Framework of ST2+ over ATM

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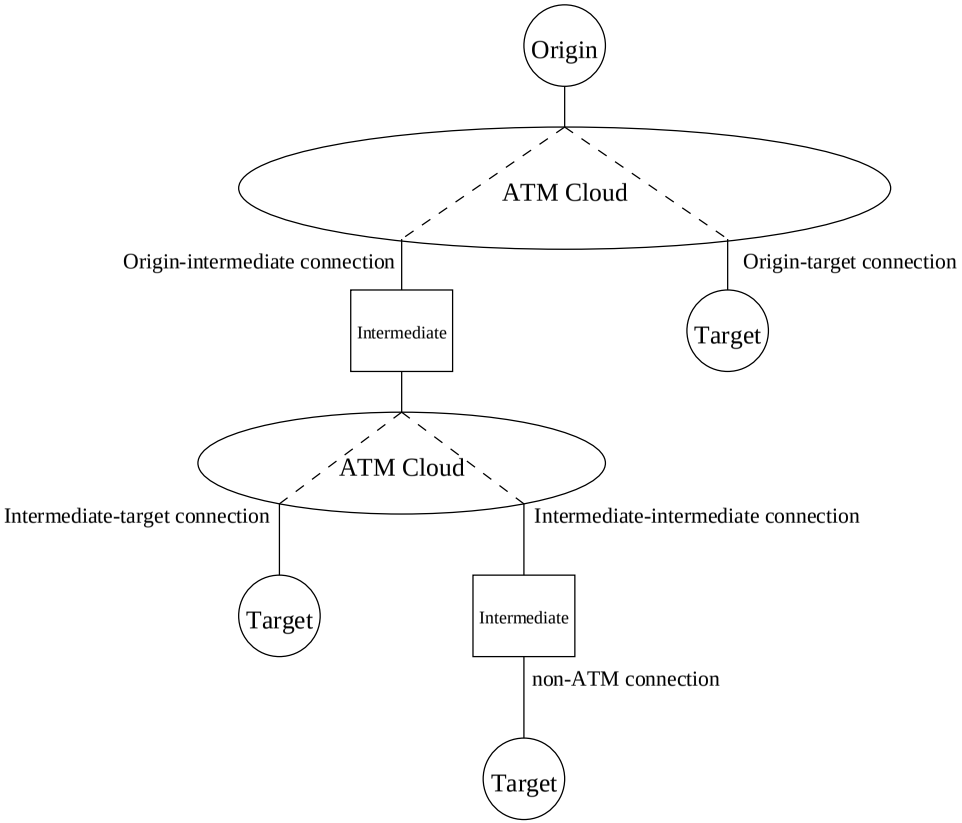
- Purpose of ST2+ over ATM
  - To specify an ATM-based communication protocol between ST2+ agents.
    - ST2+ over ATM aims to achieve ATM/non-ATM interworking in the ST2+ tree structure stream.
    - It doesn't aim to replace the entire ST2+ tree structure stream by an ATM point-to-multipoint connection.

- Basic Architecture of ST2+ over ATM



- Features of ST2+ over ATM
  - ST2+ over ATM achieves resource reservation communications across ATM and non-ATM networks.
    - ATM native API supports resource reservation communications only inside the ATM network and can't support interworking with non-ATM networks.
      - No connectivity with terminals having no ATM interfaces.
      - ATM native API doesn't support IP address and SAP (port) addressing systems.

- Features of ST2+ over ATM (cont'd)
  - ST2+ over ATM reduces UNI 3.1/4.0 signaling limitations.
    * ST2+ SCMP supports MTU size negotiation with all receivers belonging to a stream.
    * UNI 3.1/4.0 support only max CPCS-SDU (= MTU) negotiation with the called party of a point-to-point call or the first leaf of a point-to-multipoint call.

