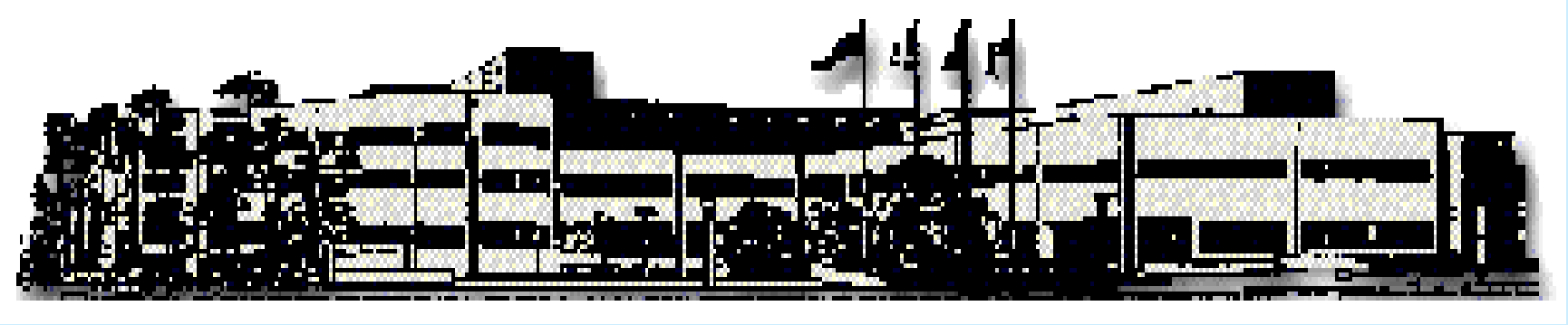
~ ATN Seminar – ATN Routing ~

Chiang Mai, Thailand

December 2001



Federal Aviation Administration (FAA) William J. Hughes Technical Center (WJHTC)

