MAN/WAN Interconnection Options for SBC

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MAN/WAN interconnection

Customer Premises

Building Closet

Transparent LAN service

Router

Private Net

NxDS1

DSU

Internet Access Service

Router

DS1

DSU

ADM

Local Access Loop

SONET/DWDM

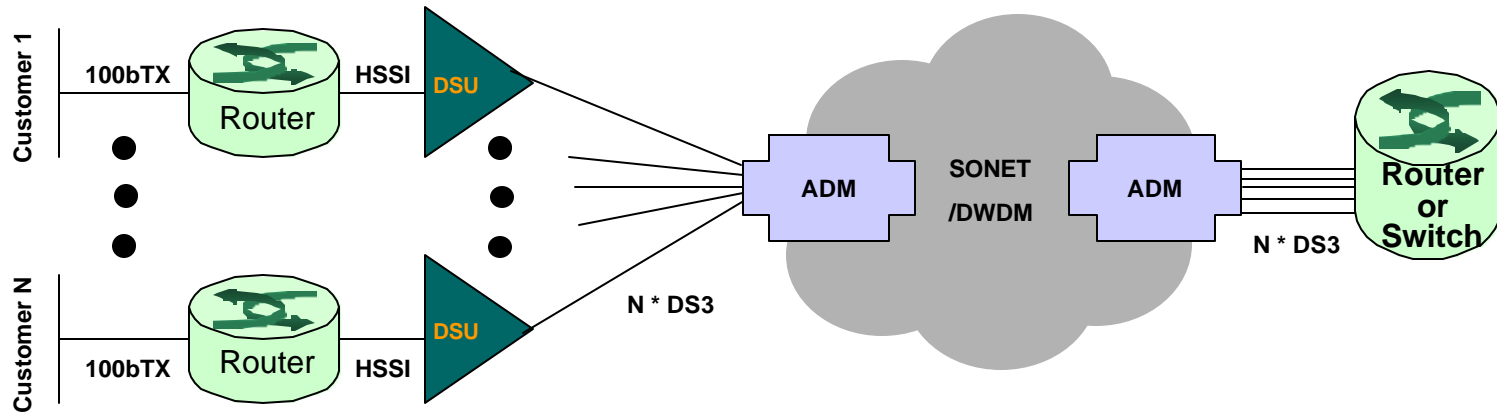To ISP POP

To IXC POP

To Another Customer site

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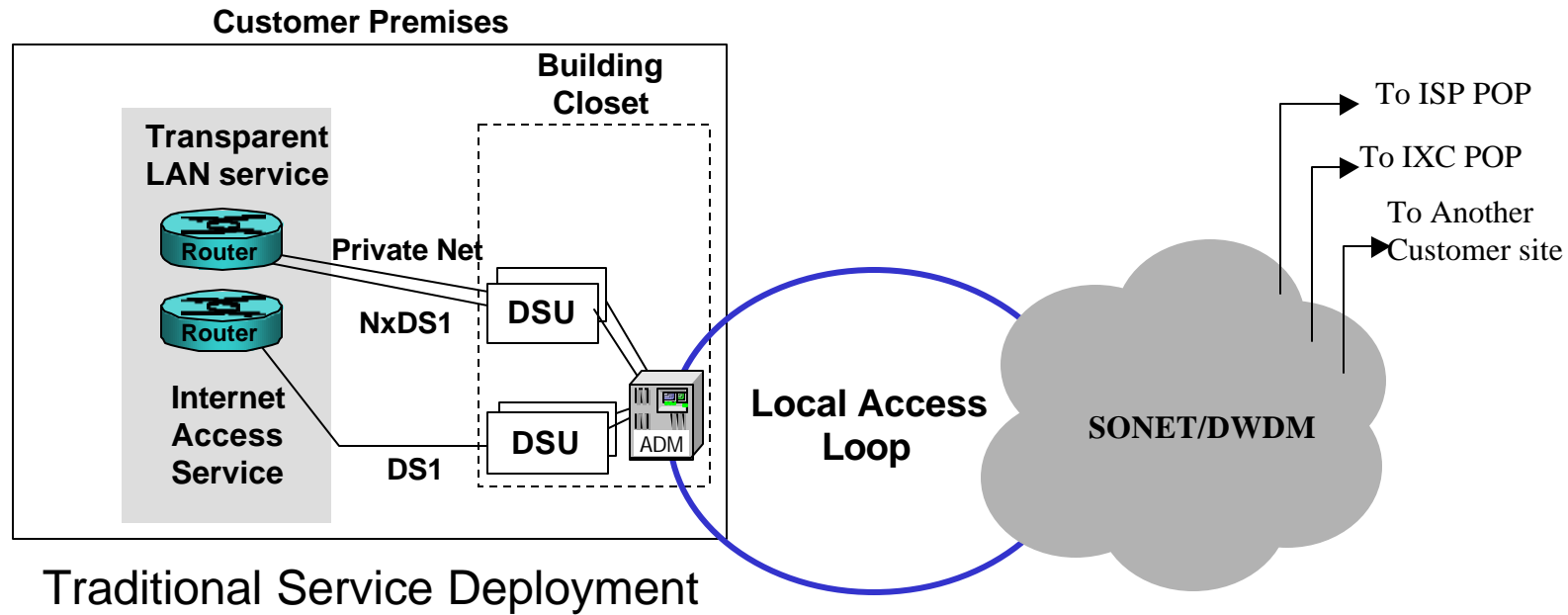
DS1 could be TDM, FR or ATM.
Fractional DS1 possible for TDM and FR
