Cisco IT
Data Center and
Operations Control Center
Tour

Data Center Storage and Servers

6. Data Center Storage and Servers

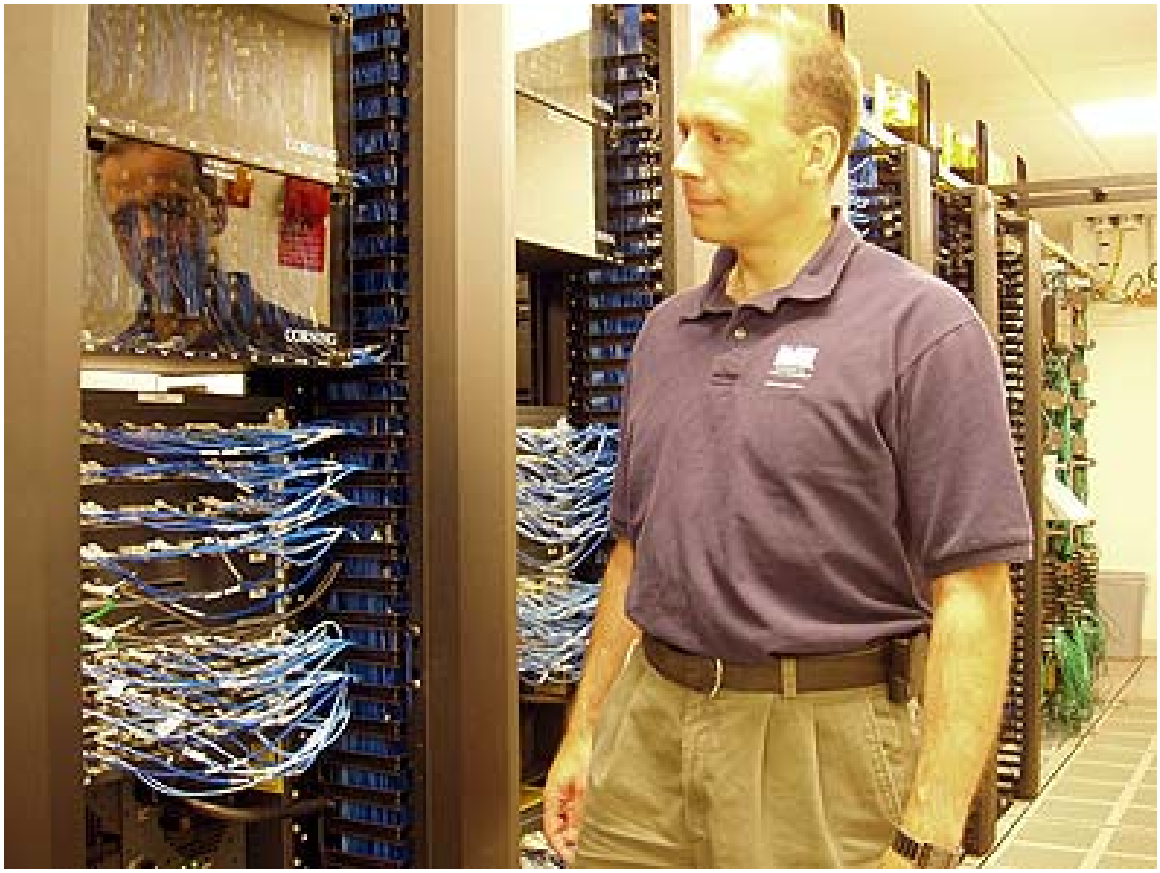
Storage

Storage Area Networks

Figure 1. Storage Switches in the Data Center

Dick: "This data center is a little bit about everything. We have a lot of storage. Most of that storage is EMC, and most of the rest is HP. In this data center, and in the other production data centers around the world, we connect hundreds of hosts to these storage frames over a storage area network (SAN). This SAN is made up of Cisco MDS multilayer switches. There's a great success story about this SAN. It has enabled us to fully utilize our storage resources. We already have about two Petabytes within Cisco – that's more than two quadrillion bytes of data. Two years ago almost all our storage was directly connected to each host. We might get two or three different hosts connected to the same frame, and we had almost half of our storage unutilized. In our SAN environment our storage utilization is a lot higher. When you consider that an EMC frame might cost up to $750,000, and we have a couple hundred frames, that's a lot of money saved."

Figure 2. Ian with Fibers Connecting Storage Switches



Ian: "These Cisco MDS 9509 storage switches have a lot of ports; they can have more than 200 each. Already they are almost all used. There are not many empty ports on these switches. And if you look around the corner, you'll see why.

"We have a lot of storage in this data center, about 600 terabytes of storage in this room of the data center, and about 800 terabytes of storage in the whole data center. All these storage frames are connected to a storage area network using these switches, connecting our hundreds of production hosts to a large pool of shared storage. This helps keep our storage utilization pretty high, and saves money.

