CERN openlab Project:
IA-64 benchmarks

January 2003 – Sverre Jarp
## IT Division – CERN

IPF Compiler Status Today

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- ## Intel's compilers:
    - Recent (Dec02) versions of ecc7/icc7 installed
    - [Use of icc7 should be pushed
        - To be discussed later.
        - Remember Fons's testimonial]

- ## GNU:
    - gcc 3.2 is actually "rather good"

- ## ORC compilers:
    - Awaiting version 2.0
        - Later in January?
        - Need: Native compilers + better C++ support

Benchmark comparisons

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- **Recent CERN benchmarks**

  - **Using latest Intel compilers (ecc7, icc7)**

  - **gcc 3.2 (on IA32 and IA64)**

  - **Comment:**
    - **It may be "a little bit" naive to expect IA-64 benchmarks not to pay a price for LP64, i.e. 64-bit pointers**
    - **Need to wait for AMD systems that can run both a 32-bit OS and a 64-bit OS to understand the cost**
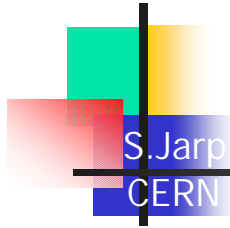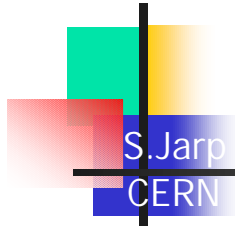
Benchmark-1: CRN jobs/FTN

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	Itanium 2 @ 900 (efc O3, ipo, prof_use)	P4 Xeon @ 2GHz, 512KB (ifc O3, ipo, prof_use)
CRN3	390	543
CRN4	322	441
CRN5	253	357
CRN12	463 (-O2)	348
Geom. Mean	348	415
CU/MHz	0.39	0.21

← **Big is best!**

- **Projections:**
  - **McKinley @ 1.0GHz: ~ 390 CU**
  - **Madison @ 1.5GHz: ~ 585 CU**
 - **P4 Xeon @ 3.0GHz: ~ 620 CU**

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Benchmark-2: ROOT tests/C++

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All jobs run in "batch" mode	Itanium 2 @ 900MHz (gcc 3.2, O3)	Itanium 2 @ 900MHz (ecc7 prod, O2, ansi_alias)	P4 Xeon @ 2GHz, 256KB (gcc 3.2, O2)	P4 Xeon @ 2GHz, 256KB (icc7 beta, O2)
stress	313	322	419	519
bench	450	540	443	533
Benchmarks.C	378	341	323	429
Geometric Mean	**375**	**390**	**389**	**491**

← **Big is best!**

- **Projections:**
  - McKinley @ 1.0 GHz: ~ 430 RM
  - Madison @ 1.5 GHz: ~ 650 RM
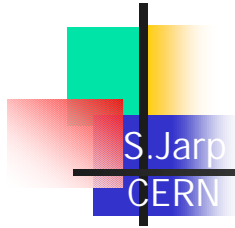 - P4 Xeon @ 3.0 GHz/512KB: ~ 750 RM
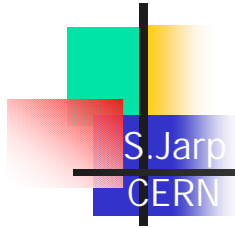
Benchmark-3: G4 tests/C++

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	Itanium 2 @ 900MHz (gcc,O3)	Itanium 2 @ 900MHz (ecc, O3,ftz)	P4 Xeon @ 2GHz, 512 KB (gcc,O3)	P4 Xeon @ 2GHz, 512 KB (icc, O3,tpp6)
exampleN01	26.5 s	31.5 s	19.4 s	20.5 s
EMTest40 (Real)	250 s	216 s	180 s	158 s

← Small is best!

- **Projections for Geant4/t40:**
  - **McKinley @ 1.0 GHz: ~ 190 s**
  - **Madison @ 1.5 GHz: ~ 125 s**
  - **P4 Xeon @ 3.0 GHz: ~ 105 s**

Benchmark-4: compilation time

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CLHEP (make –j2)	Itanium 2 @ 900MHz (gcc,O3)	Itanium 2 @ 900MHz (ecc, O3)	Pentium III @ 1 GHz (icc O3)	Pentium III @ 1 GHz (gcc O3)	
Real time	152 s	403 s	500 s	517 s	← Small best!
User time	316 s	770 s	844 s	1000 s	
System time	5 s	19 s	48 s	23 s	

- **IA-64 ecc/gcc ratio: 2.65 !**
- **IA-32 icc/gcc ratio: 0.97 !**

Benchmark conclusions

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- ## IPF/ecc (C++) on Itanium-2

  - ### Situation has improved significantly from 18 months ago!

  - ### Still, many things could be further improved (see also open performance issues)

    - **Better optimization (C++ seems to be behind C/FTN)**
      - **Improved high-level analysis**
      - **Improved region-scheduling**
      - **Improved code generation**
    - **Better co-existence gcc/ecc**
      - **Support of libstdc++.a**
      - **Allow mixing of .o files**
    - **Faster compile times**
      - **Parity with gcc 3.2**