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Leaders in parallel software development tools

Allinea Unified environment

More time computing, less time in tools

UNIVERSITÉ DU LUXEMBOURG

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Agenda

14:30 – 14:45 : Introduction to Allinea tools in University of Luxembourg

14:45 – 15:45 : Getting started with Allinea DDT (hands-on)

15:45 – 16:30 : Getting started with Allinea MAP (hands-on)

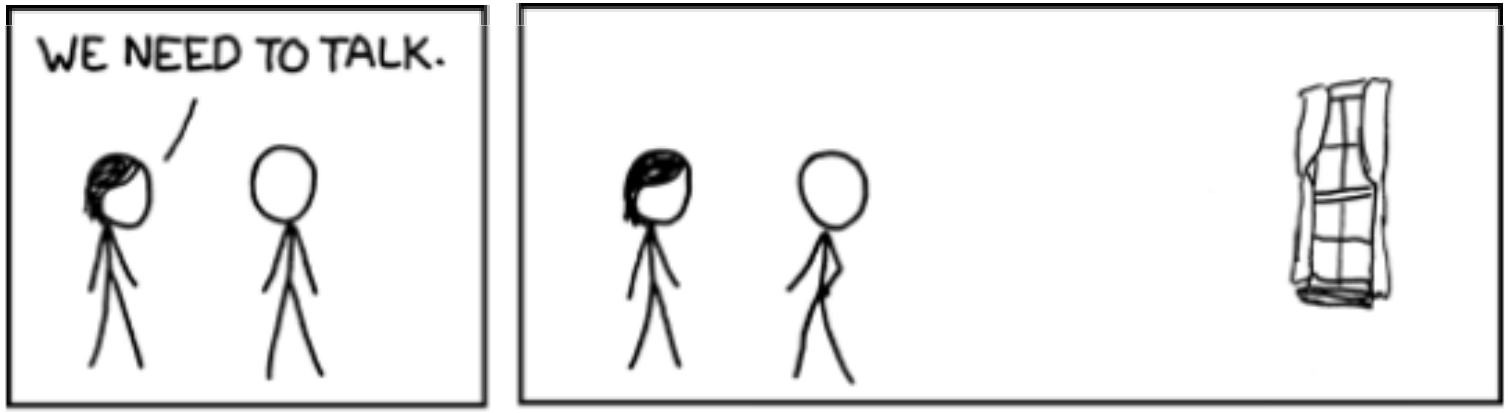
16:30 – 17:30 : Allinea open discussion and day 2 closing.

Discover the new tool “Allinea Performance Reports” !

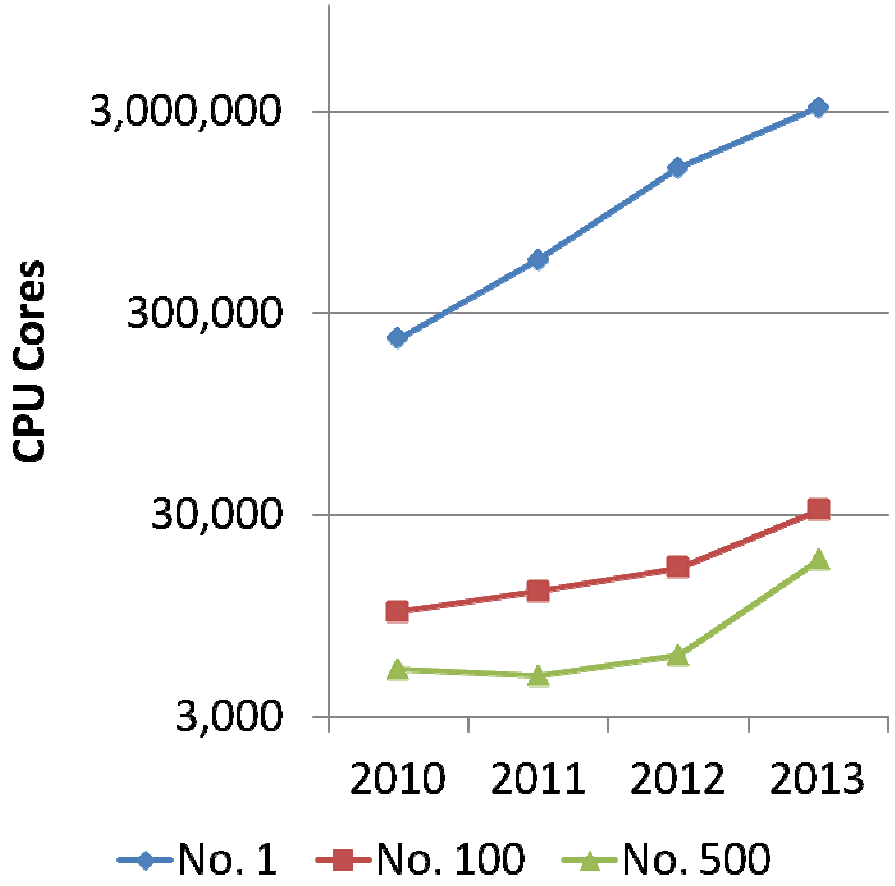
Try Allinea tools with your own codes !

