Virtual Circuit Switching: Frame Relay
Virtual Circuit Switching

- Global Addressing
- Virtual Circuit Identifier
- Three Phases
  - Data Transfer Phase
  - Setup Phase
  - Teardown Phase
Virtual circuit wide area network

- End system A
- Switches
- End system B
- End system C
- End system D
VCI - Virtual Circuit Identifier
### Switch and table

#### Incoming vs Outgoing Table

<table>
<thead>
<tr>
<th>Port</th>
<th>VCI</th>
<th>Port</th>
<th>VCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>1</td>
<td>77</td>
<td>2</td>
<td>41</td>
</tr>
</tbody>
</table>

#### Diagram

- **Data 77** incoming at port 1, outgoing at port 3.
- **Data 14** incoming at port 2, outgoing at port 3.
- **Data 22** incoming at port 3.
- **Data 41** incoming at port 2.
Source-to-destination data transfer
SVC (Switched Virtual Circuit) setup request
SVC setup acknowledgment

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<tbody>
<tr>
<td>1</td>
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<td>66</td>
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VCI = 14

VCI = 77
Frame Relay

Architecture

Frame Relay Layers

FRAD

VOFR

LMI
VCIs in Frame Relay are called DLCIs (Data Link Connection Identifier).

Frame Relay does not provide flow or error control; they must be provided by the upper-layer protocols.
Frame Relay operates only at the physical and data link layers.

- Data link: Simplified core functions of data link layer
- Physical: ANSI standards
Frame Relay frame

C/R: Command/response
EA: Extended address
FECN: Forward explicit congestion notification
BECN: Backward explicit congestion notification
DE: Discard eligibility
DLCI: Data link connection identifier

Flag Address Information FCS Flag

DLCI C/R EA DLCI FECN BECN DE EA
6 bits 1 bit 1 bit 4 bits 1 bit 1 bit 1 bit 1 bit
Three address formats

<table>
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<tr>
<th>DLCI</th>
<th>C/R</th>
<th>EA=0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCI</td>
<td>FECN</td>
<td>BECN</td>
</tr>
</tbody>
</table>

a. Two-byte address (10-bit DLCI)

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b. Three-byte address (16-bit DLCI)

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<th>C/R</th>
<th>EA=0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCI</td>
<td>0</td>
<td>EA=1</td>
</tr>
</tbody>
</table>

c. Four-byte address (23-bit DLCI)