



# **CERN Modular Physics Screensaver or Using spare CPU cycles of CERN's Desktop PCs**

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# Outline

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# Motivation (I)

## A normal Desktop PC's life at CERN

<b>Normal lifetime supposed to be 3 years</b>	<b>25400 hours</b>
<b>40 hour/ week * 50 weeks/year * 3 years</b>	<b>- 6000 hours</b>
<b>Idle time (non office hours):</b>	<b>~20000 hours *)</b>

\*) NB 1: Assuming PC powered on 24/7

NB 2: Idle time during normal office usage not counted !



## Motivation (II)

- ◆ Sixtrack for LHC particle tracking (<http://frs.home.cern.ch/frs/>)
  - ◆ A “real” physics application that is well suited, i.e. CPU intensive & moderate (low) in data transfer requirements
  - ◆ A PC version of Sixtrack has been developed recently.



## About Sixtrack (I)

- ◆ Up to now Sixtrack simulations were 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 doesn't allow to invest in dedicated farm with adequate CPU power.



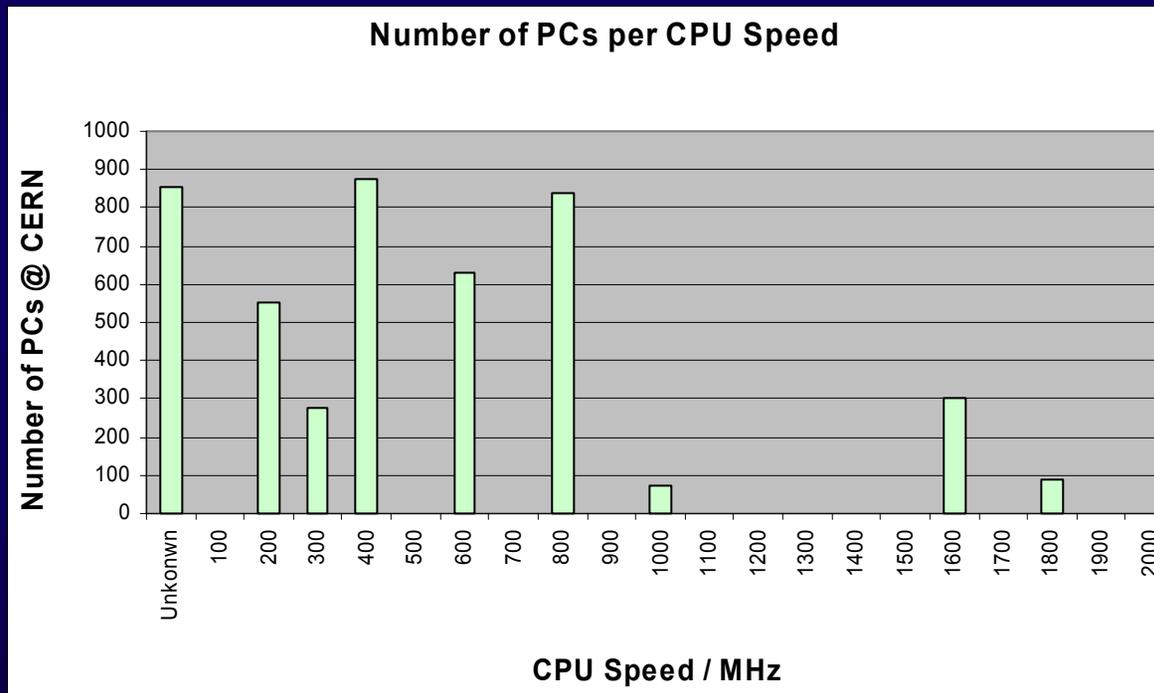
## About Sixtrack (II)

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
Typical run produces ~500 MB of output for 100 000 turns	
CPU time (PIII 800 MHz)	~2 hours



# CERN's Desktop Computer Park

5246 Desktop PCs - 4250 Windows 2000 - August 2002





# History – “Screensaver Predecessors”

◆ e.g.:

