



# Server and CSS Separation—Avaya S8700-Series Servers Using Hardware Duplication

This document provides information on separating S8700-series Servers and duplicated Center Stage Switch (CSS) elements of Port Network Connectivity (PNC) in a system with a duplicated bearer network. Separation of S8700-series Servers is addressed first followed by CSS separation. Most of the typical server separation drawings show, at a high level, CSS separation. See [Overview of Center Stage Switch separation](#) on page 14 for more detail.

The Avaya S8720 and S8730 Servers support two methods of server duplication: software duplication (IP connection) and hardware duplication (DAL1 or DAL2 card and fiber connection). Server separation is handled differently for software duplication. For information on server separation with software duplication, see *Application Note: Reference Configuration for Avaya S8720 Media Server using Software Duplication* (03-600843).

 **Important:**

This document does not apply to Avaya S8720 Server with software duplication.

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## Overview of server separation

This feature provides for the geographical separation of each S8700-series server to improve their survivability. The maximum distance is dictated by the transceiver power budget available on the DAL1/DAL2 board (fiber duplication link) in the S8700-series Servers. The actual distance may be less. It can be calculated based on details provided in [Power budgets, specifications, and calculation factors](#) on page 2.

Server separation is applicable to Avaya S8700-series Servers in both fiber-PNC and IP-PNC configurations.

S8700-series Servers separation in its basic configuration is relatively straight-forward to implement. However, variations of the basic configuration introduce some complex issues and concerns. Each server separation design must be reviewed by the Avaya Technical Assistance Center for accuracy and technical feasibility.

## Power budgets, specifications, and calculation factors

This section shows how to ensure that the power required to drive the fiber optic cable between S8700-series Servers does not exceed the power budget of the transceivers used. You also may use this section to calculate the maximum distance between S8700-series Servers based on your configuration. There are three steps involved in making these calculations:

1. Calculate the power budget available with the transceivers used. See [Optical power budgets](#) on page 2 and [Power budget calculations for selected components](#) on page 4.
2. Estimate or measure the loss in the fiber and connections between sites. See [Fiber optic calculation factors](#) on page 4.

 **CAUTION:**

Calculating the fiber connection loss and power budget provides a degree of confidence that the fiber will operate satisfactorily, but it is not a guarantee that the link will operate. Actual measurement of the proposed fiber using an Optical Time Domain Reflectometer (OTDR) is highly recommended and yields the most accurate results.

3. Verify that the power budget is greater than or equal to the loss on the fiber optic cable between server locations.

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## Optical power budgets

The optical power budget is the amount of light power available to drive data across a fiber optic connection. The power budget is calculated using the specifications for the fiber optic transceivers used at each end of a fiber connection. The optical power budget is calculated using the formula:

power budget = minimum transceiver transmit power – minimum transceiver receive sensitivity.

See [Transceiver specifications](#) on page 3 and [Power budget calculations for selected components](#) on page 4. The following abbreviations are used in the tables:

µm	micrometer
nm	nanometer
dBm	The measure of power loss with 1 milliwatt as the transmission reference.

For a list of Gigabit interface converter (GBIC) transceivers, see [http://support.avaya.com/elmodocs2/C360/Transceiver\\_List.pdf](http://support.avaya.com/elmodocs2/C360/Transceiver_List.pdf). GBIC specifications are available the vendors' websites.

**! CAUTION:**

With the 300A transceiver it is possible, when there is low loss in the fiber between 300A transceivers, that the receiver may saturate and not recover data correctly from the link. An in-line, single mode (1310 nm) attenuator may be required to increase the loss to greater than 10 dB but less than 17 dB. In-line attenuators are available that provide 5, 10, or 15 dB of attenuation.

**Table 1: Transceiver specifications**

Specification	DAJ1 <sup>1</sup>	DAL1 DAL2 <sup>2</sup>	300A <sup>3</sup>	9823B <sup>4</sup>	9823A <sup>5</sup>
Maximum <sup>6</sup> Distance	10 km	10 km	35 km	25,000 feet	4900 feet
Fiber Connector Type	SC	LC	ST-II	ST-II	ST-II
Transmitter Wavelength	1310 nm	1310 nm	1310 nm	1310 nm	850 nm
Mode Field Diameter	9 µm	9 µm	9 µm	62.5 µm	62.5 µm
Cladding Diameter	N/A	N/A		125 µm	125 µm
Transmitter Output Power (Minimum)	-9.5dBm	-9.5 dBm	-8 dBm	-19 dBm	-18 dBm
Transmitter Output Power (Typical)	N/A	N/A	-8 dBm	-18 dBm	-17 dBm
Transmitter Output Power (Maximum)	-3 dBm	-3 dBm	-5 dBm	-13 dBm	-12 dBm
Receiver Wavelength	1310 nm	1310 nm	1310 nm	1310 nm	850 nm
Receiver Sensitivity (Minimum)	-20 dBm	-20 dBm	-30 dBm	-30 dBm	-30 dbm
Receiver Sensitivity (Typical)	N/A	N/A	-30 dBm	-30 dBm	-30 dBm
Receiver Sensitivity (Saturation)	-3 dBm	-3 dBm	-11 dBm	-11 dBm	-11 dBm

1. Fiber duplication optical interface in the S8700 Servers
2. Fiber duplication optical interface in the S8710 and S8720 Servers
3. Single-mode fiber transceiver used for fiber connections between a expansion interface (EI) in a media gateway and switch node interface (SNI) in a center stage switch (CSS)
4. Multimode fiber transceiver employing a 1310-nm wavelength. Used for fiber connections between an EI in a media gateway and an SNI in a CSS
5. Multimode fiber transceiver employing a 810 nanometer wavelength. Used for fiber connections between an EI in a media gateway and an SNI in a CSS
6. The fiber signal loss determines the distance.

