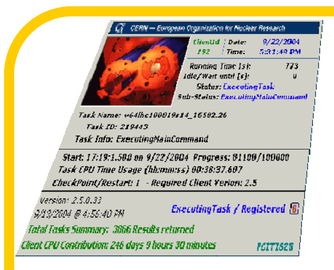
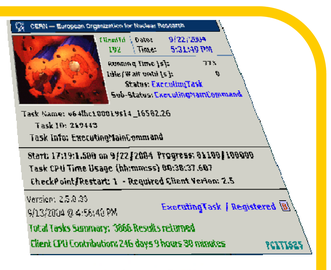


CERN Modular Physics Screensaver or Using Spare CPU Cycles of CERN's Desktop PCs



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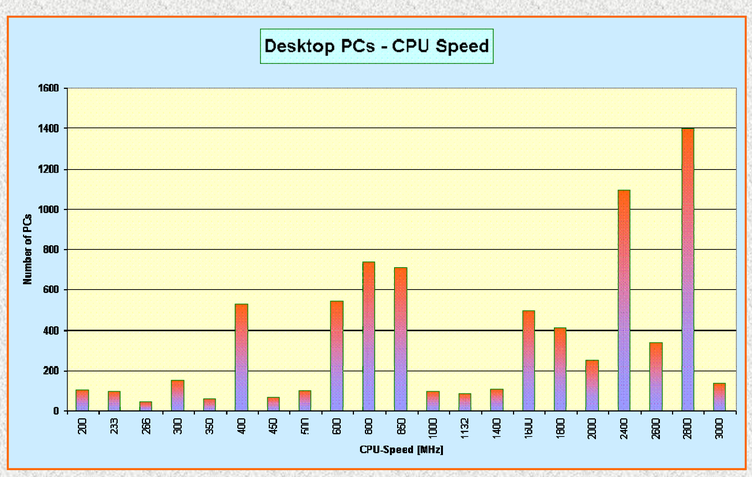
Motivation I

i) CPU Utilization of desktop PCs

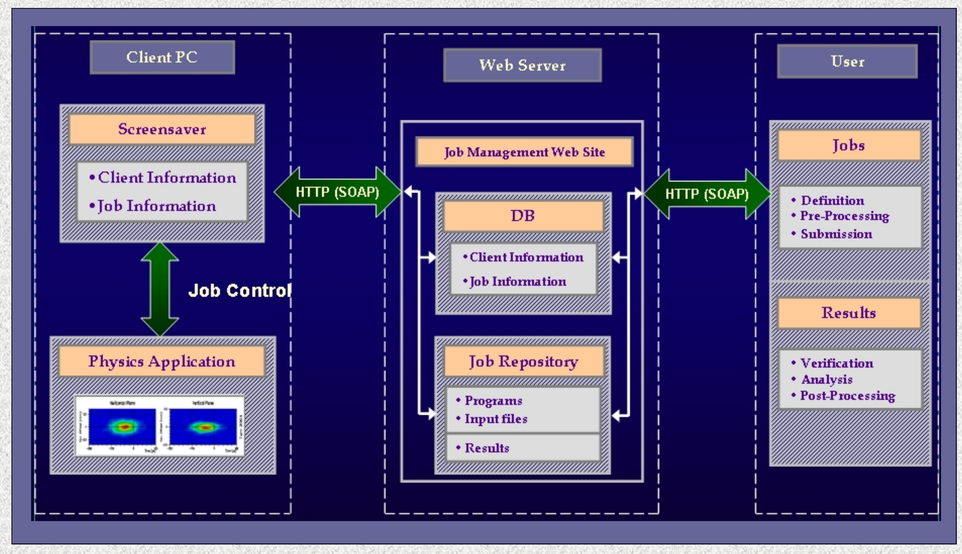
A normal Desktop PC's life at CERN	
Normal lifetime supposed to be 3 years	25400 hours
40 hour/ week * 50 weeks/year * 3 years	- 6000 hours
Idle time (non office hours):	~20000 hours *)

*) NB 1: Assuming PC powered on 24/7
NB 2: Idle time during normal office usage not counted !

ii) Number of Desktop PCs at CERN ~5000



Architecture



Conceptual Design - Advantages:

- **Using standard HTTP/SOAP protocol for Client Server Communication**
- **Easily Scalable:**

  Multiple Web-Servers can be used for job management and distribution
- **No Intranet-Internet Boundary:**

  No architectural changes necessary if wanted to use outside CERN

Motivation II

Sixtrack - High CPU demand for LHC tracking studies

Sixtrack—Required PC Resources	
Executable size	65 MB
Working Set	32 MB
Input Files	250-500 kB
Output Files	20 MB +15 MB per particle pair (compressed about 3 MByte)
Typical run produces ~500 MB of output for 100 000 turns	
CPU time (PIII 800 MHz)	~2 hours

Previously Sixtrack simulations where running on dedicated cluster (10 DUAL 800 MHz Linux PCs).