ATN Routing Using IDRP

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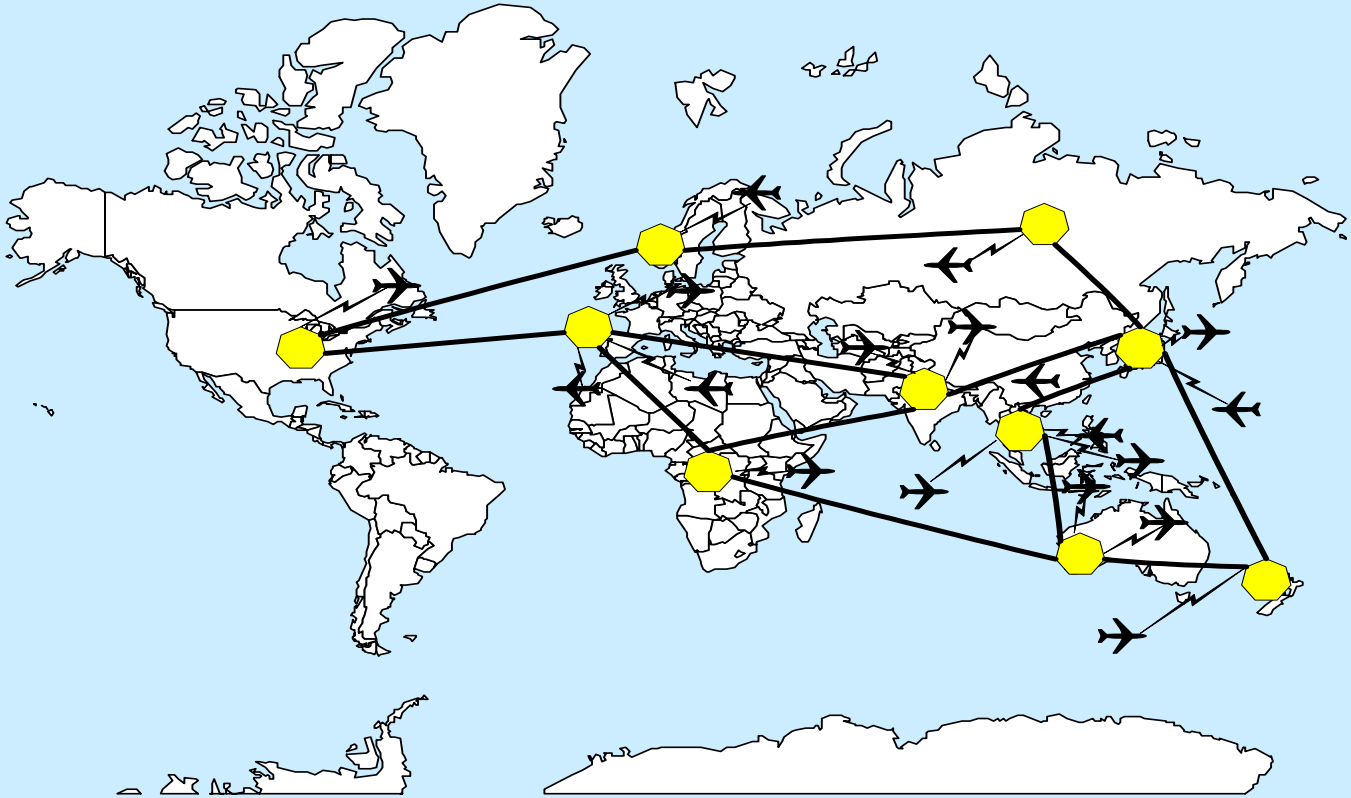
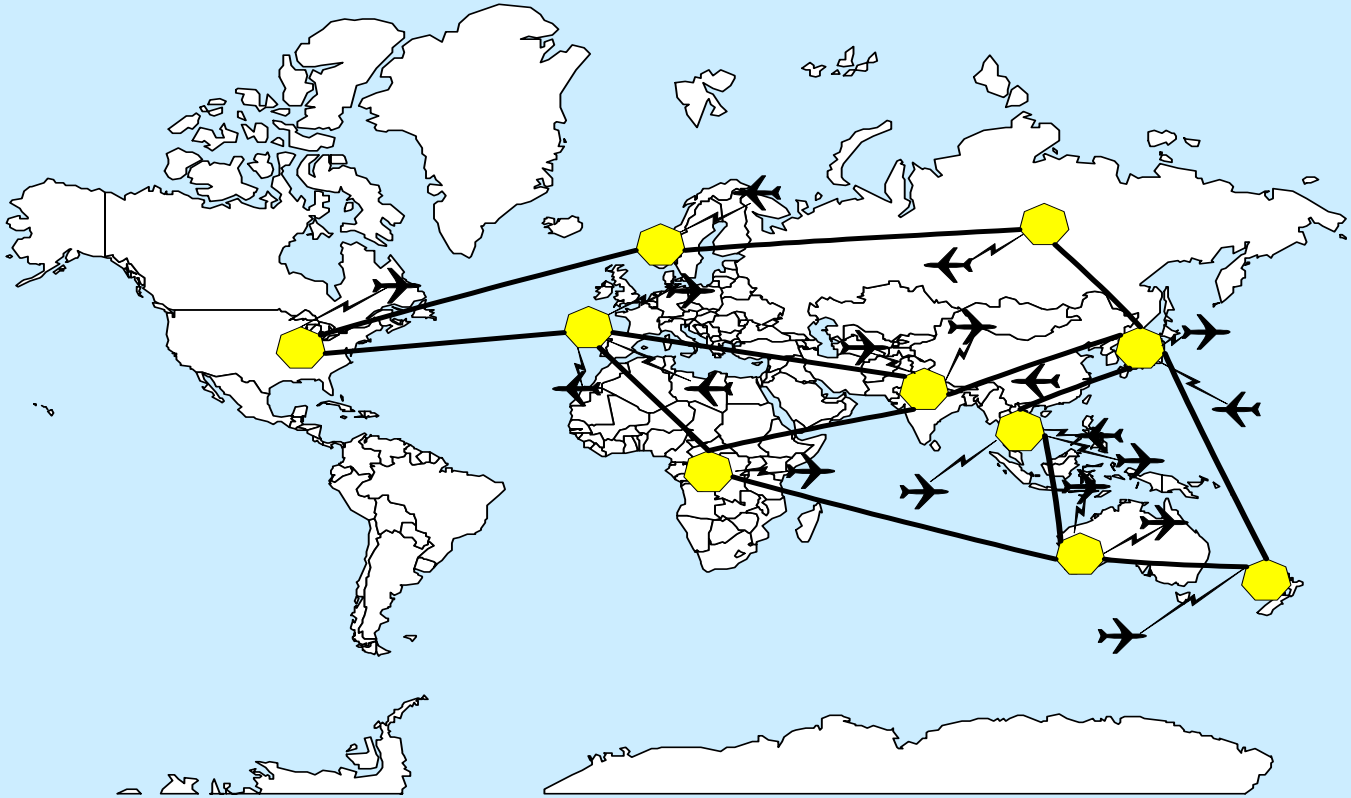
(US FAA)

