

Final Project Case Study:

Merriweather Sports

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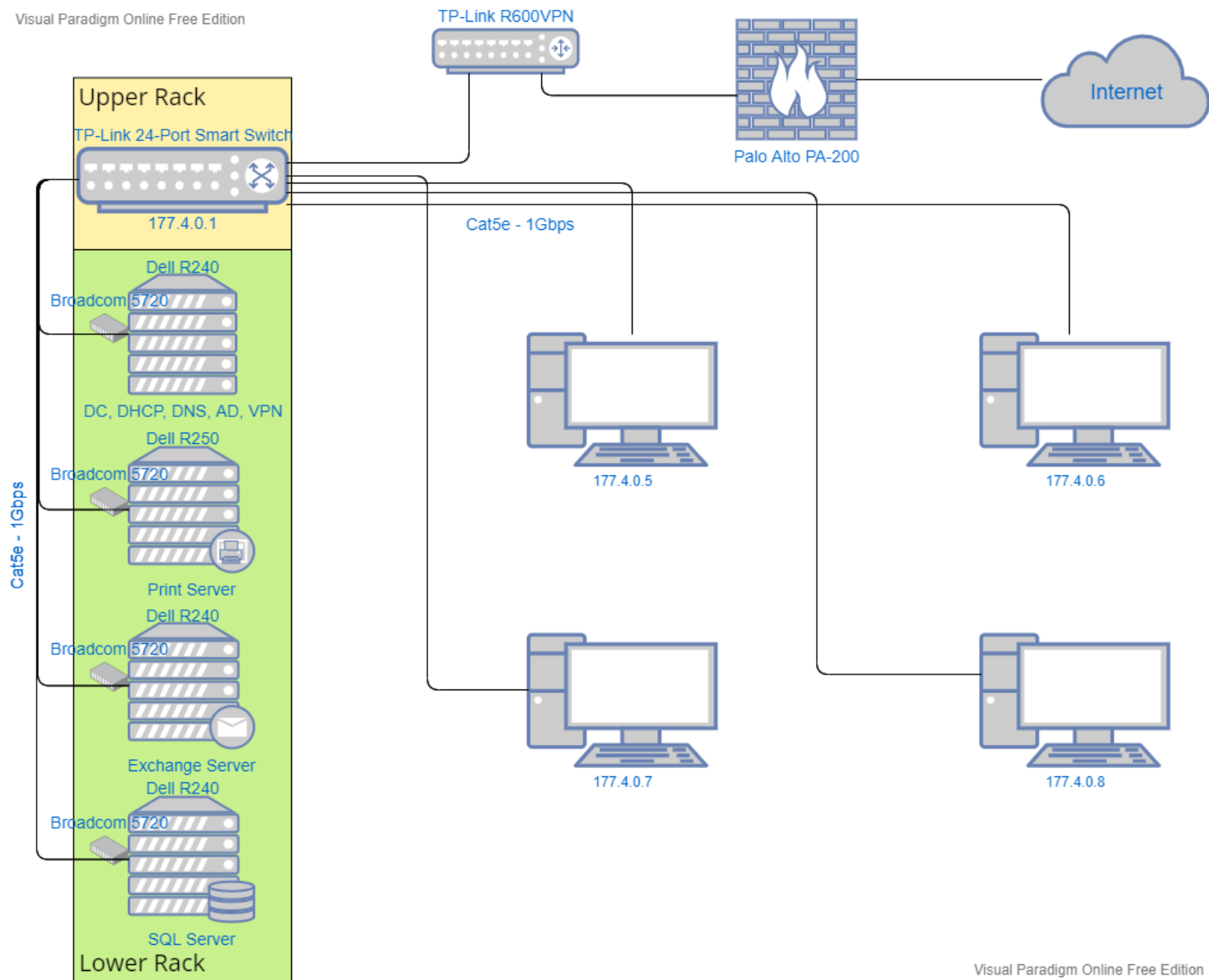
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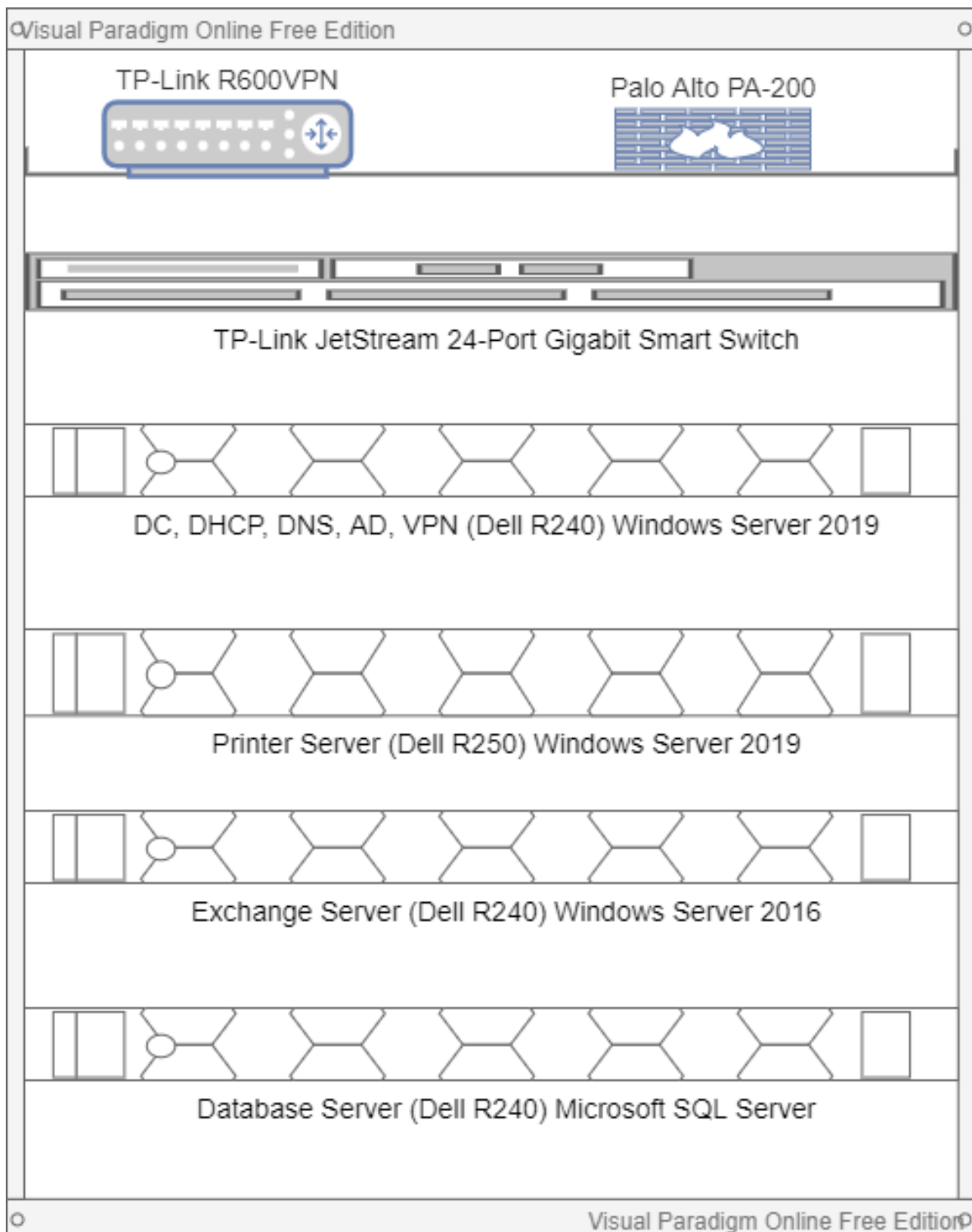
Main Site LAN Design Diagram

