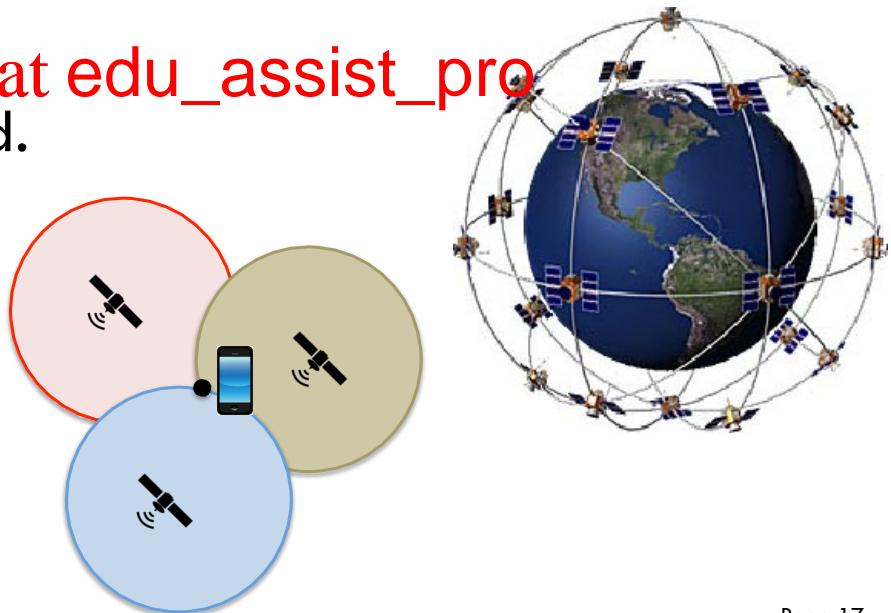
- Location adds “**Context**” to every action.
- The biggest challenge - User is moving.
- Various sources to determine the location
 - GPS
 - Assisted-GPS
 - Cell towers
 - ...
 - ...
- **Assignment Project Exam Help**
 - <https://eduassistpro.github.io/>
 - Add WeChat edu_assist_pro
- **Each source comes with different accuracy, availability, resource requirement and efficiency**
- Dependent on the environmental factors.

The Global Positioning System (GPS) Location

- Provided by the United States government
<https://www.gps.gov>
- Use the signals received from satellites for localisation.
- Each location in the world is covered by at least four satellites.
- User device receives signals from four satellites to estimate the distance and calculate the time lag to determine the location.
<https://eduassistpro.github.io/>

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- No data connection is required.
- Longer time-to-fix.
 - Identifying the satellites
 - Synchronising the clocks.



GPS Accuracy

- Standard Positioning Service (SPS)
 - Available to all users
 - No restrictions or direct charge
 - high-quality receivers have accuracies of 3m and better horizontally
 - In the level of 5-10m in worst case.
- <https://eduassistpro.github.io/>
- Precise Positioning
 - Used by US and Allied military use
 - Use more satellites than public service
- US Government can selectively deny access
 - GLONASS (Russia), BeiDou (China), Galileo (EU), NAVIC (India)

GPS Location

- Smartphones can connect to multiple constellations to improve the accuracy: GPS or GLONASS & use the combined result.
 - Many apps in Google Play Store to check the status of GPS signals

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- However, GPS is everywhere, especially in <https://eduassistpro.github.io/>

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Assisted GPS

- Tries to address some of the problems in GPS.
- Faster set-up time by getting satellite information through data connection.
- Lower energy consumption

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<https://eduassistpro.github.io/>

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Network Location

- Use near by cell tower & WiFi access point information to query a geo tagged database.
- Energy Efficient Assignment Project Exam Help
- Needs a user da
- Who provide da <https://eduassistpro.github.io/> one
 - It has been happening for sometim Add WeChat edu_assist_pro <https://www.zdnet.com/article/how-everyone-else-gets-wifi-location-data/>