Aeronautical Telecommunication Network



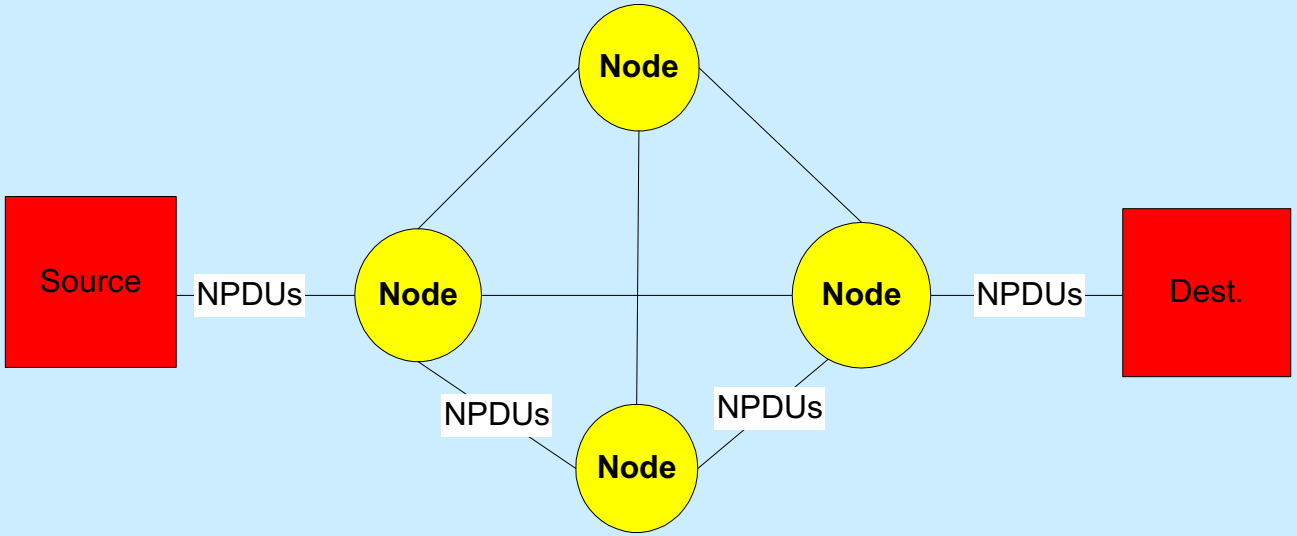
- Some ATN Goals:
  - Transparent connectivity from ground systems to aircraft
  - International connectivity among ground aviation systems

