The Western Trucking headquarters has asked for a network upgrade. Currently, a bridged 10Base-T Ethernet network is in place, with a mixture of switched and shared 10Base-T LANs. Since no usage patterns or projected growth rates have been included, we will assume the network is heavily taxed and needs immediate capacity upgrades and room for future expansion.

The existing bridged backbone network is too slow. Apparently, the level of broadcast messages along the backbone are dramatically overloading its capacity. By creating a network closest and adopting a collapsed backbone, the existing servers can share the uninterruptible power source with the new network equipment. A centralized location will increase the ability of network administrators to respond to problems and will enable the rapid replacement of network hardware should it fail.

The collapsed backbone will connect the servers, T1 connection to the Internet, and several network switches together. We must also assume the servers do not currently have enough network capacity and should be upgraded to match the capacity of our network expansion. The reduced amount of networking devices will increase network administration effectiveness. The cost of installing new cable drops is nearly half of the investment, but the chance of failure will be less due to fewer devices.

Each server will have a 6-port 1000Base-T Ethernet NIC. All six ports will be bonded together at the 1000Base-T switch using 802.3ad link aggregation to provide up to 12Gbps throughput.

The wiring closet access layer will incorporate three Foundry EdgeIron 2402CF 24-port 100Base-T managed Layer 2 Ethernet switches. Each 2402CF has dual 1000Base-T uplink ports that will be bonded together at the 1000Base-T switch using 802.3ad link aggregation. As a result, each switch will be able to communicate with the core switch at up to 4Gbps. The EdgeIron 2402CF supports up to 8.8Gbps switching performance and 6.6Mpps forwarding rate performance.

The distribution layer will incorporate a Foundry EdgeIron 24G 1000Base-T managed Layer 2 Ethernet switches. Each will have six ports connected to the 100Base-T switches and 12 ports connected to the two servers. The T1 router will also be connected to two ports of the 1000Base-T switch at 100Mbps to provide failover link redundancy and Layer 3 routing for the network. Each of these 19 total 1000Base-T switch connections will be Category 6 1' jumpers. The EdgeIron 24G supports up to 48Gbps switching performance and 35.7Mpps forwarding rate performance.

Each computer on the network will be upgraded to 100Base-T. Only 39 of the 59 existing computers will need 100Base-T NIC upgrades. Three 20-packs of Intel 100Base-T desktop NICs were selected for their low price, reliability and performance.. Each client computer will have their own Category 5e drop installed from the wiring closest switch to the computer location and connected with a 10' Category 5e patch cable.

Using three switches will allow each of the nearly 60 client computers to connect at full speed. Each switch will have ~20 computers connected at 100Mbps and use dual 1000Mbps uplink ports. This will provide full 100Mbps connections to the gigabit switch for up to 20 clients per switch.

The clients now have the potential to demand nearly 6Gbps from the servers. To support this throughput on the servers, a 6-port 1000Base-T Ethernet NICs will be installed in each server to allow full 6Gbps capacity that could be required during busy periods for Western Trucking.

This network design takes full advantage of the low price of 100Base-T network hardware. The demands on the core of the network were calculated offer full throughput for the entire network. Both the 100Base-T switches dual uplink ports and the servers 6-port NIC's will use 802.3ad link aggregation to maintain balance in network capacity throughout the network.

A collapsed backbone distribution layer will allow Western Data to significantly increase the load of the network and simplify its management. Using 802.1q VLAN tagging will allow the network administrator to create VLANs within the network to enhance security and create separate portions of the network that will enable multicast booting of the diverse clients on the network. Using built-in Quality of Service features, VoIP phone networks can be supported.

By migrating away from the bridged backbone architecture to a collapsed backbone, an investment of $356 per port is required to build the next generation architecture. This price will pay for itself very quickly assuming the new 48Gbps backbone will easily provide a 10% productivity gain and 10% network administration savings over the old 10Mbps bridged backbone.

Future expansion can support up to 8 additional clients in the access layer by including additional Category 5e drops. An 802.11g wireless network should be added in the future to provide the clients of Western Trucking WiFi Internet access they have come to expect during their time in the lobby and conference room.