Network Location

- WIGLE public database
 - www.wigle.net

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How to get location in Android – Option 1

- **Location API** in android.location [1]

- There are two main location providers:
- GPS_PROVIDER
- NETWORK_PROVIDER
- PASSIVE_PROVIDER

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- Ask for the necessary permission

- GPS_PROVIDER: Add WeChat edu_assist_pro

```
<uses-permission android:name= "android.permission.ACCESS_FINE_LOCATION" />
```

- NETWORK_PROVIDER:

```
<uses-permission android:name= "android.permission.ACCESS_COARSE_LOCATION" />
```

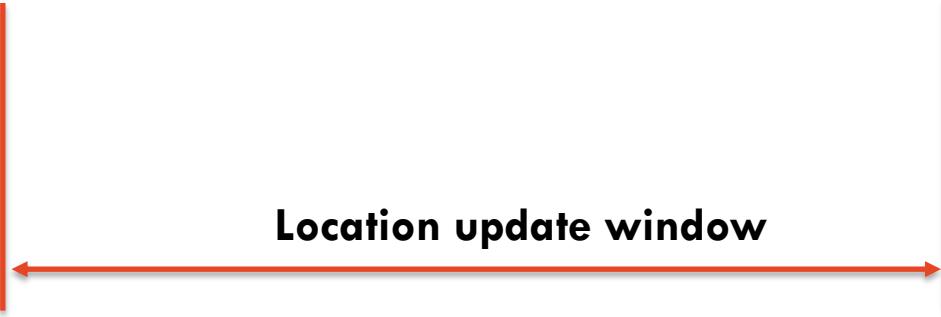
[1] <https://developer.android.com/reference/android/location/LocationManager>

How to get location in Android – Option 1

- Flow for obtaining user location
 - Start application
 - Start listening to location
 - Get the cached location
 - Maintain “best-estimate” filtering out less accurate updates
 - Stop listing to location
 - Use last “best-estimate”

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Location update window

How to get location in Android – Option 1

- Start of the window
 - As soon as app starts or after a certain user action
- Period of the window
 - Long – More battery
 - Short – Less acc
- Maintain the “best-estimate”
 - Most recent fix is not always the b
- PASSIVE_PROVIDER
 - Getting the location fix often takes too long
 - Provides locations without actually initiating a location fix.
 - Only returns locations generated by other providers

Android – Option 1: Best practices

- Reduce the size of the window
 - As soon as you receive the information you need, stop listening to location
- **Assignment Project Exam Help**
- Reduce the frequency of Location Provider access
 - <https://eduassistpro.github.io/>
- Restrict a set of providers
 - More provider – More battery
- App developers must not be troubled with all of these problems !!

How to get location in Android – Option 2

– Fused Location Provider API

- Current method [**Recommended by Google**].
- Google Play Services
- <https://developers.google.com/location-context/fused-location-provider> Assignment Project Exam Help
- <http://developer.android.com/index.html>
- Provides a muc <https://eduassistpro.github.io/> e.g. GPS or
- Automatically c WiFi Add WeChat edu_assist_pro
- Your app must do is specify the de ervice.
- Better accuracy and power management.

Google Play Services

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<https://eduassistpro.github.io/>

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- Google Play services is installed as a separate application
- Run as a background Service
- <https://developers.google.com/android/guides/setup>

Advantages of Google Play Services

- According to Google:
 1. Google Play services provide a **simple interface** and a cleaner API surface.
 2. You specify **Assignment Project Exam Help** desired quality of service and the APIs **manage the underlying**
 3. The Google Pla <https://eduassistpro.github.io/>
performance and battery usage
 4. The Google Play services APIs **Add WeChat edu_assist_pro maintained.**
Google is constantly improving the algorithms and adding more features.

