MAN/WAN Interconnection Options for SBC

Vish Ramamurti

George Young

SBC Technology Resources, Inc.

1

MAN/WAN interconnection

Customer Premises

Building Closet

Transparent LAN service

Router

Private Net

Router

NxDS1

DSU

Internet Access Service

DSU

ADM

DS1

Local Access Loop

SONET/DWDM

To ISP POP

To IXC POP

To Another Customer site
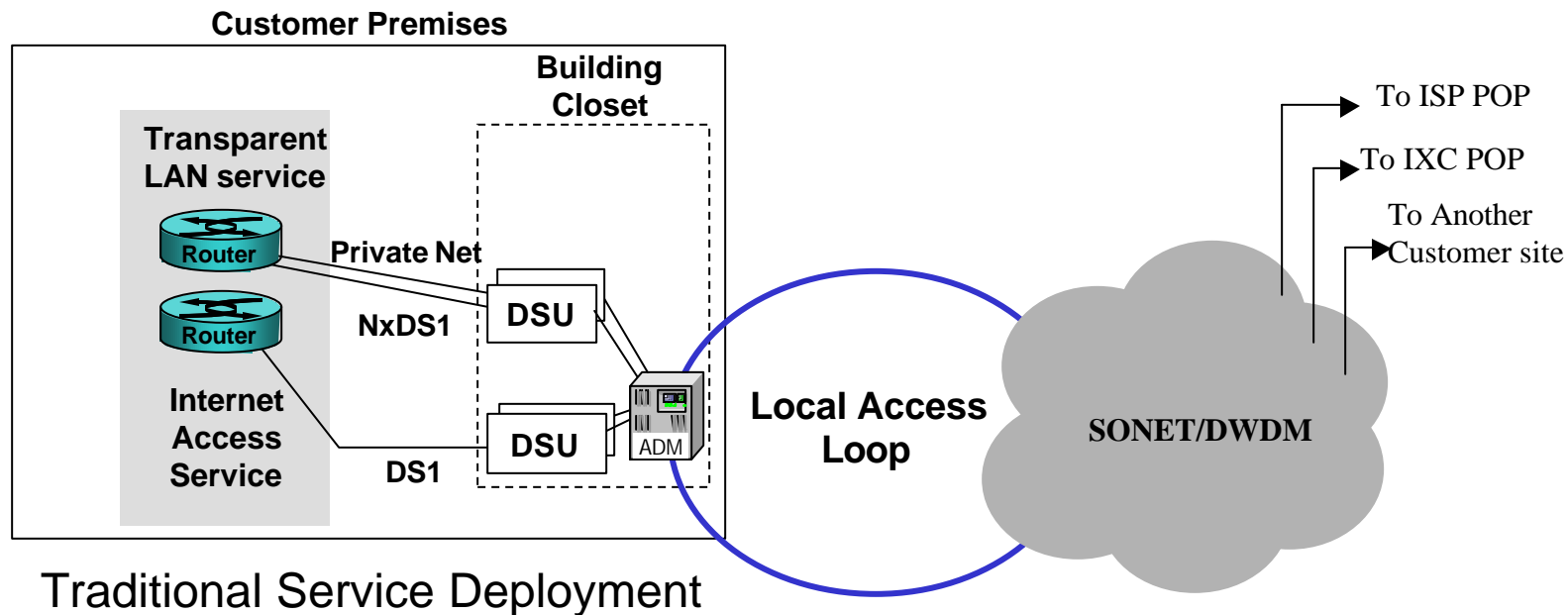
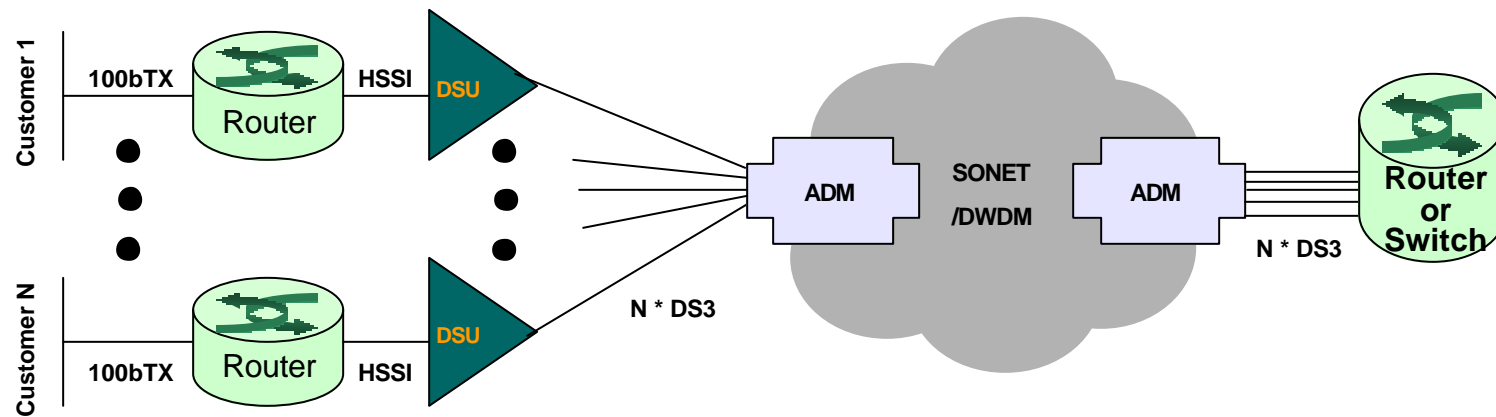Traditional Service Deployment

