Part III: ATM

ATM Signaling

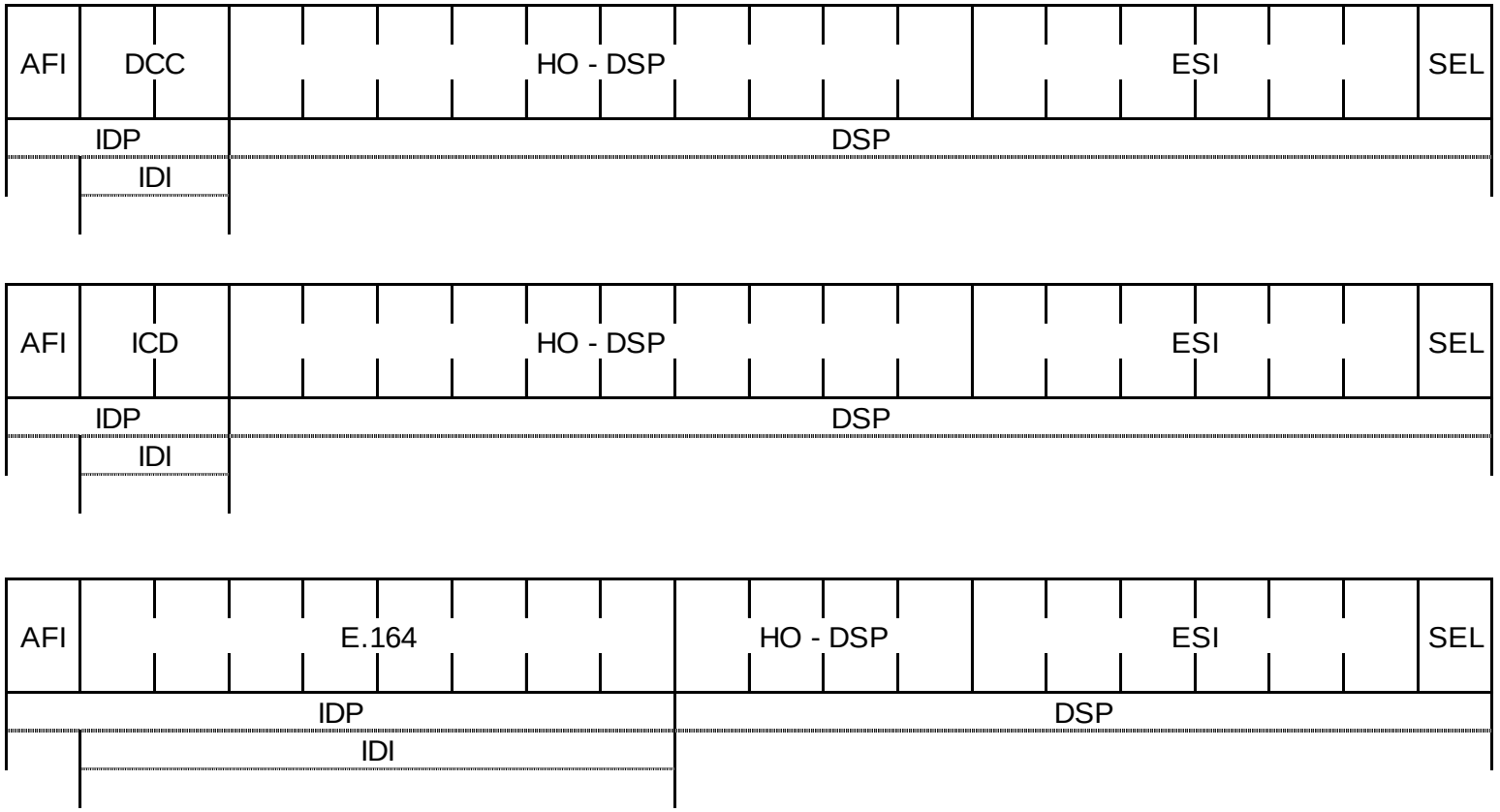
ATM Signaling

- Addressing
- Signaling Capabilities
- Signaling Messages
- Signaling Examples

ATM Addressing

- The format for ATM addresses for endpoints in private ATM networks follows OSI Network Service Access Points (NSAP)
  - Specified in ISO 8348 and ITU-T X.213
  - Low-order part specified in ISO 10589
- Three address formats defined in UNI 3.1; all formats must inter-operate
- ATM addresses are 20 bytes long

ATM Address Formats



ATM Address Fields

- Initial Domain Part (IDP)
  - Uniquely specifies an administrative authority that assigns the Domain Specific Part (DSP).
  - Composed of two fields:
    - Authority and Format Identifier (AFI)
    - Initial Domain Identifier (IDI)
- The AFI identifies the format and syntax of the remainder of the address:

AFI	Format of IDI and DSP
39	DCC ATM Format
47	ICD ATM Format
45	E.164 ATM Format

ATM Address Fields (cont.)

- Data Country Code (DCC)
  - Specifies the country in which the address is registered.
  - Country codes are given ISO 3166 and encoded in BCD.
  - The ISO National Member Body for the country manages the remainder of the address.
- International Code Designator (ICD)
  - Identifies an international organization.
  - Allocated by the ISO 6523 registration authority (the British Standards Institute).
- Organizations wishing to maintain a private numbering plan will use the ICD or the DCC formats.