Aeronautical Telecommunication Network



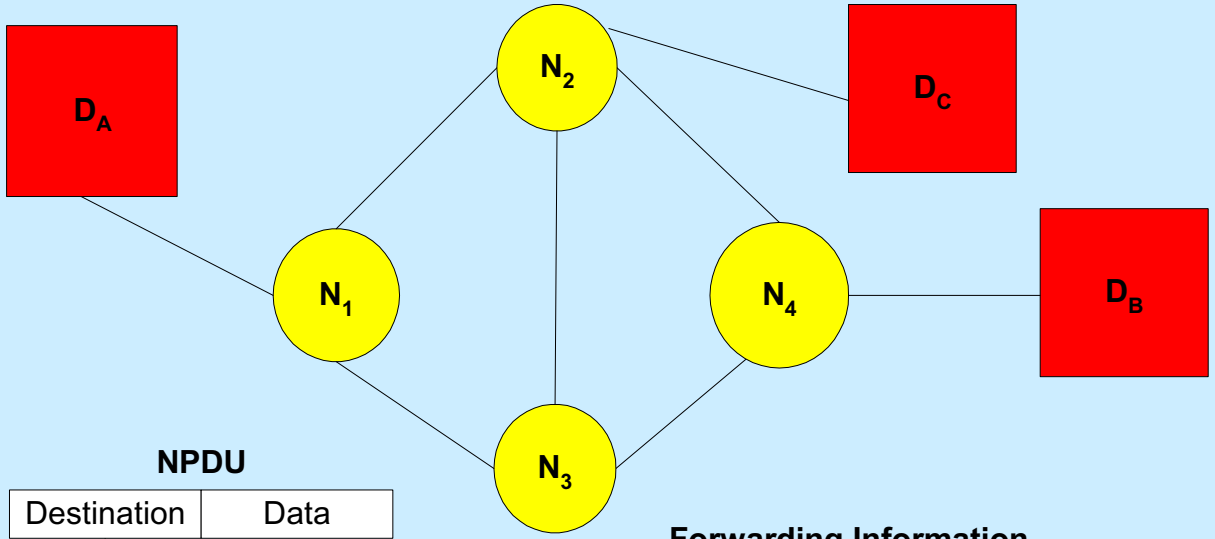
- How to Reach these ATN Goals: ROUTING
  - With support for Mobility
  - With administrative control on permitted connectivity and use of network resources

Routing



- ROUTING - A general view
  - Getting Network Protocol Data Units (NPDUs) from source to destination

Hop-by-Hop Routing



NPDU

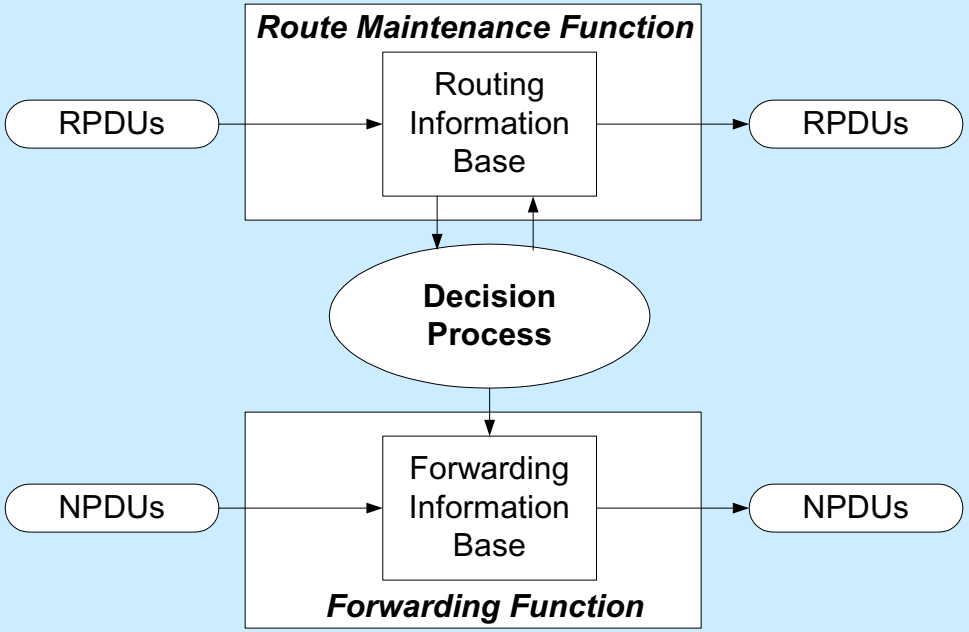
Destination	Data

Forwarding Information Base (for N_3)

