Silicon for 10 Gbit/s
Connected World

Atiq Raza
atiq@razafoundries.com

Hot Chips Symposium 2001
The First Inning – 1998 to 2000

- Explosion in the Use of the Internet
- Rapid Fiber Deployment and Increase of Bandwidth in Fiber (2X Moore’s Law)
- Availability of lots of Venture Capital for Start-Ups
- Capital availability for CAPEX requirements of Carriers
- Large demand generated by spending-happy Dotcoms and Telecom
- Hot IPO market
- Large number of acquisitions by Equipment and Chip companies
- Start-up Success was defined by Presence in Momentum Segments
Dramatic Growth in New Companies and Market Cap
Technology Companies and Market Cap by Size Now vs. 1990

Frank Quottrone of CSFB

16.4% CAGR

29.7% CAGR

Capital Markets Sow the Seed and Reap the Fruit

- Capital markets have always rewarded growth
- 1998-2000 hyper-growth was hyper-rewarded
- Growth metrics rewarded rather than business fundamentals
- Customers, subscribers, CAPEX budgets, multi-city expansion
- Sound and flaky businesses attracted capital alike
- Sound businesses grew flaky to demonstrate hyper-growth
- Ooops!! There are no fundamentals in sight – Stop!
- The brakes were bad and the debris is scattered far and wide
Moore’s Law of Nasdaq Ran Out of Gas in Y2K

January 1983 - Present

Doubles in 1 year
Doubles in 2 years
Doubles in 4 years
Doubles in 8 years

Frank Quottrone of CSFB
Indigestion in The Terabit Food Chain

Enterprises

S&M Businesses

Consumers

$ Services

$ Services

$ Entertainment

Carriers

Hosting Cos

MSOs

Applications

Services

Content

Networking Equipment: Optics & Routing

Servers & Storage Systems

Optical Components

PCs, Cell Phones, TVs, Set-tops

Contract Manufacturers

Optical Components

Semiconductor Components
U.S. Backbone Internet Bandwidth Demand

Source: Pioneer
Bandwidth Drivers

With 5,000,000 Businesses and 100 Mbps per business the aggregate bandwidth is

500 Terabits/second

With 100 Million active Consumers and 5 Mbps bandwidth per user the aggregate bandwidth is

500 Terabits/second

Andreas Bechtolsheim
Cisco Systems Inc
Restoring Health for The Terabit Food Chain

- Consumers
- S&M Businesses
- Enterprises

Arrows showing:
- $ Services
- Entertainment
- Debt Restructuring, Inventory Dissipation and New Products

- Carriers
- Mgd Services
- MSOs
- Application Services
- Content
- Networking Equipment: Optics & Routing
- Servers & Storage Systems
- PCs, Cell Phones, Set-tops
- Contract Manufacturers
- Semiconductor Components
- Optical Components
### Evolutionary Revolution

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Access</td>
<td>Constrained capital markets shorten ROI horizons</td>
</tr>
<tr>
<td>Internet Access</td>
<td>Carriers focus on Delivering Enterprise Services</td>
</tr>
<tr>
<td>Voice</td>
<td>Slower additional Dark Fiber deployment</td>
</tr>
<tr>
<td>Broadcast Media</td>
<td>Focus on Service Generation and Market Access</td>
</tr>
<tr>
<td></td>
<td>Less long haul and more Metro Services spending</td>
</tr>
<tr>
<td></td>
<td>TDM with Packet services again pick up momentum</td>
</tr>
<tr>
<td></td>
<td>IP-everywhere pauses as MPLS enables the trend</td>
</tr>
<tr>
<td></td>
<td>OC768 on hold as transport bandwidth in fiber</td>
</tr>
<tr>
<td></td>
<td>DSL connections continue – RBOCs step up</td>
</tr>
<tr>
<td></td>
<td>MSOs (cable market) grow aggressive – may win big</td>
</tr>
</tbody>
</table>
1996-2000: Transport and Routing Infrastructure

Lambda routing - OC-48s (2.4Gbps)

STS routing - 45 Mbps

IP routing - < KBps - Packets per sec.

