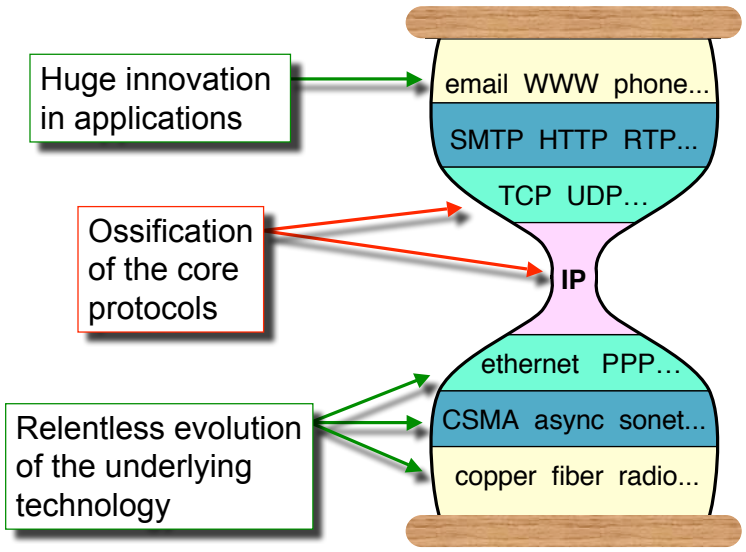
On Evolvability, Architecture, Tussle, Layering and Signalling

Mark Handley
UCL

Change

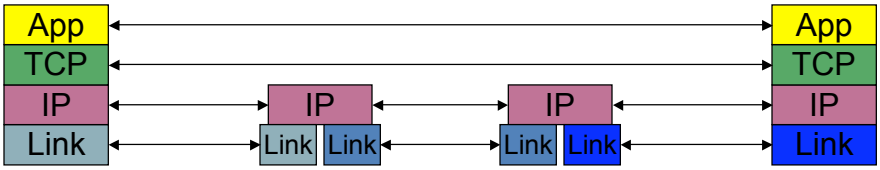


Tussle and the death of end-to-end.

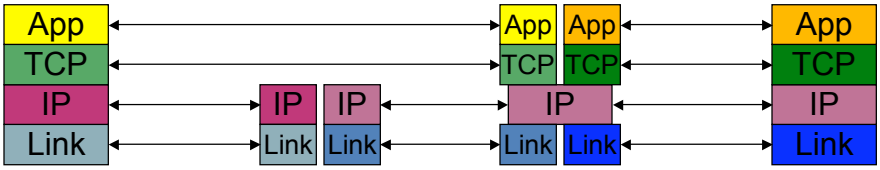
Different parties want varying degrees of control over connections.

- End systems (obviously) - to enable applications.
- Firewalls - to enhance security.
- Deep packet inspection - to differentiate service.
- Link layers - to enhance transport performance.
- Transparent caches - to enhance application performance, reduce bandwidth costs.
- Security services - to be spooky.

Current Layered E2E Architecture



Current Sort-of-Layered Sort-of-E2E Architecture



Evolvability

- Any new architecture must permit tussles to play out *within* the architecture.
- Alternative is:
  - Difficult to evolve because of unintended feature interactions.
  - Eventual ossification and stagnation.

