Observations regarding a new architecture

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Naming

- Things: objects, services, people, roles
- Types of names
  - descriptive (associative) names – “content”
  - location-related names
- Names mapped to routable tag
- Approach using standard namespaces
  - some can be locally computed
  - general names are variable length
  - hierarchical and flat are both useful

Naming (example)

- URI structure
  - <namespace> : <ns-specific part>
  - http://www.cnn.com
  - isbn:81-7808-101-6
- Can hierarchically decompose as required
- Easily mapped to finite ID using hash
  - if flat routing supported, enough (later)
- Naturally works with anycast

Provenance & Tags

- Generally care less about what entity provided an object than what entity authored it & what it is
- Provenance/tags for objects:
  - verifiable origin and modification lineage
  - content identification
  - handling/dissemination restrictions
    - IP security labels
    - DRM

Addressing & Routing

- “Address” ~ “routing tag”
- *f(name)* → *address*, f may be identity map
- Multiple routing types
  - on names (dns, email, sip?)
  - on variable-len numbers (phone network)
  - on fixed-len numbers (Internet)
- High-level routing requirements
  - operation on given graph [ie. not pure overlay]
  - adjustable using traffic engineering techniques
  - supports expressible policy
- Non-requirements
  - stretch-1 operation
  - hierarchy in addresses
  - only 1 destination address in an ADU

Current Routing Items

- Compact Routing
  - small O(sqrt(n)) tables but not always stretch1
  - extended to topology independence
  - good for scale-free graphs
  - nothing in terms of dynamics
- Overlays that know about underlying graph (VRR)
  - inspired by overlays
  - operates on underlying graph
  - flat space
- Policies for routing
  - algebraic forms
- MANET routing
  - proactive & reactive
  - IP-IP encaps
- Mobile IP

Transport

- Local case: network layer optional
- Fragmentation for two reasons
  - adapting to MTU (current)
  - performance (current for TCP somewhat)
- Application chooses between
  - uncorrected / FEC / ARQ reliability path
  - network coding?
- Storage in network
  - some nodes have more reliable storage
  - can be used to, e.g., offload end node faster

Networking & Storage

- Network hidden behind storage
  - done by AFS / Coda
  - somewhat awkward if interrupted
  - awkward for streaming
- Network hidden behind procedures
  - common RPC services
  - awkward if interrupted
  - awkward for streaming
- Network should understand two types
  - streaming and object ~ ADUs ~ DTN bundles
  - objects mesh with store-and-forward
- *store and forward with support for long-term storage*

ADUs

- ADUs ~ DTN bundles
  - like DTN bundles
- Main features of DTN bundles
  - variable-length src/destination
  - origin time and useful life (time must be sync’d)
  - class of service
  - fragmentation
  - extensions
  - segregation of mutable and non-mutable headers

Security

- Authentication of provenance
  - digital signatures (e.g. IBE) [worry: keygen]
- Protection from transmission disclosure
- Management of unwanted traffic
  - assignment of traffic engineering descriptor
  - ingress filtering of TE descriptor
- Secure notion of time

Layers

- Implementation technique ~ served us well
  - with limited set of protocols
  - and easily ‘abstractable’ link layer
- Issues with layering
  - wrong abstraction (gives rise to tunnels)
  - bad cross-layer interactions
    - ATM cell loss; IP fragmentation; TCP MSS issues; content splitting