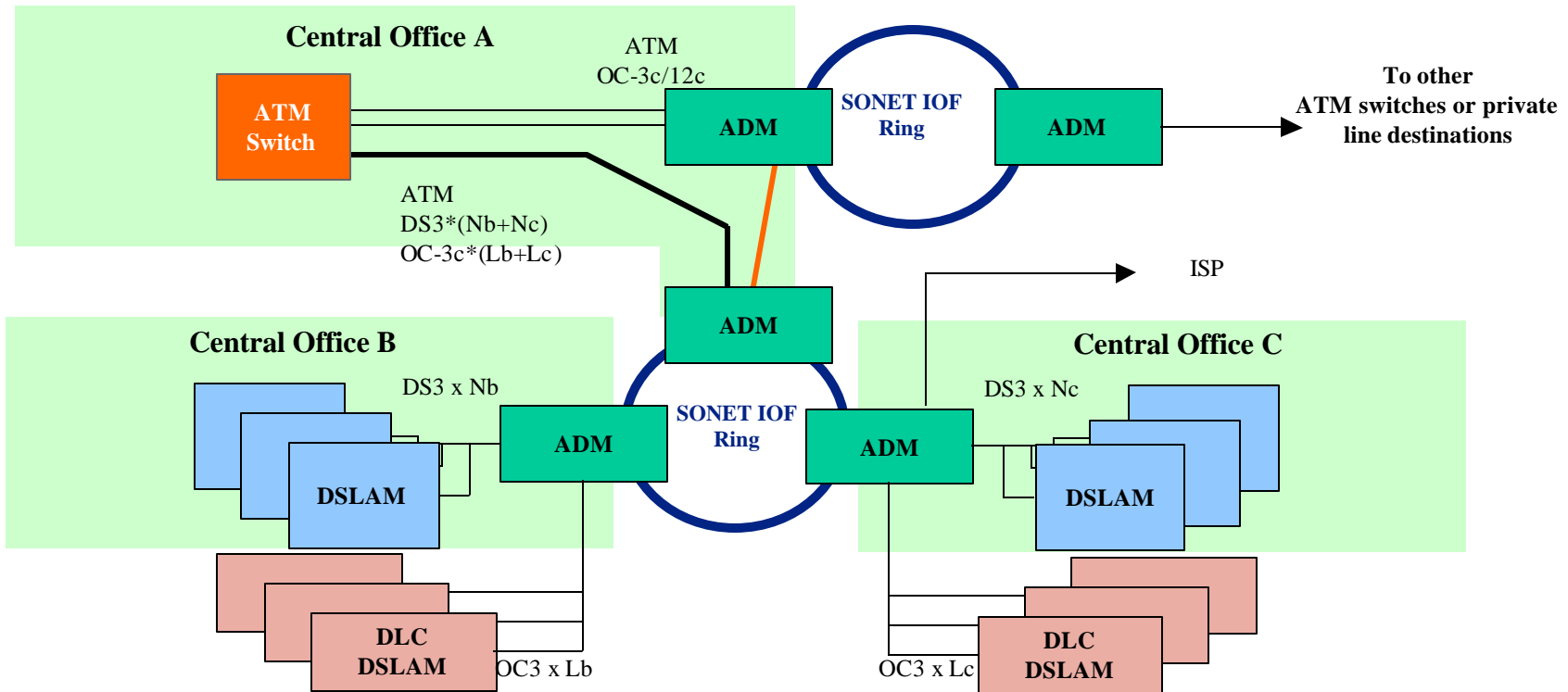FR and ATM may pass through an ATM/FR switch in the core

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MAN/WAN interconnection (Contd.)

Customer 1 100bTX — Router — HSSI — DSU

Customer N 100bTX — Router — HSSI — DSU

N * DS3

ADM — SONET /DWDM — ADM

N * DS3 — Router or Switch

MAN/WAN interconnection (Contd.)

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To ISP POP

To IXC POP

To Another
Customer site

Customer N

1GbE Router OC-n | ADM | SONET /DWDM | ADM |

OC-n could be POS or ATM.