DS1 could be TDM, FR or ATM.
Fractional DS1 possible for TDM and FR
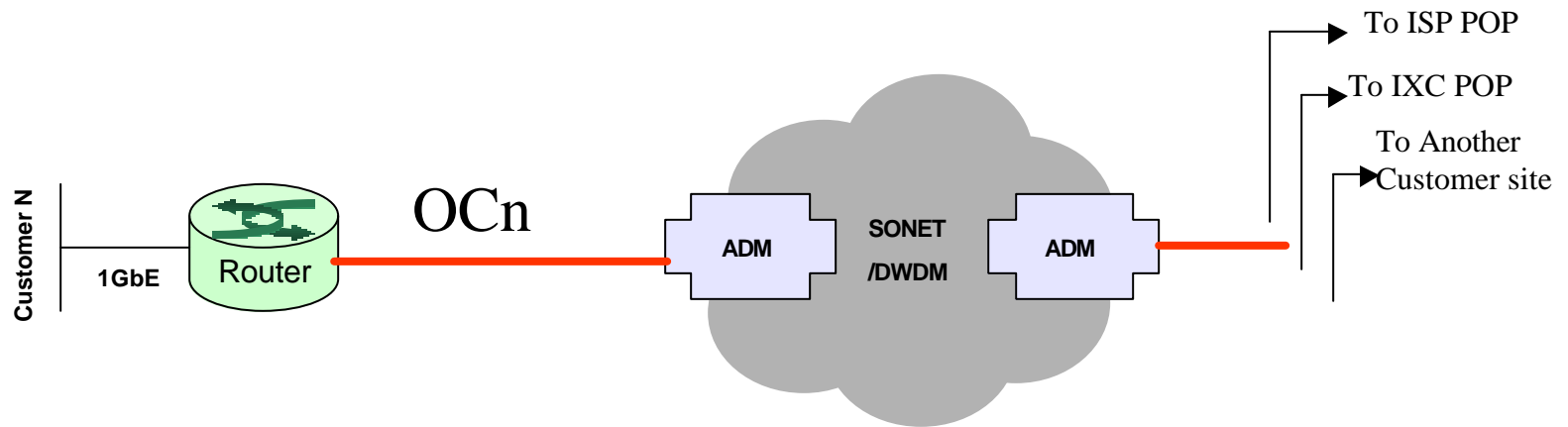FR and ATM may pass through an ATM/FR switch in the core

SBC Technology Resources, Inc.

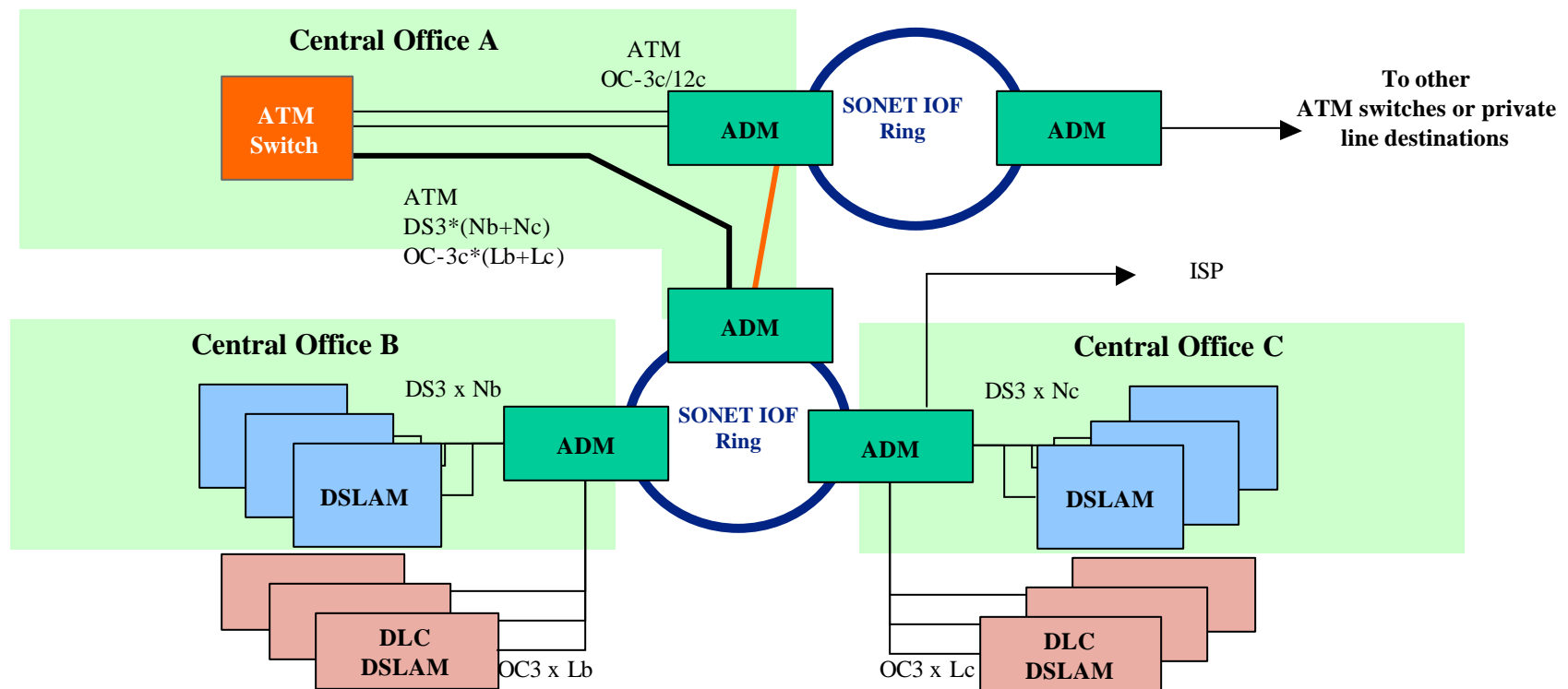# MAN/WAN interconnection (Contd.)