Visual Paradigm Online Free Edition

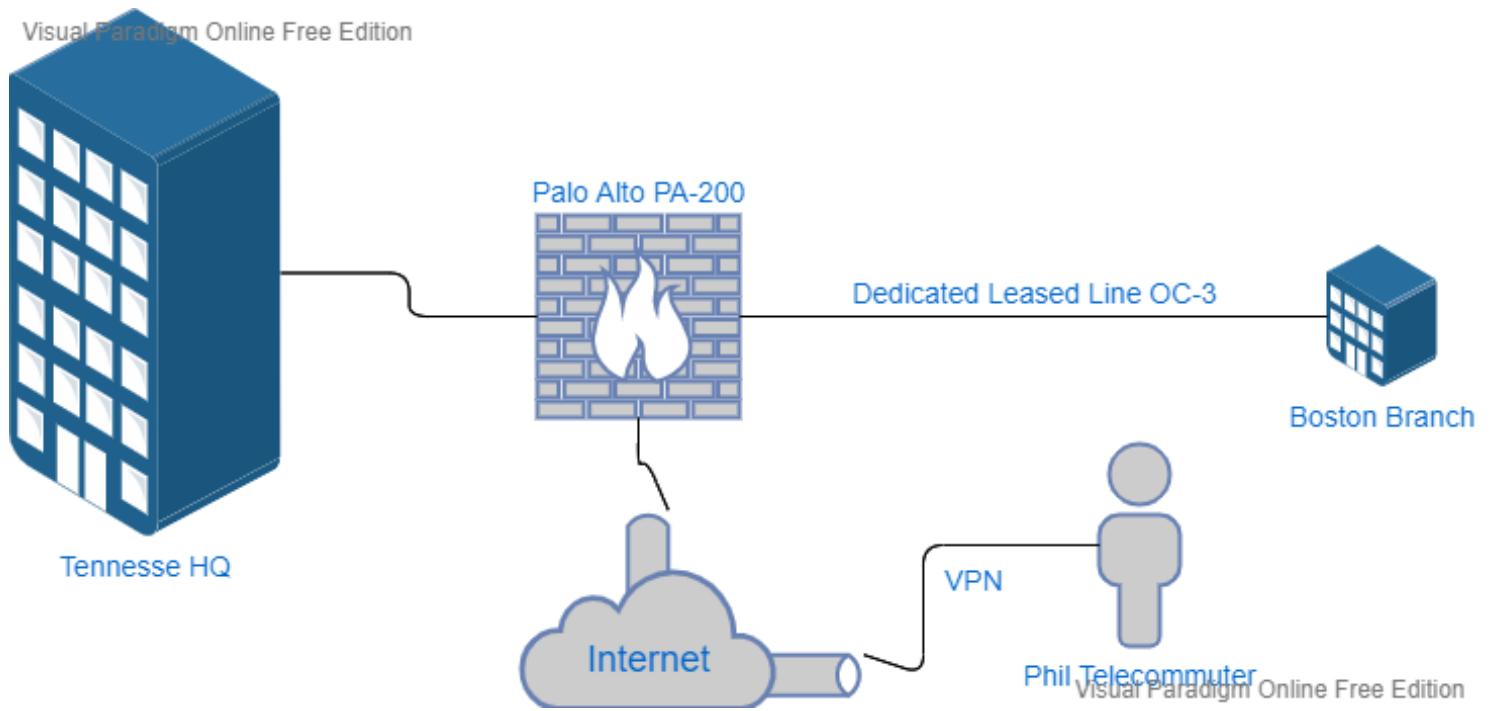


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Main Site Server Closet Design Diagram



Main Site and Branch Site WAN Design Diagram



LAN Design Description

The main parts of the LAN design are the Palo Alto PA-200 firewall which inspects all incoming connections which then go through a TP-Link R600VPN Router to translate the incoming signals to the main LAN standard which is 802.3ab¹. Afterwards the packets are sent to the switch which will route the packets to their right destinations. For cabling the chosen UTP is Cat5e² as indicated on the diagram. The Main operations of the network are being fulfilled by the DC Server in this LAN. The main server sits on 177.4.0.1, and the number of usable host address is 30 with a subnet mask of 255.255.255.224.