**Table 2: Power budget calculations for selected components**

Component	Fiber Type (wavelength)	Minimum Transmit Power	Minus	Minimum Receive Power	Equals	Power Budget
DAJ1, DAL1, DAL2	Single mode (1310 nm)	-9.5 dBm	–	-20 dBm	=	10.5 dB
300A Transceiver	Single mode	-8 dBm	–	-30 dBm	=	22 dB
9823B Transceiver	Multimode (1310 nm)	-19 dBm	–	-30 dBm	=	11 dB
9823A Transceiver	Multimode (850 nm)	-18 dBm	–	-30 dBm	=	12 dB

## Fiber optic calculation factors

Various factors must be considered when estimating the loss over end-to-end fiber optic facilities. These include:

- Fiber attenuation per kilometer
  - Single-mode fiber typically measures 0.22 dB to 0.5 dB of loss per kilometer. Use the conservative value of 0.5 dB per kilometer for power budget estimates.
  - Multi-mode fiber, depending on which transmitter wavelength is used, produces two different loss factors. Use these values for power budget estimates:
    - 1300 nm (9823B) – 1 dBm of loss per kilometer
    - 850 nm (9823A) – 2.3 dBm of loss per kilometer
- Connector loss. A conservative value for connector loss budget estimates is 0.75 dB.
- Splice attenuation. A conservative value for splice loss budget estimates is 0.15 dB.
- Safety margin. A safety margin value takes into account unforeseen future changes such as, temperature extremes, additional connectors and splices. Set aside a minimum of 2.0 dB of power budget for a safety margin.

Calculations can be made using typical values for these factors. However, estimating the loss in a fiber connection does not guarantee that the connection functions. Actual measurement of the proposed fiber using an optical time domain reflectometer (OTDR) is highly recommended and yields the most accurate results.

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## Sample fiber loss calculations

Assuming a 7-kilometer fiber optic cable distance with two splices and four connectors, an example of calculations is shown in [Sample fiber-loss calculations](#) on page 5.

**Table 3: Sample fiber-loss calculations**

Fiber Type	Fiber Loss per km		Connector Loss		Splice Loss		Safety Margin		Overall Loss
Single mode (1310 nm)	7 x 0.5	+	4 x 0.75	+	2 x 0.15	+	2.0	=	8.8 dB
Multimode (1310 nm)	7 x 1.0	+	4 x 0.75	+	2 x 0.15	+	2.0	=	12.3 dB
Multimode (850 nm)	7 x 2.3	+	4 x 0.75	+	2 x 0.15	+	2.0	=	21.4 dB

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## Comparing fiber loss estimates and power budgets

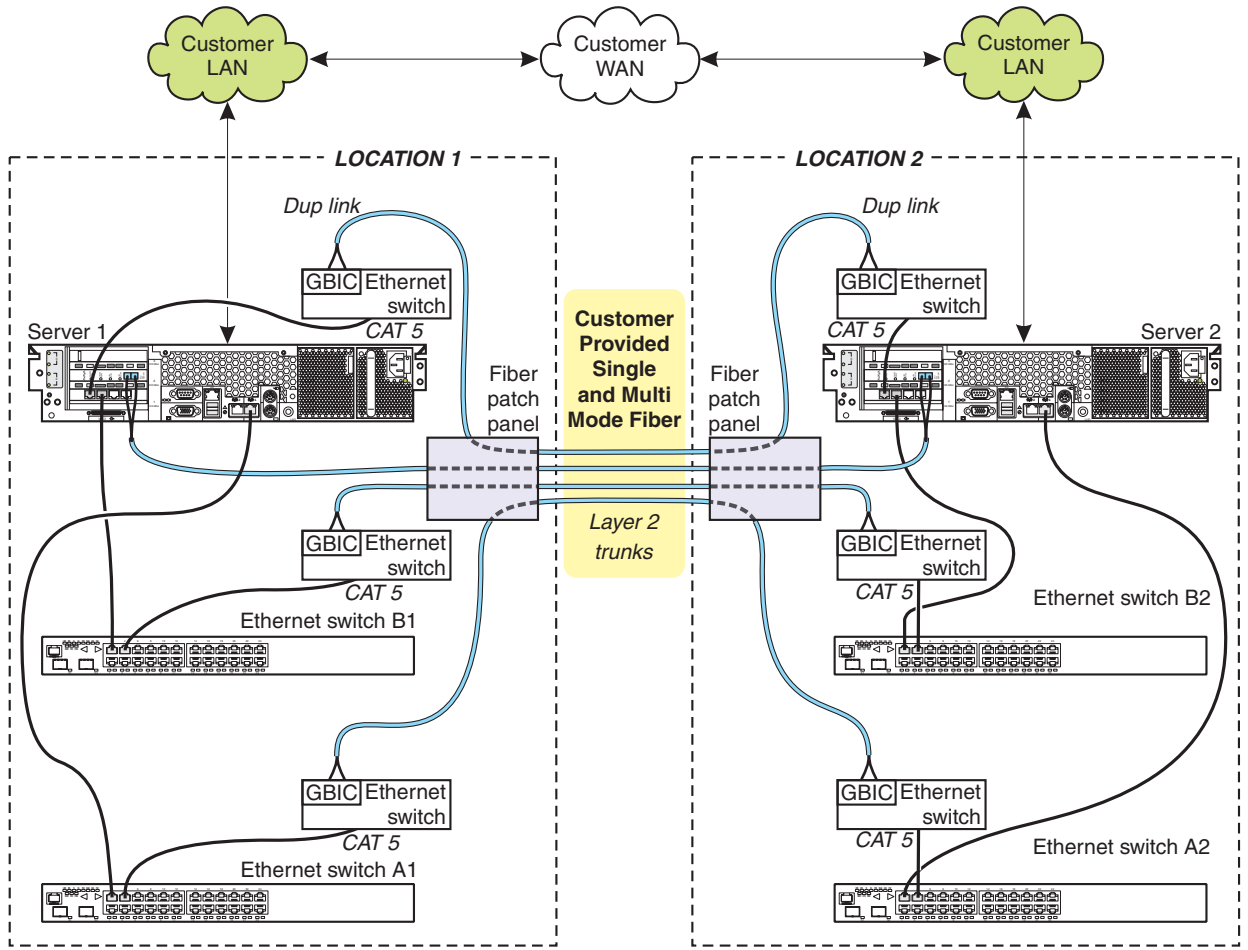
Using the sample fiber loss calculations shown in [Sample fiber-loss calculations](#) on page 5 and the power budgets shown in [Power budget calculations for selected components](#) on page 4 several conclusions can be drawn.

