IBM eServer™ Total Storage, On Demand

Bill Ott, Vice President, eServer xSeries & IntelliStation Development Systems and Technology Group
IBM 2Q 2005 Business Status

- **Key Accomplishments**
  - Operational Performance
  - PC Sale
  - Restructuring Actions
  - Microsoft Settlement

- **2Q Performance Highlights**
  - Services Signings
  - Power5-based Servers and Storage
  - Key Middleware
  - Growth Initiative
  - Cash and Balance Sheet
### IBM 2Q05 Financial Summary

<table>
<thead>
<tr>
<th></th>
<th>IBM As Rptd</th>
<th>PC Gain</th>
<th>Incremental Restructuring Charge</th>
<th>Microsoft Settlement</th>
<th>IBM Results without Non-Recurring Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue</strong></td>
<td>22.3</td>
<td></td>
<td></td>
<td></td>
<td>22.3</td>
</tr>
<tr>
<td>Yr/Yr%</td>
<td>(4%)</td>
<td></td>
<td></td>
<td></td>
<td>(4%)</td>
</tr>
<tr>
<td>Yr/Yr% excl. PC</td>
<td>6%</td>
<td></td>
<td></td>
<td></td>
<td>6%</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>13.5</td>
<td></td>
<td></td>
<td></td>
<td>13.5</td>
</tr>
<tr>
<td>GP%</td>
<td>39.4%</td>
<td></td>
<td></td>
<td></td>
<td>39.4%</td>
</tr>
<tr>
<td><strong>Expense</strong></td>
<td>6.0</td>
<td>(1.1)</td>
<td>1.7</td>
<td>(0.8)</td>
<td>6.2</td>
</tr>
<tr>
<td>PTI</td>
<td>2.7</td>
<td>1.1</td>
<td>(1.7)</td>
<td>0.8</td>
<td>2.6</td>
</tr>
<tr>
<td><strong>Tax Rate</strong></td>
<td>32.3%</td>
<td>33.1%</td>
<td>32.4%</td>
<td>39.0%</td>
<td>30.0%</td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td>1.9</td>
<td>0.7</td>
<td>(1.2)</td>
<td>0.5</td>
<td>1.8</td>
</tr>
<tr>
<td><strong>EPS</strong></td>
<td>$1.14</td>
<td>$0.45</td>
<td>($0.72)</td>
<td>$0.29</td>
<td>$1.12</td>
</tr>
<tr>
<td>Yr/Yr%</td>
<td>13%</td>
<td></td>
<td></td>
<td></td>
<td>11%</td>
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</table>

May not add due to rounding
## IBM Revenue 1Q05 and 2Q05

<table>
<thead>
<tr>
<th>($B)</th>
<th>1Q05</th>
<th>Rptd</th>
<th>@CC</th>
<th>2Q05</th>
<th>Rptd</th>
<th>@CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Services</td>
<td>11.7</td>
<td>6%</td>
<td>3%</td>
<td>12.0</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>Hardware w/o PC</td>
<td>6.7</td>
<td>--</td>
<td>(2%)</td>
<td>5.6</td>
<td>(25%)</td>
<td>(27%)</td>
</tr>
<tr>
<td>Software</td>
<td>3.6</td>
<td>2%</td>
<td>--</td>
<td>3.8</td>
<td>10%</td>
<td>7%</td>
</tr>
<tr>
<td>Global Financing</td>
<td>0.6</td>
<td>(12%)</td>
<td>(15%)</td>
<td>0.6</td>
<td>(4%)</td>
<td>(7%)</td>
</tr>
<tr>
<td>Enterprise Inv./Other</td>
<td>0.3</td>
<td>15%</td>
<td>12%</td>
<td>0.3</td>
<td>(3%)</td>
<td>(5%)</td>
</tr>
<tr>
<td>IBM</td>
<td>22.9</td>
<td>3%</td>
<td>1%</td>
<td>22.3</td>
<td>(4%)</td>
<td>(6%)</td>
</tr>
<tr>
<td>w/o PC</td>
<td>20.6</td>
<td>4%</td>
<td>1%</td>
<td>21.7</td>
<td>6%</td>
<td>4%</td>
</tr>
</tbody>
</table>
## IBM Geographic Revenue