¹ Appendix B section: standards and protocols

² Appendix K

Server Design Description

The first and main network server is a Dell R240 with minimum specs that is running windows server 2019. The main function of this server is to provide DHCP to the network, provide the DNS server, have an active directory running and hosting the VPN server using the protocol IPSEC. The for the print server we have a Dell R250 running with windows server 2019. This server has 32GB of ram³ and fast processing power to adequately fulfill and handle all printing requests on the network. The third server is a Dell R240 and similar in specs to the main one just with a little extra processing power. This server is running windows server 2016 and hosting the exchange server so all employees have access to email. Last, we have the database server which is also a Dell R240 running with Microsoft SQL Server. The current config has 16TB of storage⁴ for the database, but this can be changed and scaled as needed. All for servers are using the same network card which is a Broadcom 5720 NIC which will be connected to an 1000Base-T cable.⁵

WAN Design Description

The relatively small WAN in this design serves the purpose of connecting the Boston office to the main network, this will be done by leasing a dedicated OC-3 line from a common carrier which provide a 155Mbps link between the two sites. On the lower side of the diagram, the remote employee Phil is depicted using the IPSEC protocol connecting to the VPN server on the DC server to gain access to the network.

³ Appendix G section: Memory

⁴ Appendix I section: Hard Drive

⁵ Appendix J section: Cabling Type

Appendix A – Firewall Specs

HARDWARE SPECIFICATIONS

I/O

- [4] 10/100/1000

MANAGEMENT I/O

- [1] 10/100 out-of-band management port, [1] RJ-45 console port

STORAGE CAPACITY

- 16GB SSD

POWER SUPPLY (AVG/MAX POWER CONSUMPTION)

- 40W (20W/30W)

MAX BTU/HR

- 102 BTU

INPUT VOLTAGE (INPUT FREQUENCY)

- 100-240VAC (50-60Hz)

MAX CURRENT CONSUMPTION

- 3.3A@100VAC

MTBF

- 13 years

DIMENSIONS (STAND ALONE DEVICE/AS SHIPPED)

- 1.75"H x 7"D x 9.25"W

WEIGHT

- 2.8lbs /5.0lbs Shipping

SAFETY

- UL, CUL, CB

EMI

- FCC Class B, CE Class B, VCCI Class B

CERTIFICATIONS

- ICSA

ENVIRONMENT

- Operating temperature: 32 to 104 F, 0 to 40 C
- Non-operating temperature: -4 to 158 F, -20 to 70 C

NETWORKING

INTERFACE MODES

- L2, L3, Tap, Virtual wire (transparent mode)

ROUTING

- Modes: OSPF, RIP, BGP, Static
- Forwarding table size (entries per device/per VR): 1,000/1,000
- Policy-based forwarding
- Point-to-Point Protocol over Ethernet (PPPoE)
- Multicast: PIM-SM, PIM-SSM, IGMP v1, v2, and v3

HIGH AVAILABILITY

- Active/Passive with no session synchronization
- Failure detection: Path monitoring, Interface monitoring

ADDRESS ASSIGNMENT

- Address assignment for device: DHCP Client/PPPoE/Static
- Address assignment for users: DHCP Server/DHCP Relay/Static

IPV6

- Features: L2, L3, Tap, Virtual Wire (transparent mode)
- Services: App-ID, User-ID, Content-ID, WildFire and SSL Decryption

VLANS

- 802.1q VLAN tags per device/per interface: 4,094/4,094
- Max interfaces: 100

NAT/PAT

- Max NAT rules: 125
- Max NAT rules (DIPP): 125
- Dynamic IP and port pool: 254
- Dynamic IP pool: 16,234
- NAT Modes: 1:1 NAT, n:n NAT, m:n NAT
- DIPP oversubscription (Unique destination IPs per source port and IP): 1
- NAT64

VIRTUAL WIRE

- Max virtual wires: 50
- Interface types mapped to virtual wires: physical and subinterfaces

L2 FORWARDING

- ARP table size/device: 500
- MAC table size/device: 500
- IPv6 neighbor table size: 500

SECURITY

FIREWALL

- Policy-based control over applications, users and content
- Fragmented packet protection
- Reconnaissance scan protection
- Denial of Service (DoS)/Distributed Denial of Services (DDoS) protection
- Decryption: SSL (inbound and outbound), SSH

WILDFIRE

- Identify and analyze targeted and unknown files for more than 100 malicious behaviors
- Generate and automatically deliver protection for newly discovered malware via signature updates
- Signature update delivery in less than 1 hour, integrated logging/reporting; access to WildFire API for programmatic submission of up to 100 samples per day and up to 1,000 report queries by file hash per day (Subscription Required)

FILE AND DATA FILTERING

- File transfer: Bi-directional control over more than 60 unique file types
- Data transfer: Bi-directional control over unauthorized transfer of CC# and SSN
- Drive-by download protection

USER INTEGRATION (USER-ID)

- Microsoft Active Directory, Novell eDirectory, Sun One and other LDAP-based directories
- Microsoft Windows Server 2003/2008/2008r2, Microsoft Exchange Server 2003/2007/2010
- Microsoft Terminal Services, Citrix XenApp
- XML API to facilitate integration with non-standard user repositories

IPSEC VPN (SITE-TO-SITE)

- Key Exchange: Manual key, IKE v1
- Encryption: 3DES, AES (128-bit, 192-bit, 256-bit)
- Authentication: MD5, SHA-1, SHA-256, SHA-384, SHA-512
- Dynamic VPN tunnel creation (GlobalProtect)

THREAT PREVENTION (SUBSCRIPTION REQUIRED)

- Application, operating system vulnerability exploit protection
- Stream-based protection against viruses (including those embedded in HTML, Javascript, PDF and compressed), spyware, worms

URL FILTERING (SUBSCRIPTION REQUIRED)

- Pre-defined and custom URL categories
- Device cache for most recently accessed URLs
- URL category as part of match criteria for security policies
- Browse time information

QUALITY OF SERVICE (QOS)

- Policy-based traffic shaping by application, user, source, destination, interface, IPSec VPN tunnel and more
- 8 traffic classes with guaranteed, maximum and priority bandwidth parameters
- Real-time bandwidth monitor
- Per policy diffserv marking
- Physical interfaces supported for QoS: 4

