IP Architecture Extensions for ATM ("ROLC w/o LIS" Model)

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Assumptions

- We expect the emergence of applications that could benefit from services provided by ATM

Objective

- Provide minimum modifications to the IP architecture to enable full exploration of the ATM capabilities

Current situation

Neither LAN Emulation, nor "Classical" IP over ATM are appropriate to efficiently exploit capabilities of ATM:

- host to host SVCs are constrained by the IP "subnetwork" model
- exploration of ATM capabilities is constrained to a single IP subnet
- building large subnetwork may not be practical

What needs to be done ?

- TCP/IP applications that could benefit from ATM should be supported directly by the ATM infrastructure
- Graceful coexistence with the "traditional" TCP/IP applications (without overburdening ATM)
- Move beyond LAN Emulation and "Classical" IP over ATM
  - Incremental deployment with minimum interdependencies and no large scale coordination
  - Backward compatibility with the current ATM solutions (e.g. LAN Emulation, "Classical" IP over ATM)

When to establish an SVC ?

TCP/IP applications exhibit a wide range of traffic characteristics:

- short-lived, small volume of data (e.g. DNS query)
- long-lived, small volume of data (e.g. Telnet)
- short-lived, large volume of data (e.g. FTP)
- long-lived, large volume of data (e.g. video-conferencing)

When to establish an SVC (cont.) ?

Establishing an SVC, irrespective of the traffic characteristics may be suboptimal:

- additional control traffic (due to short-lived applications)
- unnecessary delay (due to the time needed to establish an SVC)
- additional amount of state maintained by switches
- added complexity due to the need to introduce intelligent circuit management

Conclusion: Need to put SVC management on hosts under **direct** control of the applications (QoS) !

"Local/Remote" Decision (background)

IP subnet architecture distinguishes between:

- "**local**" (reachable directly over a common subnet)
- "**remote**"(can be reached only via routers)

“Local/Remote” in the ATM Environment

- “Local” requires an SVC
- “Remote” requires to go through a router
- “Local” vs “remote” is based on IP addressing information
  - within a LIS **everything** is “local” (requires SVC)
  - outside of a LIS **everything** is “remote” (requires router)

Observation: Since addresses are completely unrelated to applications, we have a poor match for application (QoS) driven SVC management !

An Alternative Proposal

Redefine the concept and semantics of a LIS:

- "Local/Remote" decision is **decoupled** from the IP addressing information

- "Local/Remote" decision is **controlled directly** by applications (QoS)
  - an application with QoS that can justify an SVC may try to establish one – "local" decision
  - all other applications go through routers – "remote" decision

Redefining LIS
(a.k.a. "new and improved" LIS)

- LIS as a mechanism to group a set of hosts with a set of routers for the purpose of providing connectivity for
  - applications that do not benefit from ATM services
  - hosts that are not on a common ATM Network
- LIS as a mechanism to group a set of hosts with a set of routers for the purpose of imposing administrative constraints on connectivity
  - Constraints are imposed at the IP layer

Redefining LIS(cont.)

What is a **new and improved** LIS ?

- A LIS is a set of routers and hosts
- Every element in the set (either a host or a router) can establish an SVC with every other element in the set
- IP addresses of the hosts in the set are assigned in such a way that they can aggregated into a small number of IP address prefixes
- All routers in the set advertise direct reachability to all the hosts in the set – any router in the set is 1 IP hop away from any host in the set

Redefining LIS(cont.)

LIS does not constrain the ability to establish an SVC.

- A pair of hosts may establish an SVC **regardless** of the LIS boundaries
- A pair of hosts may communicate through router(s) **regardless** of the LIS boundaries

Redefining LIS – Summary

"New LIS" model = ROLC model − vestige of "Classical IP" model

- The ability to establish an SVC between hosts on different IP subnetworks (ROLC model)
- The ability to go through a router between hosts on a common IP subnetwork (eliminating vestige of "Classical IP" model)

Note: perhaps need a better term than "New LIS" – suggestions are welcomed.

Required Modifications

- Modify hosts to allow applications directly control "local/remote" decision
- Modify hosts to allow applications (QoS) directly control SVC management
- Modify routers to suppress ICMP Redirects within a single LIS
- Need mechanisms to perform ATM network-wide address resolution irrespective of IP addresses
  - possible alternatives are NHRP, NBMA ARP, algorithmic mapping, DNS, etc...
- Establish transition strategy from the current environment (LAN Emulation, "Classical" IP over ATM)

Results:

- ATM infrastructure for applications that could benefit from ATM capabilities, with the router-based overlay for all other applications

- Combines switch-based infrastructure with router-based overlay, and uses each for that which is best suited

Documentation

- draft-rekhter-ip-atm-architecture-00.txt