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Why PHY?

Serious companies like Intel, Intersil, Broadcom, and Texas Instruments are betting big on Wi-Fi microchips

Inside:

I have a confession to make, a sinful predilection to divulge. Every week as I sweep impetuously through my e-mails, inadvertently zapping precious letters from my children and newsletter partners as I rush to obliterate a host of heaven-sent opportunities for wealth and carnal bliss, I find myself helplessly clicking through to the weekly commentary of John Mauldin (www.2000wave.com). Even if I delete it one place, it pops up at another e-mail address. Thus I join some million morbid folk avidly consuming his casual doom laden prose.

In most ways, Mauldin is a conventional accountant-economist, deeply alarmed by budget deficits and trade gaps and social security liabilities and other tedious trivia such as quarterly reports that are being deprived of all significance by new "level-playing-field" government regulations which try to transform all CEOs into CFOs and accountants. As Peter Drucker said the last time I heard him croak his wisdom to an audience, oracular as usual from a huge armchair on a stage in Seattle for a Forbes CEO conference: "No one in your company knows as little about the substance of your business as the CFO." That is why Scott Sullivan and even possibly Andy Fastow are somewhat less guilty than anyone supposes since they had no idea what they were doing. It was all just numbers to them. The new Sarbanes-Oxley Act of 2002 wants to give the numerologists complete control. Indeed, by the new standard, the perfect company is Enron, since it was run entirely by consultants and accountants who knew little or nothing about the actual markets and off-shore and off-balance-sheet orifices they were prestidigitating.

Similarly, no one knows less about the U.S. economy than accountant-economists and Keynesians. Mauldin mostly follows in their trail. Like most people who see the market as a fool, Mauldin worries about the impact of negligible changes, such as expensing options. In a typical catastrophe scenario, Mauldin gullibly takes the reported earnings of the top fifteen NASDAQ players, subtracts option expenses, and arrives at the scarifying conclusion that these companies are broke. Claiming earnings of $25 billion, the top fifteen had real, "Honest-to-Pete" earnings of $13 billion, more than all of it from Microsoft (MSFT). The other fourteen had real "H-T-P" earnings of minus $3.5 billion. He draws a bunch of heavy breathing conclusions, involving future depression, H-T-P, that I will not bore you with.

The reason nearly all technology companies use options, however, is not because they are not expensed but because they are *not* expenses, regardless of what the government mandates. The market knows they aren't expenses, and as T. J. Rodgers of Cypress (CY) recently argued, the market will blithely ignore GAAP numbers. It will focus on pro-forma numbers that do not pretend that the options were more than a mild dilutent of share value heavily counteracted by greater loyalty and performance from the employee-owners.

Mauldin also worries about the assumption by many large companies of liability for the health and retirement of workers through defined benefit pension programs. There are 360 companies in the S&P with defined benefit plans that

guarantee their retirees a particular income for the rest of their lives. "If each of the S&P 500 companies lowered its expected rate of return from the current average of 9.2 percent to 6.5 percent, the total cost to earnings would be $30 billion, but if the Dow drops to 5,000 the number goes off the chart." Under federal law, Mauldin points out, moving on off the chart, if the funding level drops below 90 percent of what the actuaries say is needed, companies may be required to refill the fund within three to five years, meaning they will have to meet what amounts to margin calls and come up with large capital infusions to the pension fund directly out of earnings. And next year, these companies are going to have to adapt their pensions to account for longer life expectancy. If the retirees live forever, corporate America is going to be in a real pickle. The reality, Mauldin warns, is that for some companies the beneficial owners are going to be the retirees rather than the shareholders.

The only paradigm stock on the list of 100 recent NASDAQ IPOs is Synaptics

No they won't. If the retirees try to milk the stockholders, they will leave and the company will become virtually worthless. All Mauldin is saying is that if the economy goes in a perma-bear tank and none of these large companies grow robustly, the retirement of the baby boomers will bankrupt the U.S. economy. So what else is new? If the baby boomers do not earn their retirement wealth before they retire, they will not be able to retire. The issue is the same with social security liabilities, another disaster scenario beloved of the catastrophists. Unless both the productivity and the wealth of the U.S. economy continue to expand massively, so a gullible accountant-economist might conclude, every retiree will need to be supported by two workers, and marginal tax rates will rise to 70 percent or more. But just as no one will invest in a profitless economy, virtually no one will work in the face of a 70 percent tax rate.

Catching photons

We are left with the necessity of the very constant innovation and growth that could not happen if the doomster analysts are right and prevail with safety-first investment recommendations. If you do not realize that along with bankruptcies and failures capitalism yields huge, unexpected innovations—such as the transistor, the the microprocesser, the Internet, and fiber optics—that enhance productivity by huge multiples undreamt by accountant-economists, you will conclude like John Mauldin or Paul Krugman that our goose is cooked, and we might as well just dice it up and distribute it equally to all citizens. GAAP accounts, quarterly earnings reports, consumer sentiment, GDP data, and other numerological entrails of past enterprise are virtually irrelevant to the future of the economy.