- With single-mode fiber any of the single-mode transceivers are well within their power budgets.
- With multi-mode fiber, using either the 9823A or 9823B transceiver, the power budget is exceeded.

## Basic connections

[Ethernet and fiber connections for S8700-Series Servers](#) on page 6 shows the basic connections for the S8700-Series Servers.

**Figure 1: Ethernet and fiber connections for S8700-Series Servers**



**Note:**

The rear-panel layouts for the S8720 and S8730 are different but the cable connections are the same.

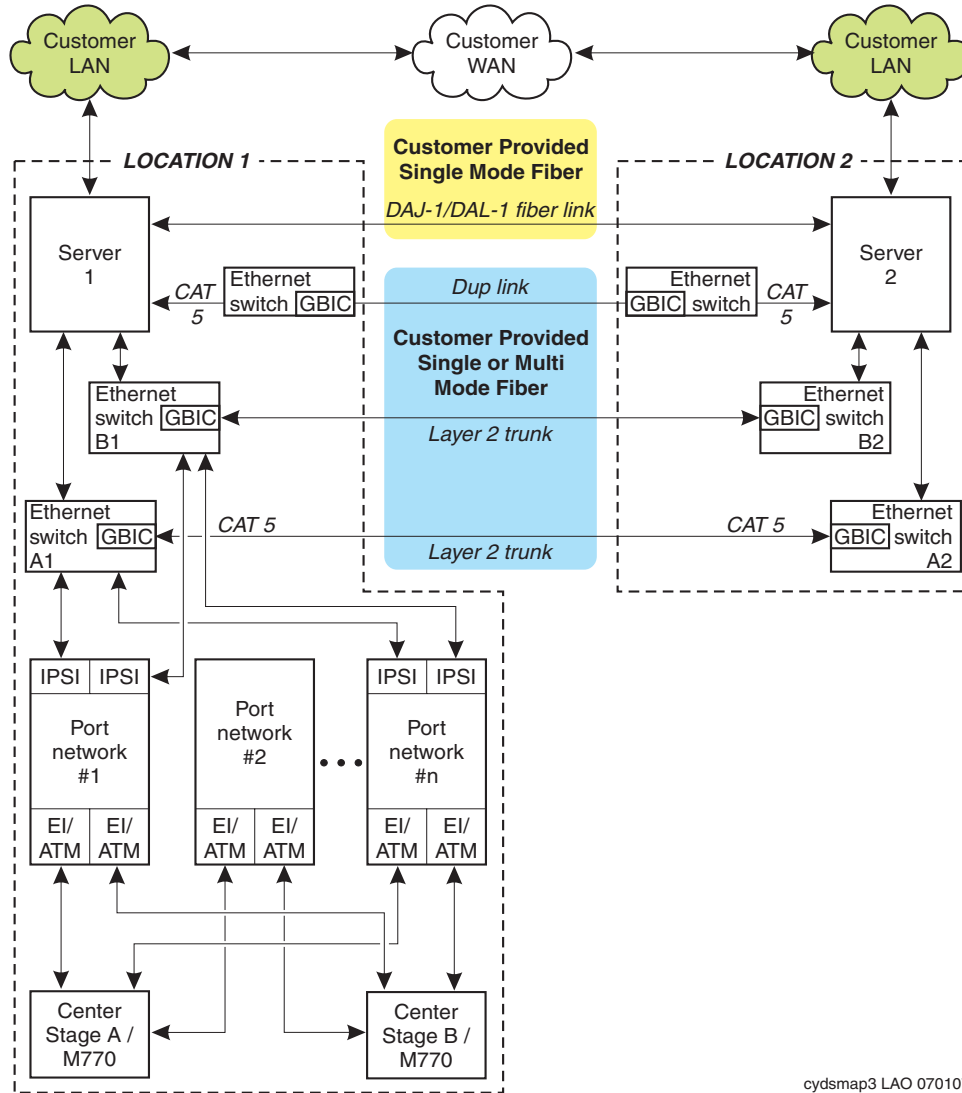
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## Typical server separation configurations

Included here are six typical configurations. The first five configurations ([Basic separation—100BaseT FX trunks \(fiber-PNC configuration\)](#) on page 8 through [Server and CSS separation—ATM CSS \(Multi-Connect configuration—critical reliability\)](#) on page 12) addresses to the S8700-series Multi-Connect configuration and the last one ([Basic separation—IP Connect](#) on page 13) addresses the S8700-series IP-connect configuration. Note that with the control and bearer signals carried on the customer's non-dedicated network, S8700-series IP-Connect configuration is by far the simplest of server separation configurations. Category 5 (Cat 5) Ethernet cabling is the minimum level supported.