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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
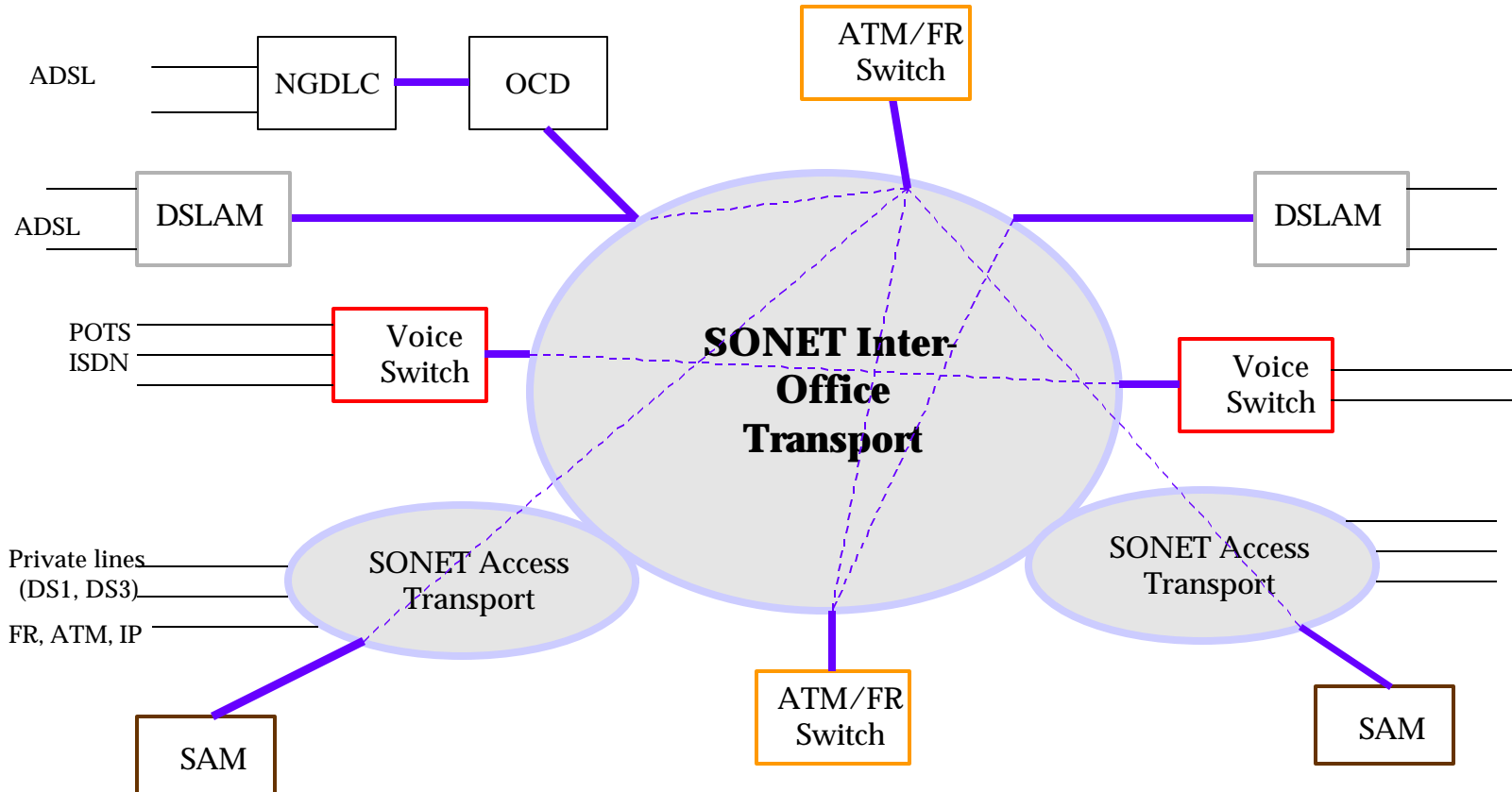
SONET IOF Ring

