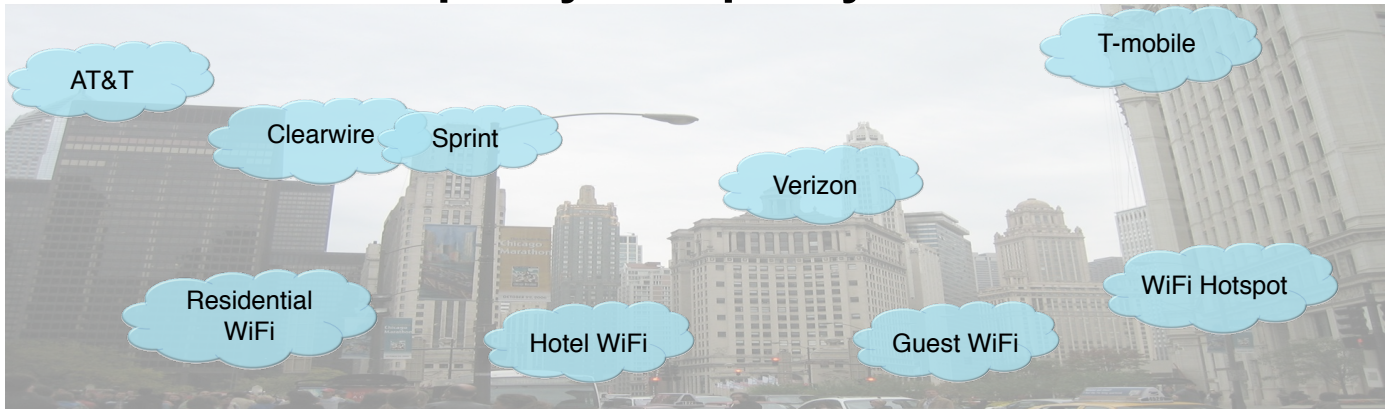# Making Use of All the Networks Around Us: A Case Study in Android

Kok-Kiong Yap, Te-Yuan Huang, Masayoshi Kobayashi, Yiannis Yiakoumis, Sachin Katti, Nick McKeown, Guru Parulkar

We have plenty of capacity around us...

AT&T · Clearwire · Sprint · T-mobile · Verizon · Residential WiFi · Hotel WiFi · Guest WiFi · WiFi Hotspot

Yet most is off limits!

Current client network stack is limiting:
- Ongoing connection cannot change to a new interface, without re-establishing state
- Application cannot take advantage of multiple interfaces to get higher throughput
- User cannot easily and dynamically choose interfaces at fine granularity

Redesigning Mobile HandHeld

- Exploits multiple networks around for best user experience
- Separation of efficient data plane and flexible control plane
- Allow applications to express their requirements
- **Eventual Goal:** Design and create a robust and high performance network stack

A First Prototype
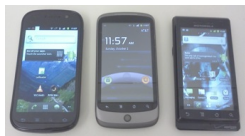
- Allows many interfaces
- All components are found in Linux 3.3 and Android
- Many limitations still exists: high latency, unfairness

Control Plane — Android Apps — Android — Apps — Linux Network Stack — "Internal" — OVS — 3G · WiFi · WiMAX

aggregate throughput

SN	Technology	Network
1	3G	AT&T
2	3G (HSPA)	T-Mobile
3	3G (CDMA)	Verizon
4	3G (HSPA)	T-Mobile
5	3G	Sprint
6	WiMAX	Clearwire
7	WiFi	802.11g @ 2.412 GHz
8	WiFi	802.11g @ 2.462 GHz
9	WiFi	802.11a @ 5.22 GHz
10	WiFi	802.11a @ 5.785 GHz

seamless connectivity

choose best network to use