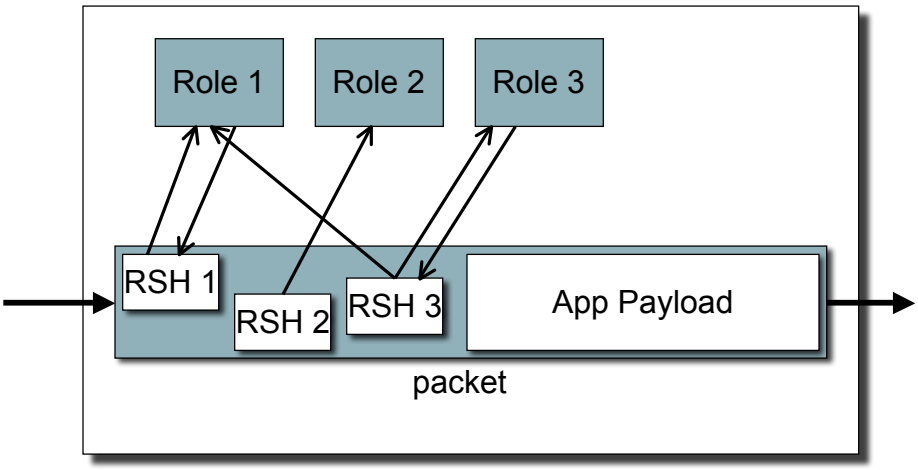
Some New Approaches

- Role-based Architecture.
- Connection Signalling.

Role-based Architecture

- Break packets into separable functionality.
  - Avoids unnecessary coupling as the architecture evolves.
- Address sub-packets to entities that perform specific roles.
  - Provides a way to talk to an entity (eg Firewall) other than the remote end system.
  - May not know its address (or it may not have an address).
- Allow entities along the path to add or remove sub-packets as required to perform their job.
  - Provides a place in the architecture for them.

Roles and Role-Specific Headers



Contrived Example

```
RSH( Forward.HbH@*; B, A)
RSH( AppMux@B; destPort, SrcPort )
RSH( Firewall@*; ``Disable = Cache")
RSH( Cache@*; )
RSH( DestApp@B; <payload>)
```

- Directive indicates data can be cached, but then indicates to the firewall to disable the Caching directive.
- Allows caching only within the firewall.

Connection Signalling

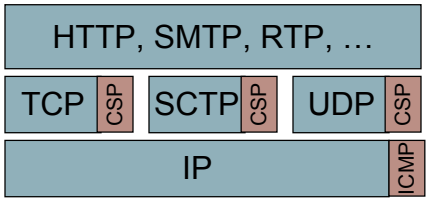
Use a signalling protocol ("CSP") to initiate all transport connections.

- Not VCs though, connections can still be datagrams.

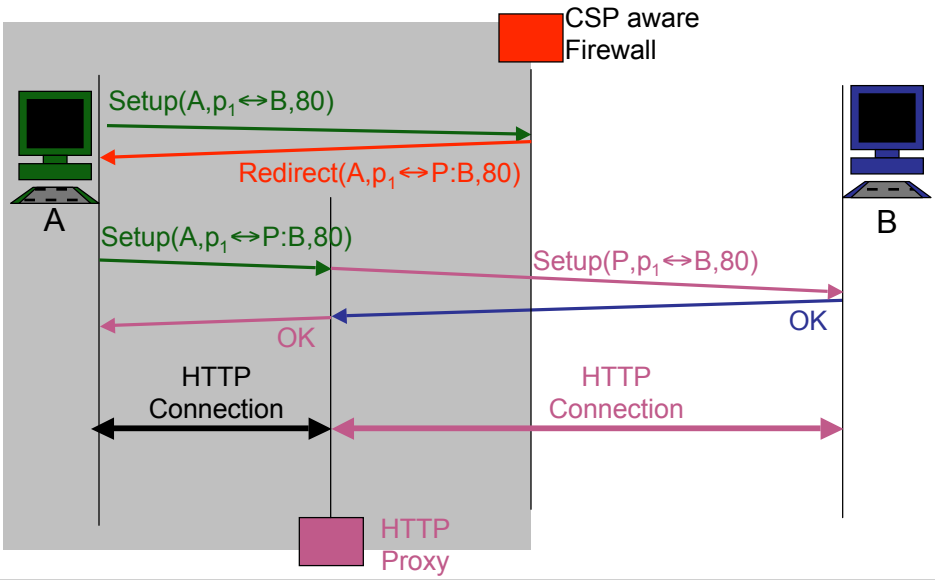
Not strictly layered under or over transport protocols.

- More like alongside, akin to how ICMP is to IP.

Provides a hook within the architecture for different entities to signal their needs.



Firewall redirect to offpath proxy



Hidden Mobile Server