Modesto
Novell’s Road to IA-64 Computing

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Modesto IA-64* Outline

- Vision Statement
- Key Requirements
- Architecture
- Migration Strategy
- Tools Strategy
- Status
- ISV Opportunities
- Call to Action

* Third-party marks and brands are the property of their respective owners.
Modesto IA-64 Vision Statement

- **Start with an appliance**
  - Cross the chasm with a clear solution
  - Reduce project complexity
  - Follow on later with more appliances and general-purpose OS
  - First appliance is internet Cache, leverage ICS momentum

- **Leverage IA-64 for performance, scalability, and reliability**
Modesto IA-64 Key Requirements

- Deliver the project on time!
- High performance services engine
- High performance Java, protocol engine
- Fully exploit Itanium™ capabilities
- Good Foundation for Finite State Machine (FSM) structure
- Support the Novell security architecture
- Manageability
- Permit Quality of Service (QoS)
Modesto IA-64
Abstract Architecture

Programming environments:
Java and Non-Java

Other Infrastructure: I/O etc.

Nano-kernel
(Low level CPU, memory and interrupt management)
Modesto IA-64 Architectural Principles

- Support each Programming Environment (PE) as efficiently as possible
  - Minimize abstractions
    - Nano-kernel abstracts hardware with minimal semantics
  - Each PE implements the abstractions it needs
    -Avoids semantic re-mappings
- Coarsely multiplex hardware resources
Modesto IA-64 Architectural Components

- Nano-kernel
- Novell Services
- JVM
- Novell Kernel Services
- Novell Kernel Services Extensions
- Cluster Enabling Services
- Consolidated IO System and Drivers
- Event Broker
- Security Services
- Protocol Frameworks and Stacks
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Nano-kernel

- Primitive execution environment (virtual machine/strands)
- Low level memory management
- First level handling of hardware events (interrupts and exceptions)
- Resource management among virtual machines
- Booting and System Registry
Modesto IA-64 Execution Environment

- The Virtual Machine (VM) abstraction
- The Strand abstraction
- VM Scheduling
  - Nano-kernel switches control between VMs
  - Choice of VM scheduling policies
- VM specific exception handling
Modesto IA-64 Virtual Machine (cont.)

- A shared memory multiprocessing environment
  - Execution contexts within a VM share the address space
- Customizable programming environments
  - Scheduling, exception handling and memory management can be customized
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Strand Abstraction

- Customization of execution contexts
  - The needed semantics can be layered
- The containing VM schedules the strand
Modesto IA-64 Virtual Memory

- Single address space scheme
- Efficient management of mapping structures and the translation look-aside buffer (TLB) cache
- Near zero-weight context switching (with respect to memory context)
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Consolidated IO System

- Object based I/O manager
- Normalized access to diverse I/O resources
- Common driver architecture
- Support for channel-attached I/O frameworks as they become available
  - Next Generation I/O (NGIO)
  - Future I/O
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LAN Protocol Framework

- Zero-copy framework
- Load distribution at the connection granularity
- Optimized buffer management
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Event Broker

- Kernel support for structuring a service as a finite state machine (FSM)
  - Execution context management
  - Concurrency management
  - Manages notifications and cancellations
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Java Virtual Machine

- Integrate our JVM with highly optimized run-time tailored to the nano-kernel
- Working with Intel and Sun
- Provide Novell Java run-time extensions
- Integrate garbage collection and memory management
- Map to native synchronization primitives
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Novell Kernel Services API

- High performance non-java execution environment with portable interface
  - Natively hosted by nano-kernel
  - Sustains high performance services
  - Compilable for 64 or 32 bit environments
  - P64 data typing model
  - Services migration bridge to the new platform
Modesto IA-64 Developer Environments

- **Novell Kernel Services (NKS)**
  - NKS hosted natively on Modesto
  - NKS preferred on NetWare 5 for SMP development
  - Migrate to new APIs on NetWare 5, then recompile for Modesto IA-64

- **Java**
Modesto IA-64 Tools Strategy

- Tool set: Compiler, IDE, debugger, static code analysis (e.g. lint), ...
- Initially, EPC will be the primary tool vendor
- Additional tool vendors will be supported when available
- Modesto will support multiple object formats
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Status

- Proxy Cache is currently executing on Modesto IA-64
- NetFire JVM has been ported to Modesto IA-64
Modesto IA-64 Demo Architecture

Java Web Server
Java Virtual Machine
Novell ICS Proxy Cache
NKS-based Network Services

Novell Kernel Services (NKS) API

Timer Services
IPC
Execution Environment
CPU Scheduling and Memory Mgmt.
Boot, Registry, and Configuration Management

Modesto Nanokernel
Interrupt and Trap Handling

Consolidated IO System (CIOS)

Itanium™ Simulator

IDF - August, 1999
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Key Characteristics

- High performance
- Directory enabled management
- Highly customizable and modular
- Highly reliable
- First product offering is the 64-bit Internet Caching System
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Deployment Scenarios

- High capacity Internet caching and content management
  - Proxy cache for Web users
  - Reverse proxy for Web publishers
Modesto IA-64 ISV Opportunities

- ISV opportunities follow first project
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Call to Action for ISV’s

- Prepare your applications for 64-bit today
- Continue to work with Novell on availability of tools and interfaces
- Engage Novell on possibilities for integrated vertical solutions
Modesto IA-64 Contacts

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