Diagram for Wiring Closet
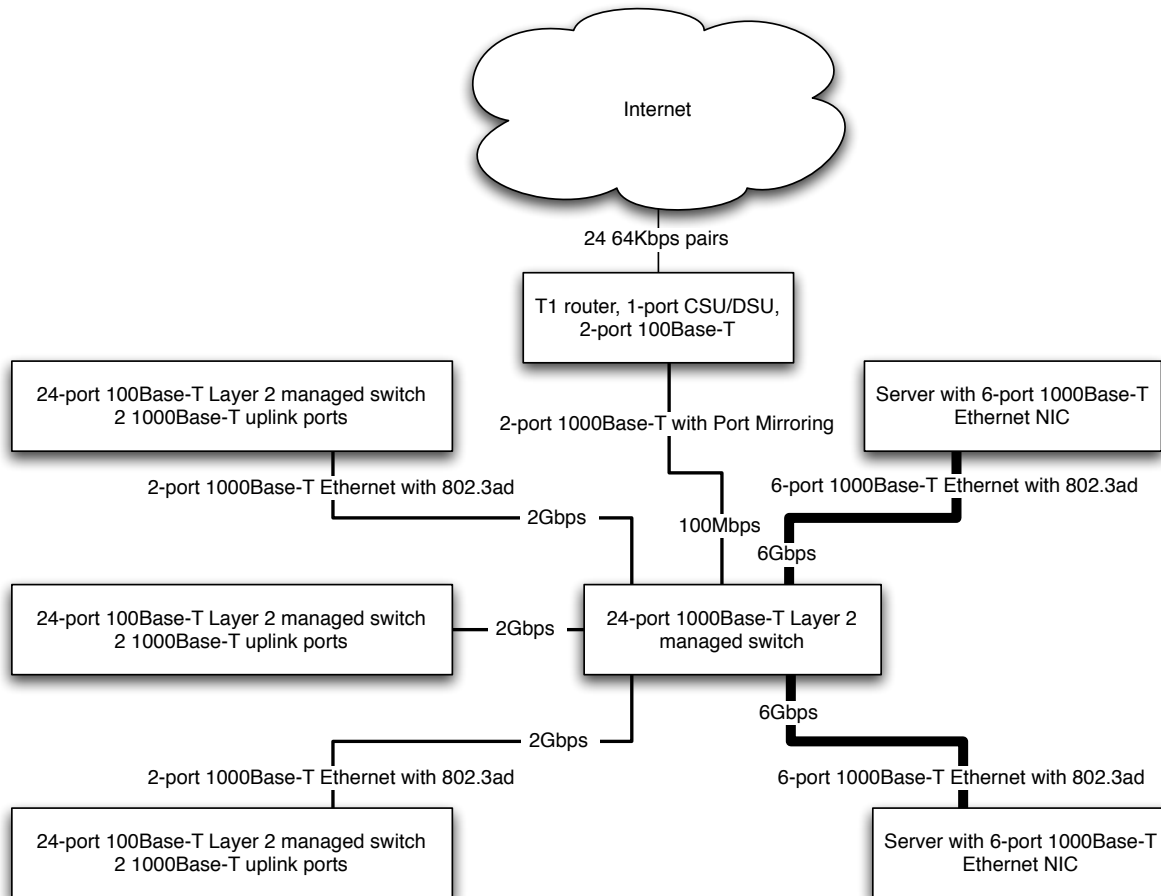
Costs

Description	Qty	Price	Ext. Price
1' Cat 6 Patch Cable	20	$3.50	$70.00
10' Cat 5e Patch Cable	60	$13.50	$810.00
Foundry EdgeIron 2402CF 24-port 1000Base-T Layer 2 switch	1	$2,750.00	$2,750.00
Foundry EdgeIron 24G 24-port 100Base-T Layer 2 switch	3	$750.00	$2,250.00
Intel 100Base-T NIC 20-pack	2	$675.00	$1,350.00
Small Tree 6-port 1000Base-T NIC	2	$750.00	$1,500.00
Category 5e Indoor Drop	52	$100.00	$5,200.00
Category 5e Outdoor Drop	7	$800.00	$5,600.00
Cisco 1841 with 1-port CSU/DSU	1	$1800.00	$1800.00
		Total	*$21330.00*