Virtualizing National Broadband Access Infrastructure

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Motivation: Public Access Networks

- Singapore, Japan, South Korea, New Zealand
- Australian NBN: ~$45b


Source: NBN Co.
Illustration: Emily Cooper
Opportunity

- Decoupling of infrastructure from service:
  - NBN provides wholesale connectivity via layer-2
  - Retailers compete to offer layer-3 services

- Enables virtualisation:
  - Multiple retailers (RSPs) per household
    - Specialised providers: video, gaming, voice, ...

[Diagram showing RSPs and services]
Benefits of Virtualization

- For RSPs:
  - Explicit control over service quality (assured “slice”)
  - Reduced need for (static) capacity planning
  - Pay-As-You-Go with on-demand provisioning

- For End-user:
  - Mix-and-match best-of-breed (streaming video, gaming, voice, …)
  - Avail of niche services at lower “unbundled” cost
  - Can customise service quality per service

- For Infrastructure provider:
  - More efficient usage of network resources (on-demand provisioning)
  - “Unbundling” encourages greater competition in service offerings
    - Content Provider can become a niche RSP
Research Questions

- SDN interfaces for virtualization?
  - Open: RSPs/users can control slices
  - Dynamic: time-scale (seconds, minutes)?

- NNI interface:
  - Pricing model?
  - Quality capabilities: b/w, latency, loss, …?

- UNI interface:
  - Household device priorities, policies associations?
Simulation Study

- **Trace data from university WiFi network**
  - 30 houses, each has one AP
  - 10-15 active clients per house
  - 8500 user sessions in total (known duration and rate)

- **4 RSPs with market share 10%, 20%, 30%, 40%**
  - Client randomly assigned to an RSP
  - RSP provisioned with base capacity = average demand
  - NNI API to increase/decrease RSP bandwidth by discrete amount at 1-minute time-scale

- **Metrics:**
  - Fraction of “unhappy” user sessions
  - Cost saving for RSP
Results

- **Dynamic bandwidth provisioning**
  - Reduces RSP cost by 70%
  - While keeping 90% sessions happy
  - Time-scale and bandwidth granularity need tuning
Conclusions

- Public-funded access networks are emerging
- Opportunity for multiple service providers per household
- SDN technology can facilitate this virtualization
  - Interfaces need to be developed
  - Pricing models need to be investigated
  - Governments need to be informed