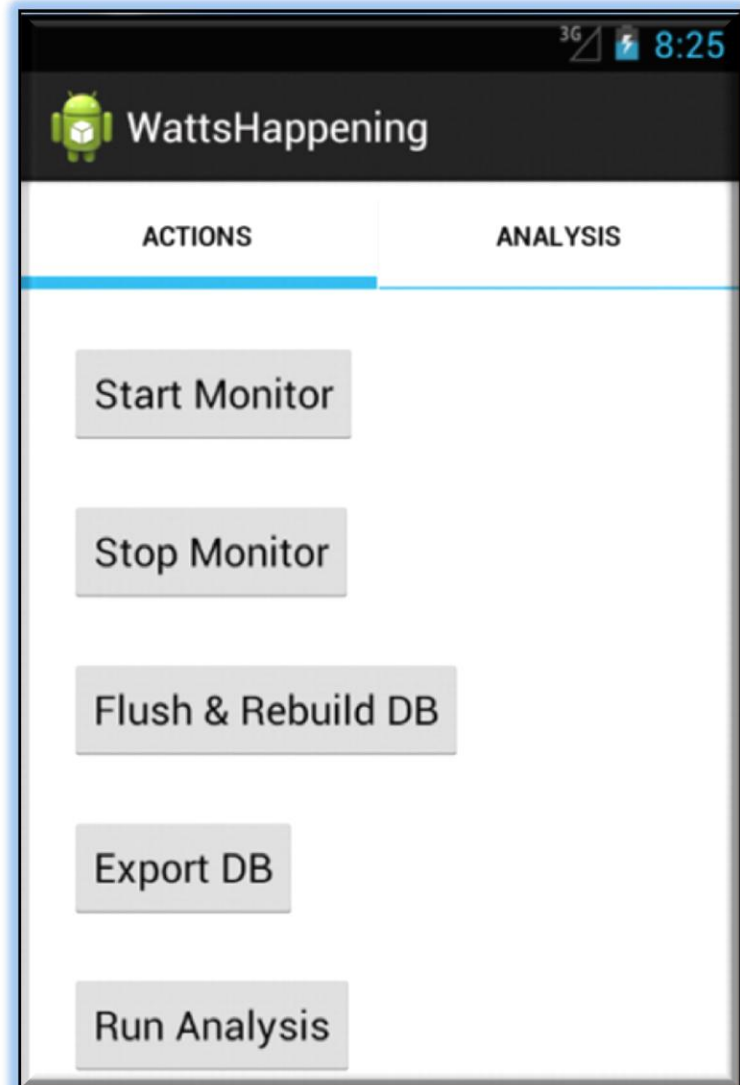


Watt's Happening: A Battery Monitoring Application

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Overview

- Motivation
- Logging
- Analyzing
- Recommending
- Future Work
- Questions



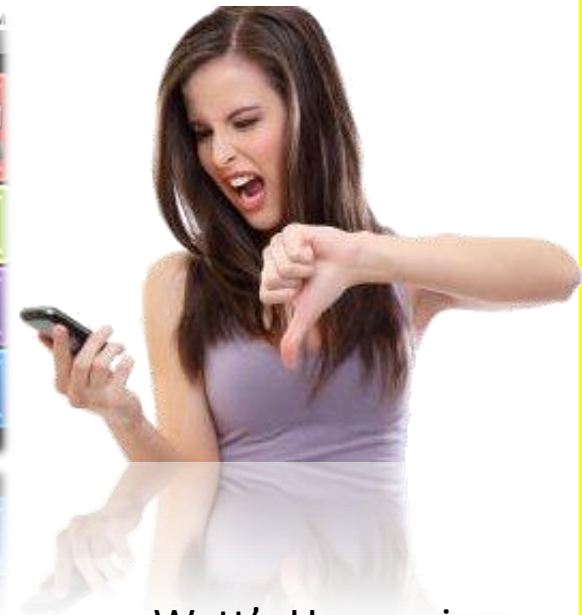
Motivation



You have 10 seconds
of battery life left



...sorry.