Restoration

COS

Traffic Engineering

Protocols

Last Mile Aggregation & Distribution

Data Centers

Traffic Engineering for Provisioning

QOS

Media Transport

Local Protocols

1996-2000: Transport and Routing Infrastructure

Source: Vinod Khosla at KPCB

Broadband

Wireless

CPE LAN Technologies

Element and Sub-Element Network Management

Intelligent Content Delivery

Services

Security

Applications

RAZAFOUNDRIES Building Great Companies

9/3/01
Lambda routing
- OC-48s (2.4Gbps)

STS routing
- 45 Mbps

IP routing
- < KBps
  - Packets per sec.

Last Mile Aggregation & Distribution
Data Centers

Traffic Engineering for Provisioning
QoS
Media Transport
Local Protocols

Source: Vinod Khosla at KPCB

2002-2005: Data Service Delivery Infrastructure
Equipment and Components for Data Center Needs

<table>
<thead>
<tr>
<th>Transport</th>
<th>Transit Core</th>
<th>Service Core</th>
<th>Edge</th>
<th>Access</th>
<th>Data Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optical</td>
<td>High Speed</td>
<td>High Speed</td>
<td>Medium Speed</td>
<td>I/O Intensive</td>
<td>I/O Intensive</td>
</tr>
</tbody>
</table>

- Optical Switches
- Optical Repeaters
- Optical ADMs
- Optical Traffic Mgt
- Optical Trunking
- Optical Gateways

- Aggregation Routers
- Optical Traffic Mgt
- Optical ADMs
- Multi-Service Switches
- Class 4 Switches
- VoP Gateways

- Aggregation Routers
- Digital Cross Connects
- Optical ADMs
- Subscriber Mgt
- ATM Switches
- Frame Relay Switches

- Remote Access
- DSLAMs and DLCs
- Class 5 Switches
- VoDSL & VoIP
- CMTS Super Head End
- Metro BB Wireless TS

- Remote Access
- DSLAMs
- Class 5 Switches
- VoDSL Gateways
- VoIP Gateways
- DLCs

- LAN Routers
- Content Switches
- Servers
- SAN Switches
- NAS Disk System
- Content Management

Supply Chain

Optical Components

Semiconductor Components
DWDM Application Example

Source: JPMS
Components for the Terabit Age

- Laser
- Laser Driver
- CMU
- X-amp
- Photo Diode
- T1/E1 Framing & Line I/F
- SERDES
- SONET/SDH FRAMER MAPPER
- PROCESSING
- STATE-FULL APPLICATIONS
- Classification
- Routing
- Policing
- Traffic Shaping
- Forwarding
- Header assembly & aggregation
- Payload processing
- Voice-over-Packet: Compression, Echo Cancellation, Telephony
- Voice-over-Packet: Packetization, SAR, Cellification, Jitter management

Payload processing
Market Segments and the Goliath Franchises

- Market Segments defined by Product or Service, Technology, Sales Channels, Customers
- Large Companies “Goliaths” develop broad multi-segment Franchises
- Start-ups succeed with a “Compelling Product or Service Focused in One Segment”

- Start-ups become Goliaths by adding products or services in contiguous segments
- Diminished Focus in one Segment creates new opportunities for Start-ups
Focus*(Innovation + Rapid Execution) = Success
Communications Chip Companies Aim to Control Line Card

Example: IBM Microelectronics
Message: Works best as one solution
Economic Drivers For Terabit Revolution

- Enterprise
  - Supply Chain Compression, Web based Business Transactions
  - Integration of Data Center Storage and Compute with WAN

- Carriers and Service Providers
  - Compelling Services (Faster time to Revenue)
  - Expanded Market Access

- Multi-Service Operators
  - Providing multiple channels, data, voice and other services
  - Targeted Advertisement Revenue

- Mobile Business End-User
  - Mobile Data Access
  - Base Station WAN Integration
Investment Hot Spots

- Enterprise Spending Increases in IT
- Service Providers focus on Delivering Managed Services
- Data Centers
  - Enterprises
  - Carriers and Service Providers
- Mobile Wireless Data Delivery
  - 802.11
  - 2.5G and 3G
- Rich Media Content Service and Delivery
Enterprise Economic Drivers

- **Commerce over the WAN**
  - Web based Commerce
  - Supply chain compression
  - Integration of WAN with the data-center resources