ATM Address Fields (cont.)

- E.164 ATM Format
  - Specifies ISDN numbers, including telephone numbers
  - Numbers can be up to 15 digits long, and are encoded in BCD
  - The field (8 bytes = 16 digits) is padded with 0 to complete the maximum length
  - Used when the ATM network interfaces with the public network.
- Domain Specific Part (DSP)
  - Subdivided into the High Order DSP (HO-DSP) and the low order part, which consists of the End System Identifier (ESI) and the Selector (SEL).

The HO-DSP Field

- Exact encoding of the HO-DSP Field is specified by the authority identified by the IDP.
- Normally, it is a hierarchical routing scheme; the HO-DSP is further divided into sub-domains managed by lower authorities.
- Contents should have topological significance in the network and should facilitate routing.
- Allocation details can be found in ISO 8348 and RFC 1237.

The ESI and Selector Fields

- End-System Identifier (ESI):
  - The ESI identifies a specific system and should be unique within a particular value of IDP + HO-DSP.
  - To allow the system to autoconfigure, this 6-byte field is normally assigned in the same fashion as an IEEE MAC address.
  - If AAL PDUs from this system are bridged into Ethernet, this will be the source MAC address.
- Selector (SEL)
  - Not used at all for routing.
  - Same usage as a TCP or UDP "port" in the End System; identifies a process which should receive the ATM connection.

Typical Allocation in ATM Workgroup Switches

- The ESI is "burned" into each ATM interface.
- When the node starts running, it registers itself with the switch and gets the IDP and the HO-DSP.
- Workgroup ATM switches normally use the ICD format.
- The HO-DSP is automatically allocated by the switch; the lower-order bytes normally indicate the switch port being used.

Signaling Capabilities (1)

- Support for switched channel connections
  - Dynamic connections set in real-time
- Support for Point-to-Multipoint connections
  - Unidirectional flow of information
  - Root node builds a tree by adding leaves
  - Leaves can be added/dropped at any time
  - No direct support yet for Multipoint-to-Multipoint
  - Same bandwidth to all leaves
- Support for connections with Asymmetric Bandwidth

Signaling Capabilities (2)

- Support for multiple service classes
- Negotiation of VCI/VPI values
- Single in-band signaling channel (VCI=5, VPCI=0)
- Support for client registration mechanisms
  - Allows addresses to be configured at the switch, and the terminal will be informed of it
- Support for End-to-End Compatibility parameter Identification
  - AAL type
  - Protocol multiplexing
  - Protocol identification (above layer 3)

Signaling Message Format

BITS								OCTET
8	7	6	5	4	3	2	1	
PROTOCOL DISCRIMINATOR								1
0	0	0	0	LENGTH OF CALL REFERENCE VALUE (IN OCTETS)				2
FLAG	CALL REFERENCE VALUE							3
CALL REFERENCE VALUE (CONTINUED)								4
CALL REFERENCE VALUE (CONTINUED)								5
MESSAGE TYPE								6
MESSAGE TYPE (CONTINUED)							7	
MESSAGE LENGTH								8
MESSAGE LENGTH (CONTINUED)								9
VARIABLE LENGTH INFORMATION ELEMENTS AS REQUIRED								ETC.

Signaling Message Fields

- PROTOCOL DISCRIMINATOR
  - Identifies the signaling protocol, e.g., Q.931, Q.93B, etc.
- FLAG
  - Gives the direction of the signaling message
- CALL REFERENCE
  - Uniquely identifies a sequence of signaling messages
- MESSAGE TYPE
  - Identifies the kind of message, e.g., SETUP, CONNECT, ADD PARTY
- MESSAGE LENGTH
  - Gives the total size of the variable-length information elements

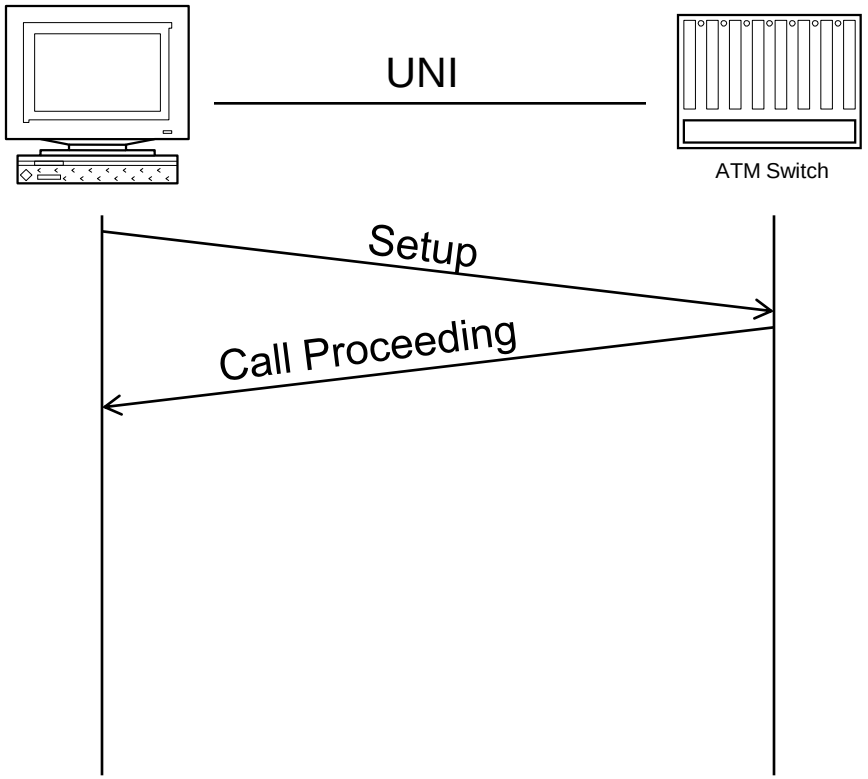
Variable-length Fields

- General structure: 8-bit identifier, flags, length, data
- Used to convey parameters such as:
  - ATM adaptation layer parameters
  - ATM cell rates
  - Quality of service parameters
  - Addressing information
  - Other parameters

