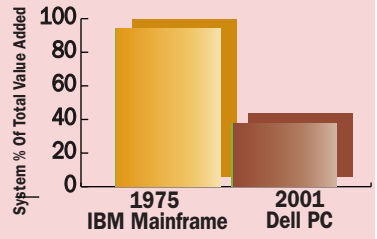
Chipping Away At Value Added

Bart Stuck and Michael Weingarten

Will component vendors drive networking gear into commoditization? High-speed chips could pave the way.

Most people in the high-tech industry are familiar with the story of the "hollowing out" of the computer industry. Twenty-five years ago, most of the value-added in an IBM System 370 accrued to IBM—approximately 95 percent, based on our guesstimates as shown in Figure 1—not to merchant chip and software suppliers.

FIGURE 1 Computer Value-Added Trends



Source: Signal Lake Estimates, Dell Financials

Today, the situation in the PC business is substantially reversed, with value-added for a PC manufacturer like Dell running around 40 percent. Clearly, what happened was that technology leadership shifted from systems players to merchant chip and software suppliers (read: Intel and Microsoft), forcing systems players to compete as assemblers of commodity computers.

TABLE 1: Computer System vs Chip Market Cap Comparison: September 2001

	Systems Market Cap $B	Chips/ Software	Combined Market Cap $B	
IBM	168	Microsoft	298	
Dell	56	Intel	174	
Total	**224**	**Total:**	**472**	**696**
Share	**32%**		**68%**	**100%**

A good indication of the shift: IBM's market cap in early September 2001 (pre-WTC) was $168 billion and Dell's was $56 billion, compared to $298 billion for Microsoft and $174 billion for Intel. This is a 32–68 split in favor of component suppliers, approximately tracking the value-added mix (Table 1).

Looking at the trend in computers, it is natural to expect a similar evolutionary path in telecom equipment. After all, telecom switches are computers; the transistor was invented at Bell Labs. Furthermore, digital Class 5 voice switches look a lot like computer mainframes with respect to physical bulk and the fact that customers are locked into buying extremely expensive proprietary software from the systems vendor. Therefore, it should be no surprise that the value-added structure of a *circa* 1985 Class 5 switch looked much like an IBM 360, with more than 90 percent of value-added retained by the systems vendor.

Despite similar beginnings, however, very little has changed in telecom equipment. In 2001, system vendors continue to retain more than 90 percent of total value-added in Class 5 switches. Again, this isn't surprising, because Class 5 switches continue to be very large boxes with very expensive line cards and software.

But what is somewhat surprising is that the percentages for next-generation packet switches don't look very different. Both Cisco's and Juniper's share of value added, for example, are approximately 80 percent. That's a lot closer to the 90+ percent levels of an IBM 360 than to Dell's 40 percent (Figure 2).