But the reason I read Mauldin is that he can surprise you every issue or so with a penetrating analysis. He had the most acute explanation of the deflation crises published by an investment advisor. In his latest letter, he concludes that index funds and other portfolios dominated by large companies are going to be "dog meat" over the next decade. I agree. He recommends that investors turn to small technology firms that will become giants over the next decade. I agree. "Instead of hoping Cisco (CSCO) or JDS Uniphase (JDSU) will come back," he tells us to look through the 100 latest companies to go public on NASDAQ. (JDSU will probably roar back, but let it pass). He says: "Find a company with a built in barrier to entry in its market, solid management, and a reasonable business plan."

It so happens that the only paradigm stock on the list of 100 recent NASDAQ IPOs is Synaptics (SYNA). It is indeed a buy at the present price. It commands a unique touchpad technology that already dominates the notebook PC market and will be increasingly useful on the new cell phone personal digital devices. It is widening its scope to biometric input devices for a variety of secure equipment. It has a trailing P/E of around 10. It has a cash reserve larger than its market cap of around $120 million. It possesses a 15 percent portion of Foveon, thus likely sharing in the most important technological innovation of the next decade. It is breaking through in China with its "QuickStroke" Chinese character recognizer. What is not to like? Even John Mauldin wants you to buy it. Otherwise most of the 100 recent NASDAQ technology IPOs are in the health and biotech fields covered by my colleague Scott Gottlieb in the *Gilder Biotech Report*. I cannot sort them out here, but Scott covers the area with a sure hand.

Buying Synaptics, however, is not a sufficient investment program in itself. Dwarfing the significance of GDP and other accounting numbers are the regulatory and tax policies of Washington bureaucracy. Catch a photon and it dies. Mauldin's cautions can actually come true if Washington continues its attempt to tax and regulate photons as they sweep around the globe at the speed of light. In blocking the proposed EchoStar (DISH)-Hughes (GMH) satellite merger early this month, the Federal Communications Commission illustrated the obtuseness of even the more savvy DC forces before the onrush of change in the Telecosm. FCC Chairman Michael Powell says the key problem facing the industry is a lack of access to capital. But if telecom companies continue to go bankrupt because federal and state governments prohibit profitability, guess how many investors will be willing to put more money at risk.

Dispite the thousand-bankruptcy failure of the

Clinton-Gore FCC, Gregory Sidak of the American Enterprise Institute shows that the FCC continues to print annually three times as many pages of regulations as it did before "deregulation" in 1996 and that the number of telecom attornies has roughly doubled since 1994. Despite the loss of more than 500,000 jobs and $3 trillion in market value, and a cascading depression in the semiconductor, computer, software, and fiber optics industries, FCC Commissioner Kathleen Abernathy washed her hands again on October 7: "We are not magicians with the power to turn around a flagging economy."

Outside Washington, smart people like Roxane Googin of the *High Tech Observer* and pundit David Isenberg are calling for the nationalization of telecom. "We are not closet socialists," writes Googin. "However, one must accept the fact that every major Internet carrier has gone bust, or is about to." New telecom services "must be supplied as a public good."

By underestimating the depth of the telechasm and delaying corrective action, the go-slow and no-go politicians threaten to make this dystopian idea a real possibility. As regulatory destruction continues its climb up the telecom pyramid, the largest players will finally succumb, and the road will be paved for a government takeover.

Wi-Fi untangles the cords

What they all miss is the biggest trend in both wireless and wireline communications: the mass exodus from regulated to unregulated technologies. Back in the Telecosm, everybody's doing it. Take Microsoft cofounder Paul Allen who at our sixth annual Telecosm conference earlier this month in Lake Tahoe sat untethered in the audience and in between comments and queries to panelists surfed the Net on Wi-Fi for two days straight. Courtesy of CloudX—a Tahoe start-up that is weaving a wireless Nokia (NOK) frequency-hopping mesh across the lake from Reno and over and around the evergreens and rocky crags of the Sierra Nevada ski country—the Resort at Squaw Creek oscillated at 2.4 GHz with Wi-Fi Internet access at up to 11 megabits per second.

When first introduced several years ago, this short-range wireless technology, also known at 802.11, merely strove to eliminate the tangle of cords under your desk by connecting computers, printers, and other office devices via radio waves, not wires. Situated in a 85 megahertz band of interference-prone, unlicensed spectrum, Wi-Fi's niche was convenience, not performance.

Today, however, it is the chief enthusiasm of techies and venture capitalists in Silicon Valley. Shipments of Wi-Fi hubs, which can transmit data up to 54 megabits per second at short range, will grow from 3 million in 2000 to almost 20 million in 2002. Intel recently announced it will put a Wi-Fi radio on every Pentium chipset. IBM (IBM), AT&T Wireless (AWE), Verizon Wireless, and Cingular Wireless have all joined Intel in Project Rainbow, an attempt to create a nationwide network of Wi-Fi "hot-spots," or access points.

