TECHNISCHE
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DRESDEN

BenchIT
Performance Measurement
for Scientific Applications

Fakultät Informatik, Institut für Technische Informatik, Professur Rechnerarchitektur

BenchIT

Project Overview

Nöthnitzer Straße 46

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ZIH
Zentrum für Informationsdienste
und Hochleistungsrechnen

Contributions

- Guido Juckeland
- Robert Schöne
- Daniel Hackenberg
- Daniel Reiche
- Ronny Tschüter
- BenchIT team

Agenda

- Design Goals
- Implementation Guidelines
- The BenchIT Concept – From Measurement to Analysis
- BenchIT – Different Solutions for Specialized Purposes
- BenchIT – Step by Step
- BenchIT-Website
- Performance Analysis and Benchmarking Project Approaches
- BenchIT – Ease of Use

Design Goals

Original targets

- Simple interface for performance measurements
- Easy comparison of different measurements
- System independence (UNIX, Linux)
- Generating of gnuplot figures

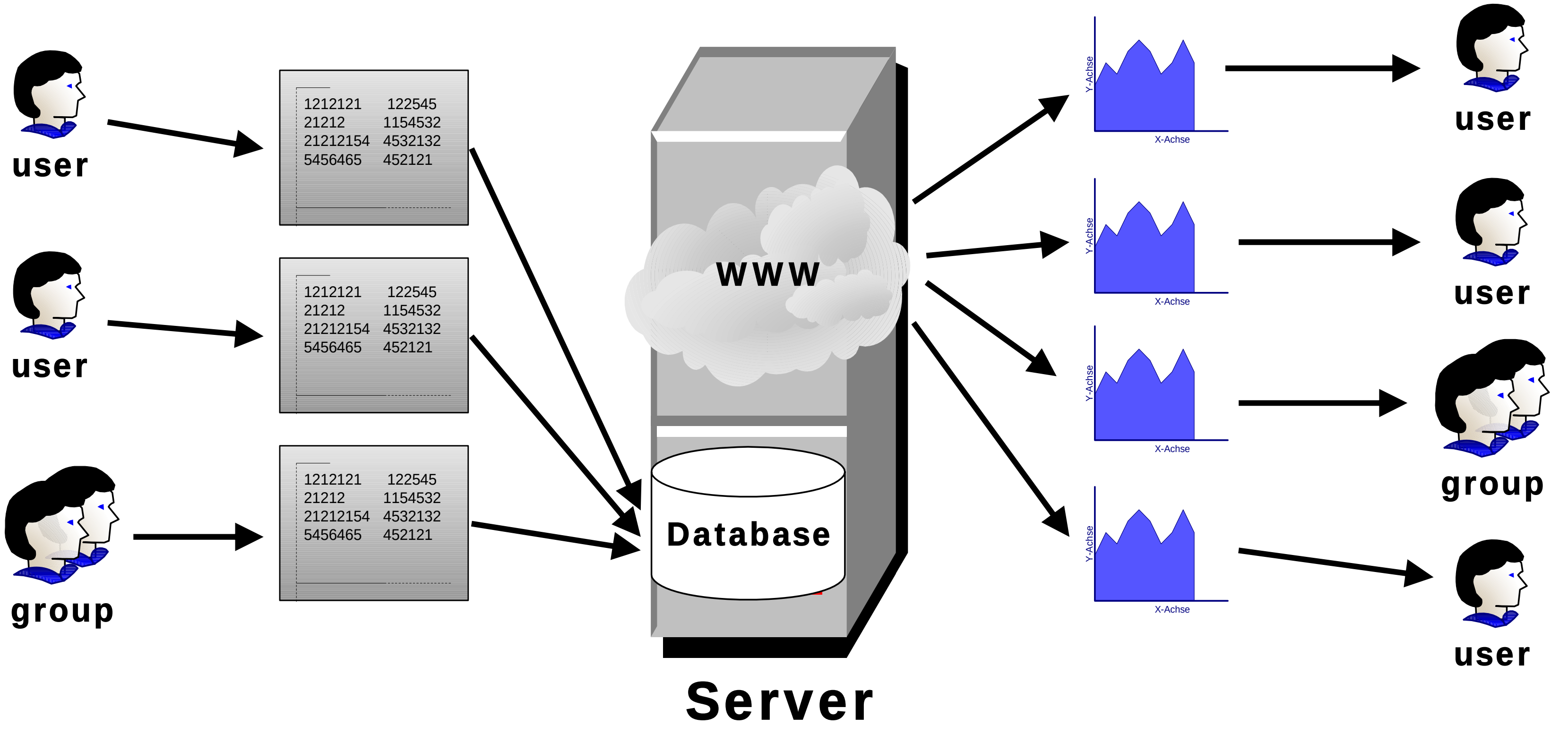
Specification under construction

- User friendly tool infrastucture (GUI/Website)
- Widespread configuration possibilities
- Save measurement environment for later validation
- Database management for result files
- User management for stored data
- Cross-compiling and remote measurement
- Incorporation of a Architecture and Microarchitecture Information Database (AID)

Implementation Guidelines

- Platform independent
  - POSIX conformability
  - ANSI-C conformability
- Usage of sh and cc only
- No make files
- Minimized size of the sources
- Plain text for
  - Configuration data
  - Results
- GPL licence model

The BenchIT Concept – From Measurement to Analysis


user
user
group
1212121 122545
21212 1154532
21212154 4532132
5456465 452121
1212121 122545
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21212154 4532132
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www
Database
Server
Y-Achse
X-Achse
Y-Achse
X-Achse
Y-Achse
X-Achse
Y-Achse
X-Achse
user
user
group
user

Measurement

Analysis

BenchIT – Different Solutions for Specialized Purposes

- **BenchIT measurement**
  - Command Line Interface (CLI)
  - BenchIT-GUI for
    - Local Measurement
    - Remote Measurement
      - Compile and run on the remote system
      - Cross-compilation on the host system and run only on the remote system
  - Derived special solution: Standalone versions for documentation and demonstration of specific features and problems

- **BenchIT visualization of results and comparison of different runs**
  - BenchIT-Website
  - BenchIT-GUI

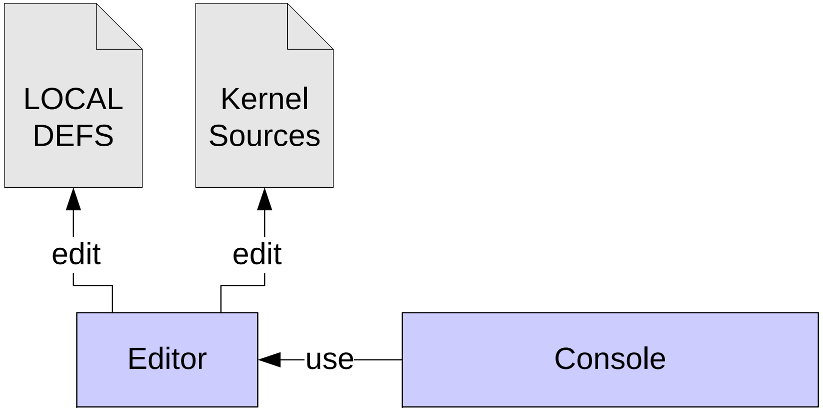
BenchIT – Step by Step

BenchIT – Step by Step

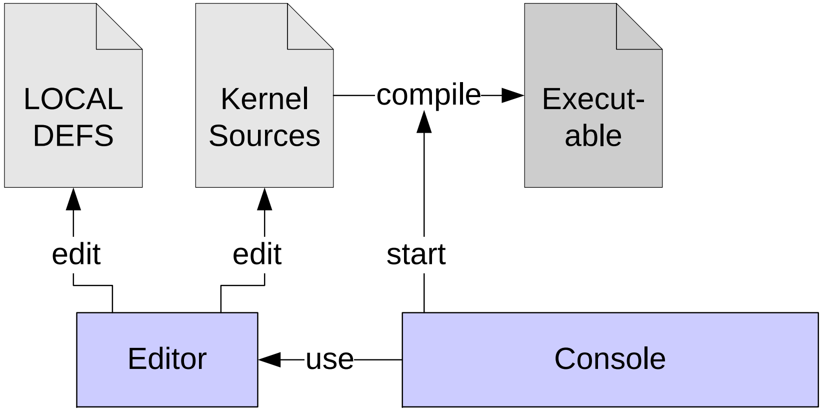
Editor

Console

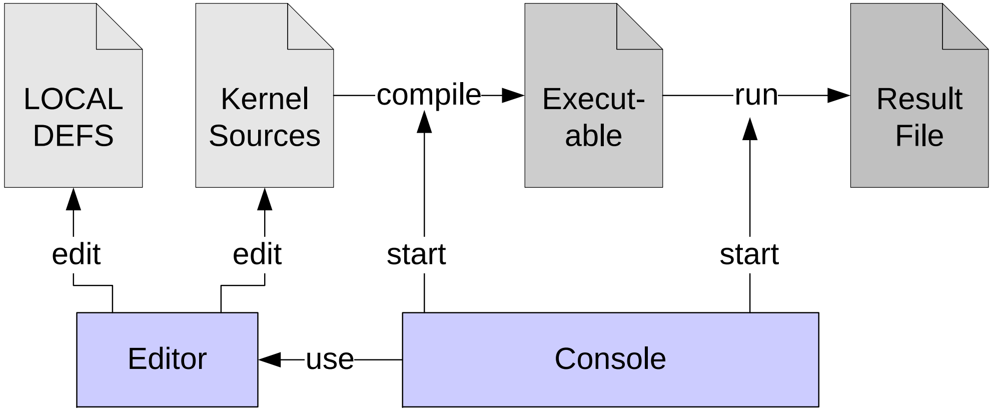
BenchIT – Step by Step


LOCAL
DEFS
Kernel
Sources
edit
edit
Editor
use
Console

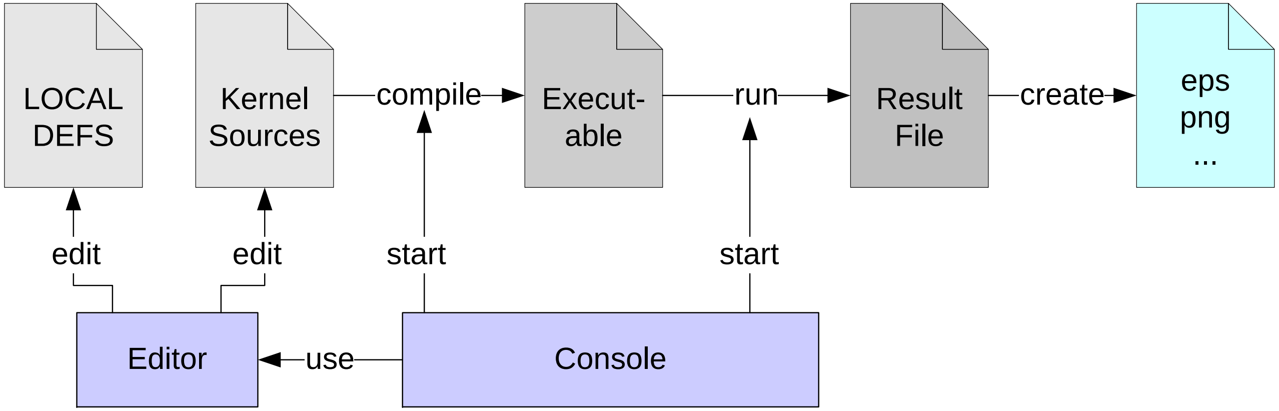
BenchIT – Step by Step


LOCAL DEFS
Kernel Sources
compile
Execut-able
edit
edit
start
Editor
use
Console

BenchIT – Step by Step


LOCAL DEFS
Kernel Sources
compile
Execut-able
run
Result File
edit
edit
start
start
Editor
use
Console

BenchIT – Step by Step


LOCAL DEFS
Kernel Sources
compile
Execut-able
run
Result File
create
eps
png
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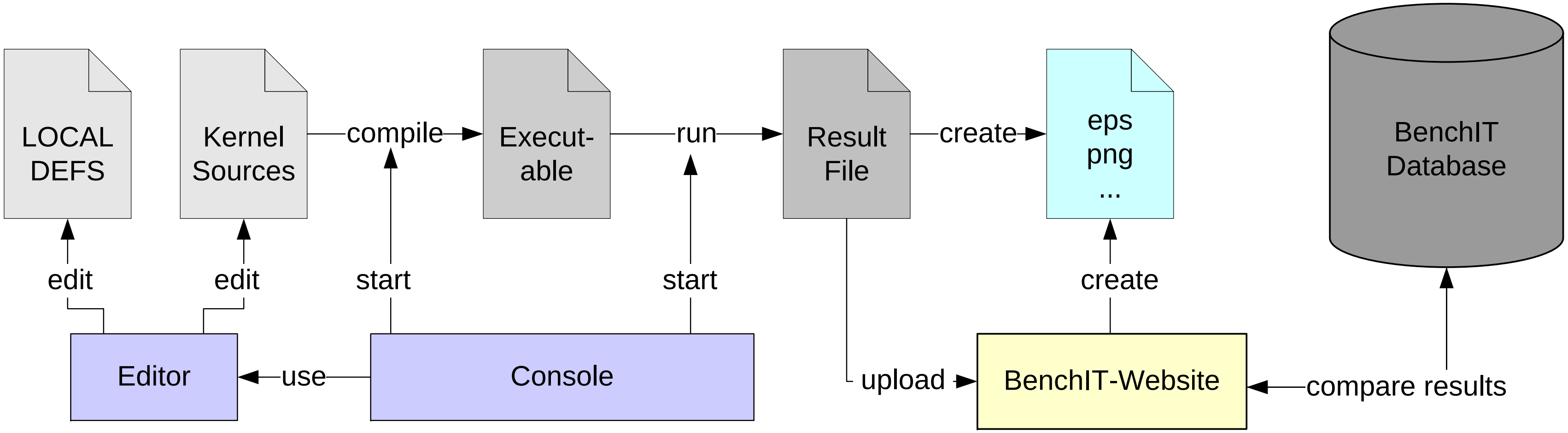
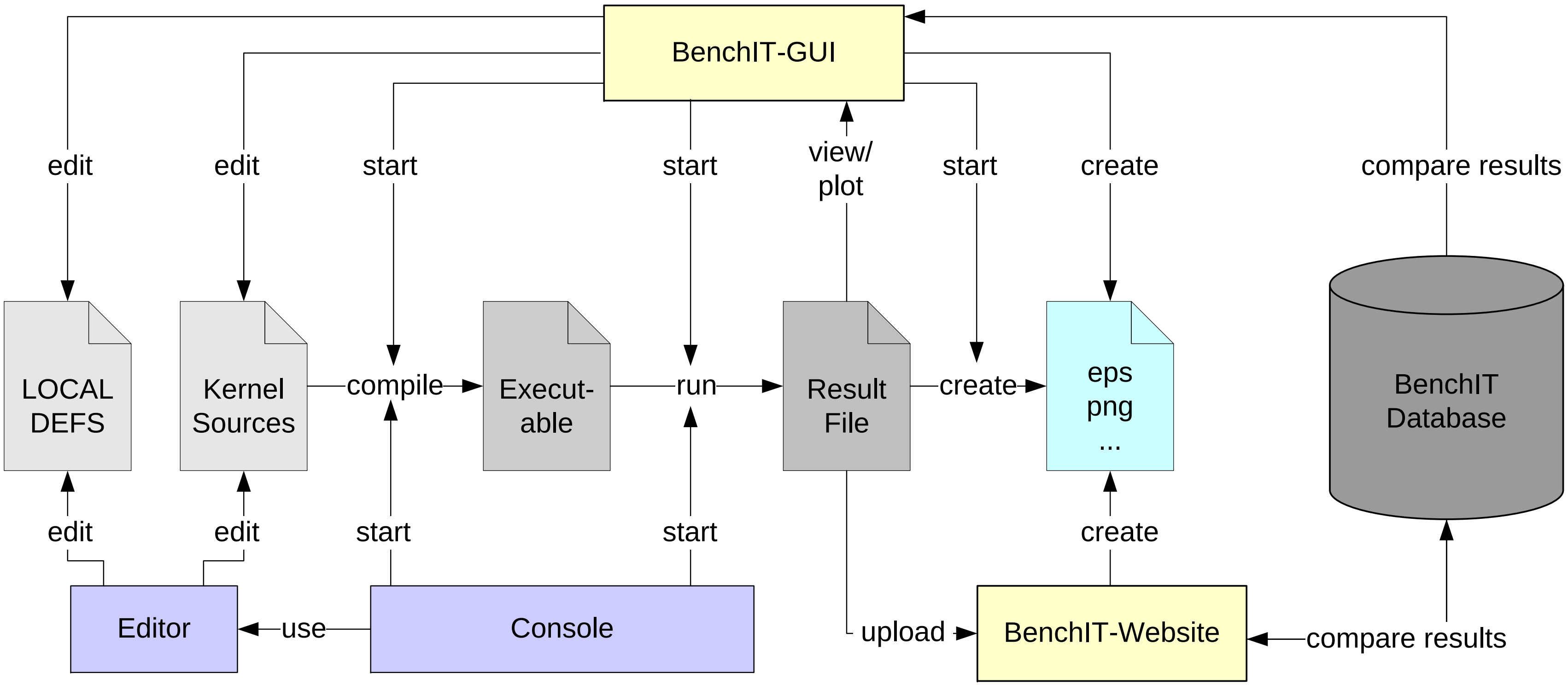
edit
edit
start
start
Editor
use
Console

BenchIT – Step by Step


LOCAL DEFS
Kernel Sources
compile
Execut-able
run
Result File
create
eps png ...
BenchIT Database
edit
edit
start
start
create
Editor
use
Console
upload
BenchIT-Website
compare results

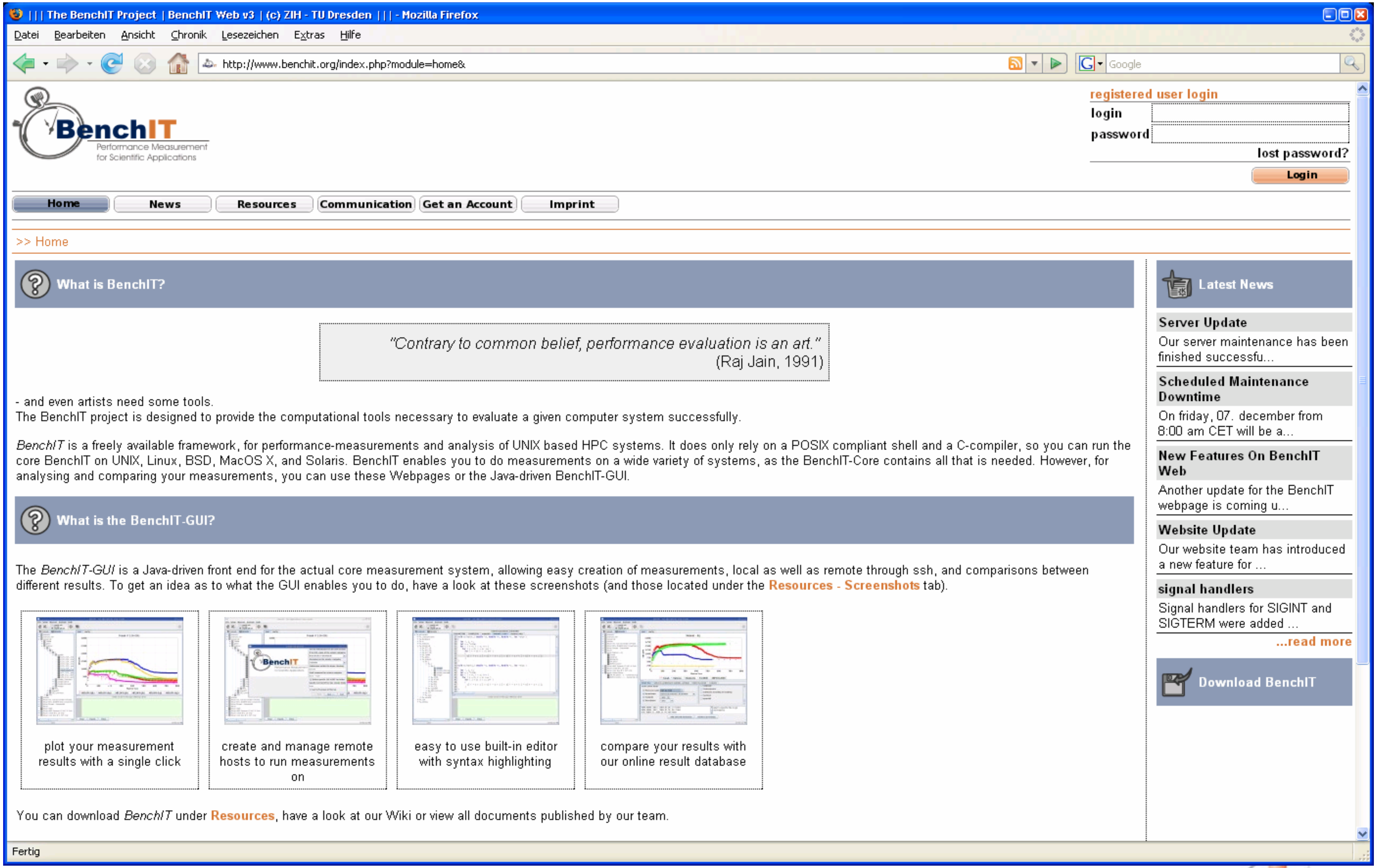
BenchIT – Step by Step


BenchIT-GUI
edit
edit
start
start
view/ plot
start
create
compare results
LOCAL DEFS
Kernel Sources
compile
Execut- able
run
Result File
create
eps png ...
BenchIT Database
edit
edit
start
start
create
Editor
use
Console
upload
BenchIT-Website
compare results

Visiting the Project Website and Getting the Sources

www.benchit.org

Get a Login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registered user login

login ____

password ____

lost password?

Login

>> Home

What is BenchIT?

> "Contrary to common belief, performance evaluation is an art."
> (Raj Jain, 1991)

- and even artists need some tools.
The BenchIT project is designed to provide the computational tools necessary to evaluate a given computer system successfully.

BenchIT is a freely available framework, for performance-measurements and analysis of UNIX based HPC systems. It does only rely on a POSIX compliant shell and a C-compiler, so you can run the core BenchIT on UNIX, Linux, BSD, MacOS X, and Solaris. BenchIT enables you to do measurements on a wide variety of systems, as the BenchIT-Core contains all that is needed. However, for analysing and comparing your measurements, you can use these Webpages or the Java-driven BenchIT-GUI.

What is the BenchIT-GUI?

The *BenchIT-GUI* is a Java-driven front end for the actual core measurement system, allowing easy creation of measurements, local as well as remote through ssh, and comparisons between different results. To get an idea as to what the GUI enables you to do, have a look at these screenshots (and those located under the **Resources - Screenshots** tab).

plot your measurement results with a single click

create and manage remote hosts to run measurements on

easy to use built-in editor with syntax highlighting

compare your results with our online result database

You can download *BenchIT* under **Resources**, have a look at our Wiki or view all documents published by our team.

Latest News

Server Update
Our server maintenance has been finished successfu...

Scheduled Maintenance Downtime
On friday, 07. december from 8:00 am CET will be a...

New Features On BenchIT Web
Another update for the BenchIT webpage is coming u...

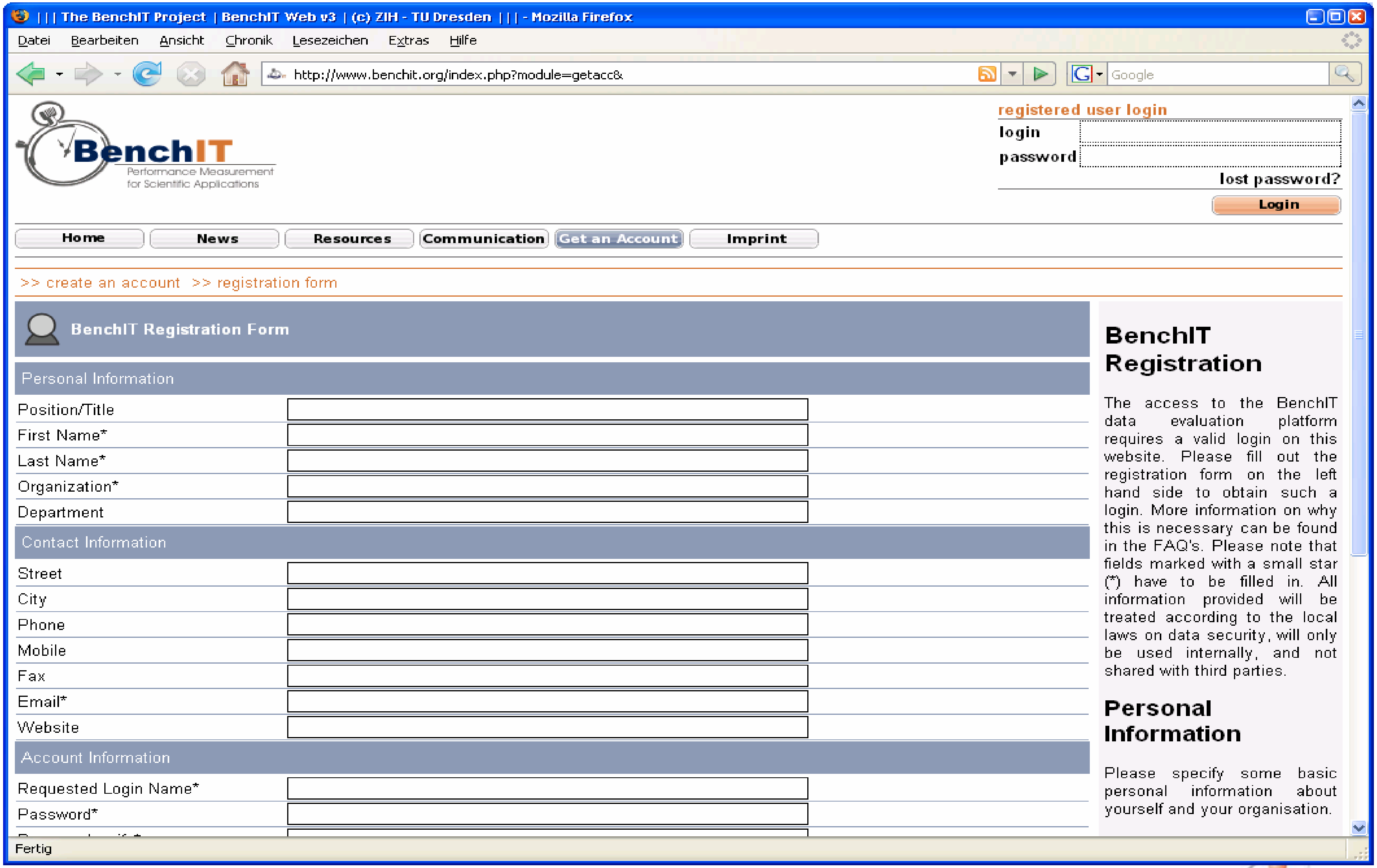
Website Update
Our website team has introduced a new feature for ...

signal handlers
Signal handlers for SIGINT and SIGTERM were added ...