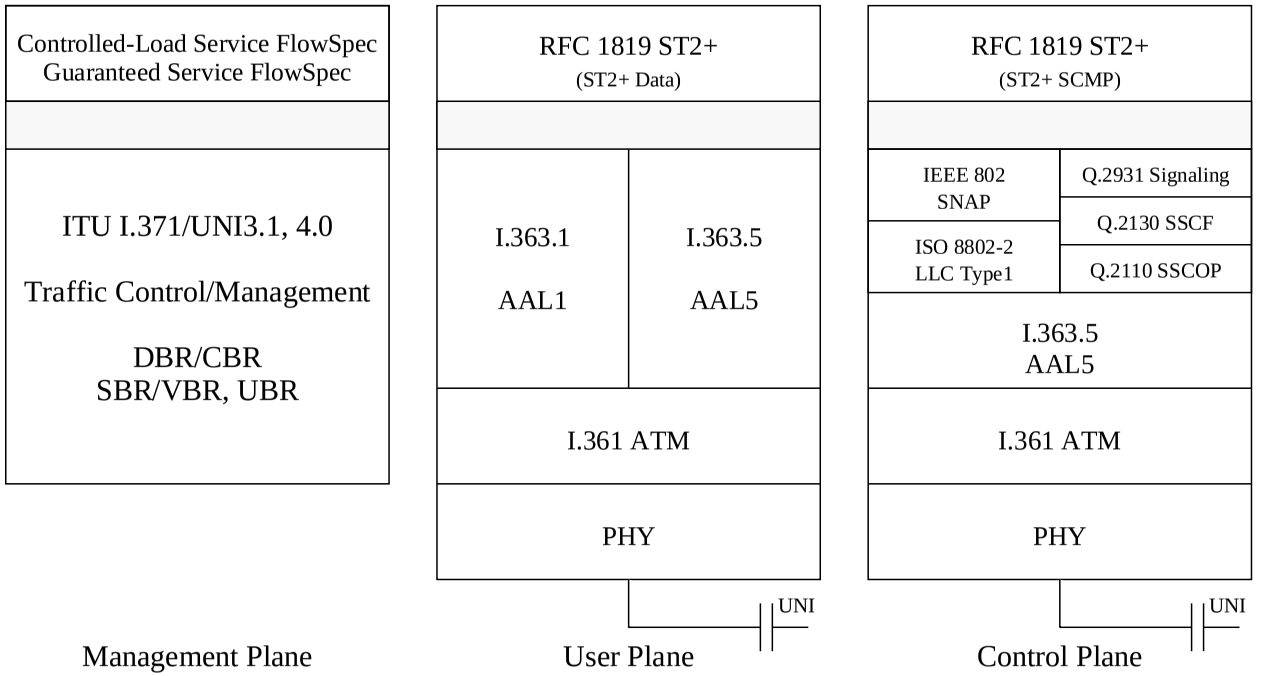
- Features of ST2+ over ATM (cont'd)
  - ST2+ over ATM reduces UNI 4.0 LIJ signaling limitations.
    * It supports UNI 4.0 LIJ Call Identifier notification from the root to the leaf using a ST2+ SCMP extension.
    * It solves the problems of LIJ Call Identifier discovery at the leaf side, which is a big issue of UNI 4.0.

- Goals of ST2+ over ATM
  - Specify a protocol interaction between ST2+ and ATM on the ATM Forum Private UNI 3.1/4.0 (S_B point).
  - Map one ST2+ Data hop into one ATM VC on the UNI.
  - Support ATM and non-ATM interworking of ST2+.
  - Support both SVC and PVC.
  - Does not require any ATM specification changes.

- Goals of ST2+ over ATM (cont'd)
  - Coexistence with RFC 1483 IPv4 encapsulation.
  - Coexistence with RFC 1577 ATMarp.
  - Coexistence with RFC 1755 ATM Signaling for IPv4 over ATM.
  - Coexistence with NHRP.
  - I.371 (1996) ITU new traffic control standard consideration for ATM WAN connectivity.

- Non-Goals of ST2+ over ATM
  - Because ST2+ is independent of both routing and IP address resolution protocols, ST2+ over ATM doesn't specify the following protocols.
    - IP-ATM address resolution protocol.
    - Routing protocol.
  - Because ST2+ over ATM specifies protocol on the UNI, it is independent of:
    - NNI protocol.
    - Router/switch architecture.

- Protocol Specification Points
  - ST2+ over ATM consists of protocol specifications of the following three planes.

