SMDS

- Switched Multimegabit Data Service
- SMDS is a Network Service
- It is not a technology or a protocol
- It is based on ATM technology
- Standards developed by Bellcore
SMDS

- SMDS can be defined as
  - a connectionless network service delivering switched LAN internetworking
  - & data dial tone in a MAN deployment
  - while adhering to IEEE 802.6 & DQDB protocols
  - by delivering fixed length cells of data to their destination
  - via a SONET transmission system.
## Network Hierarchical Model

<table>
<thead>
<tr>
<th>User Demands</th>
<th>Switched LAN <em>Internetworking</em> data dial tone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Services</td>
<td>SMDS-Switched Multimegabit Data Service</td>
</tr>
<tr>
<td>Networking Categories</td>
<td><em>MANs</em>-Metropolitan Area Networks</td>
</tr>
<tr>
<td>Cell Relay Standard</td>
<td>IEEE 802.6 <em>DQDB</em>-Distributed Queue Dual Bus</td>
</tr>
<tr>
<td>Connectionless or Connection-oriented</td>
<td>Connectionless</td>
</tr>
<tr>
<td>Switching Architecture</td>
<td>Cell Relay</td>
</tr>
<tr>
<td>Transmission Architecture</td>
<td>SONET-Synchronous Optical NETwork</td>
</tr>
</tbody>
</table>
Why SMDS for Internetworking?

- Designed to be Easily Integrated into
  – Uses Existing LANs
- Minimal Impact on User's Existing Hardware and Software
- Technology Independent Service
- Use of Existing RBOC Networks (Regional Bell Operating Companies)
- Provide Future Growth
What is a MAN?

- Metropolitan Area Network
- Provides network services within a metropolitan area
- Used for inter-LAN connectivity
- Allows multiple locations (offices) to share data within a metropolitan area
What is a MAN? (con't)

- LAN-interconnection services such as SMDS is offered by MAN

- Data-only services are most common

- Can carry Voice and Video but these multimedia implementations are complicated
MAN & SMDS not Synonymous

- SMDS is only one service offered. However, it is the most popular in the U.S.
- Other MAN implementations and services exist such as Fiber Distributed Data Interface and Distributed Queue Dual Bus
# SMDS & Other MANs Services

<table>
<thead>
<tr>
<th>MAN Services</th>
<th>SMDS: Switched multimegabit data service</th>
<th>FDDI: Fiber distributed data interface</th>
<th>DBP Telecom: Deutsche Bundepost Telecom</th>
<th>MMDS: Metrofiber multimegabit data service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Speed</td>
<td>44.736 MBps (T-3)</td>
<td>100 MBps</td>
<td>2.048 MBps (E-1)</td>
<td>100 MBps</td>
</tr>
<tr>
<td>Currently Transporting</td>
<td>Data only</td>
<td>Data only</td>
<td>Data, Voice, &amp; Video</td>
<td>Data only</td>
</tr>
<tr>
<td>Underlying Architecture</td>
<td>DQDB</td>
<td>FDDI</td>
<td>DQDB</td>
<td>Fiber backbone</td>
</tr>
<tr>
<td>Architecture Type</td>
<td>Switched access</td>
<td>Shared media</td>
<td>Switched access</td>
<td>Circuit switched</td>
</tr>
</tbody>
</table>
Distributed Queue Dual Bus

- Phone Companies use DQDB/IEEE 802.6 architecture in their MAN
- DQDB Strives to get Messages onto the BUS with a Minimum of Overhead and Without Collisions at High Traffic Levels
- "Access by Reservation"
What is SMDS?

• Switched Multi-Megabit Data Service

• A High-Speed, High-Performance, Connectionless (Datagram) Cell Switched Service
SMDS FEATURES

- Extends LAN Across Wide-area Network
- Connectionless Service
- Support Variable-length Packets (Datagrams) to 9188 Octets (53-Octet Cells at Lower Layer)
- Credit Management-based Access Class
- Supports MultiCast LAN Features
- Provides Private Logical Networks
- Supports flexible addressing
SMDS Access Protocol

SNI : Subscriber Network Interface
MSS: MAN Switching System
CPE: Customer Premises Equipment
BOC: Bell Operating Companies