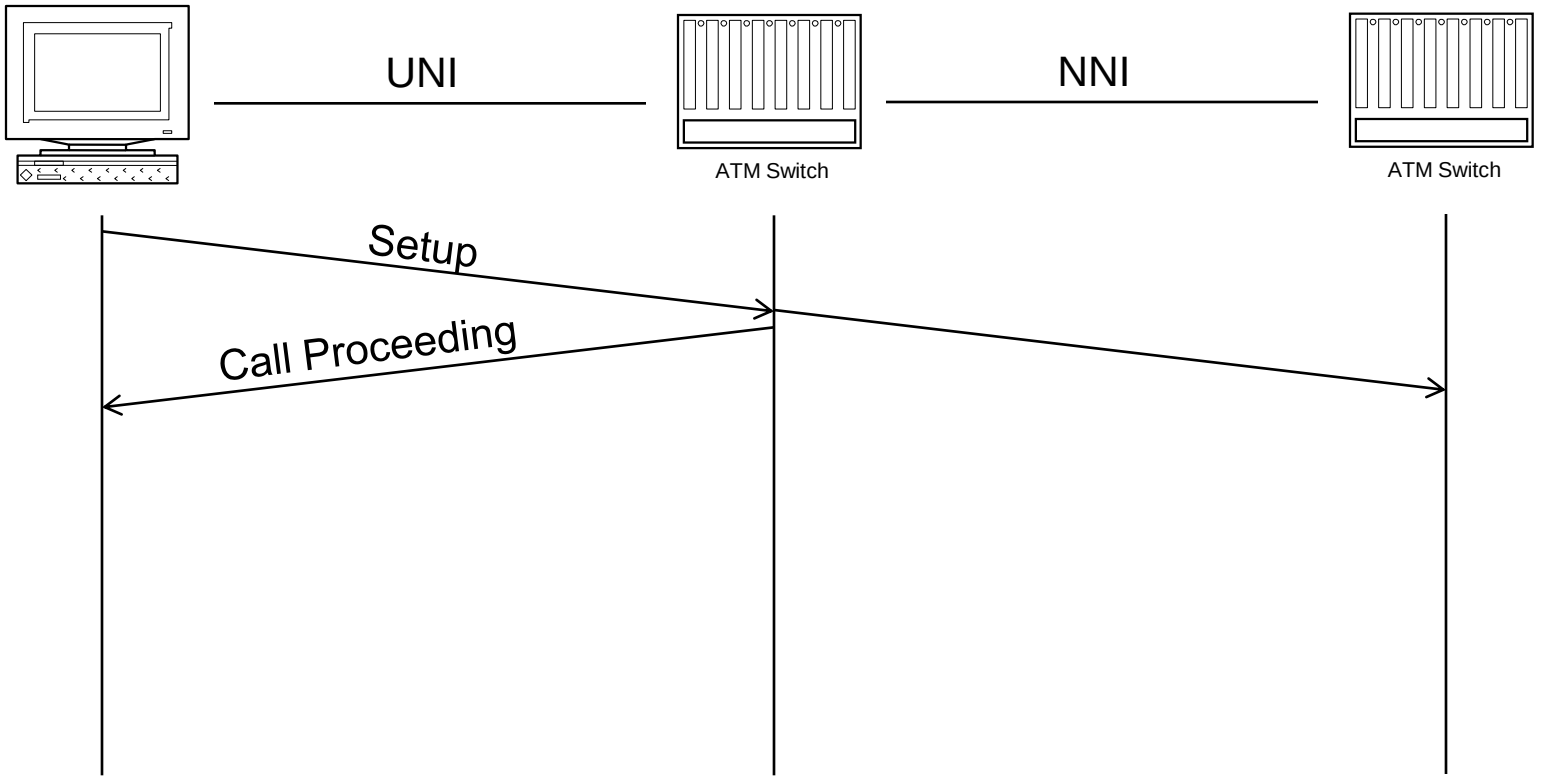
Examples Of Variable-length Parameters

- Adaptation Layer Parameters
  - Type of AAL
  - For AAL1: Rate, clock recovery method, etc.
  - For AAL3/4: Maximum CPCS-SDU size, SSCS type, etc.
  - For AAL5: Maximum CPCS-SDU size, SSCS type, etc.
- ATM User Cell Rate
  - Peak cell rates
  - Maximum burst size
  - Sustainable cell rates