SBC Technology
Resources, Inc.

MAN/WAN interconnection (Contd.)

OCn could be POS or ATM.

ADSL Architecture

Central Office A

ATM
Switch

ATM
OC-3c/12c

ADM

SONET IOF
Ring

ADM

To other
ATM switches or private
line destinations

ATM
DS3*(Nb+Nc)
OC-3c*(Lb+Lc)

ADM

ISP

Central Office B

DS3 x Nb

DSLAM

ADM

SONET IOF
Ring

ADM

Central Office C

DS3 x Nc

DSLAM

DLC
DSLAM

OC3 x Lb

OC3 x Lc

DLC
DSLAM

Current Network Architecture

SBC Technology
Resources, Inc.
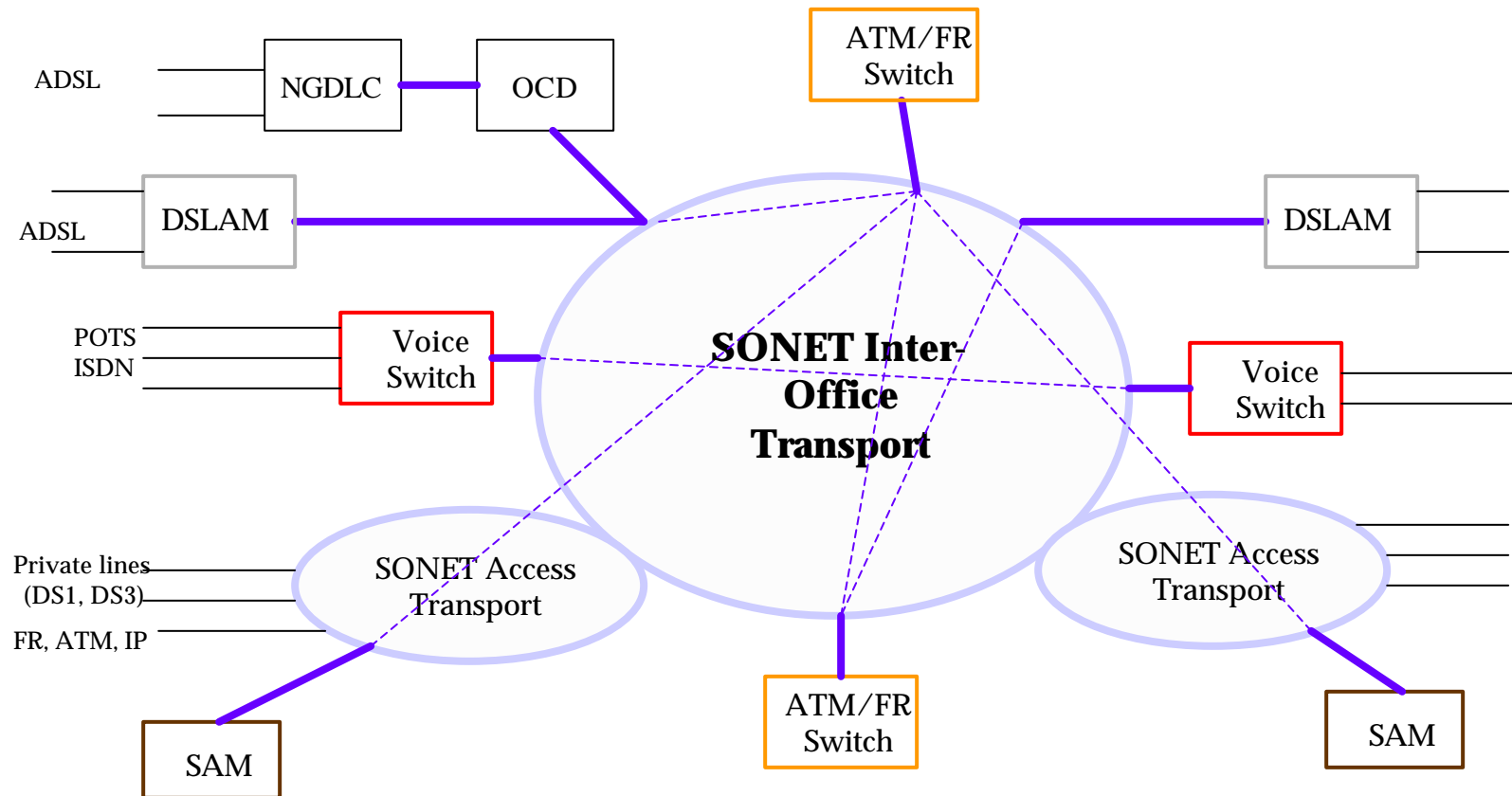
Typical SBC Transport Network in a Metro

