PhantomNet

An end-to-end mobile network testbed

Kobus Van der Merwe

Why another mobile network testbed?

- Mobile networking growing traffic-wise and growing in importance
  - Mobile devices increasing in sophistication and becoming the "compute platform of choice"
- Current network architectures (LTE/EPC) are packet based
  - But under the hood look a lot like their circuit switched forebears
- Major technology trends reshaping the way we do things
  - Cloud computing, software defined networking, network function virtualization
- Current measurement studies
  - From the "outside", no ground truth

Need a realistic "playground" where as a community we can:

- **explore/invent mobile network architectures in an end-to-end manner**
- **look "under the hood" of existing mobile network architectures**

PhantomNet

Programmable end-to-end mobile testbed to enable research at the intersection of mobile networking, cloud computing and software defined networking

- Remotely accessible and sharable
  - Emulab style

Base functionality

- Physical deployment
  - Mobile devices
  - Small cell deployment (LTE based)
  - SDN capable backbone
  - Cloud infrastructure
- Software
  - "Mobile network toolkit":
    - Modular evolved packet core (EPC) software
    - Emulab control framework

Small-cell with compute platform

Mobile Device

SDN Backbone

Cloud Infrastructure
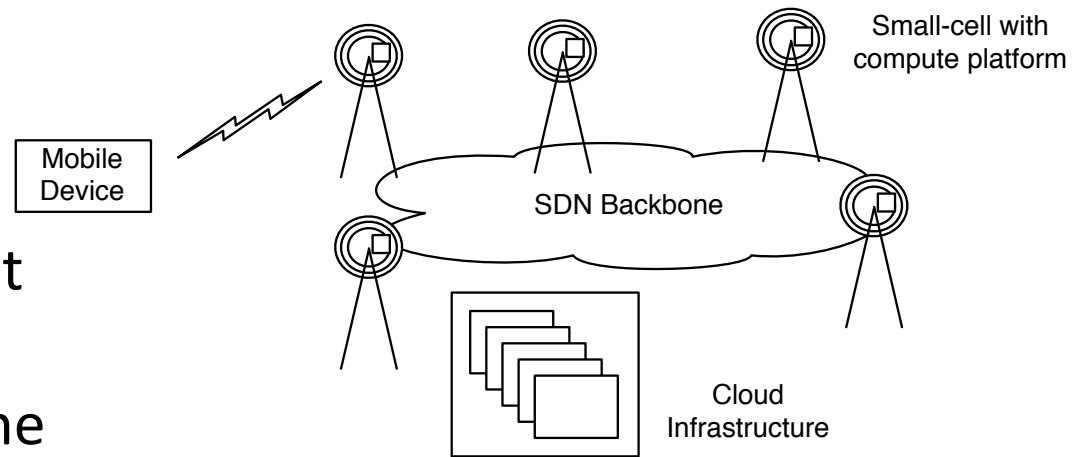
Mobile network toolkit