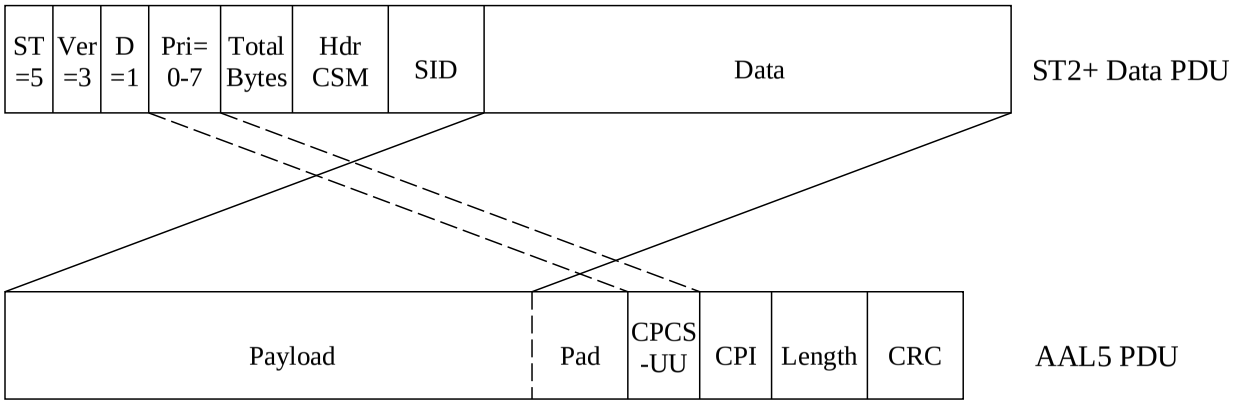


- Management Plane
  - Management Plane is concerned with Int-Serv FlowSpec mapping to ATM traffic descriptors and QoS parameters.
  - ST2+ FlowSpec is not supported, because it is difficult to map ATM.
  - Controlled-Load and Guaranteed Services are supported.
  - ST2+ over ATM will refer to FlowSpec mapping rules discussed in ISSLL WG.

- User Plane
  - User Plane specifies ST2+ Data packet mapping rules to AAL5 and AAL1 PDU.
  - ST2+ Data packet header is not mapped into the AAL PDU.
    * Once a VC is established, none of the ST2+ Data packet headers, except for the Pri field, are needed.
    * It is possible for a downstream agent to reconstruct header information except for the Pri field.

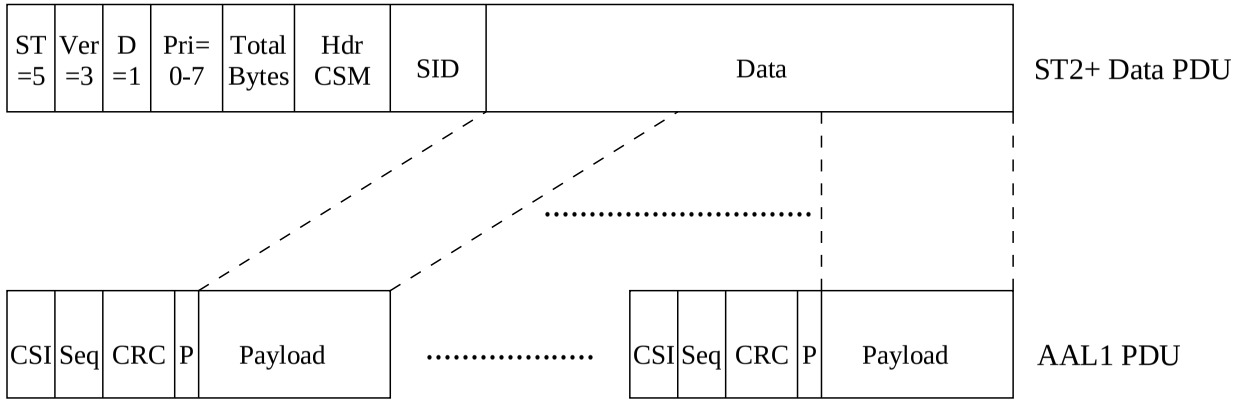
– ST2+ Data packet mapping to AAL5 PDU

  * Data field is mapped directly to the payload.
  * Pri field is mapped to the CPCS-UU.