## Basic separation—100BaseT FX trunks (fiber-PNC configuration)

Figure 2: Basic separation—100BaseT FX trunks (fiber-PNC configuration)



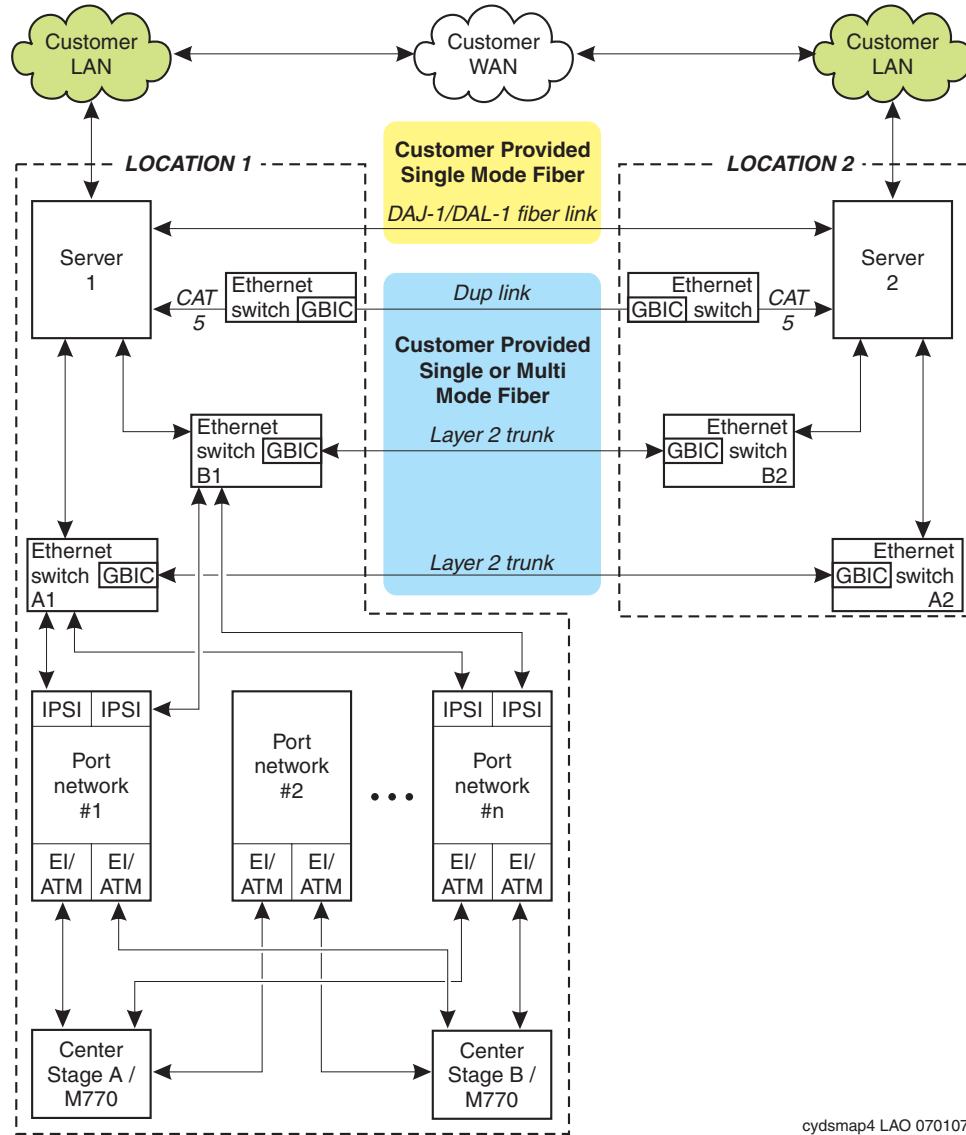
cydsmap3 LAO 070107

GBIC = GigaBit Interface Converter



## Basic separation—GBIC FX trunks (fiber-PNC configuration)

Figure 3: Basic separation—GBIC FX trunks (fiber-PNC configuration)

