

research direction



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Nov 2006



research style?

getting your research taken seriously

- not facing the big problems
- need huge culture change
 - need research towards consensus
 - sideline the market in papers

- must focus on big problems that still haven't been fixed
- question everything
 - find the enduring problem beneath the fashionable problems
 - a useful discipline: use experienced people's research agendas
 - DARPA NewArch requirements for new Internet architecture
 - a Clean-Slate Design for the Next-Generation Secure Internet
 - Future Directions in Network Architecture (FDNA) workshop papers
- we're not interested unless you get back to first principles
 - we want science, not a loaded business case that wouldn't pass due diligence
 - even if you start from intuition, back it up with principles
- must be multidisciplinary
 - society & the economy: shaping the Internet and shaped by the Internet
 - work with someone from economics, or public policy
- if it's easy, it's probably not worthwhile research



top research themes?

- global scale asynchronous event messaging
 - short co-ordination /control messages (discovery, notification, synch, config)
 - control/co-ordination for lower layers (config, routing, failures) as well as apps
 - connecting the physical world to the information world – the Internet of things
 - overlay multicast not panacea for state scaling & many other problems [1]
- resilience & availability
 - DoS resistance
 - making reliable systems out of unreliable parts (multilayer)
 - detecting, locating and fixing incipient errors & failures
 - higher layers coping with dynamic mobility & re-routing
 - policy-driven auto-configuration
- resource allocation / congestion control / fairness
 - longest lasting architectural vacuum – becoming acute
 - solution obscured by a dogma [2]
 - hi b/w-delay: no point provisioning capacity if ‘slow-start’ limits load



[1] Briscoe “The Implications of Pervasive Computing on Network Design” (2006)

[2] Briscoe “Flow rate fairness: Dismantling a religion” (Oct 2006)

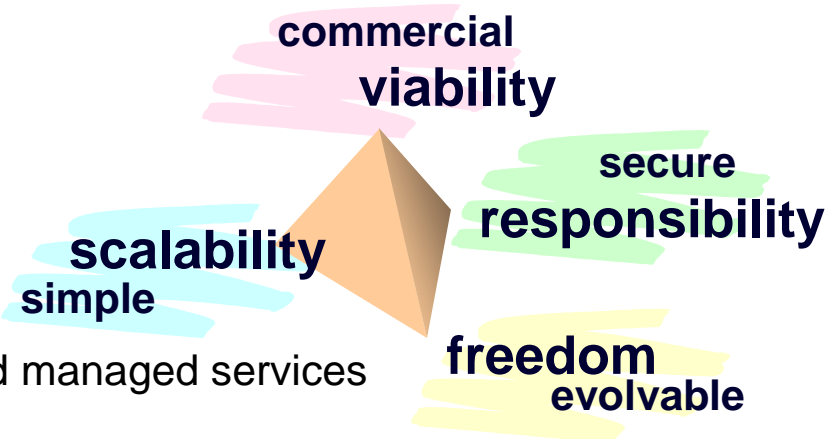
<<http://www.cs.ucl.ac.uk/staff/B.Briscoe/pubs.html>>

networks research – enduring tensions

design for tussle

between outcomes in this space

- not just self-supply (p2p, ad hoc)
 - but co-existence of ad hoc and managed services
- not just endpoint control
 - but co-existence of end control and edge (middlebox) control
- not just individual security / privacy
 - but co-existence of individual freedom and social/corporate control
- balance between approaches determined by natural selection
- imposing your political values through your design
 - just means your design will get distorted (if it's ever deployed)
- fine in theory, but where's the practice? [3]



[3] Briscoe “Designing for tussle; case studies in control over control ” (2004)
<<http://www.cs.ucl.ac.uk/staff/B.Briscoe/present.html#0406pgnet>>

one more research theme

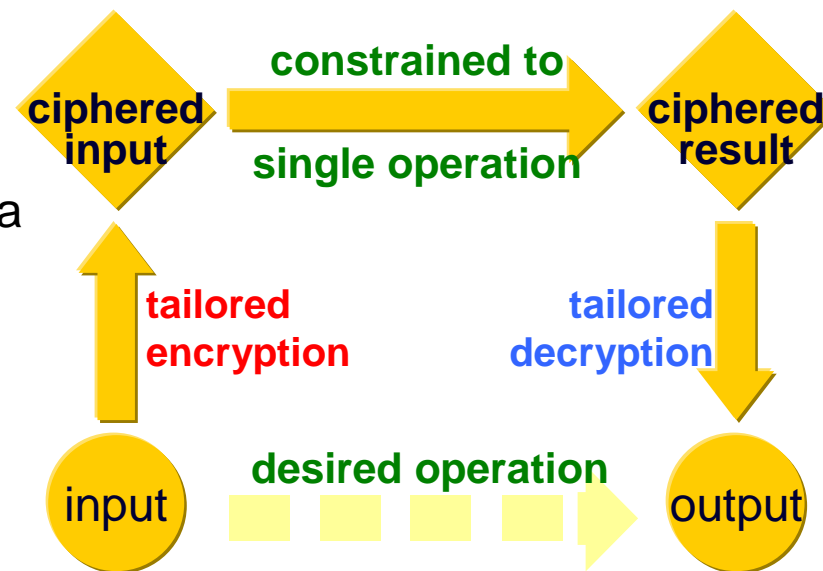
building blocks for resolving tussles?

- find *practical* homomorphic cryptosystems

- ‘computing in cipherspace’

- existing solutions

- searching in encrypted data
- voting
- second price auction
- trace anonymisation



in summary

- eat your vegetables then you can have your dessert
 - have as much spice as you want on your vegetables
- classic distributed computing problems to solve
- avoid sexy research fashions
 - active networks, multihop wireless, p2p overlays
 - unless treated as exemplars of the classic problems
- instead sex up the classic problems with some tussle

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