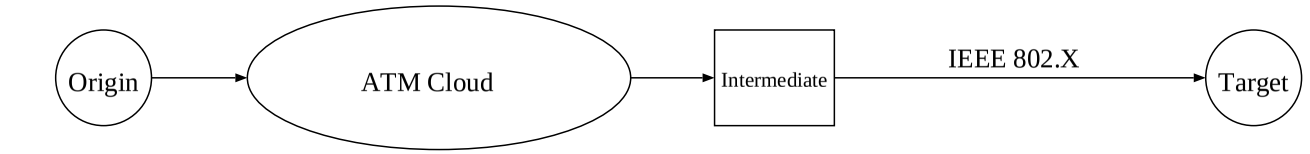
– ST2+ Data packet mapping to AAL1 PDU

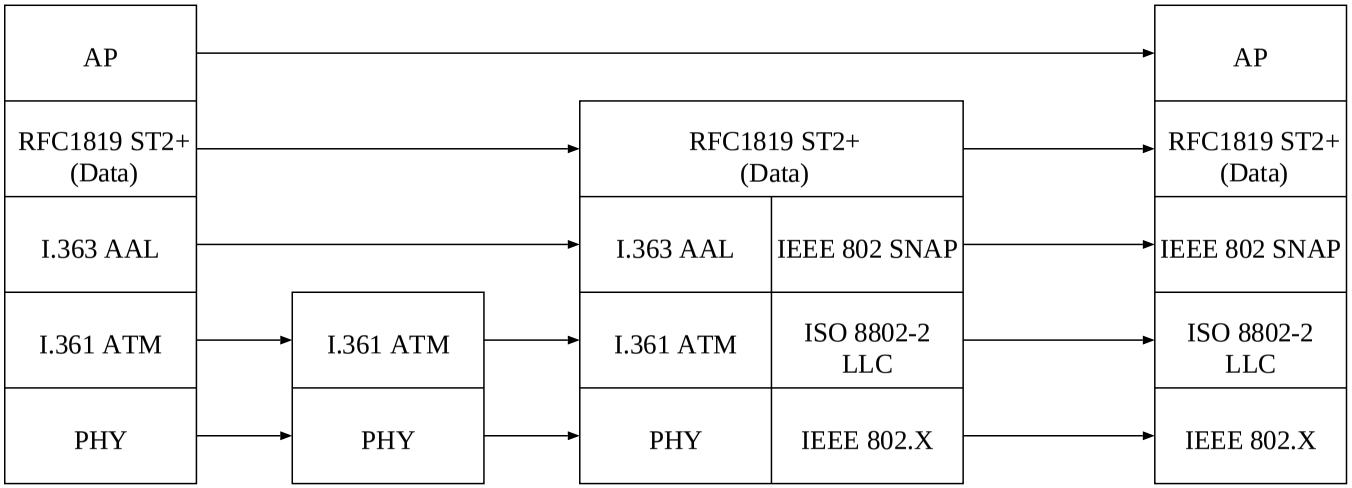
* AAL1 supports “real” stream communications.
* Data field is decomposed into and reconstructed from the payload.
* Information about the ST2+ Data packet boundary and the Pri field will be lost.



– User Plane interworking architecture

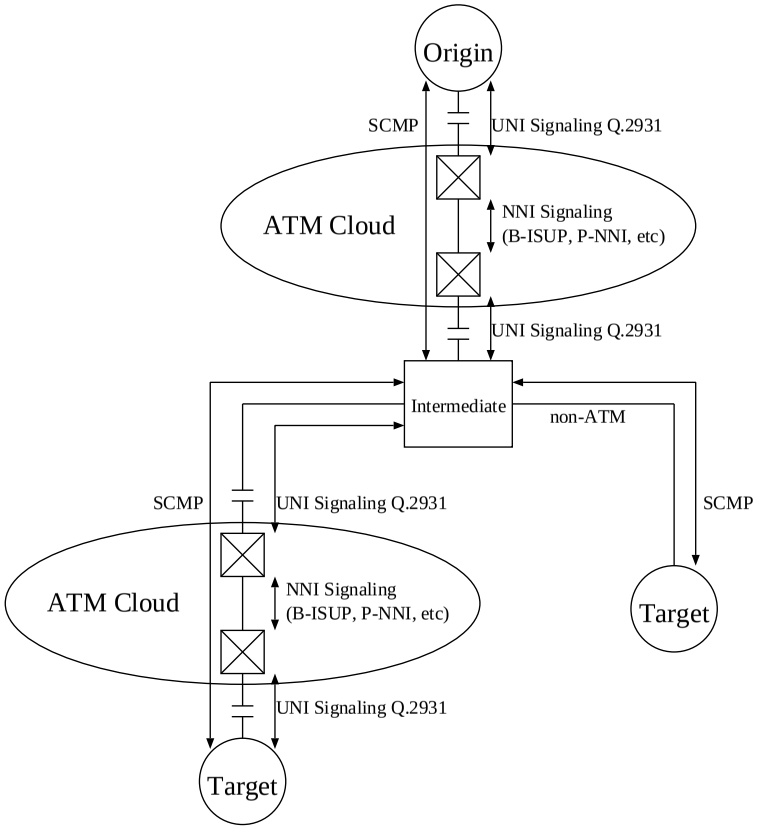
* The following is an example of ST2+ Data packet interworking with an IEEE 802.X LAN.





