SWIN BUR NE

CENTRE FOR ADVANCED INTERNET ARCHITECTURES

Making The Internet Go Away

Creating a mature and transparent communications infrastructure

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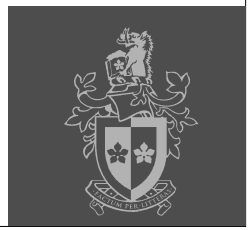

So what does this mean?

- We are forced to have a personal and irritating relationship with the Internet in order to use it
- Oddly enough, non-technical people often fail to see this as being desirable....
- The internet must cease being an opaque (and often antagonistic) companion and become a transparent extension of our own daily lives

This has happened before....

- Automotive technology faded as it evolved
  - Drive a 1920s automobile from Melbourne to Sydney ?
    - The user would be both mechanic and driver
    - The automobile's technologies continuously intrude on the user experience
  - Same trip in a modern car.....
    - Significantly more complex internal system(s)
    - Regular, untrained people can now drive long distances
    - The mechanic is a specialist, visits are exception events
    - Automobile technology has matured and become *transparent*

A Transparent Internet

- What does it mean to be transparent?
  - The technology sits below our threshold of conscious thought
- Why is this important?
  - Digital communications infrastructure will not become ubiquitous until it becomes invisible
- How do we get there?
  - New cross-discipline research programs, industry engagement

New focus for network R&D?

- The consumer experience is paramount
  - We often forget about the end-user's perspective, to everyone's detriment
  - That's regular consumers – the ones whose VCRs still flash “12:00”

    ....ok, that includes some of us too
- The challenges
  - Convenience, Reliability, Predictability
  - There's different science involved in making large systems work well

Is this just a network layer problem?

- True, the overall end user experience is a combination of
  - End-to-end network behavior
  - Application/end-host limitations
- Applications can *partially* hide limitations in the underlying communications infrastructure
  - But no excuse not to make IP network service as good as possible

And the research team is?

- Traditional researchers will not conquer this next phase in the Internet's evolution
- Neither will developers or operators alone
- Need a joint effort
  - Operators, researchers, developers
  - Sharing knowledge, insights, experiences, goals

So what are the Grand Problems?

TIRED	WIRED
• Optimising, re-inventing or analyzing TCP under obscure conditions • Yet another QoS mechanism that works great inside a simulator • Faster forwarding • Pretending that business needs aren't important	• Broadband access technologies and architectures • Network resilience • Seamless mobility • Saving the Internet from narrow minded business models

Providers need to make money

- Research community needs to remember....
  - When an ISP dies, that's a form of network failure
  - When an ISP creates walled gardens to lock-in customers, that's a form of network failure
  - When an ISP can't see a business reason to play nice with neighbors, that's a form of network failure
- Cuts across access, mobility and resilience
  - Will impact on the transparency of the future Internet
- Keep it in mind

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Where to next?

- Broadband Access
  - Edge-qos mechanisms, automated network management tools, ...
- Mobility and Resilience
  - Push research towards large scale IP networks
  - Instrumentation and modelling of IP networks with millions(++) of nodes and links
    - Map and/or predict IP 'weather patterns'
  - Revisit protocol and topology designs with end user experience as motivating metric

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Broadband Access

- Many problems now in the 'last mile'/access nets
- For example, billing models
  - Billing metrics (per-byte and byte-cap) are unrelated to the consumer's online experience
    - 'The Internet' appears as an unpredictable cost-value trade off
  - Can we align load models with consumer experience?
- Or, Quality of Service
  - Need automated management tools before access Sps can deploy/offer tiered service levels on large scale
    - Need traffic characterisation/modeling before ISPs can adequately engineer for even simple tiered service levels

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Network Resilience

- We know how to make networks fast
- Now let us model and improve the failure characteristics of a running Internet
  - Impulse response modeling of BGP clouds?
  - Graceful failure modes?
  - Autodetection of e2e IP service degradation?
  - Impact of TCP on consumer perception of e2e network degradation?
  - Vulnerability and defense analysis
  - Etc....

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Internet mobility

- Can we make the Internet truly mobile?
  - Static:mobile ratio from 90:10 to 10:90?
  - IP mobility across fixed and un-wired links
  - Inter-ISP hand-off
- Need practical focus on the dynamic impact of IP mobility to the consumer experience
  - Practical: That means considering tens of thousands/millions of nodes, not just a handful
  - Consumer: That means a systems level, multi-ISP view
  - This is hard

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A Cross-discipline challenge

- Convenience, reliability and predictability wont be easy
  - Focus new research on refining IP networking tools and technologies
- We need a new generation of IP network gurus who can model & control large scale, complex systems
  - A grand challenge on the scale of modeling planetary weather patterns
- The Internet's next big success will be when society thinks of it as a service rather than a technology

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- You may now throw soft objects.....

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