Earthlink (ELNK) founder Sky Dayton appears on the October cover of *Wired* magazine proclaiming that his new Wi-Fi venture, Boingo, will connect the masses through hot-spots at hotels, airports, malls, and coffeehouses. Nicholas Negroponte, head of MIT Media Labs, agrees: "Everything you assumed about telecommunications is about to change."

Beyond the hyperbole, why are serious people like Negroponte touting the Wi-Fi revolution and serious companies like Intel (INTC), Intersil (ISIL), Broadcom (BRCM), and Texas Instruments (TXN) betting big on Wi-Fi microchips? Why is Wi-Fi—whose spectrum band is crowded by interference from microwave ovens, baby monitors, digital satellite radios, and industrial, scientific, and medical (ISM) uses, and whose range is 100 times less than mobile phones—the key recipient of new investment and entrepreneurial energy, while many mobile phone companies in America and Europe, with their pristine airwaves, struggle to fight crushing debt loads and technology setbacks? Why do enthusiasts even naively regard it as a replacement for high-speed cable modems and DSL?

The simple answer is that Wi-Fi isn't regulated. Wireless is. Wi-Fi spectrum costs nothing. Wireless spectrum costs billions. The only Wi-Fi requirement is that you don't interfere with other users, a feat that will become easier as radios become smarter (and a principle that should govern all future wireless spectrum issues).

Regulated to death

The wireline world is no different. In 1999 and 2000, Lucent (LU), Nortel (NT), and Cisco were fighting to be telecom's top-dog. Lucent and Nortel, the two established telecom equipment companies, had the best scientists, research and development programs, and customer relationships. Cisco, the fast-growing datacom player, on the other hand, acquired its technology from the outside, sold mostly to businesses, not telecom carriers, and was mainly a marketing company. Cisco's attempts to enter the telecom market were rather weak. And a good thing too.

As attorneys flow into regulated sectors, the innovators flow out

By focusing chiefly on unregulated "enterprise" networks, Cisco has increased its revenues each of the last five quarters, hitting $4.8 billion in June before slipping a bit. What's more, enterprise networks are

TELECOSM TECHNOLOGIES

Corvis (CORV)

WDM SYSTEMS, RAMAN AMPLIFICATION, EDGE SWITCHES

OCTOBER 28 PRICE: 0.62 52-WEEK RANGE 0.47-3.90 MARKET CAP: 255M

WAIT STATE—Corvis announced weak but unsurprising third-quarter revenues of $1.4 million and said it would repurchase up to $25 million—or about 10%—of the company's outstanding shares. Broadwing in the U.S. and France Telecom accounted for all sales this quarter. AT&T is said to be planning between $500 million and $1 billion in long-haul network upgrades in 2003 and is evaluating systems from Corvis, Ciena, and Lucent. If T really wants to spend a billion bucks, it should choose Ciena or Lucent. For that amount, it could build and service three Corvis nets. Corvis expects to end the calendar year with about $500 million in cash and short-term investments, meaning good news from T or possibly from China could substantially boost its $250 million market cap.

Good Government II: Established in the wake of a sale to the U.S. Government, Corvis Government Solutions, Inc. is a new subsidiary targeting the expanding connectivity needs of the world's largest bandwidth user, Uncle Sam.

JDS Uniphase (JDSU)

ACTIVE AND PASSIVE OPTICAL COMPONENTS

OCTOBER 28 PRICE: 2.20 52-WEEK RANGE 1.58-12.44 MARKET CAP: 3.2B

JDSU announced revenues of $193 million in the September quarter and projected sales of $150-$160 million for the December quarter. The company's Global Realignment Program so far has reduced annual operating expenditures by $1.1 billion, and $130 million more in annual cuts are going into effect this quarter. The one-time cost of the restructuring plan is over $1 billion. JDSU's noncommunications businesses (optical coatings, nontelecom lasers, etc.) are profitable, and the company retains a clean balance sheet with $1.36 billion in cash and short-term investments and only trivial debt.

Ciena (CIEN)

METRO WDM PLATFORMS

OCTOBER 28 PRICE: 3.71 52-WEEK RANGE 2.41-21.71 MARKET CAP: 1.5B

Look for more news and commentary on Ciena next month as we approach their earnings season.

Essex (ESEX.OB)

OPTICAL PROCESSORS

OCTOBER 28 PRICE: 2.35 52-WEEK RANGE 1.50-8.25 MARKET CAP: 14M

At September's NFOEC, Telcordia, the Bells' center for technological expertise and innovation, proposed the use of Essex's 6.25 GHz hyperfine WDM device as a way for commercial carriers to enhance the spectral efficiency of existing metropolitan and enterprise optical networks.