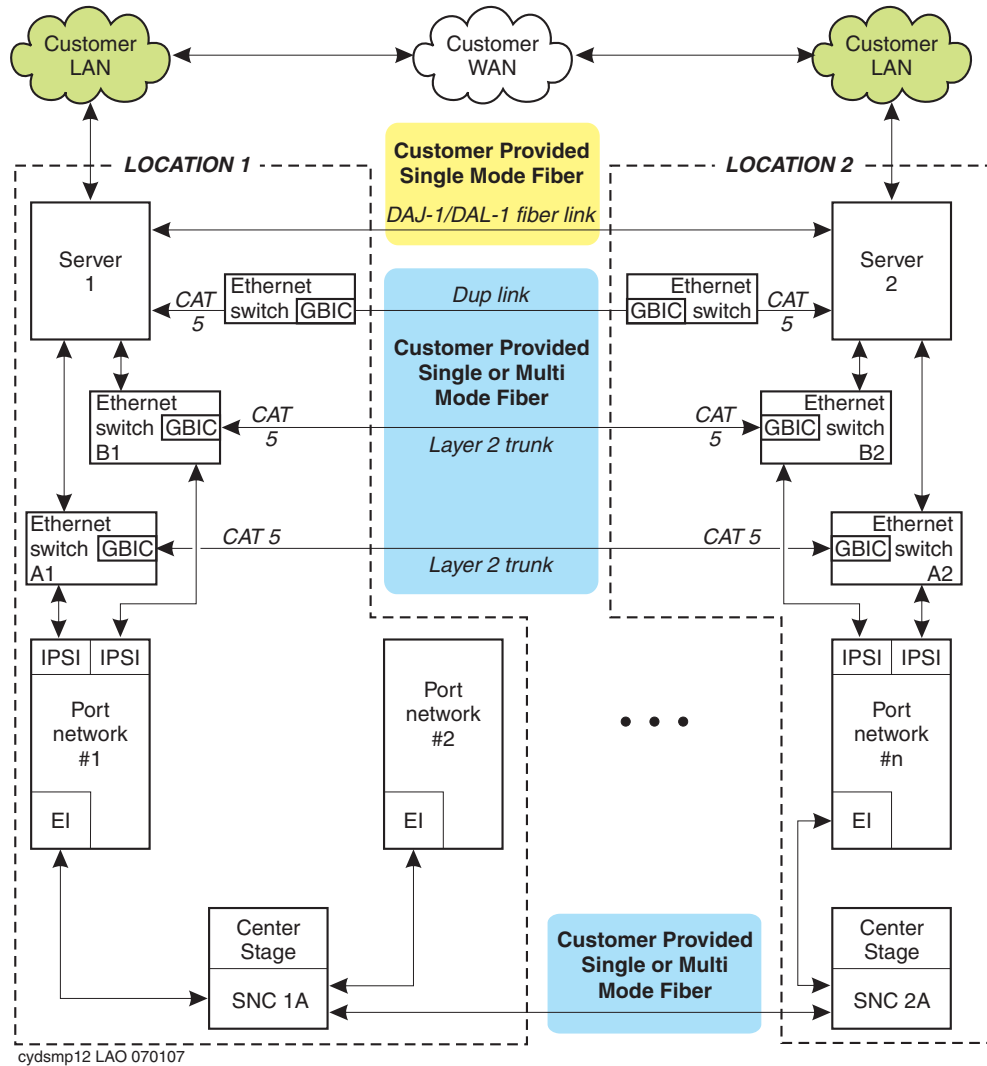


cydsmap4 LAO 070107

GBIC = GigaBit Interface Converter

## Server and CSS separation—100BaseT FX trunks (fiber-PNC configuration —high reliability)

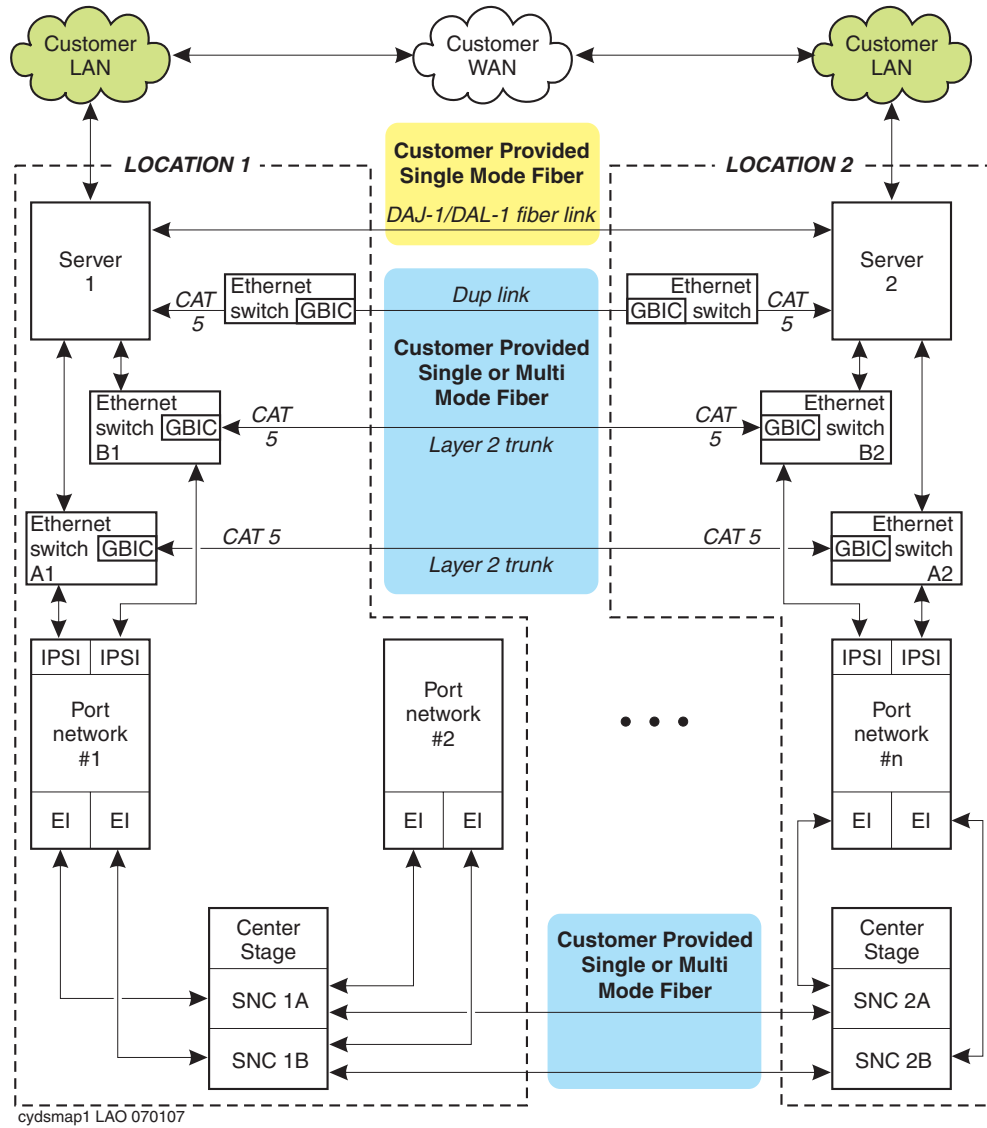
Figure 4: Server and CSS separation—100BaseT FX trunks (fiber-PNC configuration—high reliability)



GBIC = GigaBit Interface Converter

## Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability)