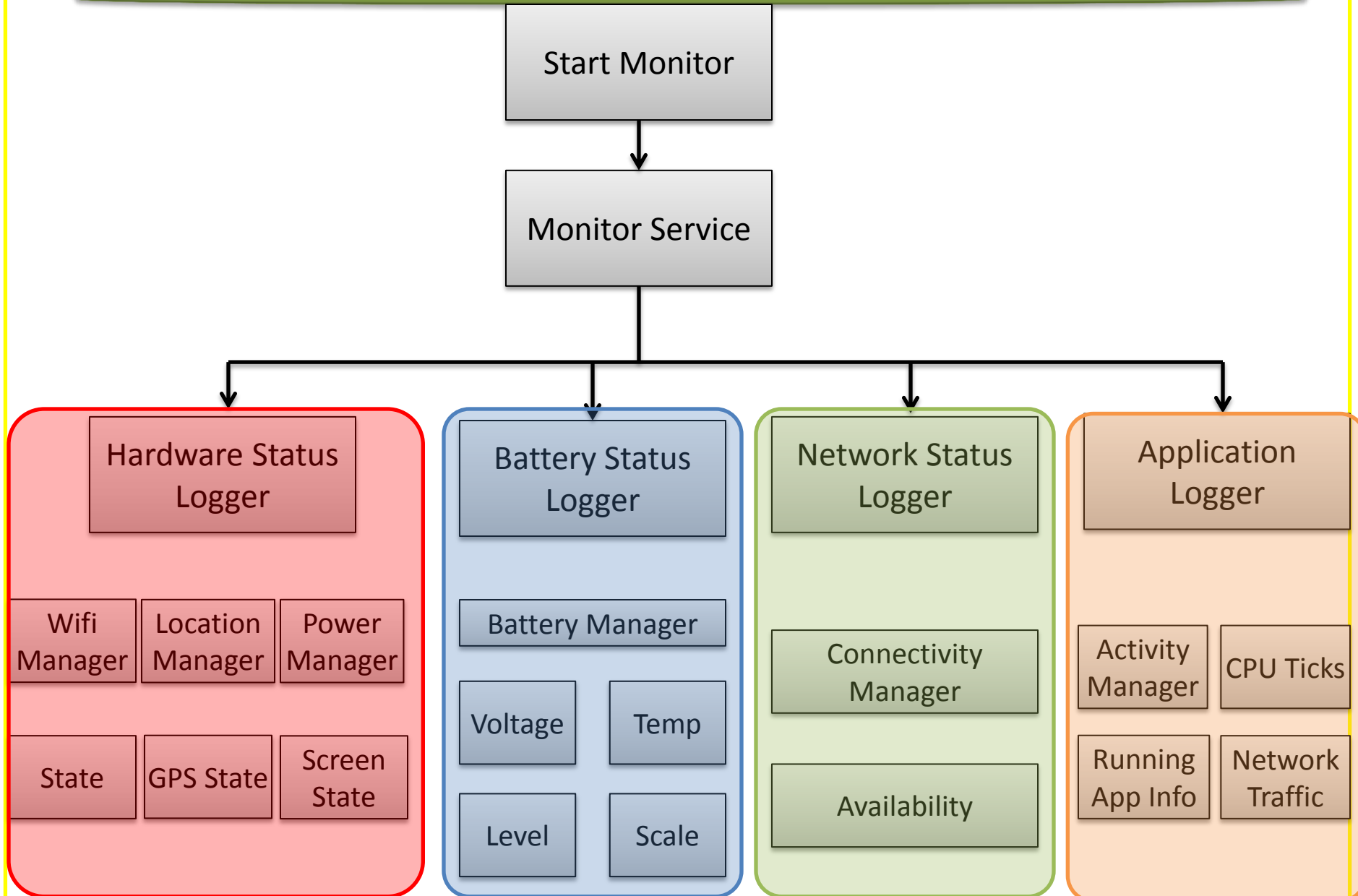


Watt's Happening

Logging Decisions

- Poll vs. Continuously Monitoring
- Passive Pull (GPS, Bluetooth)
- Alarm System
- Time Between Pulls
- Short running Applications