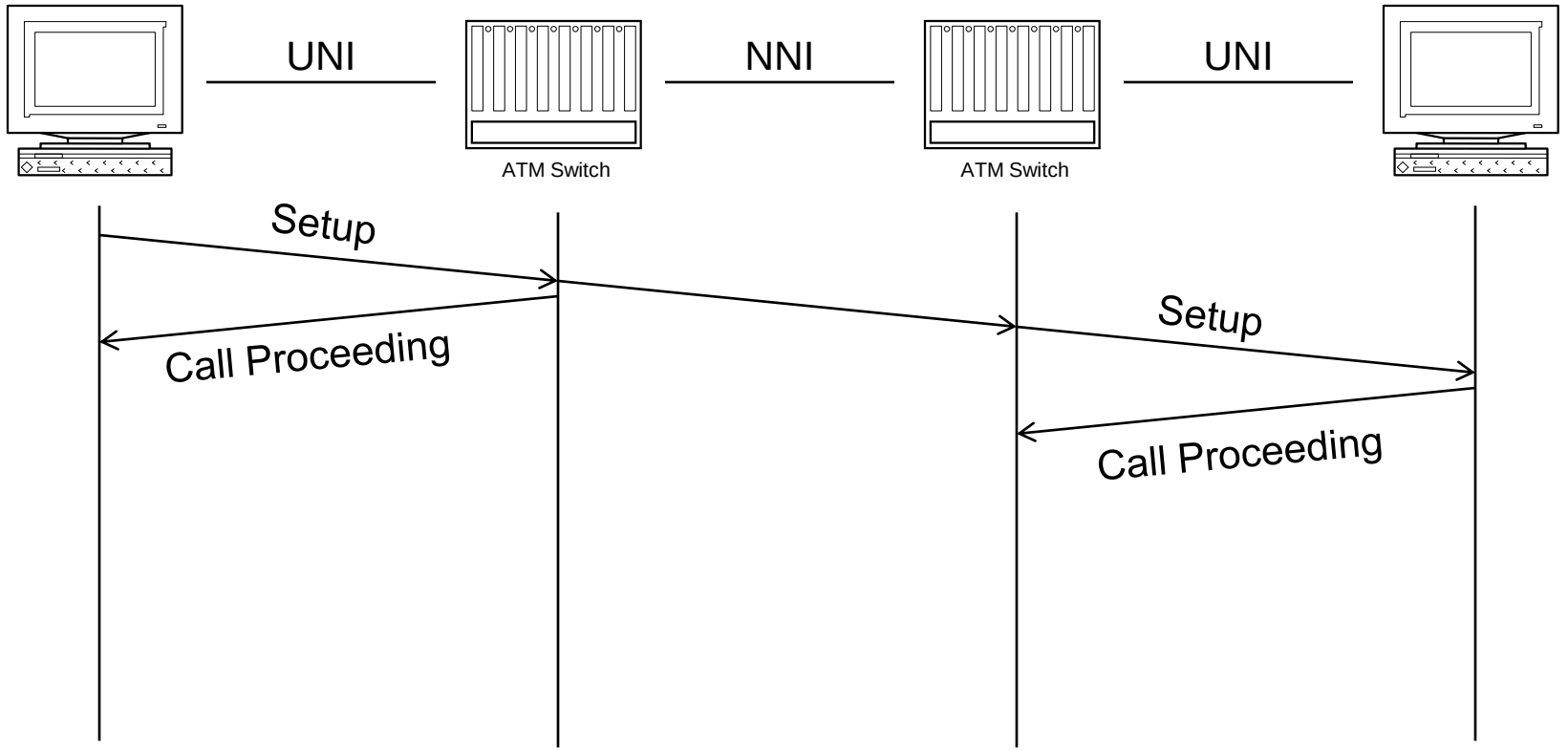
Example: Initiate a Call (1)



