

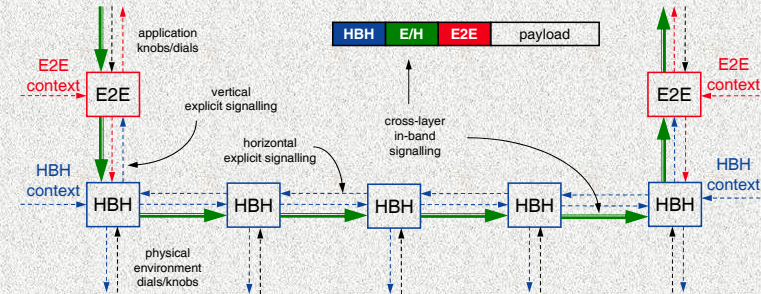
Cross-Layer Optimisations for Survivable Networking

Piyush Upadhyay, Manolis Sifalakis, David Hutchison, James P.G. Sterbenz – www.ittc.ku.edu/resilinet

Protocol Layering

- Traditional strict layer boundaries
 - good architectural abstraction
 - layers based on network roles
 - separation of concerns
 - e.g. IP over any link layer (802.n, SONET,...)
- Strict layering results in poor performance
 - too much information hiding
 - need *translucency* between layers
 - implicit assumptions \Rightarrow improper response
 - e.g. TCP over wireless throttles on corruption
 - limits cross-layer modular-reuse of functions

2-Layer Model: E2E | HBH

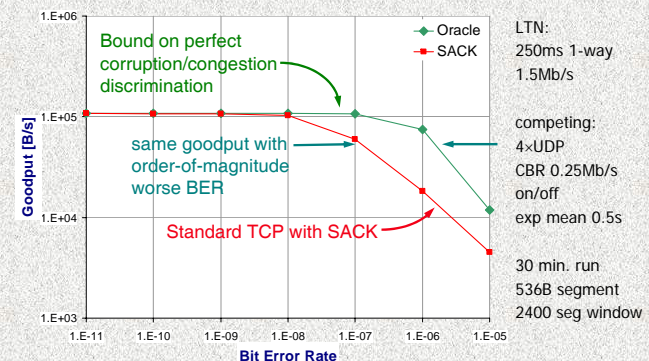


- Initial ns-2 model: end-to-end & hop-by-hop
 - other layers (e.g. path routing) later
- Gain fundamental understanding
 - cost (complexity) vs. benefit (performance)

Cross-Layer Optimisations

- Relax layer semantics: fuzzy boundaries
 - improve performance and survivability
 - while retaining most benefits of layering
- Cross-layer control loops
 - *dials* expose characteristics below
 - *knobs* influence behaviour
 - e.g. error control based on loss characteristics
- Composable protocol functionality
 - new modules (e.g. FEC, ARQ) as needed
 - functionality may reused by multiple layers

Performance Gains



- Performance bound (perfect information)
 - cause of loss explicitly signalled to TCP
 - previous TCP ETEN work [Krishnan+Sterbenz2004]