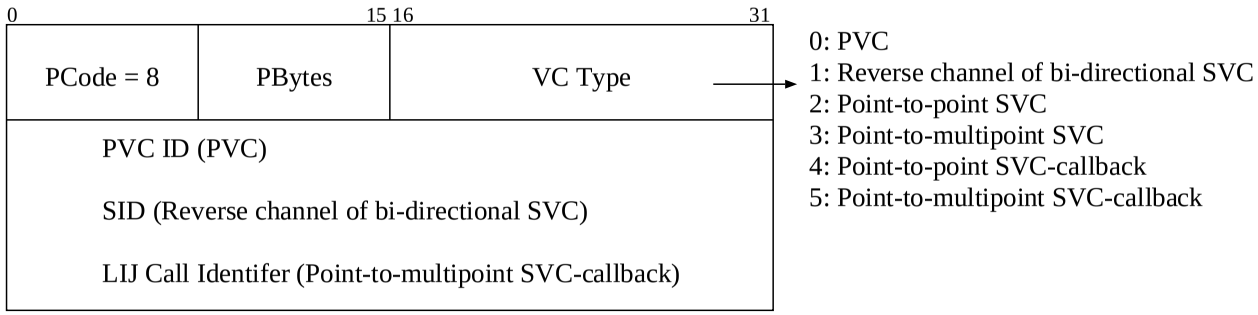
- Control Plane
  - Control Plane specifies interaction between ST2+ SCMP and Q.2931 UNI Signaling.
    - ST2+ layer and ATM layer connections are established sequentially by the SCMP and the Q.2931.
  - ST2+ SCMP is mapped to AAL5 PDU based on RFC 1483 LLC encapsulation format.
    - SCMP may share the VC (SVC/PVC) for IPv4.
    - SCMP may occupy particular VCs (SVC/PVC).

– Control Plane interworking architecture



– SCMP extension for ST2+ over ATM

  * New common SCMP element that specifies VC type is defined for ATM support.
  * CONNECT and CHANGE messages that pass across UNI must contain common SCMP elements for VC type.



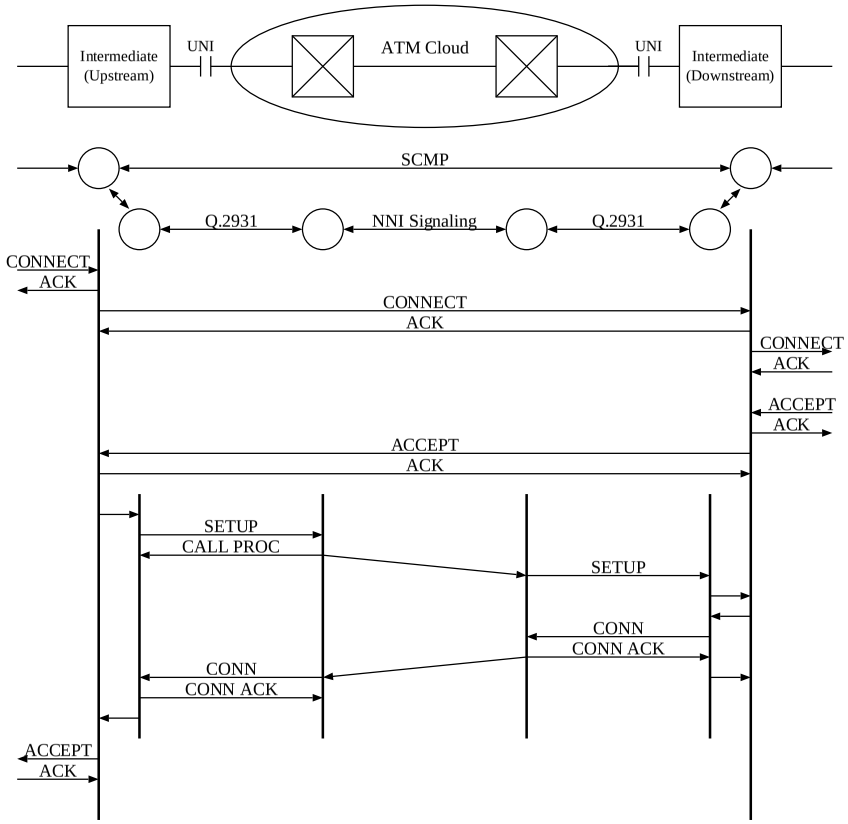
- SCMP extension for ST2+ over ATM (cont'd)
  - PVC is identified with the PVC ID that is uniquely assigned between neighboring ST2+ agents.
  - Reverse channel of bi-directional SVC is identified with the SID.
  - LIJ Call Identifier is specified for point-to-multipoint SVC-callback.
  - Algorithm for selecting VC type depends on implementation.

