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Abstract: This document describes the hardware infrastructure that supports the Transaction Management Service (TMS).

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0.0 Document Control

0.1 Document History

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0.3 Associated Documents

Reference	Version	Date	Title	Source
TD/ARC/029			TMS Architecture Specification	Pathway
TD/ARC/030			OPS Architecture Specification	Pathway
BP/DES/003			Counter Hardware Design Specification	Pathway
TD/STD/004			Generalised API for OPS/TMS	Pathway

Unless a specific version is referred to above, reference should be made to the current approved versions of the documents.

0.4 Abbreviations/Definitions

Abbreviation	Definition
ATM	Asynchronous Transfer Mode
BT	British Telecom
BCV	Business Continuity Volumes
CNIM	Counter Network Information Monitor; counter-based ISDN monitoring service
DMSU	Digital Main Switch Unit
DMZ	(Firewall) Demilitarised Zone
EMC	ElectroMagnetic Compatibility
EPOSS	Electronic Point Of Sale Service: counter application supported by Horizon.
FRIACO	Fixed Rate Internet Access Call Origination
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
L2TP	Layer 2 Tunnelling Protocol
LAN	Local Area Network
LAR	Logical Access Router
LSE	Local Switch Exchange
NB	Network Banking
NBE	Network Banking Engine
NBS	Network Banking Service

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OPS	Office Platform Service. The provision and support of the hardware and software at outlets including the Desktop environment of the Horizon system.
PC	Personal Computer
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Circuit
RADIUS	Remote Authentication Dial-In User Service
RAID	Redundant Array of Independent Disks
RIPOSTE	Retail Integrated Point Of Sale system in a Transaction Environment: product from Escher that provides both the infrastructure and the Desktop environment of the Horizon system. Now superseded by WebRiposte.
RMS	Riposte Message Server: message storage and replication mechanism of Riposte.
TCP	Transmission Control Protocol
TIP	Transaction Information Processing: Post Office Ltd application that handles transaction data returned from Horizon.
TMS	Transaction Management Service. The hardware and software required for the replication, transmission and management of transactions committed to the Horizon Riposte Message Store and Pathway Data Centres, or vice versa.
VPN	Virtual Private Network
WAN	Wide Area Network
WebRiposte	An enhanced version of Riposte providing additional services based upon web-enabled functionality.

0.5 Changes in this Version

Version	Changes
0.5	Review comments incorporated.

0.6 Changes Expected

Changes
As the result of comments on V0.5.

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1.0 Introduction

1.1 Purpose

This document is an introduction to the hardware that supports the Transaction Management Service (TMS). It describes the platform and network components of the service and its relationship to other elements of the Pathway solution delivered at BI3. It is produced in conjunction with the documents listed in section 1.3, *Related Documents*.

1.2 Readership

This document is intended to be used in conjunction with *TMS Architecture Specification.*

1.3 Related Documents

Documents that are referred to in this document, and that should be read in conjunction with it, are as follows:

- *Counter Hardware Design Specification*

  This document describes the hardware that is used by the Office Platform Service.

- *TMS Architecture Specification*

  This document covers the following topics:

  - How WebRiposte facilities are used across the TMS domain.
  - How counter applications interface with the TMS.
  - How agents interface with the TMS.
  - Security domains that are relevant to the TMS.
  - Resilience features in use in outlets and across the TMS domain.

- *OPS Architecture Specification*

  This document covers the following topics:

  - The hardware and software components and architecture of OPS.
  - The style and architecture of the OPS Desktop.
  - How the architecture supports changes and extensions.

- *Generalised API for OPS/TMS*

  This document is designed to facilitate application development in the Pathway environment. It is intended to augment the documentation supplied by Escher by setting the Horizon implementation into context. It gives additional information for application developers about the architecture and facilities of OPS, TMS, and the Electronic Point Of Sale Service (EPOSS).

For publication details refer to section 0.3.

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1.4 Scope

1.4.1 Document Set

This document forms part of the set that defines the environment that supports counter applications within the Horizon system.