D_A	N_1
D_B	N_4
D_C	N_2
.	.
D_x	N_x

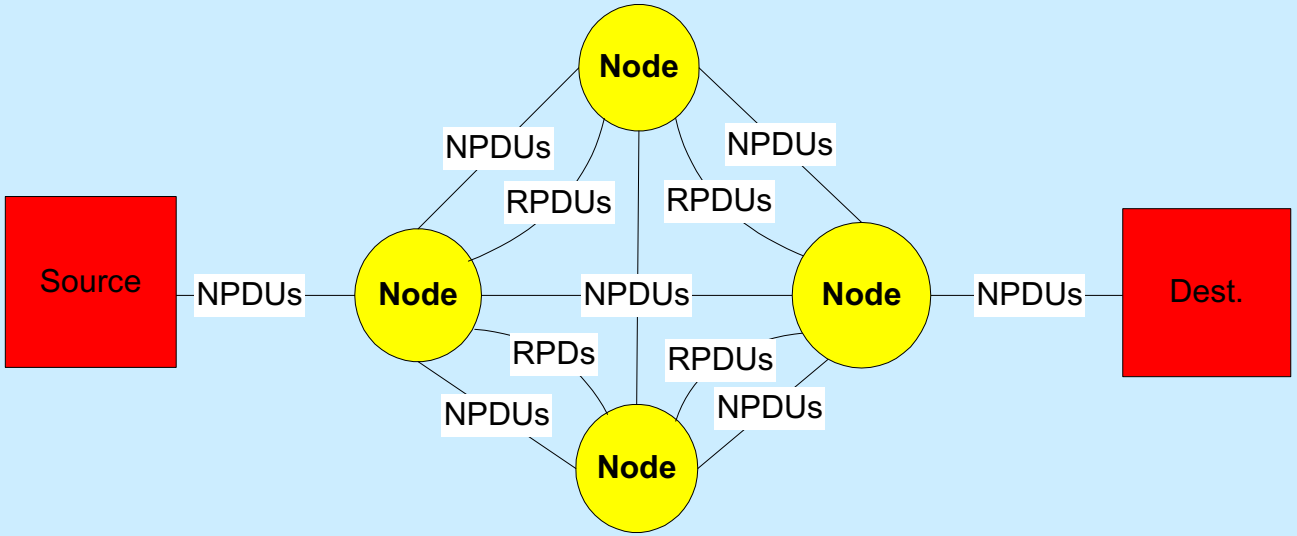
- Hop-by-Hop Routing
  - Each node maintains a Forwarding Information Base, which contains the next network node for specific/aggregate destinations

Routing Functions



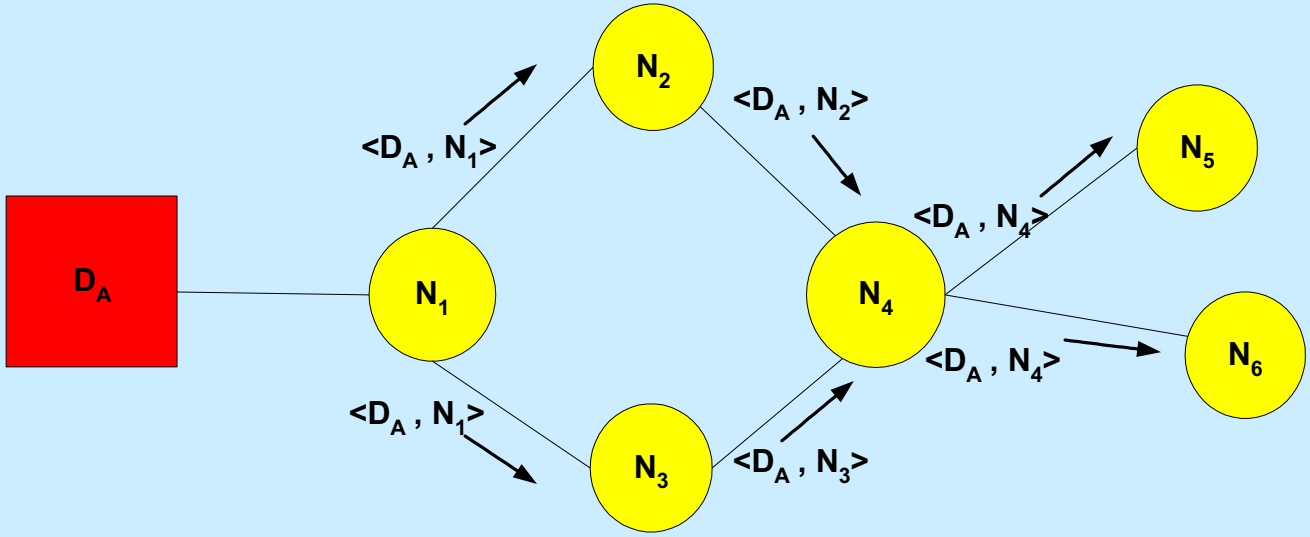
- Routing involves two functions: "route maintenance" and "forwarding"
  - Route maintenance refers to update of the Routing Information Base
  - Forwarding refers to relaying of NPDUs using the Forwarding Information Base
- Route maintenance may be static or adaptive (i.e., dynamic)
  - adaptive route maintenance involves the exchange of Routing PDUs

