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HPC Server 2008 R2 Highlights

Flexible Deployment
- Diskless compute nodes with iSCSI boot

Extremes of Scale
- Proven performance and scalability

Advanced Troubleshooting
- Diagnostics framework and new tests

Business Critical SOA
- Scale out business application to a cluster

Accelerating Excel
- Distributed Excel and UDF offloading

Cluster of Workstations
- Use idle workstations to extend your cluster
Visual Studio 2010 Highlights

- **F5 HPC Application Debug**
  - Simple Straight forward configuration leveraging the Job scheduler

- **New Manycore parallel programming models**
  - Supporting both managed and native code and easy to use

- **Manycore parallel building blocks**
  - Lower the bar for developer to successfully build parallel applications

- **New Parallel Debugger**
  - Works at the same abstraction as the new parallel prog models

- **New Parallel Profiler**
  - Advanced visualizations to ease root cause analysis

- **New functional .NET language (F#)**
  - Parallelism implicit in many operations
MPI Debug Demo
Concurrency for C++

Tools:
- Visual Studio 2010
  - Parallel Debugger
  - Profiler Concurrency Analysis
- Intel Parallel Studio
  - Parallel Composer
  - Parallel Inspector
  - Parallel Amplifier

Data Structures:
- Parallel Pattern Library
- Asynchronous Agents Library

Native Libraries:
- Intel OpenMP
- Intel TBB

Native Concurrency Runtime:
- Task Scheduler
- Resource Manager
- UMS Threads
- Threads

Key:
- Intel® Parallel Studio
- Visual Studio 2010
- Windows 7
Demo of parallel\_any\_of

**Carmichael Numbers**

$n$ is a carmichael number if $n$ is square-free and for all prime divisors $p$ of:

$$p - 1 \mid n - 1$$

e.g.:

$$561 = 3 \cdot 11 \cdot 17 \text{ is square-free}$$

$$2\mid560, \ 10\mid560, 16\mid560$$

Distribution gets rare as $N$ increases:

$$C(N) < N \exp \frac{-k \log X \log \log \log \log N}{\log \log N}$$
Demo of parallel\_any\_of
Why Agents

Not all patterns map to tasks
  - pipelines, state machines, producer / consumer
  - Attributes of agents
    - Encapsulation and isolation of data
    - Asynchronous communication between components
    - Manages state transitions, control flow or data flow
  - Benefits of agents
    - Safer by default
    - State is coordinated not shared
    - Teachable & Learnable
Demo Dining Philosophers
Visual Studio 2010
Tools, Programming Models, Runtimes

Tools
- Parallel Debugger Tool
- Windows Profiler
- Concurrency Analysis
- Visual Studio IDE

Programming Models
- Parallel LINQ
- Task Parallel Library
- Data Structures

-.NET Framework 4
- ThreadPool
- Task Scheduler
- Resource Manager

Operating System
- Windows
- UMS Threads

Key:
- Managed
- Native
- Tooling

Visual C++ 10
Concurrent Runtime
- Task Scheduler
- Resource Manager

Parallel Pattern Library
Agents Library
Demo

“Strassen’s Algorithm”
Demo
Parallel Profiling of “Strassen’s Algorithm”
Demo Parallel Debugger
Additional Resources

- The “Manycore Shift” is happening
  - Parallelism in your code is inevitable
  - Visual Studio 2010, with .NET 4, Parallel Patterns Library and Agents Library will help
- Parallel Computing Dev Center
  - http://msdn.com/concurrency
- Download Visual Studio 2010 RC (“go-live” license)
  - http://go.microsoft.com/?linkid=9692084
- Samples for Native & Managed
  - Managed: http://code.msdn.com/parextsamples
  - Native: http://code.msdn.com/concrtextras
- Team Blogs
  - Managed: http://blogs.msdn.com/pfxteam
  - Native: http://blogs.msdn.com/nativeconcurrency
  - Tools: http://blogs.msdn.com/visualizeparallel
- Forums