"All the blue cables you see here interconnect our storage frames into a storage area network using Cisco MDS multilayer director switches. The orange cables are the regular fiber that we used for data networking when we installed the data center about five years ago. This cable was pulled maybe a year and a half or two years ago. We don't often have to pull new cable in production data centers, unlike in the Build room or the engineering data centers, which is why we still keep the network cabinets at one end of the data center. Otherwise we'd probably have migrated to the engineering data center architecture by now, with network equipment at the end of each half-rack."

Tape Backup Storage

Figure 3. Tape Storage Library

Dick: "We have a lot of tape storage for vital records, but we have backup storage offsite in the North Carolina data center. Its primary purpose is to act as a hot standby backup site. That data center was developed to support the critical systems here in duplicate on the other side of the United States, to replicate them and run if we encountered a failure here. The ERP environment updates the data to RTP on a continuous basis throughout the day and when we need it to recover the data, it takes about 20 minutes, which is time lost.

"In reality, the backup solution isn't as automated as we want it to be because we still rely on several people to get it set up, and there are many things we haven't been able to test adequately. We're still improving our disaster recovery procedures and we still have some work to do."

Servers

Figure 4. Rows of Servers in the Data Center

Ian: "The interesting thing about the production or business data centers is the variety of solutions and partners that are represented here. The equipment in our business data centers is in large part supported directly by vendors under contract with us. Those vendors will come in, perform upgrades and changes to the systems, and troubleshoot and repair if there's a problem. You'll also see those systems in their cabinets, in their native habitats, instead of in standard engineering racks, because the support contracts specify that everything is left in its vendor state of packaging."

Dick: "We have a lot of different servers in distributed environments, mostly smaller Linux and Windows servers that we can stack and pool together. We've got some enormous SUN E-10000 servers with 28 processors each and some Sun HP superdomes, which are big, heavy, and expensive servers.

Remote Monitoring of Storage and Servers

Figure 5. Modem access to monitored resources

Dick: "A lot of the storage frames here have small modem boxes next to them. That way if any of these storage frames has a problem, it automatically calls back to the vendor's home office, and tells the vendor we're having a problem. The vendor can dial in and investigate, and then they alert operations about the situation.

"It's good to have this level of support, but there have been problems. One day I got a rather big phone bill—for 10,000 calls in a month—all of them from this data center in San Jose and all of them from these storage frames. They were calling directly out of our regular number. I went to the storage provider to ask if they could do something about this and they got their own phone number. Now all these calls are billed to them.

"Analog modems will be a thing of the past very soon. We're getting ready to go to a VPN solution over our IP network and our connection to the Internet, which will give a vendor direct access to those boxes, but to nowhere else in our environment."

CallManager Servers

Figure 6. CallManager Cluster

Ian: "Cisco has 54 buildings in San Jose, and hundreds of large buildings worldwide. In 2001 each building had a PBX. In San Jose each building had a large PBX, called an Extended Peripheral Node, with a pair of Primary Peripheral Node PBXs to direct them.

"When we first started replacing these PBXs, we replaced each one with a pair of Cisco CallManagers, and we ended up with hundreds of CallManagers worldwide. Recently we began migrating these CallManagers to a centralized call processing architecture, with a small number of CallManager clusters handling call processing for numerous locations in a region. When we finished consolidating the 50 buildings in San Jose, we ended up with a cluster of eight CallManagers, called a super cluster.

"The super cluster is backed up by a second super cluster in another data center, which isn't doing any call processing but is ready to if the first one becomes unavailable. All the phones are registered to this cluster, but are set to automatically reregister to the backup super cluster if needed. What's amazing to many people is how we can replace 50 large PBXs, each larger than a refrigerator, with a quarter of a rack of equipment. The savings in space, power, and management time is impressive."

Dick: "You know, when I started at Cisco there were big telephone switches, one per building. We dedicated a room for telephony with that big box sitting in it, heating up the room for you. And two years ago we eliminated all those telephone PBXs in all those buildings. We replaced it all with our super cluster, which is six small servers inside of a single rack, maybe1/3 of the rack. The super cluster supports telephony throughout the 50 campuses now, with more than 34,000 IP phones. So it's pretty amazing to bring a customer in and to show how many people we're managing with that little cluster of processors."

End

Data Center Storage and Servers

You can go back to Inside the Build Room, move ahead to learn about how data center components are powered and cabled, or you can go to any other part of the tour.

We hope you have enjoyed this part of the Cisco IT Data Center tour. You can contact your Cisco sales person to arrange an Executive Briefing Center visit, and request a live tour of the Cisco main production data center and operations control center.

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