<table>
<thead>
<tr>
<th>Region</th>
<th>1Q05</th>
<th>Rptd</th>
<th>@CC</th>
<th>2Q05</th>
<th>Rptd</th>
<th>@CC</th>
<th>w/o PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>9.3</td>
<td>2%</td>
<td>1%</td>
<td>9.4</td>
<td>(3%)</td>
<td>(4%)</td>
<td>5%</td>
</tr>
<tr>
<td>Europe/ME/A</td>
<td>7.7</td>
<td>7%</td>
<td>2%</td>
<td>7.5</td>
<td>--</td>
<td>(4%)</td>
<td>4%</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>5.2</td>
<td>1%</td>
<td>(2%)</td>
<td>4.6</td>
<td>(10%)</td>
<td>(13%)</td>
<td>2%</td>
</tr>
<tr>
<td>OEM</td>
<td>0.7</td>
<td>3%</td>
<td>3%</td>
<td>0.7</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>IBM</td>
<td>22.9</td>
<td>3%</td>
<td>1%</td>
<td>22.3</td>
<td>(4%)</td>
<td>(6%)</td>
<td>4%</td>
</tr>
</tbody>
</table>

- Continued strong growth in emerging countries without PC
Global Services

Revenue $12.0B, +6%; 4% @CC

<table>
<thead>
<tr>
<th>($B)</th>
<th>2Q05</th>
<th>Yr/Yr</th>
<th>Yr/Yr @CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>12.0</td>
<td>6%</td>
<td>4%</td>
</tr>
<tr>
<td>PTI Margin w/o Incr Restructuring</td>
<td>8.5%</td>
<td>0.8 pts</td>
<td>4%</td>
</tr>
<tr>
<td>PTI Margin As Reported</td>
<td>(0.7%)</td>
<td>(8.4 pts)</td>
<td>4%</td>
</tr>
</tbody>
</table>

Revenue
- Strategic Outsourcing: 5% Yr/Yr, 2% @CC
- Business Consulting Services: 9% Yr/Yr, 7% @CC
- Integrated Tech Services: 5% Yr/Yr, 2% @CC
- Maintenance: 5% Yr/Yr, 2% @CC

IGS WW Contract Signings

2Q05 Signings     Yr/Yr
- SO                80%
- ITS               6%
- BCS               30%
- C&SI              4%
- BTO               192%
## Systems & Technology

### Revenue $4.9B, +5%; 3% @CC

<table>
<thead>
<tr>
<th></th>
<th>2Q05 Revenue</th>
<th></th>
<th>GP%</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>As Rptd @CC</td>
<td>GP%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>zSeries</td>
<td>(24%) (25%)</td>
<td>+</td>
<td>-</td>
<td>3Q product announcement</td>
</tr>
<tr>
<td>iSeries</td>
<td>10% 9%</td>
<td>-</td>
<td>+</td>
<td>Growth in all geos, Strength in high-end</td>
</tr>
<tr>
<td>pSeries</td>
<td>36% 34%</td>
<td>+</td>
<td>+</td>
<td>Double-digit growth in all geos</td>
</tr>
<tr>
<td>xSeries Servers</td>
<td>11% 8%</td>
<td>-</td>
<td>=</td>
<td>Continued blade leadership</td>
</tr>
<tr>
<td>Total Storage</td>
<td>19% 17%</td>
<td>-</td>
<td>+</td>
<td>Double-digit disk &amp; tape growth</td>
</tr>
<tr>
<td>Microelectronics</td>
<td>(5%) (5%)</td>
<td>+</td>
<td></td>
<td>Product transition to gaming</td>
</tr>
<tr>
<td>E&amp;TS</td>
<td>37% 36%</td>
<td>+</td>
<td></td>
<td>7th quarter of double-digit growth</td>
</tr>
<tr>
<td>Printing Systems</td>
<td>(3%) (5%)</td>
<td>+</td>
<td></td>
<td>Maintenance decline</td>
</tr>
<tr>
<td>Retail Store Sols</td>
<td>(19%) (20%)</td>
<td>-</td>
<td></td>
<td>Large customer deferrals</td>
</tr>
</tbody>
</table>
Software

Revenue $3.8B, +10%; 7% @CC

<table>
<thead>
<tr>
<th>Brand</th>
<th>Yr/Yr</th>
<th>@CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebSphere Family</td>
<td>18%</td>
<td>14%</td>
</tr>
<tr>
<td>Information Mgmt</td>
<td>15%</td>
<td>11%</td>
</tr>
<tr>
<td>Lotus</td>
<td>17%</td>
<td>14%</td>
</tr>
<tr>
<td>Tivoli</td>
<td>28%</td>
<td>25%</td>
</tr>
<tr>
<td>Rational</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Other Middleware</td>
<td>2%</td>
<td>(1%)</td>
</tr>
</tbody>
</table>