ADM

Central Office C

DS3 x Nc

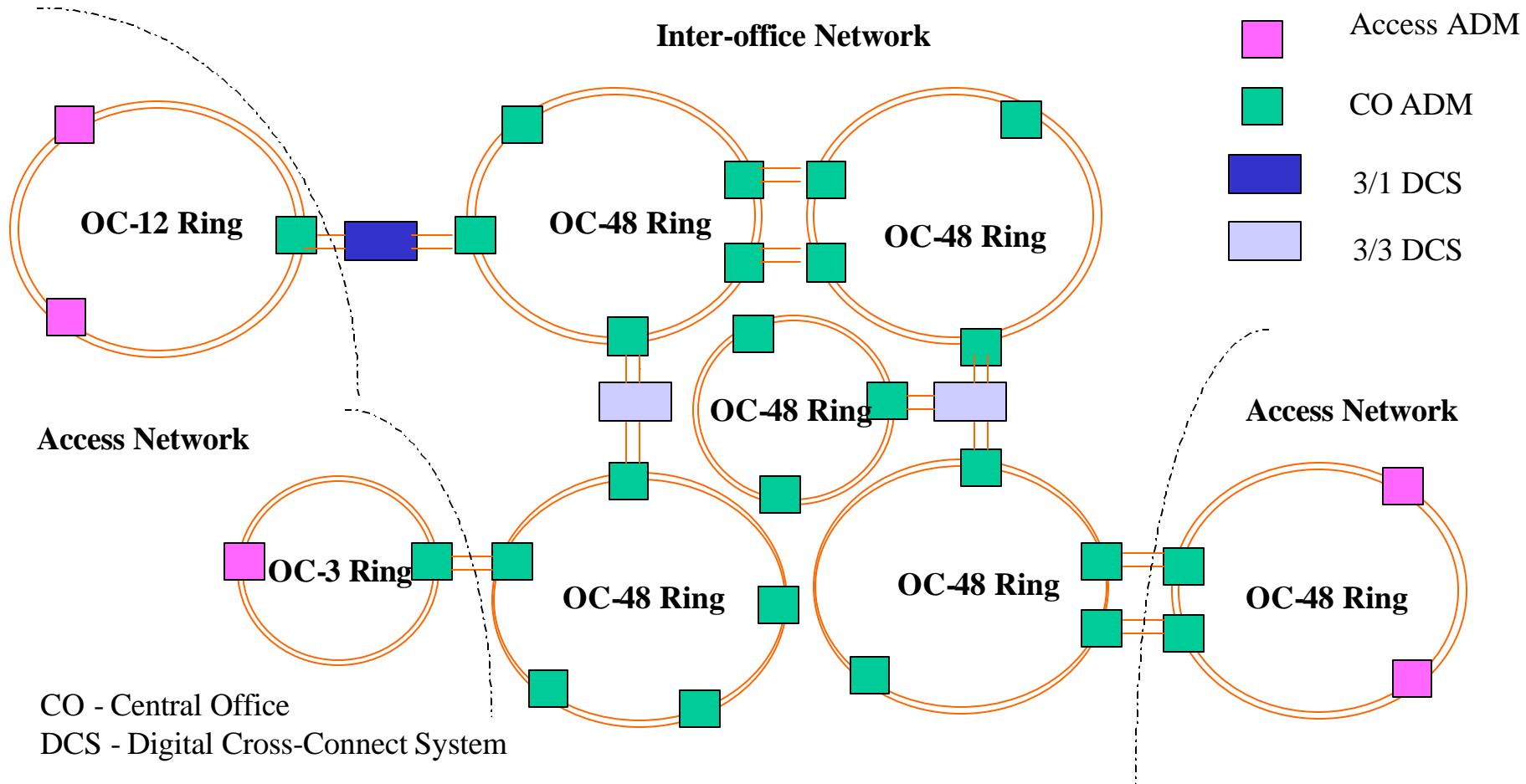DSLAM

DLC DSLAM

OC3 x Lb

OC3 x Lc

DLC DSLAM

IOF - Interoffice Facility
ADM - Add-Drop Multiplexer
DLC - Digital Loop Carrier
DSLAM - DSL Access Multiplexer
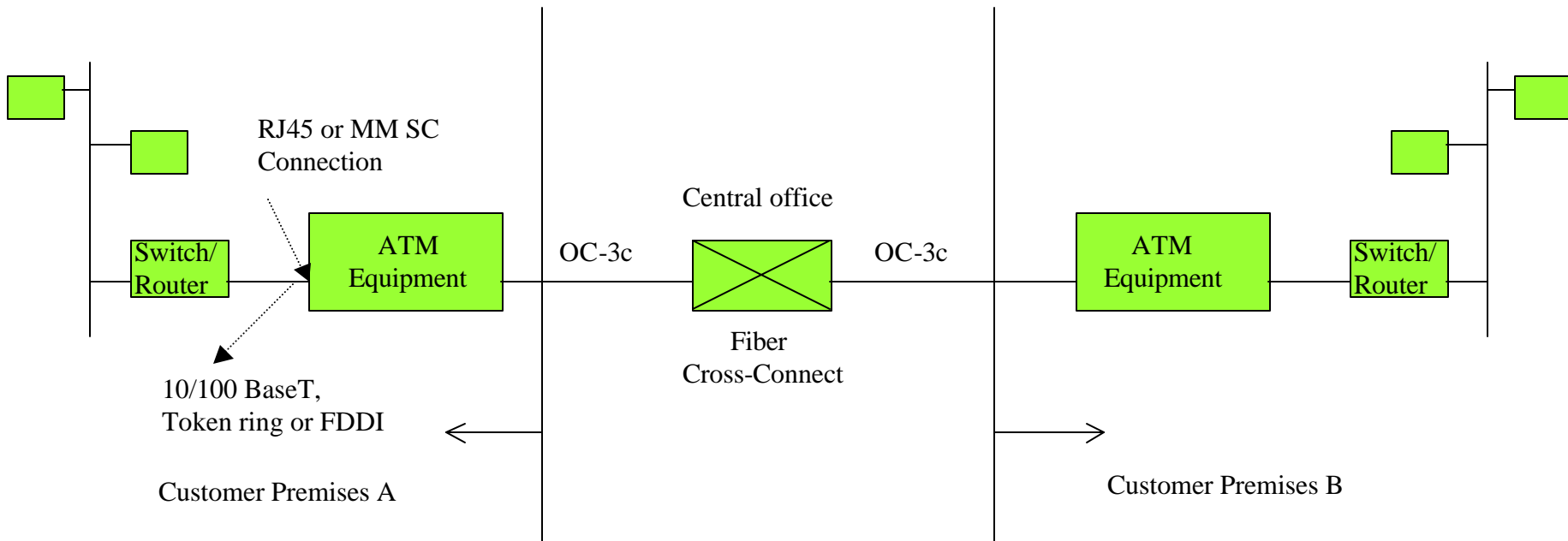
Current Network Architecture