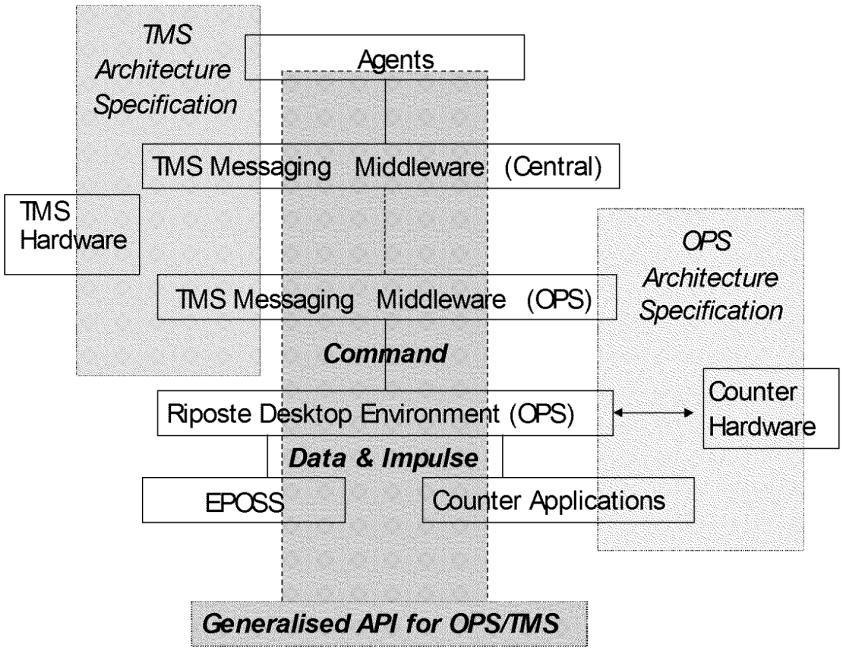

Figure 1-1 Document set

Figure 1-1 relates the components of the system to the documents that describe them, giving an indication of the scope of each document.

The scope of each document is described in section 1.3, *Related Documents*.

Each of the applications that support the Post Office Ltd business requirements has components that operate within the Riposte Desktop architecture and interact with TMS.

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1.4.2 Contents

This document is organised as follows:

Section	Contents
Section 1	introduces the document and its position within the document set.
Section 2	describes the scope of the document.
Section 3	describes correspondence server hardware.
Section 4	describes agent server hardware.
Section 5	describes network components.

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2.0 Scope

The architecture of TMS is described in *TMS Architecture Specification*. This document describes the hardware components, other than counter hardware components, that support the Transaction Management Service (TMS).

2.1 Components

The components described are as follows:

- Correspondence servers

  There are eight correspondence servers at each Data Centre, four of which are Compaq ProLiant DL380G2 servers with EMC disks that provide disk mirroring and backup facilities. The other four are Compaq ProLiant DL360G2 servers and have Compaq disk arrays. They run under Windows NT Server V4.0. The main software on these servers is the Riposte Message Service.

- Generic agent servers

  There are four generic agent servers at each Data Centre; they are Compaq ProLiant DL360G2 Agent servers and run under Windows NT Server 4.0. They support Riposte Client software and any client software such as Oracle that is required, and form the interface between the host central servers and the correspondence servers. The agent applications act as clients to both, by 'pulling' information from one and 'pushing' it to the other. This occurs in both directions.

- NBS agent servers

  There are eight NBS agent servers, four at each Data Centre. Each cluster has one NBS agent server running the NBS Authorisation Agent. They are Compaq ML350 servers, run under Windows NT Server 4.0 and support Riposte Client software. They provide hardware support for the encryption of data to and from the NBE and form the interface between the NBE and the correspondence servers for real-time transactions.

- Network components

  Network components include connections between counters in the outlets, connections from the outlets to the Data Centres, connections within the Data Centres that carry data from the correspondence servers to the agent servers, and connections between the Data Centres.

2.2 External Certification

All hardware used on the Horizon project is certified by the suppliers to be conformant to EN54014 as indicated by the presence of a "CE" mark. All platforms used are specified as validated to meet the requirement of Microsoft, and listed in Microsoft's HCL.