...read more

Download BenchIT

Get a Login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registered user login
login
password
lost password?
Login
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Get an Account
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>> create an account >> registration form
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BenchIT Registration Form

Personal Information

Position/Title	
First Name*	
Last Name*	
Organization*	
Department	

Contact Information

Street	
City	
Phone	
Mobile	
Fax	
Email*	
Website	

Account Information

Requested Login Name*	
Password*	

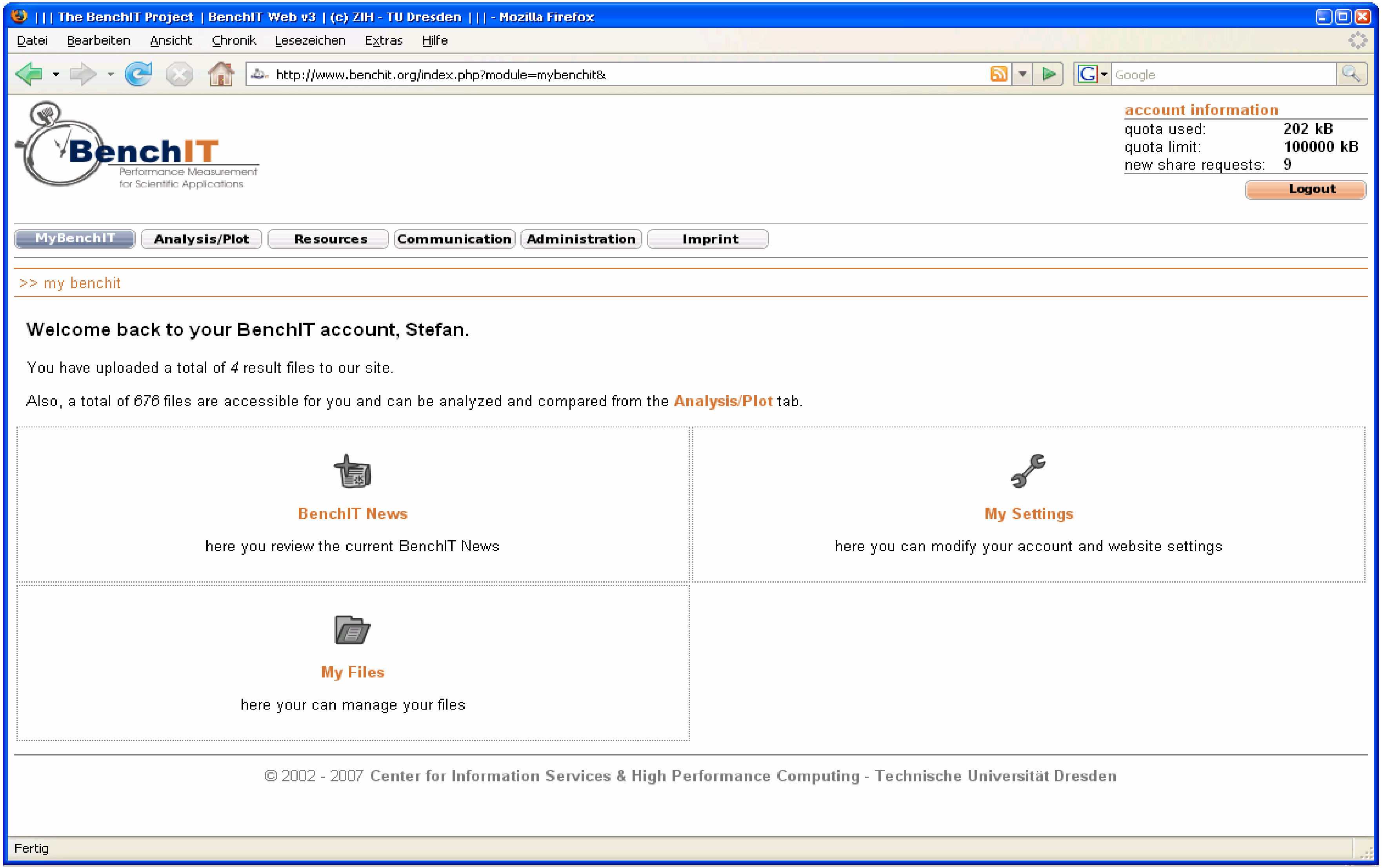
BenchIT Registration

The access to the BenchIT data evaluation platform requires a valid login on this website. Please fill out the left hand side to obtain such a login. More information on why this is necessary can be found in the FAQ's. Please note that fields marked with a small star (*) have to be filled in. All information provided will be treated according to the local laws on data security, will only be used internally, and not shared with third parties.

Personal Information

Please specify some basic personal information about yourself and your organisation.

Main View



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account information

quota used: 202 kB
quota limit: 100000 kB
new share requests: 9

>> my benchit

Welcome back to your BenchIT account, Stefan.

You have uploaded a total of 4 result files to our site.

Also, a total of 676 files are accessible for you and can be analyzed and compared from the **Analysis/Plot** tab.

BenchIT News

here you review the current BenchIT News

My Settings

here you can modify your account and website settings

My Files

here your can manage your files

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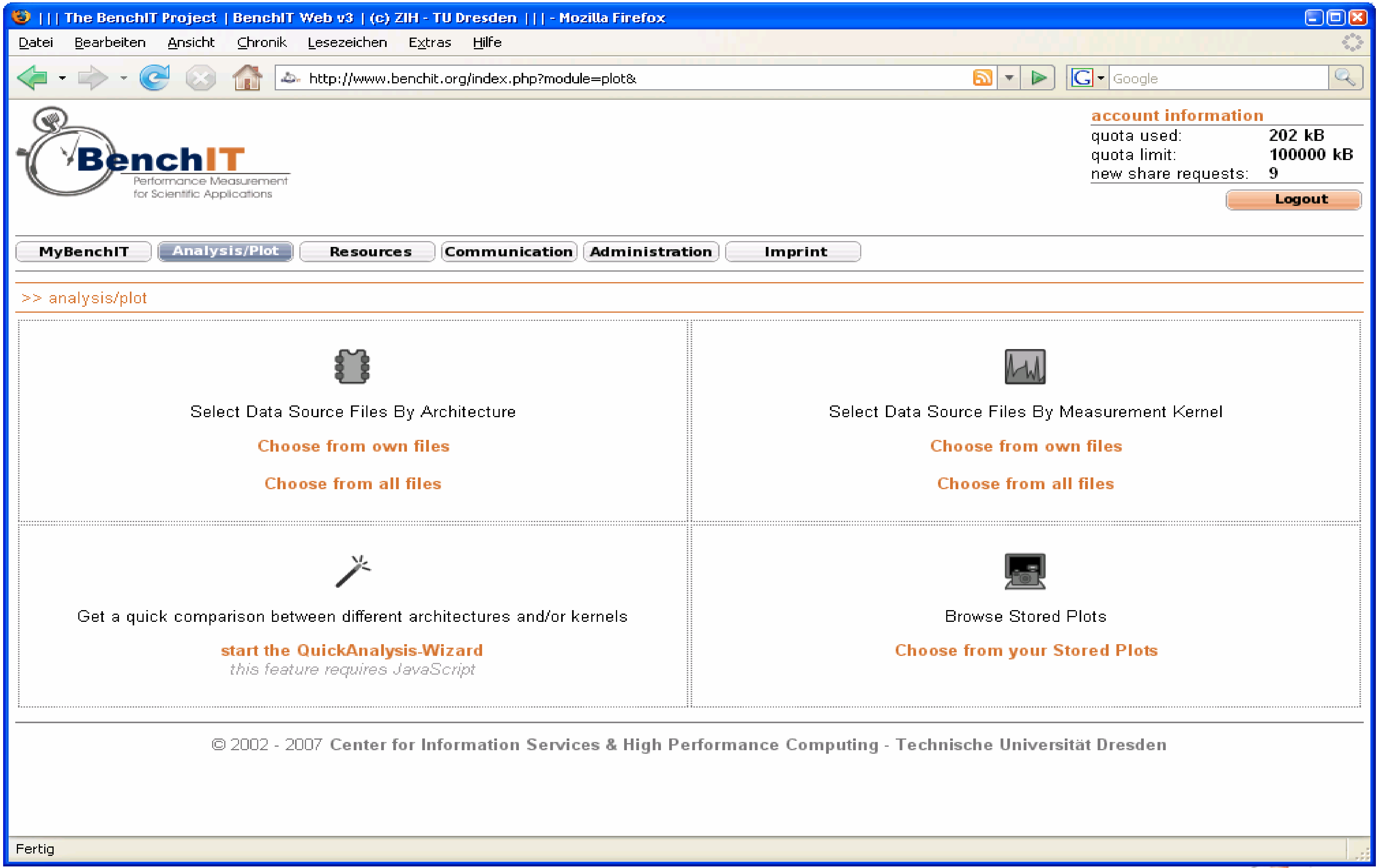
Compare Different …



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account information

quota used:	202 kB
quota limit:	100000 kB
new share requests:	9

>> analysis/plot

Select Data Source Files By Architecture

Choose from own files

Choose from all files

Select Data Source Files By Measurement Kernel

Choose from own files

Choose from all files

Get a quick comparison between different architectures and/or kernels

start the QuickAnalysis-Wizard

this feature requires JavaScript

Browse Stored Plots

Choose from your Stored Plots

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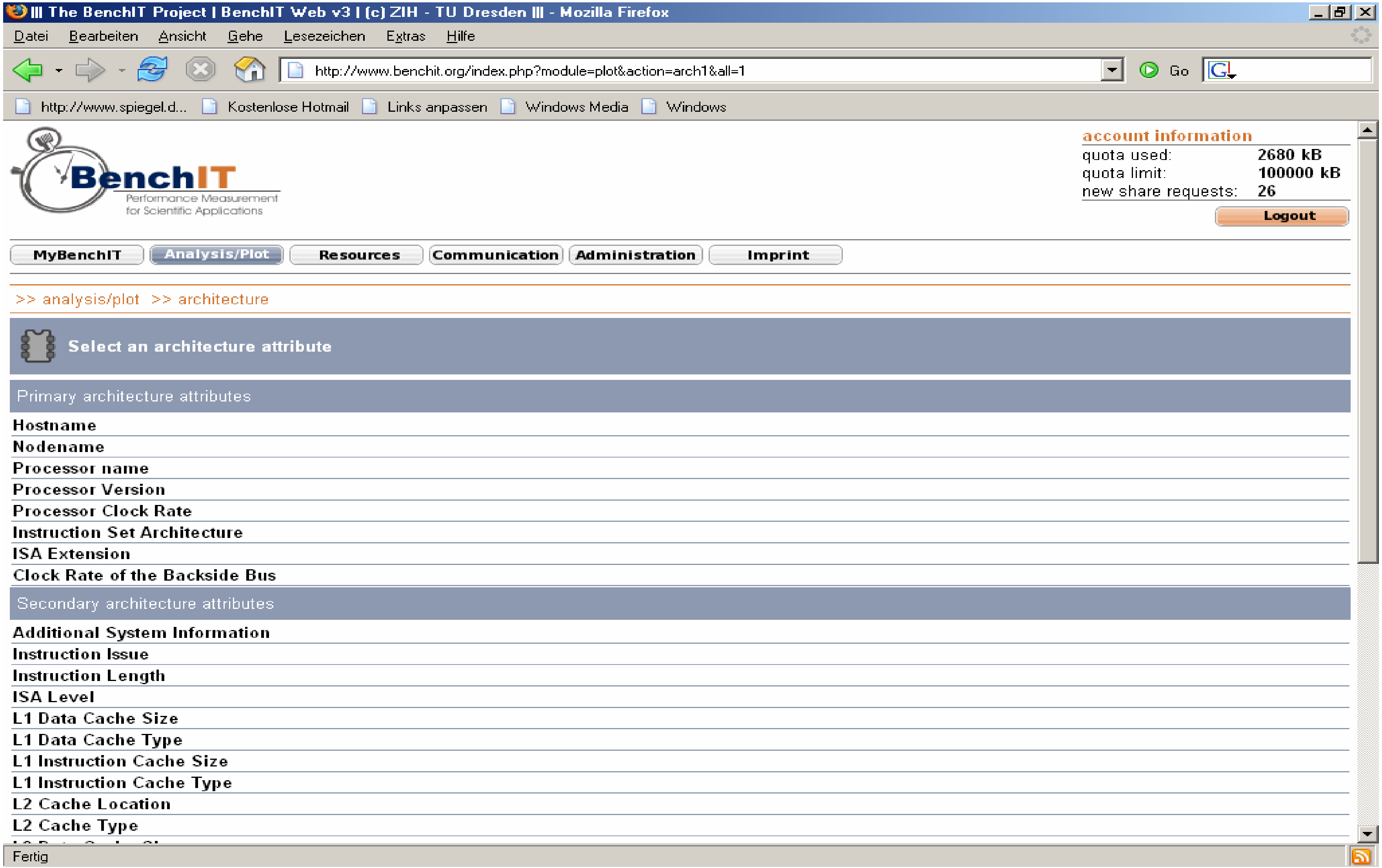
Compare Different … Architectures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account information

quota used:	2680 kB
quota limit:	100000 kB
new share requests:	26

>> analysis/plot >> architecture

Select an architecture attribute

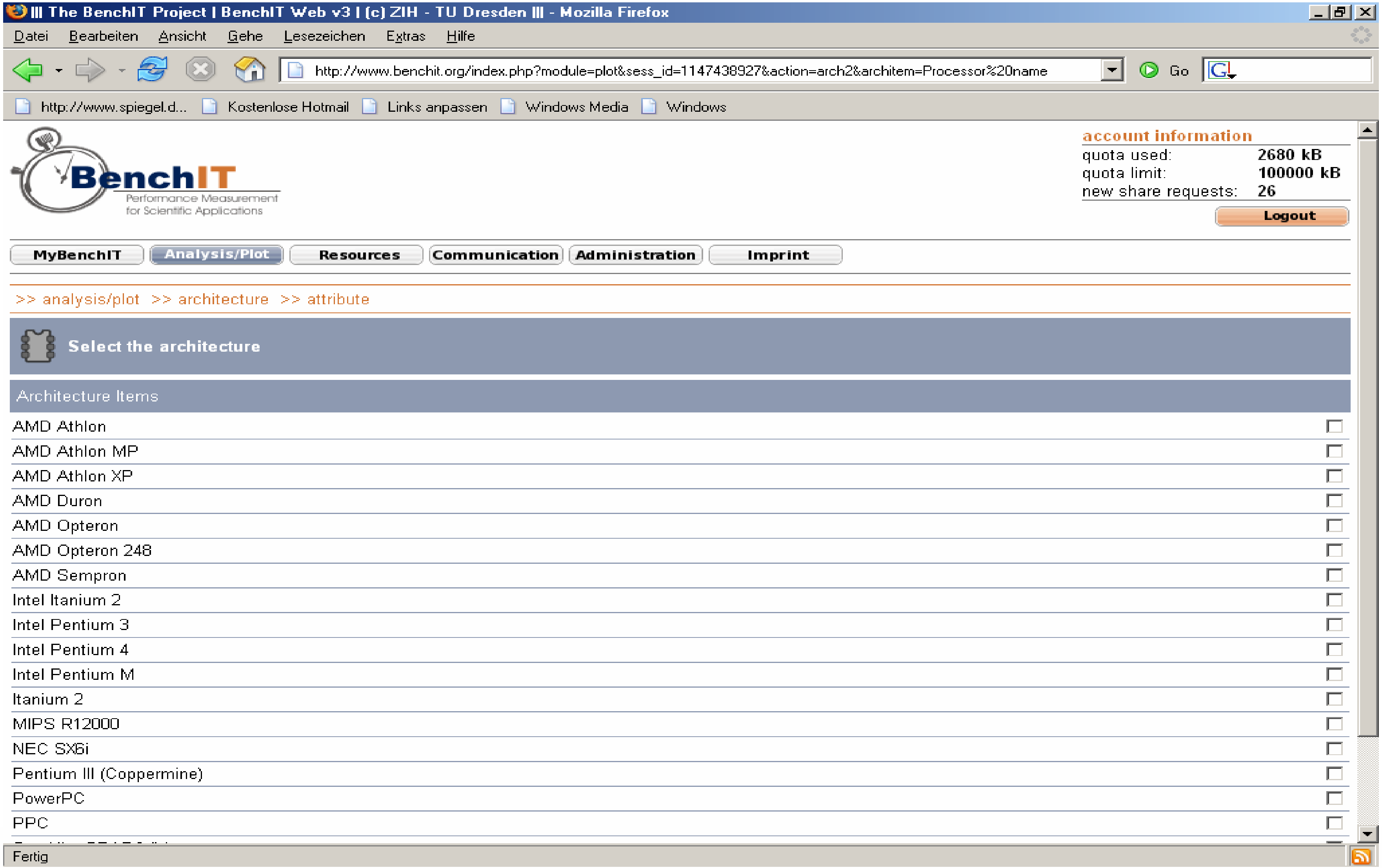
Primary architecture attributes

- **Hostname**
- **Nodename**
- **Processor name**
- **Processor Version**
- **Processor Clock Rate**
- **Instruction Set Architecture**
- **ISA Extension**
- **Clock Rate of the Backside Bus**

Secondary architecture attributes

- **Additional System Information**
- **Instruction Issue**
- **Instruction Length**
- **ISA Level**
- **L1 Data Cache Size**
- **L1 Data Cache Type**
- **L1 Instruction Cache Size**
- **L1 Instruction Cache Type**
- **L2 Cache Location**
- **L2 Cache Type**

Compare Different … Processors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account information

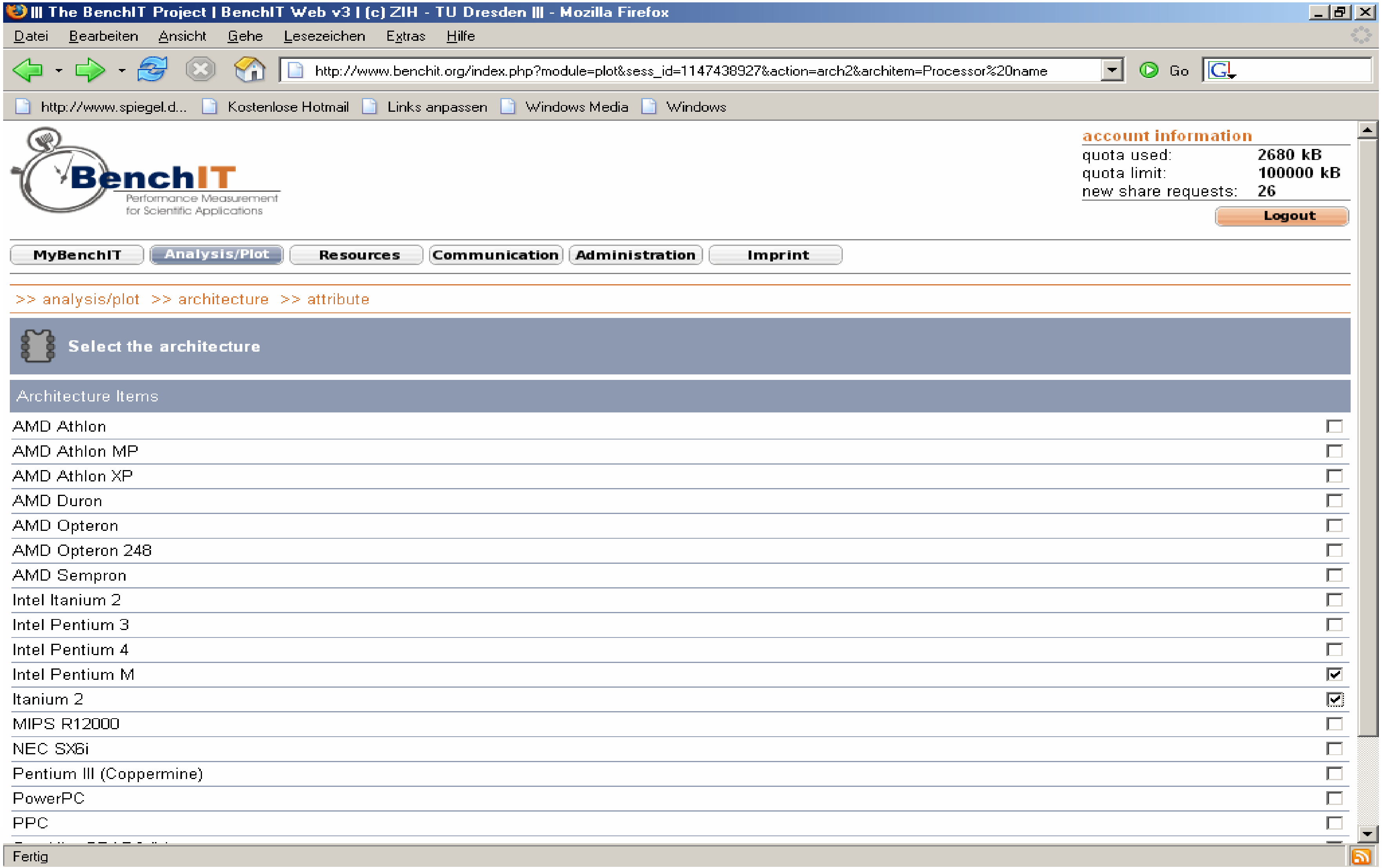
quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

>> analysis/plot >> architecture >> attribute

Select the architecture

Architecture Items	
AMD Athlon	☐
AMD Athlon MP	☐
AMD Athlon XP	☐
AMD Duron	☐
AMD Opteron	☐
AMD Opteron 248	☐
AMD Sempron	☐
Intel Itanium 2	☐
Intel Pentium 3	☐
Intel Pentium 4	☐
Intel Pentium M	☐
Itanium 2	☐
MIPS R12000	☐
NEC SX6i	☐
Pentium III (Coppermine)	☐
PowerPC	☐
PPC	☐

Compare Different … Intel Pentiums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http://www.benchit.org/index.php?module=plot&sess_id=1147438927&action=arch2&architem=Processor%20name

account information

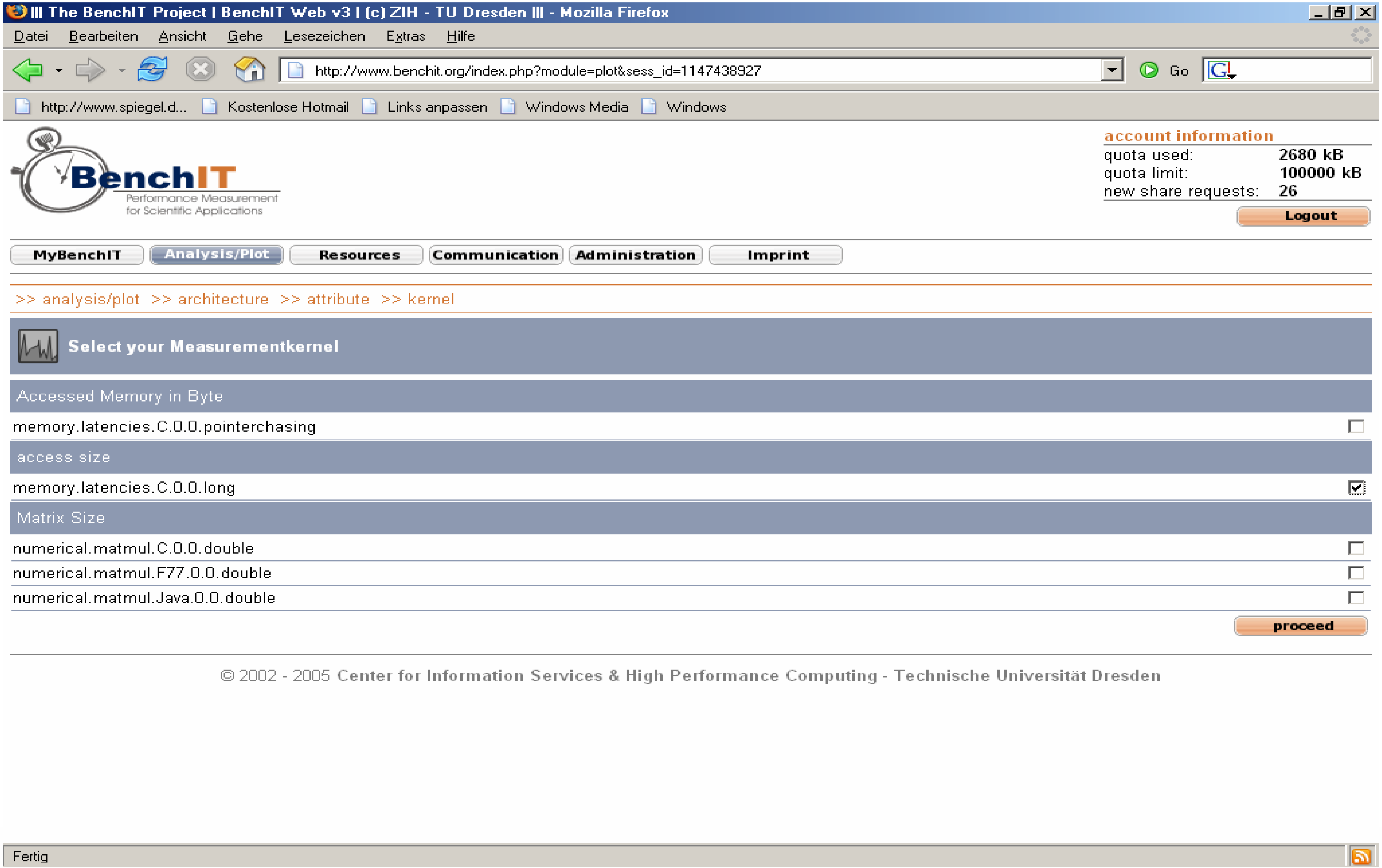
quota used:	2680 kB
quota limit:	100000 kB
new share requests:	26

>> analysis/plot >> architecture >> attribute

Select the architecture

Architecture Items	
AMD Athlon	☐
AMD Athlon MP	☐
AMD Athlon XP	☐
AMD Duron	☐
AMD Opteron	☐
AMD Opteron 248	☐
AMD Sempron	☐
Intel Itanium 2	☐
Intel Pentium 3	☐
Intel Pentium 4	☐
Intel Pentium M	☑
Itanium 2	☑
MIPS R12000	☐
NEC SX6i	☐
Pentium III (Coppermine)	☐
PowerPC	☐
PPC	☐

Compare Different … Kernels which Run on Both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account information

quota used:	2680 kB
quota limit:	100000 kB
new share requests:	26

>> analysis/plot >> architecture >> attribute >> kernel

Select your Measurementkernel

Accessed Memory in Byte	
memory.latencies.C.0.0.pointerchasing	☐
access size	
memory.latencies.C.0.0.long	☑
Matrix Size	
numerical.matmul.C.0.0.double	☐
numerical.matmul.F77.0.0.double	☐
numerical.matmul.Java.0.0.double	☐