Back to - How to get location in Android – Option 2

- How ? → Tutorial – Week 10

Optimize location for battery & efficiency

Recall: Assignment Project Exam Help

- **Accuracy:** higher the battery drain.
<https://eduassistpro.github.io/>
- **Frequency:** More battery is used, the more battery is used. Add WeChat edu_assist_pro
- **Latency:** Less latency usually requires more battery.
- **Step 1:**
 - Utilize cached location via `getLastKnownLocation(String)`:
 - Getting the location fix often takes too long and more resources

Accuracy – Google Play Services Location

- Specify location accuracy using the `setPriority()` method
- **PRIORITY_HIGH_ACCURACY**
 - Most accurate
 - Use as many providers as necessary (GPS, WiFi, Cell-towers, etc.)
- **PRIORITY_BALANCED_POWER_ACCURACY**
 - Accurate location
 - Rarely uses GP
- **PRIORITY_LOW_POWER**
 - Coarse (city-level) accuracy
 - Mostly using on cell towers
- **PRIORITY_NO_POWER**
 - Passive location
 - Rely on location computed by other apps

Frequency & Latency – Google Play Services Location

- **setinterval()** method
 - The interval at which *location is computed for your app.*
 - Larger the better for battery
- **setMaxWaitTime()** method
 - Larger the better
 - Delays the delivery
- Combination of the two methods
 - Set **setMaxWaitTime()** several times larger than **setinterval()**
- Set timeout to avoid keep trying
 - **setExpirationDuration()**

Google Play Services Location APIs

- Seems a lot easier than Location APIs
- Why is it necessary to learn all location access methods ?
- **Low flexibility**
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 - E.g. Can not restrict your app to receive only WiFi location.
- Not so easy aft <https://eduassistpro.github.io/>

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Google Maps battery draining issue: Here is how you can fix it

Wondering how to fix Google Maps battery draining issue? battery caused by Google Maps background processes

2
SHARES

SHARE



Written by [Meghna Dutta](#) | New Delhi | Updated: August 3, 2018 1:30:34 pm

How to Fix Google Play Services Battery Drain on Android

By [Robert Zak](#) / Mar 15, 2020 / [Android](#)



How to get location in Android – Option 3

- **Geofencing API**
 - Google Play Services
 - <https://developers.google.com/location-context/geofencing>
 - Geofencing API allows you to define perimeters
 - Your app gets a notification when the device crosses a geofence

<https://eduassistpro.github.io/>

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Exercise

- Can you suggest 2 alternatives to geofencing without using Geofencing API or GPS?

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<https://eduassistpro.github.io/>

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Navigation is not only about GPS

- One of the consistent challenges when navigating with Google Maps is figuring out the right direction to go **Assignment Project Exam Help**
- New approach for n Global localization, <https://eduassistpro.github.io/> combines Visual Pos Service (VPS), Street View, and Maps **Add WeChat edu_assist_pro**

Google Play Services APIs

- **Develop**
 - Awareness, Fit, Places
- **Grow**
 - Analytics **Assignment Project Exam Help**
- **Earn**
 - Ads <https://eduassistpro.github.io/>
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Google Fit APIs

- Sensor API
 - Raw sensor data access from both smartphone and wearables
- Recording API **Assignment Project Exam Help**
 - Automated storage with subscriptions
- History API **<https://eduassistpro.github.io/>**
 - Access to historical fitness data
- Sessions API **Add WeChat edu_assist_pro**
 - Store data/meta data of fitness activities
- Goals API
 - Tracking users fitness goals
- Bluetooth Low Energy API
 - Connect companion devices to Google Fit