Inter-office Network

Access ADM
CO ADM
3/1 DCS
3/3 DCS

OC12 Ring

OC48 Ring

OC48 Ring

OC48 Ring

Access Network

OC3 Ring

OC48 Ring

OC48 Ring

Access Network

OC48 Ring

SBC Native LAN Service

RJ45 or MM SC
Connection

Central office

| Switch/Router | ATM Equipment | OC-3c | Fiber Cross-Connect | OC-3c | ATM Equipment | Switch/Router |

10/100 BaseT,
Token ring or FDDI
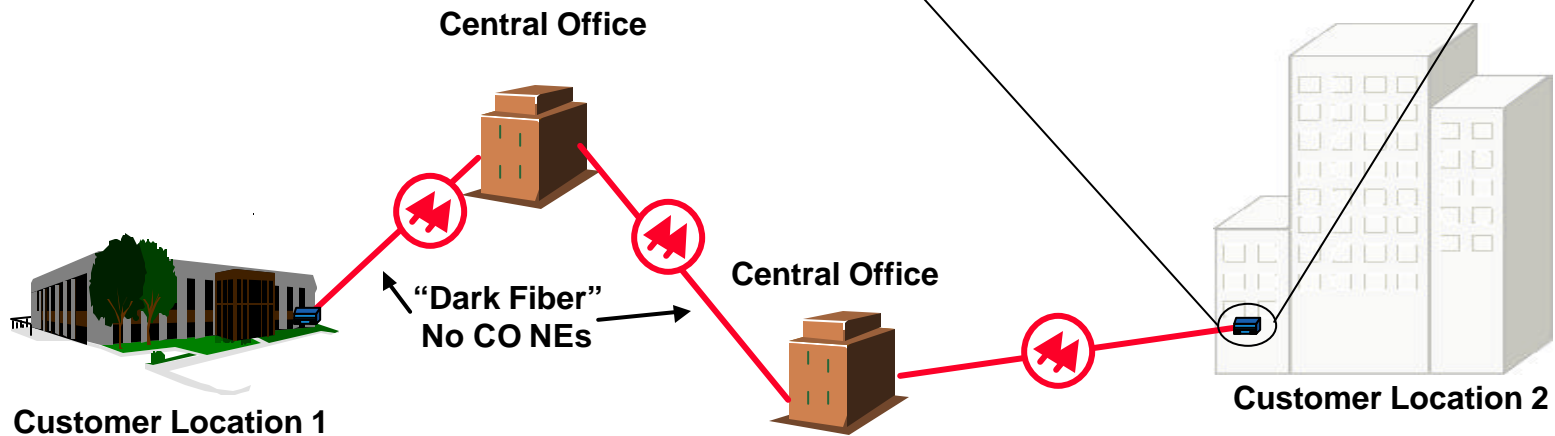
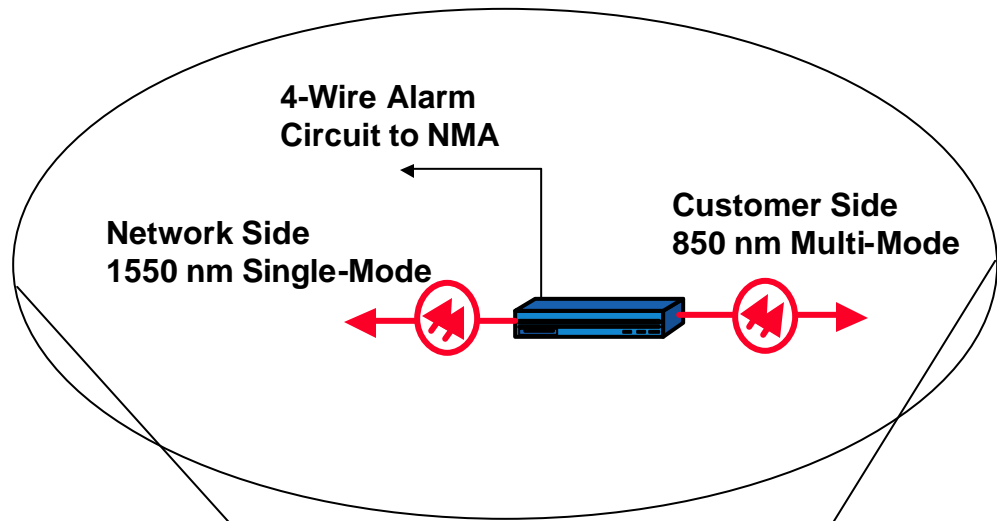Customer Premises A