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3.0 Correspondence Servers

There are currently sixteen correspondence servers. They are Compaq ProLiant DL380G2 (eight) and DL360G2 (eight) arranged in four clusters of four, each cluster having two servers in each of the two Data Centres, one in each location with an EMC disk array and one with a Compaq disk array.

The servers support the Riposte Message Store (RMS) and its replication and form the main interface between the agent applications and the counter. Communication to the counters is over an ISDN or satellite proxy. For ISDN outages, ISDN sites may use PSTN via laptop and ISDN emulator. Communication to the agent servers is via the Data Centre Local Area Network (LAN).

Each server has a mirrored set of hard disks configured as drive C: for the operating system, swap file and application software. D: Drive is used for temporary storage of audit data before it is transferred to the Audit Server. In addition to the system disk there is a set of ten 18GB drives that hold the Riposte Message volumes.

3.1 Correspondence Servers: EMC-connected

Four Compaq ProLiant DL380G2 servers in each Data Centre are configured as shown in the following sections. Their node IDs are listed in Table 3-1.

3.1.1 Specification

3.1.1.1 Machine

Description	Details
Machine Name	ProLiant DL380G2
Manufacturer	Compaq
Processor/Speed	Pentium III/1.4GHz Processor
No. of Processors	2
Memory fitted	2048Mb
Hard Disk	Mirrored 72Gb Internal SCSI System Disks

3.1.1.2 Extra Hardware Items

Description	Manufacturer
AHA-2944UW SCSI Controller	Adaptec

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3.1.2 Configuration

The hardware is configured as follows:

- The system disk (C:) is 8GB. The remainder of the system drive (64GB) is configured as a single data partition (D:).
- The system and data partitions are mirrored in RAID.
- The Riposte Message Store disks are arranged as ten partitions (logical drives P: Q: and S:to Z:). The disks are presented as twenty 9GB disks by EMC and are then set up in Disk Administration as 18 GB Stripe Sets.

In addition to the Riposte message store, the EMC array holds ten volumes Business Continuity Volumes (BCV) for message store backup, and two hot-swap disks. If a disk fails, data from its mirror is automatically copied to a warm standby disk that then becomes the second plex. The failed disk is then replaced, and the replacement becomes the new warm standby disk.

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3.2 Correspondence Servers: Compaq-connected

Four Compaq ProLiant DL360G2 servers in each Data Centre are configured as shown in the following sections. Their node IDs are listed in Table 3-1.

3.2.1 Specification

3.2.1.1 Machine

Description	Details
Machine Name	ProLiant DL360G2
Manufacturer	Compaq
Processor/Speed	1.4GHz Processor
No. of Processors	2
Memory fitted	2048Mb
Hard Disk	72Gb Mirrored Internal SCSI System Disks

3.2.1.2 Extra Hardware Items

Description	Manufacturer
5302 RAID Controller	Compaq

3.2.2 Configuration

The hardware is configured as follows:

- The system disk (C:) is 8GB. The remainder of the system drive (64GB) is configured as a single data partition (D:).
- The system and data partitions are mirrored in RAID.
- A single 172 GB device is presented to NT. NT partitioning is used to split this into 10 17,264 MB NT partitions (P: Q: and S: to Z:).

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3.3 Clusters

There are four correspondence servers per cluster, two in each Data Centre. The associated node ID of each server is listed in Table 3-1. All the correspondence servers are active, but if one fails, its load is serviced by the remaining servers.

The main characteristics of this configuration are as follows.

- There are four correspondence servers in a Riposte cluster, each sharing the outlet load equally. They are defined as neighbours in a 'fully meshed' configuration.
- In each cluster, one server at each Data Centre uses EMC disks, the other uses Compaq Disks.
- The audit workload is run on the correspondence server at each Data Centre that is connected to the EMC disks.
- There are four generic agent servers per site, with two connected to one correspondence server and two connected to the other correspondence server at each site.
- There are four NBS agent servers per site, connected to both correspondence servers at each site.

3.4 Node Identifiers and Relationships

3.4.1 Node Identifiers

Table 3-1 shows the correspondence server clusters, their Riposte node identifiers and the correspondence servers at each Data Centre that comprise each cluster.

