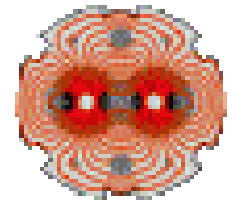




Accelerator beam simulations with SixTrack



LHC@home – next step



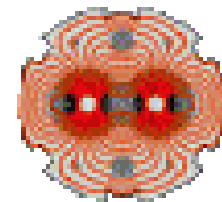
M. Giovannozzi, E. McIntosh,
R. de Maria, F. Schmidt, D. Mikushin I. Zacharov



CERN – Beams Department

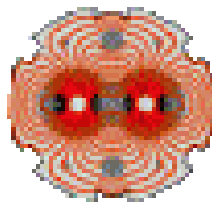
- Goals of SixTrack studies
- SixTrack and LHC@home
- Outlook

Acknowledgements: P. Jones, N. Høimyr, M. Marquina, IT support



SixTrack and LHC@home

- Massive numerical simulations
 - Scans over phase space variables, beam parameters
 - Several realisations of LHC ring model
 - Large number of turns (10^6 typical)
 - Easy possibility to split a single study into several simulations, whose results can be obtained independently on each other
- **Key issue: numerical compatibility of results obtained on heterogeneous architectures: solved for SixTrack!**



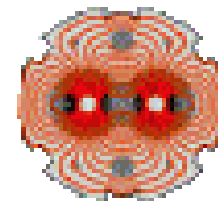
Sixtrack

- Fortran program
- Uses special libm for trig functions
- Uses cernlib (rn32)
- Uses C routines for special tasks (I/O)
- Operates by qsub to LSF
- Can use BOINC to send work to PCs world wide:
 - LHC@home volunteer project

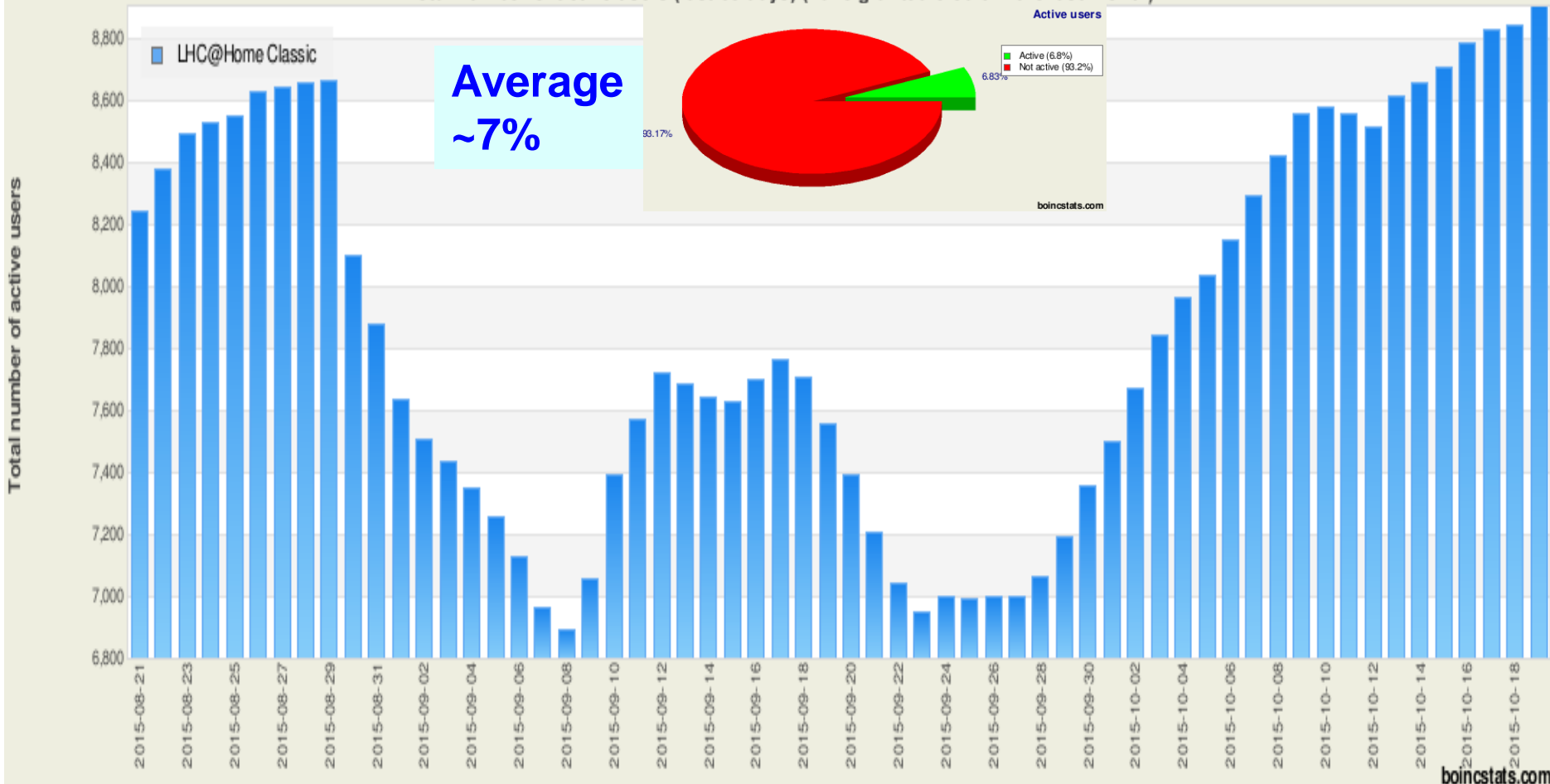
→ **perfect example for Accelerated computing study**