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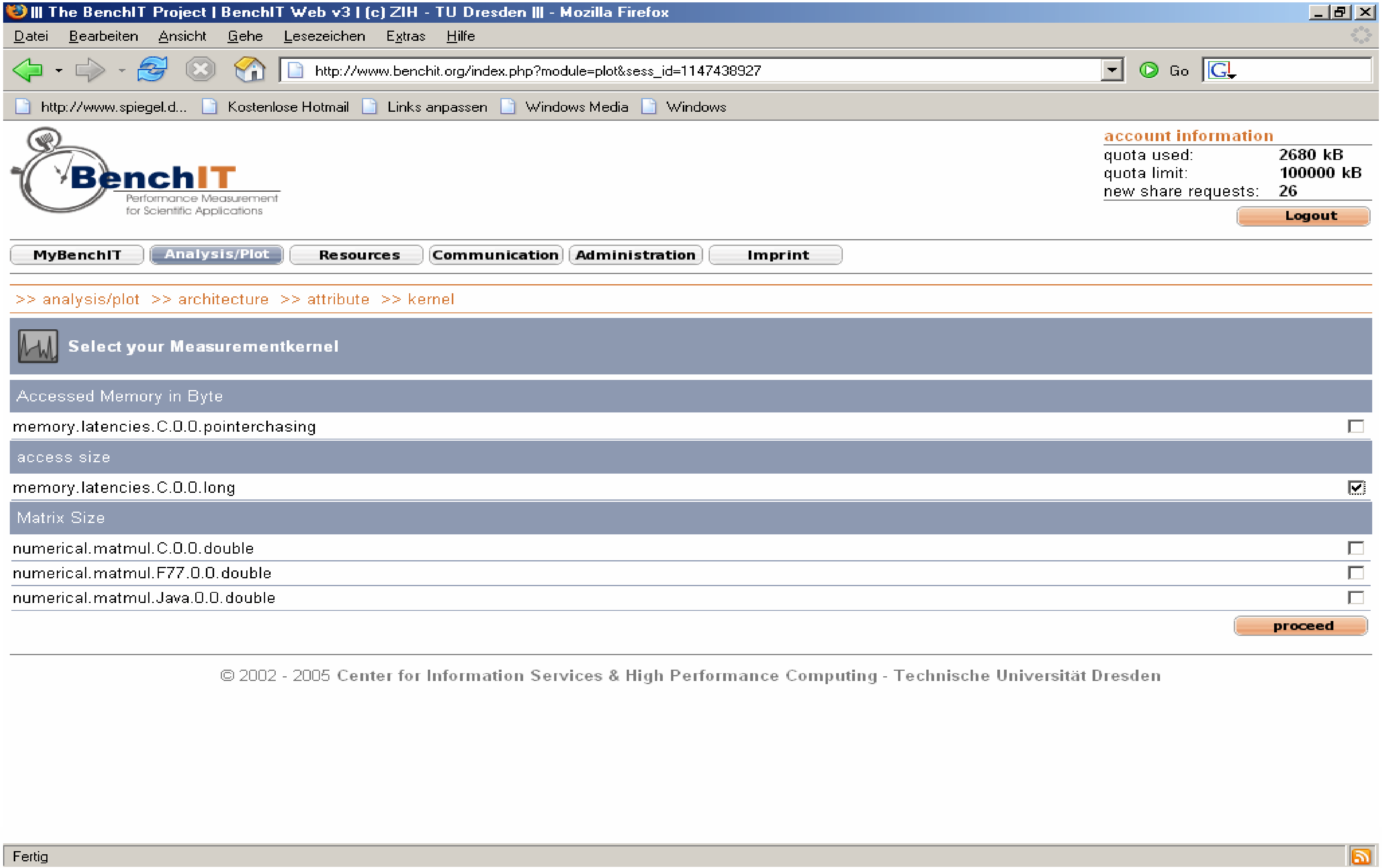
Compare their Memory Access Times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account information

quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

>> analysis/plot >> architecture >> attribute >> kernel

Select your Measurementkernel

Accessed Memory in Byte

memory.latencies.C.0.0.pointerchasing ☐

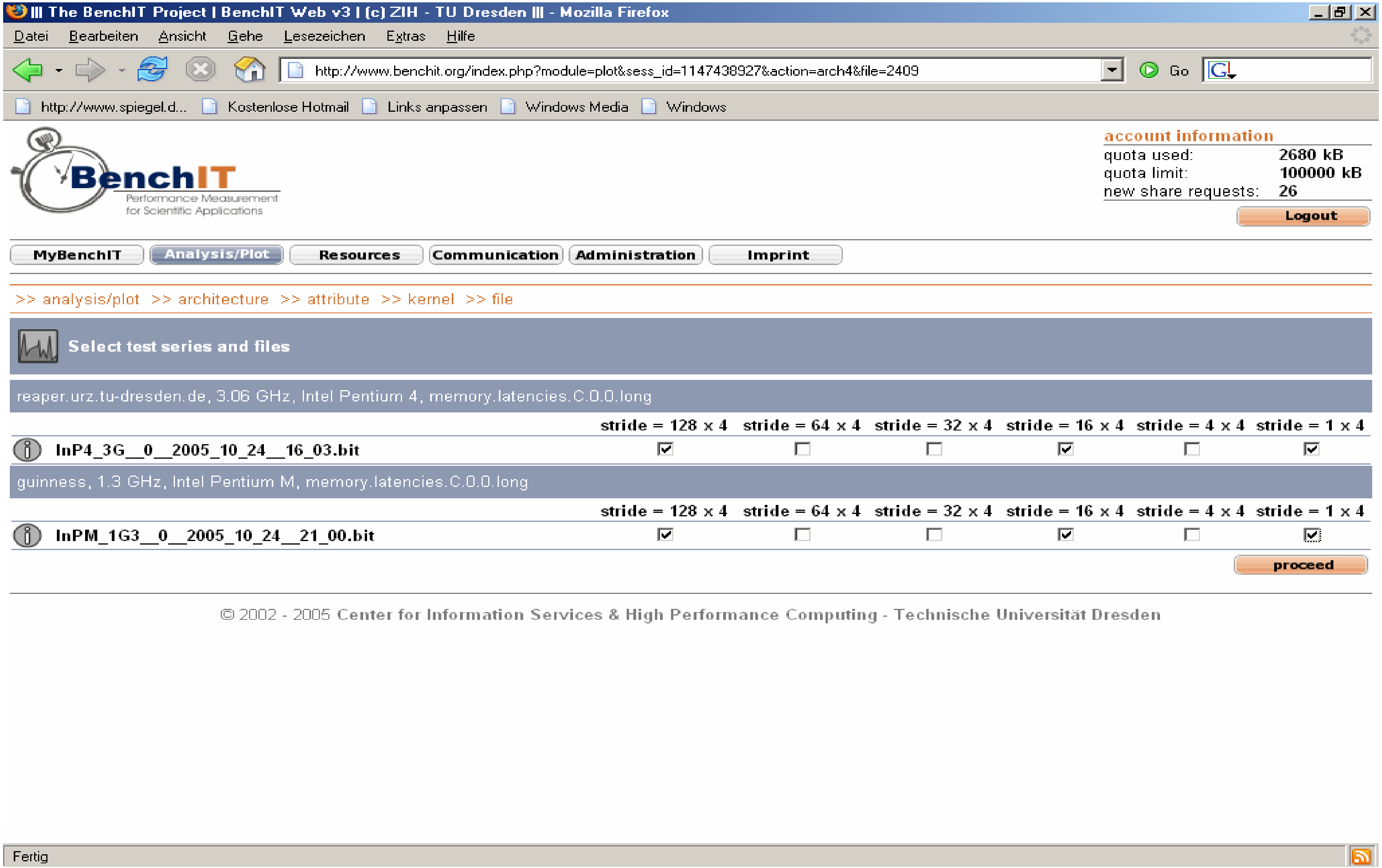
access size

memory.latencies.C.0.0.long ☑

Matrix Size

numerical.matmul.C.0.0.double ☐
numerical.matmul.F77.0.0.double ☐
numerical.matmul.Java.0.0.double ☐

Compare their Memory Access Times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http://www.benchit.org/index.php?module=plot&sess_id=1147438927&action=arch4&file=2409

account information

quota used:	2680 kB
quota limit:	100000 kB
new share requests:	26

>> analysis/plot >> architecture >> attribute >> kernel >> file

Select test series and files

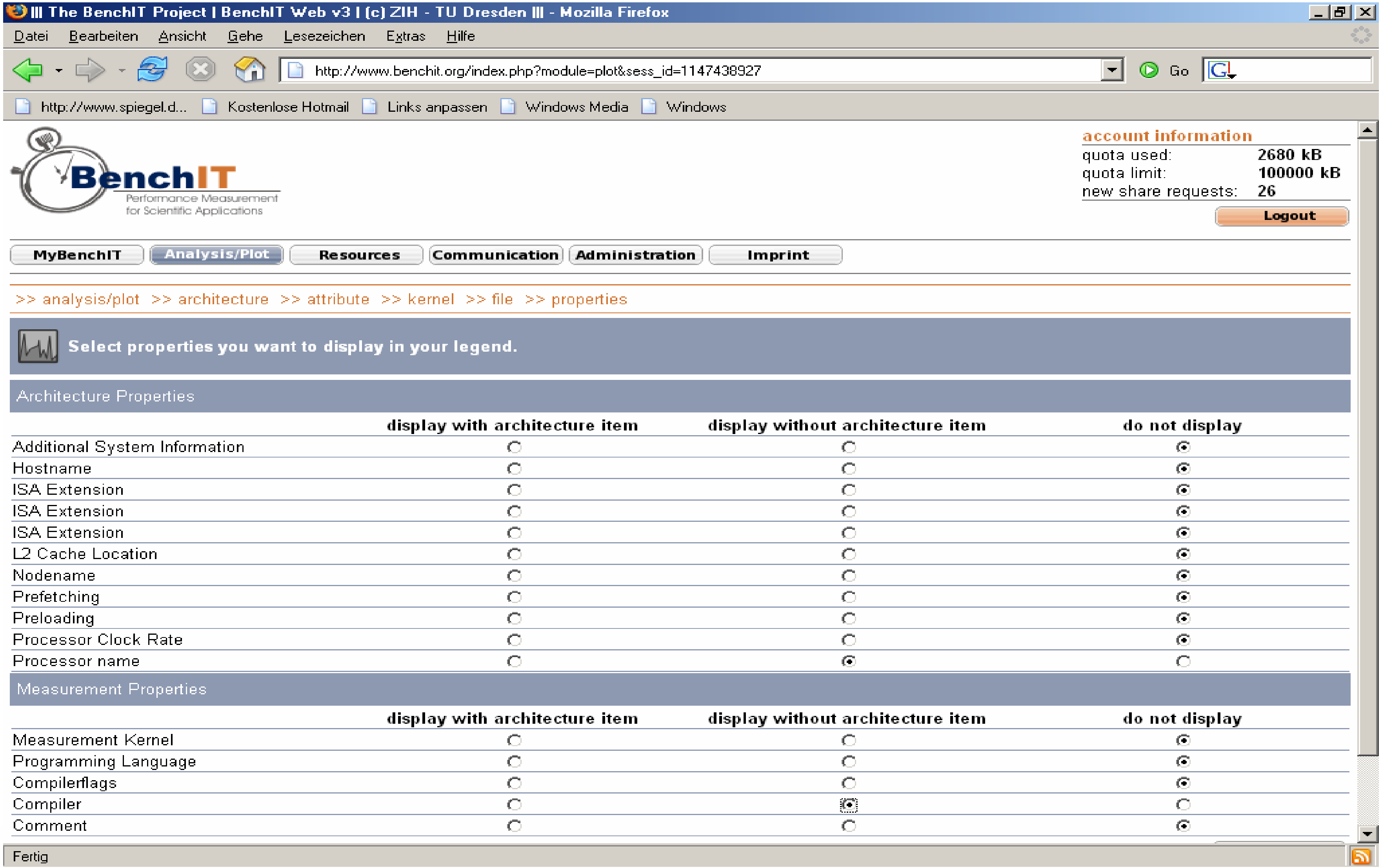
reaper.urz.tu-dresden.de, 3.06 GHz, Intel Pentium 4, memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
InP4_3G__0__2005_10_24__16_03.bit	☑	☐	☐	☑	☐	☑

guinness, 1.3 GHz, Intel Pentium M, memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
InPM_1G3__0__2005_10_24__21_00.bit	☑	☐	☐	☑	☐	☑

Select Additional Information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http://www.benchit.org/index.php?module=plot&sess_id=1147438927

account information

quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

>> analysis/plot >> architecture >> attribute >> kernel >> file >> properties

Select properties you want to display in your legend.

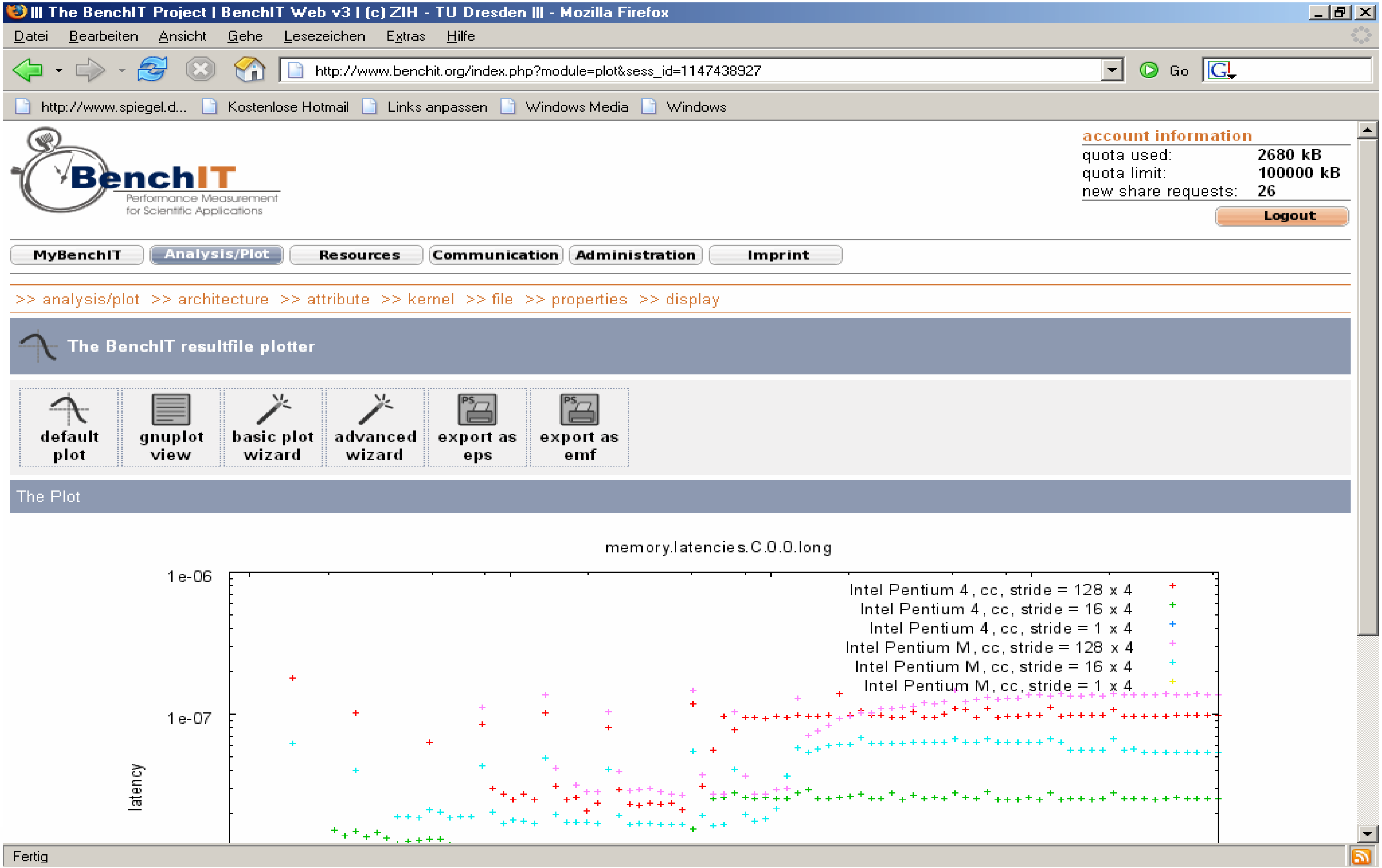
Architecture Properties

	display with architecture item	display without architecture item	do not display
Additional System Information	○	○	●
Hostname	○	○	●
ISA Extension	○	○	●
ISA Extension	○	○	●
ISA Extension	○	○	●
L2 Cache Location	○	○	●
Nodename	○	○	●
Prefetching	○	○	●
Preloading	○	○	●
Processor Clock Rate	○	○	●
Processor name	○	●	○

Measurement Properties

	display with architecture item	display without architecture item	do not display
Measurement Kernel	○	○	●
Programming Language	○	○	●
Compilerflags	○	○	●
Compiler	○	●	○
Comment	○	○	●

Compared Results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>> architecture
>> attribute
>> kernel
>> file
>> properties
>> display
The BenchIT resultfile plotter
default plot
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
memory.latencies.C.0.0.long
1 e-06
1 e-07
latency
Intel Pentium 4, cc, stride = 128 x 4
Intel Pentium 4, cc, stride = 16 x 4
Intel Pentium 4, cc, stride = 1 x 4
Intel Pentium M, cc, stride = 128 x 4
Intel Pentium M, cc, stride = 16 x 4
Intel Pentium M, cc, stride = 1 x 4
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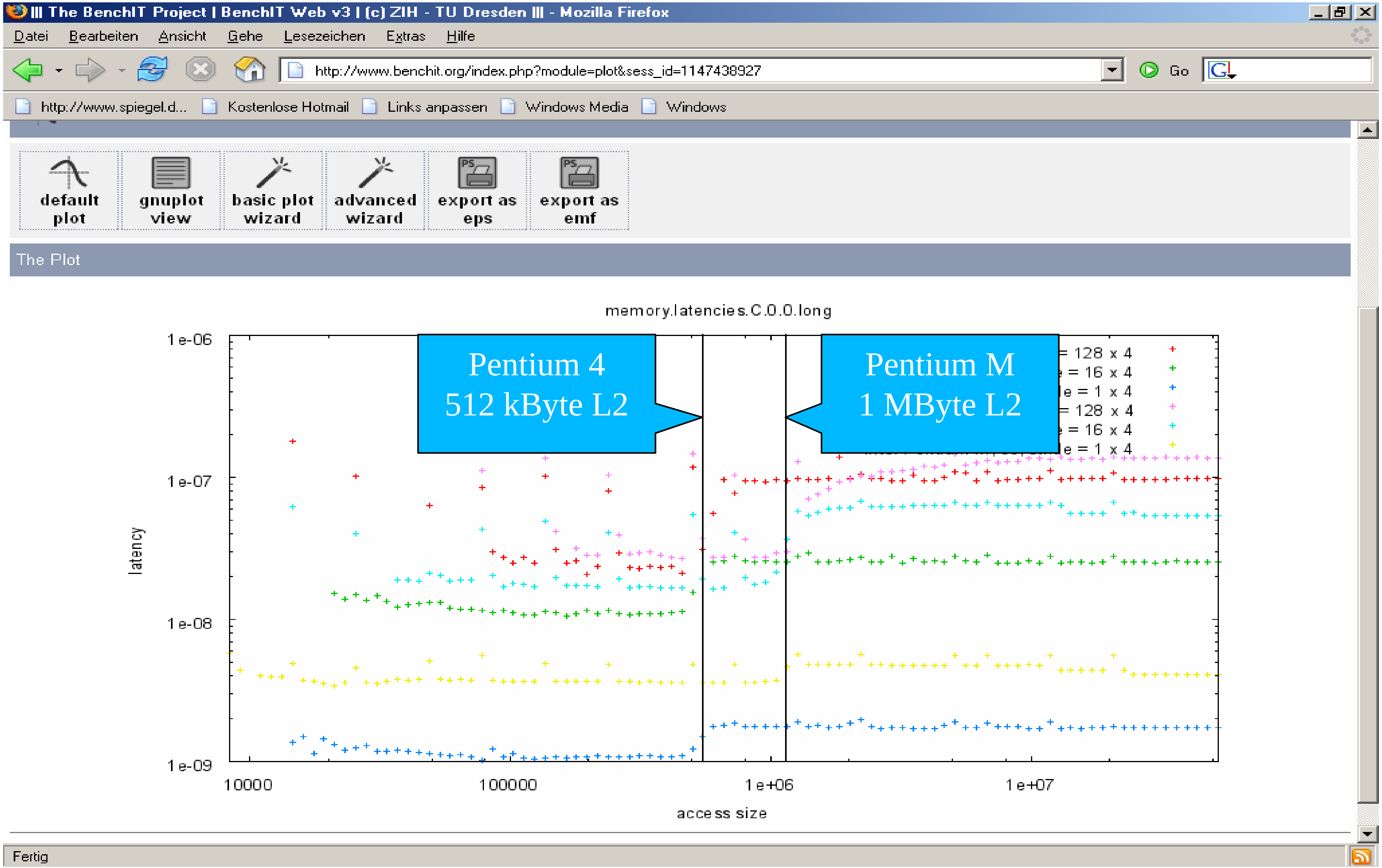
http://www.benchit.org/index.php?module=plot&sess_id=1147438927

account information

quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

Compared Results


III The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden III - Mozilla Firefox
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http://www.benchit.org/index.php?module=plot&sess_id=1147438927
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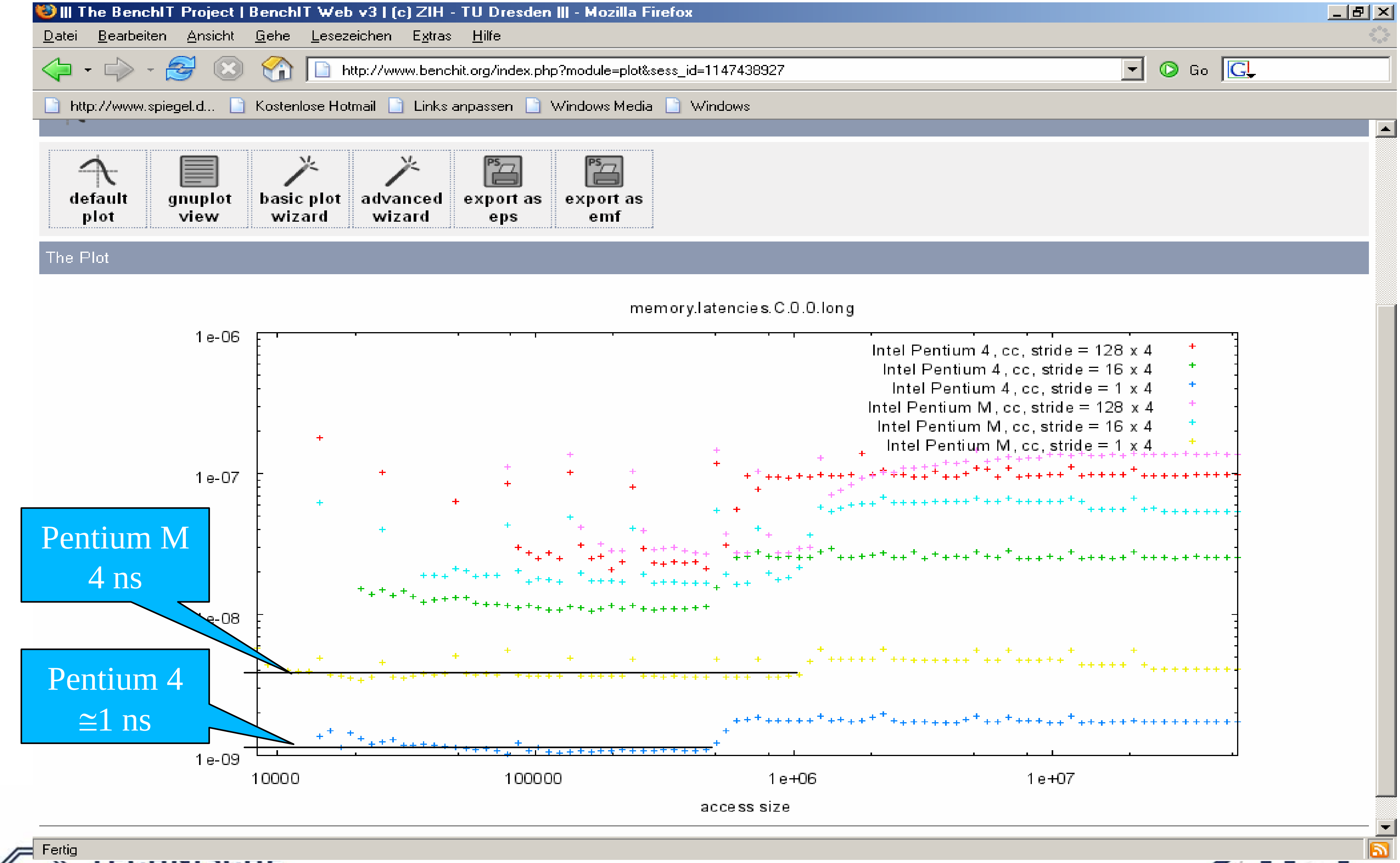
default plot
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
memory.latencies.C.0.0.long
latency
access size
1 e-06
1 e-07
1 e-08
1 e-09
10000
100000
1 e+06
1 e+07
= 128 x 4
= 16 x 4
e = 1 x 4
= 128 x 4
= 16 x 4
e = 1 x 4
Fertig

Pentium 4
512 kByte L2

Pentium M
1 MByte L2

Compared Results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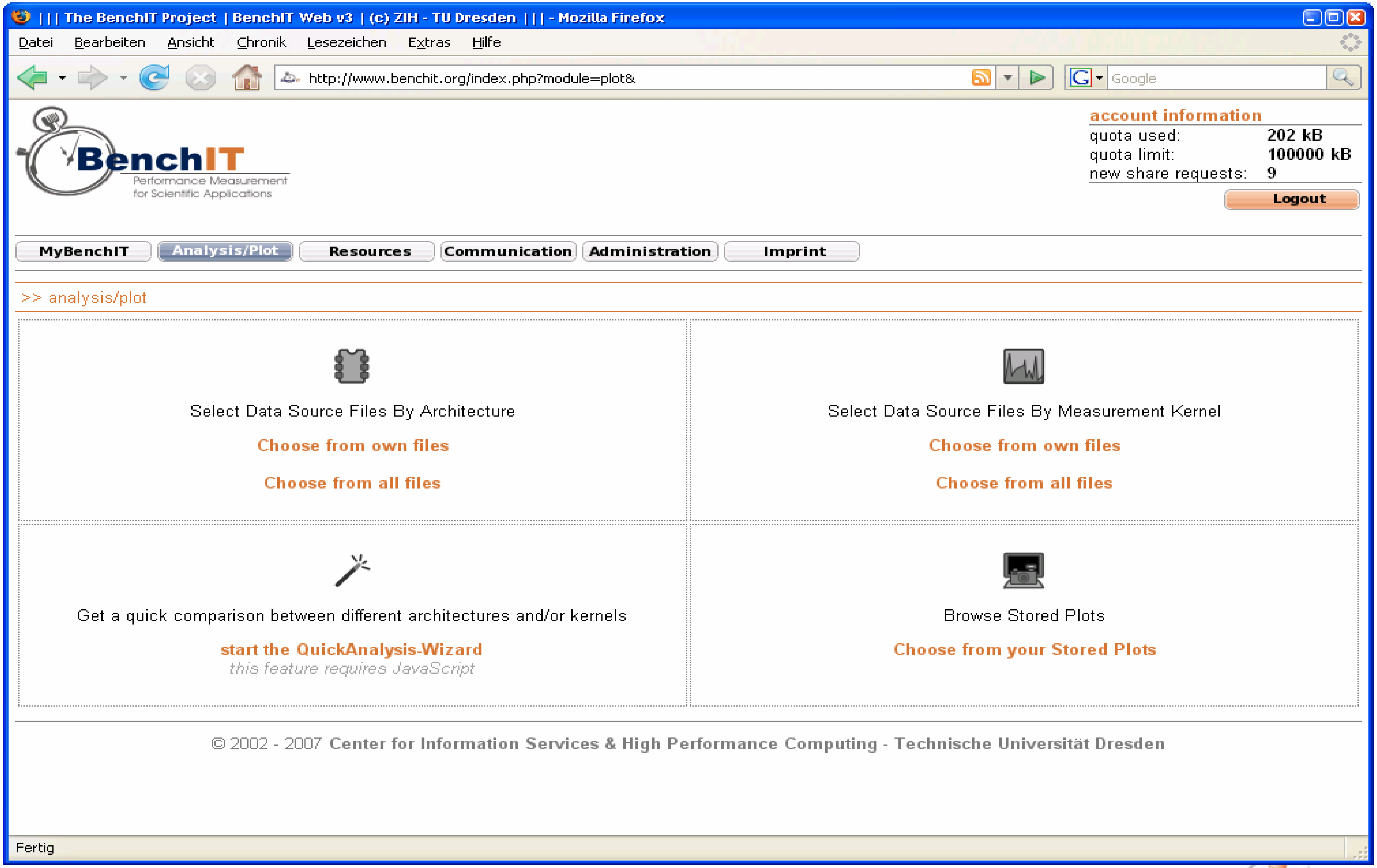
advanced wizard
export as eps
export as emf
The Plot
memory.latencies.C.0.0.long
1e-06
1e-07
1e-08
1e-09
10000
100000
1e+06
1e+07
access size
Intel Pentium 4, cc, stride = 128 x 4
Intel Pentium 4, cc, stride = 16 x 4
Intel Pentium 4, cc, stride = 1 x 4
Intel Pentium M, cc, stride = 128 x 4
Intel Pentium M, cc, stride = 16 x 4
Intel Pentium M, cc, stride = 1 x 4
Fertig

Pentium M
4 ns

Pentium 4
≅1 ns

How does this work on other CPUs?