KEY

Avanex (AVNX)

ADAPTIVE PHOTONIC PROCESSORS

OCTOBER 28 PRICE: .77 52-WEEK RANGE .63-9.40 MARKET CAP: 55M

Third-quarter revenues of $5.2 million are less than exciting, but CEO Paul Engle believes today's operating expenses of around $11 million can be trimmed further to realize a $4 million burn rate by June of 2003. Cash and short-term investments of $120 million suggest Avanex can continue to hang on until U.S. telecom cap-ex comes back or effective sales channels are opened to Asia. Declining module sales led to the quarter's revenue decline while sales of subsystems gained strength. Avanex views this as their move up the supply chain. Customers in the quarter increased to 12 from 10 in the previous quarter, despite the loss of WorldCom. Three were greater-than-10% customers, again led by Cisco.

Back to Cali: Further restructuring steps include the closing of the 22,000-square-foot Richardson, Texas, Photonics Center facility by the end of this calendar year. The operations and about half of the 15 employees there will transfer to the Fremont, California, headquarters.

StorageNetworks (STOR)

DATA STORAGE MANAGEMENT, SOFTWARE

OCTOBER 28 PRICE: .86 52-WEEK RANGE 0.85-8.10 MARKET CAP: 88M

After an essentially break-even quarter, StorageNetworks exited 3Q'02 with nearly $190 million in cash. Revenues of $22 million came almost entirely from the legacy managed services business. In an effort to align costs with anticipated revenue, STOR eliminated 80 positions, cutting its headcount to 215 this month.

Scale Eight

MASSIVELY PARALLEL GLOBAL STORAGE

PRIVATE

SEARCH OVER—Former Cray and Silicon Graphics exec Robert "Bo" Ewald is Scale Eight's new CEO. Ewald spent 1984-1996 at Cray Research, where he led sales and marketing, software development, hardware engineering, and manufacturing before serving as president and COO. During this time, the supercomputing company grew from less than $100 million to nearly $1 billion in revenue and was the best-performing stock on the NYSE.

Equinix (EQIX)

SECURE INTERNET BUSINESS EXCHANGES

OCTOBER 28 PRICE: 0.24 52-WEEK RANGE 0.19-3.53 MARKET CAP: 24M

ASIAN EXPANSION—In a deal designed to deleverage the Equinix balance sheet, Singapore Technologies has invested $30 million, merged its Internet infrastructure unit into Equinix, and taken a 28% stake in the new company. Equinix also announced the acquisition of privately held Pihana Pacific, a Honolulu-based provider of Internet-exchange data center services. The deals double Equinix's Internet Business Exchange (IBX) centers from seven to fourteen in six countries, with emphasis in Asia.

Dealing with debt: Equinix will use about $23 million of the investment proceeds to equitize more than $130 million of its debt, including about 80% of its outstanding senior notes. Current Equinix shareholders will own 33% of the new company; Pihana shareholders, 21%; and senior noteholders, 18%.

MEAD'S ANALOG REVOLUTION

NATIONAL SEMICONDUCTOR (NSM)
SYNAPTICS (SYNA)
SONIC INNOVATIONS (SNCI)
FOVEON
IMPINJ
AUDIENCE INC.
DIGITALPERSONA

COMPANIES TO WATCH

ANALOG DEVICES (ADI)
AVISTAR (AVSR)
COMCAST (CMCSK)
COX (COX)
ENDWAVE (ENWV)
POWERWAVE (PWAV)
SAMSUNG
SEMITOOL (SMTL)
XILINX (XLNX)

Mirror Image Internet

GLOBAL CACHING AND STOREWIDTH PLATFORM

PRIVATE

Sprint PCS (PCS)

NATIONWIDE CDMA WIRELESS NETWORK

OCTOBER 28 PRICE: 3.49 52-WEEK RANGE 1.75-27.50 MARKET CAP: 3.4B

FORCED REFOCUS—First, the bad news: ClearPay, Sprint's subprime customer acquisition program, turned into NoPay. The net subscriber addition leader for fifteen quarters in a row became the first major carrier to report a net subscriber loss.

Taking the Bite Out of Megabyte: The Vision data service has achieved take-rates of approximately 10% of new customers in the first two weeks of October. There are now more than 120,000 Vision subscribers, 4 million 1x-data-ready handsets in the base, with penetration expected to be 40% by year-end. Revenue per user (ARPU) for Vision is 30% higher than for 2G subs. Nevertheless, the complex per-megabyte pricing scheme deterred new customers, and new CEO Len Lauer quickly instituted a $10 flat-rate data plan—the first in the industry.

