Agenda

- Roadmap
- Processor
- Features
- Performance
- Software
- Call to Action
Year 2000 Market Segments

- **High End Servers**
  - **Availability**
    - Downtime measured in minutes per year
    - Enterprise OS, Systems Management, Clusters/Failover
  - **Scalability**
    - 4, 8-way and above systems
    - Architectural headroom
  - **Performance**
    - Large memory addressability, over 4GB physical memory
    - High tpc performance

- **High End Workstations**
  - **3D Graphics**
    - Large data set modeling, simulation, rendering
    - High performance cards, graphics bandwidth
  - **Performance**
    - Large memory addressability, over 4GB physical memory
    - High fp performance
  - **Scalability**
    - System expandability
    - Multiple PCI segments
IA-64 Roadmap

Performance

- Extends Merced performance, features
- Full Merced & IA-32 software compatibility
- Common IA-32 sys arch

- Scalability enhancements
- Big cache for high end workloads
- Full speed cache bus
- 3D graphics enhancements

McKinley Processor

- 0.13μ technology
- Madison: perf for high end segments
- Deerfield: Price/perf for volume segments

Merced Processor

Greater IPC*

Frequency (MHz) Boost

2000 2001 2002

Strong roadmap with great headroom

*IPC = Instructions Per (clock) Cycle
Extending the Intel Architecture

**Server Apps**
- High Performance Technical Computing
- Data Warehousing
- High-end Decision Support Systems (DSS)
- High-Capacity OLTP
- Line of Business (LOB)
- E-Business
  - Security
  - Web/Directory
  - Dynamic apps
  - Java

**Workstation Apps**
- Digital Content Creation (DCC)
- Electronic Design Automation (EDA)
- Mechanical Design Automation (MDA)
- Financial Analysis
- Technical Analysis

**IA-32:**
- outstanding performance and price-performance

**IA-64:**
- Scalability
- Headroom
- FP Performance
- Large addressability
- Enterprise Class Availability

**Complementary IA-32 and IA-64 solutions**
Unprecedented Industry Commitment

Make sure your plans include Merced / IA-64
Focus on Complete Solutions

- Hardware Development Aligned
  - Processor design on track
  - Chipset components taping out
  - Critical IHVs engaged
- OEM Designs Progressing
  - Over 30 server and workstation designs meeting milestones
  - System schematics finalized
- Software Progress on All Fronts
  - Compiler hitting performance targets
  - Multiple OS’s booting on simulator
  - Multiple apps running on simulator

Complete solutions available starting 2H ‘00
Merced Processor

- **Features for the high end**
  - Terabytes of memory addressing
  - High availability features
  - Enhanced scalability

- **Performance for the high end**
  - World class fp performance
  - World class tpc performance
  - World class security algorithm performance
  - Large, three level cache

- **Full IA-32 backward binary compatibility**

- **Industry leading 0.18µ process**

*Performance, Compatibility, Scalability, Availability*
Merced Cartridge Features

- Efficient heat dissipation technology
- Separate signal & power connections for signal integrity
- Full speed cache bus
- Intel designed static cache RAM
- Cost effective performance substrate

Optimized for manufacturability and cost
Merced Processor Progress

- Final stages of functional logic validation
  - Multiprocessor OS Kernel booting on Merced logic model

- Thorough MP system validation underway
  - Elaborate logic simulation on pre-silicon
  - Large number of post-silicon tests already ported

- Physical implementation well on track
  - Timing convergence nearing completion
  - Circuit design making excellent progress
  - Layout completion in lock step with circuit design

Samples in ‘99, production in mid-2000
Merced = High Availability

Integrated Solution for Enterprise Availability Requirements

- Enhanced error handling support
- System monitoring tools

- Enhanced availability features from leading UNIX vendors
- Comprehensive error handling and logging
- Extensible Firmware Interface sys mgmt hooks
- Extensive ECC, parity error detection, correction
- Enhanced MCA
  - Process level error containment for maximum availability
- Extensive ECC
- Intel server management
- Modularity
- Serviceability
- OEM enabled redundancy

- Extensive error detection, correction, and containment (ECC, parity, DRAM chipkill)
- Clustering
- VI architecture...

- Hot plug PCI
- Hot swap
Merced = Enterprise Scalability

- Optimized memory utilization
  - 64 bit memory architecture
  - Flexible page sizes up to 256MB reduces overhead
  - Innovative, large 3 level cache hierarchy reduces bus traffic

- Highly efficient bus
  - Enhanced deferred transaction support increases bus utilization
  - Cache line size optimized to conserve bandwidth

- Advanced architectural features
  - Speculation reduces memory latency effects

 Scalability for the most demanding requirements
**High Performance Computing for Workstations**

- **Better Performance for improved graphics:**
  - Register based architecture
  - Large register resources (128)
- **2 Extended Precision (EP) FMACs, 2 SP FMACs**
  - ~3 GFLOPs extended precision peak performance
  - ~6 GFLOPs single precision peak performance
Intel® 82460GX Chipset