Compare a Kernel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Analysis/Plot
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Communication
Administration
Imprint
Fertig

http://www.benchit.org/index.php?module=plot&

BenchIT
Performance Measurement for Scientific Applications

account information

quota used:	202 kB
quota limit:	100000 kB
new share requests:	9

>> analysis/plot

Select Data Source Files By Architecture

Choose from own files

Choose from all files

Select Data Source Files By Measurement Kernel

Choose from own files

Choose from all files

Get a quick comparison between different architectures and/or kernels

start the QuickAnalysis-Wizard

this feature requires JavaScript

Browse Stored Plots

Choose from your Stored Plots

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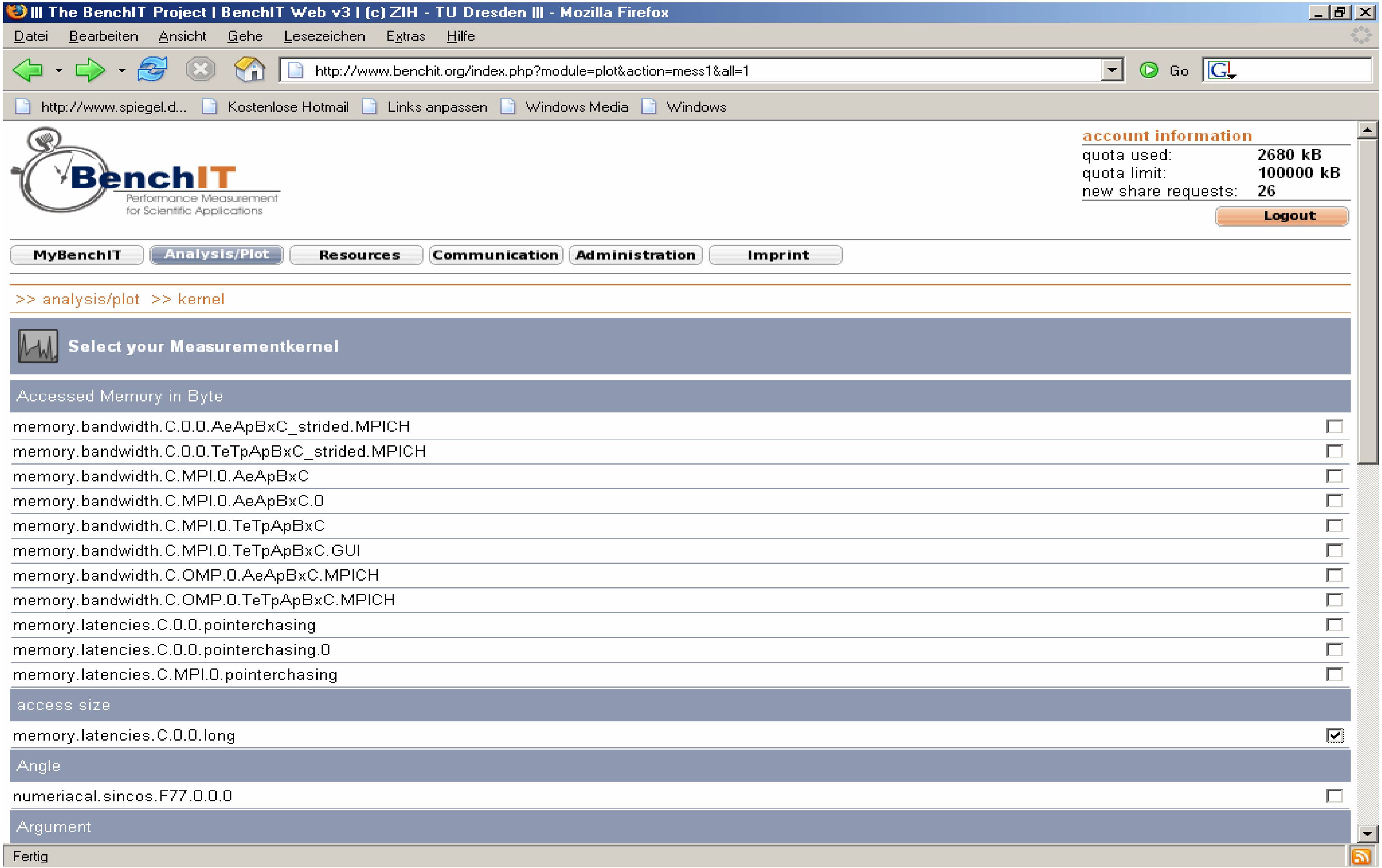
Compare Memory Latencies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http://www.benchit.org/index.php?module=plot&action=mess1&all=1

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account information

quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

>> analysis/plot >> kernel

Select your Measurementkernel

Accessed Memory in Byte

- memory.bandwidth.C.0.0.AeApBxC_strided.MPICH ☐
- memory.bandwidth.C.0.0.TeTpApBxC_strided.MPICH ☐
- memory.bandwidth.C.MPI.0.AeApBxC ☐
- memory.bandwidth.C.MPI.0.AeApBxC.0 ☐
- memory.bandwidth.C.MPI.0.TeTpApBxC ☐
- memory.bandwidth.C.MPI.0.TeTpApBxC.GUI ☐
- memory.bandwidth.C.OMP.0.AeApBxC.MPICH ☐
- memory.bandwidth.C.OMP.0.TeTpApBxC.MPICH ☐
- memory.latencies.C.0.0.pointerchasing ☐
- memory.latencies.C.0.0.pointerchasing.0 ☐
- memory.latencies.C.MPI.0.pointerchasing ☐

access size

- memory.latencies.C.0.0.long ☑

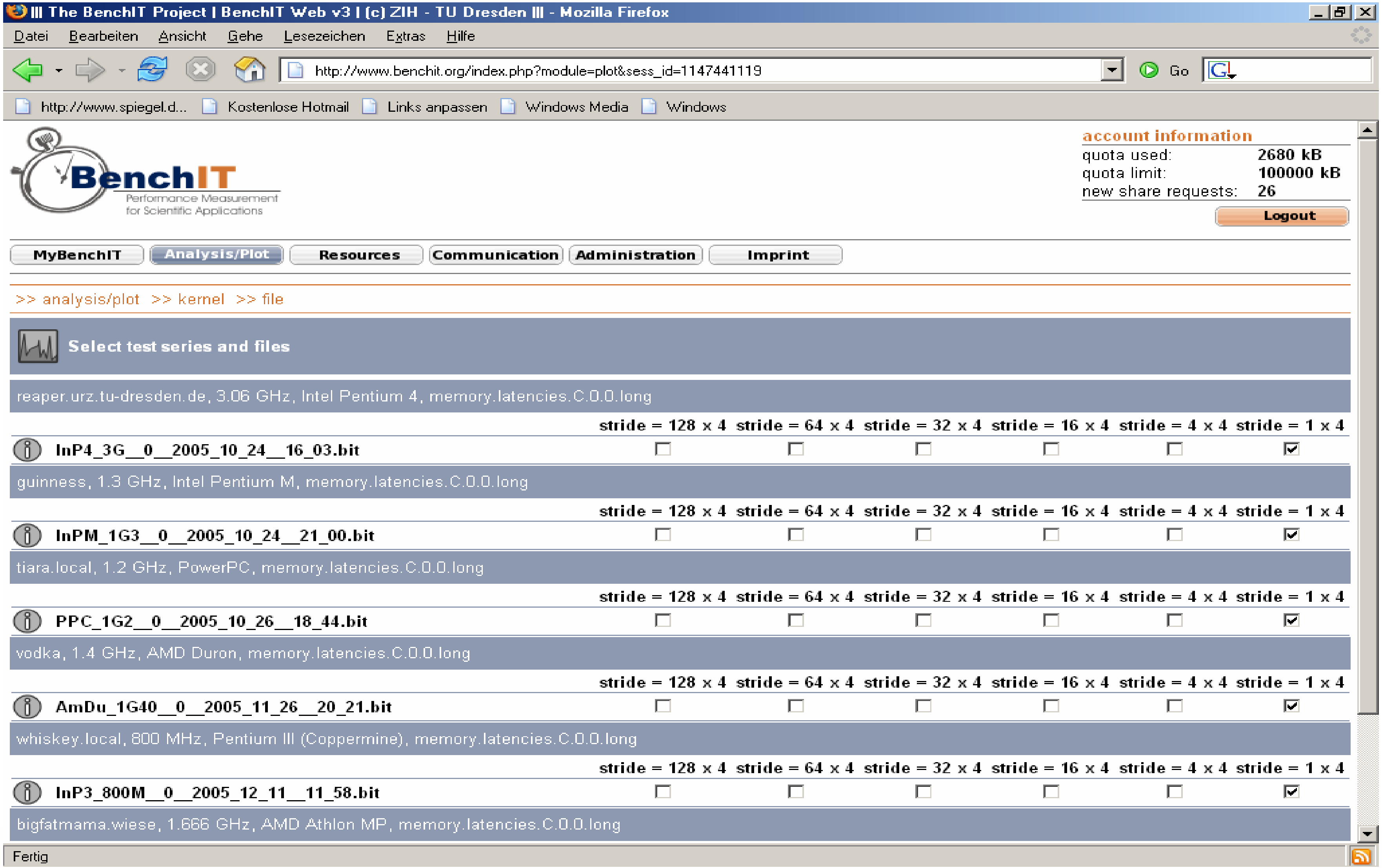
Angle

- numeriacal.sincos.F77.0.0.0 ☐

Argument

Fertig

Compare over a Larger Set of CPUs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Performance Measurement for Scientific Applications
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MyBenchIT
Analysis/Plot
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Communication
Administration
Imprint
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http://www.benchit.org/index.php?module=plot&sess_id=1147441119

account information

quota used: 2680 kB
quota limit: 100000 kB
new share requests: 26

>> analysis/plot >> kernel >> file

Select test series and files

reaper.urz.tu-dresden.de, 3.06 GHz, Intel Pentium 4, memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
InP4_3G__0__2005_10_24__16_03.bit	☐	☐	☐	☐	☐	☑

guinness, 1.3 GHz, Intel Pentium M, memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
InPM_1G3__0__2005_10_24__21_00.bit	☐	☐	☐	☐	☐	☑

tiara.local, 1.2 GHz, PowerPC, memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
PPC_1G2__0__2005_10_26__18_44.bit	☐	☐	☐	☐	☐	☑

vodka, 1.4 GHz, AMD Duron, memory.latencies.C.0.0.long

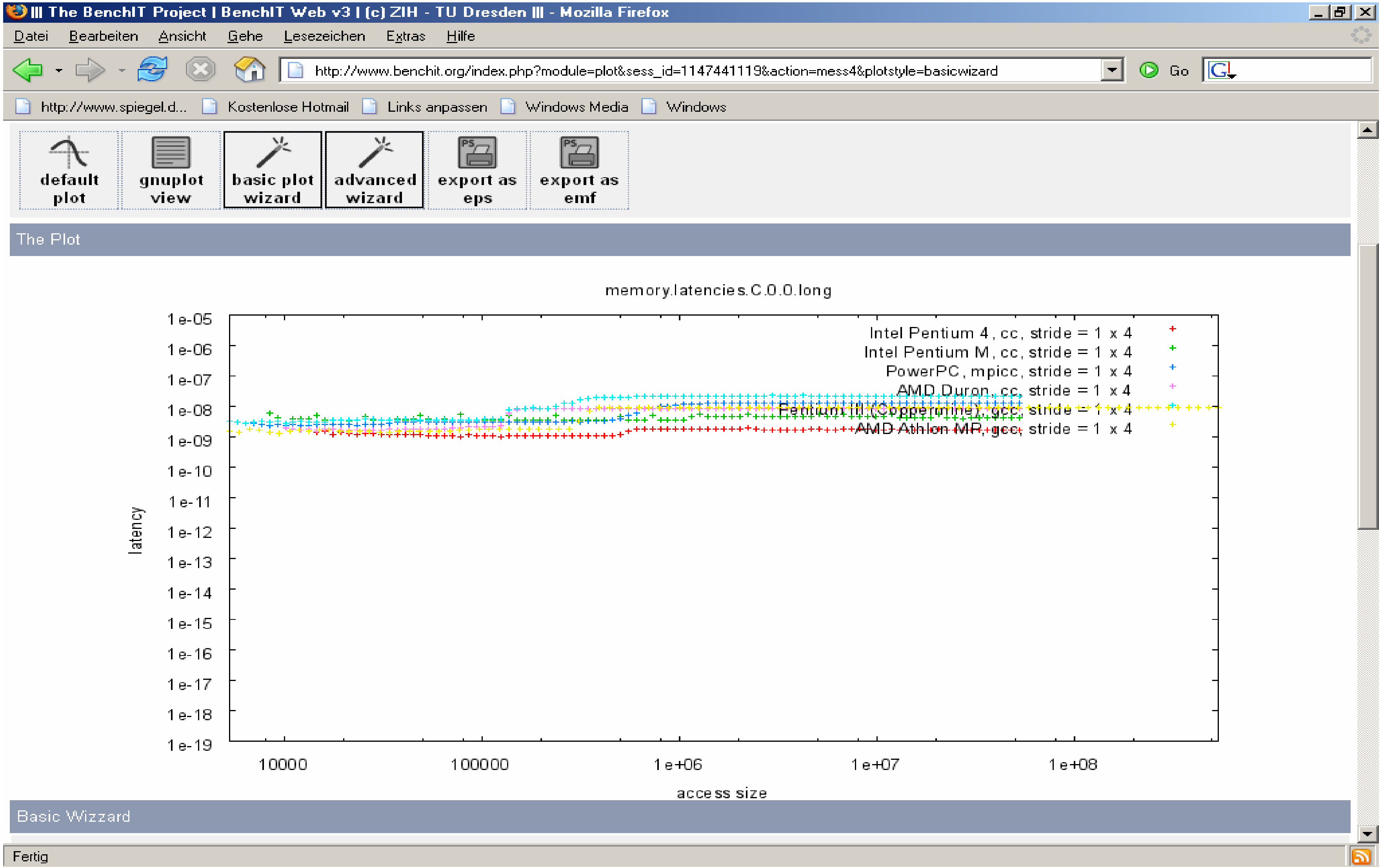
	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
AmDu_1G40__0__2005_11_26__20_21.bit	☐	☐	☐	☐	☐	☑

whiskey.local, 800 MHz, Pentium III (Coppermine), memory.latencies.C.0.0.long

	stride = 128 x 4	stride = 64 x 4	stride = 32 x 4	stride = 16 x 4	stride = 4 x 4	stride = 1 x 4
InP3_800M__0__2005_12_11__11_58.bit	☐	☐	☐	☐	☐	☑

bigfatmama.wiese, 1.666 GHz, AMD Athlon MP, memory.latencies.C.0.0.long

Not Satisfying?



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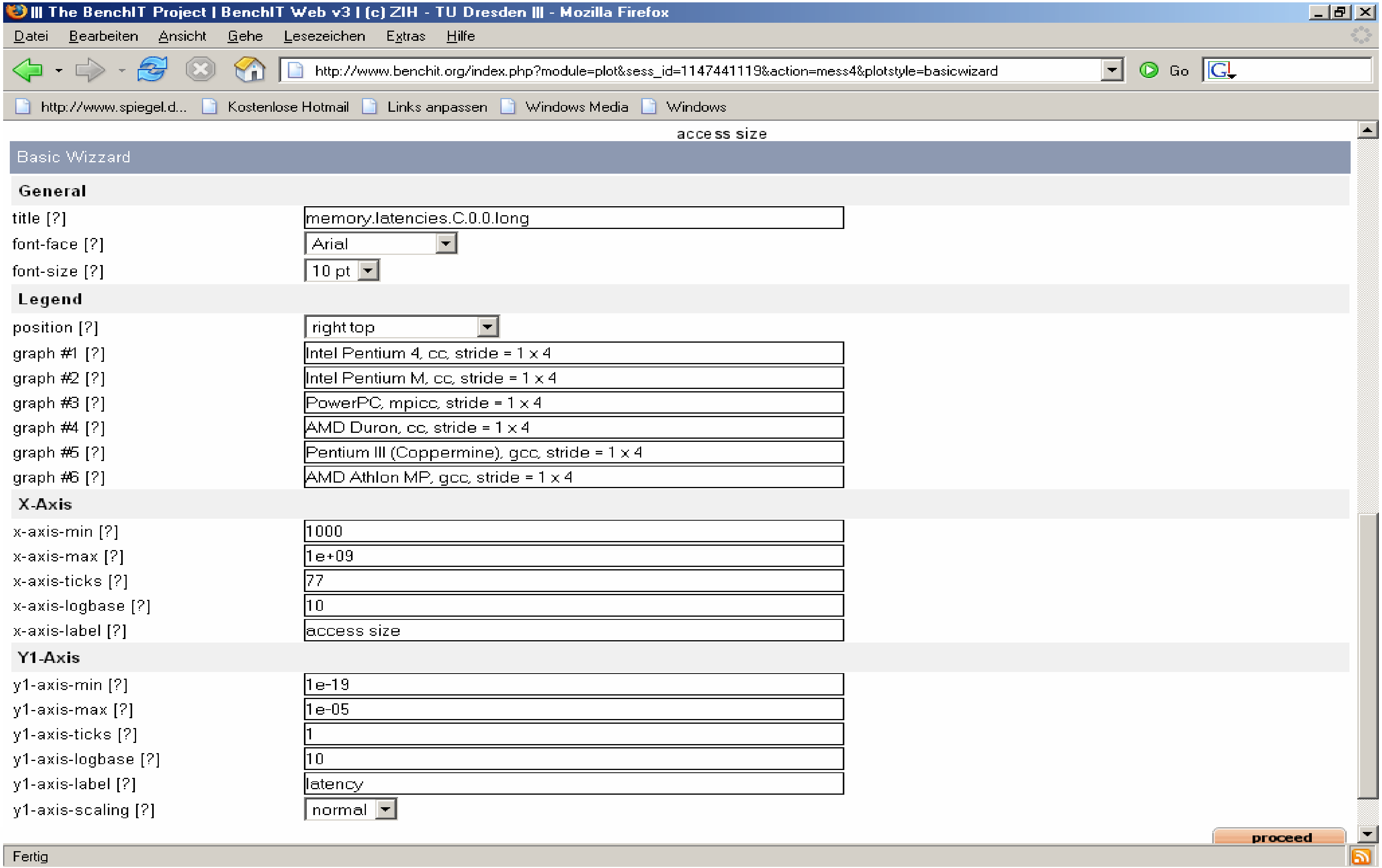
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
memory.latencies.C.0.0.long
1e-05
1e-06
1e-07
1e-08
1e-09
1e-10
1e-11
1e-12
1e-13
1e-14
1e-15
1e-16
1e-17
1e-18
1e-19
latency
10000
100000
1e+06
1e+07
1e+08
access size
Intel Pentium 4, cc, stride = 1 x 4
Intel Pentium M, cc, stride = 1 x 4
PowerPC, mpicc, stride = 1 x 4
AMD Duron, cc, stride = 1 x 4
Pentium III (Coppermine), gcc, stride = 1 x 4
AMD Athlon MP, gcc, stride = 1 x 4
Basic Wizzard
Fertig

http://www.benchit.org/index.php?module=plot&sess_id=1147441119&action=mess4&plotstyle=basicwizard

Basic Settings …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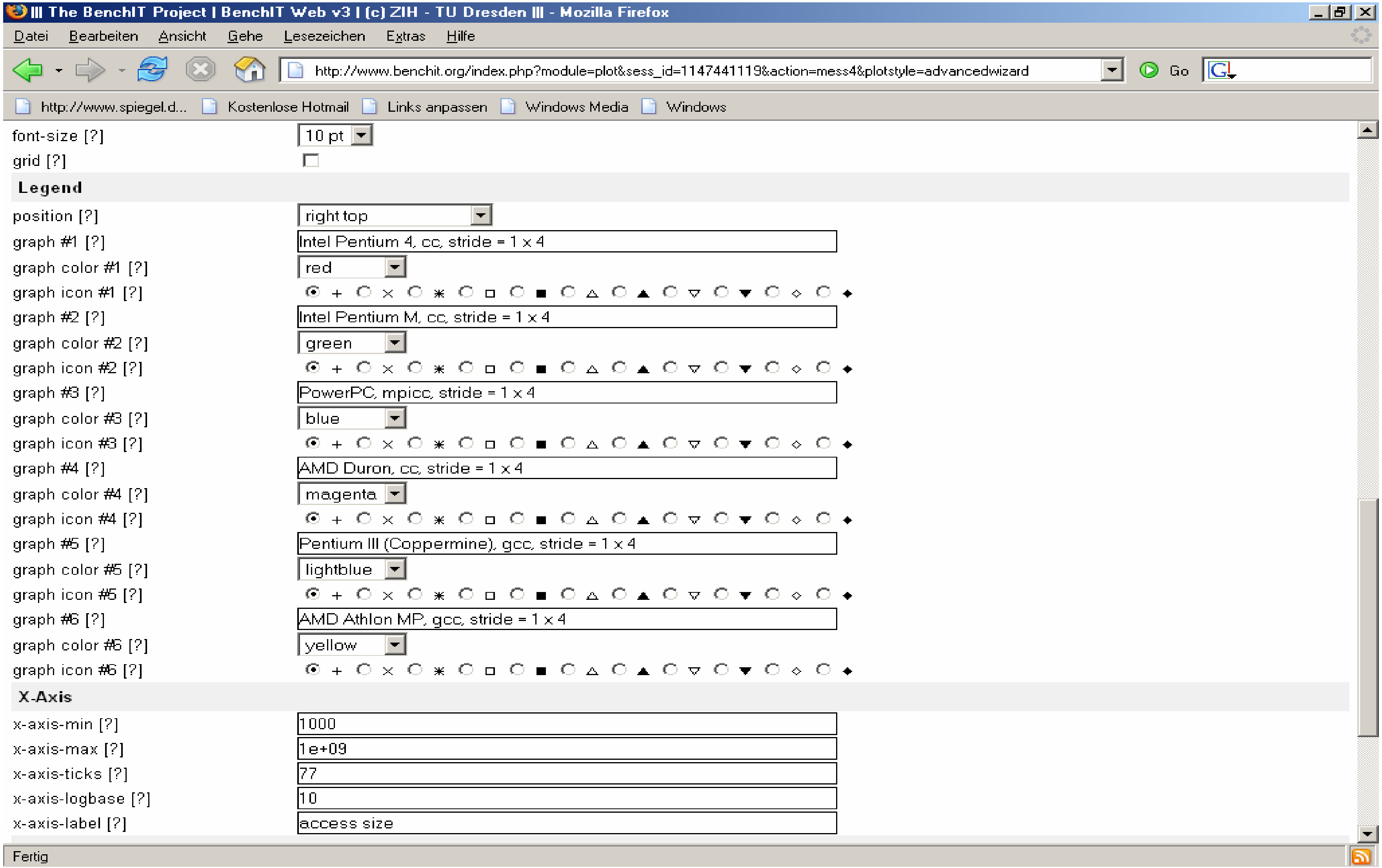
Links anpassen
Windows Media
Windows
access size
Basic Wizzard
proceed
Fertig

General	
title [?]	memory.latencies.C.0.0.long
font-face [?]	Arial
font-size [?]	10 pt
Legend	
position [?]	right top
graph #1 [?]	Intel Pentium 4, cc, stride = 1 x 4
graph #2 [?]	Intel Pentium M, cc, stride = 1 x 4
graph #3 [?]	PowerPC, mpicc, stride = 1 x 4
graph #4 [?]	AMD Duron, cc, stride = 1 x 4
graph #5 [?]	Pentium III (Coppermine), gcc, stride = 1 x 4
graph #6 [?]	AMD Athlon MP, gcc, stride = 1 x 4
X-Axis	
x-axis-min [?]	1000
x-axis-max [?]	1e+09
x-axis-ticks [?]	77
x-axis-logbase [?]	10
x-axis-label [?]	access size
Y1-Axis	
y1-axis-min [?]	1e-19
y1-axis-max [?]	1e-05
y1-axis-ticks [?]	1
y1-axis-logbase [?]	10
y1-axis-label [?]	latency
y1-axis-scaling [?]	normal

… and more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Fertig

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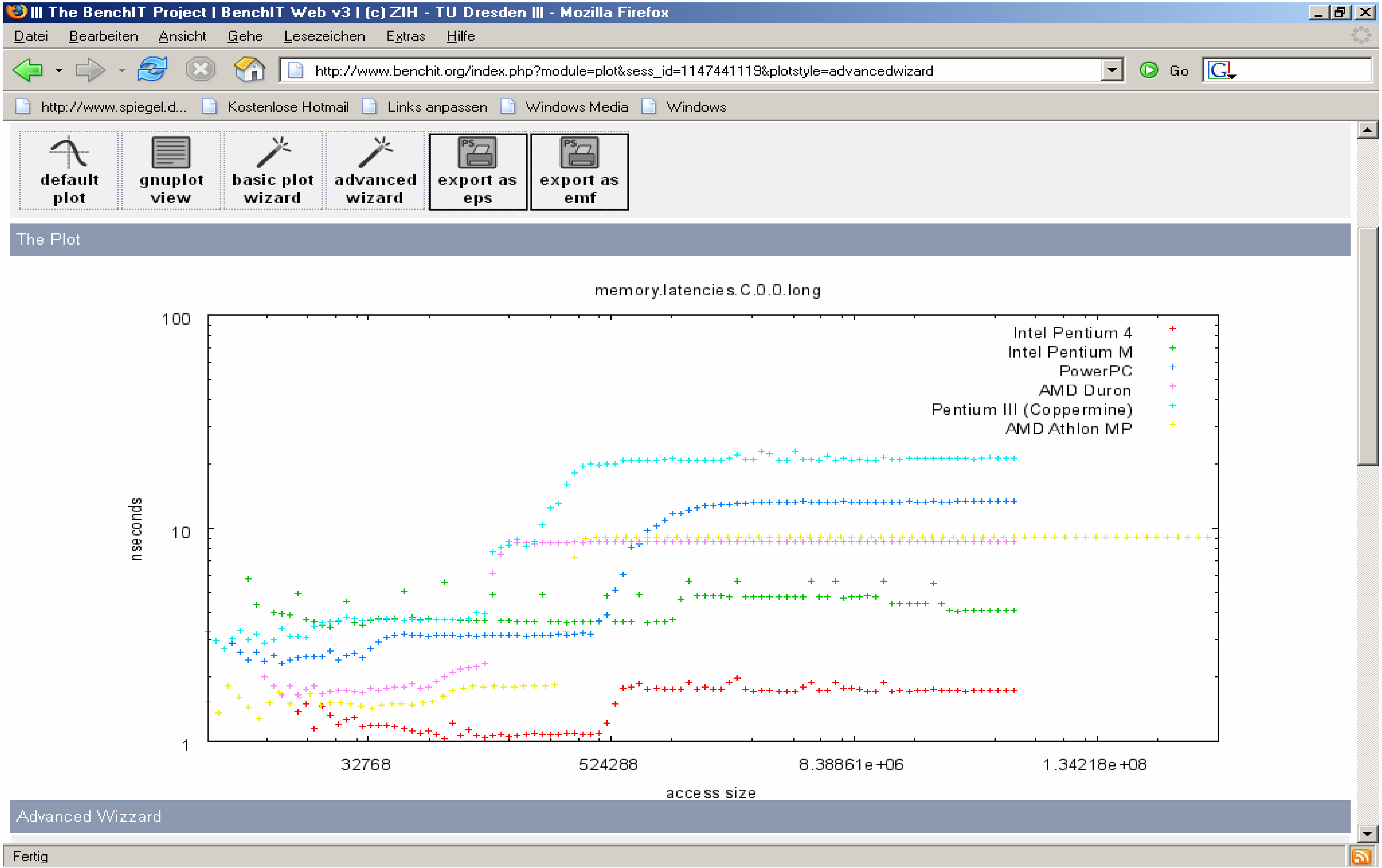
http://www.benchit.org/index.php?module=plot&sess_id=1147441119&action=mess4&plotstyle=advancedwizard

font-size [?]	10 pt
grid [?]	☐
Legend	
position [?]	right top
graph #1 [?]	Intel Pentium 4, cc, stride = 1 x 4
graph color #1 [?]	red
graph icon #1 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
graph #2 [?]	Intel Pentium M, cc, stride = 1 x 4
graph color #2 [?]	green
graph icon #2 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
graph #3 [?]	PowerPC, mpicc, stride = 1 x 4
graph color #3 [?]	blue
graph icon #3 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
graph #4 [?]	AMD Duron, cc, stride = 1 x 4
graph color #4 [?]	magenta
graph icon #4 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
graph #5 [?]	Pentium III (Coppermine), gcc, stride = 1 x 4
graph color #5 [?]	lightblue
graph icon #5 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
graph #6 [?]	AMD Athlon MP, gcc, stride = 1 x 4
graph color #6 [?]	yellow
graph icon #6 [?]	● + ○ × ○ ✱ ○ □ ○ ■ ○ △ ○ ▲ ○ ▽ ○ ▼ ○ ◇ ○ ◆
X-Axis	
x-axis-min [?]	1000
x-axis-max [?]	1e+09
x-axis-ticks [?]	77
x-axis-logbase [?]	10
x-axis-label [?]	access size