Distributed Adaptive Routing



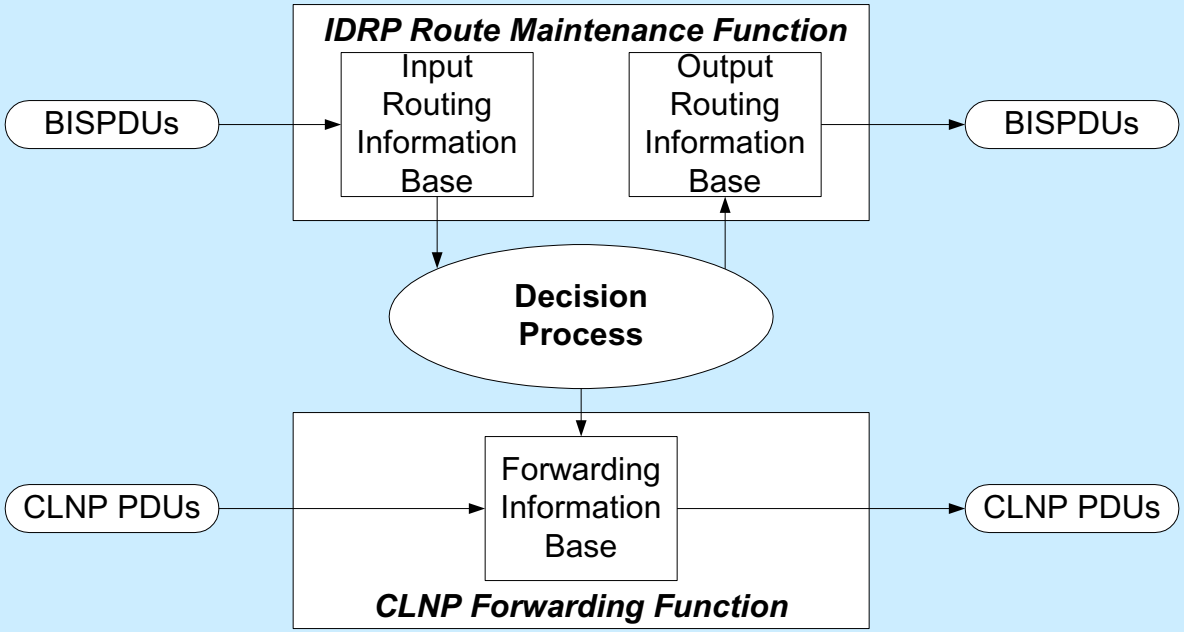
- Adaptive routing may be centralized or distributed (ATN method in figure)
- There are two ways to do distributed adaptive routing
  - a change can be broadcast to every node in the network (called link state routing)
  - a change can be propagated through network as needed (called distance vector routing)

Distance Vector Routing (RPDU Propagation)