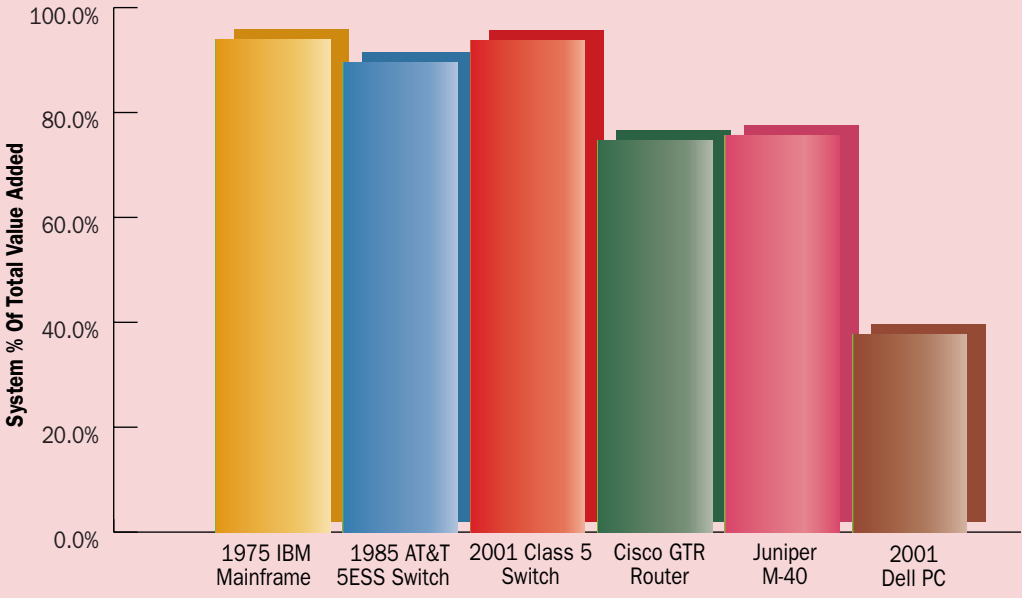
A Closer Look

Let's take a closer look at the detailed cost structures of Cisco and Juniper (Table 2). Both enjoy high 65-percent gross margins, which pay for substantial outlays for R&D, sales, general and administrative costs—47 percent for Cisco and 34 percent for Juniper. This leaves profit—almost 17 percent for Cisco and more than 30 percent for Juniper.

The two companies' cost structure breakdowns also demonstrate their high value-added, defined here simply as the revenue received for a systems box less the purchased components. (In Table 2, the other items listed under "Cost of Goods Sold" are attributable to the systems company rather than an outside vendor, so they are counted as part of the system vendor's value-added.) As Table 2

Bart Stuck (barts@signallake.com) and Michael Weingarten (mikew@signallake.com) are Managing Directors of Signal Lake, a venture capital fund (Westport CT and Boston MA). Weingarten also is managing director of Telecom Advisory Services at Monitor Group (Cambridge MA), a leading international strategy consulting firm.

FIGURE 2 Computer vs Telecom Value-Added Trends



Source: Signal Lake Estimates, Company Financials

Reliance on custom ASICs has kept telecom value-added high on the system side

shows, both vendors' cost of purchased components is less than 20 percent of total revenues, resulting in the 80+ percent figure for value-added.

As a result of these cost structures, telecom systems companies have much higher market caps than networking chip vendors (Table 3). As of September 2001, three leading systems vendors (Cisco, Lucent and Nortel) were worth $144 billion, while three leading networking chip vendors (AMCC, PMCS and Vitesse) were worth $11 billion. These chip vendors account for a higher market share in their segment than the chosen system vendors represent in their market, which only reinforces the lopsided nature of the market cap comparison. As it is, the system-to-chip mix is 93/7, and would increase further if we added other companies such as Alcatel, Tellabs and Juniper.

Will The Model Change?

What are the prospects for changing this and having the telecom equipment market follow the PC model? A lot depends on chipmakers' ability to seize leadership over next-generation technology. In our recent article "In Search Of The (10 Gbps Chip) Holy Grail" (*BCR* October 2001, pp. 45–49), we noted that in the past few years, a lot of effort had been made by chip vendors such as IBM and Intel to develop general purpose network processor chips (NPs). These chips, in theory, would handle both dataplane and control plane functions in a single "system on a chip," in a manner analogous to microprocessors in PCs. If successful, NPs would substitute for proprietary ASICs and would result in a hollowing out of system value added, as occurred in PCs.

Unfortunately, as we noted in that article, the highest-speed NPs in volume shipments today only operate at 2.4 Gbps. Furthermore, the topology of network routing and switching at this point in time is still far too complex to perform in a single chip. As a result, leading systems players have continued to rely on proprietary ASICs and software. This in turn has sustained high telecom equipment system value-added levels.

Is this likely to change any time soon? Not if we are counting on single NPs operating in system-on-a-chip mode. In 2002, we will be looking at systems composed of multiple-chip chipsets for the ingress dataplane and egress dataplane, linking to a chipset that includes a single NP serving as the control plane, and to ternary content-address-

TABLE 2: Router Cost Structure Estimates

	2001 Cisco GTR Router	2001 Juniper M-40
Street Price (Including OS)	**100.0%**	**100.0%**
Total System Cost of Goods Sold (CGS)	**36.0%**	**35.4%**
System Labor	5.0%	4.0%
System OH	10.0%	8.0%
Total Parts Cost*	16.4%	18.8%
Depreciation	4.6%	4.6%
System Gross Margin	**64.0%**	**64.6%**
System R&D, SG&A	**47.2%**	**34.2%**
R&D	21.6%	15.2%
SG&A	25.6%	19.0%
System Profits Before Taxes	**16.8%**	**30.4%**
Total Systems VA	**83.6%**	**81.2%**
Total Component VA*	**16.4%**	**18.8%**

Source: Signal Lake Estimates, Company Financials.
Contract manufacturing included as part of system value add.