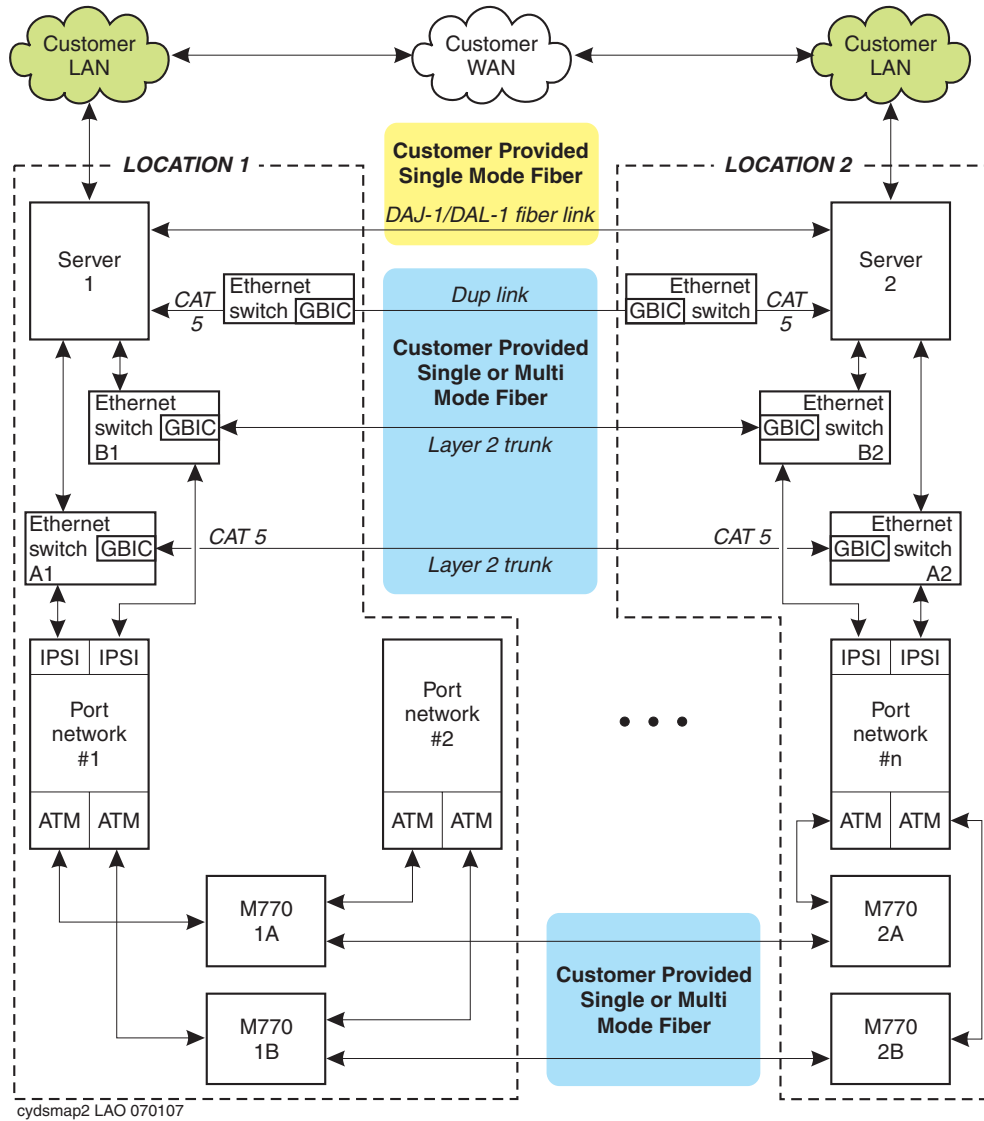
Figure 5: Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability)



GBIC = GigaBit Interface Converter

## Server and CSS separation—GBIC FX trunks (Multi-Connect configuration)

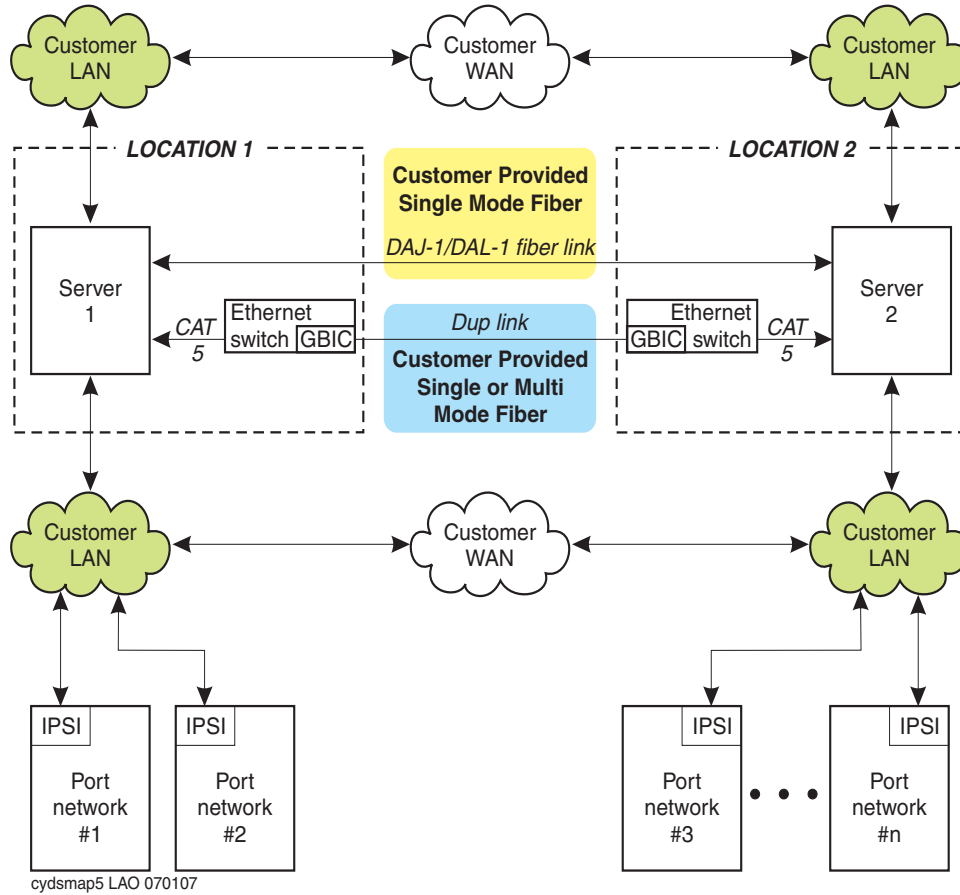
Figure 6: Server and CSS separation—ATM CSS (Multi-Connect configuration—critical reliability)



GBIC = GigaBit Interface Converter

## Basic separation—IP Connect

Figure 7: Basic separation—IP Connect



GBIC = GigaBit Interface Converter

## Overview of Center Stage Switch separation

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### Center Stage Switch—high level description

Multi-Connect systems with four or more port networks (PNs) may use a Center Stage Switch (CSS) to interconnect the PNs. The CSS is comprised, depending on the number of equipped PNs, of one, two, or three switch node carriers (SNCs). The SNC contains switch node interface (SNI) circuit packs that terminate the fiber connection from an expansion interface (EI) circuit pack in a PN. SNCs are also referred to simply as switch nodes and are numbered 1, 2, and 3. The first switch node supports 16 PNs. When more than one switch node is required, they are interconnected with fiber using SNIs at each end.