- ST2+ detection at ATM layer of called party
  - * ATM Signaling layer must detect upper layer protocol of incoming call and notify it to upper layer entity for multi-protocol support.
  - * Following B-LLI format should be defined for ST2+ identification in the SETUP message.

    B-LLI ::= ISO/IEC TR9577, IPI = 0, SNAP = 80, OUI = IANA, PID = XXX
  - * In this case, B-HLI user specific type field must be present and must contain ST2+ SID value.

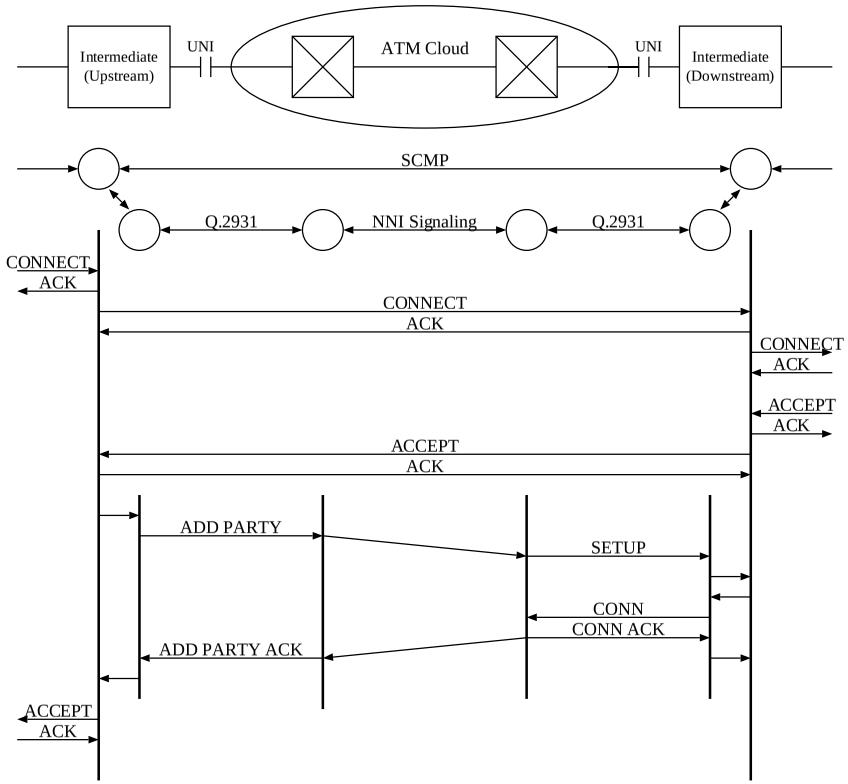
– SCMP/Q.2931 message flow example for a CONNECT

* P-P or first leaf of P-MP connection



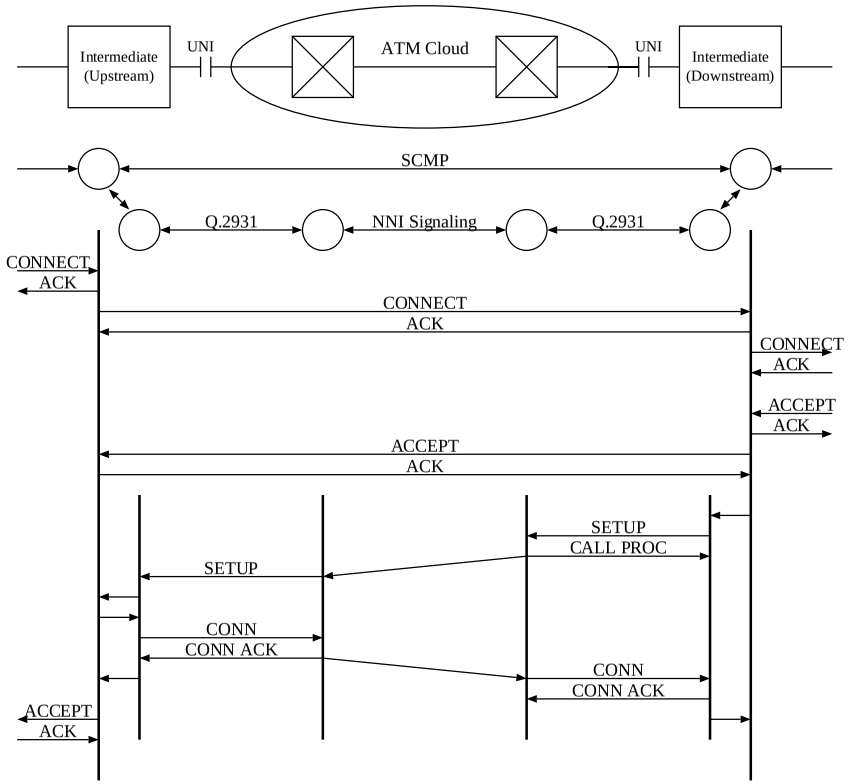
– SCMP/Q.2931 message flow example for a CONNECT