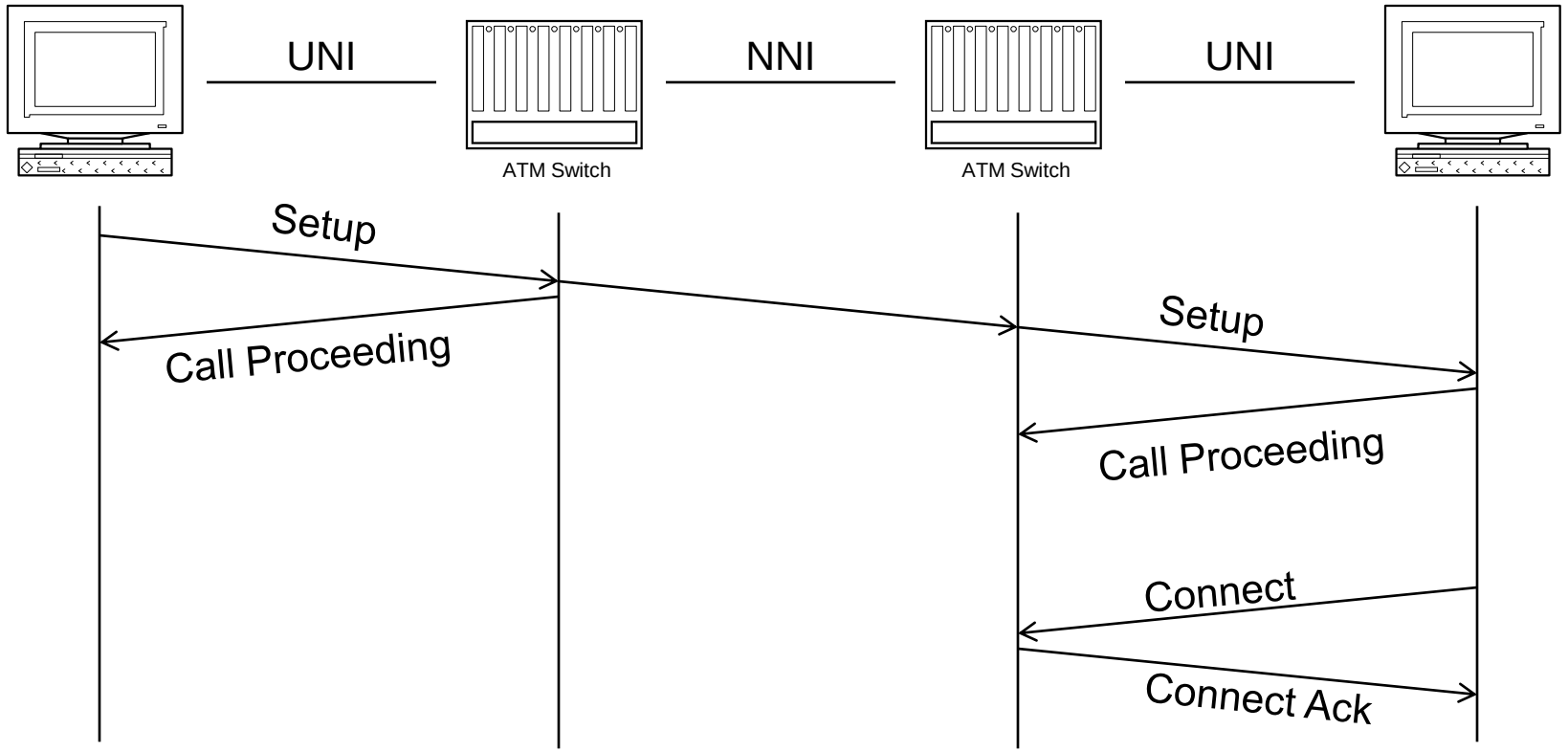
Initiate a Call (2)



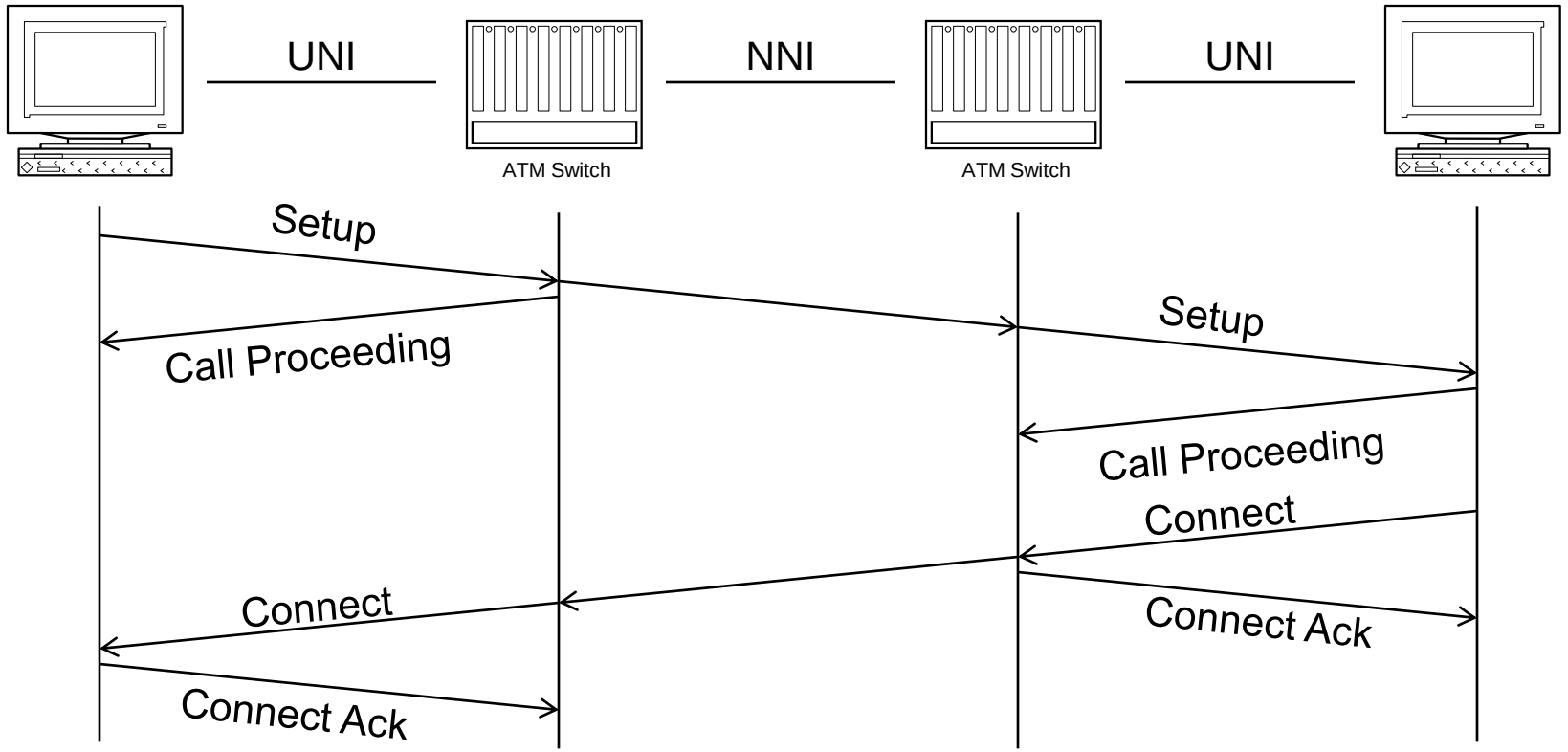
Initiate a Call (3)