2Q05 Yr/Yr

GP Margin 86.7% +0.5 pts

- Strength in Americas and Asia
- Gained or held market share in key segments
IBM Systems & Technology Group

▪ **Who Are We**
  - #1 Systems Vendor
    - $19B in 2004
  - Fastest growing vendor in storage, UNIX servers and Intel-based servers
  - Top blade-server vendor
  - 10,000 development employees worldwide
  - 21 development sites World Wide

▪ **What We Do**
  - IBM eServer
    - zSeries mainframe
    - iSeries midmarket
    - pSeries UNIX
    - xSeries Intel-based
    - BladeCenter
    - Systems Control Software
  - IBM TotalStorage
    - Tape
    - Disk
    - Storage software
  - Key Competitors:
    - HP, Sun, EMC
IBM Technology Leadership

Core Products

IBM eServer
- Mainframe Servers
- Unix Servers
- Blade Servers
- Intel processor-based Servers
- AMD processor-based Servers

TotalStorage
- Disk Storage
- Storage Networking
- Tape and Optical Systems
- Storage Software

Core Technologies
- Operating Systems
- Processors

Core on demand Technologies
- POWER™ Architecture
- Server & Storage Virtualization
- Systems Consolidation
- Capacity on Demand
- Partitioning
- Grid Computing
- Autonomic Computing
- Linux open standards
- Virtualization Engine
Momentum in High Growth Segments

- **IBM is**
  - First in worldwide server revenue for the ninth consecutive quarter
  - First in UNIX-based server revenue
  - First in blade server revenue.

- **IBM overtook the top position in UNIX-based server revenue, growing nearly seven points year-to-year**

AND

- **IBM led Blade server revenue for the eight consecutive quarter ending 2Q05 with 40 percent of the revenue share**

Source: IDC Worldwide Quarterly Server Tracker, 2Q05, issued on August 25, 2005
IBM xSeries

Power, Packaging and Cooling Challenges
The System Technology Challenge/Drivers

- More Speed!
- Higher Density!
- More Data Capacity!
- More Bandwidth!
- Lower Cost!
- Smaller!
- More Portable!
- More Open!
# Trends That Affect Power, Packaging, and Cooling

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology Drivers</th>
<th>Market Drivers</th>
<th>Technology Enables</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>2001</td>
<td>2</td>
<td>168 cores*</td>
<td>Heat Pipes</td>
</tr>
<tr>
<td>2002</td>
<td>3</td>
<td>244 cores*</td>
<td>Vapor Chamber</td>
</tr>
<tr>
<td>2003</td>
<td>4</td>
<td>488 cores*</td>
<td>Chilled Air Rack</td>
</tr>
<tr>
<td>2004</td>
<td>5</td>
<td>3.3V, 5V, 12V</td>
<td>Chilled Air / Water</td>
</tr>
<tr>
<td>2005</td>
<td>6</td>
<td>300 GB, 3.5&quot; SATA/SAS</td>
<td>12V Distributed</td>
</tr>
<tr>
<td>2006</td>
<td>7</td>
<td>600 GB</td>
<td>12V Distributed</td>
</tr>
<tr>
<td>2007</td>
<td>8</td>
<td>2.5&quot; SFF, SCSI, 2.5&quot; SAS</td>
<td>Modular Scalar Systems</td>
</tr>
</tbody>
</table>

## Technology Drivers
- **Processors**
  - Power Density (W/CM)
  - Chip Voltage (VDC)
- **IO**
  - PCI
  - PCI X
- **Media (HDD, CD, FDD)**
  - 36 GB
  - 3.5"
- **Cooling**
  - Cooling Ability (W/CM u)
- **Power**
  - Power Density (W/in)
- **Packaging**
  - Rack / Tower
  - Rack Optimized
  - Server Blade - Low Power
  - Server Blade - High Power
  - Modular Scalar Systems

## Market Drivers
- Intel CPU / Rack (42U)
  - 168 cores* (single core)
  - 244 cores* (dual core)
  - 488 cores* (quad core)

## Technology Enables
- Heat Pipes
- Vapor Chamber
- Chilled Air Rack
- Chilled Air / Water
- 3.3V, 5V, 12V
- 12V Distributed
- Modular Scalar Systems
Challenges:

- **Server designs have reached several limits:**
  - Power supply density: cooling a bottleneck, continued push higher
  - Thermal: ability to move enough air to cool at server, rack and building levels
  - Acoustics: increased airflow = more noise