A significant increase in the workload (CPU demand) as LHC magnets arrive at CERN and data of the field errors become available.

Present budget situation makes it difficult to invest in dedicated farm with adequate CPU power.

Implementation

Client - VB6 Screensaver

- **Registration:**
  - **"I am here"**
  - **System Info**
- **Simplified Job Cycle:**
  - **Idle**
  - **Request Task**
  - **Download Task**
  - **Execute Task**
  - **Return Results**
  - **Version Check**
- **Client Auto Update:**
  - **Compare active version to latest on server**
  - **Download and Install new version**

Job Management Server – Standard Web Site

- **a few dynamic Web pages**
  - **registerClient**
  - **requestTask**
  - **sendTask**
  - **receiveResults**
  - **clientVersion**
- **DataBase**
  - **Client Information**
  - **Job List**
  - **Job requirements**
- **Job Repository**
  - **Executables**
  - **Data-files**
  - **Result-files**

CPSS http://cern.ch/cpss CPSS

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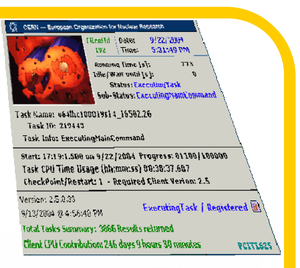

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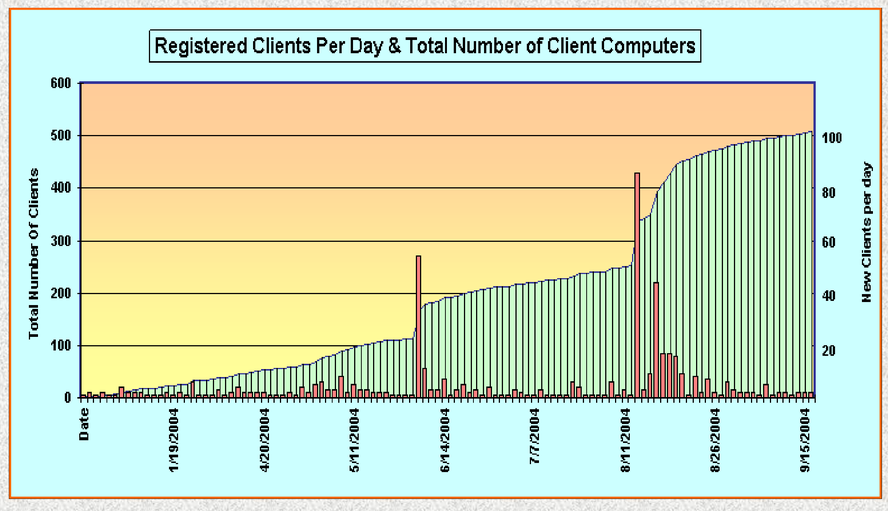
Deployment

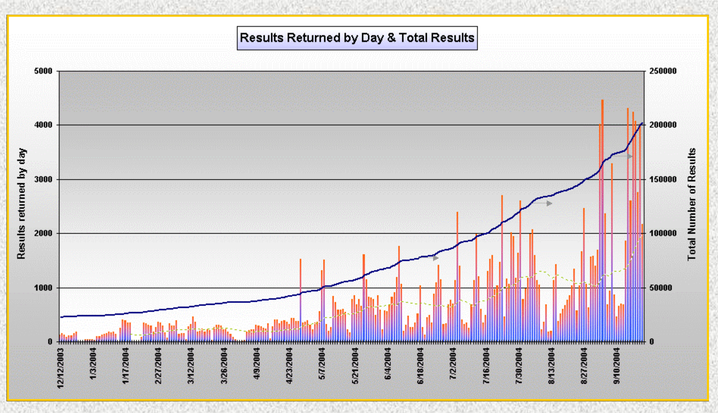
CERN Internal Deployment on Voluntary Basis

- **8th June: Invitation/Recommendation to IT Department**
- **13th August: Article in CERN Bulletin inviting people to install CPSS**