- **Secure Data Center Operation**
  - Enabling a secure data-center perimeter – **Wire-speed Firewalls**
  - Managing the security of distributed Data Centers – **SAN/WAN Integration**
  - Security of business information over the WAN – **Hard Secure WAN Flows**

- **Data Storage Consolidation and Warehousing**
  - Data backup
  - Disaster based data-recovery
  - Better Storage Utilization

- **Network Equipment Management**
  - Load-balancing
  - LAN-SAN-WAN Integration
Carrier and Service Provider Economic Drivers

λ **Metro Services**
- Managed Data Services to Points-Of-Presence closer to Enterprise Customers
- Hard QOS flows delivered from Carriers to Enterprise
- Web hosting, Application hosting
- Storage Service integration

λ **Media Delivery**
- Video-On-Demand distribution
- Advertisement integration
- Web hosting for data delivery

λ **Data Center Managed Services**
- Resource Usage Based Billing model
- Virtualization of Storage and Compute Resources
- Security – Firewall, Intrusion Detection, Secure Transport
Virtual Control of Data Center Resources

Current Enterprise Data Center Model

New Enterprise Data Center Model

Secure Boundary

Data Flows
Data Center Evolution

SAN / NAS Hybrid  DAS

Web Servers  Content Servers  App Servers

Local Load Balancers

Bandwidth Management

LAN Routers / Switches

Content Switches

Global Firewalls

Global Load Balancers

Metro Services Systems  Metro Services Systems
Mobile Wireless Data Integration with WAN

- **2G Cellular**
- **2.5G + GPRS**
- **3G Cellular + GPRS**
- **802.11b Islands**
Media and Data Distribution over HFC and Cable

Hub
~20k HHP

Head-end
~500k HHP

Fiber Nodes
~500 HHP

Fiber Nodes

IP Backbone

Data

Media

Voice

Today: 1.5Mbps to each home
Potential: 100Mbps to each home
### Engines to Generate Services From Optical Traffic

<table>
<thead>
<tr>
<th>Custom processors for processing OC-192 routes and beyond</th>
<th>Custom ASIC Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra-high performance parallel I/O processors for Web Servers</td>
<td>Custom ASIC Products</td>
</tr>
<tr>
<td>Packet processors for TCP/IP termination and re-direction</td>
<td>Custom ASIC Products</td>
</tr>
<tr>
<td>Stateful packet processors for processing secure traffic</td>
<td>Custom ASIC Products and Standard Products</td>
</tr>
<tr>
<td>Programmable packet processors for packet forwarding</td>
<td>Custom ASIC Products and Standard Products</td>
</tr>
<tr>
<td>Digital signal processors for RF for wireless, HFC and Coax</td>
<td>Custom ASIC Products and Standard Products</td>
</tr>
<tr>
<td>High performance programmable control processors</td>
<td>Standard Products</td>
</tr>
<tr>
<td>Special purpose processors for classification acceleration</td>
<td>Standard Products</td>
</tr>
<tr>
<td>Digital signal processors for Voice-over-Packet applications</td>
<td>Standard Products</td>
</tr>
</tbody>
</table>
# Equipment Companies with ASICs vs. Standard Chips