SSL VPN/REMOTE ACCESS (GLOBALPROTECT)

- GlobalProtect Gateway
- GlobalProtect Portal
- Transport: IPSec with SSL fall-back
- Authentication: LDAP, SecurID, or local DB
- Client OS: Mac OS X 10.6, 10.7 (32/64 bit), 10.8 (32/64 bit), Windows XP, Windows Vista (32/64 bit), Windows 7 (32/64 bit)
- Third party client support: Apple iOS, Android 4.0 and greater, VPNC IPSec for Linux

MANAGEMENT, REPORTING, VISIBILITY TOOLS

- Integrated web interface, CLI or central management (Panorama)
- Multi-language user interface
- Syslog, Netflow v9 and SNMP v2/v3
- XML-based REST API
- Graphical summary of applications, URL categories, threats and data (ACC)
- View, filter and export traffic, threat, WildFire, URL, and data filtering logs
- Fully customizable reporting

Source: [Palo-Alto-PA-200.pdf \(paloalto-firewalls.com\)](#)

Appendix B – Router Specs

HARDWARE FEATURES

Standards and Protocols	IEEE 802.3, 802.3u, 802.3ab TCP/IP, DHCP, ICMP, NAT, PPPoE, SNTP, HTTP, DNS, IPsec, PPTP
Interface	1 Fixed Gigabit WAN Port 1 Fixed Gigabit LAN Port 3 Changeable Gigabit WAN/LAN Ports
Network Media	10BASE-T: UTP category 3, 4, 5 cable (Max 100m) EIA/TIA-568 100Ω STP (Max 100m) 100BASE-TX: UTP category 5, 5e cable (Max 100m) EIA/TIA-568 100Ω STP (Max 100m) 1000BASE-T: UTP category 5, 5e, 6 cable (Max 100m)
Button	Reset Button
Power Supply	External 9V/0.6A DC Adapter
Flash	SPI 16MB
DRAM	DDR II 128MB
LED	PWR, SYS, WAN, LAN
Dimensions (W x D x H)	6.2 × 4.0 × 1.0 in. (158 × 101 × 25mm)

PERFORMANCE

Concurrent Session	20K
NAT Throughput	680Mbps
IPsec VPN Throughput (3DES)	13Mbps

BASIC FUNCTIONS

WAN Connection Type	Static/Dynamic IP, PPPoE/Russian PPPoE, PPTP/Russian PPTP, L2TP/Russian L2TP, Bigpond Cable
MAC Clone	Modify WAN MAC Address
DHCP	DHCP Server/Client DHCP Address Reservation

PERFORMANCE	
Concurrent Session	20K
NAT Throughput	680Mbps
IPsec VPN Throughput (3DES)	13Mbps
BASIC FUNCTIONS	
WAN Connection Type	Static/Dynamic IP,PPPoE/Russian PPPoE, PPTP/Russian PPTP, L2TP/Russian L2TP, Bigpond Cable
MAC Clone	Modify WAN MAC Address
DHCP	DHCP Server/Client DHCP Address Reservation
ADVANCED FUNCTIONS	
ACL	IP/MAC/Domain Name Filtering
Advanced Routing	Static Routing Policy Routing
ARP Inspection	IP/MAC Binding
Bandwidth Control	IP/Port-based Bandwidth Control Guarantee & Limited Bandwidth
Forwarding	Virtual Server Port Triggering DMZ UPnP
Security	SPI Firewall VPN Passthrough FTP/TFTP/H.323/RTSP ALG DoS Defence, Ping of Death Local Management
VPN	
IPsec VPN	20 IPsec VPN Tunnels LAN-to-LAN Main, Aggressive Negotiation Mode DES, 3DES, AES128, AES192, AES256 Encryption Algorithm MD5, SHA1 Authentication Algorithm Manual, IKE Key Management Mode Dead Peer Detection (DPD) Perfect Forward Secrecy (PFS)

PPTP VPN	16 PPTP VPN Tunnels PPTP VPN Server PPTP with MPPE Encryption
L2TP VPN	16 L2TP VPN Tunnels
MANAGEMENT	
Service	Dynamic DNS (DynDNS and No-IP)
Maintenance	Time Setting Diagnostic Firmware Upgrade Factory Defaults/Reboot Backup&Restore System Log Remote Management Statistics
OTHERS	
Certification	CE, FCC, RoHS
Package Contents	TL-R600VPN Power Adapter RJ-45 Ethernet Cable Quick Installation Guide
Environment	Operating Temperature: 0°C~40°C (32°F~104°F); Storage Temperature: -40°C~70°C (-40°F~158°F) Operating Humidity: 10%~90% non-condensing Storage Humidity: 5%~90% non-condensing

Source: [TL-R600VPN](#) | [SafeStream Gigabit Multi-WAN Desktop VPN Router](#) | [TP-Link](#)

Appendix C – Switch Specs

HARDWARE FEATURES

Standards and Protocols	IEEE 802.3i IEEE 802.3u IEEE 802.3ab IEEE 802.3az IEEE802.3z IEEE 802.3ad IEEE 802.3x IEEE 802.1d IEEE 802.1s, IEEE 802.1w IEEE 802.1q IEEE 802.1p IEEE 802.1x
Interface	24 10/100/1000Mbps RJ45 Ports (Auto Negotiation/Auto MDI/MDIX) 4 Gigabit SFP Slots
Network Media	10BASE-T: UTP category 3, 4, 5 cable (maximum 100m) 100BASE-TX/1000Base-T: UTP category 5, 5e or above cable (maximum 100m) 1000BASE-X: MMF, SMF
Fan Quantity	Fanless
Physical Security Lock	Yes
Power Supply	100~240VAC, 50/60Hz
Dimensions (W x D x H)	17.3 x 7.1 x 1.7 in. (440 x 180 x 44 mm)
Mounting	19" 1U rack-mountable
Max Power Consumption	20.4W
Max Heat Dissipation	69.6 BTU/h

PERFORMANCE

Bandwidth/Backplane	56Gbps
Packet Forwarding Rate	41.7Mpps
MAC Address Table	8K
Jumbo Frame	9KB