SAM - ATM Service Access Multiplexer
OCD - Optical Concentration Device

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Typical SBC Transport Network in a Metro

802-17-01-00087
vr_sbcman_01.pdf
Sept 10-13, 2001

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

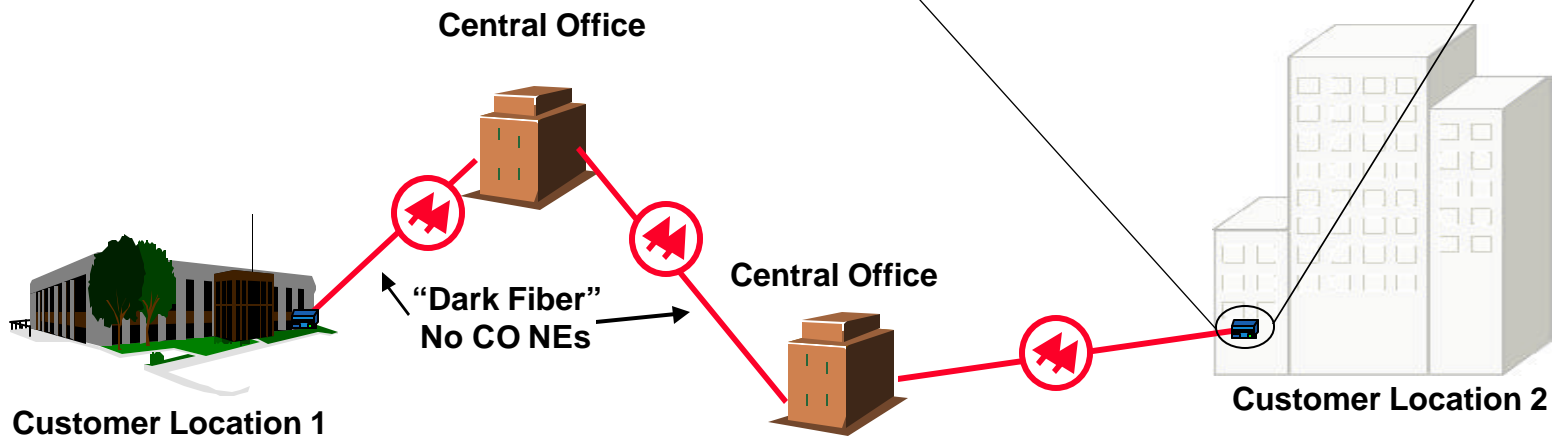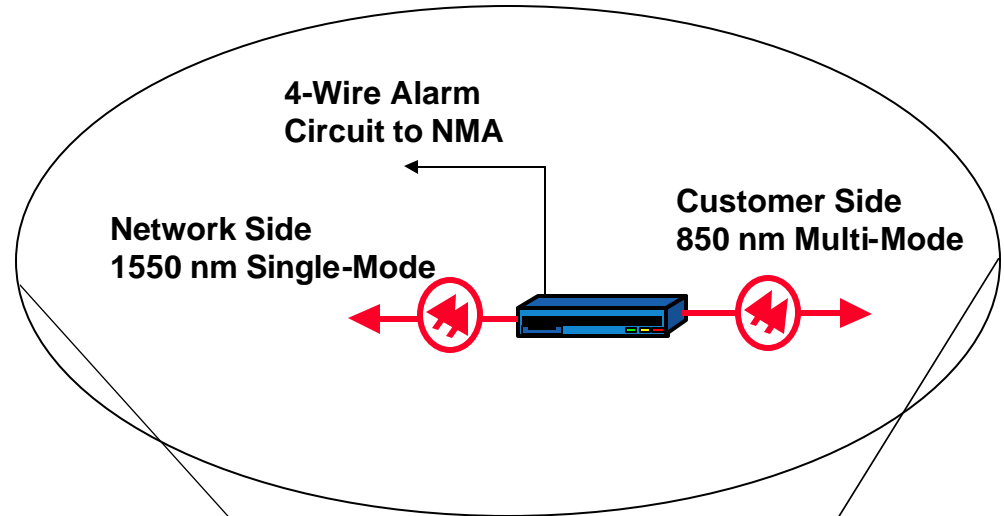10/100 BaseT,
Token ring or FDDI