  * P-MP connection



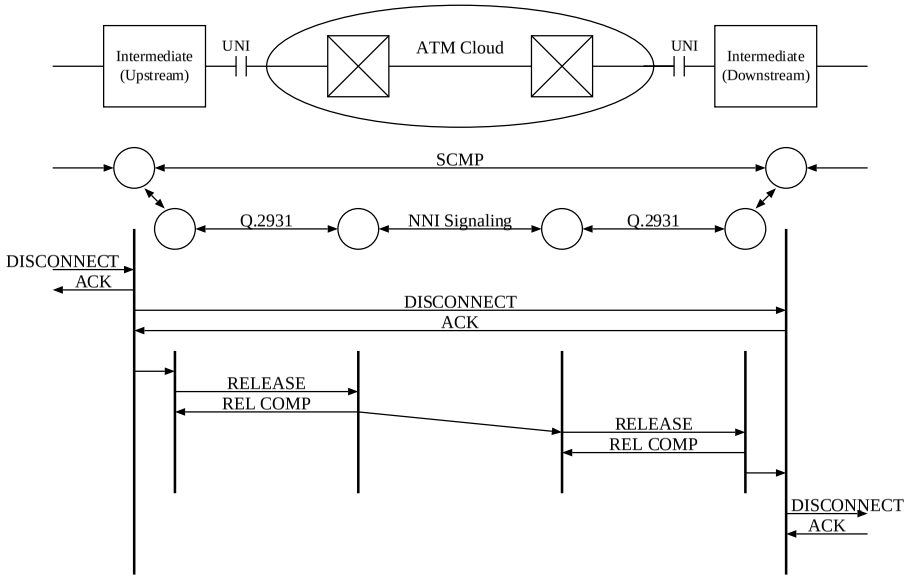
– SCMP/Q.2931 message flow example for a CONNECT

  * P-P callback connection



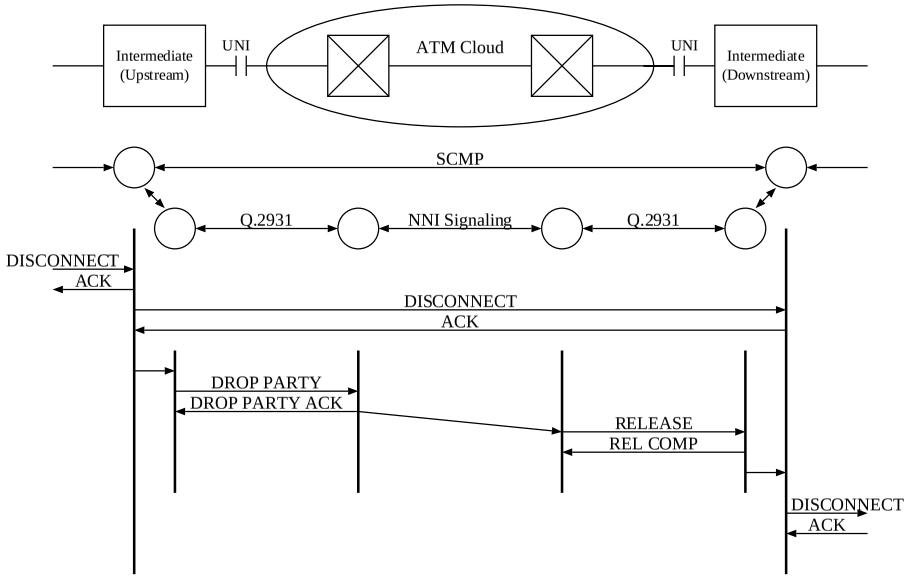
– SCMP/Q.2931 message flow example for a DISCONNECT