<https://developers.google.com/fit/android/>

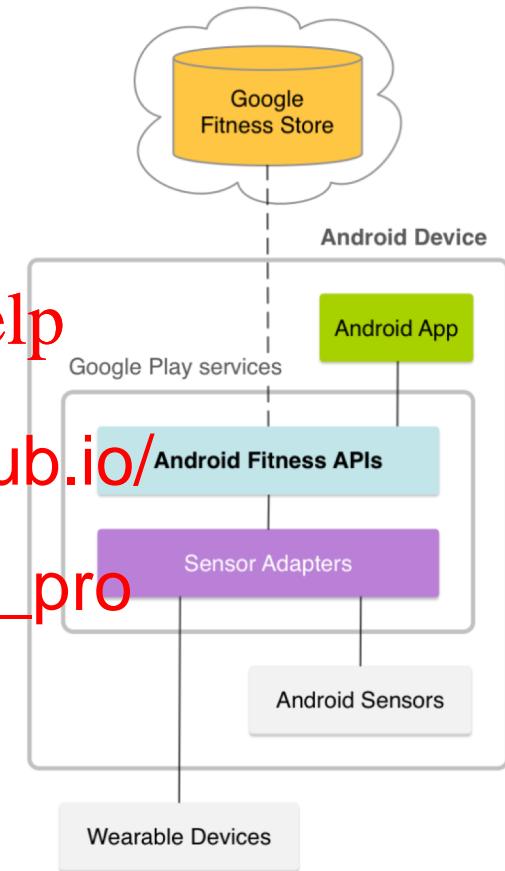


Figure 1: Google Fit on Android.

Awareness APIs

- **Fence API**
 - React to changes in the user's environment
 - The user's current location (latitude/longitude)
 - The user's current activity, like walking or driving.
 - Device-specific conditions, such as whether the headphones are plugged in.
 - Proximity to nearby beacons

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- **Snapshot API** <https://eduassistpro.github.io/>

- Get an idea about user's current envi
 - 1. Time
 - 2. Location
 - 3. Place
 - 4. Activity
 - 5. Beacons
 - 6. Headphones
 - 7. Weather

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- **Have fun developing “Context-Aware” apps...!**
- <https://developers.google.com/awareness/>

What' Next ?

- **Start working on Project Proposal**
 - Due in week 6.
- **Tutorial 4 Assignment Project Exam Help**
 - Learn how to develop a mobile application using Google's Firebase platform
 - Understand how to use Firebase's Realtime Database to store and read data
 - <https://eduassistpro.github.io/>
- Next week
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 - How to respect and effectively manage Mobile Networking resources when you develop apps?

Optional

Internet Protocols Basics

<https://eduassistpro.github.io/>

These slides are adopted from

- **Add WeChat** edu_assist_pro
Computer Networking: A Top Down Approach
7th Ed. Jim Kurose, Keith Ross
Pearson - Addison-Wesley

What is Internet ?

- Billions of connected computing devices

- Communication links
 - Fiber, copper, radio, satellite
- Hosts – end devices
 - User device
- Packet Switches
 - Routers, Switches