SOFTWARE FEATURES

Quality of Service	<ul style="list-style-type: none"> Support 802.1p CoS/DSCP priority Support 8 priority queues Queue scheduling: SP, WRR, SP+WRR Port/Flow- based Rate Limiting IPv6 QoS Voice VLAN
L2 and L2+ Features	<ul style="list-style-type: none"> Static Routing DHCP Relay DHCP Server IGMP Snooping V1/V2/V3 802.3ad LACP (Up to 8 aggregation groups, containing 8 ports per group) Spanning Tree STP/RSTP/MSTP BPDU Filtering/Guard TC/Root Protect Loopback detection 802.3x Flow Control LLDP, LLDP-MED
VLAN	<ul style="list-style-type: none"> Supports up to 4K VLANs simultaneously (out of 4K VLAN IDs) MAC/Protocol-based VLAN
Access Control List	<ul style="list-style-type: none"> L2~L4 package filtering MAC ACL IP ACL Combined ACL IPv6 ACL
Security	<ul style="list-style-type: none"> AAA Port Security DHCP Snooping IP-MAC-Port Binding IPv6-MAC-Port Binding ARP Inspection 802.1x and Radius Authentication SSH v1/v2 SSL v3/TLSv1 Broadcast/Multicast/Unknown-unicast Storm Control Dos Defend
IPv6	<ul style="list-style-type: none"> Dual IPv4/IPv6 stack Multicast Listener Discovery (MLD) Snooping IPv6 neighbor discovery (ND) Path maximum transmission unit (MTU) discovery Internet Control Message Protocol (ICMP) version 6 TCPv6/UDPv6

IPv6 Applications	DHCPv6 Client Ping6 Tracert6 Telnet (v6) IPv6 SNMP IPv6 SSH IPv6 SSL Http/Https IPv6 TFTP
Management	Web-based GUI and CLI management SNMP v1/v2c/v3,compatible with public MIBs and TP-LINK private MIBs RMON (1, 2, 3, 9 groups) CPU Monitoring Port Mirroring Firmware Upgrade: TFTP & Web System Diagnose: VCT SYSLOG & Public MIBS Dual Image EEE
OTHERS	
Certification	CE, FCC, RoHS
Package Contents	T1600G-28TS Power Cord Installation Guide Resource CD Rackmount Kit Rubber Feet
Environment	Operating Temperature: 0°C~40°C (32°F~104°F); Storage Temperature: -40°C~70°C (-40°F~158°F) Operating Humidity: 10%~90% non-condensing Storage Humidity: 5%~90% non-condensing

Source: [T1600G-28TS | JetStream 24-Port Gigabit Smart Switch with 4 SFP Slots | TP-Link](#)

Appendix D – Server R240 Specs

PowerEdge R240		
Features	Technical Specification	
Processor	1 processor from the following: Intel® Xeon® E-2200 product family, Intel Pentium®, Intel Core i3®, Intel Celeron®	
Memory	4 x DDR4 DIMM slots, Supports UDIMM, up to 2666MT/s, 64GB Max. Supports registered ECC	
Storage controllers	Internal controllers: PERC H730P, H330, HBA330 Software RAID: PERC S140 External controllers: 12Gbps SAS HBA	
Internal boot	Boot Optimized Storage Subsystem (BOSS): 2 x M.2 240GB (RAID 1 or No RAID) or 1 x M.2 240GB (No RAID only) Internal Dual SD Module ¹ : 2x microSD (16GB, 32GB or 64GB) or 1x microSD (16GB, 32GB or 64GB)	
Drive bays	Up to 4 x 3.5 cabled SATA, SAS (optional) or SSD* Up to 4 x 3.5 or 2.5 hot-plug SATA, SAS (optional) or SSD* *available in the hot-plug configuration	
Power supplies	Single 250W (Bronze) or 450W (Platinum) power supply ⁴	
Dimensions	Form factor: Rack (1U)	Chassis width: 434.00mm (17.08 in) Chassis depth: 573.596mm (22.58 in) (3.5" HDD config) Note: These dimensions do not include: bezel, redundant PSU Chassis weight: 12.2 kg (26.89 lb.)
Embedded management	iDRAC9 iDRAC Direct	
Bezel	Optional security bezel	
OpenManage™ Software	OpenManage Enterprise	OpenManage Power Manager OpenManage Mobile
Integrations and connections	Integrations: Microsoft® System Center VMware® vCenter™ BMC Truesight (available from BMC) Red Hat Ansible	Connections: Nagios Core & Nagios XI Micro Focus Operations Manager i (OMi) IBM Tivoli Netcool/OMNibus
Tools	iDRAC Service Module iDRAC RESTful API with Redfish OpenManage Server Administrator Dell EMC Repository Manager Dell EMC System Update	Dell EMC Server Update Utility Dell EMC Update Catalogs Dell EMC RACADM CLI IPMI Tool
Security	TPM 1.2/2.0 optional Cryptographically signed firmware Silicon Root of Trust	Secure Boot System Lockdown (requires iDRAC Enterprise or Datacenter) System Erase
I/O & Ports	Networking Options: 2 x 1GbE LOM Network Interface Controller (NIC) ports Front ports: 1x USB 2.0, 1 x iDRAC micro USB 2.0 management port Rear ports: 2 x USB 3.0, VGA, serial connector	2 x PCIe Gen 3.0 slots: • One x8 slot low-profile, half-length with x4 slot width • One x16 slot low-profile/full-height, half-length with x8 bandwidth
Supported operating systems	Citrix® XenServer® Microsoft® Windows Server® with Hyper-V (2016 and 2019) Red Hat® Enterprise Linux Ubuntu® Server LTS	SUSE® Linux Enterprise Server VMware® ESXi For specifications and interoperability details, see Dell.com/OSsupport .
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM .	
Recommended support	Dell EMC ProSupport Plus for critical systems or Dell EMC ProSupport for comprehensive hardware and software support for your PowerEdge solution. Consulting and deployment offerings are also available. Contact your Dell EMC representative today for more information. Availability and terms of Dell EMC Services vary by region. For more information, visit Dell.com/ServiceDescriptions .	

