The PyPy project

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UCT

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What is this talk about?

- short introduction to the PyPy project
- short introduction to RPython
- just in time compilation and other innovations
- how virtual machines should be written

Who am I?

- Maciej Fijalkowski
- PyPy core developer
- own company - baroquesoftware.com

What's PyPy?

- a python interpreter
- implements the full language (no restrictions!)
- runs faster

What makes PyPy different?

- not written in C/C++
- has just in time compiler
- runs fast
- core interpreter does not know about the JIT (mostly)

What's RPython?

- implementation language for PyPy (and other projects, topaz, hippyvm, ...)
- a subset of Python that can be statically compiled
- extensive static analysis and transformation (GC, JIT, ...)

RPython example

- demo
- like python, but can compile to C
- quite a bit quicker

RPython interpreter example

- RPython is an ugly language
- mostly for writing interpreters
- demo

Classic compilation

- you take a language X, parse it, compile it to assembler
- works well for simple "static enough" languages

Virtual Machine

- you take language X, compile it to imaginary computer
- you implement that imaginary computer

JIT - introduction

- you have a virtual machine from the previous slide
- you compile bits and pieces of the code straight into assembler

Tracing JIT - introduction

- instead of compiling e.g. function at a time you **trace** what the interpreter does
- follow steps one by one and generate assembler
- very natural inlining, hot paths etc.

Metatracing

- trace the **interpreter** instead of the program
- for complicated languages, like Python, is essential
- hints necessary to close the semantics gap
- avoids duplication of code

RPython interpreter example - JIT

- demo
- jit adding means adding a few hints (pypy has about 100)

Recap on virtual machines

- don't write virtual machines by hand
- don't write JITs in hand
- use tools (PyPy/truffle)

- pypy.org
- baroquesoftware.com
- fijal@baroquesoftware.com
- Any questions?

Extra slide - what do I do for a living?

- selling pypy commercial support
- various grants
- implementing extra features