- Create "standard" mobile network architectures:
  - E.g., 4G: LTE + EPC
- Replace some/all components to realize different architectures:
  - Cloudlet-like architecture
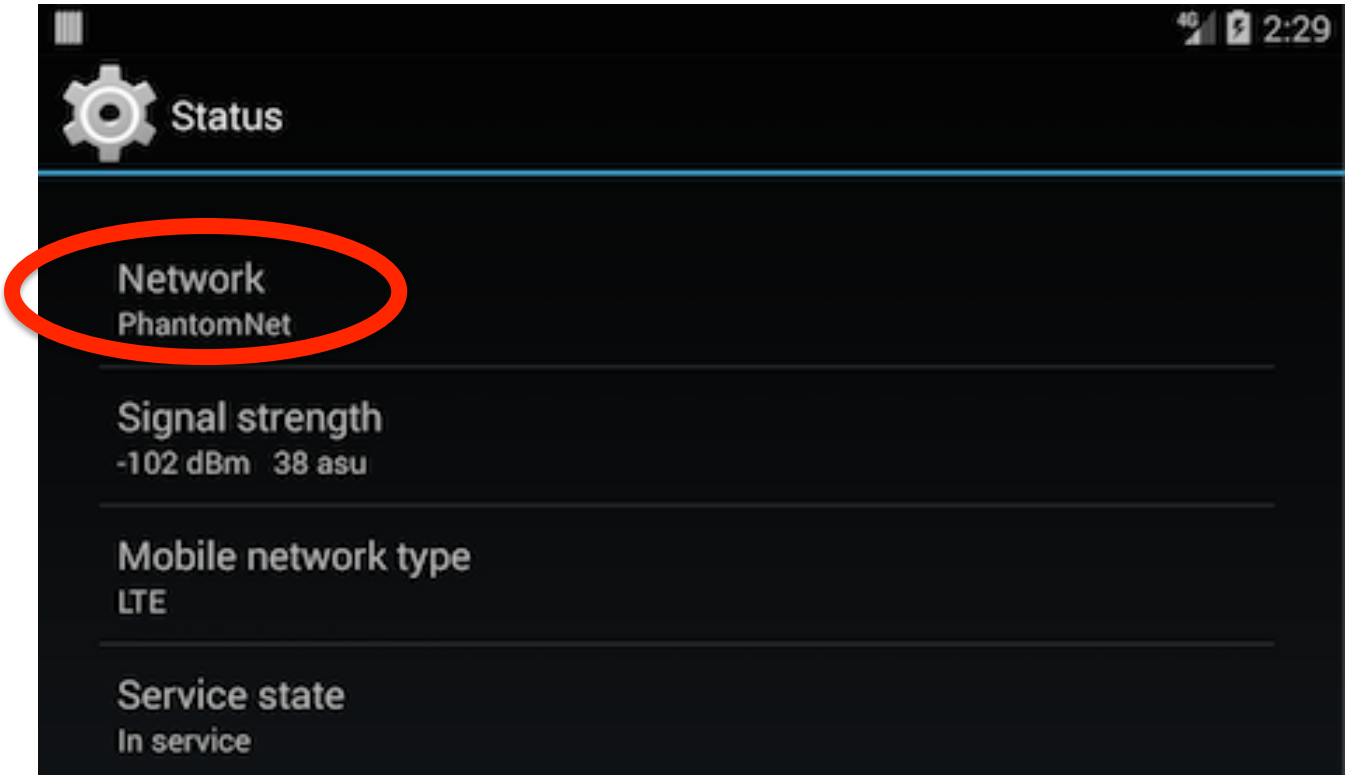 - Mobility First approaches
  - Softcell
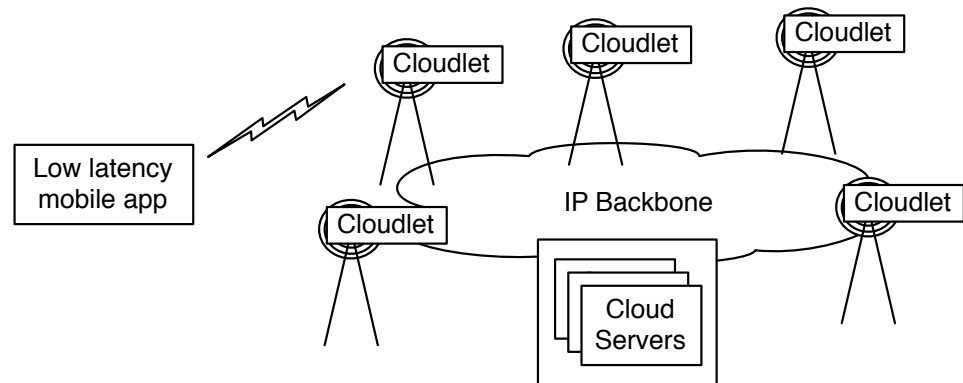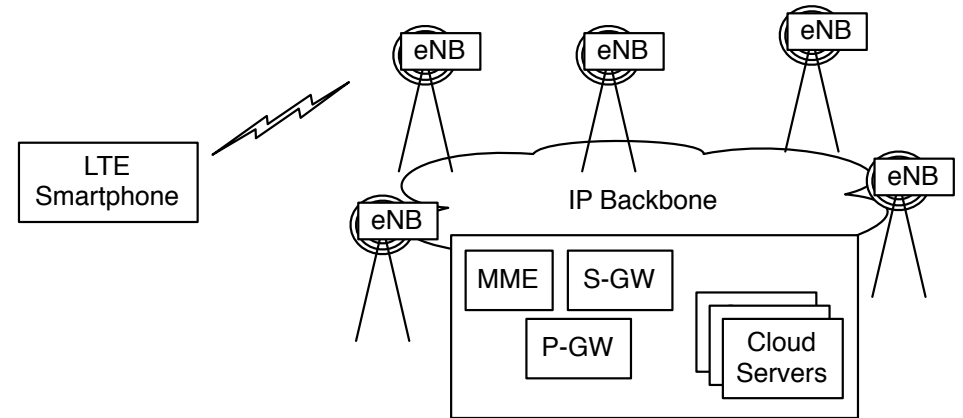
Status

Open for business:

www.phantomnet.org

- Integrated OpenEPC with Emulab
  - Uses emulation for RAN (UE and eNodeB)
  - Specifies LTE/EPC topology using NS file with PhantomNet enhancements
  - Brings up experiment with correct e2e configurations

Status cont.

- Hardware RAN interworking with EPC
  - End-to-end lab setup:
    - UE (Huawei modem, Nexus 7 tablet, Nexus 5 smartphone), eNodeB (ipaccess small cell)
      - band 4
  - Functioning with OpenEPC in Emulab environment

Status

Network
PhantomNet

Signal strength
-102 dBm 38 asu

Mobile network type
LTE

Service state
In service

Status cont.

- Used PhantomNet in my Advanced Networking course
- Lab Assignment
  - Goals
    - Introduce to PhantomNet testbed
    - Learn about LTE/EPC
    - Replicate part of recent paper on using SDN in LTE/EPC to realize offloading
      - Own paper from course project in previous version of course
  - Can make assignment available if folks would like to use in their courses
- Using for a number of class projects

Conclusion

- We are looking for users
  - please contact me if you are interested in using PhantomNet

- We are planning to have workshop early next year
  - target: first week of February
  - part "tutorial" on PhantomNet
  - part community input on how to go forward