EPICS SCA Clients
on the .net x64 platform

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Control experts don't care 64-bit.

Control systems are fine on 32-bit!

However, some of us are already on 64.

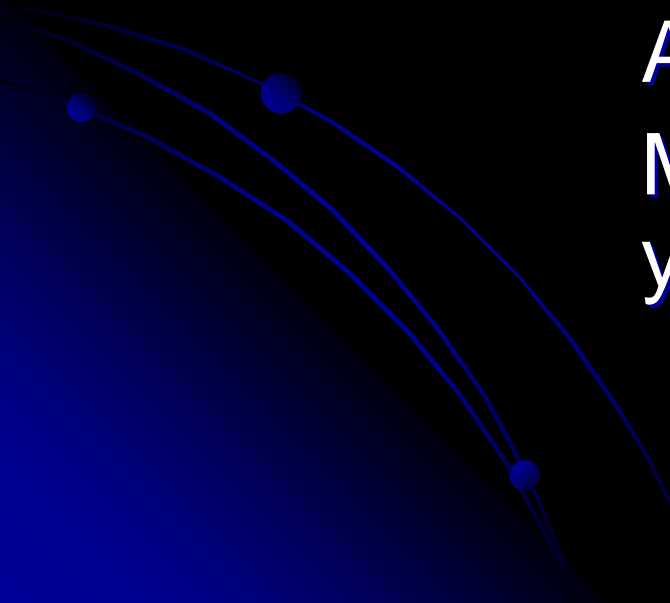Scientific Computing.
Server-side Computing.
Computer Games.

64-bit PC is not expensive.

Moving to 64-bit!

- Merits
  - Wider Memory Space
  - Faster Execution Speed

Accelerator physicists do Model-based controls using your system!

Scientific Computing on .NET

- **C# provides reasonable performance**
  - H. Nishimura and T. Scarvie .
    "**Particle Tracking and Simulation
    on the .NET Framework**", EPAC 2006

Performance of Particle Tracking
on AMD Athlon 4800+

Compiler	Test1	Test2	Test3
C++ /32	0.263 sec	0.294 sec	0.197 sec
C++/64	0.247 sec	0.223 sec	0.145 sec
C#	0.220 sec	0.386 sec	0.153 sec

Test 1. 10,000 turns of a particle in 5-dim phase space.
Test 2. 1,000 turns of a particle in 6-dim phase space.
Test 3. 100 turns of a linear DA map.

EPICS must support 64-bit

- It is difficult to mix 32-bit and 64-bit routines on 64-bit PCs.

64-bit apps cannot call 32-bit routines without using a kind of IPC.

- **64-bit EPICS access makes sense!**

Porting CA to 64

- CA is a Portable C++ Library
  - Only a little work required on Windows to recompile for 64-bit by using Visual C++

- Athlon Dual Core gave a Timing Problem
  - Trouble posted on a web.
  - Posted as a patch for gamers by AMD!

Gamers have power on the market.

CA.dll for 64-bit Windows is ready!

SCA.NET for 64-bit

- There was absolutely nothing to do!
  SCA.NET for 32-bit also works for 64-bit.

- The Secret is "**Any CPU**" build option.

  **Binaries built for "Any CPU"
  run natively on Any CPU.**

  Prepare
  32-bit CA.dll on 32-bit Windows
  64-bit CA.dll on 64-bit Windows

Inside SCA.NET

```
[DllImport("ca.dll")]
 unsafe public static extern
  char * ca_message(uint ca_status);
```
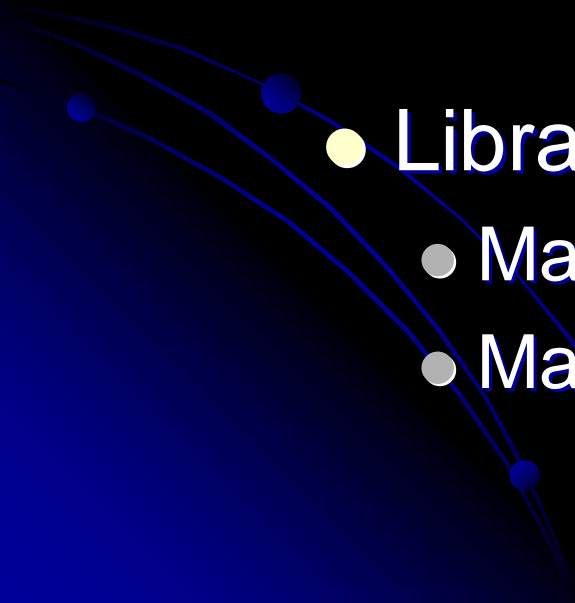
The CPU is not explicitly assigned.
ca.dll can be 32-bit, 64-bit,
or even **ca.so** on Linux!

EPICS .NET Apps are Portable!

- An SCA.NET client on .NET runs on both 32-bit and 64-bit Windows if built for "Any CPU".

  - EPICS CA itself is CPU dependent.

  - Libraries from third parties
    - May be for "Any CPU"
    - May be CPU-dependent.

Third Party Libraries

- Many Commercial Libraries and Tools
- Many Open-Source Libraries and Tools
  - Source Forge
  - CodePlex at www.codeplex.com
- Our Favorites
  - ZedGraph for Plot/Chart, ZedGraph.org
  - SourceGrid for string grids, www.devage.com
- We have not yet chosen any instrumentation component library.

Example

32-bit Apps on 64-bit Windows

- 64-bit Windows has WOW64
  - 32-bit Apps can run seamlessly on WOW64
  - (16-bit apps don't run at all anymore)
  - CLR loads 32-bit DLLs for 32-bit apps (not 64-bit DLLs).
  - If system-oriented, it may not run.

- .NET Apps can be built for x86, x64, ia64..
  - If built for x86, it runs in 32-bit mode on 64.
  - If built for x64, it runs only on x64.

.NET Today

- .NET 3.0 is coming
  - On top of .NET 2.0 as fancy options.
  - "Native" on Windows Vista
- Third Party Libraries
  - Becoming Managed
  - Becoming .NET 2.0 compatible.
    Therefore becoming portable!

Conclusion

- Controls systems must support 64-bit on the client side for scientists.

By porting CA to 64-bit on Windows, SCA.NET client can run on 64 without any change.