The CSS, as a whole, is referred to by letter with the initial CSS (duplex and high reliability) being A. The largest configuration available (44 PNs) would consist of switch nodes 1A, 2A, and 3A. The CSS and its associated fiber connections and EI circuit packs are also referred to as the port network connectivity (PNC). You may see references, especially on administration screens, to A-PNC (standard, high and critical reliability) and B-PNC (critical reliability).

The CSS may be duplicated to provide critical reliability. When duplicate CSS connectivity is provided, the second CSS is referred to as the B CSS or B-PNC. All components are duplicated including SNCs, SNIs, fiber connections, and EIs in the port networks. With duplicate CSS connectivity, each switch node consists of two separate SNCs, one from each PNC. The first switch node is comprised of 1A and 1B, the second switch node is 2A and 2B, and the last switch node is 3A and 3B.

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## CSS separation configurations

There are two configurations that may be considered for separation of the CSS.

- The first configuration (See [Server and CSS separation—100BaseT FX trunks \(fiber-PNC configuration—high reliability\)](#) on page 10) consists of separated switch nodes. For the A-PNC, the first switch node (1A) is at location 1 and the second switch node (2A) is at location 2. For critical reliability the duplicate switch nodes for the B-PNC are similarly separated (see [Server and CSS separation—100BaseT FX trunks \(Multi-Connect configuration—critical reliability\)](#) on page 11).

These switch nodes, 1A to 2A and 1B to 2B, are linked together by fiber connections between locations.

With these configurations, the fiber connections from the PNs go to the switch node that they are closest to or collocated with.

- The second configuration type (See [CSS Separation example—SNC in different cabinets](#) on page 17) consists of separated, duplicate switch nodes. With this configuration the switch nodes that comprise the A-PNC are located at one location and the switch nodes that comprise the B-PNC are located at the other location. At each location, the switch nodes are linked together by fiber connections. Each SNC is located in the E carrier position of its cabinet.

With this configuration, each PN is connected, via fiber, to each CSS. This results in more long range fiber connections.

**Note:**

[CSS Separation example—SNC in different cabinets](#) on page 17 shows a duplicate two switch node configuration that would be required to support more than 15 port networks. For smaller configurations (15 port networks or less), the 2A and 2B switch node carriers would not be required.

## Center Stage Switch separation administration

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### Switch Node Carrier administration

Locating SNCs at separate locations does not impact their translation. Each SNC must have its duplicate specified on the Cabinet screen. See [Cabinet 1 administration](#) on page 18 through [Cabinet 5 administration](#) on page 20 for examples of typical cabinet translations.

The installation of Switch Node Interface circuit packs for connection to PNs is in alternating order working from the extreme left and right of the carrier inwards for each CSS location, starting on the left.

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### DS1C remote port networks

A Switch Node Carrier **cannot** be located in a DS1C-remoted port network.

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### Fiber link administration

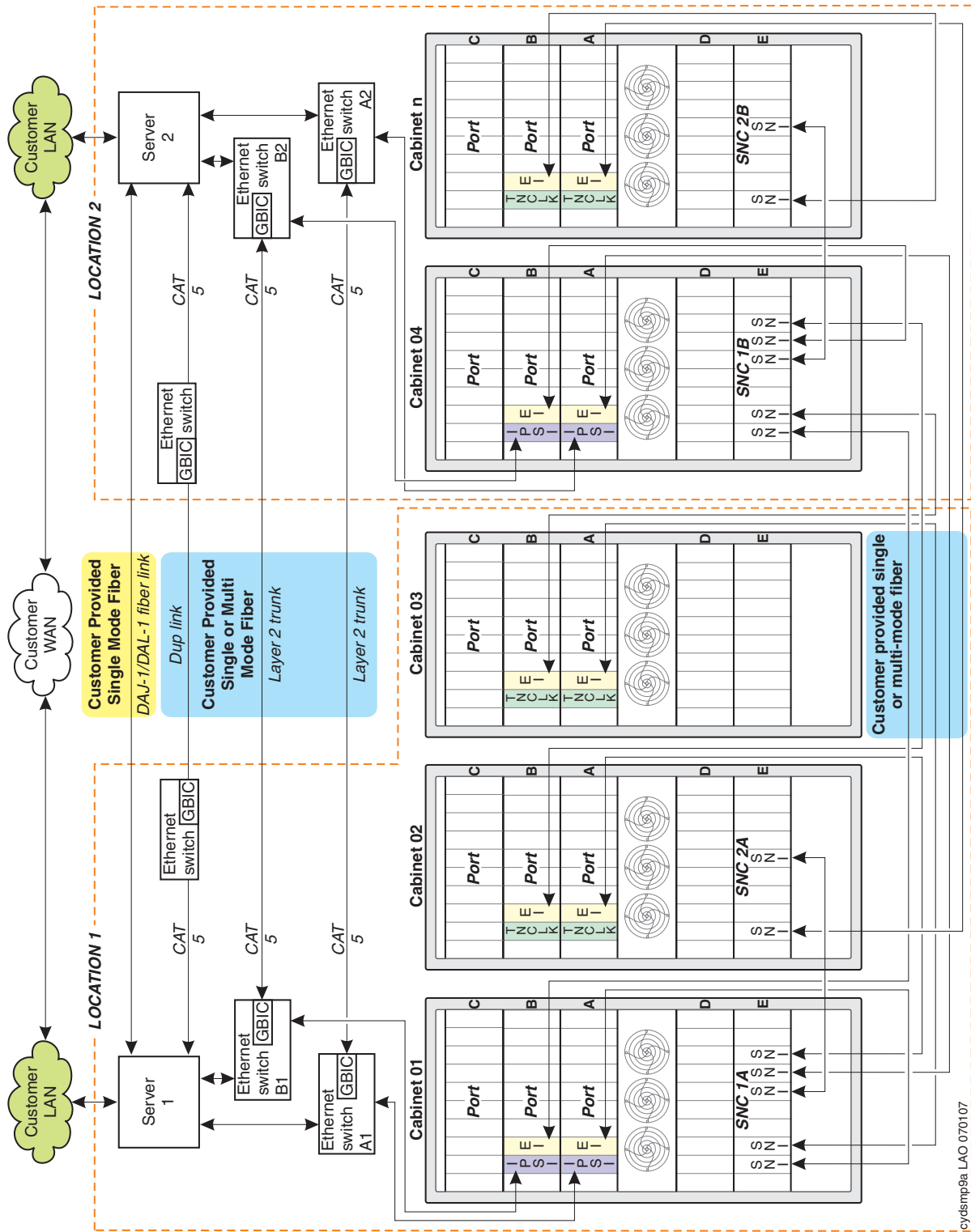
Fiber link administration is not affected by CSS Separation.

