

### Q.931: ISDN Network Layer Protocol for Signaling

Network Layer is specified by the ITU [Q-series documents](#) Q.930 through Q.939. Q.931, the layer 3 protocol, is used for the ISDN call establishment, maintenance, and termination of logical network connections between two devices.

During the layer 3 call setup, three parties are involved, and are where messages sent and received; 1) the Caller, 2) the ISDN Switch, and 3) the Receiver. Following is an example of call setup steps:

- Caller sends a SETUP to the Switch.
- If the SETUP is OK, the switch sends a CALL PROCEEDING to the Caller, and then a SETUP to the Receiver.
- The Receiver gets the SETUP. If it is OK, then it rings the phone and sends an ALERTING message to the Switch.
- The Switch forwards the ALERTING message to the Caller.
- When the receiver answers the call, it sends a CONNECT message to the Switch
- The Switch forwards the CONNECT message to the Caller.
- The Caller sends a CONNECT ACKNOWLEDGE message to the Switch
- The Switch forwards the CONNECT ACK message to the Receiver.
- Done. The connection is now up.

What services and features the telco switch provides to the attached ISDN device is specified in the optional field - Service Profile IDs (SPIDs); when they are used, they are only accessed at device initialization time, before the call is set up. The format of the SPID is usually the 10-digit phone number of the ISDN line, plus a prefix and a suffix that are sometimes used to identify features on the line, but in reality it can be whatever the Telco decides it should be. See ITU spec Q.932 for details.

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**Protocol Structure - Q.931: ISDN Network Layer Protocol for Signaling** Information Field Structure - the Information Field is a variable length field that contains the Q.931 protocol data:

1	2	3	4	5	6	7	8
Protocol Discriminator							
0	0	0	0	Length of CRV			
Call Reference Value (1 or 2 octets)							
0	Message Type						
Mandatory & Optional Information Elements (variable)							

- Protocol Discriminator (1 octet) - identifies the Layer 3 protocol. If this is a Q.931 header, this value is always 08<sub>16</sub>.
- Length(1 octet) - indicates the length of the next field, the CRV.
- Call Reference Value (CRV) (1 or 2 octets) - used to uniquely identify each call on the user-network interface. This value is assigned at the beginning of a call, and this value becomes available for another call when the call is cleared.
- Message Type (1 octet) - identifies the message type (i.e., SETUP, CONNECT, etc.). This determines what additional information is required and allowed.
- Mandatory and Optional Information Elements (variable length) - are options that are set depending on the Message Type.