Qualcomm (QCOM)

CDMA INTEGRATED CIRCUITS, IP, SOFTWARE

OCTOBER 28 PRICE: 36.50 52-WEEK RANGE 23.21-62.49 MARKET CAP: 28B

BUSY MONTH—Qualcomm announced the availability of WCDMA test mobiles at 1900 MHz, enabling North American carriers to move forward with test and deployment activities in spectrum that they own rather than at 2100 MHz, which is still in limbo. Qualcomm's SnapTrack (A-GPS) location-based service will be integrated into Alcatel's Intelligent Networks products, providing the GSM industry with a wireless location system that actually works. The OmniTracs satellite service also picked up 36 new trucking customers. Most impressive, however, is the sampling of the MSM 6300 chipset, which integrates GSM and CDMA 2000, further reducing excuses for European or Chinese customers who might go CDMA but don't know how to make the transition from their substantial GSM base.

Asia Update: Japan's KDDI added 510,000 new CDMA 2000 subscribers in September. Koreans purchased 4.3 million CDMA handsets in the third quarter, a 35% sequential increase, and the proportion of color-screen handsets grew from 64% to 82%, with CDMA2000 1x enabled phones representing over 90% of all units shipped to date. China Unicom's CDMA network is now growing at 50,000 new subscribers per day, reaching the 4 million mark. Unicom also awarded over $1.1 billion worth of contracts with four equipment providers, and India awarded Lucent two CDMA2000 1x contracts, the biggest five-year contract for nationwide coverage from Reliance.

Altera (ALTR)

PROGRAMMABLE LOGIC DEVICES

OCTOBER 28 PRICE: 11.95 52-WEEK RANGE 8.32-27.59 MARKET CAP: 4.5B

Third-quarter sales were $180.1 million, 3% better than last year, and earnings of $.06 per share matched the June 2002 quarter. Sales of new products, now totaling over 30% of revenue, increased 18% sequentially. The high-end Stratix, is ramping faster than any of Altera's previous families and combines PLD, DSP, and memory capabilities. It has accumulated 1,600 customer engagements, and the new Cyclone family is priced at less than half of comparable PLDs, which moves "down market" into a range of consumer and communications applications.

Broadcom (BRCM)

BROADBAND INTEGRATED CIRCUITS

OCTOBER 28 PRICE: 12.29 52-WEEK RANGE 9.52-53.35 MARKET CAP: 4.5B

Third-quarter revenues of $290 million were up 12% sequentially and 36% year-over-year, yielding the fifth consecutive quarter of revenue growth and reduced operating losses, which were just $9.1 million. Strong growth from the Enterprise and Wi-Fi sectors propped up struggling set-top box sales. In the Wi-Fi segment, Broadcom continued shipping its 802.11b solution to Linksys, Motorola, and Dell, and introduced both the first simultaneous dual band 802.11 b/a chipset and the only forward compatible access point/router platform supporting 802.11a , b, and g standards. On the ADSL front, Broadcom sampled its CPE (customer premise equipment) solution and has design wins. The big news, however, is in the central office, where Broadcom has secured design wins with Ericsson, Sumitomo, Siemens, and Alcatel. Collectively, these companies represent 60% of the worldwide ADSL central office market.

Terayon (TERN)

BROADBAND CABLE MODEMS, HEAD-ENDS

OCTOBER 28 PRICE: 2.74 52-WEEK RANGE 0.86-14.75 MARKET CAP: 208M

VALIDATION—Terayon's DOCSIS 1.1-based CMTS (cable modem termination system) achieved CableLabs certification, and five major cable MSOs are testing it.

Four of Five: Time Warner's Central Florida Division, its third largest, is now purchasing and deploying Terayon's DOCSIS 2.0-based modem.

EZchip (LNOP)

10 GIGABIT NETWORK PROCESSORS

OCTOBER 28 PRICE: 5.50 52-WEEK RANGE 3.79-16.45 MARKET CAP: 40M

SECOND GENERATION—EZchip released the second generation of its breakthrough network processor, the NP-1c. The NP-1c is manufactured with IBM's 0.11micron process and will feature a two-fold performance increase and a 30% price reduction. NP-1c samples are expected during Q1'03. EZchip notes continued growth in customer relationships, including large-system vendors allocating precious engineering resources toward designing EZchip-based products.

National Semiconductor (NSM)

SINGLE-CHIP SYSTEMS, ANALOG EXPERTISE, FOVEON IMAGERS

OCTOBER 28 PRICE: 13.86 52-WEEK RANGE 9.95-37.30 MARKET CAP: 2.5B

The release of a new set of software drivers for its Geode microprocessor family, in support of Microsoft XP Embedded, secures National's partnership with Microsoft to deliver rich multimedia and content control for consumer-information access devices.

Sigma on sale: Sigma, the producer of the first Foveon-powered consumer camera, announced that the single-lens reflex SD-9 will sell for $1,700, implying a "street price" of just $1,500. Foveon was encouraged by the aggressive pricing, saying it reinforces the company's essential business proposition as the producer of highest quality/lowest cost digital imagers.

