A Framework For IPv6 Over ATM

draft-schulter-ipv6atm-framework-00.txt

Peter Schulter

Markus Jork

Digital Equipment Corp

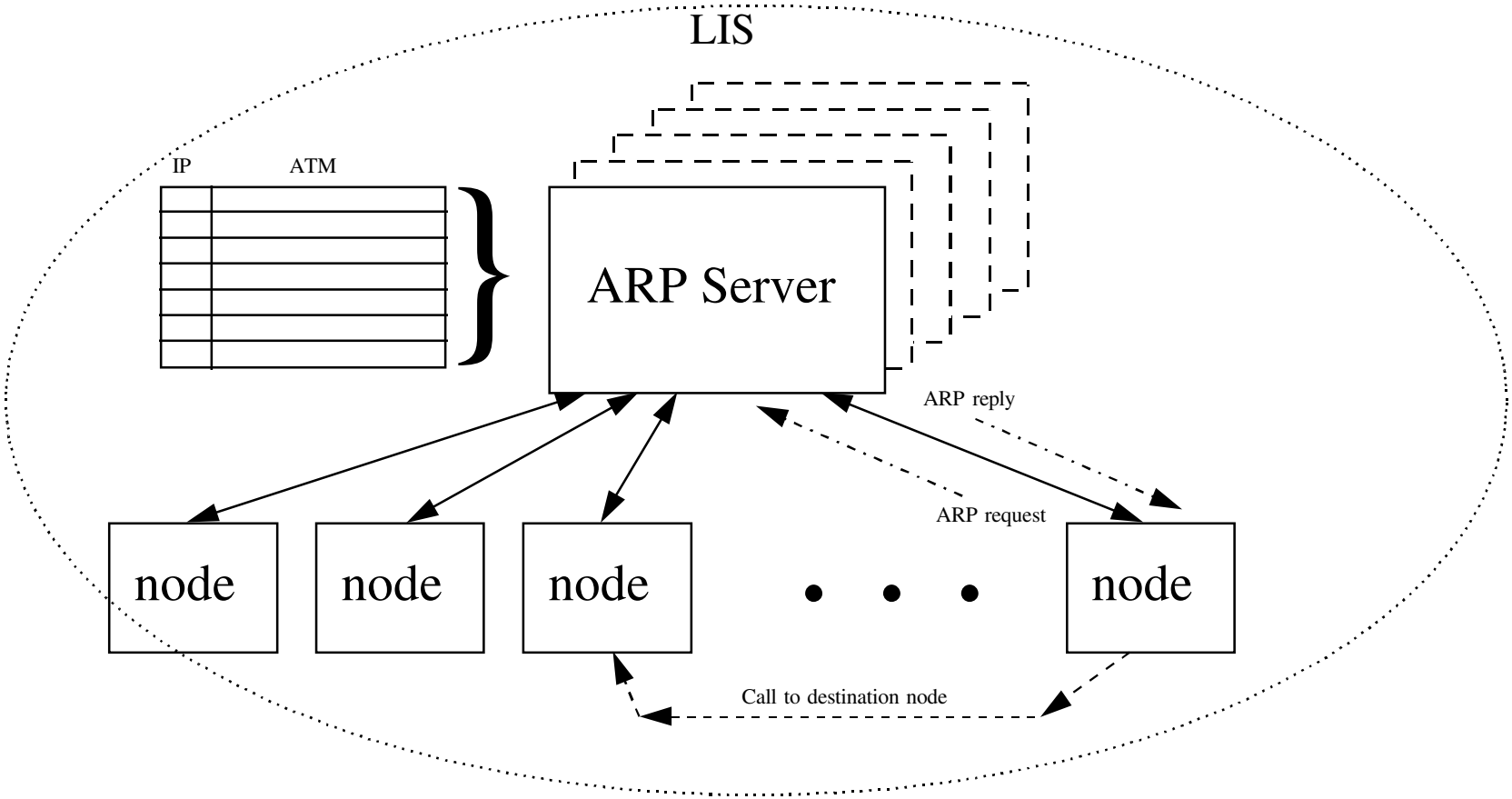
schulter@zk3.dec.com

jork@nestvx.enet.dec.com

Requirements & Goals

- Provide IPv6 to ATM address resolution
- Introduce no new protocols to hosts and routers
- Maintain subnetwork model while providing “cut-through” for QoS services using only IPv6 ND protocols
- Maintain IPv6 addressing hierarchy
- Maintain IPv6 address configuration models
- Minimize the amount of state information needed by servers
- Scalable
- Fault tolerant and autoconfigurable