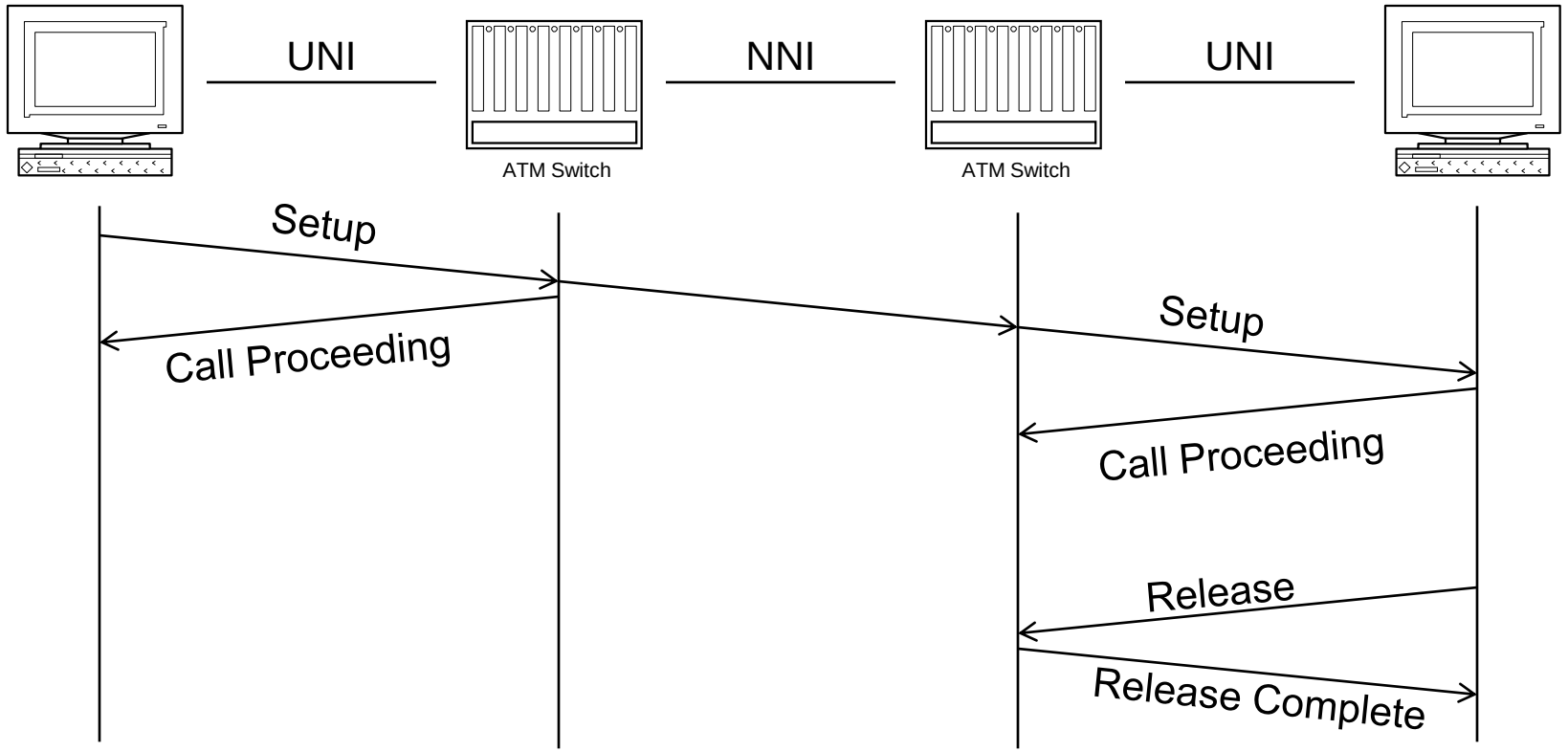
Example: Accept a Call (1)