Cluster	Node ID for EMC-connected Correspondence Server (Bootle)	Node ID for EMC-connected Correspondence Server (Wigan)	Node ID for CPQ-connected Correspondence (Bootle)	Node ID for CPQ-connected Correspondence Server (Wigan)
1	32	33	52	53
2	34	35	54	55
3	36	37	56	57
4	38	39	58	59

Table 3-1 Correspondence server clusters and node identifiers

3.4.2 Neighbour Relationships

There are three types of neighbour relationships for the correspondence servers:

- To other correspondence servers
- To outlets
- To clients (on agent servers or the OSD Software Depot)

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3.4.2.1 Other Correspondence Servers

Each correspondence server is set up as a neighbour to each other correspondence server in the same cluster. Each relationship is configured with both IP addresses for the remote machine. The relationships are all configured as local, permanent and non-virtual.

3.4.2.2 Outlets

Relationships with the outlets are set up as part of the rollout process by the Tivoli system management software.

Each correspondence server is set up as a neighbour to each gateway PC in each outlet assigned to that cluster. Each relationship is configured with the single IP addresses for the gateway. The relationships are all configured as non-local, non-permanent and non-virtual.

3.4.2.3 Clients

Each correspondence server in cluster 1 is set up as a neighbour to each client PC. Each relationship is configured with both IP addresses for the remote machine. The relationships are all configured as non-local, permanent, and non-virtual.

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4.0 Agent servers

4.1 Generic agent servers

Each Data Centre has four generic agent servers. They are Compaq ProLiant DL360G2 Agent servers and run under Windows NT Server 4.0, connected to the correspondence servers and the client servers through duplicated 100MBit Ethernet.

4.1.1 Specification

4.1.1.1 Machine

Description	Details
Machine Name	ProLiant DL360G2
Manufacturer	Compaq
Processor/Speed	Pentium III / 1.4GHz Processor
No. of Processors	2
Memory fitted	512Mb
Hard Disk	36Gb Mirrored Internal SCSI Disks

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4.2 NBS agent servers

Each Data Centre has four NBS agent servers, one for each Riposte cluster. They are Compaq ProLiant ML350 servers and run under Windows NT Server 4.0.

An NBS Agent Server runs both the NBS Authorisation Agent and the NBS Expedited Confirmation Agents for that cluster. The NBS Authorisation Agents run at both sites, one site being active and one standby. The Expedited Confirmation Agents are only run on one of the two servers for the cluster. Both agents connect to both correspondence servers within their cluster at the Data Centre where they are running.

4.2.1.1 Machine

Description	Details
Machine Name	ProLiant ML350
Manufacturer	Compaq
Processor/Speed	Pentium III / 1.4GHz Processor
No. of Processors	2
Memory fitted	512Mb
Hard Disk	9.1Gb
Additional Item	2x Internal PCI HSM - Atalla PCI Card

4.2.2 Configuration

The desktop architecture for this platform is the normal NT4.0 Server desktop. Disk partitions are as defined below:

A: - Floppy diskette 1.44MB

C: - Local disk holding system and application files, and temporary working storage.

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5.0 Network Components

The network components that support the Transaction Management Service are as follows:

- Connections between the counters in outlets
- Connections from the outlets to the Data Centres
- Connections within the Data Centres
- Connections between the Data Centres

5.1 Connections between Counters in Outlets

Each gateway PC has two network cards (one for WAN use, one for LAN use). The AutoConfig process allocates every outlet a WAN IP address (ISDN, Frame Relay or satellite) and a LAN IP address. (It is necessary to allocate both for every outlet, since an outlet may change from being a single counter outlet to having more than one counter.)

Counters in outlets are linked via a LAN using UDP over IP. System management software uses TCP/IP. Counters on the local LAN within an outlet employ VPN for all traffic between counters and the Gateway PC.

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5.2 Connections between Outlets and the Data Centres

One counter in each outlet (the gateway PC) acts as the connection to the Data Centres and is responsible for the communication with the Data Centre. It supports a mechanism known as a Virtual Private Network (VPN) in which all communication with the Data Centre is encrypted with a key that is unique to that outlet. As well as protecting the data passed to and from the outlet, this provides authentication of the outlet to the Data Centre (and vice versa). (Other counter PCs within the outlet are linked to the gateway PC via LAN cards. These connections are also encrypted but use a key that is different from the key used between the gateway PC and the Data Centre.)