Code Structure



Example Tables

ID	Timeslice_ID	Voltage	Temp	Percentage
1	1	4144.0	220.0	0.9
2	2	4131.0	220.0	0.9

**Battery
Table**

ID	Timeslice_ID	Name	Enabled	Status
1101	276	Bluetooth	0	, Scanmode: None
1102	276	WIFI	0	Disabled

**Hardware
Table**

ID	Timeslice_ID	Name	State	Connection
3320	277	Ethernet	IDLE	IsAvailable: 1 IsConnected: 0
3321	277	Mobile_supl	IDLE	IsAvailable: 1 IsConnected: 0

**Network
Table**

ID	Timeslice_ID	Name	App_ID	CPU	RX_Bytes	TX_Bytes
13053	277	Maps	10008	481.0	4933.0	2120.0
13054	277	Contacts	10005	310.0	0.0	0.0

App Table

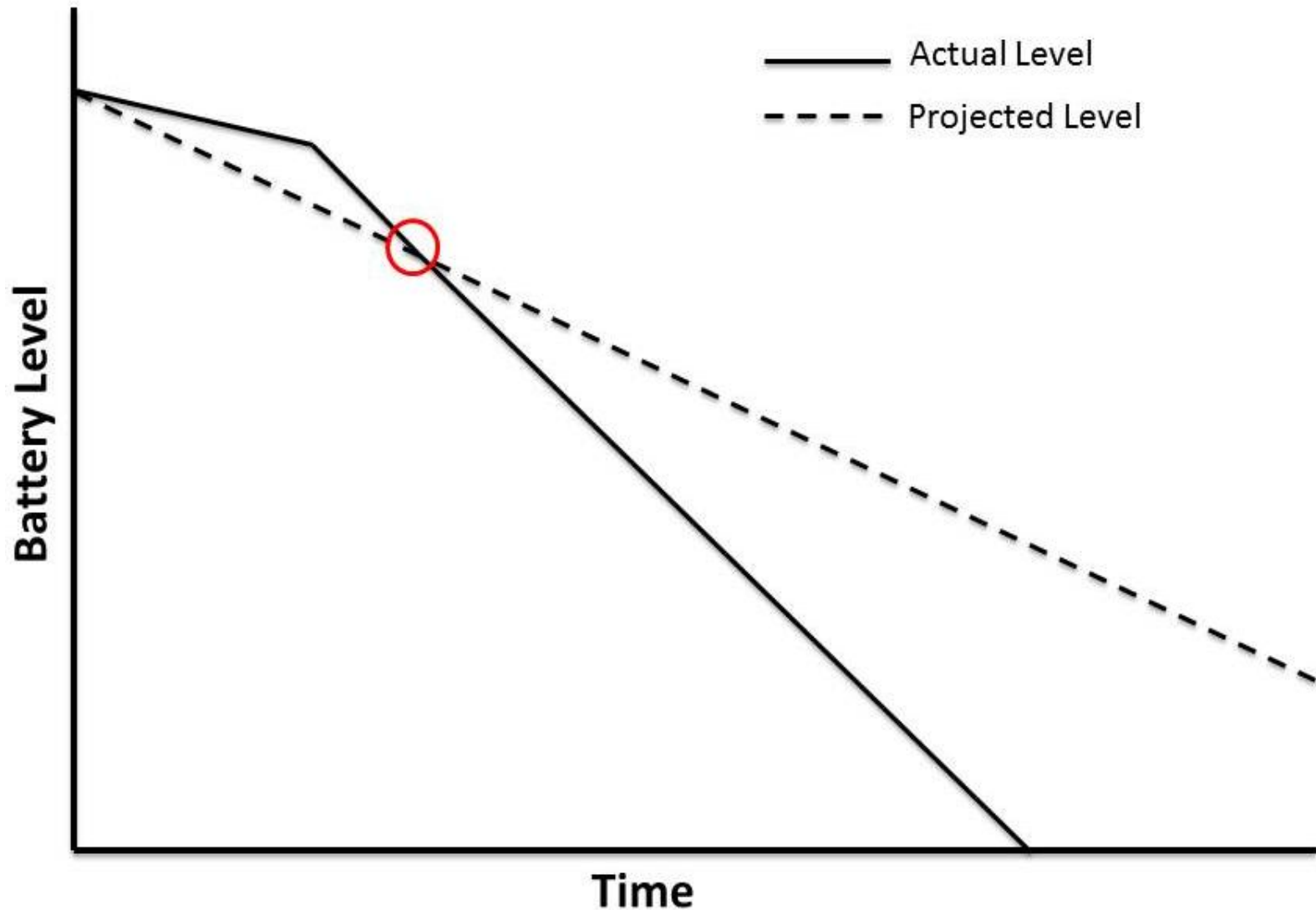
ID	App_UID	Hist_CPU	Hist_Net	Hist_HW	#_of_Updates
210	10207	0.0	0.0	0.0	120
211	10221	0.0	19908.0	0.0	98