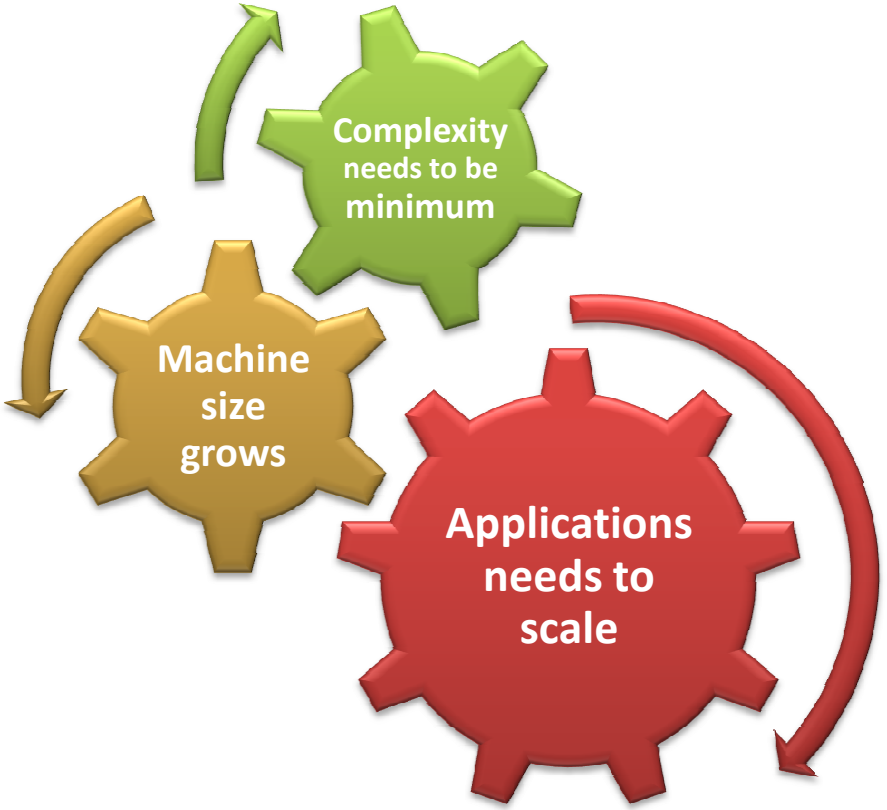
And now…

Let's talk about us!



New technologies, more parallelism





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Need to dive into the code ?