Multiple CPE
DQDB Access

Single CPE
DQDB Access
LAN Interconnection Using Bridges in SMDS Network

Customer A
San Francisco

Customer B
San Francisco

Customer A
Redwood City

Customer B
San Jose

802.3 LAN

SMDS NETWORK

Host

CPE

DS1 or DS3
LAN Interconnection Using IP Routers in SMDS Network

Customer A
San Francisco

Customer B
Redwood City

Customer B
San Jose

Host

SMDS NETWORK

CPE

802.3 LAN

DS1 or DS3

CPE

SMDS NETWORK

CPE

802.3 LAN

Customer A
San Francisco

CPE

802.3 LAN

CPE

802.3 LAN

CPE

802.3 LAN

CPE

802.3 LAN

CPE
LAN Interconnection Using Brouters in SMDS Network

Customer A
San Francisco

CPE

802.3 LAN

Host

DS1 or DS3

SMDS NETWORK

Customer A
Redwood City

CPE

802.3 LAN

Customer B
San Francisco

CPE

SMIA PC

Customer B
San Joe

CPE
SMDS Architecture

SMDS Interface Protocol

Interswitching System Interface

Intercarrier Interface

Distributed Queue Dual Bus

Interexchange Carrier Network

Operations System/Network Element

Operations Systems

SMDS NETWORK

SNI

ISSI

ICI

SNI

SNI

SIP

UPPER LAYERS

LOCAL PROT.

SIP

UPPER LAYERS

DQDB ACCESS

SNI

SNI

SNI

SNI

SIP

UPPER LAYERS

UPPER LAYERS

UPPER LAYERS

UPPER LAYERS

SIP

SIP

SIP

SIP

DQDB ACCESS

SMDS Interface Protocol
Layer 3 of SMDS Interface Protocol (SIP)

Level 3 of the SIP accepts data from the higher layer protocols

The SMDS PDU consists of the following main fields:
• header field
• information field
• packet assembler and Dissembler field
• cyclic redundancy check field
• trailer field
LAYER 3 PDU FRAME FORMAT

36  < 9188  0-3  0-4  4

Header  Information Field  PAD  X+CRC32  Trailer

1 1 2 8 8 6 2 4 1 3 2 12

r  BEag  BA  size  DA  SA  X+HLP  PL  X+QOS  CIB  HEL  X+Brdg  HE

Copyright 1998, Professor John T. Gorgone
R  reserved
BETag  Beginning End Tag
BA  Buffer Allocation
SA  Source Address
X+  Unchanged by the Network
HLPI  Higher Layer Protocol Identifier
PL  PAD Length
QOS  Quality of Service
CIB  CRC32 Indication Bit
HEL  Header Extension Length
Brdg  Bridging
LEN  Length
HE  Header Extension
## SMDS Layer 2 Frame Format

### Key Components:
- **Header**
- **Segmentation Unit**
- **Trailer**

### Details:
- **Access Control**
- **Network Control Information**
- **Segment Type**
- **Message Identifier**
- **Payload Length**
- **Payload CRC**

### Frame Format Breakdown:
- **Header** (56 bytes):
  - 8 bytes for Access Control
  - 32 bytes for Network Control Information
  - 2 bytes for Segment Type
  - 14 bytes for Message Identifier

- **Segmentation Unit** (352 bytes):
  - Variable lengthPayload

- **Trailer** (16 bytes):
  - 6 bytes for Payload Length
  - 10 bytes for Payload CRC

---

Copyright 1998, Professor John T. Gorgone
LAYER 1:

SMDS access path is described in SIP level 1.

The operation is divided into the physical layer convergence protocol and transmission system sublayers.
Security

- Closed User Group (Logical Private Network)
  - Group Addressing
  - Address Screening
- Provides Error Detection
  - Cells with Address Errors are NOT Delivered
- Transparently Carries all User Data
  - Passwords
  - Encrypted Data
Performance and Quality of Service

■ Availability
  - Service Availability: 99.7%
  - Mean Time between Service Outages: 1092 Hours
  - Mean Time to Restore: 3.5 Hours

■ Accuracy
  - Erred Packet Data Unit (PDU):\(^{5}\) in \(10E^{-13}\)
  - Misdelivered PDU: \(5\) in \(10E^5\)
  - PDU Not Delivered: \(1\) in \(10E^4\)
  - Duplicated PDU: \(5\) in \(10E^8\)
Performance and Quality of Service

- **Delay (SNI to SNI)**
  - DS-3 to DS-3
    - 20 MS Average
    - 30 MS in 95% Of All Cases
- **DS-1 to DS-3**
  - 75 MS Average
  - 85 MS in 95% Of All Cases
- **DS-1 to DS-1**
  - 130 Ms Average
  - 140 MS in 95 % Of All Cases
Summary

SMDS Supports Internetworking of a Large Number of LANs, Regardless of Different Technology or Different Vendors