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Synaptics (SYNA)

TOUCH-SENSORS, FOVEON IMAGERS

OCTOBER 28 PRICE: 4.50 52-WEEK RANGE 3.13-20.75 MARKET CAP: 121M

Third-quarter sales were $22.5 million, and GAAP earnings were $.05 per share. Profitability in the midst of a PC slump, combined with cash and short-term investments of $65 million plus a 15% stake in Foveon, makes Synaptics an attractive play on a high-tech comeback.

Mobile Momentum: Global demand for mobile PCs—laptops and notebooks—is set to outpace that of desktops, with South Korea and Japan leading the charge in Asia. This shift coupled with Synaptics' dominance of the mobile PC interface market should allow the company to continue to grow and to achieve its larger goals of product diversification.

Intel (INTC)

MICROPROCESSORS, SINGLE-CHIP SYSTEMS

OCTOBER 28 PRICE: 16.59 52-WEEK RANGE 12.95-36.78 MARKET CAP: 113B

UNDERUTILIZED—PC softness curbed Intel's ability to exploit its bold ramp into 300mm facilities and to convert fully to 130nm geometries and below. As a result, weaker gross margins for the Architecture Group, 83% of its revenues, lessened earnings despite gains in market share and advances in the Flash memory market driven by graphics-rich new handsets. Also gaining traction are several new products such as 802.11a/b dual band solutions and gigabit Ethernet adapters. Expect initial shipments of the low power Calexico chipset to begin contributing next quarter.

Wi-Fi War Chest: Intel announced its plans to invest $150 million in companies developing 802.1x wireless networking technology.

Texas Instruments (TXN)

DIGITAL, ANALOG, MIXED-SIGNAL PROCESSORS

OCTOBER 28 PRICE: 15.50 52-WEEK RANGE 13.10-37.00 MARKET CAP: 28B

TI is trying to ride the transition from GSM to GPRS both in Europe and North America. Wireless proved to be the only revenue segment that came in better than expectations. But the non-CDMA North American carriers are nowhere near completion of their several-billion-dollar TDMA to GSM/GPRS transitions and will disappoint TI, which should get with the CDMA program.

Narad Networks

GIGABIT ETHERNET COAXIAL CABLE NETWORKS

PRIVATE

UP, UP, and AWAY—Narad moved further up-spectrum, announcing at the sixth annual Gilder/Forbes Telecosm conference that it would extend its broadband cable networks via 60 GHz wireless links. Employing indium phosphide (InP) MMICs (monolithic microwave integrated circuits), Narad will deploy self-configuring Gigabit Ethernet mesh networks.

Soma Networks

BROADBAND WIRELESS ACCESS, NETWORK SOFTWARE

PRIVATE

The Telecosm Technologies list is not a model portfolio. It is a list of technologies in the Gilder Paradigm and of companies that lead in their application. Companies appear on this list only for their technology leadership, without consideration of their current share price or the appropriate timing of an investment decision. The presence of a company on the list is not a recommendation to buy shares at the current price. Mr. Gilder and other GTR staff may hold positions in some or all of the stocks listed.

expanding. Bank of America (BAC) recently purchased fourteen large-capacity links to connect its far-flung U.S. offices directly instead of using tariffed telecom services. Cisco is also the leading provider of CMTS (cable modem termination system) units used to upgrade cable TV networks for broadband. Falling outside the telecom regulatory regime, cable modems have consistently outsold DSL services from the Bells two-to-one. Voice over the Internet (VoIP), moreover, is making serious inroads against the more robust, decades-old circuit-switched method. The encroachment of unregulated, private networks into regulated territory is the unmistakable trend. Other companies playing in this market are Extreme Networks (EXTR), Foundry Networks (FDRY), EZchip (LNOP), Xilinx , Cypress, and Applied Micro Circuits (AMCC).

Lucent and Nortel, meanwhile, are near death. Their focus on optical "backbone" networks, last-mile switching, and wireless infrastructure—all regulated in some form—seals their fate. Over the same five-quarter period, Lucent's sales have fallen from $5.9 billion to $3 billion and Nortel's from $4.6 billion to $2.7 billion. Lucent has laid off 67 percent of its employees and Nortel 62 percent, totaling 128,000 workers. Their big hope for the future is not the U.S. but China, which has recently issued a $1.1 billion order for CDMA infrastructure for China Unicom (CHU). Meanwhile, big U.S. Regional Bell SBC Communications (SBC) just announced a further capital investment cut of 38 percent, and last week Lucent announced an additional 25 percent sequential sales decline for the September quarter.

Federal, state, and local telecom taxes, sometimes totaling more than 30 percent, should be eliminated. The FCC should expedite a declaration that all broadband offerings are not "telecom services" but "information services," thus deregulating them. It should immediately eliminate price controls on wholesale services and equipment. It should allow consolidation. It should return without delay the $16 billion it charged wireless carriers for spectrum it never delivered. It should shut down the carnival of lawyers seeking treble damages against the Bells on behalf of gaseous competitors and comically attempting to block the AT&T (T)-Comcast (CMCSA) cable merger because of Ma Bell's supposed racial broadband redlining.

