Active Signaling Protocol (ASP)
Execution Environment

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ASP Functionality

- Dynamic (remote) loading of AA code
- Security and Resource Protection
- Fine grain network I/O
- NodeOS extended Channel Interface
- User Application (UA) API
- Timing Services
AA Examples

- Ping and traceroute
- Ps, netstat, ifconfig, (remote) cat
- Management apps to map topology
- RSVP and the AFSP variant
- Active Congestion Control (ACC)
- AA probes
ASP Execution Environment

- Hosts the execution of Active Applications (AA)
- User space operating system
- Protocol Programming Interface (PPI)
  - System call interface
- Written in Java with limitations
  - Performance and resource control
Dynamic Loading

• Based on an AASpec
  – AA name
  – Loading path
  – Initial Java class

• Remote loading using either TCP or RDP
Resource Protection

• AA Process Model
• Shared byte code (read only text)
• Separate data space (AA local data)
• Separate file space
• Simple Round Robin scheduling
Security

- Privileged AA(s) have capabilities
- Interface table modification
- Forwarding table modifications
- File space privileges
- Process termination
- VNET packet diversion
Virtual Network Stack (VNET)

- Extensible model including simple layer 2-4 implementations
- Link layers using UDP/IP or ANEP/UDP/IP encapsulation
- IP like unicast network layer with point to point interfaces
- UDP like transport service
- Hop by hop delivery (Router Alert)
Virtual Network Stack (VNET)

• Reliable Datagram Protocol (ACC)
• Zero copy stack
• Mb/s rates with RDP and no Java JIT
IP Network I/O

- UDP and TCP support
- Raw IP support migrating to Netiod
- Fine grain control
  - Header parameters
  - Outgoing/Incoming interface
EE Channel Interface

- VNET, UDP, and TCP
- Interface control "if[n]"
- Extensions
  - EE header processing "if/ip/udp/aaspec"
  - Recv/Send address specs
Timing Services

• Soft State containers with refresh timers
• Retransmission timers
• Can be used for hard state
User Application (UA) API

• Link between applications and the network
• Layered on TCP
• Uses AASpecs for naming and dynamic loading
• No user identity
Anatomy of an AA

- UA Interface
- Activity ID (Globally unique)
- Soft State
Future Work

- Versioning
- AA Interprocess Communication (IPC)
- Better management tools
- AA Java ClassLoader groups
- Network distribution of capabilities
- Raw IP with Netiod and Channel interface
- AA FlowIDs at the ANEP layer (Activity IDs)
- User Identities