- Time-to-money chipset for 1-4P Merced systems
- OEMs using Intel components to build 32P+ systems

Availability Features
- ECC on memory and data paths
- Supports Intel server management
- Memory Chipkill

AGP Pro
AGP 4X

Graphics Bridge

System Control

Memory Control

I/O
- Integrated PCI Hot Plug
- Supports 66MHz / 64 bit PCI
OEM Merced Designs

Driving Merced into the highest ends

- 8 Way
- 16 Way
- 32 Way
- 64 Way
- 512 Way

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Software Program Deliverables

- **Tools reduce ISV effort, TTM**
  - Choice of leading compilers, libraries, tools
  - Comprehensive pre-silicon software development environment

- **Optimized high end OS’s**
  - Production quality IBM/SCO Monterey, Win64, Modesto, Linux, HP-UX, IRIX, Solaris, Bravo
  - Concurrent with Merced system availability

- **Production ready applications**
  - Industry leaders committed to availability concurrent with Merced systems
  - IA-32 compatibility instantly enables broad software base
<table>
<thead>
<tr>
<th>Year</th>
<th>Apps</th>
<th>Tools</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>Key Applications 64 bit Code Cleaning, Pre-Silicon Porting</td>
<td>64-bit Transition Tools, Pre-Silicon Development Environment</td>
<td>OS on Simulator</td>
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<tr>
<td>1999</td>
<td>Dependency Apps Code Cleaning, Pre-Si Porting</td>
<td>SDK on Hardware</td>
<td>OS on Hardware</td>
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<td>2000</td>
<td>Optimize on Software Development Vehicle</td>
<td>Production SDK</td>
<td>Production OS</td>
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*Tools, OSs, Apps converging on Merced production*
Pre-Silicon Software Development Kits

- **SDKs Include:**
  - Compiler
  - Linker
  - Libraries
  - Debugger
  - IA-64 OS
  - Merced Simulator

- **Simulation Environment:**
  - Software
    - IA-64 Application
    - IA-64 OS
    - IA-64 Drivers
  - Simulator
    - Simulator Kernel
  - Processor
    - Standard Devices
    - User-Defined Device Model
  - Host
    - IA-32 OS
    - IA-32 Host
    - Actual IA-64 Devices

*Pre-silicon development enables concurrent availability*
Merced Software Tools Progress

- **Compiler progress**
  - Almost 100% of functional tests passing
  - Exceeding performance targets

- **Development tools progress**
  - SDKs delivered to key OEMs, OSVs and tools vendors
  - Full SDKs with OS, Compiler and Tools to select ISVs in Q1

- **Variety of 64-bit cleanup tools publicly available**
  - HP, Microsoft, SCO (URLs in Backup)
  - LINT tools, DLL finders

*Start your 64 bit code cleaning and optimizations now*
Merced OS Progress

- 7 OS’s Booting on Merced simulator:
  - Win64
  - SCO UnixWare
    - Monterey booting later in Q1
  - Novell Modesto
  - HP-UX
    - Several ISV applications running
    - Software transition kits available on the web
  - Solaris
  - IRIX
  - Compaq Unix

- Full support for Linux

*Fully functional, high availability OSs concurrent with Merced*
Merced Application Targets

- Large memory
- Large, fast caches
- Explicit parallelism
- Scalability
- FMACs = faster FP
- SIMD calculations
- Full speed EP

Matching application needs with architecture benefits
Server Solution Stacks

Custom Applications

<table>
<thead>
<tr>
<th>Vertical Applications</th>
<th>Stack 1 - LOB</th>
<th>Stack 2 - E-Business</th>
<th>Stack 3 - DSS</th>
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<tbody>
<tr>
<td>Horizontal Applications</td>
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<td>Database</td>
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<td>Middleware</td>
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<tr>
<td>Operating Systems</td>
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- Major DB & ERP ISVs actively porting, running on simulator

Example: Online Procurement App

Focus on full stacks to accelerate availability
Workstation Applications

- Top ISVs in key segments publicly committed to Merced
- Several apps actively porting, running on simulator

Focus on leaders in target segments
Optimized drivers for critical devices:

- Graphics, Storage, Networking/Comm, Clustering, Video, Audio, Printer
- 64 bit DDIs
- PCI Hot Plug

Production ready concurrent with Merced systems
Summary

- Merced - features for the high end
- Merced - highly competitive performance
- Merced - focus on complete solutions
- Merced - samples in ‘99, production in mid-2000
- Merced - unprecedented industry support
Call to Action

- **OEMs**
  - Continue working with Intel on Merced system designs

- **OSVs**
  - Continue IA-64 optimization
  - Deliver ISV and IHV development kits

- **ISVs**
  - Attend “Preparing 32 bit code for IA-64” session
  - Get your code 64 bit ready
  - Identify your key dependency apps
  - Drive your key dependency apps to 64 bit readiness

- **IHVs**
  - Attend “Preparing 32 bit code for IA-64” session
  - Get your drivers 64 bit ready
  - Discuss IA-64 product requirements with OEM customers
  - Prepare for IA-64 driver porting using Intel and OSV tools