As attorneys flow into regulated sectors, the innovators flow out. One CEO of a major U.S. semiconductor company recently told me that the best Chinese engineers are heading back home to a much more inviting economic environment.

Instead of letting this debacle play out or further socializing the world's most dynamic industry, Michael Powell's FCC must look to the markets to see how deregulation breathes life wherever it is tried. If the FCC will not act, President Bush should give Powell new marching orders.

Computation in overshoot

As cool, convenient, and free as Telecosm's Cloud-X wireless service was, however, and as often as Wi-Fi entered our discussions, the chief goal of Telecosm this year was to explore the larger homophonous question: Why PHY? Why is the physical real-world layer of electronic systems ascendant over logic? Why is device physics once again the dominant issue in semiconductors, with Moore's law bumping up against numerous barriers? Why is physiology more and more a model for silicon advance? Why is Intel's unheatsinkable Itanic irrelevant and its new leap into analog making waves in the industry?

The answer is the same that prompted our previous caveats on Intel and our original calls for all-optical telecom networks, single-chip systems, and the Internet itself. Computation is in overshoot, providing more gigahertz of cycles than current memory technology can absorb or current applications can use. Connecting computers of all shapes and sizes is now the task. In handheld devices, rack-mounted servers, and Wi-Fi notebooks, power and silicon area are scarce. The goal is low-powered single-chip systems. Bandwidth, if you can harness it, is abundant. Sight and sound are ascendant. Spreadsheets are, well, spreadsheets. It's easy to generate them but tough to share them.

Despite heroically accommodating a 9,000-fold rise in Internet traffic between 1995 and 2002, at a cost well under $39 trillion—the amount it would have taken using the technologies of 1995—the Internet is still expensively fraught with two-way analog to digital conversions, each requiring an expensive laser. Previously high-end niche products, these lasers need to pump thousands of lambdas in thousands of networks and in volumes that proved far too costly. LMDS (don't ask) urban wireless systems at 24, 28, and 38 GHz promised cheaper building access than fiber, but they foundered on their clunky daisy-chains of exotic and discrete analog components, combined with labor-intensive assembly and labor-intensive roof-right negotiations. (That they didn't work was also a big negative.) IP routers changed the topology of telecommunications but still resembled esoteric, power-hungry mainframes, and again to return the signal to the fiber optic line entailed more lasers and multiplexers.

The new gear easily outperformed pre-Internet era equipment. But it needed to accommodate a massive shift of networks from voice to data while simultaneously transforming the system from copper (64 KHz) and electronics to fiber (200 THz) and optics, achieving a potential of some ten orders of magnitude advantage in bandwidth and bit error rate. The problem was a cagey determination to phase-in the ten orders of magnitude change in ways that did not disrupt old markets and relationships. It could not be done.

Enmeshed in a digital computer frame of mind, much of Silicon Valley failed to grasp that the new optical technology was intrinsically analog. It would not permit a routine extension of the digital packet-switched paradigm of the enterprise into a global web of glass and light. Thus the Valley shunned the simple analog and physical layer concepts of a lambda-switched Telecosm.

Today's technologists, managers, entrepreneurs, and investors, however, can still look to a telecosmic future. Responding to the inherent properties of the technology itself, as Carver Mead ordains, we are now well along the listening curves of the new analog paradigm.

Corvis cuts costs

Consider the apparently paradoxical case of Corvis (CORV), which saves costs on optical components by building the only all-optical network. Despite supplying thousands more direct end-to-end lightwave connections between metro nodes and business locations, Corvis uses literally 1,000 fewer laser line cards than Ciena or Lucent, each deploying networks on a foundation of O-E-O switches at major hubs. Retaining the E (electronics) also requires lots of additional and expensive O (optics). A Corvis O-O-O network costs some $110 million less to build than a Ciena or Lucent network and will save a carrier some $515 million in operational expenses over time. By completely removing distance from the equation—the essential goal of the Internet—Corvis reduces the cost of a DS-3 mile by 90 percent as a network adds capacity from 20 Gbps to 300 Gbps. Even in a continuing telecom depression, Corvis stock remains highly attractive. Its $250 million market cap compares to annual global capital spending on network backbones of $10-$20 billion.

At Telecosm, the company's tall, quiet scientist CEO David Huber was as focused and fiery as we've seen him, beginning his presentation with a sharp retort for Andrew Odlyzko, the world's leading Internet traffic authority, who minutes earlier had made the case that since only 1 percent of Internet traffic was video or audio, streaming media was unlikely to be a significant factor in future bandwidth demand. "The reason why only 1 percent of Internet traffic is streaming is obvious," Huber began incredulously. "*You can't get streaming video over the Internet* . . . so therefore the use of it is low." Huber agrees with us that cable TV networks were broadband before broadband was cool and are likely to be the foundation of the broadband future.