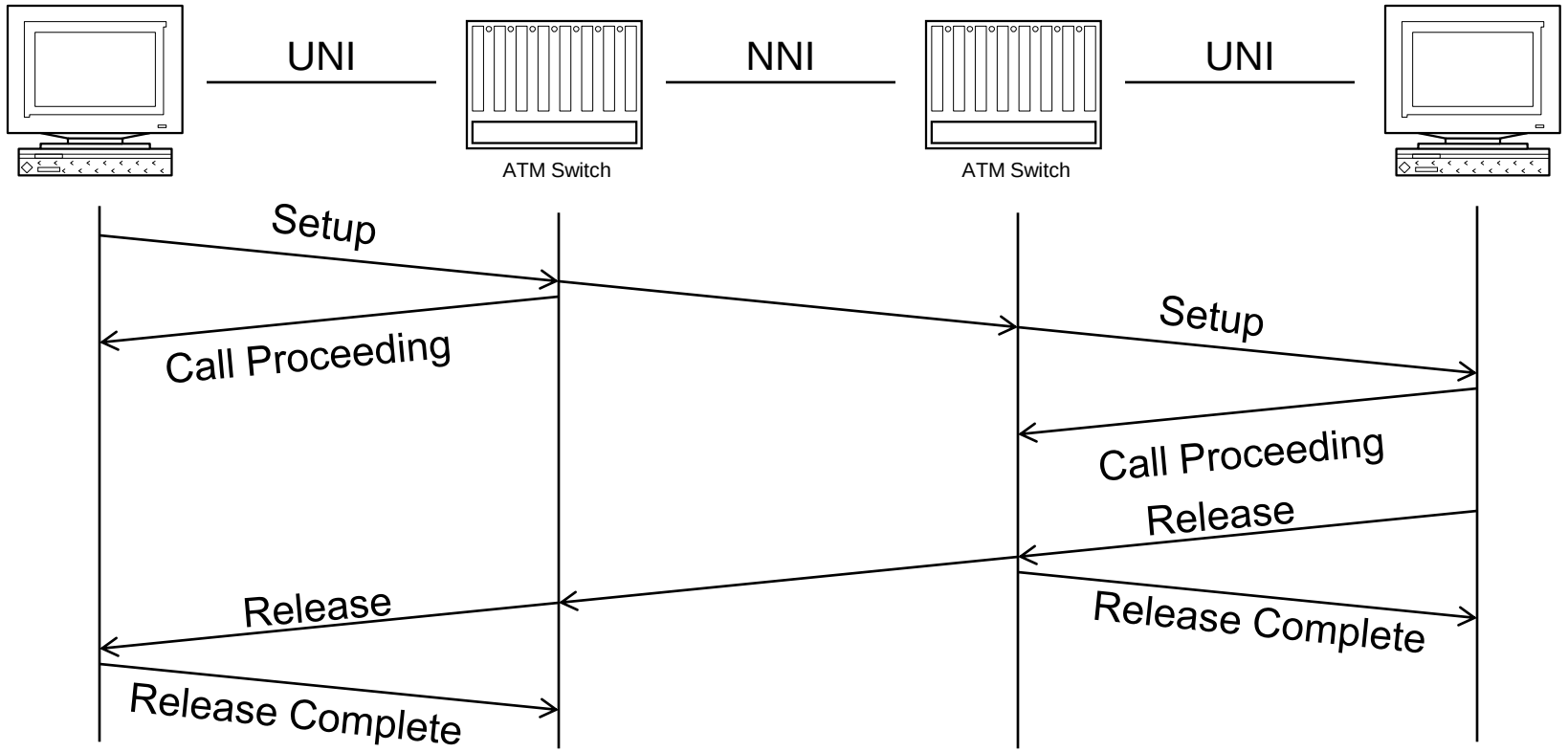
Accept a Call (2)



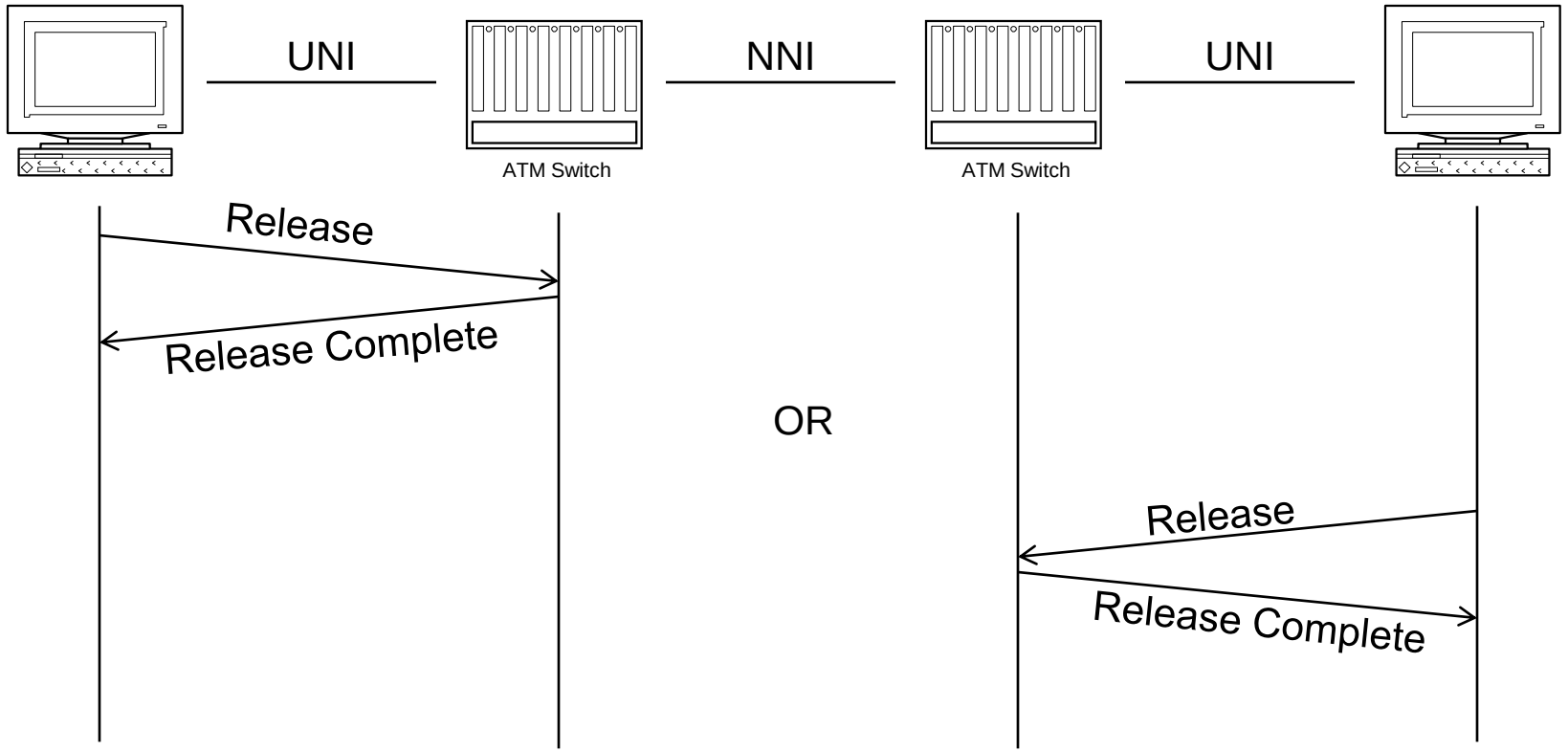
Example: Reject a Call (1)