- **Ability to provide primary power, building and rack: over 30kW per rack**
  - Higher power driving higher input currents
    - Running out of AC ampacity with primary connector, C13/C14 must use C19/C20 and further as input connectors
  - Racks require more capacity than 60A 3-phase service

- **Energy Efficient Designs**
  - "80 plus" desktop initiative gaining interest in Server market

- **Other technology drivers**
  - Number of planar voltages is increasing.
    - To conserve planar area, VRMs & SIPs need to be more common / smaller
  - Lower load voltages, 1.8V, 1.5V, 1.2V, etc., coupled with high dynamic loads continues to drive "point-of-load" VRs.
  - Power Management
    - Growing need to monitor currents and power
    - Dynamic voltage adjustments
**When 20% of Racks are at 31.8kW (6 BladeCenters), Then high density data center limits are reached.**

80% of racks must be at 5KW or below.
Power Supply Roadmap

- **GENERAL**
  - N+N bulk power required for redundancy
  - 12V distribution within the chassis drives VRM / VRD input, DASD, PCI, FANS
  - High efficiency converter technologies
  - Design for future power increases (mech. package, connectors)
  - Focus on quality and reliability
  - Voltage and current monitoring circuitry

- **LOW END**
  - Density pressure will continue driving lower number of output voltages
    - Facilitates denser power supply packaging trend
    - Improved power supply efficiency
    - Requires more use of VRDs and VRMs CBBs

- **ISSUES**
  - Power supply densities limited at system level by cooling
  - Connector ratings / dc power distribution
  - AC Power distribution
    - need more power than 60A 3-phase can provide
Technical Challenges and Solutions

- **What We Need**
  - Higher Reliability - MTBF
  - Higher Power Density
  - Higher Transient Response - di/dt
  - Higher Efficiency
  - Lower Voltage - Higher Current
  - Voltage/Current Distribution
  - Increased Number Of Voltage Domains
  - Ability to Hot Swap
  - Lower Cost
  - Shorter Development Cycles
  - Best Industry Quality
  - Error and Status Reporting
  - Power measurement capabilities

- **How We Get There**
  - More Integration
  - Higher Switching Frequencies
  - Lower Switching and Conduction Losses
  - Topology Influences
    - RES/ZVS/ZCS
  - Better EMI Design
  - Innovative Design
  - Lower Output Impedance
  - Thermal Management
  - Component Improvements
    - Integrated
    - Battery Technology
    - Power Semiconductors
    - Capacitors
    - Interconnect
Backup
xSeries Metrics

History
PS Density
W / ci. in.

Density

PS Cost $ / W

Cost

Date
Updated 08/27/04
Server Load Power Proportions

BladeCenter vs Rack Optimized

Rack Optimized
- Power: 29.8%
- I/O Subsystem: 11.3%
- Memory: 17.7%
- Cooling: 8.6%
- Processors: 32.6%

BladeCenter
- Power: 22.1%
- I/O Subsystem: 4.6%
- Memory: 10.5%
- Cooling: 7.3%
- Processors: 55.5%
AC Power Distribution Challenge

System Electrical Connectors for CMOS

xSeries customers are almost at the same AC input requirements as the Mainframes (60A 3-phase required for many applications)
Momentum in High Growth Segments

8-way+ Revenue Marketshare

<table>
<thead>
<tr>
<th>Quarter</th>
<th>IBM</th>
<th>HP</th>
<th>Dell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q201</td>
<td>24%</td>
<td>67%</td>
<td>31%</td>
</tr>
<tr>
<td>Q401</td>
<td>50%</td>
<td>20%</td>
<td>30%</td>
</tr>
<tr>
<td>Q202</td>
<td>60%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Q402</td>
<td>70%</td>
<td>40%</td>
<td>10%</td>
</tr>
<tr>
<td>Q203</td>
<td>80%</td>
<td>50%</td>
<td>0%</td>
</tr>
<tr>
<td>Q403</td>
<td>90%</td>
<td>60%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Blade Revenue Marketshare

<table>
<thead>
<tr>
<th>Quarter</th>
<th>IBM</th>
<th>HP</th>
<th>Dell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q202</td>
<td>31%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q302</td>
<td>24%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q402</td>
<td>10%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q103</td>
<td>0%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q203</td>
<td>0%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q303</td>
<td>0%</td>
<td>44%</td>
<td>67%</td>
</tr>
<tr>
<td>Q403</td>
<td>0%</td>
<td>44%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Source: IDC and Systems and Technology Group Market Intelligence