**Aggregate
App Table**

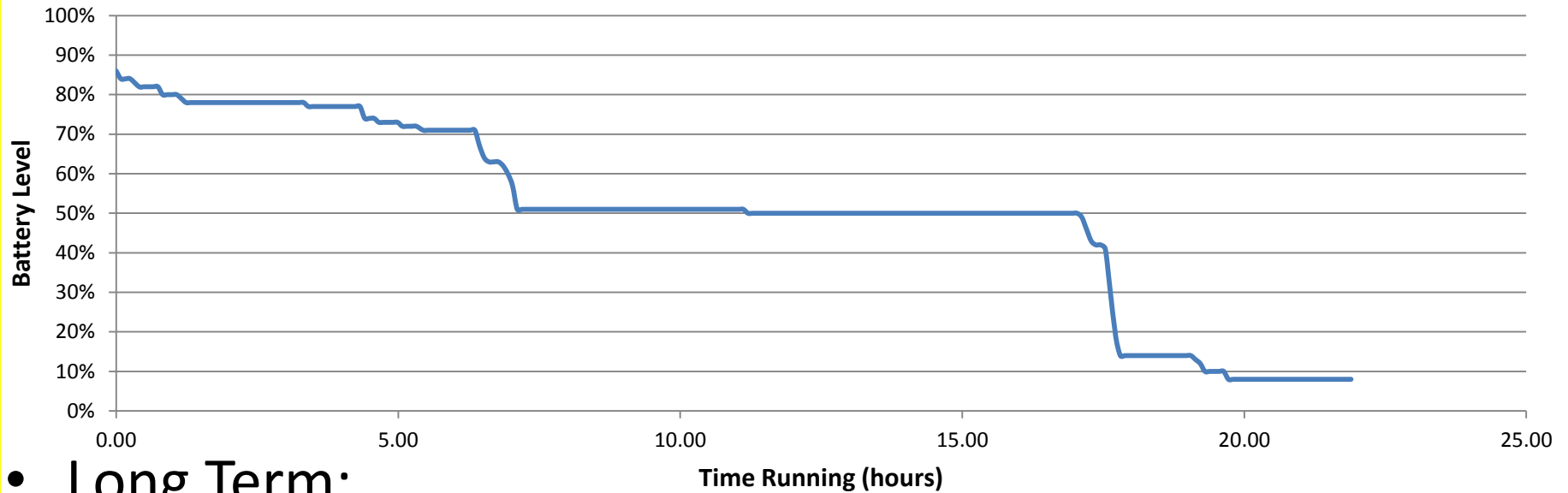
Estimated Time Remaining

- Goal: Estimate the amount of time remaining before the battery dies
- Problem:
 - Overestimation: Estimating that the time remaining is longer than the actual remaining battery life
 - Underestimation: Estimating that the time remaining is less than the actual remaining battery life
- Which outcome is more desirable?