Source: [poweredge-r240-spec-sheet.pdf \(dell.com\)](https://www.dell.com/poweredge-r240-spec-sheet)

Appendix E – Server R250 Specs

Feature	Technical Specifications	
Processor	One Intel Xeon E-2300 series processor with up to 8 cores or one Intel Pentium processor with up to 2 cores	
Memory	4 DDR4 DIMM slots, supports UDIMM 128 GB max, speeds up to 3200 MT/s Note: For Pentium processor, the maximum memory speed is 2666 MT/s.	
Storage controllers	<ul style="list-style-type: none"> Internal controllers: PERC H345, H755, HBA355i, S150 Internal Boot: Internal Dual SD Module or USB or Boot Optimized Storage Subsystem (BOSS-S1): HWRaid 2 x M.2 SSDs External HBAs (non-RAID): HBA355e 	
Drive bays	<ul style="list-style-type: none"> Up to 4 x 3.5-inch hot swap SAS/SATA (HDD/SSD) max 30.72 TB Up to 2 x 3.5-inch cabled SAS/SATA (HDD/SSD) max 15.36 TB Up to 4 x 3.5-inch cabled SAS/SATA (HDD/SSD) max 30.72 TB 	
Power supplies	<ul style="list-style-type: none"> 450W Bronze 100-240 VAC, cabled 450W Platinum 100-240 VAC, cabled 	
Cooling options	Air cooling	
Fans	<ul style="list-style-type: none"> Up to four cabled fans 	
Dimension	<ul style="list-style-type: none"> Height: 42.8 mm (1.68 inches) Width: 482.6 mm (19 inches) Depth: 598.64 mm (23.56 inches) with bezel 585 mm (23.03 inches) without bezel 	
Form Factor	1U rack server	
Embedded management	<ul style="list-style-type: none"> iDRAC9 iDRAC Direct iDRAC RESTful API with Redfish iDRAC Service Manual 	
Bezel	Optional bezel or security bezel	
OpenManage Software	<ul style="list-style-type: none"> OpenManage Enterprise OpenManage Power Manager plugin OpenManage SupportAssist plugin OpenManage Update Manager plugin 	
Mobility	OpenManage Mobile	
Integrations and Connections	OpenManage Integrations	OpenManage Connections
	<ul style="list-style-type: none"> BMC Truesight Microsoft System Center Red Hat Ansible Modules VMware vCenter and vRealize Operations Manager 	<ul style="list-style-type: none"> IBM Tivoli Netcool/OMNibus IBM Tivoli Network Manager IP Edition Micro Focus Operations Manager Nagios Core Nagios XI
Security	<ul style="list-style-type: none"> Cryptographically signed firmware Secure Boot Secure Erase Silicon Root of Trust System Lockdown (requires iDRAC9 Enterprise or Datacenter) TPM 2.0 FIPS, CC-TCG certified, TPM 2.0 China NationZ 	
Embedded NIC	2 x 1 GbE LOM	
GPU options	Not supported	
Ports	Front Ports <ul style="list-style-type: none"> 1 x USB 2.0 1 x iDRAC Direct (Micro-AB USB) port 	Rear Ports <ul style="list-style-type: none"> 1 x USB 2.0 1 x iDRAC ethernet port 1 x USB 3.0 1 x VGA 1 x Serial port
	Internal Ports <ul style="list-style-type: none"> 1 x USB 3.0 (optional) 	
PCIe	2 PCIe slots: <ul style="list-style-type: none"> 1 x8 Gen4 (x16 connector) low profile, half length 1 x8 Gen4 (x8 connector) low profile, half length 	
Operating System and Hypervisors	<ul style="list-style-type: none"> Canonical Ubuntu Server LTS Citrix Hypervisor Microsoft Windows Server with Hyper-V Red Hat Enterprise Linux SUSE Linux Enterprise Server VMware ESXi (support only from Dec'21) For specifications and interoperability details, see Dell.com/OSsupport .	
OEM-ready version available	From bezel to BIOS to packaging, your servers can look and feel as if they were designed and built by you. For more information, visit Dell.com/OEM .	

Source: dell-emc-poweredge-r250-spec-sheet.pdf

Appendix F – DC Server Components

COMPONENTS

Option	Selection	SKU / Product Code	Quantity
Base	PowerEdge R240 Server	[210-AQQE] / G4BC0N7	1
Trusted Platform Module (TPM)	Trusted Platform Module 2.0	[461-AAEM] / GFC801N	1
Chassis	3.5" Chassis with up to 2 Cabled Hard Drives and Software RAID	[321-BDUL] / GK8QVB3	1
Regulatory	PowerEdge R240 CCC and BIS Marking, No CE Marking	[389-DSU0] / G8PQSX6	1
Processor	Intel® Pentium Gold G5420 3.8GHz, 4M cache, 2C/4T, no turbo (58W)	[338-BUJK] / G9VUBHA	1
Memory	8GB UDIMM, 3200MT/s, ECC	[370-AGQW] / G7MKLZD	2
RAID	C20, No RAID with Embedded SATA for SATA HDDs or SATA SSDs (Mixed Drive Types Allowed)	[780-BCDM] / GV6ZOKT	1
RAID/Internal Storage Controllers	No Controller	[405-AACD] / GLTBAZ3	1
Hard Drive	1TB 7.2K RPM SATA 6Gbps 512n 3.5in Cabled Hard Drive	[400-AVBD] / 5111186	1
Boot Optimized Storage Cards	None		
Operating System	No Operating System	[619-ABVR] / GF8GD3Y	1
OS Media Kits	No Media Required	[605-BBFN] / GKI7IAZI	1
Embedded Systems Management	iDRAC9 Basic	[385-BBLD] / GCQ1VPA	1
Group Manager	iDRAC Group Manager, Disabled	[379-BCQY] / GTVA94K	1
Password	iDRAC, Factory Generated Password	[379-BCRG] / G61PYE9	1
iDRAC Service Module	None		
PCIe Riser	PCIe Riser with Fan with up to 1 FH, x8 PCIe + 1 LP, x4 PCIe Gen3 Slots	[330-BBMH][384-BBWB] / G5RIUPZ	1
Additional Network Cards	On-Board Broadcom 5720 Dual Port 1Gb LOM	[542-BBBP] / GZ7VTNS	1
IDSDM and VFlash Card Reader	None		
Internal SD Module	None		
Internal Optical Drive	No Internal Optical Drive	[429-ABBF] / GCLDN2S	1
Power Supply	Single, Cabled Power Supply, 250W	[450-AHTZ] / GK9NOSC	1
Power Cords	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America	[450-AALV] / GPHWFU8	1
Bezel	No Bezel	[350-BBBW][350-BBSC] / GOKLE95	1
BIOS and Advanced System Configuration Settings	Performance BIOS Setting	[384-BBBL] / GJO594B	1
Rack Rails	No Rack Rails or Cable Management Arm	[770-BBHJ] / GKFR425	1
System Documentation	No Systems Documentation, No OpenManage DVD Kit	[631-AACK] / GVRYSM7	1
Secondary OS	None		
Enabled Virtualization	None		
Microsoft SQL Server	None		