## Companies with Custom ASICs

<table>
<thead>
<tr>
<th>Company</th>
<th>Equity Market Cap</th>
<th>Equity Cash</th>
<th>Total Ent Value</th>
<th>Revenues 2001</th>
<th>Revenues 2002</th>
<th>Multiple of TEV 2001</th>
<th>Multiple of TEV 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcatel</td>
<td>20,447</td>
<td>3,083</td>
<td>25,172</td>
<td>2,979</td>
<td>3,141</td>
<td>8.4 x</td>
<td>8.0 x</td>
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<tr>
<td>Brocade</td>
<td>8,018</td>
<td>218</td>
<td>7,800</td>
<td>515</td>
<td>670</td>
<td>15.1 x</td>
<td>11.6 x</td>
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<tr>
<td>Ciena</td>
<td>10,001</td>
<td>1,501</td>
<td>9,365</td>
<td>1,741</td>
<td>2,632</td>
<td>5.4 x</td>
<td>3.6 x</td>
</tr>
<tr>
<td>Cisco</td>
<td>132,800</td>
<td>6,200</td>
<td>126,600</td>
<td>18,336</td>
<td>20,441</td>
<td>6.9 x</td>
<td>6.2 x</td>
</tr>
<tr>
<td>Extreme Networks</td>
<td>2,910</td>
<td>271</td>
<td>2,639</td>
<td>491</td>
<td>540</td>
<td>5.4 x</td>
<td>4.9 x</td>
</tr>
<tr>
<td>Foundry Networks</td>
<td>2,129</td>
<td>260</td>
<td>1,869</td>
<td>355</td>
<td>440</td>
<td>5.3 x</td>
<td>4.2 x</td>
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<tr>
<td>Juniper</td>
<td>7,347</td>
<td>1,600</td>
<td>5,747</td>
<td>941</td>
<td>989</td>
<td>6.1 x</td>
<td>5.8 x</td>
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<tr>
<td>Nortel</td>
<td>23,235</td>
<td>1,930</td>
<td>25,605</td>
<td>18,895</td>
<td>19,363</td>
<td>1.4 x</td>
<td>1.3 x</td>
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<tr>
<td>ONI Systems</td>
<td>2,865</td>
<td>739</td>
<td>2,426</td>
<td>281</td>
<td>470</td>
<td>8.6 x</td>
<td>5.2 x</td>
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<tr>
<td>Redback</td>
<td>952</td>
<td>314</td>
<td>1,142</td>
<td>277</td>
<td>380</td>
<td>4.1 x</td>
<td>3.0 x</td>
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<tr>
<td>Riverstone</td>
<td>1,463</td>
<td>176</td>
<td>1,287</td>
<td>219</td>
<td>404</td>
<td>5.9 x</td>
<td>3.2 x</td>
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<tr>
<td>Sonus</td>
<td>4,021</td>
<td>136</td>
<td>3,885</td>
<td>207</td>
<td>311</td>
<td>18.7 x</td>
<td>12.5 x</td>
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<tr>
<td>Tellabs</td>
<td>6,372</td>
<td>1,034</td>
<td>5,341</td>
<td>2,269</td>
<td>1,873</td>
<td>2.4 x</td>
<td>2.9 x</td>
</tr>
<tr>
<td>Tellium</td>
<td>1,111</td>
<td>231</td>
<td>882</td>
<td>130</td>
<td>288</td>
<td>6.8 x</td>
<td>3.1 x</td>
</tr>
<tr>
<td>Sun Microsystems</td>
<td>52,800</td>
<td>1,860</td>
<td>53,389</td>
<td>18,250</td>
<td>17,147</td>
<td>2.9 x</td>
<td>3.1 x</td>
</tr>
</tbody>
</table>

### Average
- Revenues Multiple of TEV: 6.9 x
- Median Revenues Multiple of TEV: 5.2 x

### Median
- Revenues Multiple of TEV: 5.9 x
- Median Revenues Multiple of TEV: 4.2 x

## Companies with Off the Shelf ASICs

<table>
<thead>
<tr>
<th>Company</th>
<th>Equity Market Cap</th>
<th>Equity Cash</th>
<th>Total Ent Value</th>
<th>Revenues 2001</th>
<th>Revenues 2002</th>
<th>Multiple of TEV 2001</th>
<th>Multiple of TEV 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADC</td>
<td>3,900</td>
<td>432</td>
<td>3,602</td>
<td>2,530</td>
<td>2,229</td>
<td>1.4 x</td>
<td>1.6 x</td>
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<tr>
<td>3Com</td>
<td>1,721</td>
<td>1,847</td>
<td>(126)</td>
<td>1,864</td>
<td>1,755</td>
<td>-0.1 x</td>
<td>-0.1 x</td>
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<tr>
<td>CacheFlow</td>
<td>191</td>
<td>82</td>
<td>110</td>
<td>86</td>
<td>119</td>
<td>1.3 x</td>
<td>0.9 x</td>
</tr>
<tr>
<td>f5 Networks</td>
<td>310</td>
<td>69</td>
<td>241</td>
<td>117</td>
<td>169</td>
<td>2.1 x</td>
<td>1.4 x</td>
</tr>
<tr>
<td>Network Appliance</td>
<td>4,580</td>
<td>364</td>
<td>4,216</td>
<td>1,066</td>
<td>921</td>
<td>4.2 x</td>
<td>4.6 x</td>
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<tr>
<td>Lucent</td>
<td>22,036</td>
<td>2,285</td>
<td>25,961</td>
<td>21,528</td>
<td>20,446</td>
<td>1.2 x</td>
<td>1.3 x</td>
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<td>Marconi</td>
<td>3,398</td>
<td>728</td>
<td>2,670</td>
<td>9,927</td>
<td>8,746</td>
<td>0.3 x</td>
<td>0.3 x</td>
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<tr>
<td>Scientific Atlanta</td>
<td>4,393</td>
<td>754</td>
<td>3,639</td>
<td>2,511</td>
<td>2,254</td>
<td>1.4 x</td>
<td>1.6 x</td>
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<tr>
<td>Sycamore</td>
<td>1,873</td>
<td>1,300</td>
<td>573</td>
<td>226</td>
<td>308</td>
<td>2.5 x</td>
<td>1.9 x</td>
</tr>
</tbody>
</table>