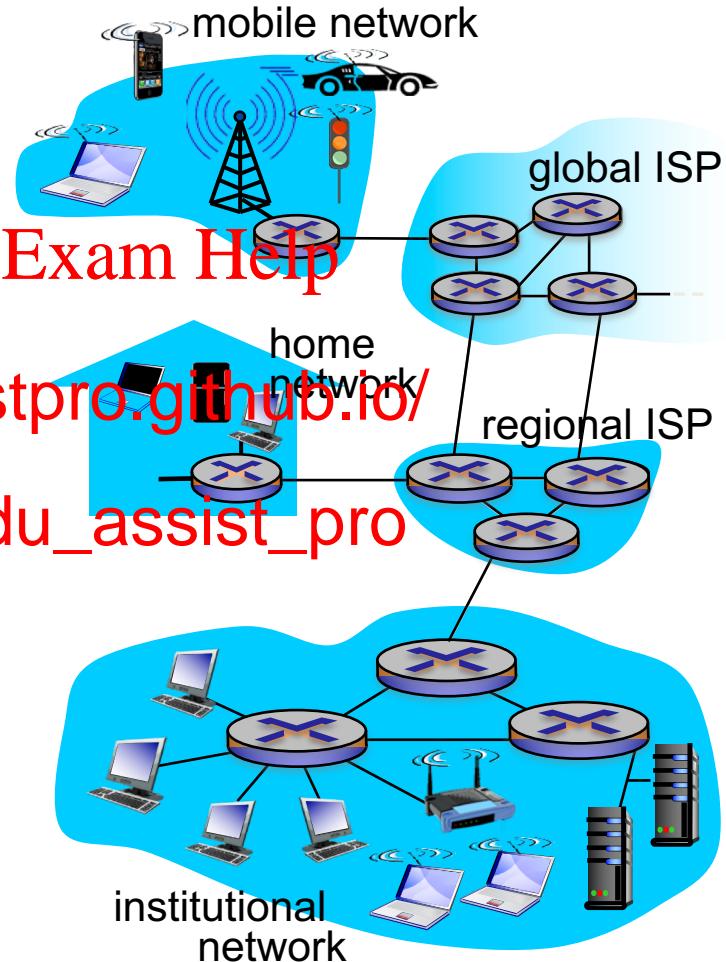
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- To inter-operate, we need;

- Protocols
 - TCP, IP, HTTP, 802.11
- Standards
 - RFC
 - IETF



What is a Protocol ?

human protocols:

- “what’s the time?”
- “I have a question”
- introductions

... specific messages sent
... specific actions taken
when messages received,
or other events

network protocols:

- machines rather than humans
- all communication activity in

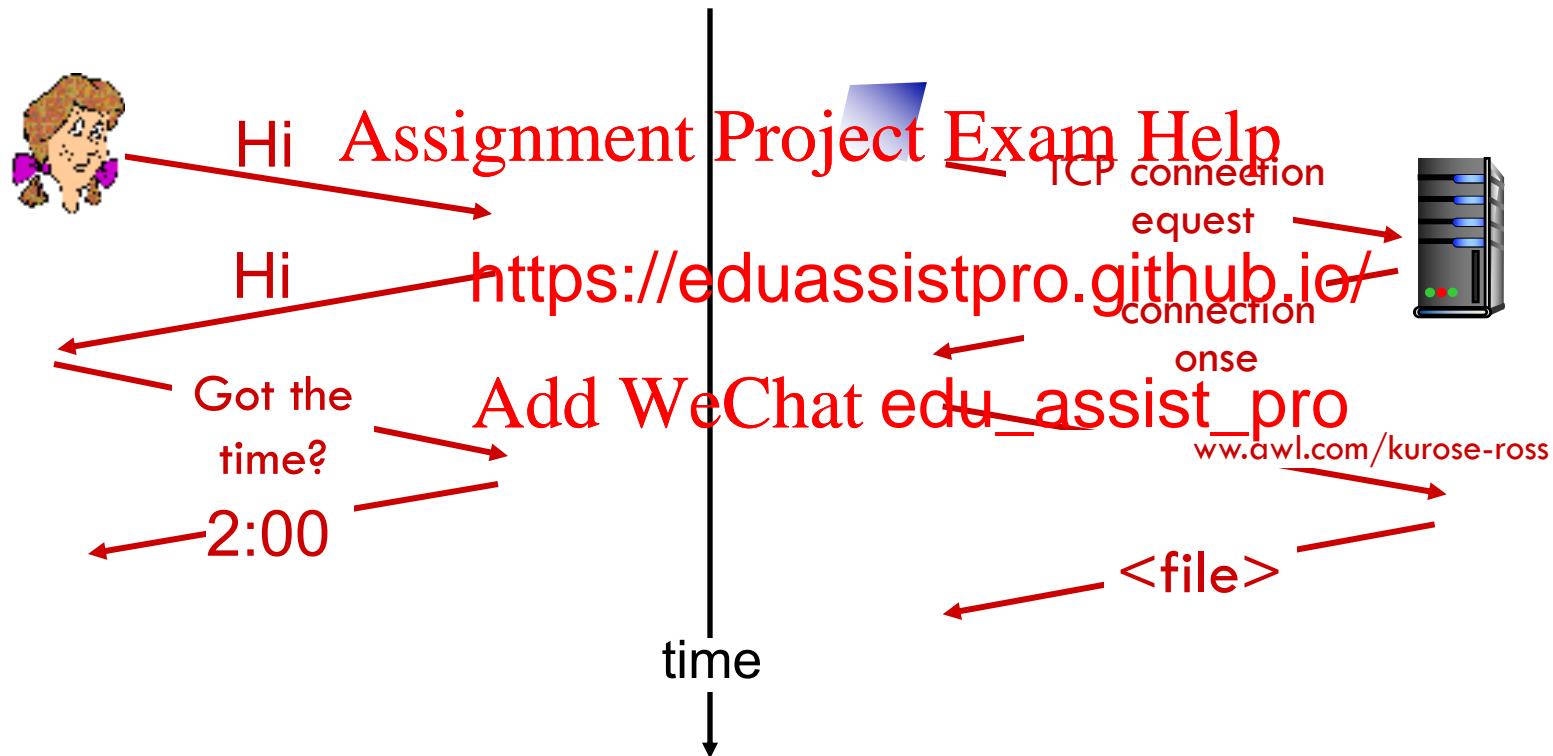
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protocols define format, order of messages sent and received among network entities, and actions taken on message transmission, receipt