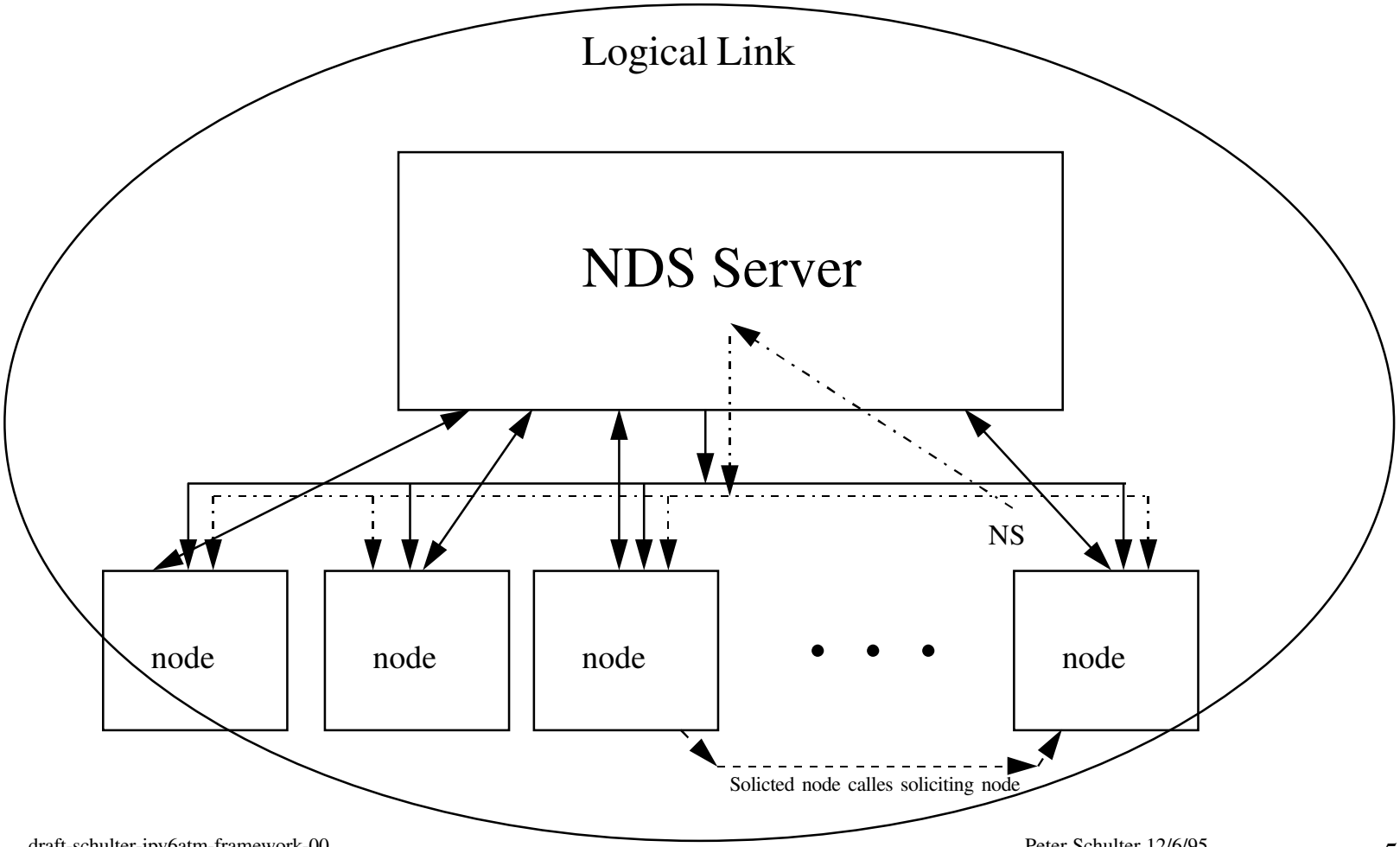
Current IP over ATM Model



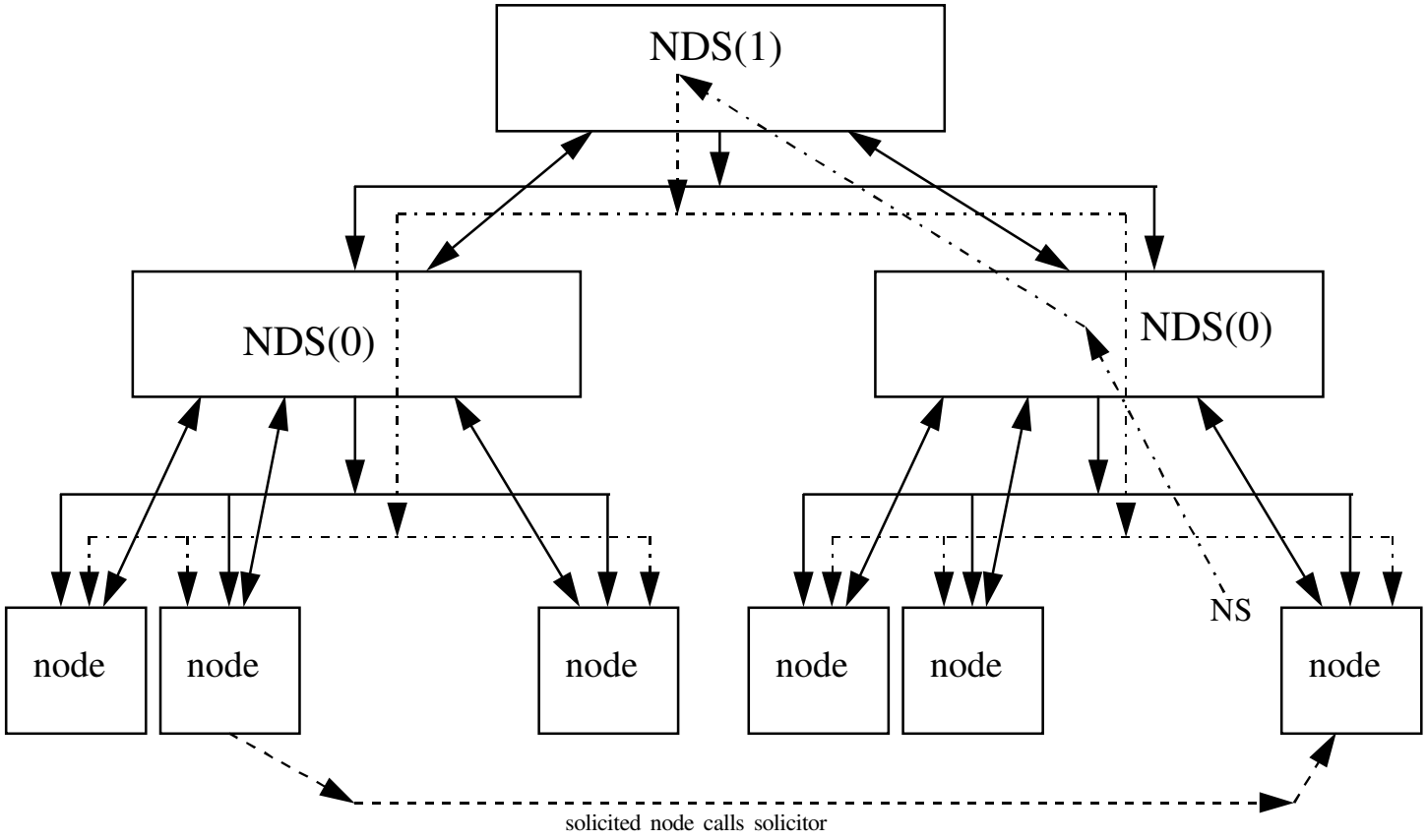
Logical Links

- Semantically equivalent to a LIS
- Maintains subnet boundaries
- Fully supports link-local addressing
- Provides multicast capabilities for
  - all-nodes multicast address
  - all-routers multicast address
  - solicited host multicast address
  - DHCPv6 server multicast address
- Uses ND protocols for address resolution — does not require a resolution database server
- Uses Neighbor Discovery Servers (NDS) to provide an assist to the ND protocols

Logical Link Model for IPv6



Expanding the Logical Link



Connecting Logical Links

Logical links can be connected using routers and NHRP to maintain the LIS/subnet model.

OR

Logical links can be connected by extending the NDS tree beyond the Logical Link level and allowing limited ND activity between Logical Links