Ready for Download?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advanced wizard
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export as emf
The Plot
memory.latencies.C.0.0.long
100
10
1
nseconds
32768
524288
8.38861e+06
1.34218e+08
access size
Intel Pentium 4
Intel Pentium M
PowerPC
AMD Duron
Pentium III (Coppermine)
AMD Athlon MP
Advanced Wizzard
Fertig

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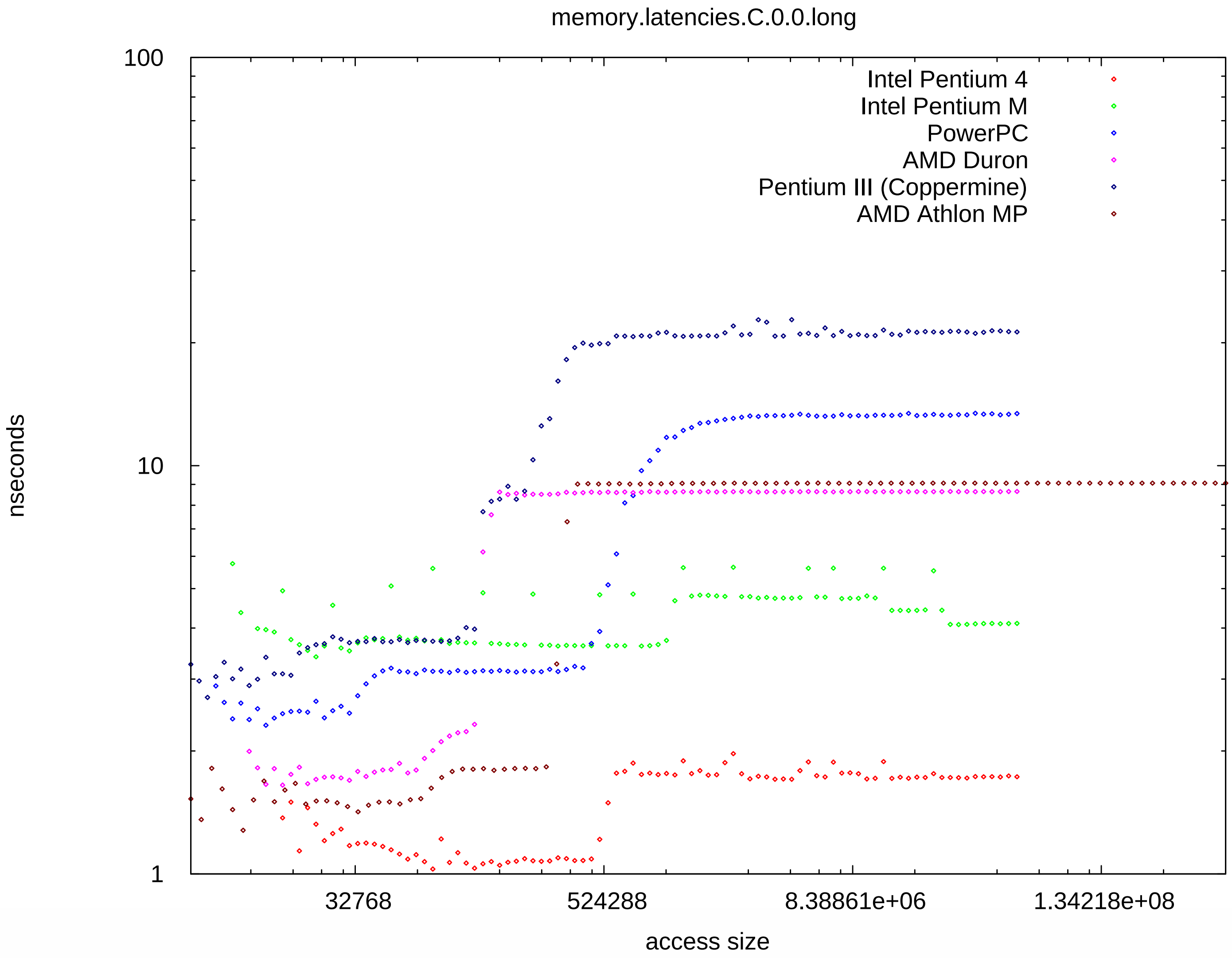
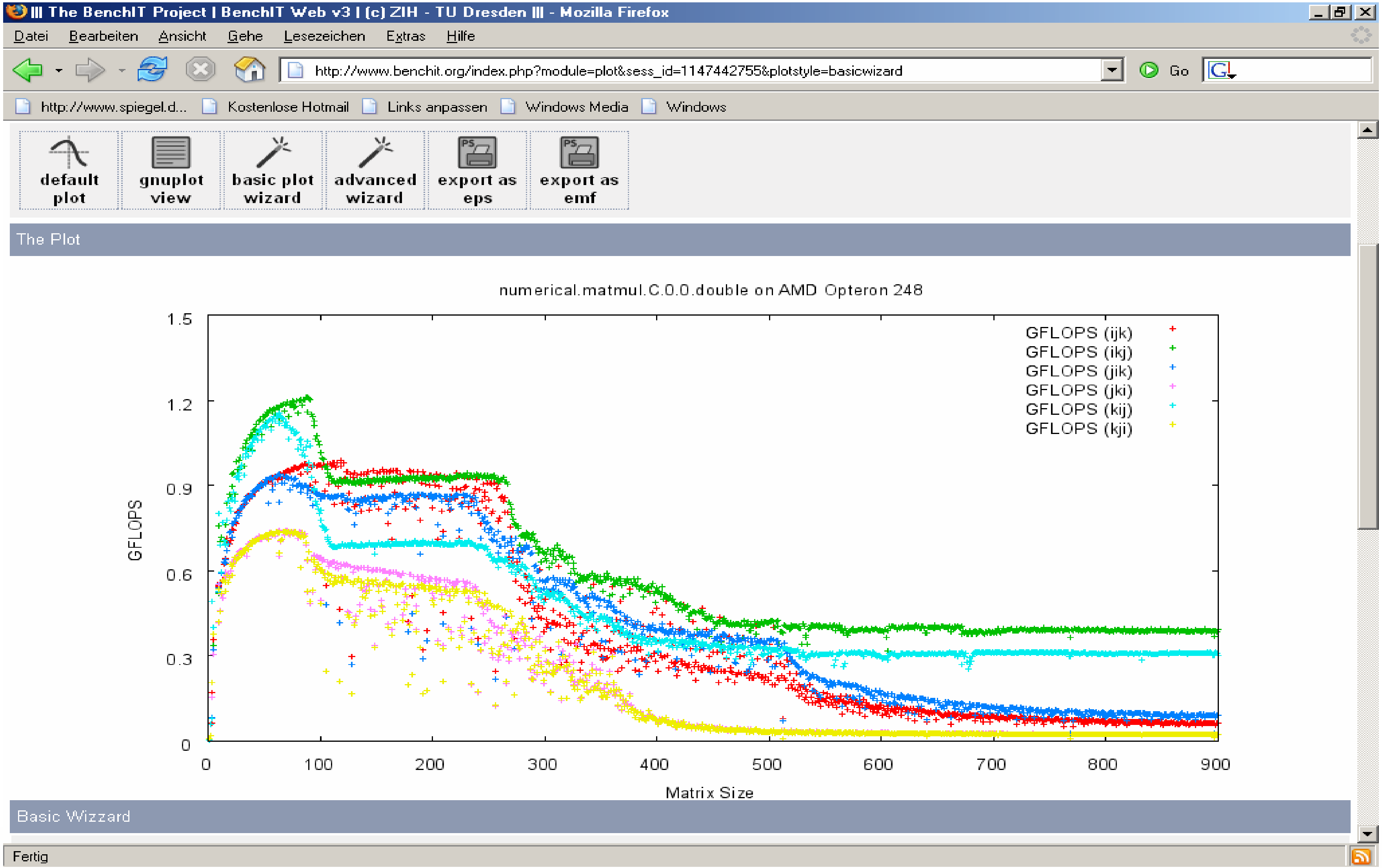
http://www.benchit.org/index.php?module=plot&sess_id=1147441119&plotstyle=advancedwizard

Scalable Graphics: eps or emf



Compare Different Implementations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advanced wizard
export as eps
export as emf
numerical.matmul.C.0.0.double on AMD Opteron 248
GFLOPS
1.5
1.2
0.9
0.6
0.3
0
0
100
200
300
400
500
600
700
800
900
Matrix Size
GFLOPS (ijk)
GFLOPS (ikj)
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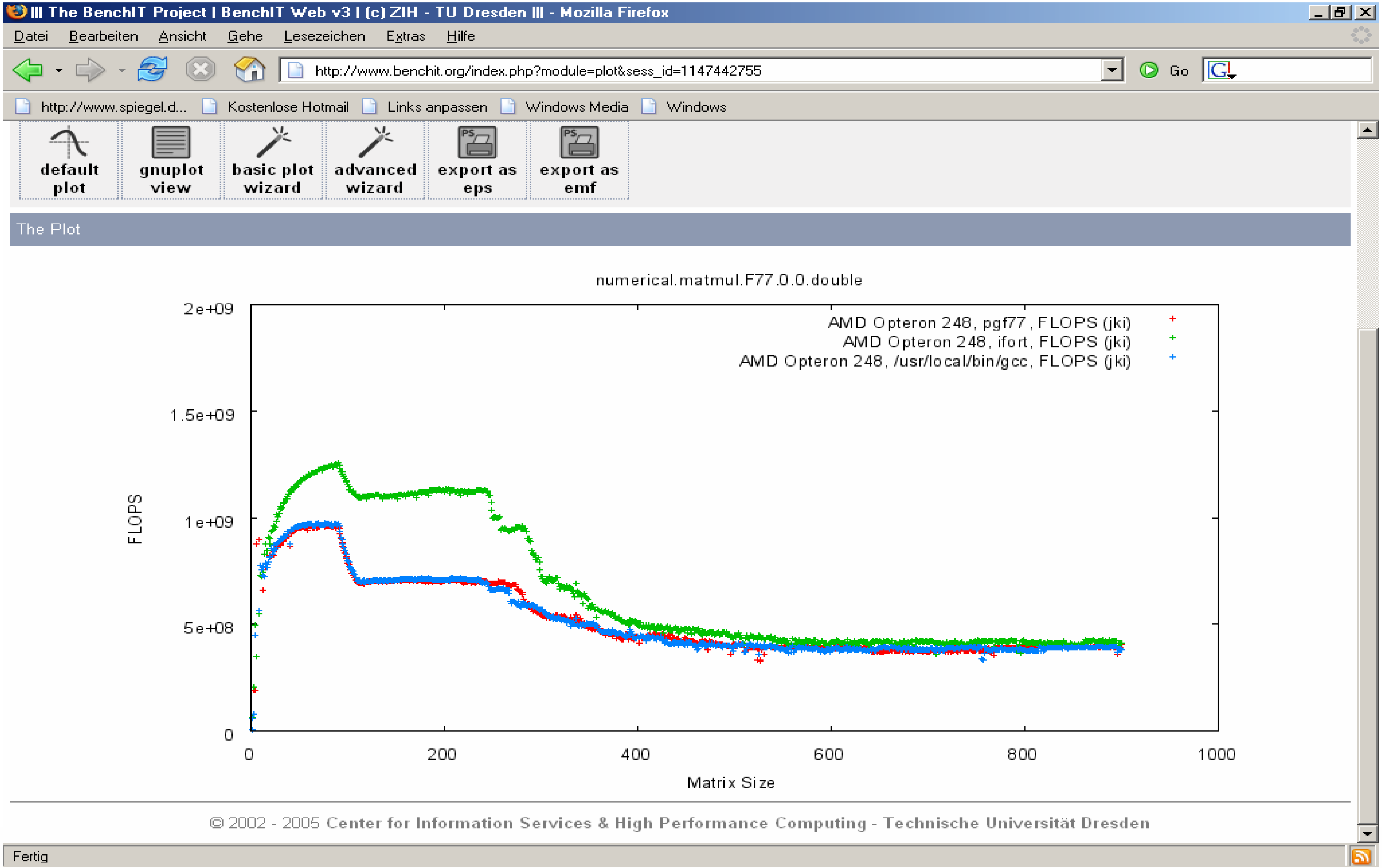
GFLOPS (jki)
GFLOPS (kij)
GFLOPS (kji)
Fertig

http://www.benchit.org/index.php?module=plot&sess_id=1147442755&plotstyle=basicwizard

The Plot

Basic Wizzard

Compare Different Compilers



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basic plot wizard
advanced wizard
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export as emf
The Plot
numerical.matmul.F77.0.0.double
AMD Opteron 248, pgf77, FLOPS (jki)
AMD Opteron 248, ifort, FLOPS (jki)
AMD Opteron 248, /usr/local/bin/gcc, FLOPS (jki)
FLOPS
2e+09
1.5e+09
1e+09
5e+08
0
0
200
400
600
800
1000
Matrix Size

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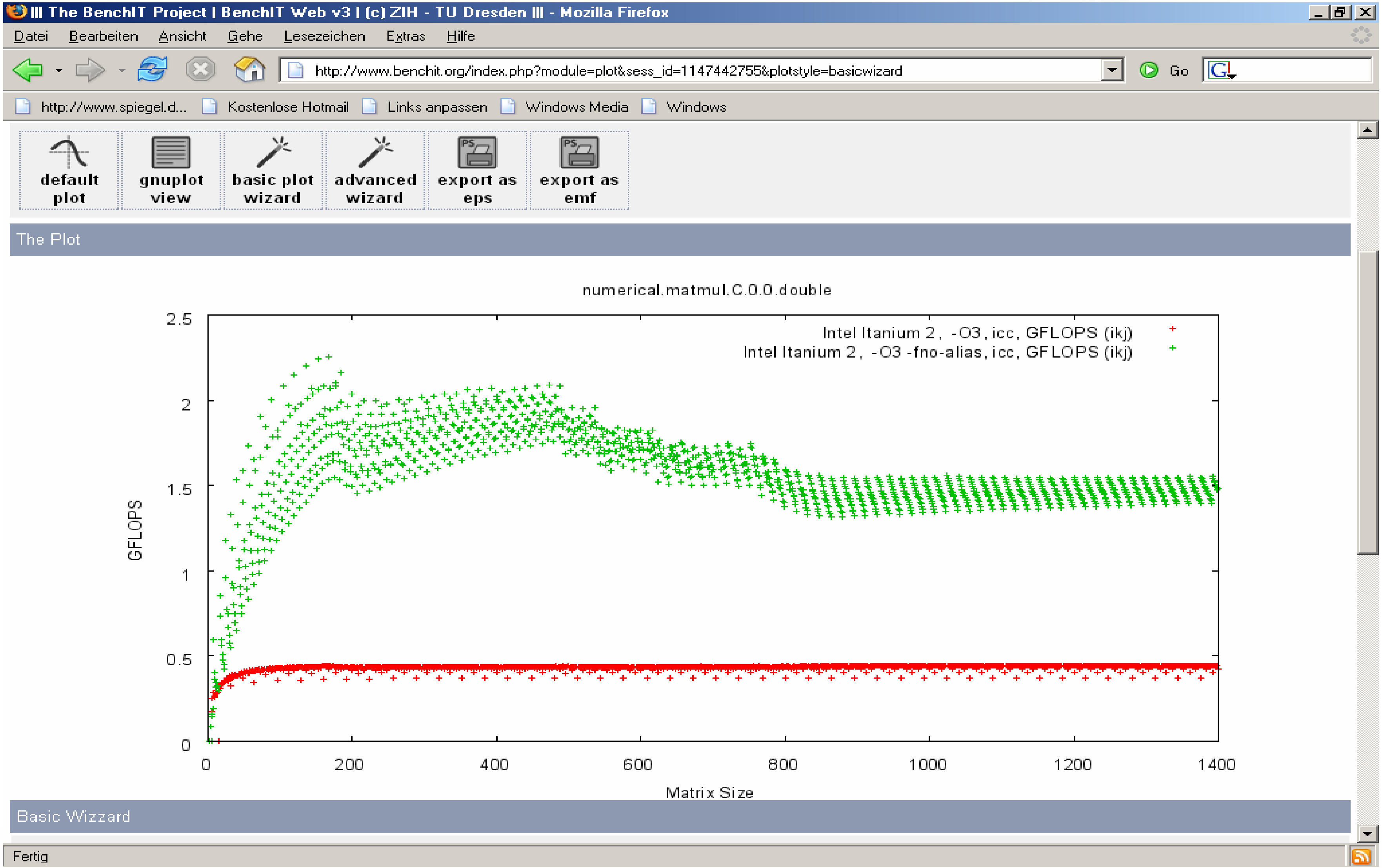
Fertig

Compare Different Compilerflags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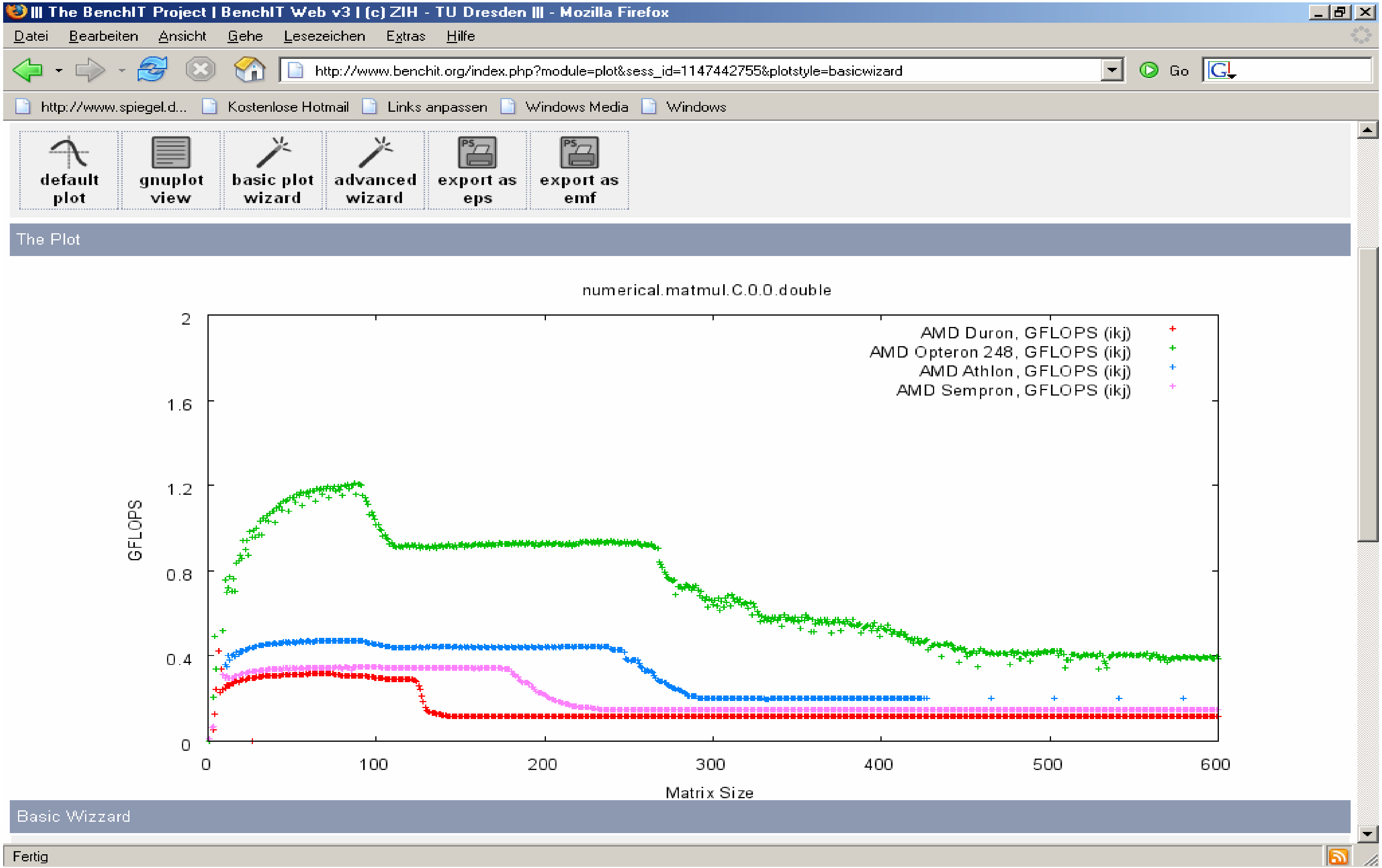
The Plot
numerical.matmul.C.0.0.double
Intel Itanium 2, -O3, icc, GFLOPS (ikj)
Intel Itanium 2, -O3 -fno-alias, icc, GFLOPS (ikj)
GFLOPS
0
0.5
1
1.5
2
2.5
0
200
400
600
800
1000
1200
1400
Matrix Size
Basic Wizzard
Fertig

http://www.benchit.org/index.php?module=plot&sess_id=1147442755&plotstyle=basicwizard

Compare Different Generations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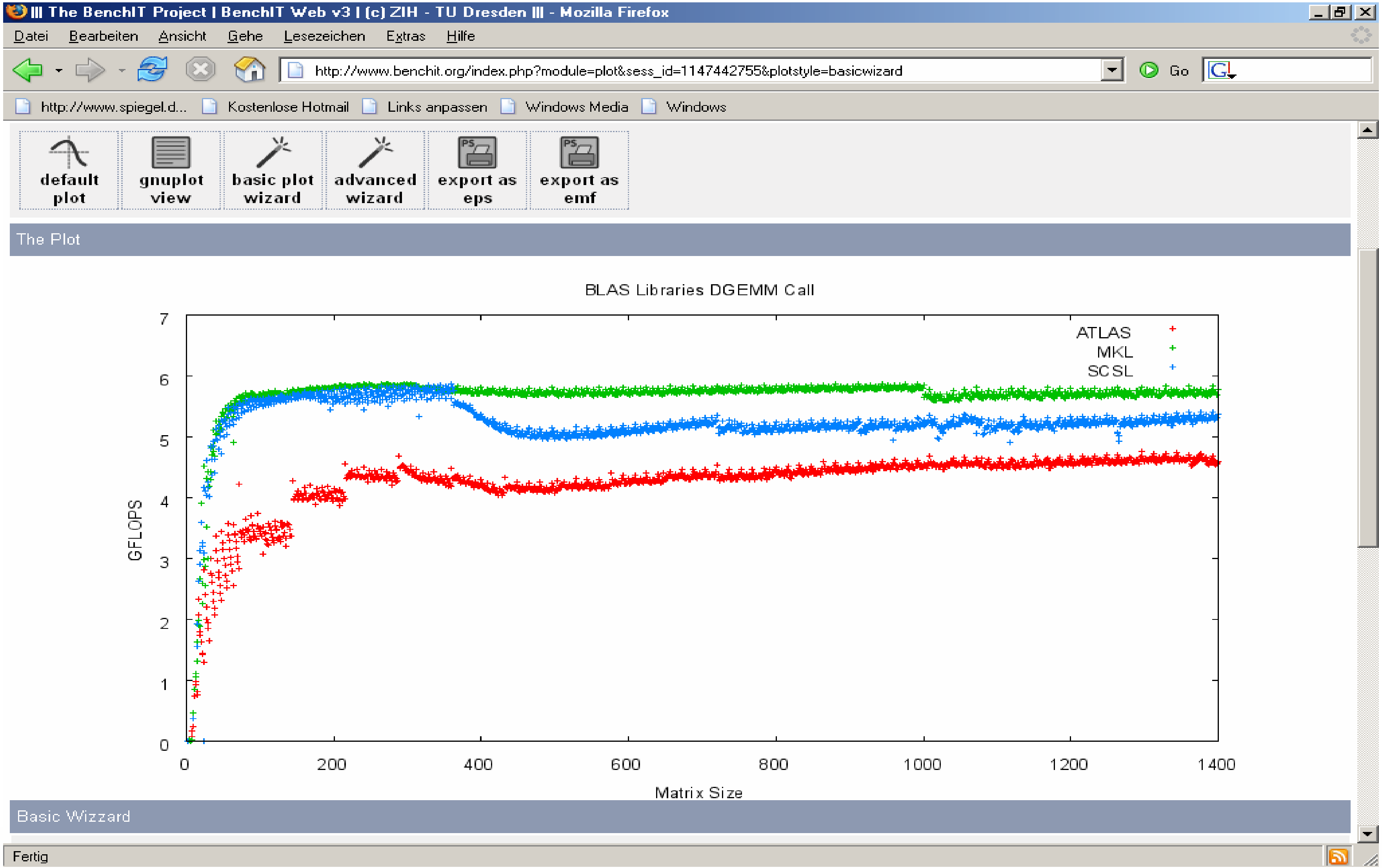
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
numerical.matmul.C.0.0.double
AMD Duron, GFLOPS (ikj)
AMD Opteron 248, GFLOPS (ikj)
AMD Athlon, GFLOPS (ikj)
AMD Sempron, GFLOPS (ikj)
GFLOPS
0
0.4
0.8
1.2
1.6
2
0
100
200
300
400
500
600
Matrix Size
Basic Wizzard
Fertig

http://www.benchit.org/index.php?module=plot&sess_id=1147442755&plotstyle=basicwizard