Customer Premises A

Customer Premises B
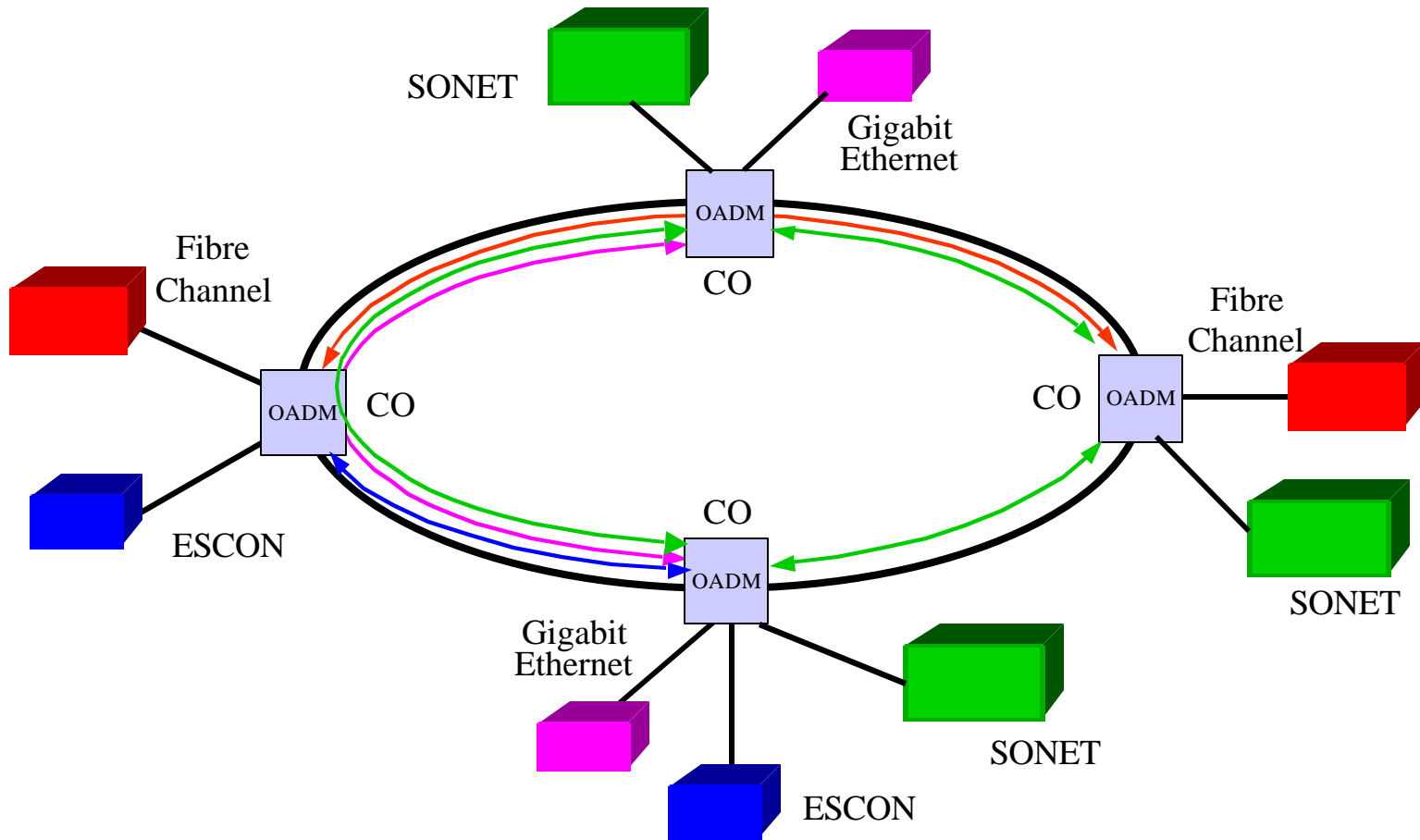
SBC's GigaMAN: Gigabit Ethernet