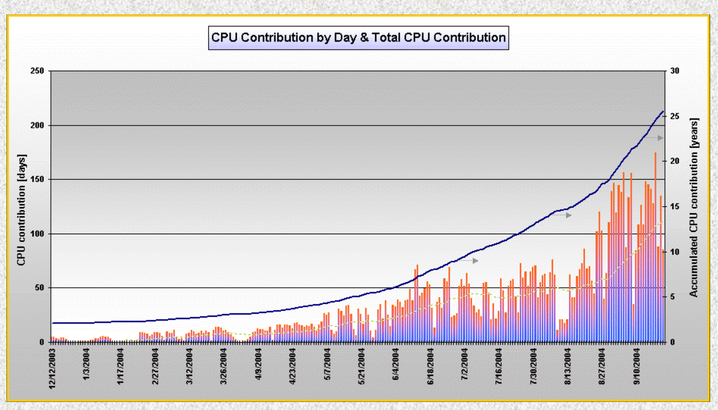


Performance

Task Throughput:

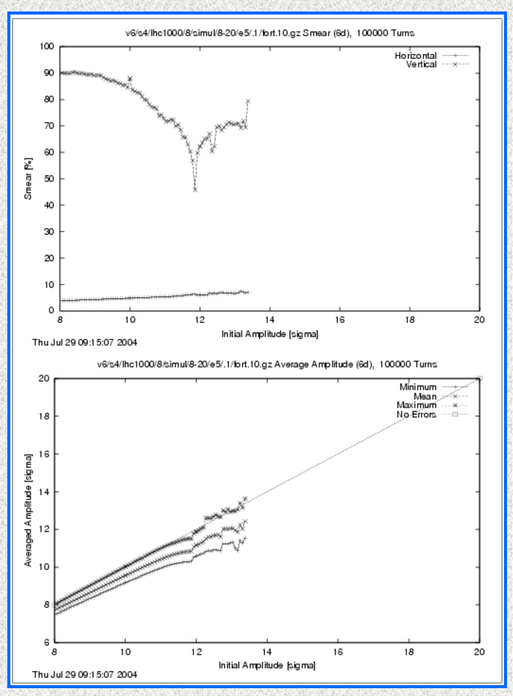


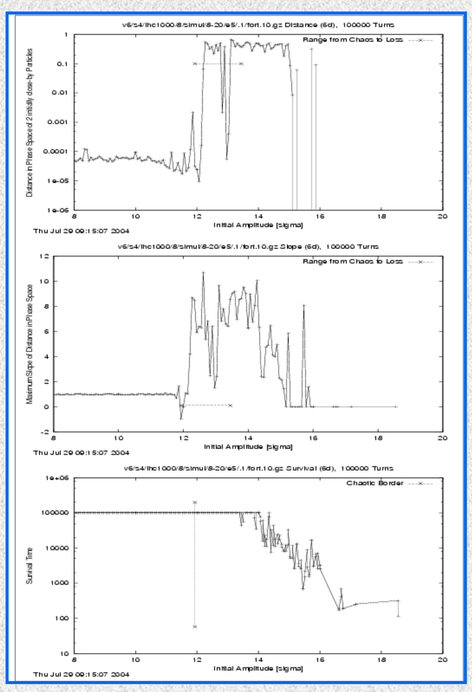
Accumulated CPU Time:

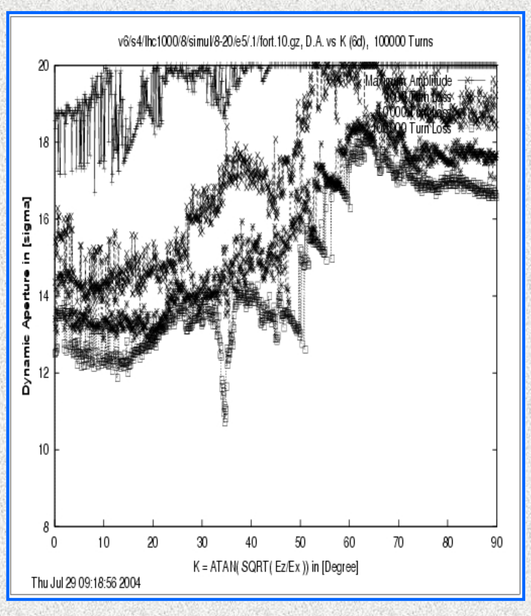


Results I

Increased CPU Resources allow new, more precise studies:







Results II

New insights in numerical precision of studies:

- **Rare compiler rounding errors:**

  Windows 2000/XP difference in reading binary input files

- **Special Functions show hardware dependency:**

  Intel /AMD discrepancies for: Error Function, Exp, ...

CPSS http://cern.ch/cpss CPSS