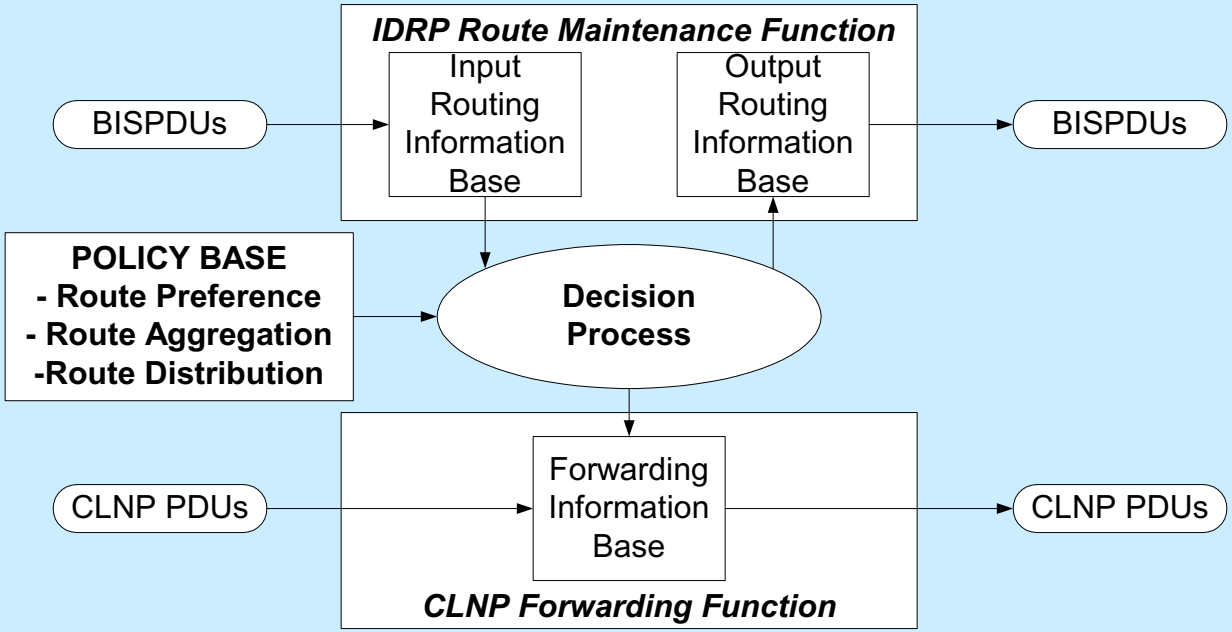
- The OSI Inter-domain Routing Protocol (IDRP) used in the ATN is a "distance vector" type of distributed adaptive routing protocol
- In simplified example, Node N will send an RPDU of the form <D,N> which indicates that Node N can reach destination D

IDRP Routing Functions



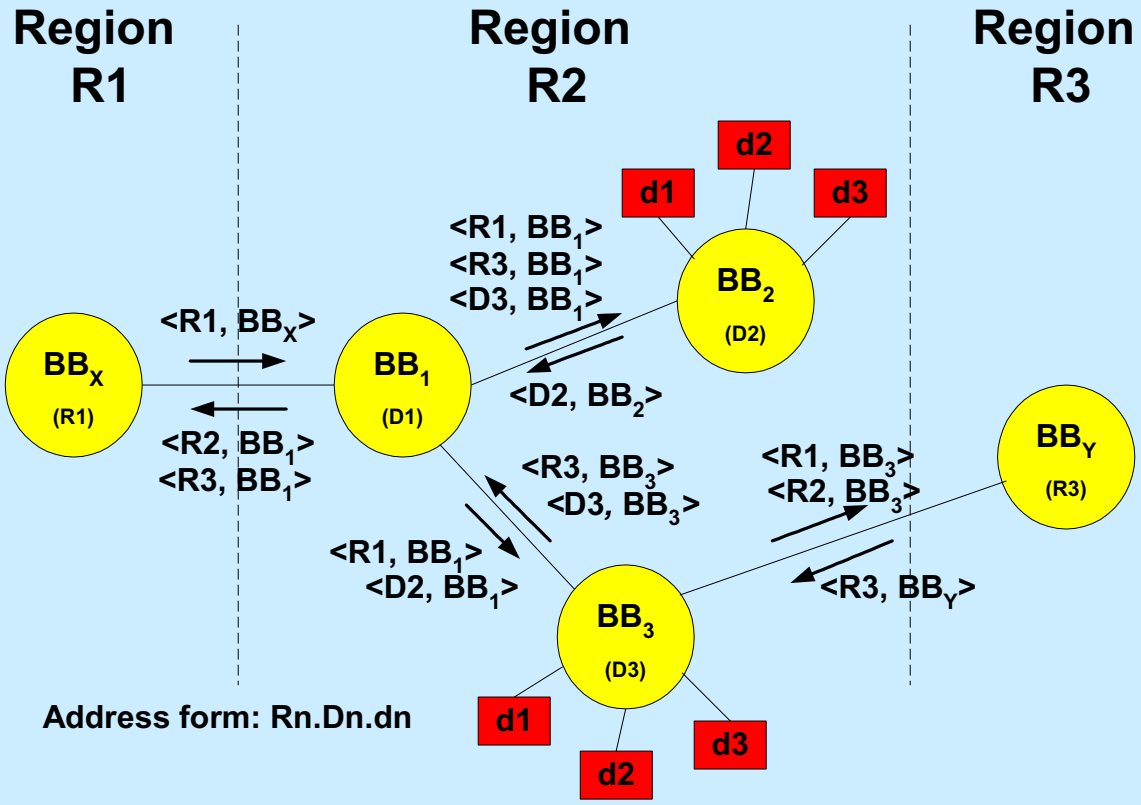
- An IDRP router is called a Boundary Intermediate System (BIS)
  - Routing PDUs are called BISPDUs
  - Routing PDUs can carry additional information about routes
  - Network PDUs are called CLNP PDUs