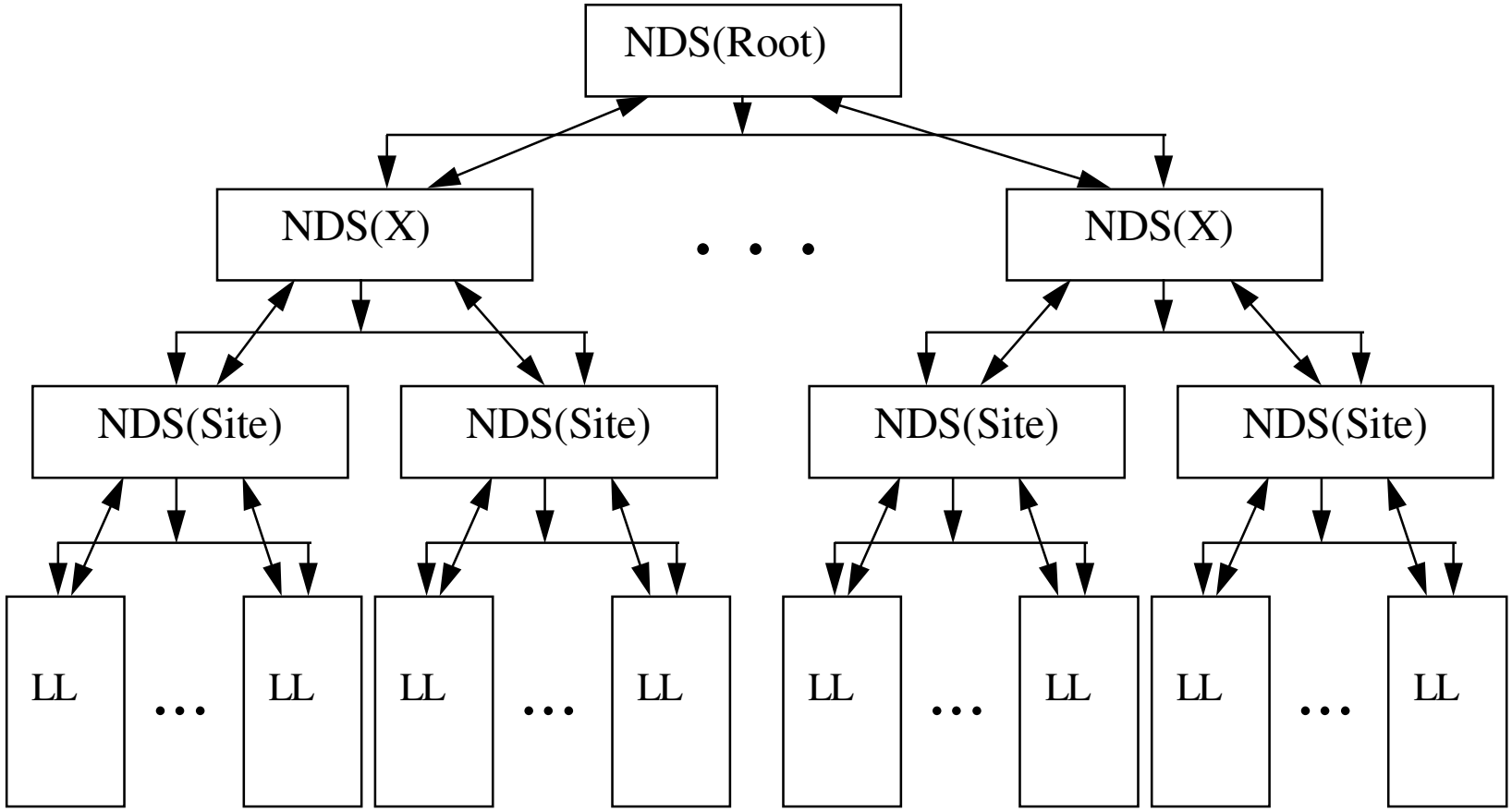
Logical vs. Physical On-link

- Physically on-link — nodes are capable of connecting
  - All nodes on an ATM network are physically on-link
- Logically on-link — nodes are permitted to connect
  - IPv6 determines which nodes are directly reachable ˝“on-link” by associating a set of prefixes with a network interface
  - Nodes not “on-link” are reachable only through a router
- By managing prefix information, each node’s idea of which ˝prefixes are “on-link” can be made to include prefixes on other ˝Logical Links
- Cut-through is then possible and requires no new protocols on ˝hosts or routers
- IPv6 addressing semantics are still maintained

Beyond Logical Links

- Logical Links can be aggregated into “Sites” by extending the NDS tree structure vertically
- Similarly, “Sites” can be aggregated into larger units
- IPv6 Address scope boundaries are defined administratively
  - Link-local address are not visible outside Logical Links [NDS(LL)]
  - Site-local addresses are not visible outside “Sites” ˝[NDS(Site)]
  - Global addresses are visible throughout the NDS tree ˝[NDS(Root)]
  - Anycast addresses can be supported
- NDS servers maintain prefix information only
  - Prefix information is distributed via router advertisements
  - NDS’s associate prefixes with the VCs on which the prefix advertisement was received
- NDS servers control and route ND packets, and limit the scope of ND packets

Global NDS Trees



Autoconfiguration & Failover

- Autoconfiguration uses UNI 4.0 Anycast addressing with organizational scopes
- Autoconfigured NDS tree are limited to 16 levels and have one anycast address assigned to each NDS tree level
- UNI 4.0 Anycast scoping is used to control tree formation and ˝NDS reachability
- Tree configuration (connection of the hierarchy) is automatic ˝but is dependent on ATM network topology
- Nodes and servers recover automatically from NDS failures
- Nodes can automatically relocate between Logical Links where ˝ATM network topology does not provide the desired connectivity
- IPv6 Stateless address configuration and DHCPv6 work with no modifications

Work to be Done

- Current draft is incomplete
- Need to address multicast
- Need to address security
- Need to address routerless Logical Links (i.e., no local ˝router advertisements generated)
- Additional drafts to cover NDS protocols and procedures, and ˝VC setup and usage (covering also QoS and RSVP issues)