Figure 5-1 shows the Wide Area Network (WAN) connections from the outlets to the Data Centres and the connections to the Network Banking Engines (NBEs) located at IBM premises in Warwick and Greenford.

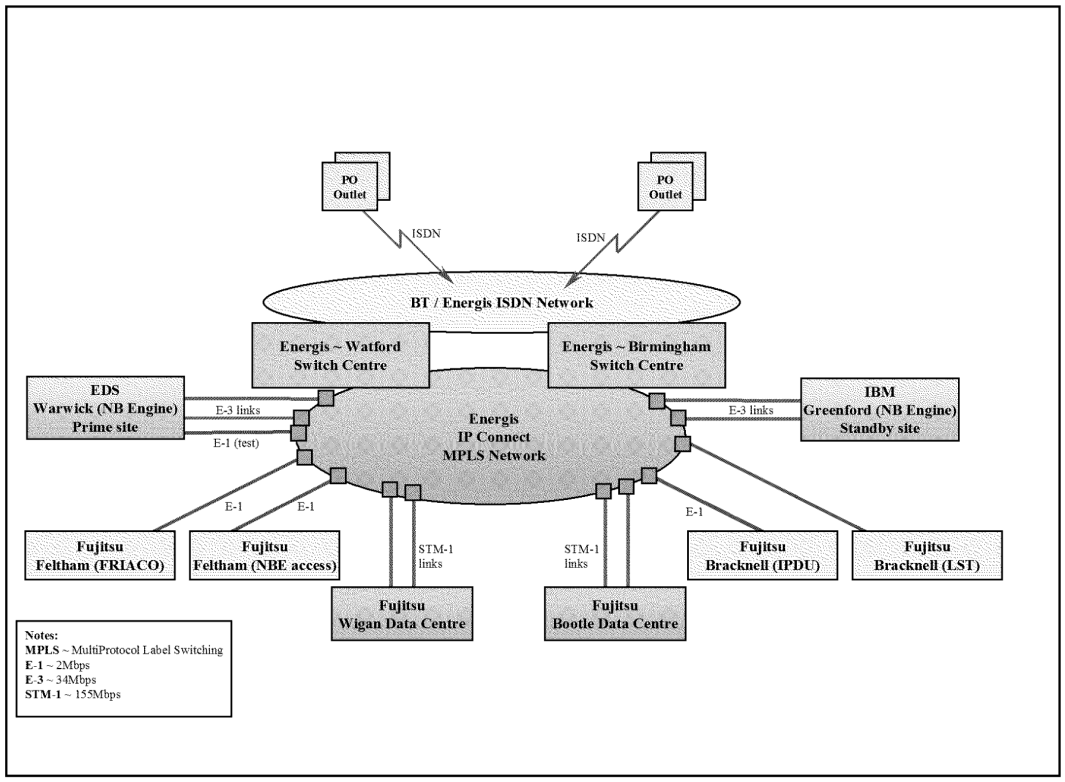

Figure 5-1 Connections to and within a Data Centre

The FRIACO service and the various connection types are described in the following sections.

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5.2.1 FRIACO Service

The FRIACO service enables outlets to connect via ISDN (or PSTN) to the local BT digital exchange (DLE); the call is then forwarded via the Internet to the Data Centre, as determined by the 'destination' number being called by the outlet's Gateway PC.

5.2.1.1 Connection types

5.2.1.1.1 'Silver' outlets

A 'silver' outlet is one that requires a permanent connection to the Data Centre during the normal Post Office business day, and in some instances a 24-hour connection. A silver outlet will, in the majority of cases, be connected via the FRIACO service. If it is not possible to provide a FRIACO connection to an office that requires this class of service, the Energis RemoteConnect service is used instead. This is a metered call that uses the Energis Data Network with call termination on the LNS routers as with the FRIACO service.