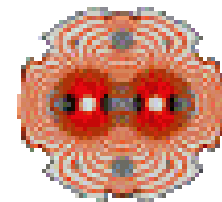
LHC@home: users

130 352 users total, ~9k active



Total number of active users (last 60 days) (have granted credit in the last month)





LHC@home: hosts

350k hosts total, ~14k active

3.5% Windows server

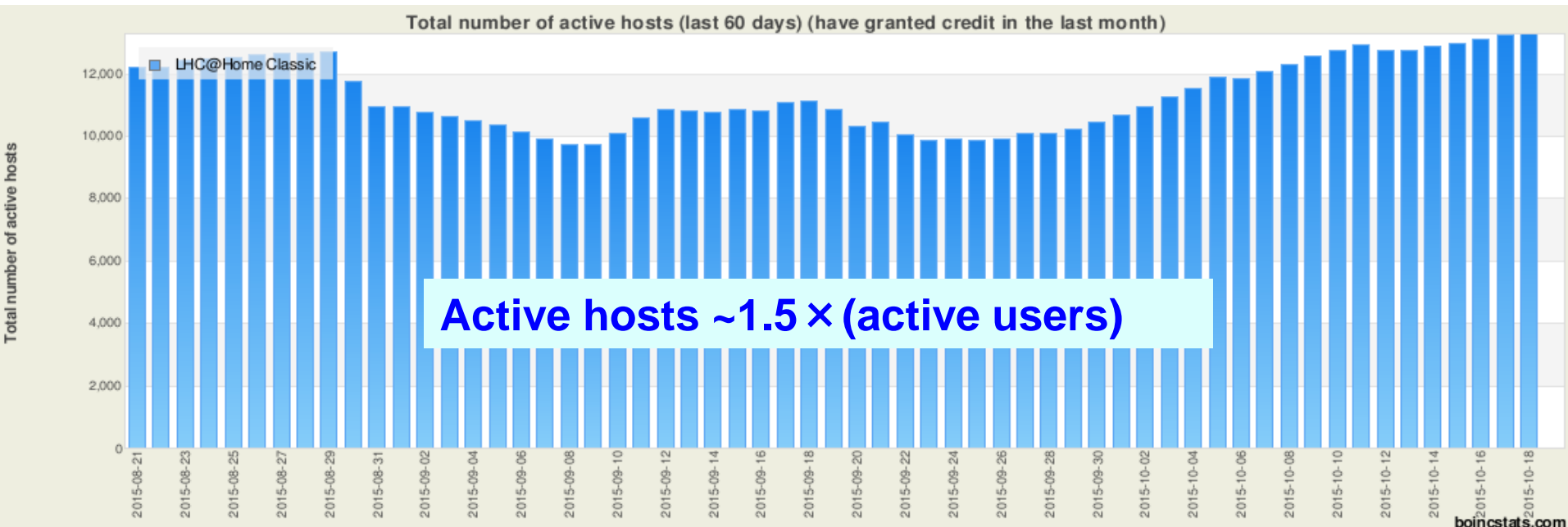
5.3% Windows XP

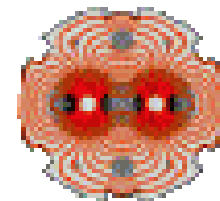
65.4% Windows (7, etc.) →

24.0% Linux

>65% newer hardware
with possible acceleration capability:

- NVIDIA or AMD GPU
- Intel Integrated Graphics (i3,i5,i7)





Example milkyway@home

Double precision GPU required:

<p>Nvidia Linux 64bit and Windows GTX260 or better CUDA compute cap >1.3</p>	<p>AMD Windows only Radeon 47xx, 48xx, 58xx, 69xx, FirePro V87xx, FireStream 92xx OpenCL</p>
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Multiple (16) versions of executables selected auto by scheduler

Milkyway@home: 140X more compute capability out of the same user community

→ motivation to use accelerators