The big hope for Lucent and Nortel is China, which has recently issued a $1 billion order for CDMA infrastructure for China Unicom

SPRINT PCS VS. T-MOBILE: comparing two mobile voice & data plans

CARRIER/PLAN VOICE MINUTES	ANYTIME VOICE	BASE PRICE DATA • 10MB	BASE PRICE EACH EXTRA MB	PRICE VOICE+20 MB	TOTAL PRICE VOICE+50 MB	TOTAL PRICE
T-MOBILE #1	600	$50	$10	$10	$160	$460
T-MOBILE #2	1400	$110	$10	$10	$220	$520
SPRINT PCS #1	500	$45	$10	$0	$55	$55
SPRINT PCS #2	2000	$75	$10	$0	$85	$85

20 MB ≈ user would on average per day send or receive 20 simple e-mails (no attachments), send or receive 2 photos, and visit 10 websites. All figures are per month.

EZchip at it again

EZchip is another firm that continues its journey deeper into the single-chip paradigm. Though firmly in the digital realm, EZchip eliminates 80 percent of the chips, power, and cost of router line cards by physically integrating the essential components of a router—the processors, memories, and software—on one programmable chip. That's as physical as you can get. At Telecosm, company chief Eli Fruchter faced off with Intel's (INTC) director of network processor marketing Nabil Damouny. Fruchter described all the distinctive features of his chip that put it far beyond Intel's current reach and Damouny responded with figures on current market share in the U.S. and Asia, and winked about new design wins. At last week's Network Processor Conference West, where EZchip won the prize for the best new processor, the company announced its second generation NP-1c, a radical upgrade on its first generation device. Available early next year, 1c increases clock speed from 166 MHz to 250 MHz and boosts the number of task-optimized processors by 50 percent, doubling performance. This means that the chip can directly couple at wirespeed to a hypothetical extreme case of a SONET stream of 40 byte packets, the minimum size imposing the largest speed demands on a processor. It also can handle minimum size Ethernet packets of 64 bytes (most Ethernet frames are 1,550 bytes). Or the EZchip can do twice as much processing on more usual-sized message flows. A new IBM .11-micron process reduces the chip's cost by 30 percent to $795. EZchip is hurtling beyond Moore's law to deliver some 300 percent gains in cost effectiveness per year.

The previous era—the computer era—was launched and sustained by cheap Intel microprocessors that created an entire new market, the PC. EZchip is exactly what the Telecosm needs for the rapid multiplication of cheap, ubiquitous routers in every piece of communications hardware on the edge of the network.

Data do right

Back in June when we visited Sprint PCS (PCS) in Kansas City to review their forthcoming 3G offering, now known as Vision, the head of marketing hinted that the new pricing plan for data would be on a per-megabyte basis. We asked, "Won't it be difficult for subscribers to estimate the amount of data they might use each month? And to adjust their behavior accordingly?"

Evidently it was. Just two months after introducing the first nationwide 3G service in the U.S. using a complex pricing scheme, Sprint was dissatisfied with 120,000 Vision subscribers and replaced long-time CEO Chuck Levine with Sprint FON (FON) executive Len Lauer. Lauer moved quickly and boldly: all the wireless e-mail, photos, and web access you want for $10 per month.

No non-CDMA network can match the deal. T-Mobile, formerly known as Voicestream and the only other U.S. carrier with a nationwide data network, offers 10 megabytes per month for $10. But each additional megabyte on T-Mobile's GSM/GPRS (general packet radio service) network costs another $10.

Consider a moderate user who uses some 20 MB in a month and costs the flat $10 as a Sprint customer. T-Mobile would charge him $110. And did we mention that Sprint's network (60 Kbps) is twice as fast as T-Mobile's (25 Kbps) and at the same time nearly doubles voice capacity?

The same CDMA advantages are playing out around the world. In Japan, KDDI added 510,000 CDMA 1x users in September alone. From a standing start earlier this year China Unicom has reached 4 million CDMA subscribers, recently adding an amazing 50,000 per day. At this rate, Unicom, which this week placed an order for $1.1 billion in new CDMA 1x gear, the largest contract going to Lucent, will reach what once seemed a laughable projection of 7 million CDMA users in the first year.

We've said for years that the non-CDMA networks in the U.S.—Cingular, AT&T Wireless, T-Mobile, and Nextel (NXTL)—would have trouble surviving Sprint and Verizon (VZ). Sprint's unmatchable flat-rate move will push at least one of them over the edge.

Qualcomm (QCOM) stock may well reflect these developments, but it's nice to see the company yet again exceeding its technology, product, and market-growth promises (see center spread). Up next for Qualcomm—integrating Wi-Fi.

—George Gilder and Bret Swanson, October 28, 2002

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