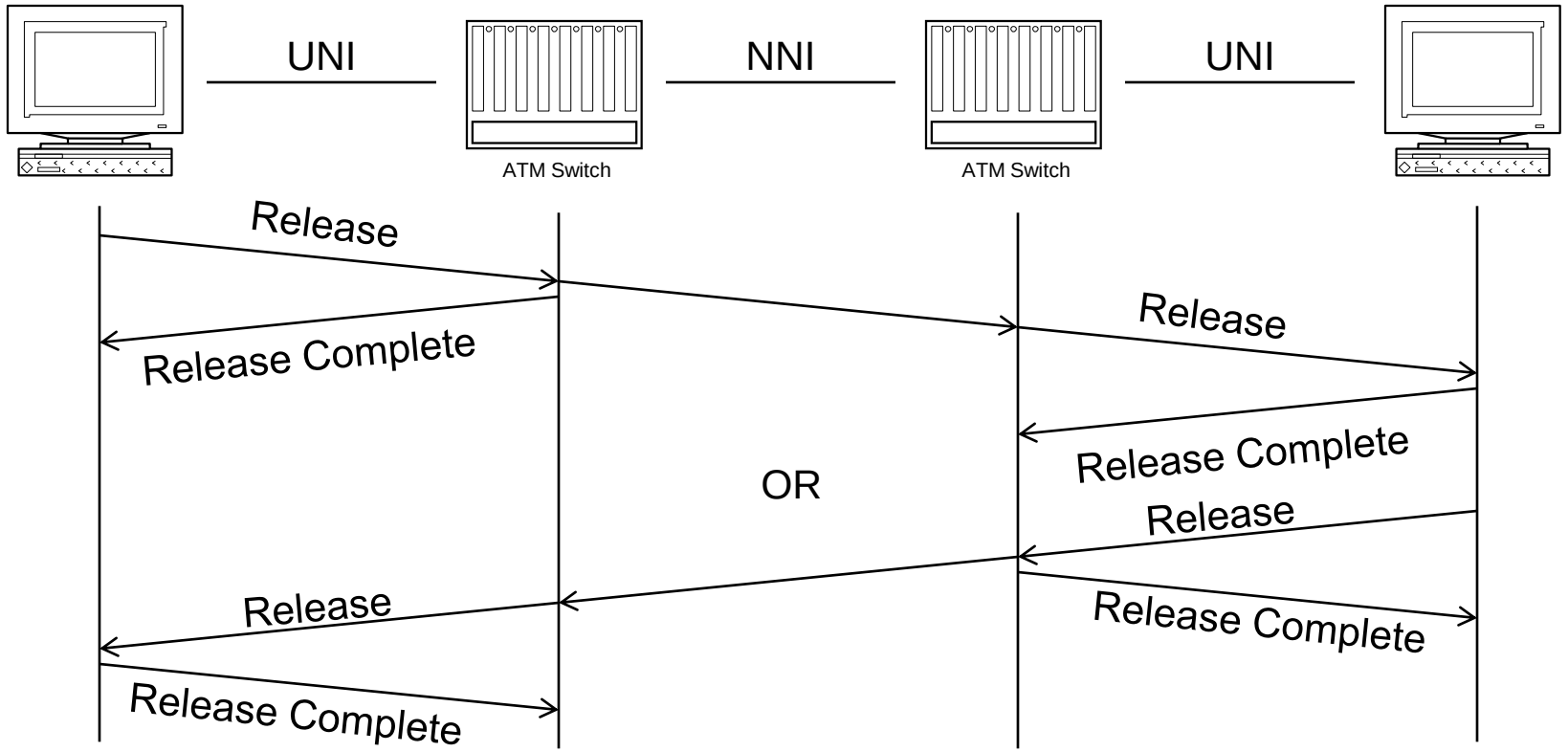
Reject a Call (2)



Example: User Clears a Call (1)



User Clears a Call (2)



Example: Network Clears a Call