Products from chip vendors will look a lot like Cisco or Juniper routers—but a lot cheaper

TABLE 3 Telecom System vs Chip Market Cap Comparison: September 2001

Systems Market Cap $B		Chips Market Cap $B		Combined Market Cap $B
Cisco	105	AMCC	3.9	
Lucent	21	Vitesse	2.5	
Nortel	18	PMC Sierra	4.2	
Total	**144**	**Total**	**10.6**	**154.6**
Share	**93%**		**7%**	**100%**

able memory (CAM) chips and switching fabric chips. As a result, chip manufacturers in the next generation of products will be seeking to develop integrated systems on a suite of chipsets, with each needing to work seamlessly with the others.

This isn't easy to do. As we noted in our earlier article, PMC Sierra thought that if it could acquire one of each type of chip, it would have a system. After spending $2.2 billion on acquisitions, it had to write off the whole thing a year later.

However, if and when chip vendors succeed in developing a suite of chipsets that work together seamlessly, the old telecom system-centric structure will begin to crumble. Anyone who is familiar with the merchant chip business knows that in order to sell chips, it isn't enough simply to produce a working chip. Customers also need reference designs that show them how the chip can be integrated with other chips in board-level products. These reference designs don't simply involve writing software (although that is an important and necessary step). Chip companies typically go the next step and design an entire line card that uses their chips along with those of other vendors. At that point, much of the value-added at the line card level will have been hollowed out.

Going one step further, if a chip vendor wishes to develop a suite of chipsets that integrates the control and dataplane functions with the switching fabric (which a number of them are working on), its requisite reference design necessarily will move beyond line cards to a full "reference chassis" combining line card with switching fabric backplane. At this point, the question becomes: What is the difference between a full systems design from Cisco or Juniper, as opposed to a chassis "reference design" developed by chip vendors for their system customers?

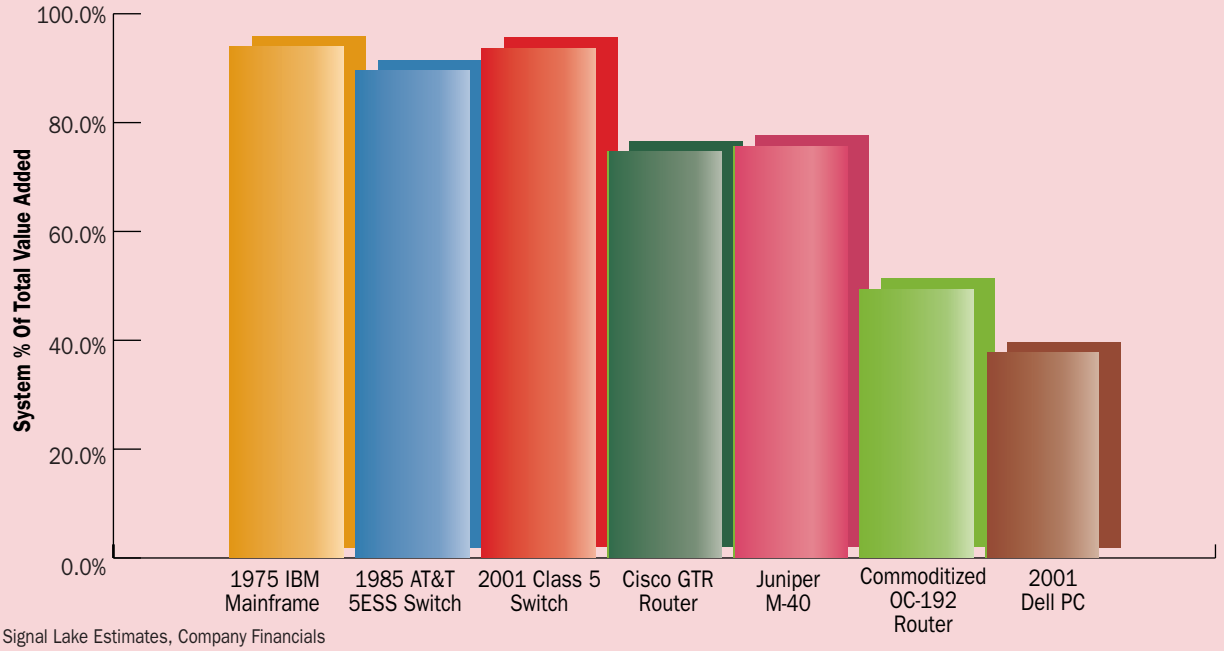
The answer: Not much. Sure, there may be some proprietary operating system bells and whistles added by the systems vendor. However, if a chip vendor reference chassis supports TCP/IP with IEEE standard DiffServ and MPLS protocols, this will make independent systems design largely unnecessary. The result: The systems players will be hollowed out.