- **A modern integrated environment for HPC developers**
- **Supporting the lifecycle of application development and improvement**
  - **Allinea DDT :** Productively debug code
  - **Allinea MAP :** Enhance application performance
- **Designed for productivity**
  - Consistent easy to use tools
  - Fewer failed jobs
- **Available at University of Luxembourg**
  - Allinea Unified Supercomputing on 64 procs with accelerator support

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allinea DDT

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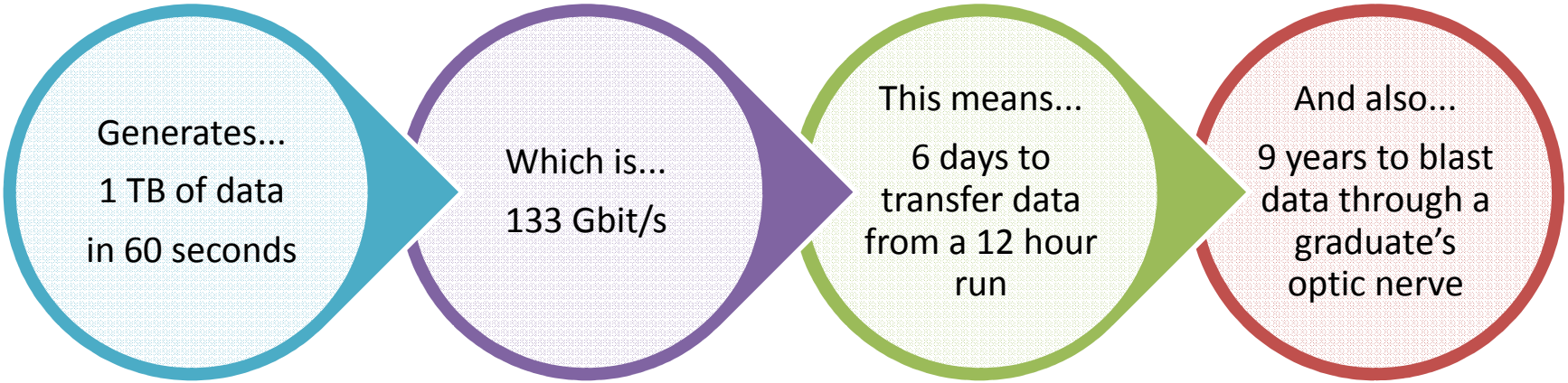
Beware exploding bandwidth needs…