Compare Different Libraries


||| The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden ||| - Mozilla Firefox
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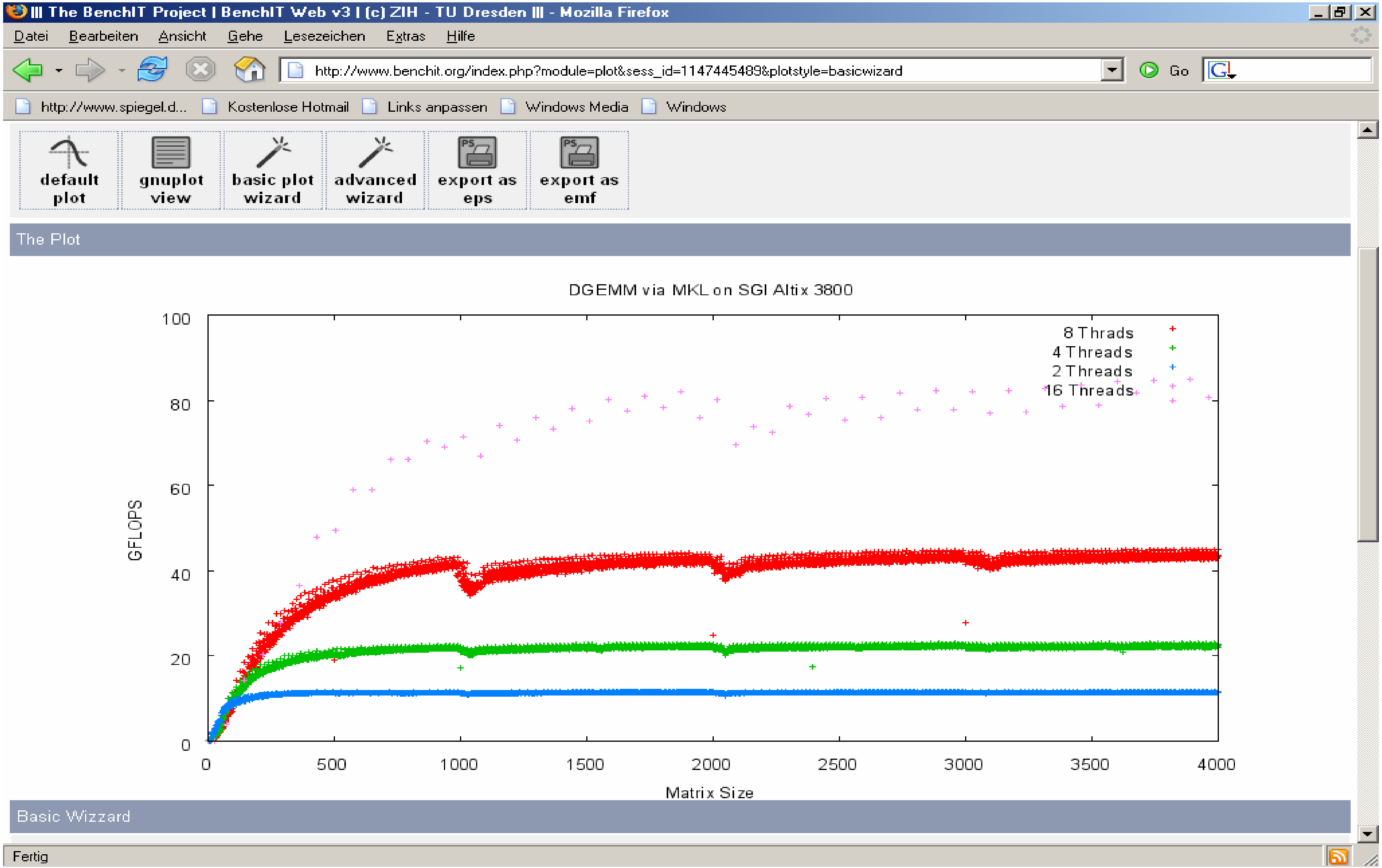
default plot
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
BLAS Libraries DGEMM Call
GFLOPS
Matrix Size
0
1
2
3
4
5
6
7
0
200
400
600
800
1000
1200
1400
ATLAS
MKL
SCSL
Basic Wizzard
Fertig

http://www.benchit.org/index.php?module=plot&sess_id=1147442755&plotstyle=basicwizard

Stefan Pflüger

… but also a Different Number of Threads



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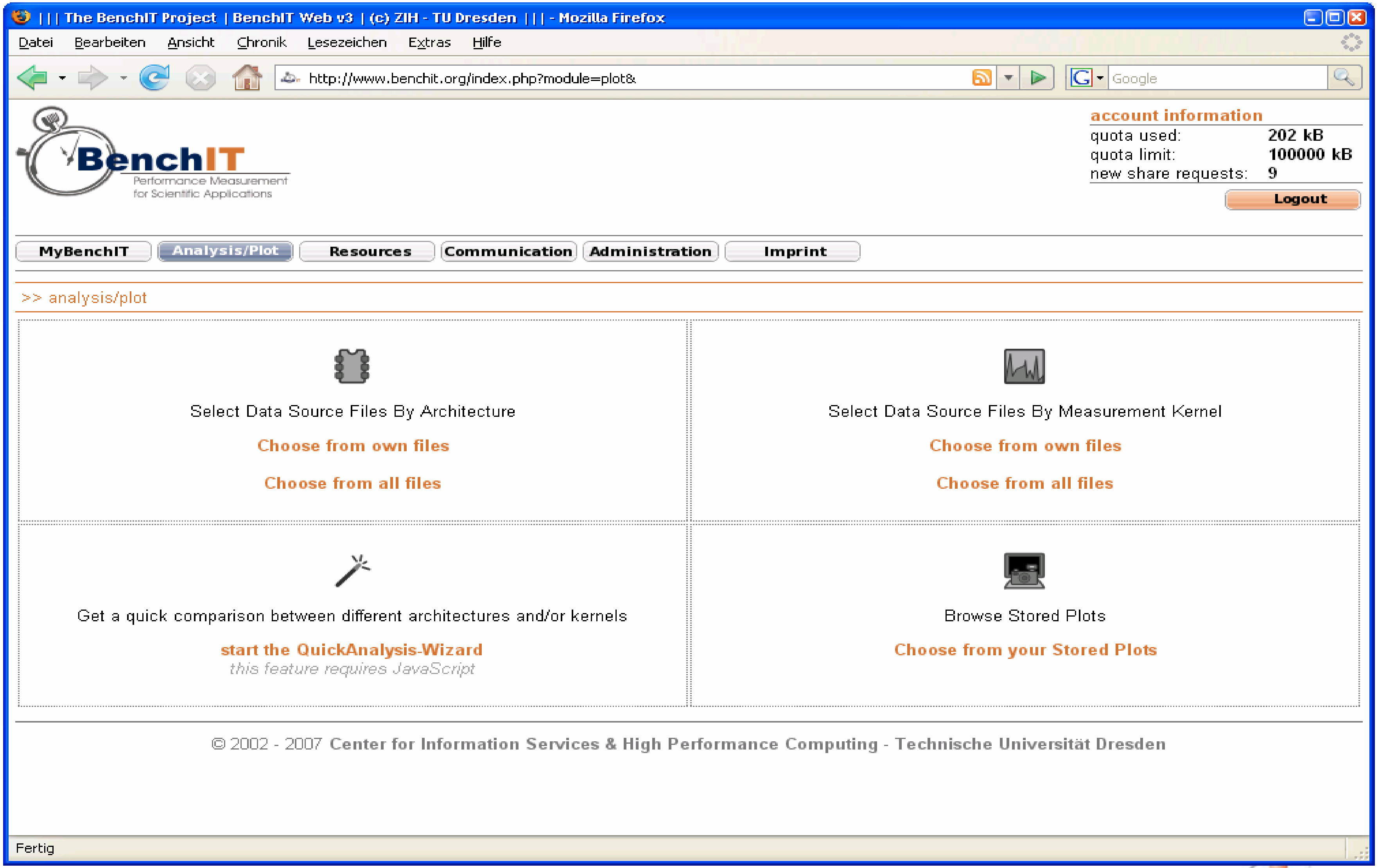
default plot
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
DGEMM via MKL on SGI Altix 3800
8 Thrads
4 Threads
2 Threads
16 Threads
GFLOPS
0
20
40
60
80
100
Matrix Size
0
500
1000
1500
2000
2500
3000
3500
4000
Basic Wizzard
Fertig

Quick Analysis Wizard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Extras
Hilfe
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Communication
Administration
Imprint
Fertig

account information

quota used: 202 kB
quota limit: 100000 kB
new share requests: 9

>> analysis/plot

Select Data Source Files By Architecture

Choose from own files

Choose from all files

Select Data Source Files By Measurement Kernel

Choose from own files

Choose from all files

Get a quick comparison between different architectures and/or kernels

start the QuickAnalysis-Wizard

this feature requires JavaScript

Browse Stored Plots

Choose from your Stored Plots

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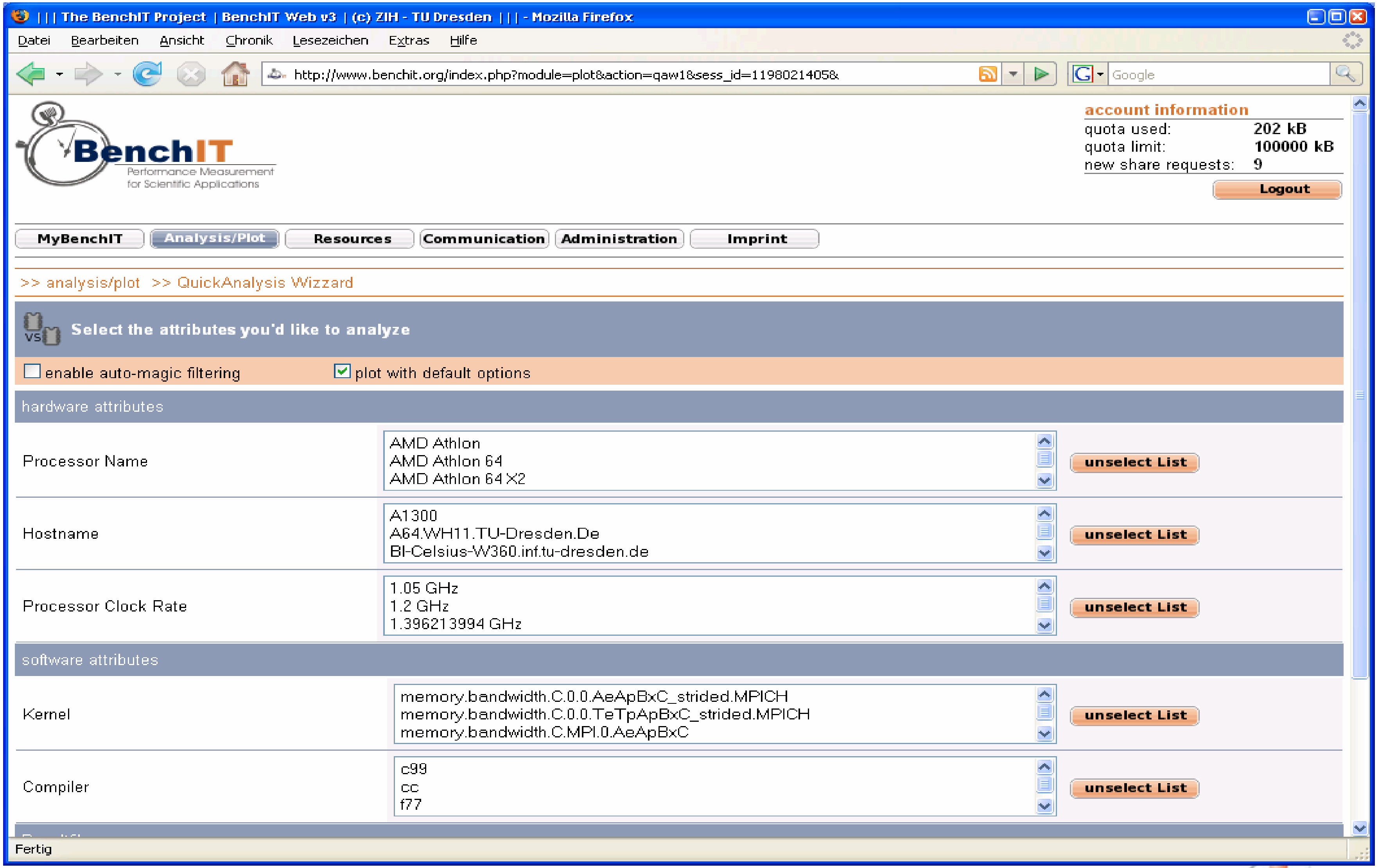
Quick Analysis Wizard


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198021405&
Google
BenchIT
Performance Measurement for Scientific Applications
Logout
MyBenchIT
Analysis/Plot
Resources
Communication
Administration
Imprint
unselect List
Fertig

account information

quota used: 202 kB
quota limit: 100000 kB
new share requests: 9

>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering
☑ plot with default options

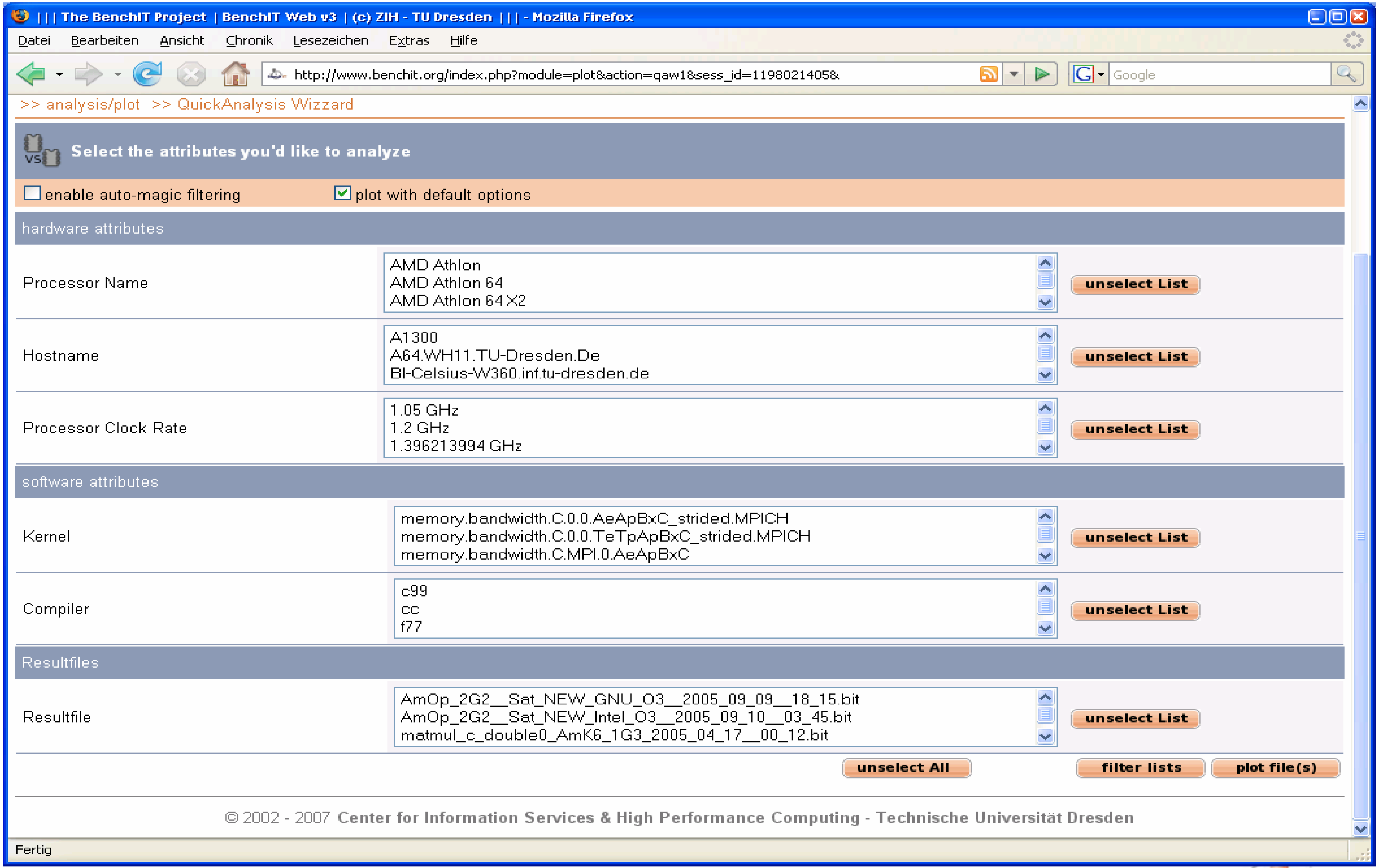
hardware attributes

Processor Name	AMD Athlon AMD Athlon 64 AMD Athlon 64 X2
Hostname	A1300 A64.WH11.TU-Dresden.De BI-Celsius-W360.inf.tu-dresden.de
Processor Clock Rate	1.05 GHz 1.2 GHz 1.396213994 GHz

software attributes

Kernel	memory.bandwidth.C.0.0.AeApBxC_strided.MPICH memory.bandwidth.C.0.0.TeTpApBxC_strided.MPICH memory.bandwidth.C.MPI.0.AeApBxC
Compiler	c99 cc f77

Quick Analysis Wizard


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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unselect List
unselect All
filter lists
plot file(s)
Fertig

http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198021405&

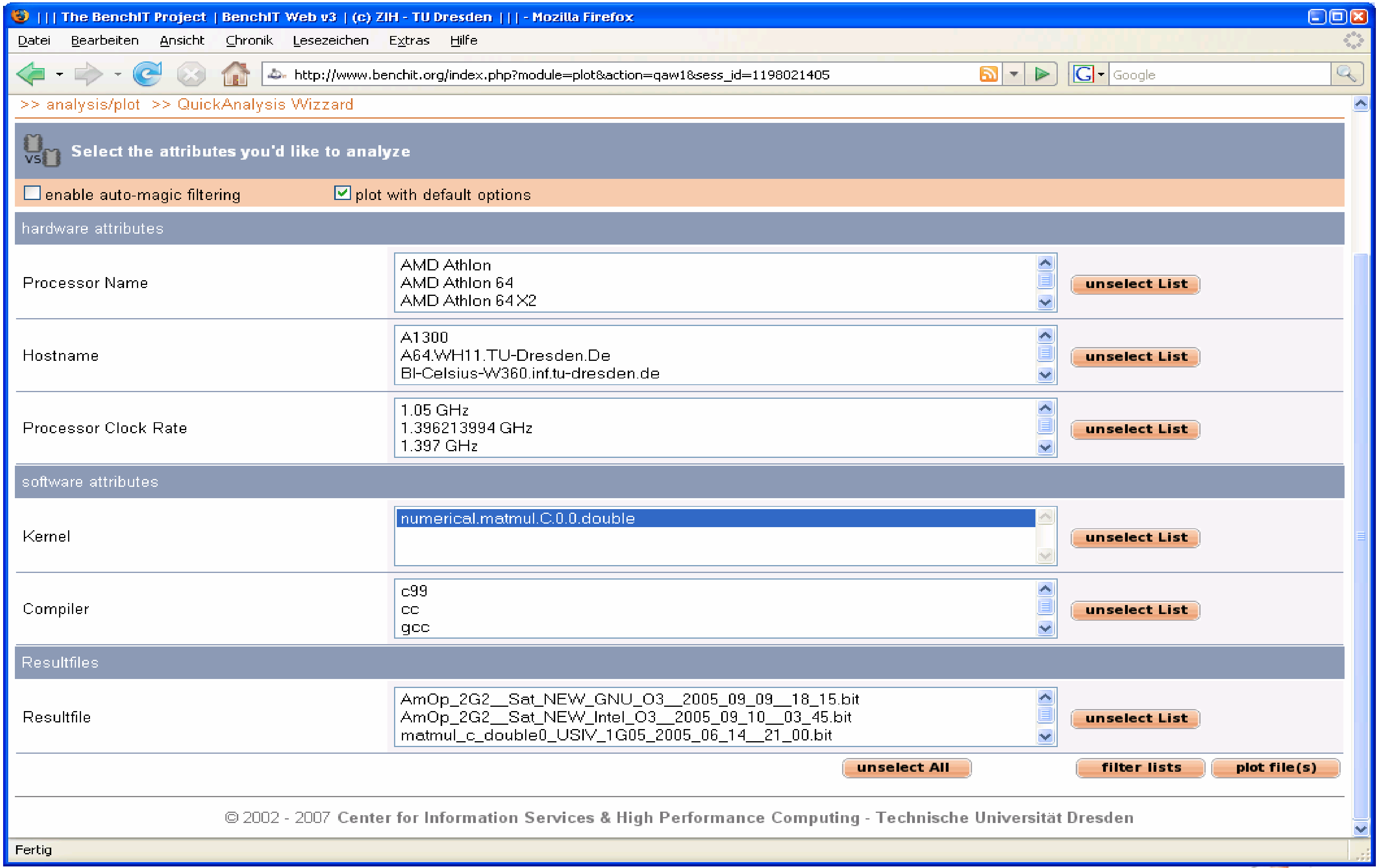
>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering ☑ plot with default options

hardware attributes	
Processor Name	AMD Athlon AMD Athlon 64 AMD Athlon 64 X2
Hostname	A1300 A64.WH11.TU-Dresden.De BI-Celsius-W360.inf.tu-dresden.de
Processor Clock Rate	1.05 GHz 1.2 GHz 1.396213994 GHz
software attributes	
Kernel	memory.bandwidth.C.0.0.AeApBxC_strided.MPICH memory.bandwidth.C.0.0.TeTpApBxC_strided.MPICH memory.bandwidth.C.MPI.0.AeApBxC
Compiler	c99 cc f77
Resultfiles	
Resultfile	AmOp_2G2__Sat_NEW_GNU_O3__2005_09_09__18_15.bit AmOp_2G2__Sat_NEW_Intel_O3__2005_09_10__03_45.bit matmul_c_double0_AmK6_1G3_2005_04_17__00_12.bit

Quick Analysis Wizard


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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filter lists
plot file(s)
Fertig

http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198021405

>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering ☑ plot with default options

hardware attributes

Processor Name	AMD Athlon AMD Athlon 64 AMD Athlon 64 X2
Hostname	A1300 A64.WH11.TU-Dresden.De BI-Celsius-W360.inf.tu-dresden.de
Processor Clock Rate	1.05 GHz 1.396213994 GHz 1.397 GHz

software attributes

Kernel	numerical.matmul.C.0.0.double
Compiler	c99 cc gcc

Resultfiles

Resultfile	AmOp_2G2__Sat_NEW_GNU_O3__2005_09_09__18_15.bit AmOp_2G2__Sat_NEW_Intel_O3__2005_09_10__03_45.bit matmul_c_double0_USIV_1G05_2005_06_14__21_00.bit

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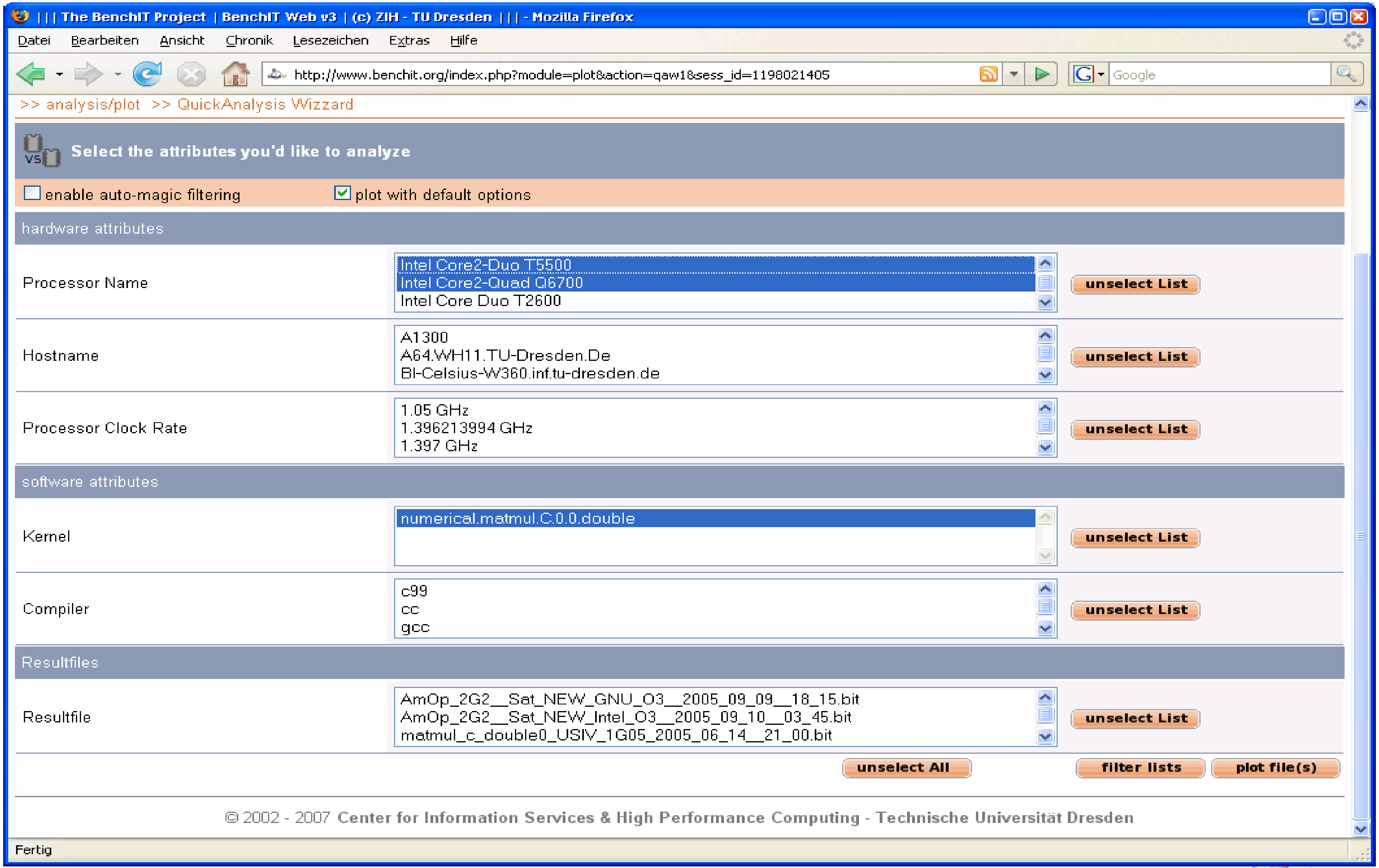
Quick Analysis Wizard


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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plot file(s)
Fertig

http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198021405

>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering ☑ plot with default options

hardware attributes

Processor Name: Intel Core2-Duo T5500 (selected), Intel Core2-Quad Q6700 (selected), Intel Core Duo T2600