Customer Premises B
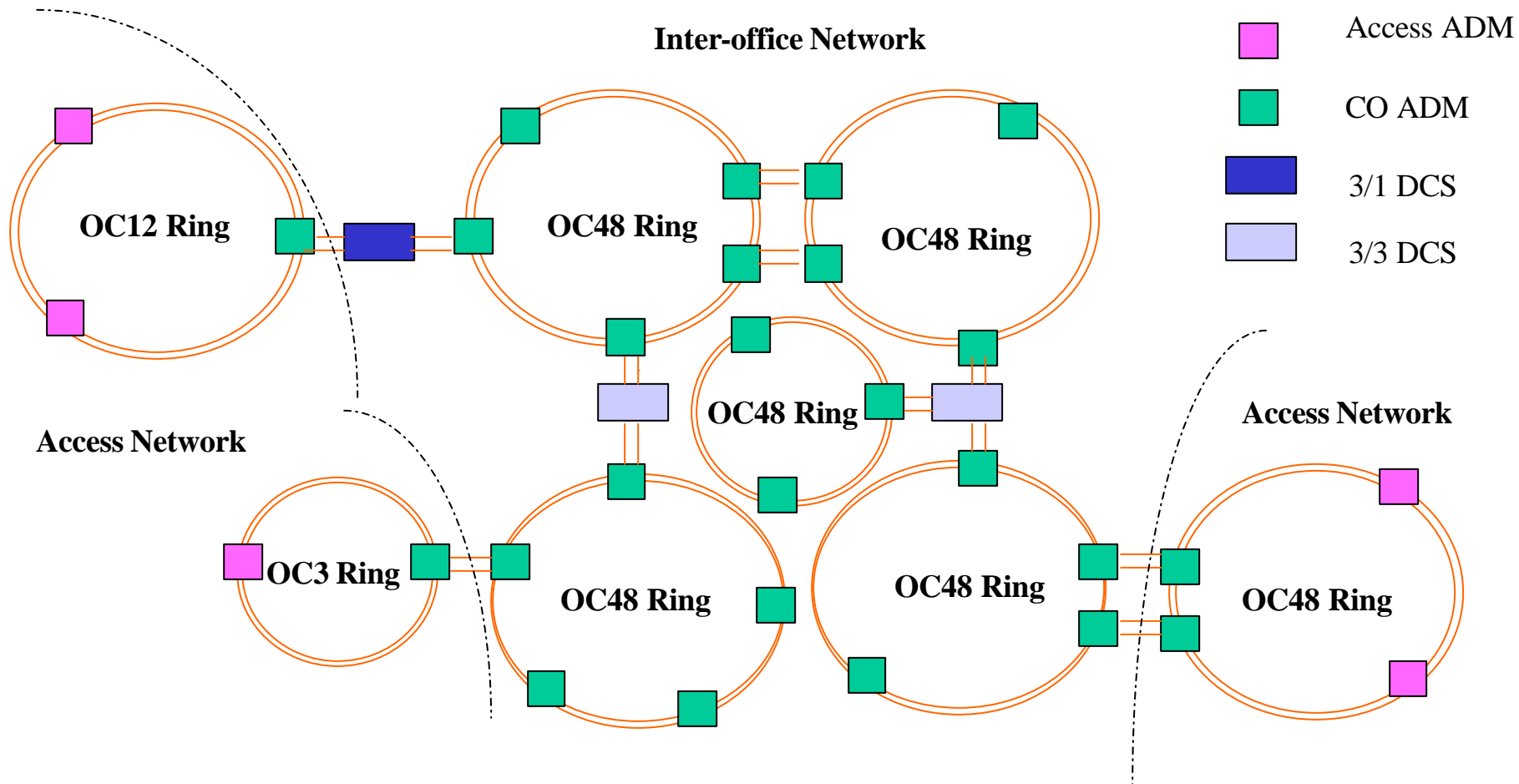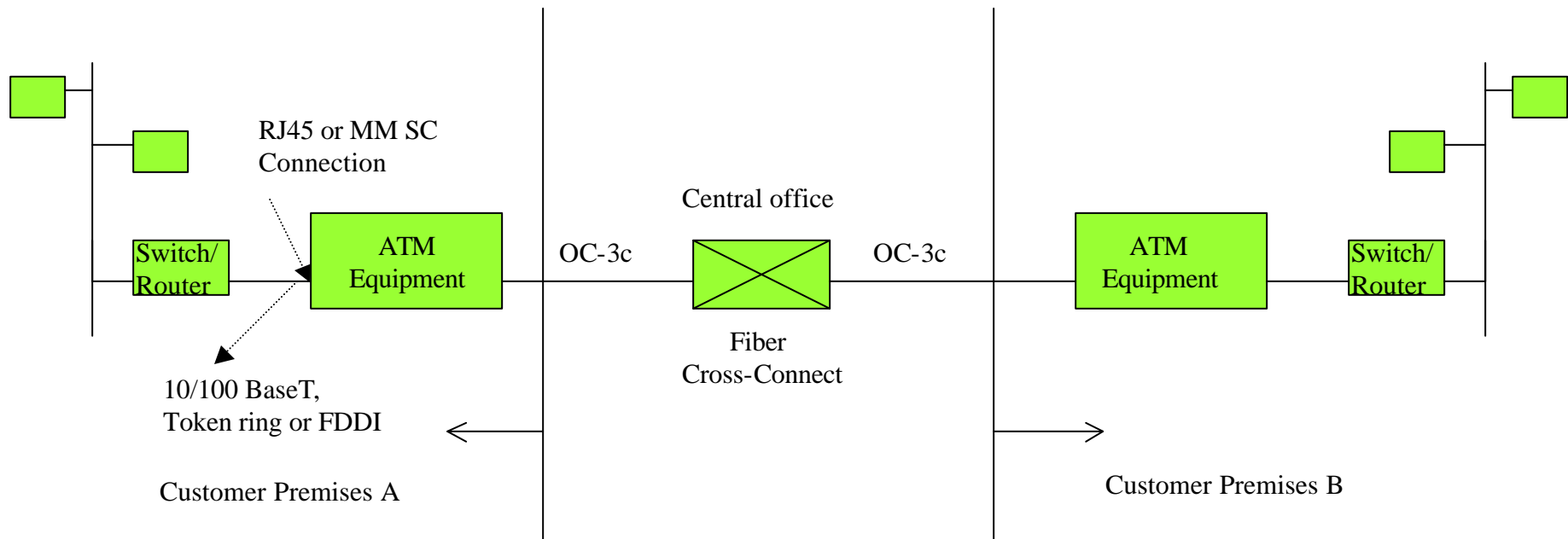
SBC's GigaMAN: Gigabit Ethernet