Trivial 16k processes wave equation code running on Titan



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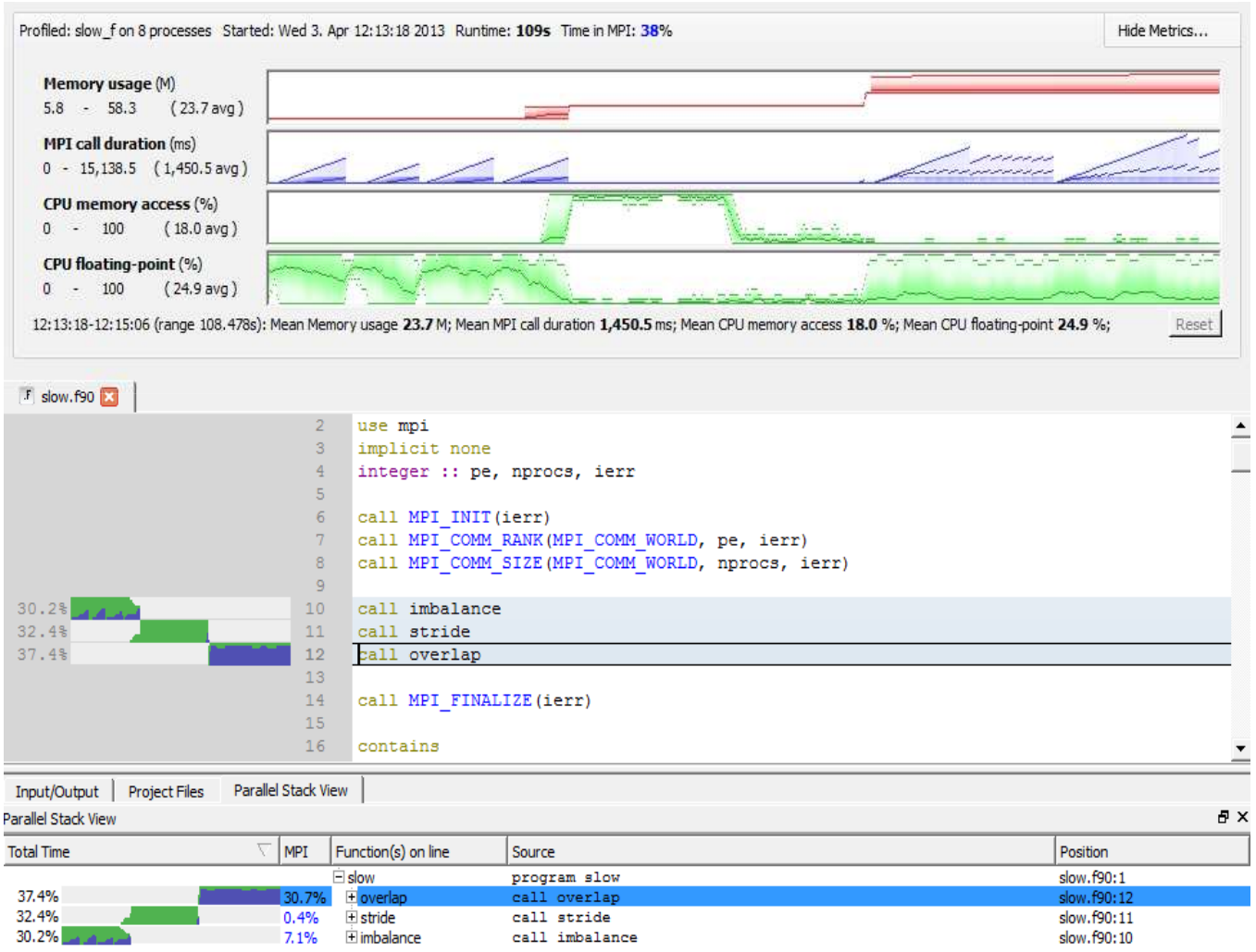
Attacking Visual Scalability



Common horizontal axis

Aggregate across all processes

Highlight imbalance visually

Always refer to source code

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Statistic sampling or tracing ?
Complementary approaches

Optimize with Allinea MAP

- Characterize performance at-scale with a lightweight tool
- See which lines of code are hotspots
- Identify common problems at once

Prepare strategy with Allinea MAP

- Pass more obscure problems to an expert
- Identify loop(s) to instrument
- Identify performance counter(s) to record

Record traces

- Retrieve low level details
  - without generating huge traces
  - without huge overheads

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Integrated with Allinea DDT

- Use Allinea MAP to find a bottleneck
- Flick to Allinea DDT to understand it
- Compare variables, expressions, call paths
- High memory usage? Use Allinea DDT !
- Common interface and settings files