What is a protocol ?

a human protocol and a computer network protocol:



Transport Service Requirement

application	data loss	throughput	time sensitive
file transfer	no loss	elastic	no
e-mail	no loss	elastic	no
Web documents			no
real-time audio/video		1Mbps	yes, 100's msec
stored audio/video	loss-tolerant	vi sa	yes, few secs
interactive games	loss-tolerant	few kbps up	yes, 100's msec
text messaging	no loss	elastic	yes and no

Common Internet Protocols

application	application layer protocol	underlying transport protocol
e-mail	SMTP [RFC 2821]	TCP
remote terminal access	Telnet [RFC 854]	TCP
Web file transfer	HTTP (e.g., You RTP [RFC 1889])	TCP TCP
streaming multimedia	Add WeChat edu_assist_pro	TCP or UDP
Internet telephony	SIP, RTP, proprietary (e.g., Skype)	TCP or UDP

TCP and UDP

TCP service:

- *reliable transport* between sending and receiving process
- *flow control*: sender won't overwhelm receiver
- *congestion control*: sender when network overloaded
- *does not provide*: timing, minimum throughput guarantee, security
- *connection-oriented*: setup required between client and server processes

UDP service:

- *unreliable data transfer* between sending and receiving process

<https://eduassistpro.github.io/> provides timing, flow control, throughput guarantee, security, or connection setup,

Q: why bother? Why is there a UDP?

Securing TCP

TCP & UDP

- no encryption
- cleartext password sent into socket traverse I cleartext

SSL is at app layer

- apps use SSL libraries, that

“talk” to TCP

SSL

- provides encrypted TCP connection
- data integrity
- end-point authentication

PI
<https://eduassistpro.github.io/>
sswords sent into

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- see Chapter 8

HTTP Overview

HTTP: hypertext transfer protocol

- Web's application layer protocol

- client/server model

- **client:** browser that receives, (using, and “displays”

- **server:** Web server sends (using HTTP protocol) objects in response to requests

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HTTP overview

uses TCP:

- client initiates TCP connection (creates socket) to server, port 80
- server accepts TCP connection from
- HTTP messages (application-layer protocol messages) exchanged between browser (HTTP client) and Web server (HTTP server)
- TCP connection closed

HTTP is “stateless”