A separate range of telephone numbers is used for the FRIACO and RemoteConnect services. If a silver outlet is to be for business hours only, outside the defined hours of usage, the outlet is switched from permanent connection use a dial on-demand connection. The Counter Network Information Monitor (CNIM) program switches the ISDN telephone number to be called for the FRIACO service to that of the RemoteConnect dial on-demand service. The ISDN number for the Eicon card on the Gateway PC, is switched via an API call, which instigates an Eicon card reset in the process.

5.2.1.1.2 'Bronze' and 'silver part time' outlets

A 'bronze' outlet is one that does not require to be permanently connected or to have a permanently connected RemoteConnect service, but utilises the dial on-demand RemoteConnect service. However, these outlets can be switched to silver connections for pre-defined times of the day on pre-defined days of the week. Sites that utilise this capability are defined as silver part time with the capability of switching to silver via the CNIM at the appropriate time of day.

5.2.2 ISDN dial-out

Three Cisco 5350 Routers per Data Centre supply the ISDN dial-out capability that is required for support and for System Management functions. On receipt of a call, the CNIM causes the outlet to drop the connection and dial the Data Centre back utilising the less expensive FRIACO or RemoteConnect service.

5.2.3 Satellite connection

Some outlets, in areas where ISDN is not available, communicate with the Data Centres via satellite links to a ground station that is then linked via the network to the Data Centres.

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5.2.4 PSTN dial-in

A PSTN connection can be used for outlets whose normal connection has been disrupted. The PSTN connection connects the outlet, via a laptop, to the Access server. It can then use a FRIACO connection (see section 5.2.1).

The network provider's Remote Authentication Dial-In User Service (RADIUS) authenticates the call and ascertains where the target Home Gateway Router (also known as the L2TP Network Server Router (LNS)) resides and the route to use. The LNS Router connects to the target site's LAN and presents the data IP packets in the form in which they were transmitted by the counter PC in the outlet.

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5.3 Connections within the Data Centres

Figure 5-2 shows the network infrastructure within each Data Centre.

The following features have been introduced within the Data Centres to support NBS:

- New routers route traffic from the Energis Data Network to the VPN layer within the Data Centres. This in-bound traffic to the Data Centres may be metered or unmetered (FRIACO).
- A Firewall Demilitarised Zone (DMZ) which encompasses the Network Banking Agents. The firewall DMZ incorporates a firewall farm, consisting of multiple firewalls, which provide security and resilience of access to the NBS Agents and beyond to the Network Banking Engines (NBE).