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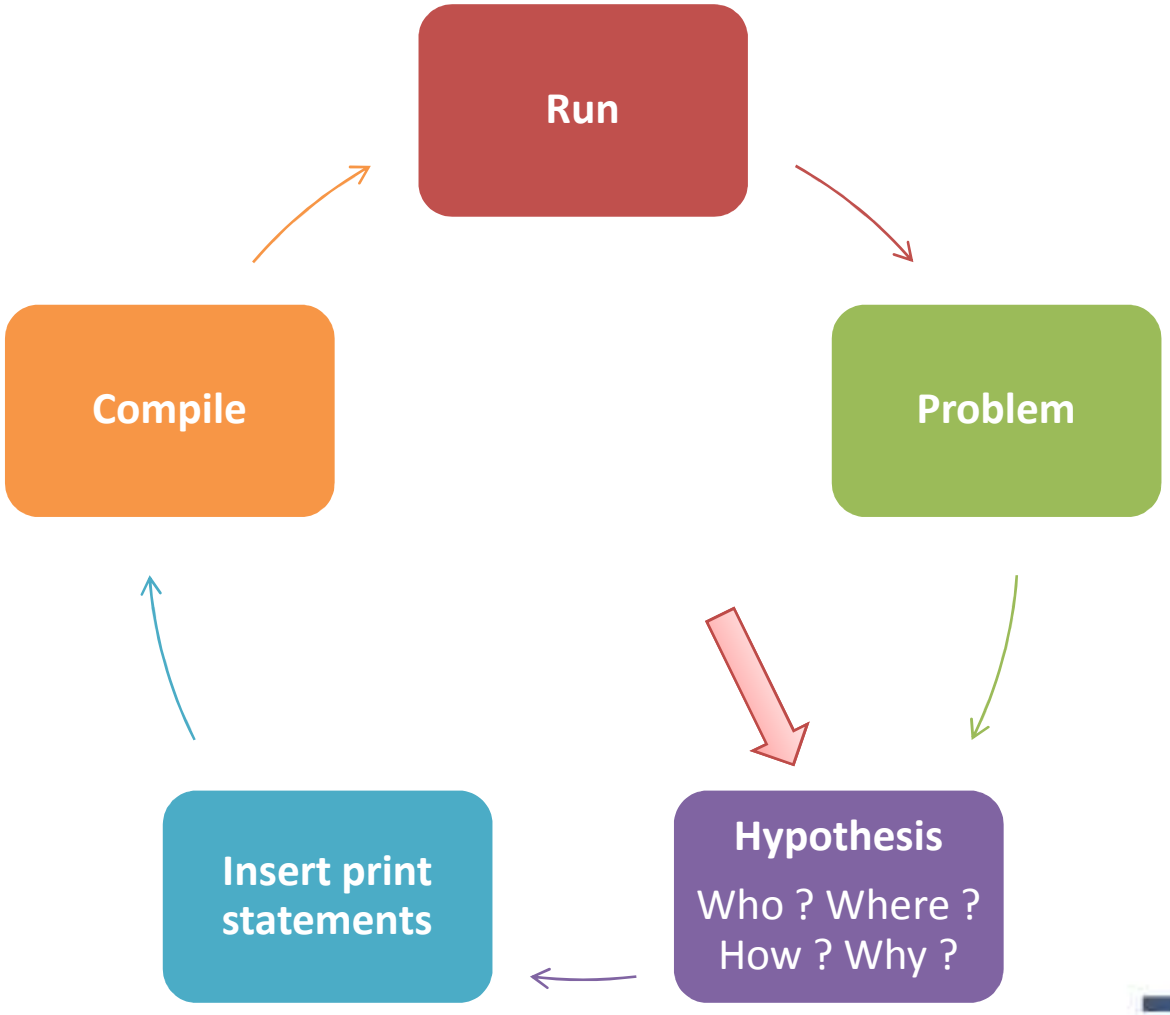
Debugging in practice
The usual method