- **Full Gigabit Ethernet**
- **Single Point-to-Point Connection**
- **No Regeneration**
- **No Protection (or Use 2 Circuits)**
- **SX Version of IEEE 802.3 (No LX)**
- **Optical Budget: 29 dB**

4-Wire Alarm Circuit to NMA

Network Side 1550 nm Single-Mode

Customer Side 850 nm Multi-Mode

Central Office

Central Office

"Dark Fiber" No CO NEs

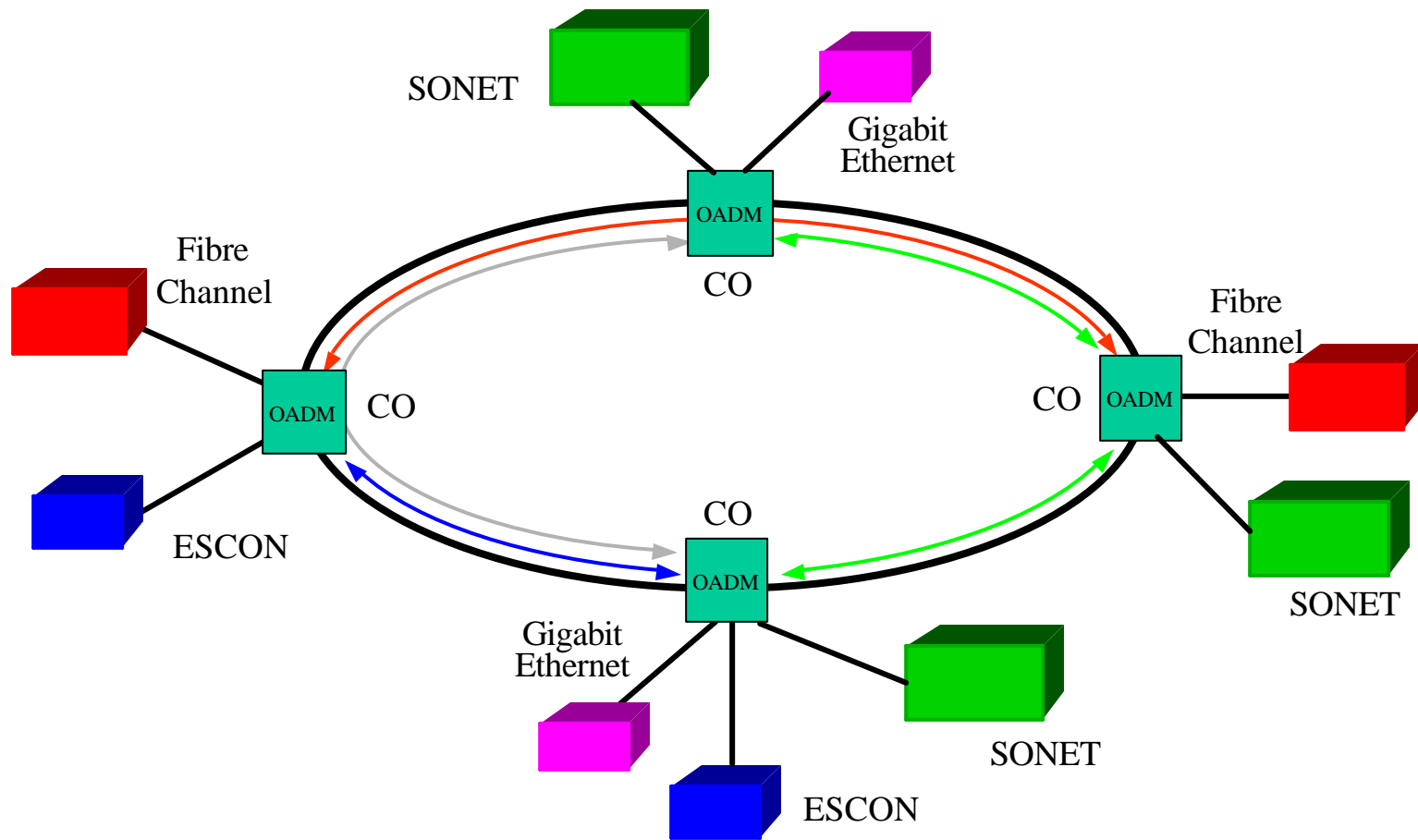**Customer Location 1**