IDRP Policy-based Routing



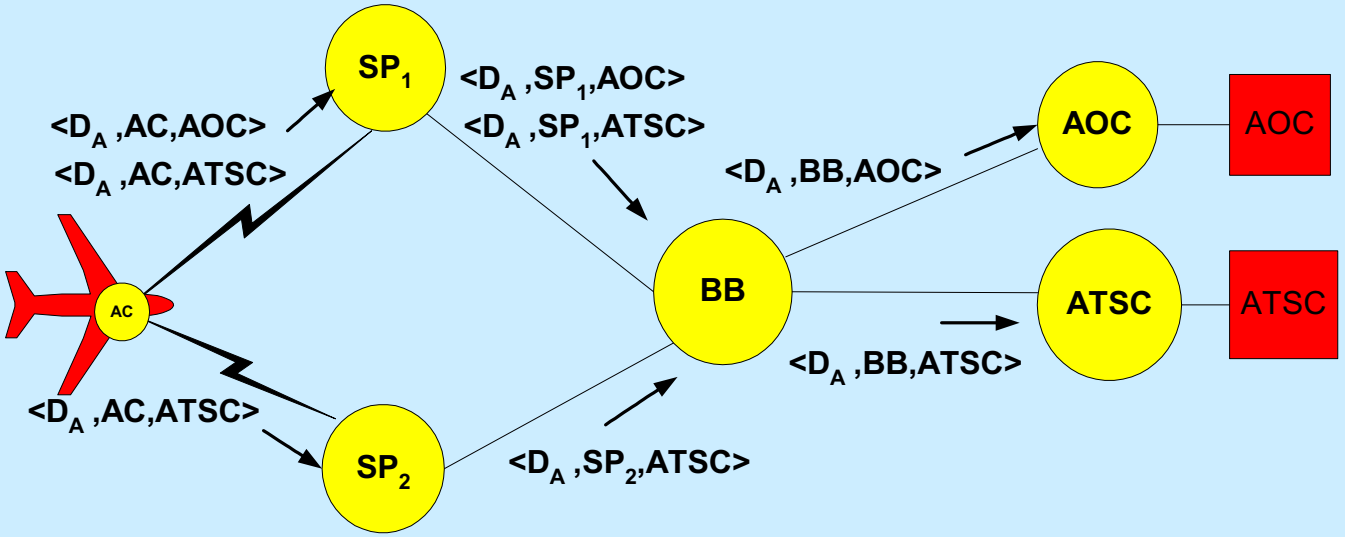
- The IDRP decision process is conditioned by the policy base
  - Route Preference policies determine which routes are accepted from other BISs
  - Route Aggregation policies determine how routes are combined (for distribution)
  - Route Distribution policies determine which routes are propagated to other BISs
    - Selective advertisement allows administrations to control use of their network

Example Policy-Based Routing



- Inter-Regional and Intra-Regional Policy Goals:
  - Region R2 is a transit domain for Regions R1 and R3
  - Sub-region D1 is a transit domain for Sub-Regions D2 and D3

Example Mobile Routing



Summary

- ATN Routing uses the IDRP Routing Protocol
  - IDRP supports policy-based routing which allows administrations to autonomously control use of their network
  - IDRP supports mobility by permitting aggregate routes to be selectively propagated through the network
- The Asia and Pacific ATNTTF is defining:
  - common policy requirements, and
  - guidance for local policy in the region