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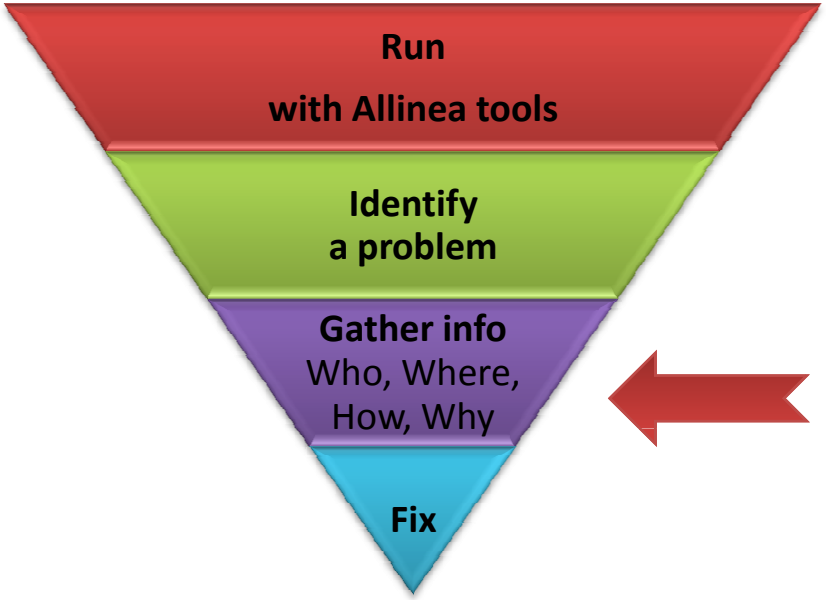
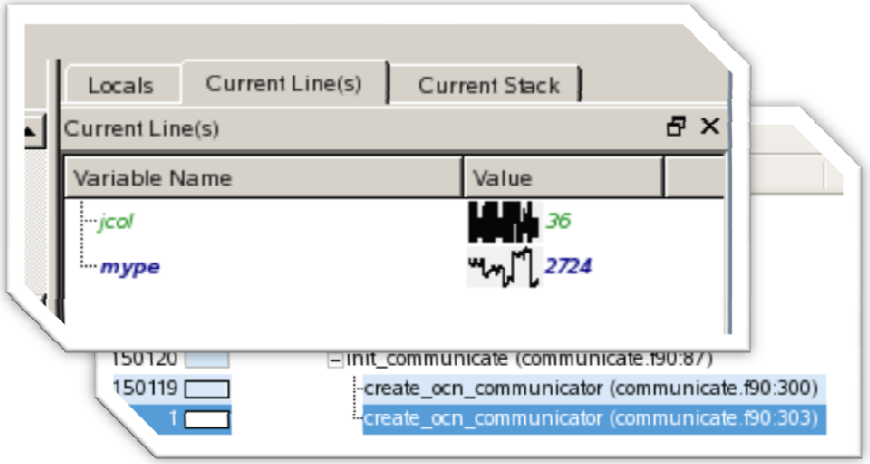
Allinea DDT helps to understand

- ***Who* had a rogue behavior ?**
  - Merges stacks from processes and threads
- ***Where* did it happen?**
  - Allinea DDT leaps to source automatically
- ***How* did it happen?**
  - Detailed error message given to the user
  - Some faults evident instantly from source
- ***Why* did it happen?**
  - Unique “Smart Highlighting”
    - Coloring differences and changes
  - Sparklines comparing data across processes





Summary

- **To “make” science quickly, all HPC aspects need to be accessible**
  - Tools need to be usable to avoid wasting time
  - Provided information needs to be adequate
- **Allinea DDT and Allinea MAP : 2 sides of the same coin**
  - Unified profiling and debugging to fix or optimize code
  - Integrates new features to help reduce your time developing code
- **BONUS : Allinea Performance Reports for the HPC users**
  - New product released a few weeks ago – will be available soon at Uni Luxembourg!
  - Understand application behaviour quickly

Hands-on workshop

In the beginning was the Word

1- Connect to the front-end node :

```
$ ssh –Y -p 8022 <username>@access-gaia.uni.lu
```

2- Get the training package

```
$ cp /path/to/archive/allinea_wshop.tar.gz  $WORK/
```

3- Connect on a compute nodeSetup the environment

```
$ oarsub -I
```

4- Setup the environment

```
$ cd $WORK
$ tar xvfz $WORK/allinea_wshop.tar.gz
$ module load OpenMPI/1.6.5-GCC-4.7.2 DDT
```

NOTE : in order to use GCC-4.8.3 (relies on DWARF4), Allinea tools version 4.2 or later is required !