Hostname: A1300, A64.WH11.TU-Dresden.De, BI-Celsius-W360.inf.tu-dresden.de

Processor Clock Rate: 1.05 GHz, 1.396213994 GHz, 1.397 GHz

software attributes

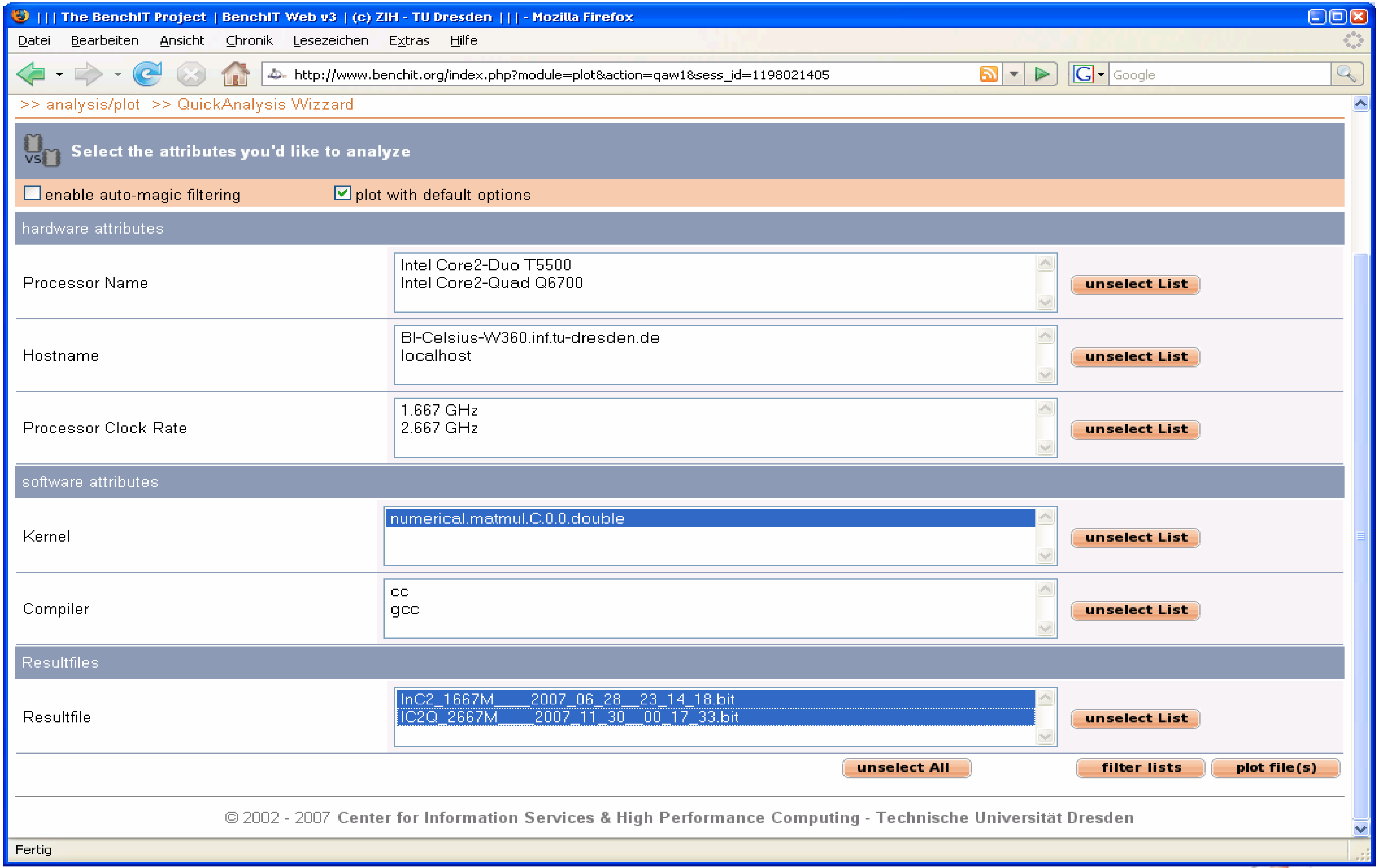
Kernel: numerical.matmul.C.0.0.double (selected)

Compiler: c99, cc, gcc

Resultfiles

Resultfile: AmOp_2G2__Sat_NEW_GNU_O3__2005_09_09__18_15.bit, AmOp_2G2__Sat_NEW_Intel_O3__2005_09_10__03_45.bit, matmul_c_double0_USIV_1G05_2005_06_14__21_00.bit

Quick Analysis Wizard


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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Google
unselect List
unselect All
filter lists
plot file(s)
Fertig

http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198021405

>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering ☑ plot with default options

hardware attributes

Processor Name	Intel Core2-Duo T5500 Intel Core2-Quad Q6700
Hostname	BI-Celsius-W360.inf.tu-dresden.de localhost
Processor Clock Rate	1.667 GHz 2.667 GHz

software attributes

Kernel	numerical.matmul.C.0.0.double
Compiler	cc gcc

Resultfiles

Resultfile	InC2_1667M___2007_06_28__23_14_18.bit IC2Q_2667M___2007_11_30__00_17_33.bit

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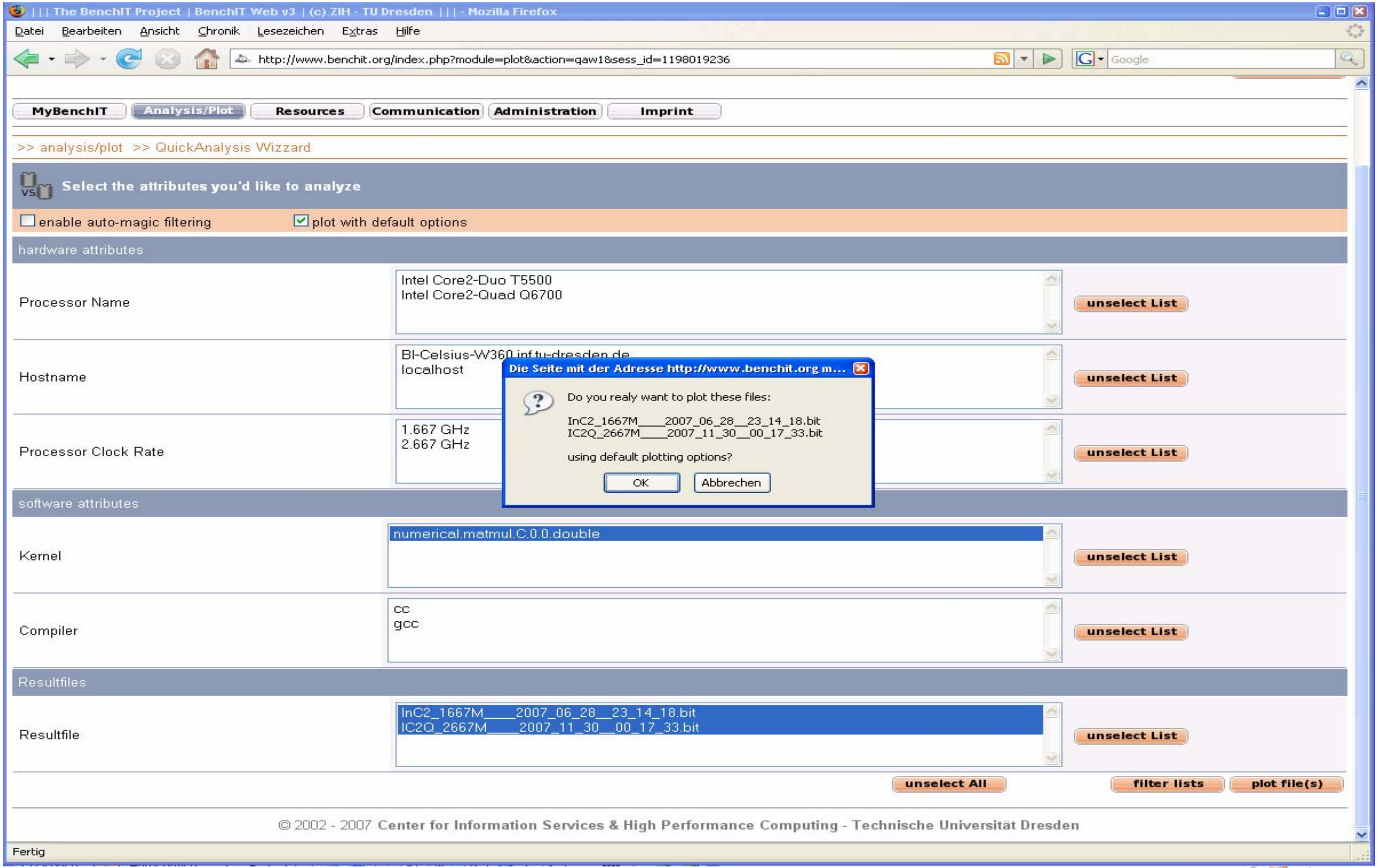
Stefan Pflüger

Quick Analysis Wizard



| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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Analysis/Plot
Resources
Communication
Administration
Imprint
unselect List
unselect All
filter lists
plot file(s)
OK
Abbrechen
Fertig

http://www.benchit.org/index.php?module=plot&action=qaw1&sess_id=1198019236

>> analysis/plot >> QuickAnalysis Wizzard

Select the attributes you'd like to analyze

☐ enable auto-magic filtering ☑ plot with default options

hardware attributes

Processor Name	Intel Core2-Duo T5500 Intel Core2-Quad Q6700
Hostname	BI-Celsius-W360.inf.tu-dresden.de localhost
Processor Clock Rate	1.667 GHz 2.667 GHz

software attributes

Kernel	numerical.matmul.C.0.0.double
Compiler	cc gcc

Resultfiles

Resultfile	InC2_1667M____2007_06_28__23_14_18.bit IC2Q_2667M____2007_11_30__00_17_33.bit

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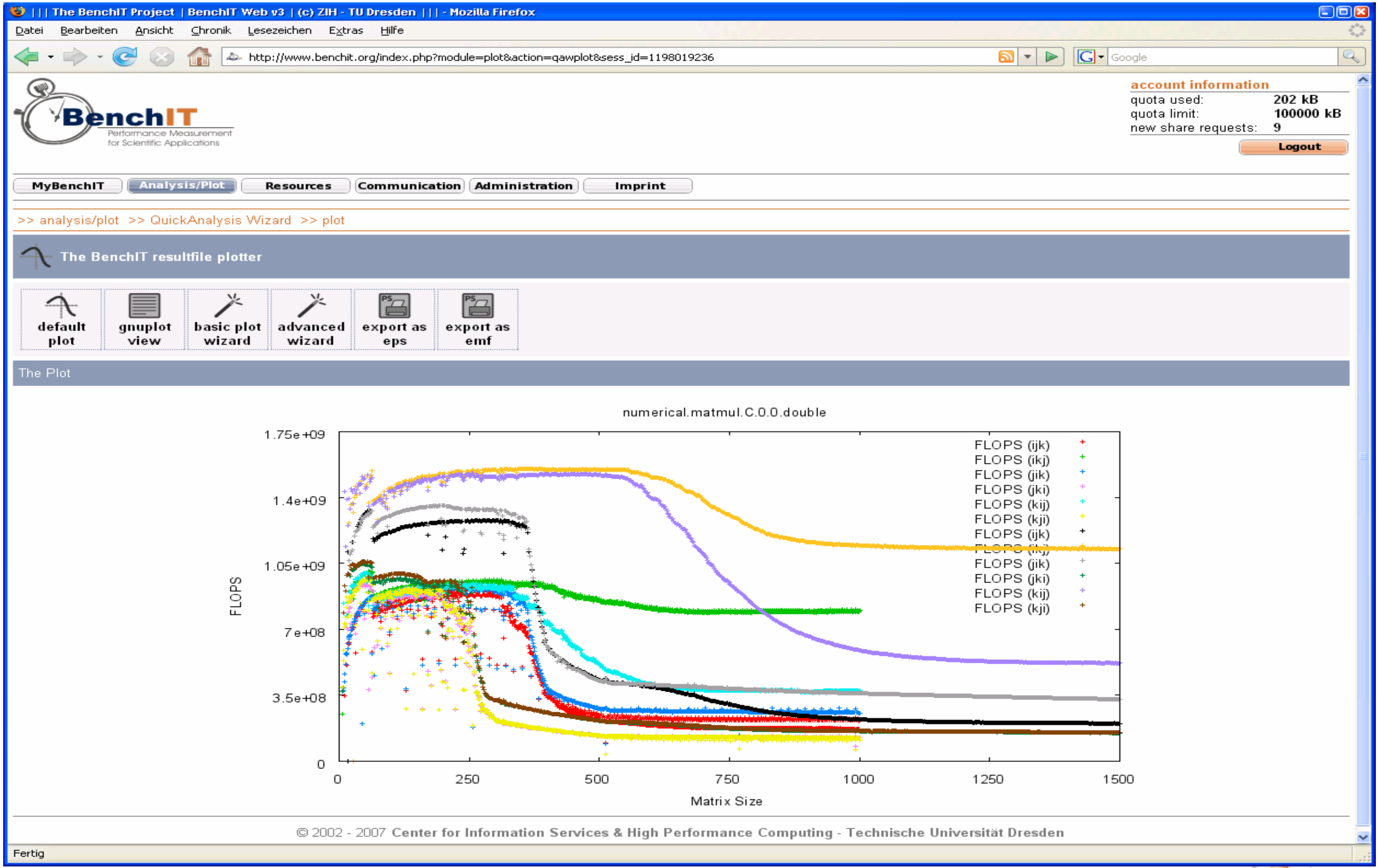
Die Seite mit der Adresse http://www.benchit.org m...

Do you realy want to plot these files:

InC2_1667M____2007_06_28__23_14_18.bit
IC2Q_2667M____2007_11_30__00_17_33.bit

using default plotting options?

Quick Analysis Wizard - Plot


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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Google
BenchIT
Performance Measurement for Scientific Applications
Logout
MyBenchIT
Analysis/Plot
Resources
Communication
Administration
Imprint
>> analysis/plot >> QuickAnalysis Wizard >> plot
The BenchIT resultfile plotter
default plot
gnuplot view
basic plot wizard
advanced wizard
export as eps
export as emf
The Plot
numerical.matmul.C.0.0.double
1.75e+09
1.4e+09
1.05e+09
7e+08
3.5e+08
0
FLOPS
0
250
500
750
1000
1250
1500
Matrix Size
FLOPS (ijk)
FLOPS (ikj)
FLOPS (jik)
FLOPS (jki)
FLOPS (kij)
FLOPS (kji)
FLOPS (ijk)
FLOPS (ikj)
FLOPS (jik)
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FLOPS (kij)
FLOPS (kji)
Fertig

account information

quota used:	202 kB
quota limit:	100000 kB
new share requests:	9

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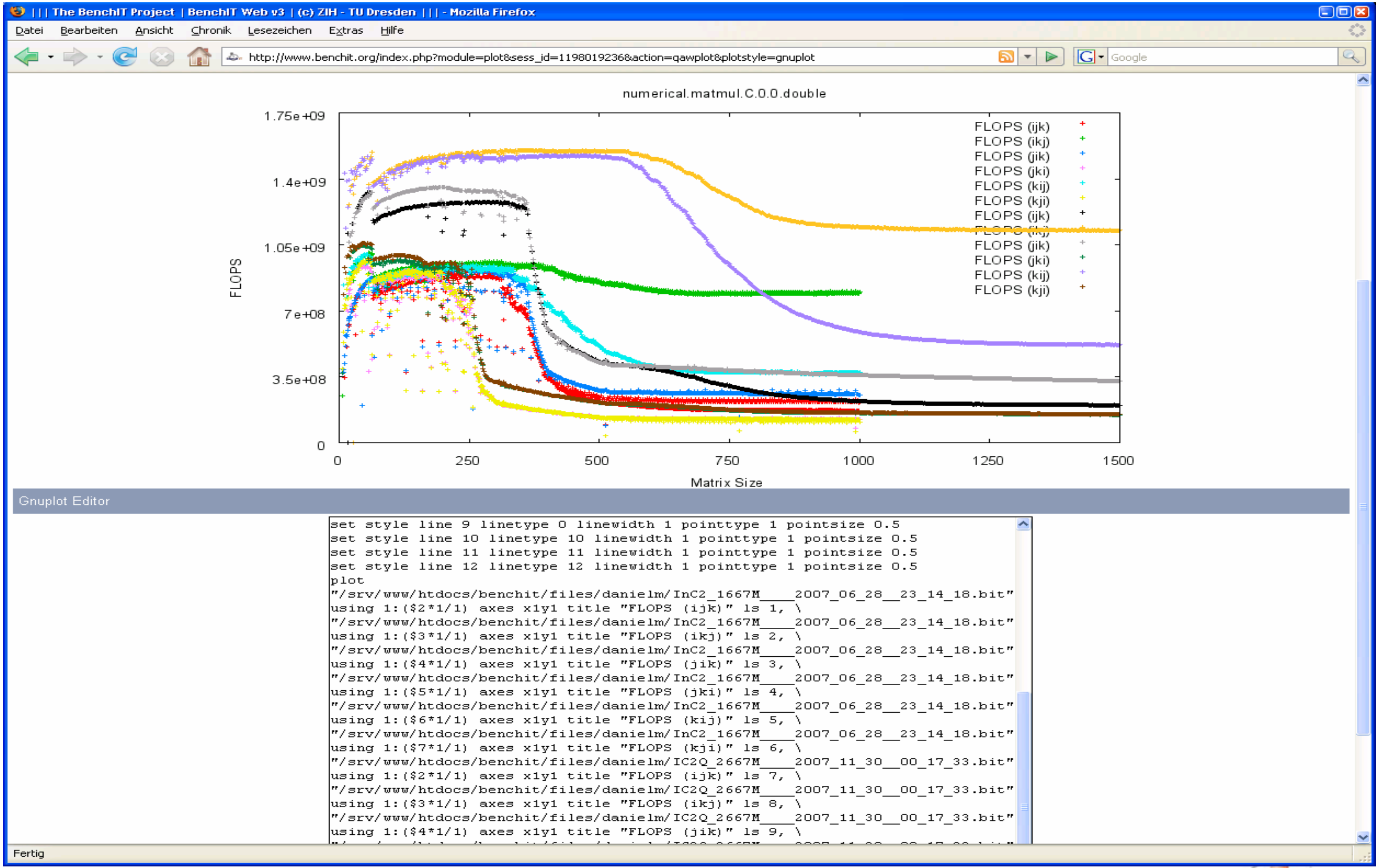
Quick Analysis Wizard – Gnuplot View


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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Hilfe
http://www.benchit.org/index.php?module=plot&sess_id=1198019236&action=qawplot&plotstyle=gnuplot
Google
numerical.matmul.C.0.0.double
1.75e+09
1.4e+09
1.05e+09
7e+08
3.5e+08
0
FLOPS
0
250
500
750
1000
1250
1500
Matrix Size
FLOPS (ijk)
FLOPS (ikj)
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FLOPS (jki)
FLOPS (kij)
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FLOPS (ijk)
FLOPS (ikj)
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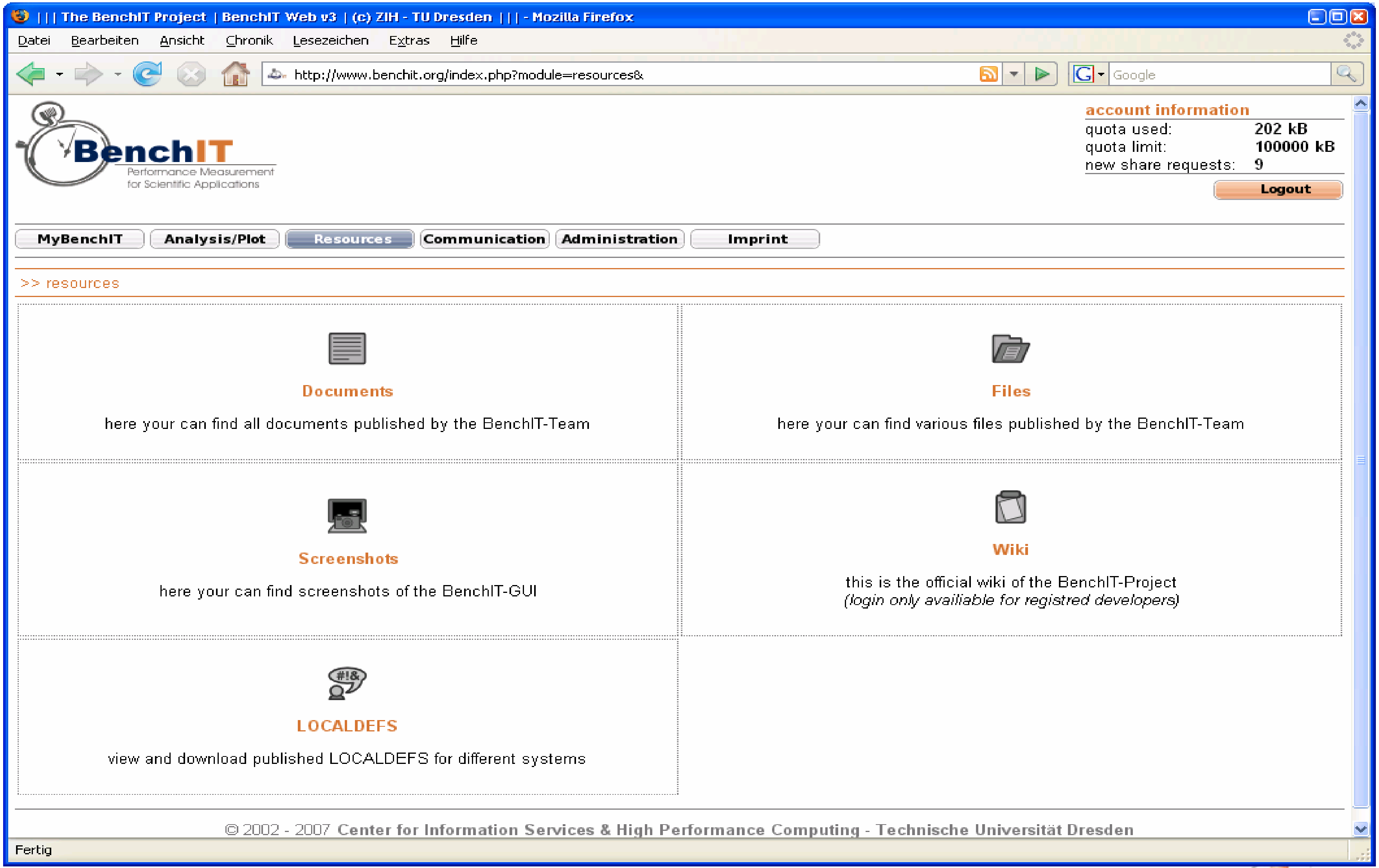
FLOPS (kji)
Gnuplot Editor
Fertig

```
set style line 9 linetype 0 linewidth 1 pointtype 1 pointsize 0.5
set style line 10 linetype 10 linewidth 1 pointtype 1 pointsize 0.5
set style line 11 linetype 11 linewidth 1 pointtype 1 pointsize 0.5
set style line 12 linetype 12 linewidth 1 pointtype 1 pointsize 0.5
plot
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($2*1/1) axes x1y1 title "FLOPS (ijk)" ls 1, \
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($3*1/1) axes x1y1 title "FLOPS (ikj)" ls 2, \
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($4*1/1) axes x1y1 title "FLOPS (jik)" ls 3, \
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($5*1/1) axes x1y1 title "FLOPS (jki)" ls 4, \
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($6*1/1) axes x1y1 title "FLOPS (kij)" ls 5, \
"/srv/www/htdocs/benchit/files/danielm/InC2_1667M____2007_06_28__23_14_18.bit"
using 1:($7*1/1) axes x1y1 title "FLOPS (kji)" ls 6, \
"/srv/www/htdocs/benchit/files/danielm/IC2Q_2667M____2007_11_30__00_17_33.bit"
using 1:($2*1/1) axes x1y1 title "FLOPS (ijk)" ls 7, \
"/srv/www/htdocs/benchit/files/danielm/IC2Q_2667M____2007_11_30__00_17_33.bit"
using 1:($3*1/1) axes x1y1 title "FLOPS (ikj)" ls 8, \
"/srv/www/htdocs/benchit/files/danielm/IC2Q_2667M____2007_11_30__00_17_33.bit"
using 1:($4*1/1) axes x1y1 title "FLOPS (jik)" ls 9, \
```

Getting the Sources


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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http://www.benchit.org/index.php?module=resources&
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Performance Measurement for Scientific Applications
Logout
MyBenchIT
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Resources
Communication
Administration
Imprint
Fertig

account information

quota used: 202 kB
quota limit: 100000 kB
new share requests: 9

>> resources

Documents

here your can find all documents published by the BenchIT-Team

Files

here your can find various files published by the BenchIT-Team

Screenshots

here your can find screenshots of the BenchIT-GUI

Wiki

this is the official wiki of the BenchIT-Project
(login only availiable for registred developers)

LOCALDEFS

view and download published LOCALDEFS for different systems

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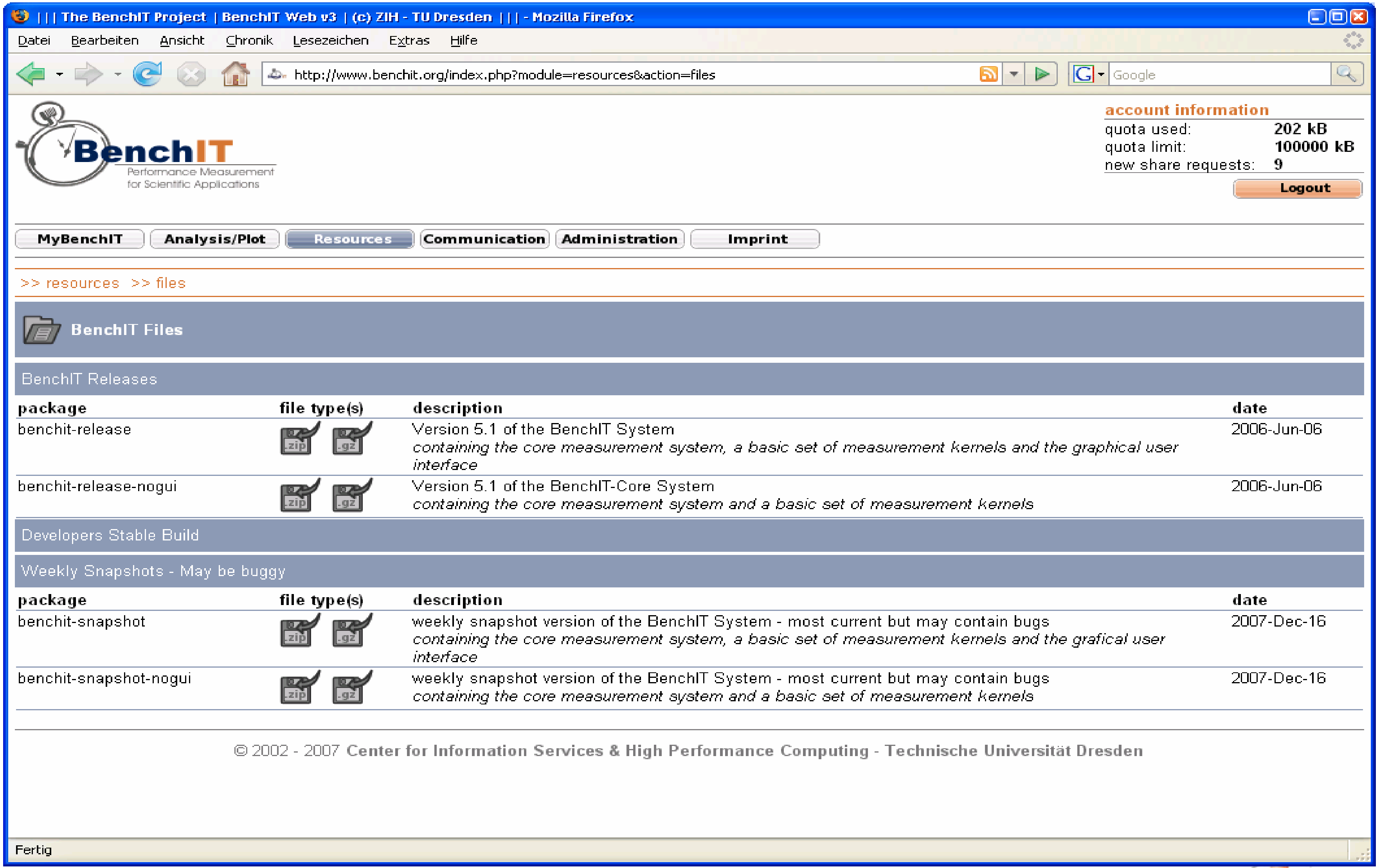
Getting the Sources


| | | The BenchIT Project | BenchIT Web v3 | (c) ZIH - TU Dresden | | | - Mozilla Firefox
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BenchIT
Performance Measurement for Scientific Applications
MyBenchIT
Analysis/Plot
Resources
Communication
Administration
Imprint
Logout
Fertig

account information
quota used: 202 kB
quota limit: 100000 kB
new share requests: 9

>> resources >> files

BenchIT Files

BenchIT Releases

package	file type(s)	description	date
benchit-release	zip .gz	Version 5.1 of the BenchIT System *containing the core measurement system, a basic set of measurement kernels and the graphical user interface*	2006-Jun-06
benchit-release-nogui	zip .gz	Version 5.1 of the BenchIT-Core System *containing the core measurement system and a basic set of measurement kernels*	2006-Jun-06