Source: [dell.com](https://www.dell.com)

Appendix G – Print Server Components

Components

Option	Selection	SKU / Product Code	Quantity
Base	PowerEdge R250 Server	[210-BBOP] / GOJY18W	1
Trusted Platform Module	Trusted Platform Module 2.0 V3	[461-AAIG] / GGX1VDO	1
Chassis	3.5" Chassis with up to 2 Cabled Hard Drives and Software RAID	[321-BGXH] / GZYWT1S	1
Processor	Intel® Xeon® E-2324G 3.1GHz, 8M Cache, 4C/4T, Turbo (65W), 3200 MT/s	[338-CCKP] / GU43CLE	1
System Monitoring Tools	Heatsink for 80W or less CPU	[412-AAPW] / GH5K9IL	1
Memory Configuration Type	Performance Optimized	[370-AAIP] / GH9QBEI	1
Memory DIMM Type and Speed	3200MT/s UDIMM	[370-AGNY] / GCM520L	1
Memory	16GB UDIMM, 3200MT/s, ECC	[370-AGQU] / GE1SVG3	2
RAID	C20, No RAID with Embedded SATA for SATA HDDs or SATA SSDs (Mixed Drive Types Allowed)	[780-BCDM] / GV6ZOKT	1
RAID/Internal Storage Controllers	No Controller	[405-AACD] / GLTBAZ3	1
Hard Drive	2TB Hard Drive SATA 6Gbps 7.2K 512n 3.5in Cabled	[161-BBHE] / G5Y06TC	2
BIOS and Advanced System Configuration Settings	Performance BIOS Setting	[384-BBBL] / GJO594B	1
Advanced System Configurations	UEFI BIOS Boot Mode with GPT Partition	[800-BBDM] / GSFTG4Y	1
Power Supply	Single, Cabled Power Supply, 450W	[450-AKWN] / G4J581I	1
Power Cords	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America	[450-AALV] / G749Q3L	1
PCIe Riser	No PCIe Riser	[330-BBWM][330-BBXB] / G03KW2J	1
Embedded Systems Management (Multi)	iDRAC9, Basic 15G	[385-BBRB] / G2D7AYX	1
Additional Network Cards	On-Board Broadcom 5720 Dual Port 1Gb LOM	[542-BBBP] / GZ7VTNS	1
Bezel	No Bezel	[350-BBBW][350-BCGO] / GX26SFW	1
Boot Optimized Storage Cards	None		
Password	iDRAC,Factory Generated Password	[379-BCRG] / G61PYE9	1
IDRAC Service Module	None		
Group Manager	iDRAC Group Manager, Disabled	[379-BCQY] / GTVA94K	1
Operating System	No Operating System	[611-BBBF] / G78MU35	1
OS Media Kits	No Media Required	[605-BBFN] / GKH7AZI	1
Database Software	None		
Enabled Virtualization	None		
Secondary OS	None		
Internal SD Module	None		
IDSDM Card Reader	None		
Rack Rails	No Rack Rails or Cable Management Arm	[770-BBHJ] / GKFR425	1
Internal Optical Drive	No Internal Optical Drive for 2/4 HD Chassis	[429-ABLW] / G7WKVDC	1
System Documentation	No Systems Documentation, No OpenManage DVD Kit	[631-AACK] / GVRYSM7	1

Source: [dell.com](https://www.dell.com)

Appendix H – Exchange Server Components

COMPONENTS

Option	Selection	SKU / Product Code	Quantity
Base	PowerEdge R240 Server	[210-AQQE] / G4BC0N7	1
Trusted Platform Module (TPM)	Trusted Platform Module 2.0	[461-AAEM] / GFC801N	1
Chassis	3.5" Chassis with up to 2 Cabled Hard Drives and Software RAID	[321-BDUL] / GK8QVB3	1
Regulatory	PowerEdge R240 CCC and BIS Marking, No CE Marking	[389-DSUO] / G8PQSX6	1
Processor	Intel® Pentium Gold G5420 3.8GHz, 4M cache, 2C/4T, no turbo (58W)	[338-BUJK] / G9VUBHA	1
Memory	8GB UDIMM, 3200MT/s, ECC	[370-AGQW] / G7MKLZD	2
RAID	C20, No RAID with Embedded SATA for SATA HDDs or SATA SSDs (Mixed Drive Types Allowed)	[780-BCDM] / GV6ZOKT	1
RAID/Internal Storage Controllers	No Controller	[405-AACD] / GLTBAZ3	1
Hard Drive	1TB 7.2K RPM SATA 6Gbps 512n 3.5in Cabled Hard Drive	[400-AVBD] / 5111186	1
Boot Optimized Storage Cards	None		
Operating System	No Operating System	[619-ABVR] / GF8GD3Y	1
OS Media Kits	No Media Required	[605-BBFN] / GKH7AZI	1
Embedded Systems Management	iDRAC9 Basic	[385-BBLD] / GCQ1VPA	1
Group Manager	iDRAC Group Manager, Disabled	[379-BCQY] / GTVA94K	1
Password	iDRAC, Factory Generated Password	[379-BCRG] / G61PYE9	1
iDRAC Service Module	None		
PCIe Riser	PCIe Riser with Fan with up to 1 FH, x8 PCIe + 1 LP, x4 PCIe Gen3 Slots	[330-BBMH][384-BBWB] / G5RIUPZ	1
Additional Network Cards	On-Board Broadcom 5720 Dual Port 1Gb LOM	[542-BBBP] / GZ7VTNS	1
IDSMD and VFlash Card Reader	None		
Internal SD Module	None		
Internal Optical Drive	No Internal Optical Drive	[429-ABBF] / GCLDN2S	1
Power Supply	Single, Cabled Power Supply, 250W	[450-AHTZ] / GK9NOSC	1
Power Cords	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America	[450-AALV] / GPHWFU8	1
Bezel	No Bezel	[350-BBBW][350-BBSC] / GOKLE95	1
BIOS and Advanced System Configuration Settings	Performance BIOS Setting	[384-BBBL] / GJO594B	1
Rack Rails	No Rack Rails or Cable Management Arm	[770-BBHJ] / GKFR425	1
System Documentation	No Systems Documentation, No OpenManage DVD Kit	[631-AACK] / GVRYSM7	1
Secondary OS	None		
Enabled Virtualization	None		
Microsoft SQL Server	None		

