Portable Native Client

Fast, Secure, Simple
You probably know NaCl

- Native C/C++ code on the web
- Near-native speed
- Software Fault Isolation sandboxing
You probably *think* you know PNaCl

That project that pretends bitcode is stable.
PNaCl: worthy of the Web

- Architecture independent
  - x86
  - ARM
  - MIPS
- Bindings to the Web platform
PNaCl: worthy of the Web

- Compute offload
  - Performance matters
  - But “good enough” isn’t: battery life matters too
- Entire C/C++ code bases
  - POSIX & dynamic linking
  - OpenGL ES 2.0
  - Threads & atomics
  - SIMD & crypto
PNaCl: the Web, and then some more...

Untrusted code everywhere
- Image/video handling
- Lightweight datacenter VMs
- Smart devices

Also want portability and performance
What does PNaCl bring to LLVM?

- Novel concerns
- Lasting reach
PNaCl’s use of LLVM

Developer

C/C++

LTO

User

native exe

OS + sandbox

pexe
Our folly: portable executable

- SSA
- Limited types
- Few relocations
- Mostly just arithmetic operations

Sounds like LLVM bitcode?
Code generation tuned to each device

● Generate code for the target
  ○ Fast
  ○ Parallel streaming CG
  ○ Dynamic load balancing
  ○ Cached

● O2 quality for generated code

Want a small and nimble compiler
Tuning to the target

- Know the exact target ISA
- Know the exact code being executed
- Adapt the sandbox
- Defense in depth
Questions?

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