Developers Stable Build

Weekly Snapshots - May be buggy

package	file type(s)	description	date
benchit-snapshot	zip .gz	weekly snapshot version of the BenchIT System - most current but may contain bugs *containing the core measurement system, a basic set of measurement kernels and the grafical user interface*	2007-Dec-16
benchit-snapshot-nogui	zip .gz	weekly snapshot version of the BenchIT System - most current but may contain bugs *containing the core measurement system and a basic set of measurement kernels*	2007-Dec-16

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Performance Analysis and Benchmarking Project Approaches

Reference considerations in context of the

ZENTURIO Experiment Management System

for Cluster and Grid Computing

http://www.dps.uibk.ac.at/projects/zenturio/related.html

Multi-Experiment Performance Analysis and Benchmarking

- **PMaC** Performance Modeling and Characterization
  San Diego Supercomputer Center, USA
  http://www.sdsc.edu/pmac/pmac.html

PMaC Parts

- **MAPS (Memory Access Pattern Signature):**

  Measurement of memory bandwidth for various HPC architectures
- **MetaSim:**

  Determines code block memory access patterns for performance prediction of serial NPBs (NPB: NAS Parallel Benchmark)
- **Performance Predictions:**

  Performance Predictions using MAPS, MetaSim, and Dimemas of NPB and PETSc kernels (PETSc: Portable, Extensible Toolkit for Scientific Computation)
- **ASAPP (Application Scheduler & Performance Portal):**

  Portal that enables performance guided job scheduling across multiple architectures
- **Terascale Application Information:**

  Scalability information for NPACI (National Partnership for Advanced Computational Infrastructure) applications and their bottlenecks in large processor runs
- **PMaC HPC Benchmark Suite:**

  A compact set of orthogonal benchmarks to measure fundamental performance models of HPC systems

Multi-Experiment Performance Analysis and Benchmarking

- **Paradyn** Performance Measurement Tools, University of Wisconsin-Madison, USA
- **APART** IST Working Group on Automatic Performance Analysis
- **SKaMPI** Special Karlsruher MPI Benchmark , University of Karlsruhe, Germany
- **Automated Benchmarking Tool** Information Technology Laboratory, National Institute of Standards and Technology, USA
- **XPARE** eXPeriment Alerting and REporting, University of Utah, University of Oregon

Parameter Study

- **Nimrod** A Tool for Distributed parametric Modelling, Monash University, Australia

- **ILAB** A Parameter Study Tool, Nasa Ames Research Center, USA

Support for Specialized Computer Architectures

Support for Grid Architectures

- **Unicore** A Uniform Interface to Computing Resources, Germany
- **OGSA** Open Grid Service Architecture, the Global Grid Forum
- **JiPANG** A Jini-based Computing Portal System, Electronical Laboratory, Tokyo Institute of Technology, Japan

Experiment Management

- **ZOO** A Desktop Experiment Management Environment, University of Wisconsin-Madison, USA

- **JAM** Jini Technology-enabled Application Manager, Swiss Center for Scientific Computing (CSCS), Switzerland

Combined Approaches

- **ASKALON**

  A Programming Environment and Tool Set for Cluster and Grid Computing

  University of Vienna and University of Innsbruck

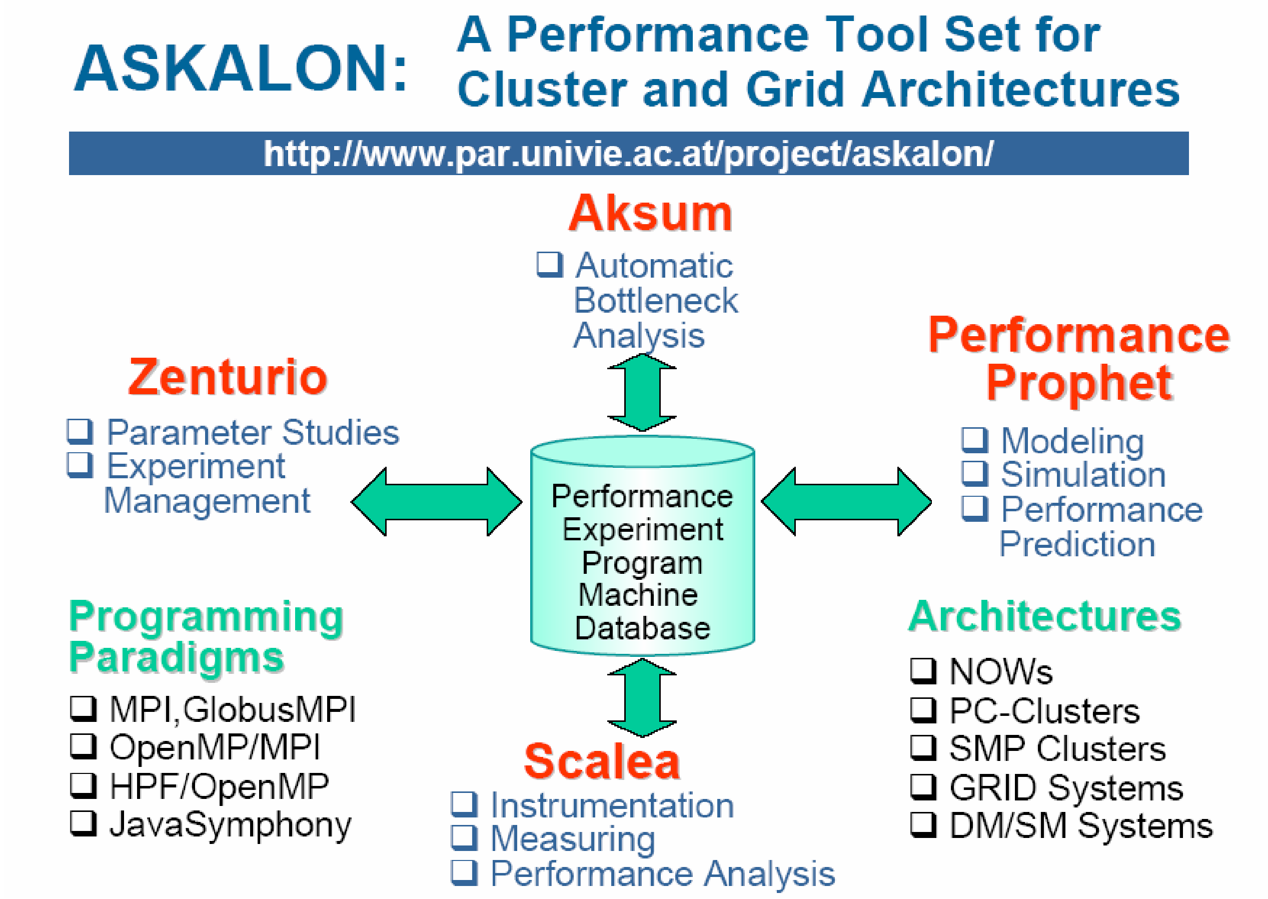
  http://www.par.univie.ac.at/project/askalon/

- **TAU (Tuning and Analysis Utilities) Parallel Performance System**

  Performance Research Laboratory, University of Oregon

  http://acts.nersc.gov/tau/main.html

ASKALON – Project Overview



ASKALON: A Performance Tool Set for Cluster and Grid Architectures

http://www.par.univie.ac.at/project/askalon/

Aksum

- ☐ Automatic Bottleneck Analysis

Zenturio

- ☐ Parameter Studies
- ☐ Experiment Management

Performance Prophet

- ☐ Modeling
- ☐ Simulation
- ☐ Performance Prediction

Performance
Experiment
Program
Machine
Database

Programming Paradigms

- ☐ MPI,GlobusMPI
- ☐ OpenMP/MPI
- ☐ HPF/OpenMP
- ☐ JavaSymphony

Scalea

- ☐ Instrumentation
- ☐ Measuring
- ☐ Performance Analysis

Architectures

- ☐ NOWs
- ☐ PC-Clusters
- ☐ SMP Clusters
- ☐ GRID Systems
- ☐ DM/SM Systems

http://www.par.univie.ac.at/project/askalon/

http://www.par.univie.ac.at/project/prophet/other/prophet-modeling.pdf

SCALEA – Part of ASKALON

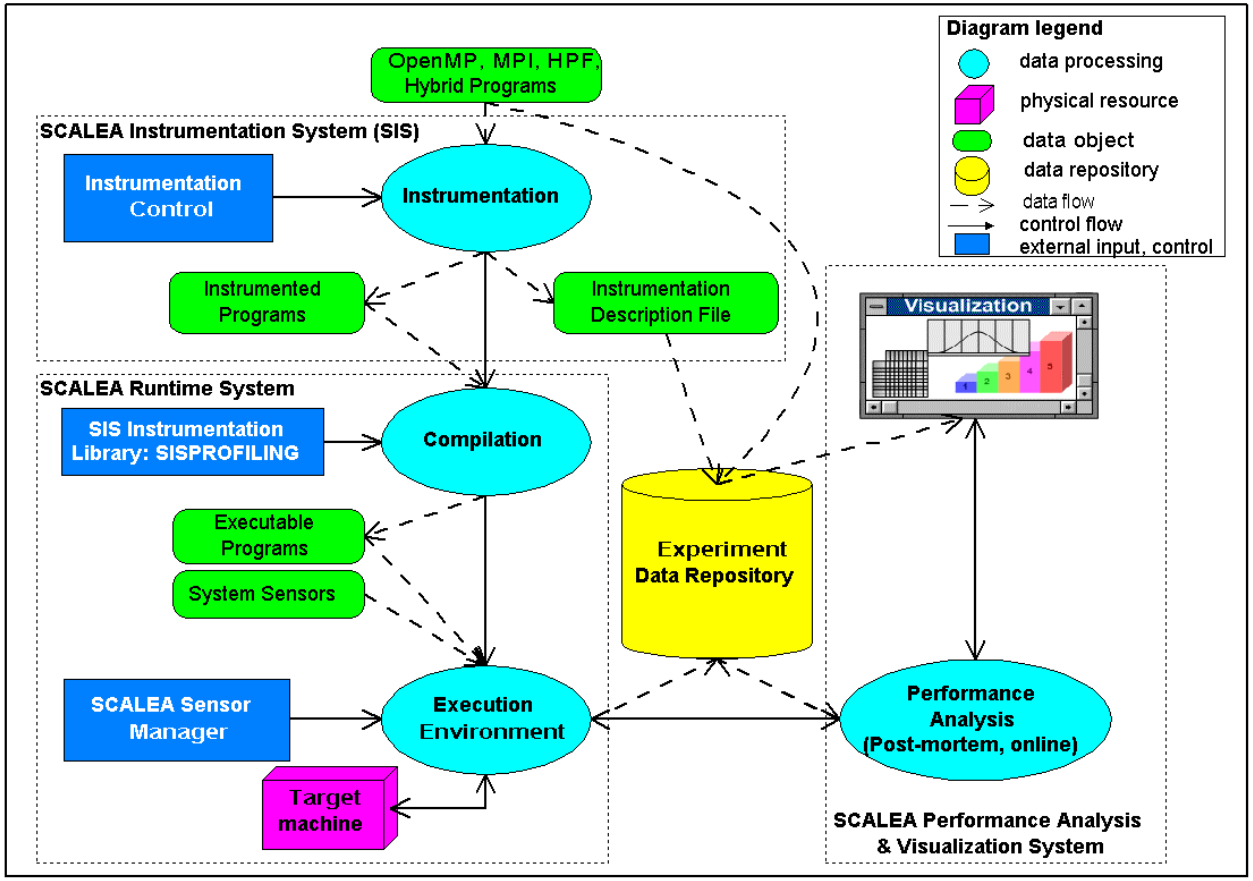
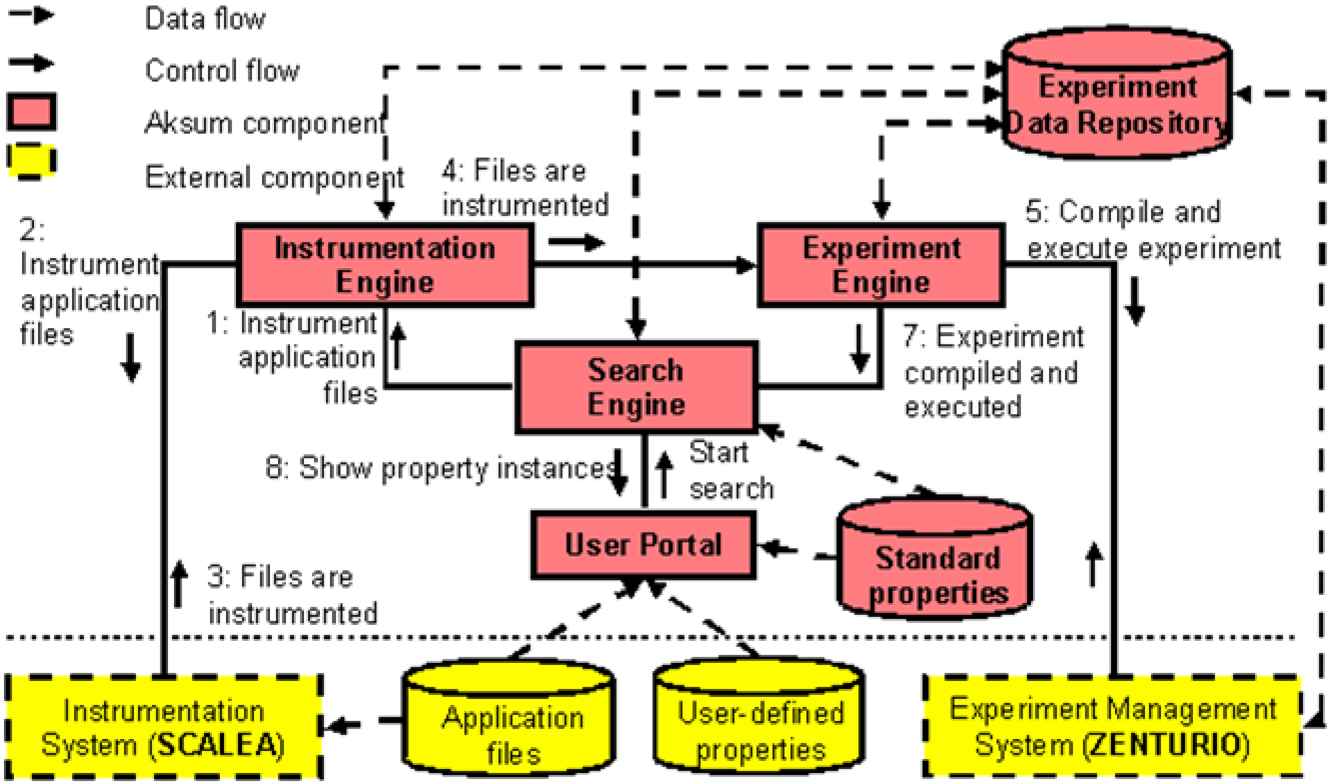


Diagram legend
data processing
physical resource
data object
data repository
data flow
control flow
external input, control
OpenMP, MPI, HPF, Hybrid Programs
SCALEA Instrumentation System (SIS)
Instrumentation Control
Instrumentation
Instrumented Programs
Instrumentation Description File
SCALEA Runtime System
SIS Instrumentation Library: SISPROFILING
Compilation
Executable Programs
System Sensors
SCALEA Sensor Manager
Execution Environment
Target machine
Experiment Data Repository
Visualization
Performance Analysis (Post-mortem, online)
SCALEA Performance Analysis & Visualization System

SCALEA: Performance Instrumentation, Measurement, Analysis and Visualization Tool for Parallel Programs (Part of the ASKALON project)

http://www.par.univie.ac.at/project/scalea/

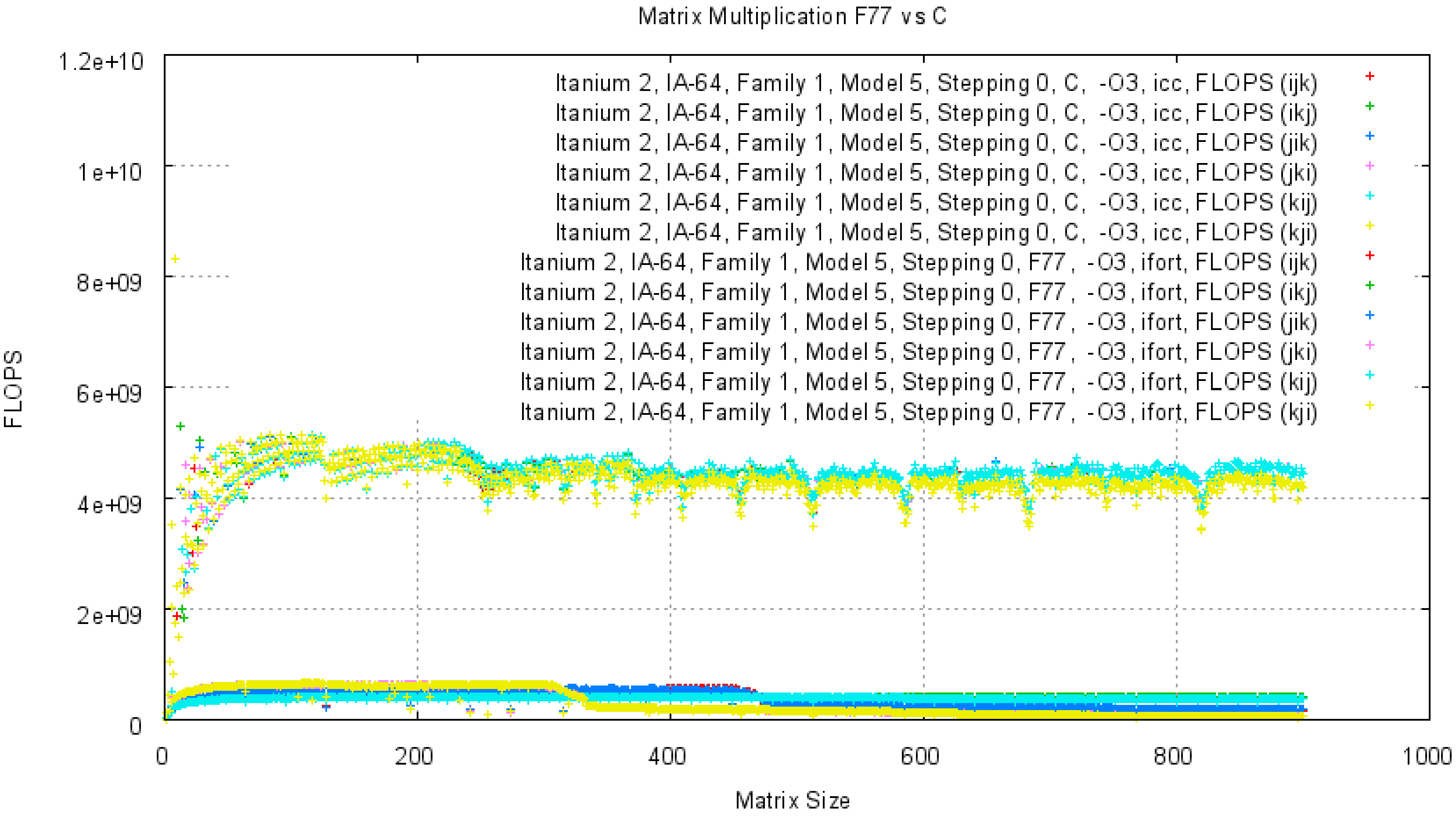
AKSUM – Part of ASKALON


Data flow
Control flow
Aksum component
External component
Experiment Data Repository
4: Files are instrumented
2: Instrument application files
Instrumentation Engine
Experiment Engine
5: Compile and execute experiment
1: Instrument application files
Search Engine
7: Experiment compiled and executed
8: Show property instances
Start search
User Portal
Standard properties
3: Files are instrumented
Instrumentation System (SCALEA)
Application files
User-defined properties
Experiment Management System (ZENTURIO)

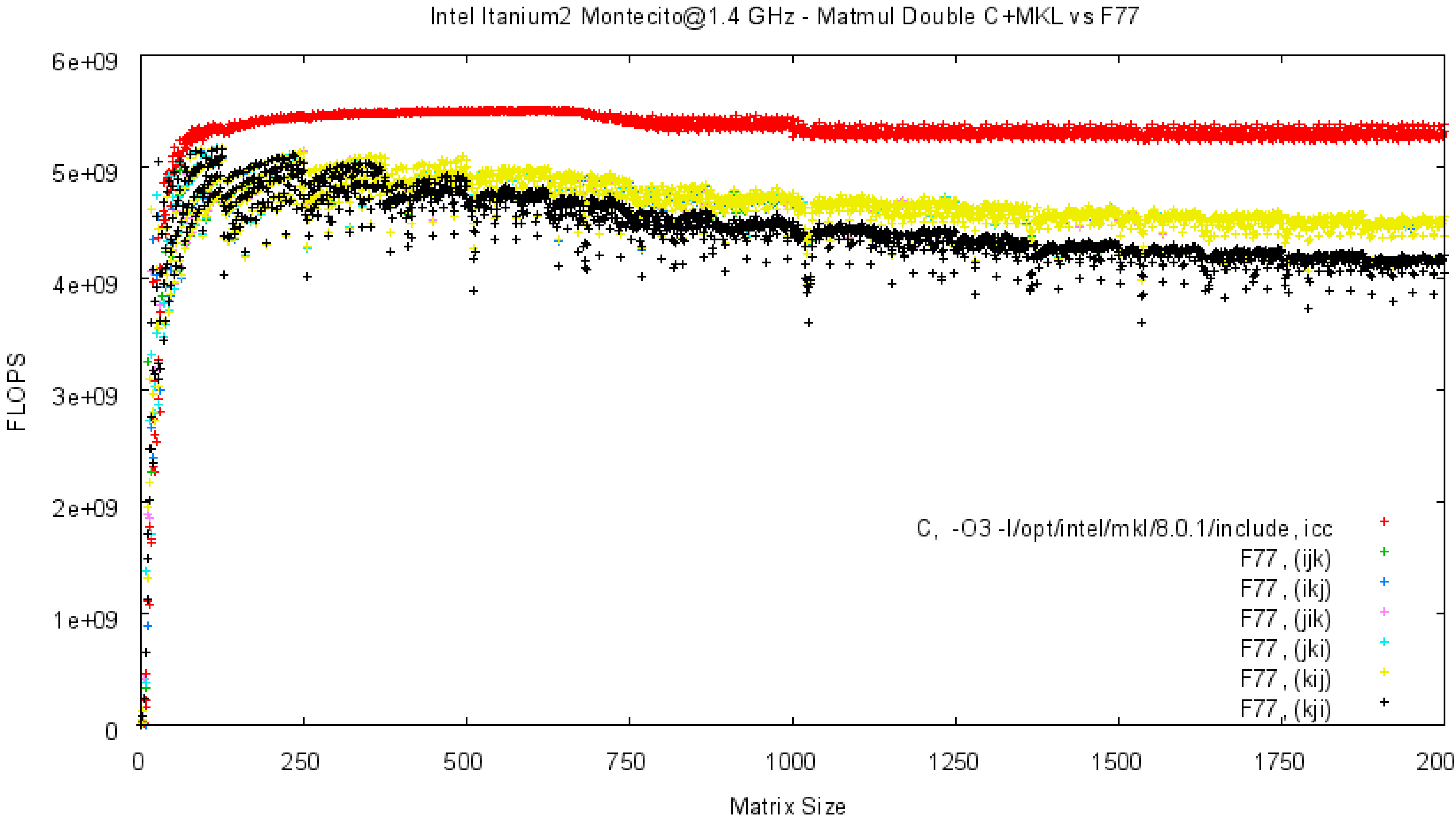
AKSUM: Multi-Experiment Analysis Tool (Part of the ASKALON project)

http://www.par.univie.ac.at/project/aksum/The_tool.html

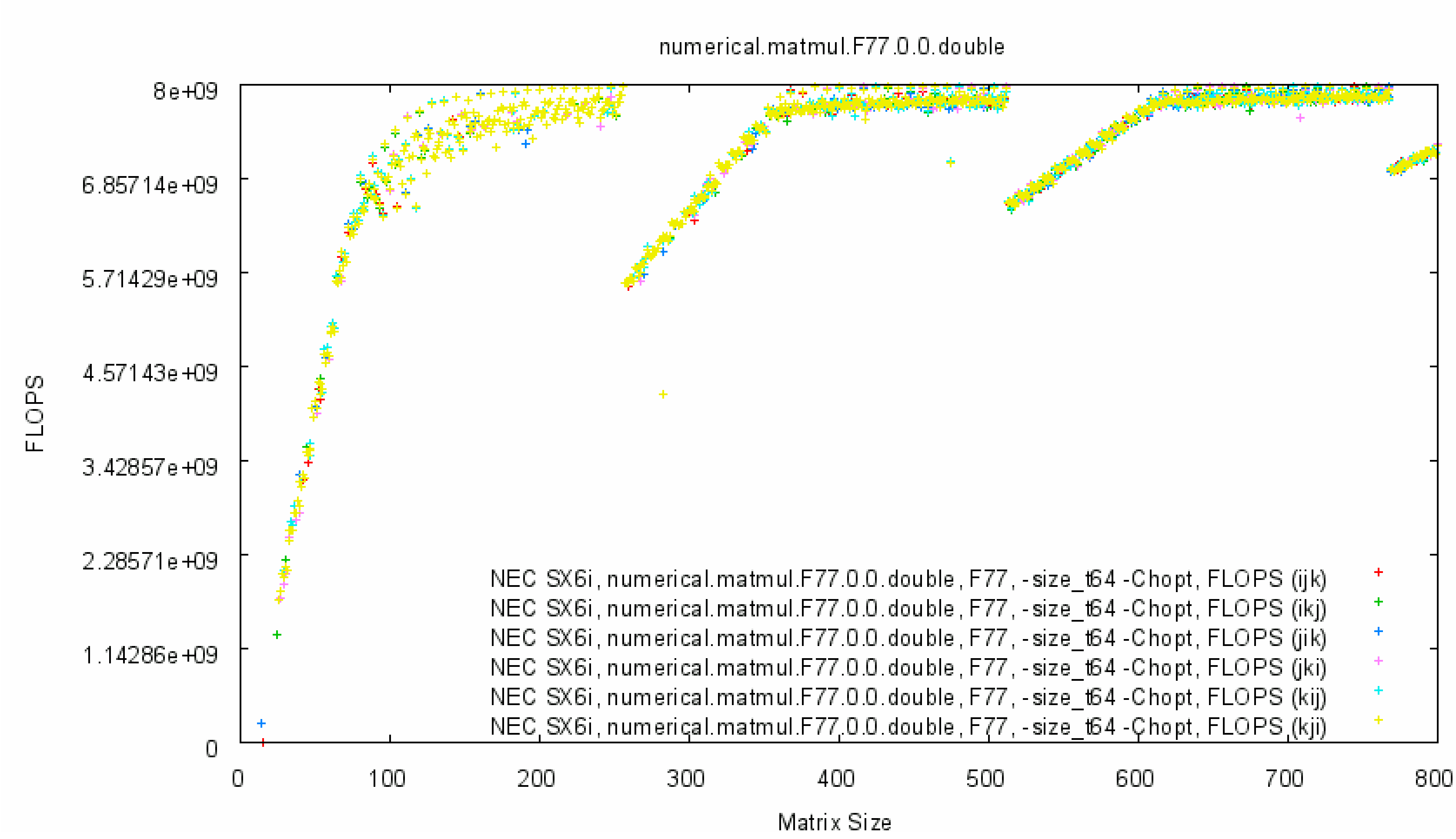
BenchIT – Ease of Use



BenchIT – Ease of Use



BenchIT – Ease of Use



Thanks for Using

www.benchit.org