◆ **seti@home:** <http://setiathome.ssl.berkeley.edu/>

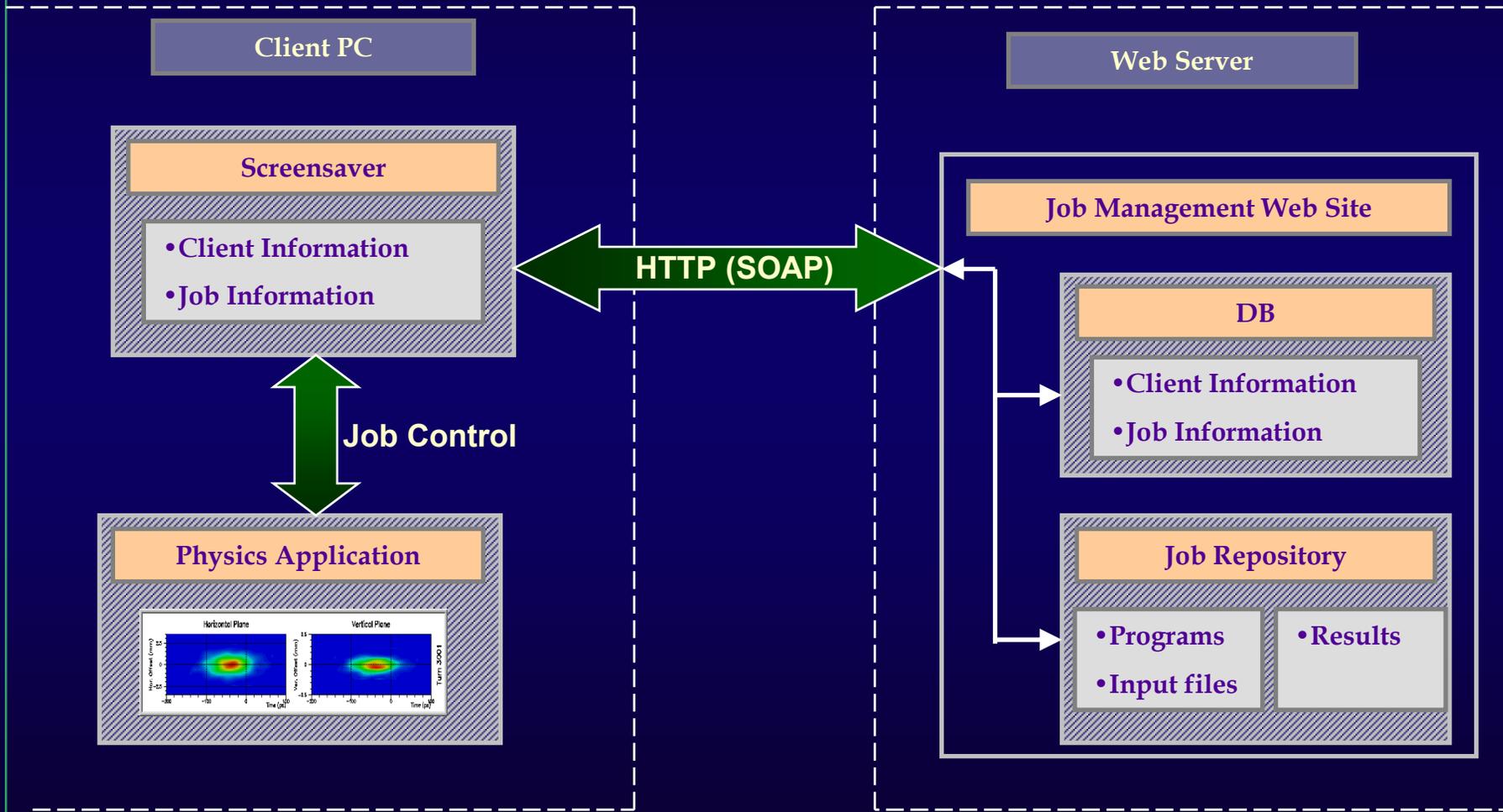
“Search for Extraterrestrial Intelligence” - Analysis of space observatory data

◆ **UD - United Devices:** <http://www.ud.com>

Medical Research  
Internet Performance Testing  
etc.



# Architecture





## Conceptual Design - Advantages

- ◆ Using standard HTTP/SOAP protocol for Client Server Communication
- ◆ Client and Server don't need same OS Architecture
- ◆ Easily Scalable:
  - ◆ Multiple Web-Servers can be used for job management and distribution
- ◆ No Intranet-Internet Boundary:
  - ◆ No architectural changes necessary if used outside CERN



# Prototype Implementation

## Client - VB6 Screensaver

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

## Job Management Server – Standard Web Site

- ◆ **a few ASP pages**
  - ◆ registerClient
  - ◆ requestTask
  - ◆ sendTask
  - ◆ receiveResults
  - ◆ clientVersion
- ◆ **DB**
  - ◆ Client Information
  - ◆ Job List
  - ◆ Job requirements
- ◆ **Job Repository**
  - ◆ Executables
  - ◆ Datafiles
  - ◆ Resultfiles



# Status of Prototype

- ◆ Presently the screensaver runs on a few PCs in "Idle" mode

The screenshot displays the CERN Physics Screen Saver interface. At the top, it reads "CERN — European Organization for Nuclear Research". On the left, there is a small window showing a particle detector visualization. To the right, the status is "Idle", with an "Idle Time [s]" of 16 and a "Job Request in [s]" of 1190. The date is 2002-10-18 and the time is 5:25:04 PM. Below this, the job information is displayed: "Job Name: No Task Assigned 'Retry in 1200 seconds'", "Job ID: N/A", and "Job Info: 6 'retry later' so far". At the bottom, the version is 0.3.0.13, the date and time are 2002-10-18 @ 5:23:38 PM, and the status is "Idle / Registered" with a small icon.

- ◆ If everything goes well, test will be started during November on a limited number of PCs and first results are expected towards the end of the year.



## Future Implementations and Enhancements:

- ◆ **Web-Service (SOAP, .NET)**
  - ◆ **Taking advantage of emerging new technologies, i.e. Web-Services (SOAP)**
  
- ◆ **Client Background Mode:**
  - ◆ **On sufficiently powerful PCs - Executing tasks not only as screensaver but also in background mode with low priority**
  
- ◆ **Targeting private home PCs:**
  - ◆ **Very large computer base and computing power**
  - ◆ **Turnaround time might be significantly different**
  - ◆ **Question to physicists:**  
“Imagine you had unlimited computing resources, ....”



## Summary

- ◆ Significant potential of presently unused PC resources available inside CERN (and even more outside)
- ◆ Light implementation by widely reusing available standard infrastructure (e.g. CERN Web-Services)

**“It’s not a new idea but it is really time to do it !”**