**Note:**

Many installations may use multi-mode fiber for the connection from a PN to the collocated CSS while using single-mode fiber to connect the PN to the distant CSS. The **Fiber Translation** field on the **Fiber Link Administration** screen specifies the fiber type for **both** fiber runs, that is, multi-mode or single-mode (see [Fiber Link administration](#) on page 20). This is an information-only field that can be set to either value. Be careful to properly document the actual fiber type used for each PN. This may assist any future maintenance activity.



Figure 8: CSS Separation example—SNC in different cabinets



cydsmp9a LAO 070107

## Typical SNC administration screens

[Cabinet 1 administration](#) on page 18 through [Fiber Link administration](#) on page 20 are typical translations for the configuration shown in [CSS Separation example—SNC in different cabinets](#) on page 17.

**Figure 9: Cabinet 1 administration**

```
display cabinet 1
                                CABINET
CABINET DESCRIPTION
    Cabinet: 1
    Cabinet Layout: five-carrier
    Cabinet Type: expansion-portnetwork
Number of Portnetworks: 1
Survivable Remote EPN? n
    Location: 1
    Cabinet Holdover: A-carrier-only
    Room:           Floor:           Building:
CARRIER DESCRIPTION
Carrier      Carrier Type      Number      Duplicate
C           not-used          PN  01
B           port              PN  01
A           expansion-control PN  01
X           Fan
D           not-used          PN  01
E        switch-node     SN  01     04E
```

**Figure 10: Cabinet 2 administration**

```

display cabinet 2
                                     CABINET
CABINET DESCRIPTION
    Cabinet: 2
    Cabinet Layout: five-carrier
    Cabinet Type: expansion-portnetwork
Number of Portnetworks: 1
Survivable Remote EPN? n
    Location: 1
    Cabinet Holdover: A-carrier-only
    Room:           Floor:           Building:

CARRIER DESCRIPTION
Carrier      Carrier Type      Number      Duplicate
-----
C           not-used          PN 02
B           port              PN 02
A           expansion-control PN 02
X           Fan
D           not-used          PN 02
E        switch-node     SN 02      05E
    
```

**Figure 11: Cabinet 4 administration**

```

display cabinet 4
                                     CABINET
CABINET DESCRIPTION
    Cabinet: 4
    Cabinet Layout: five-carrier
    Cabinet Type: expansion-portnetwork
Number of Portnetworks: 1
Survivable Remote EPN? n
    Location: 2
    Cabinet Holdover: A-carrier-only
    Room:           Floor:           Building:

CARRIER DESCRIPTION
Carrier      Carrier Type      Number      Duplicate
-----
C           not-used          PN 04
B           port              PN 04
A           expansion-control PN 04
X           Fan
D           not-used          PN 04
E        dup-switch-node   SN 01      01E
    
```

**Figure 12: Cabinet 5 administration**

```

display cabinet 5
                                CABINET
CABINET DESCRIPTION
    Cabinet: 5
    Cabinet Layout: five-carrier
    Cabinet Type: expansion-portnetwork
Number of Portnetworks: 1
Survivable Remote EPN? n
    Location: 2
    Cabinet Holdover: A-carrier-only
    Room:           Floor:           Building:

CARRIER DESCRIPTION
Carrier      Carrier Type      Number      Duplicate
-----
C           not-used          PN 05
B           port              PN 05
A           expansion-control PN 05
X           Fan
D           not-used          PN 05
E         dup-sw-node      SN 02      02E
    
```

**Figure 13: Fiber Link administration**

```

display fiber-link 1
                                FIBER LINK ADMINISTRATION
Fiber Link #: 1
Is one endpoint remotod via DS1 Converter Complex? no

    ENDPOINT-1                      ENDPOINT-2
    (A-PNC)                          (A-PNC)
Board Location: 01A01                Board Location: 01E04
Board Type: ei                       Board Type: sni

    ENDPOINT-1                      ENDPOINT-2
    (B-PNC)                          (B-PNC)
Board Location: 01B02                Board Location: 04E04
Board Type: ei                       Board Type: sni

Fiber Translation: multi-mode      Converter? no
Type of Transceivers: A
    
```