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ENERGY SCIENCES NETWORK

Intelligent Networks

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Disclaimer

The views expressed here reflect my personal (delusional?) perspectives and should be taken as such

Future of Networks

- “Layerless” Networks
- Dynamically Adaptive Networks
- Atomic Services and Service Chaining

“Layerless” Networks

Premise: *Networks of today have clearly defined layers (e.g. L1-L3), but emerging technologies are blurring the lines*

Motivation: IP has worked well as an abstraction for end-to-end connectivity, but loses efficiency due to network layering (e.g. adaptation/de-adaptation overheads, fragmentation, replication of functions (e.g. protection at layer 1, 2), etc)

Hard Problems:

- How do you model such technologies and capabilities?
 - e.g. ARCHSTONE [DoE], OGF Network Markup Language WG (NML-WG), ONF Forwarding Abstractions WG (FAWG)
- How do you design a control language that provides the needed flexibility?
 - e.g. ONF OF2(?)

Dynamically Adaptive Networks

Premise: *Networks of today are reasonably static, but as traffic ebbs and flows, the network should adapt accordingly*

Motivation: Best-effort routing selects a best path based on static metrics, this create hotspots in the network causing application throughput throttling due to perceived congestion

Hard Problems:

- How do you request specific service requirements from the network? (External Trigger)
 - e.g. OGF Network Service Interface WG (NSI-WG), Google B4, SDX
- What information should a network monitor to trigger re-optimization? (Internal Trigger)
 - e.g. HNTES [DoE]

Atomic Services and Service Chaining

Premise: Today's networks generally just provide connectivity, but future networks will incorporate additional services to enhance the user experience

Motivation: For any remote services, the user's first impression experience is the network (e.g. if the network does not perform, the user experience is impacted regardless of the quality of the remote application)

Hard Problems:

- How do you model and advertise such diverse services (e.g. IDS, data caching, compute, etc) to a user/application
 - e.g. RAINS [DoE], GENI RSpec [NSF], GENUS [EU]
- How does a user/application request for one or more services and chain services together
 - e.g. GENI ExoGENI [NSF], IETF Service Function Chaining WG (SFC-WG), SDX/SDI
- How would you build a suitable AA model for this
 - e.g. GENI ABAC [NSF]

Thoughts?