Customer Location 2

MON Application

- Multi-service Optical Network -- Customer Dedicated DWDM network

- Targeted for large business customers
  - Storage area networks
  - Large amount of GbE traffic
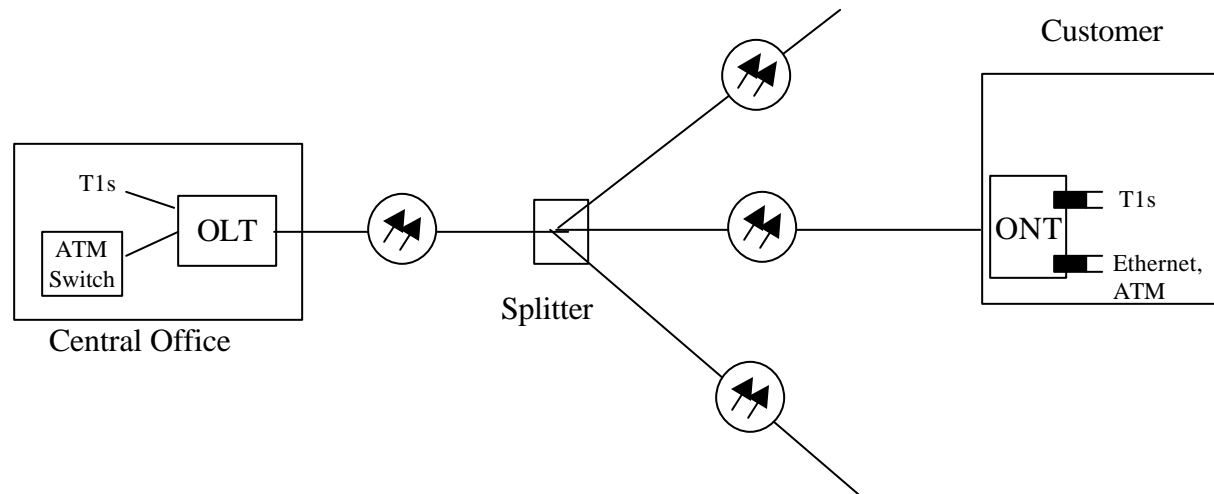 - Rapidly growing SONET needs
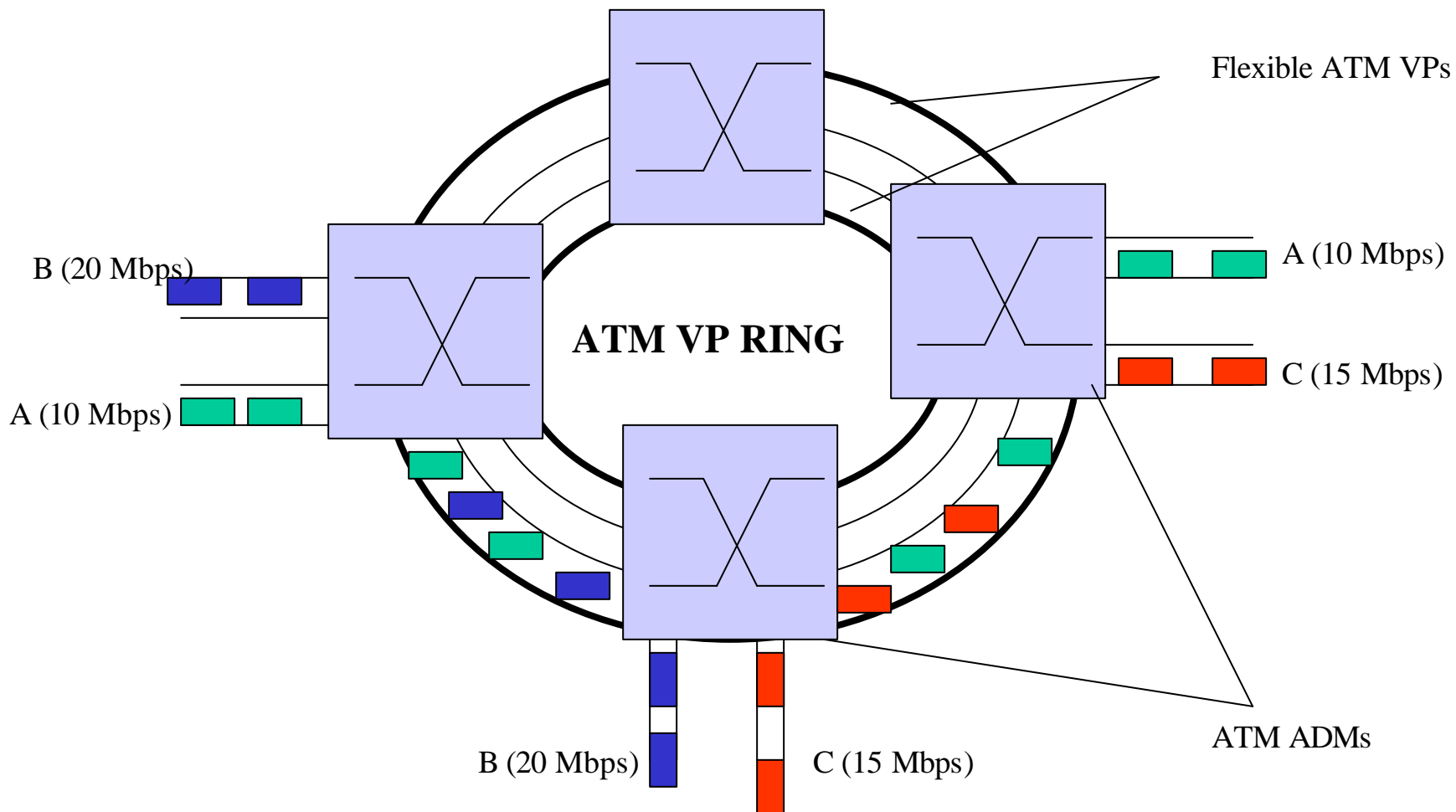
Future Shared DWDM Infrastructure