* P-P or entirely P-MP connection



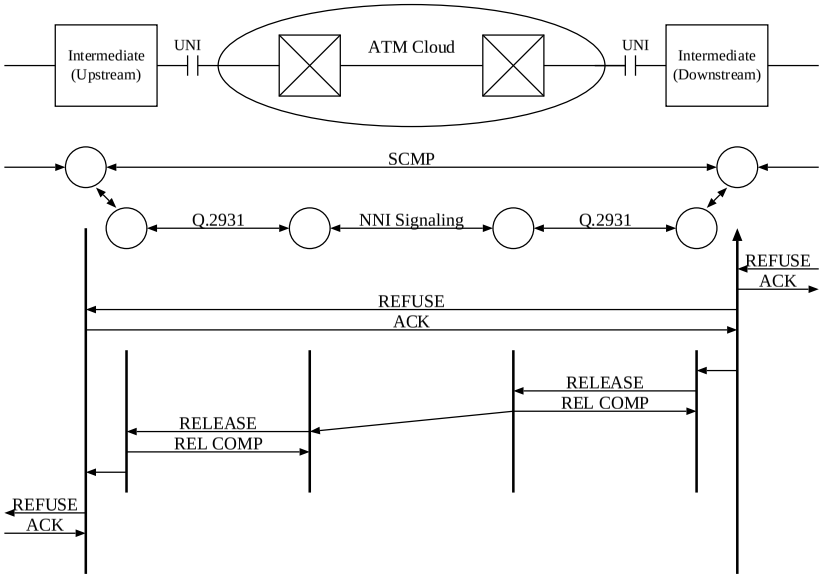
– SCMP/Q.2931 message flow example for a DISCONNECT

  * P-MP connection



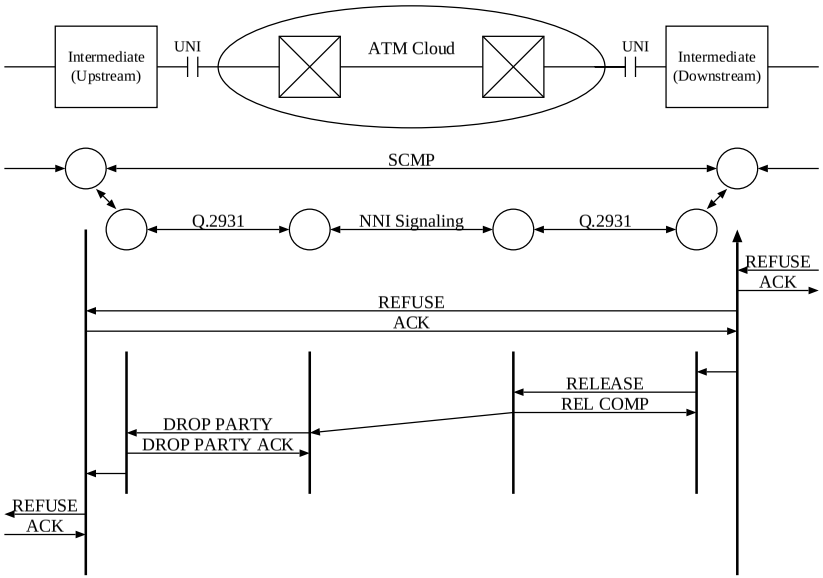
– SCMP/Q.2931 message flow example for a REFUSE

  * P-P or entirely P-MP connection



– SCMP/Q.2931 message flow example for a REFUSE

* P-MP connection



- Conclusions
  - ST2+ over ATM is appropriate to one of the setup protocols for Int-Serv FlowSpec over ATM.
    - ST2+ over ATM achieves resource reservation communications across ATM and non-ATM networks.
    - ST2+ over ATM reduces UNI signaling limitations.
    - Does not require any ATM specification changes.
  - I believe ST2+ over ATM standardization is needed.

- Proposed Schedule
  - May 96: Submit ID of ST FlowSpec for the Controlled-Load Service. (Done)
  - ??? 96: Submit ID of ST FlowSpec for the Guaranteed Service.
  - Sep 96: Submit ID of ST2+ over ATM (UNI3.1).
  - Mar 97: Submit above ID to IESG for publication.
  - Apr 97: Submit ID of ST2+ over ATM (UNI3.1/4.0).
  - Dec 97: Submit above ID to IESG for publication.