- • 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

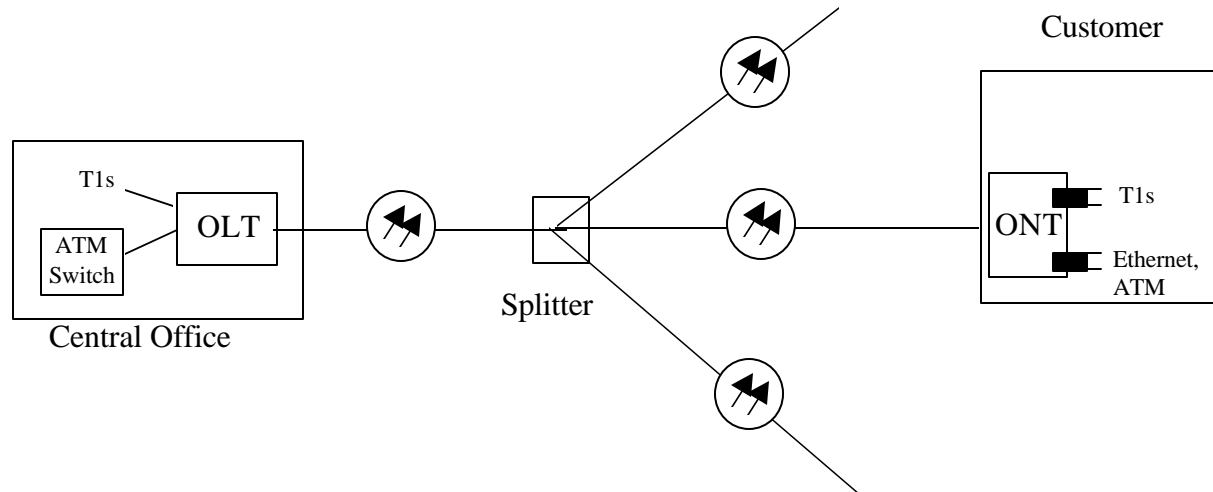**Customer Location 1**

Customer Location 2

MON Application

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

- Targeted for very large business customers
  - Storage area networks
  - Large amount of GbE traffic
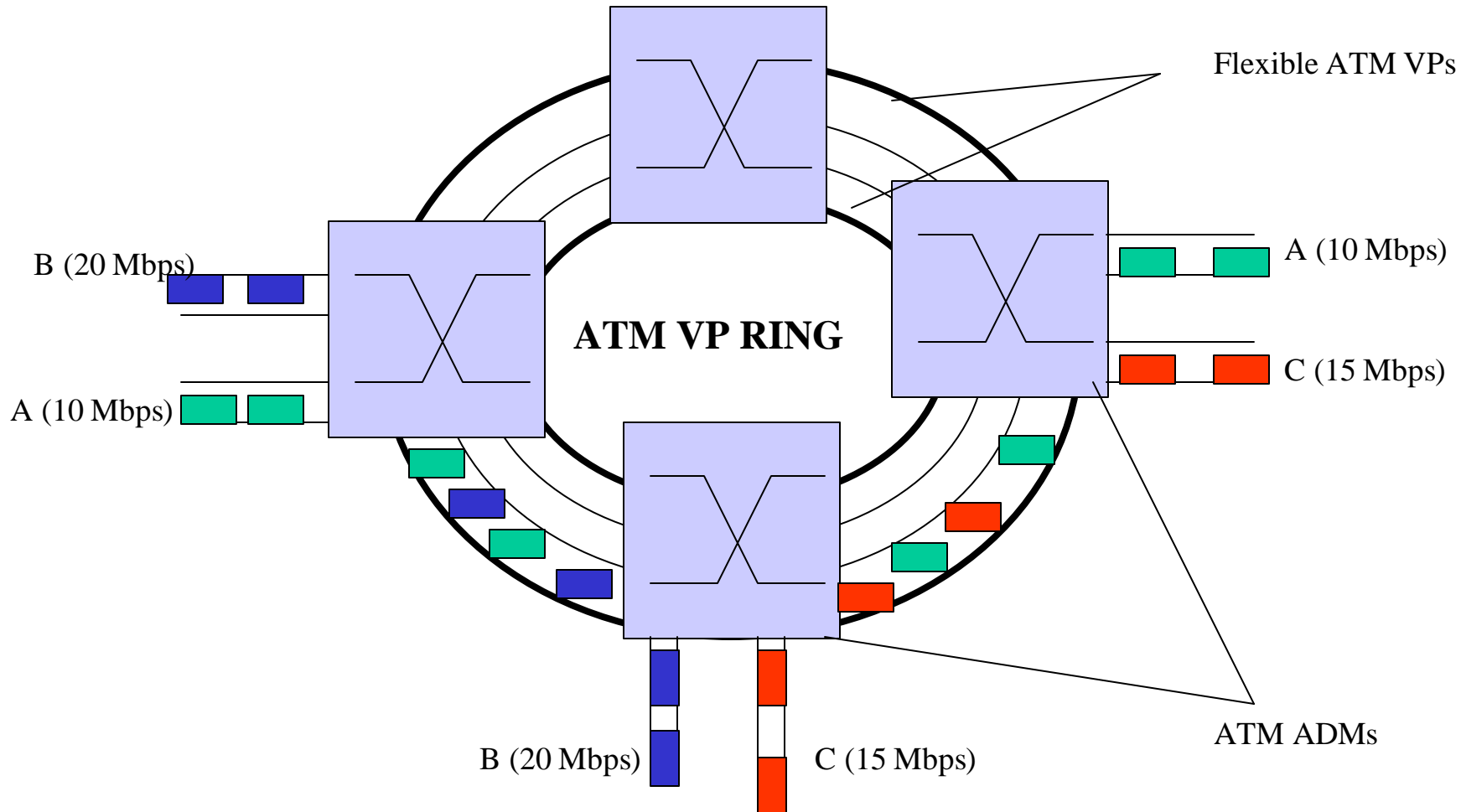 - Rapidly expanding SONET demands