5- Read instructions

```
$ evince allinea_wshop/exercise1/handout_ex1.pdf
```

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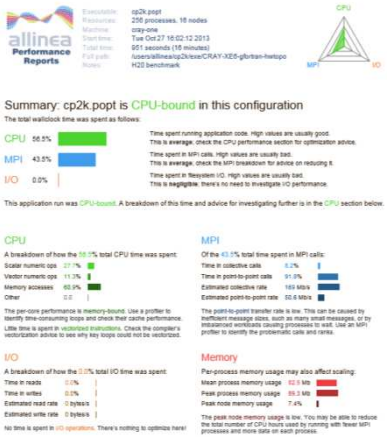
Thank you

Your contacts :

- Technical Support team : support@allinea.com
- Sales team : sales@allinea.com

Understand cluster usage efficiency

- **Monitors application behavior to provide answers:**
  - Are the applications running on the cluster efficient ?
  - Are there software or hardware bottlenecks affecting performance ?
  - Is the combination of application parameters optimal ?
  - What cluster/scale should the user choose for his job ?



- **Effortless one-touch reports:**

```
mpirun –n 42 ./my_executable argument1
```

becomes

```
perf-report mpirun –n 42 ./my_executable argument1
```

- **Fully supported in x86_64 environments**

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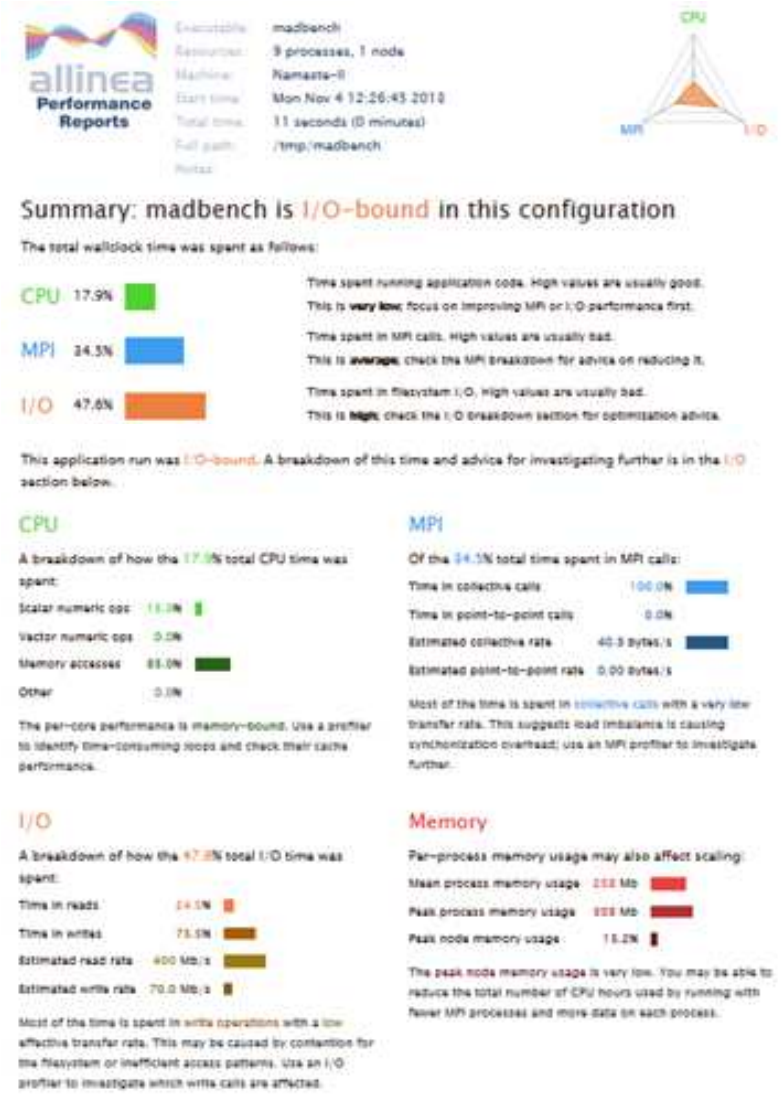
Better performance quickly and easily



- No instrumentation needed
- No need for recompilation or source code
- Perfect for ISV applications
- Less than 5% runtime overhead
- Fully scalable
- Run regularly – or in regression tests
- Explicit and usable output with hints

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