- server maintains no information about past client requests

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<https://eduassistpro.github.io/>

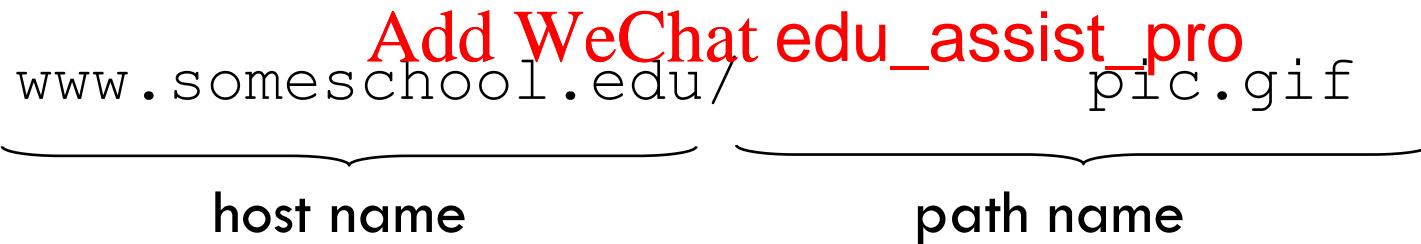
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at maintain
are complex!

- past history (state) must be maintained
- if server/client crashes, their views of “state” may be inconsistent, must be reconciled

Web and HTTP

- web page consists of **objects**
- object can be HTML file, JPEG image, Java applet, audio file,...
- web page consists of **host Project Exam Help** which includes **several referenced object**
- each object is a <https://eduassistpro.github.io/>



HTTP Method Types

HTTP/1.0:

- GET
- POST
- HEAD
- asks server to I <https://eduassistpro.github.io/> requested object out of response

HTTP/1.1:

- GET, POST, HEAD

- PUT

s file in entity body
specified in URL

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- deletes file specified in the URL field

HTTP Request Message

- two types of HTTP messages: *request, response*
- HTTP *request message*:

- ASCII (human-readable format)

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request line
(GET, POST,
HEAD commands)

header
lines

carriage return,
line feed at start
of line indicates
end of header lines

https://eduassistpro.github.io/
Host: www-net.
User-Agent: Fi
Accept: text/h
Accept-Language: en-us,en;q=0.5\r\n
Accept-Encoding: gzip,deflate\r\n
Accept-Charset: ISO-8859-1,utf-8;q=0.7\r\n
Keep-Alive: 115\r\n
Connection: keep-alive\r\n\r\n

carriage return character

line-feed character

\r\n

0\r\n

tion/xhtml+xml\r\n

\r\n

\r\n

\r\n

\r\n

\r\n

HTTP Response Message

status line
(protocol
status code
status phrase)

2007 17:00:02

header lines

data, e.g.,
requested
HTML file

```
HTTP/1.1 200 OK\r\nDate: Sun, 26 Sep 2010 20:09:20 GMT\r\nServer: Apache/2.0.13 (CentOS)\r\nLast-Modified: Sun, 26 Sep 2010 20:09:20 GMT\r\nETag: https://eduassistpro.github.io/\r\nAccept-Ranges: bytes\r\nContent-Length: 26\r\nKeep-Alive: timeout 00\r\nConnection: Keep-Alive\r\nContent-Type: text/html; charset=ISO-8859-1\r\n\r\ndata data data data data ...
```

* Check out the online interactive exercises for more examples: http://gaia.cs.umass.edu/kurose_ross/interactive/

HTTP response status codes

- status code appears in 1st line in server-to-client response message.
- some sample codes:

200 OK Assignment Project Exam Help

- request succ

301 Moved Permanently <https://eduassistpro.github.io/>

- requested object moved, new loc ed later in this msg
(Location:)

400 Bad Request

- request msg not understood by server

404 Not Found

- requested document not found on this server

505 HTTP Version Not Supported