### Average
- Revenues Multiple of TEV: 1.6 x
- Median Revenues Multiple of TEV: 1.5 x

### Median
- Revenues Multiple of TEV: 1.4 x
- Median Revenues Multiple of TEV: 1.4 x

## Premium on Average for Custom ASICs
- 4.3 x

## Premium on Median for Custom ASICs
- 4.1 x
Indexed Stock Price History

Period when all businesses attracted capital alike

Indexed Stock Prices


Critical Technological Challenges

- Routing Multiple (N) 10G flows in a unified Routing Engine
  - High Performance Route Processors and Classification Engines
  - Enabling High Speed SERDES on chip

- Supporting the Routing Table bloat for the future
  - Get the highest performance out of Moore’s Law
  - Distributed Routing Models
  - High Speed Packet Memory buffers and next generation TCAMs

- Enabling latency control and QoS at 10G rates
  - MPLS at the Core

- Transitioning from 1G to 2.5G/3.125G to 10G line rates

- 10G Ethernet requires XAUI (4x3.125) to 10Gbps SERDES

- Switch Fabrics with QOS and TDM support with on-chip SERDES

- 40G line rates will require all-optical ADM
Growth of BGP Routing Table

BGP Routing Table Growth Chasing Moore’s Law

Source: Tony Li, Procket: “Hyperexponential Growth will exceed Moore’s Law”
Raza Foundries Partner Companies

Acquired by AMCC
- Terabit Switch Fabric
- Content-Aware Delivery System
- Metro Wireless and Optical Systems
- Advanced SAN Chipsets

Acquired by Cisco
- Broadband Access Systems
- Global Ethernet Wireless Solutions
- Optical Packet Processor Engine
- Next Generation Web Server

- Hardened QOS over Optics
- Distributed Application Delivery
- Hyper Fabric
- Advanced SAN Chipsets