SONET

Gigabit
Ethernet

Fibre
Channel

OADM

CO

ESCON

CO

CO

OADM

CO

OADM

Fibre
Channel

SONET

OADM

Gigabit
Ethernet

SONET

ESCON

ATM Passive Optical Network (APON)

Customer

T1s

ATM
Switch

OLT

ONT

T1s

Ethernet,
ATM

Splitter

Central Office

ATM VP RING

Flexible ATM VPs

B (20 Mbps)

A (10 Mbps)

ATM VP RING

A (10 Mbps)

C (15 Mbps)

ATM ADMs

B (20 Mbps)   C (15 Mbps)

ATM VP Ring

- ATM is the common transport layer over a "thin" layer of SONET.

- Integration of transport and switch functions at ATM layer

- Support for all types of services (private lines, FR, ATM, voice, IP, etc.)

- Statistical multiplexing for data traffic (without SONET hierarchy)

- ATM VP Protection Switching with 50~100 msec error restoration time

- Protects against ATM layer as well as lower layer defects

- Protection bandwidth could be utilized by best-effort data traffic

A lot of the benefits are similar to what
RPR hopes to provide

ADSL Transport with ATM VP Rings
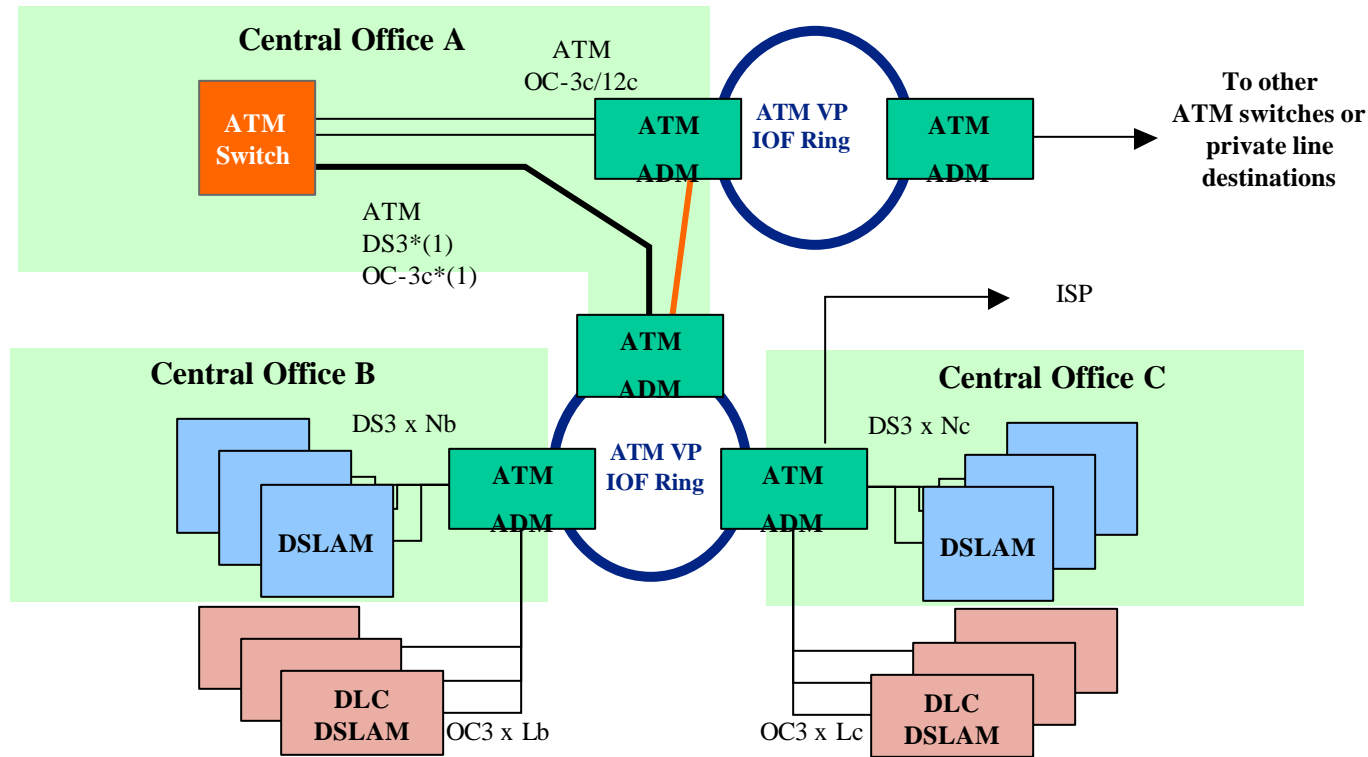
- ATM VP Rings enable the aggregation and multiplexing of lightly loaded DS3 and OC3c circuits.

- This reduces the number of DS3/OC3c circuits & ports on IOF network and ATM switches.

- This also reduces back-hauling, resulting in reduced IOF network and ATM port costs.

Important reasons why ATM VP Ring business case did not prove in

- Lack of enough ATM sources in the access network
- Adaptation of non-ATM traffic to ATM was expensive
- ATM VP rings were not so attractive in the core as the bandwidth utilization in the ATM "pipes" in the core was high.

Important Lesson: Do not make RPR too complicated that makes adaptation of traffic to RPR too expensive.