Future Shared DWDM Infrastructure

ATM Passive Optical Network (APON)

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Customer

T1s

OLT

ATM
Switch

ONT

T1s

Ethernet,
ATM

Central Office

Splitter

ATM VP RING

Flexible ATM VPs

B (20 Mbps)

A (10 Mbps)

ATM VP RING

A (10 Mbps)

C (15 Mbps)

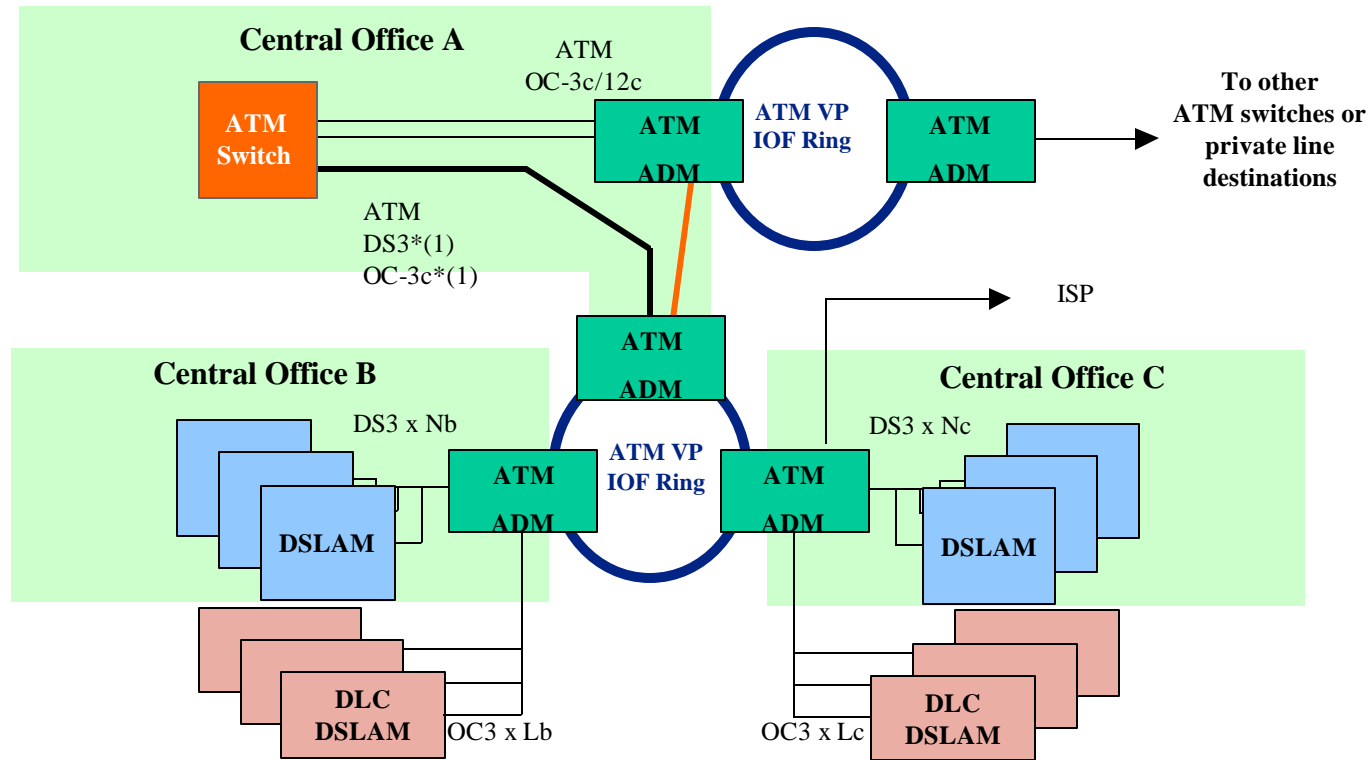B (20 Mbps)   C (15 Mbps)

ATM ADMs

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ATM VP Ring

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

l Integration of transport and switch functions at ATM layer

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

l Statistical multiplexing for data traffic (without SONET hierarchy)

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

l Protects against ATM layer as well as lower layer defects

l 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

Central Office A

ATM OC-3c/12c

ATM Switch

ATM ADM

ATM VP IOF Ring

ATM ADM

To other ATM switches or private line destinations

ATM DS3*(1) OC-3c*(1)

ATM ADM

ISP

Central Office B

DS3 x Nb

ATM ADM

ATM VP IOF Ring

ATM ADM

Central Office C

DS3 x Nc

DSLAM

DSLAM

DLC DSLAM

OC3 x Lb

OC3 x Lc

DLC DSLAM

- 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, since the bandwidth utilization in the ATM "pipes" in the core was high.
- Administrative costs of managing connection-oriented paths and circuits were not appreciably reduced.

Important Lesson: Do not make RPR so complicated that adaptation of traffic to RPR becomes too costly.

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