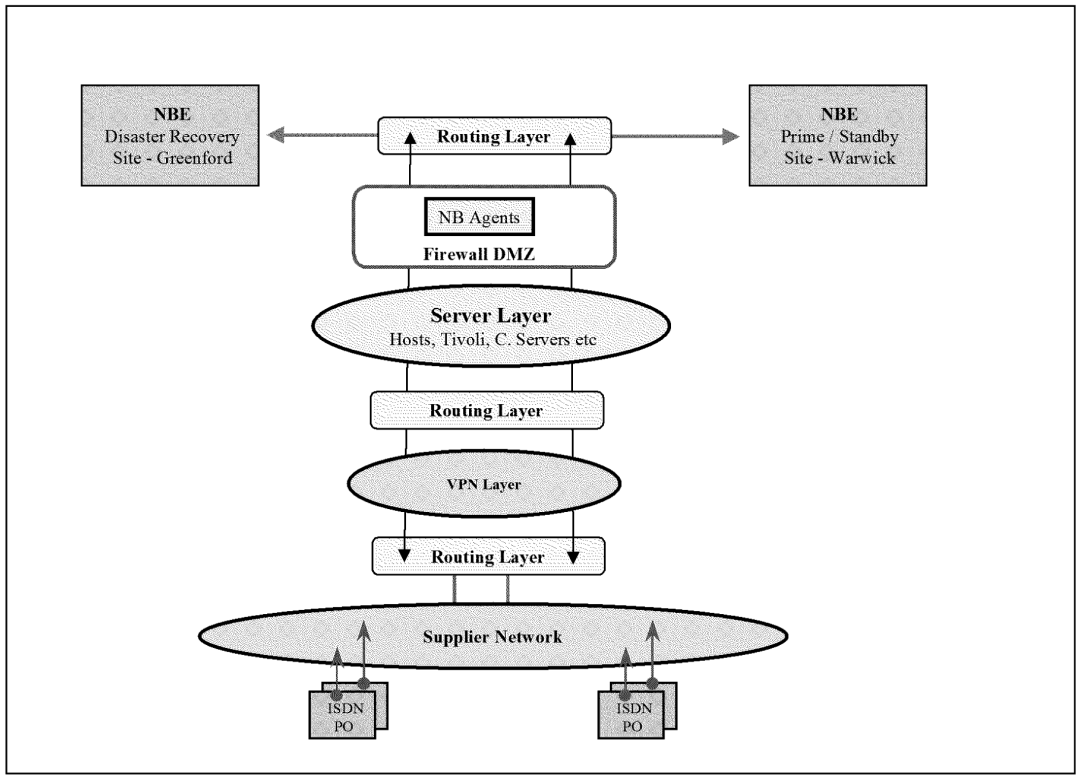

Figure 5-2 Connections within the Data Centres showing dual LANs

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5.4 Connections between the Data Centres

The links between the Data Centres consist of two OC-3 circuits (155Mbps) utilising Asynchronous Transfer Mode (ATM). Switches at each end allow for traffic separation via Permanent Virtual Circuits (PVCs), each with pre-defined bandwidth.

Figure 5-3 shows the network infrastructure at both Data Centres and the connections between them.

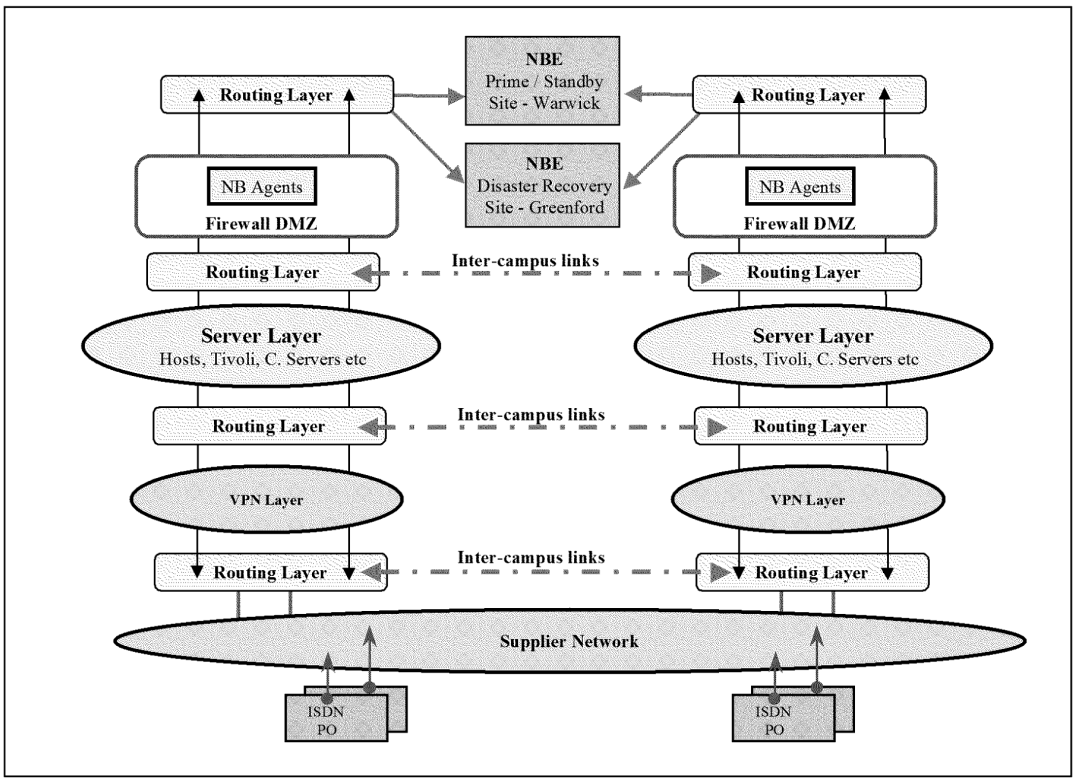

Figure 5-3 Connections between the Data Centres