Overestimation Example



Battery Level



- Long Term:
 - Data since last charge
- Short Term:
 - Data in the last 5 minutes
- Calculation:
 - $\text{Change in usage} / \text{change in time (\% per minute usage)}$
 - If the short term usage > 0 , use solely short term data
 - If short term usage $= 0$, use solely long term data

Analyzing Application Usage

- How do we know which applications are more intensive?
- Rank based on hardware usage
 - CPU usage
 - Network traffic usage

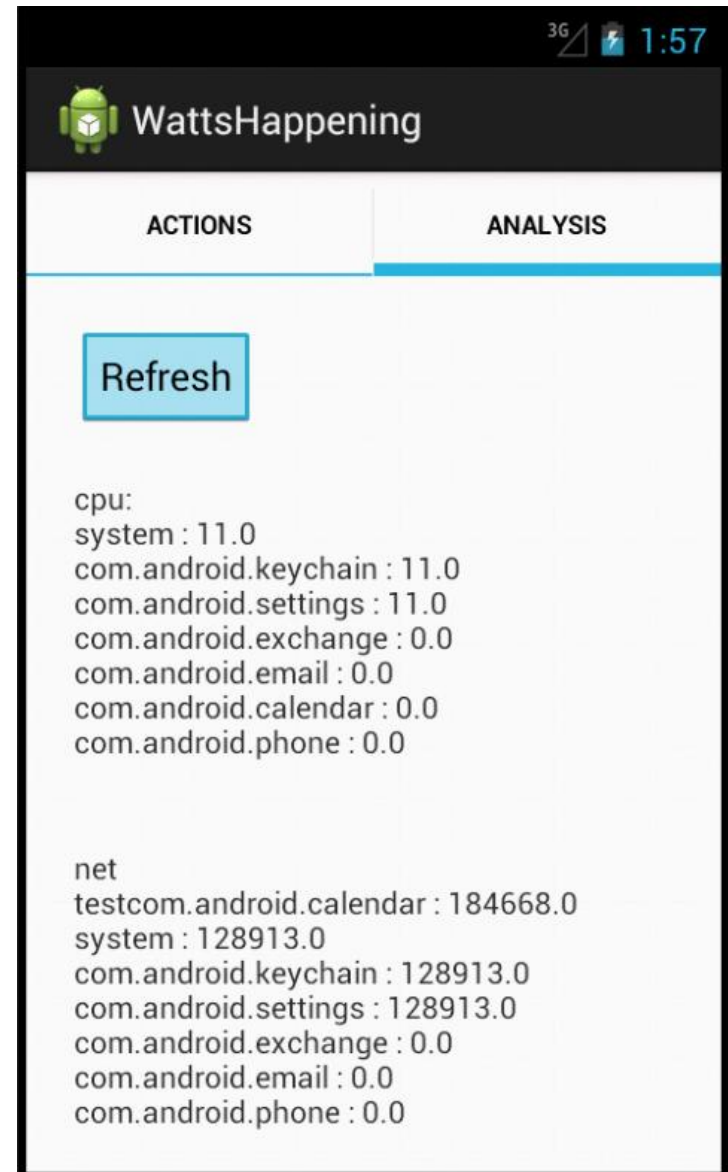


Our Metrics

- CPU Usage
 - CPU ticks used by application
 - CPU ticks used in total
 - Gives the % of CPU used by the application over that time
 - Track that average over long periodsc
- Network Usage
 - Number of RX and TX bytes
 - Which network is currently active
 - Gives the data transfer rates over time
 - Possible to correlate this with which network is active

Showing High Usage Applications

- Rank by CPU usage
- Rank by Network Usage



Possible Application

- Power Model of Hardware
 - Could give us battery usage of an application
- Determine a user's historic usage model to recommend hardware settings
- Recommend which applications to kill to make it to a certain time without your battery dying

Questions?