- Transparent Optical Switch
- Advanced Service Delivery
- Wire-Speed Security Systems
<table>
<thead>
<tr>
<th>Investments</th>
<th>Co-Investors</th>
<th>Products</th>
<th>Segment</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procket</td>
<td>NEA, USVP, Redpoint</td>
<td>Router</td>
<td>Core Router</td>
<td>Equipment</td>
</tr>
<tr>
<td>Switch-On</td>
<td>Sequoia, Redwood</td>
<td>Classification Accelerator</td>
<td>Router Chips</td>
<td>Acquired by PMCS</td>
</tr>
<tr>
<td>SiByte</td>
<td>Cisco, Bowman, ATI</td>
<td>Comm Processors</td>
<td>Line Card Control</td>
<td>Acquired by BRCM</td>
</tr>
<tr>
<td>Nexsi</td>
<td>Sequoia</td>
<td>10G Content Switch</td>
<td>Data Center System</td>
<td>Equipment</td>
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<tr>
<td>Silicon Access</td>
<td>Norwest Ventures</td>
<td>Network Accelerators</td>
<td>Router Chips</td>
<td>Chips</td>
</tr>
<tr>
<td>VxTel</td>
<td>Sequoia, Telesoft</td>
<td>VOP Chips</td>
<td>Chips for Class 4</td>
<td>Acquired by Intel</td>
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<tr>
<td>Optovation</td>
<td>NEA, Redwood</td>
<td>Optical Components</td>
<td>Optical Transport</td>
<td>Modules</td>
</tr>
<tr>
<td>Nishan</td>
<td>WP&amp;G, Comm Ven</td>
<td>Storage Area Networking</td>
<td>Data Center System</td>
<td>Equipment</td>
</tr>
<tr>
<td>Cyaras Networks</td>
<td>NEA</td>
<td>Optoelectronic ADM</td>
<td>Optical Networking</td>
<td>Acquired by Ciena</td>
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<tr>
<td>Mobilian</td>
<td>Bessemer</td>
<td>802.11+ Bluetooth</td>
<td>Wireless LAN</td>
<td>Chips</td>
</tr>
<tr>
<td>Zeevo</td>
<td>Sequoia</td>
<td>Blue Tooth Chipset</td>
<td>Wireless LAN</td>
<td>Chips</td>
</tr>
<tr>
<td>Euclid</td>
<td>Redwood</td>
<td>Network Services</td>
<td>Data Center Services</td>
<td>Services</td>
</tr>
<tr>
<td>PaxoNet</td>
<td></td>
<td>Framer/POS chips</td>
<td>Optical Linecard</td>
<td>Chips</td>
</tr>
<tr>
<td>Mellanox</td>
<td>Sequoia, USVP</td>
<td>Infiniband ICs</td>
<td>Server &amp; Storage Fabric</td>
<td>Chips</td>
</tr>
<tr>
<td>Quantum Bridge</td>
<td>TPG, NEA</td>
<td>PON Switch</td>
<td>Transport Equipment</td>
<td>Filed for IPO</td>
</tr>
<tr>
<td>Celox</td>
<td>TPG, Apex Partners</td>
<td>Optical ATM Transport</td>
<td>Transport integration</td>
<td>Equipment</td>
</tr>
<tr>
<td>Arcot</td>
<td>Accel, Onset</td>
<td>User Authentication</td>
<td>Security Software</td>
<td>Software</td>
</tr>
<tr>
<td>Everypath</td>
<td>Sevin Rosen, USVP</td>
<td>Web Access by Phone</td>
<td>Wireless Access Software</td>
<td>Services</td>
</tr>
<tr>
<td>Magma DA</td>
<td>NEA, CMEA</td>
<td>Synthesis/P&amp;R Fusion</td>
<td>Next gen CAD</td>
<td>Filed for IPO</td>
</tr>
<tr>
<td>Lara Networks</td>
<td>Battery, Telesoft</td>
<td>CAM &amp; Processors</td>
<td>Router Chips</td>
<td>Acquired by Cypress</td>
</tr>
</tbody>
</table>
Economic Drivers For Terabit Revolution

Enterprise
- Supply Chain Compression, Web based Business Transactions
- Integration of Data Center Storage and Compute with WAN

Carriers and Service Providers
- Compelling Services (Faster time to Revenue)
- Expanded Market Access

Multi-Service Operators
- Providing multiple channels, data, voice and other services
- Targeted Advertisement Revenue

Mobile Business End-User
- Mobile Data Access
- Base Station WAN Integration
Highlights of the Raza Portfolio – Eighteen Months

- Highest Valuation private “Chip Company” - SiByte - $2.2B
- Highest Valuation acquisition after downturn - VxTel - $500M
- Fastest path to liquidity for “Chip Company” - Yuni - $250M
- First acquisition by Cisco after downturn - AuroraNetics - $150M
- Seven acquisitions
- Two IPO filings
Contrary to some opinions, the Internet is not shrinking, nor does it appear to be slowing yet in its growth, says Internet veteran and network scientist Dr. Lawrence Roberts. In fact, new measurements by Roberts and his research team suggest traffic on the Internet has recently been growing faster than ever before, increasing as much as an unprecedented four times annually through the first quarter of 2001.

Roberts believes this data has implications for service providers and communications equipment vendors. "Carriers have been holding back on purchases due to spending constraints. Recently, some had been growing their capacities by redeploying equipment and capacity they'd previously acquired for OC-192 testing. But this borrowed time is about to run out -- if traffic continues to grow at rates like these, network buildouts will need to continue soon."