To illustrate what could happen, we begin with a Juniper M40 selling for a street price indexed at 100. Our guesstimate calculations suggest that an M40 has a component cost of around 19 (including component-vendor margins). The system

TABLE 4 Proprietary Versus Commoditized OC-192 Router Cost Comparison

	2001 Juniper M-40 $ Index	% Street Price	2002 Commoditized OC-192 Router $ Index	% Street Price
Street Price (Including OS)	**100.0**	**100.0%**	**40.0**	**100.0%**
Total System Cost of Goods Sold (CGS)	**35.4**	**35.4%**	**30.4**	**76.0%**
System Labor	4.0	4.0%	3.0	7.5%
System OH	8.0	8.0%	6.0	15.0%
Depreciation	4.6	4.6%	3.5	8.6%
Total Parts Cost*	18.8	18.8%	18.0	44.9%
System Gross Margin	**64.6**	**64.6%**	**9.6**	**24.0%**
System R&D, SG&A	**34.2**	**34.2%**	**6.0**	**15.0%**
R&D	15.2	15.2%	2.0	5.0%
SG&A	19.0	19.0%	4.0	10.0%
System Profits Before Taxes	**30.4**	**30.4%**	**3.6**	**9.0%**
Total Systems VA	**81.2**	**81.2%**	**22.0**	**55.1%**
Total Component VA*	**18.8**	**18.8%**	**18.0**	**44.9%**

FIGURE 3 Computer vs Telecom Value-Added Trends: Impact Of Commoditized OC-192 Router



Source: Signal Lake Estimates, Company Financials

vendor then adds 34 of R&D plus SG&A, assembly/depreciation of 17 and margin of 30, for total system value added of 81 (Table 4).

Now compare this to what could happen with an OC-192 router that uses 10-Gbps chips working together as a system. The component costs don't look all that different. After all, the street price of the new 10 Gbps chips is likely to be in the $1,000–1,500 range.

Instead, there will be major savings in overhead and profit margins, for three main reasons:

- Since these chips incorporate routing software capability in the chips, there is a limited need for additional R&D at the system level over and above that already done by chip vendors.
- Since systems suppliers will be providing largely commoditized boxes, there can be large reductions in SG&A (after all, the high-powered direct sales marketing efforts will become unnecessary, just as no one sells PCs via direct selling any longer).
- There will be large reductions in per-box profits—as seen in the PC market, anyone trying to maintain high margins in a commoditized environment won't survive.

As a result of this process, the street price of an OC-192 router could drop by 60 percent (we also assumed savings in system direct labor and overhead, due to the use of smaller chassis as the result of using more capable chips). Again, the savings don't come from direct savings in the component bill of materials, but from hollowing out a bloated overhead and profit structure that assumes the need for proprietary systems designs.

If our commoditized router gets built, it results in a box with 50 percent systems value-added. Superimposing this on our previous value-added comparison chart (Figure 3), our commoditized router would be within 13 points of a Dell computer (at 38 percent). It makes sense that system value-added never gets to the PC level, given that routers will be sold in the thousands as opposed to millions. Even at this level, however, the potential implications for the telecom industry are profound.

Conclusion

Will we ever get there? Back in 1975, the sanity of anyone advocating this type of change in the computer industry would have been questioned. Having seen just this sort of industry transformation occur in computers, it's a lot easier to contemplate this time around□

Companies Mentioned In This Article

Alcatel (www.alcatel.com)
AMCC (www.amcc.com)
Cisco (www.cisco.com
Dell (www.dell.com
IBM (www.ibm.com)
Intel (www.intel.com)
Juniper (www.junipernetworks.com)
Lucent (www.lucent.com)
Microsoft (www.microsoft.com)
Nortel (www.nortelnetworks.com)
PMC-Sierra (www.pmc-sierra.com)
Tellabs (www.tellabs.com)
Vitesse (www.vitesse.com