Source: [dell.com](https://www.dell.com)

Apenndix I – SQL Server Components

COMPONENTS

Option	Selection	SKU / Product Code	Quantity
Base	PowerEdge R240 Server	[210-AQQE] / G4BC0N7	1
Trusted Platform Module (TPM)	No Trusted Platform Module	[461-AADZ] / GMHJL5Y	1
Chassis	3.5" Chassis with up to 4 Cabled Hard Drives and Software RAID	[321-BDUN] / G016IFX	1
Regulatory	PowerEdge R240 CCC and BIS Marking, No CE Marking	[389-DSUO] / G8PQSX6	1
Processor	Intel® Xeon® E-2224 3.4GHz, 8M cache, 4C/4T, turbo (71W)	[338-BUIY] / G1ZEYDR	1
Memory	8GB UDIMM, 3200MT/s, ECC	[370-AGQW] / G7MKLZD	2
RAID	C20, No RAID with Embedded SATA for SATA HDDs or SATA SSDs (Mixed Drive Types Allowed)	[780-BCDM] / GV6ZOKT	1
RAID/Internal Storage Controllers	No Controller	[405-AACD] / GLTBAZ3	1
Hard Drive	4TB 7.2K RPM SATA 6Gbps 512n 3.5in Cabled Hard Drive	[400-ASNZ] / 5111207	4
Boot Optimized Storage Cards	None		
Operating System	No Operating System	[619-ABVR] / GF8GD3Y	1
OS Media Kits	No Media Required	[605-BBFN] / GKH7AZI	1
Embedded Systems Management	iDRAC9 Basic	[385-BBLD] / GCQ1VPA	1
Group Manager	iDRAC Group Manager, Disabled	[379-BCQY] / GTVA94K	1
Password	iDRAC,Factory Generated Password	[379-BCRG] / G61PYE9	1
iDRAC Service Module	None		
PCIe Riser	PCIe Riser with Fan with up to 1 FH, x8 PCIe + 1 LP, x4 PCIe Gen3 Slots	[330-BBMH][384-BBWB] / G5RIUPZ	1
Additional Network Cards	On-Board Broadcom 5720 Dual Port 1Gb LOM	[542-BBBP] / GZ7VTNS	1
IDSDM and VFlash Card Reader	None		
Internal SD Module	None		
Internal Optical Drive	No Internal Optical Drive	[429-ABBF] / GCLDN2S	1
Power Supply	Single, Cabled Power Supply, 250W	[450-AHTZ] / GK9NOSC	1
Power Cords	NEMA 5-15P to C13 Wall Plug, 125 Volt, 15 AMP, 10 Feet (3m), Power Cord, North America	[450-AALV] / GPHWFU8	1
Bezel	No Bezel	[350-BBBW][350-BBSC] / GOKLE95	1
BIOS and Advanced System Configuration Settings	Performance BIOS Setting	[384-BBBL] / GJO594B	1
Advanced System Configurations	UEFI BIOS Boot Mode with GPT Partition	[800-BBDM] / GSFTG4Y	1
Rack Rails	No Rack Rails or Cable Management Arm	[770-BBHJ] / GKFR425	1
System Documentation	No Systems Documentation, No OpenManage DVD Kit	[631-AACK] / GVRYSM7	1
Secondary OS	None		
Enabled Virtualization	None		
Microsoft SQL Server	None		

Source: [dell.com](https://www.dell.com)

Appendix J – NIC Specs

Tech Specs

Device Type
Network adapter

Form Factor
Plug-in card

Interface (Bus) Type
PCI Express

Ports
Gigabit Ethernet x 2

Cabling Type
Ethernet 10Base-T, Ethernet 100Base-TX, Ethernet 1000Base-T

Data Link Protocol
10Mb LAN, 100Mb LAN, GigE

Data Transfer Rate
1 Gbps

Processor
1 x BCM5720 - Broadcom

Compliant Standards
IEEE 802.3

Designed For
PowerEdge R220, T430, T630; PowerEdge R230, R630, R730

Source: [Dell Broadcom 5720 Dual Port 1Gigabit Network Interface Card Full Height | Dell USA](#)

Appendix K – Cat5e Specs



Applications

- Work area cable.
- Support current and future Category 5e applications, such as :
1,000Base-T (Gigabit Ethernet), 100 Base-T, 10 Base-T, FDDI, ATM.

General standards

- International standard : ISO/IEC 11801 2nd edition (2002) and ISO/IEC 11801 Amendment 2 (2010)
- European standard : EN 50173-1 (2002) and EN 50173-1 Amendment 1 (2009)
- U.S. Standards : ANSI/TIA/EIA 568-B.2-1 (2002)

Source: [1311844.pdf \(farnell.com\)](#)