LLVM JIT: Upcoming Challenges and Opportunities

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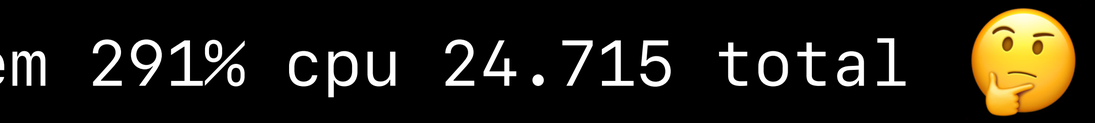

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- Why? Open question — attach a profiler and have at it!

ORC (On Request Compilation) Users

Xcode Previews PostgreSQL Julia

Mojo Jank Clasp `clang-repl` ...

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Help projects migrate to ORC

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- API
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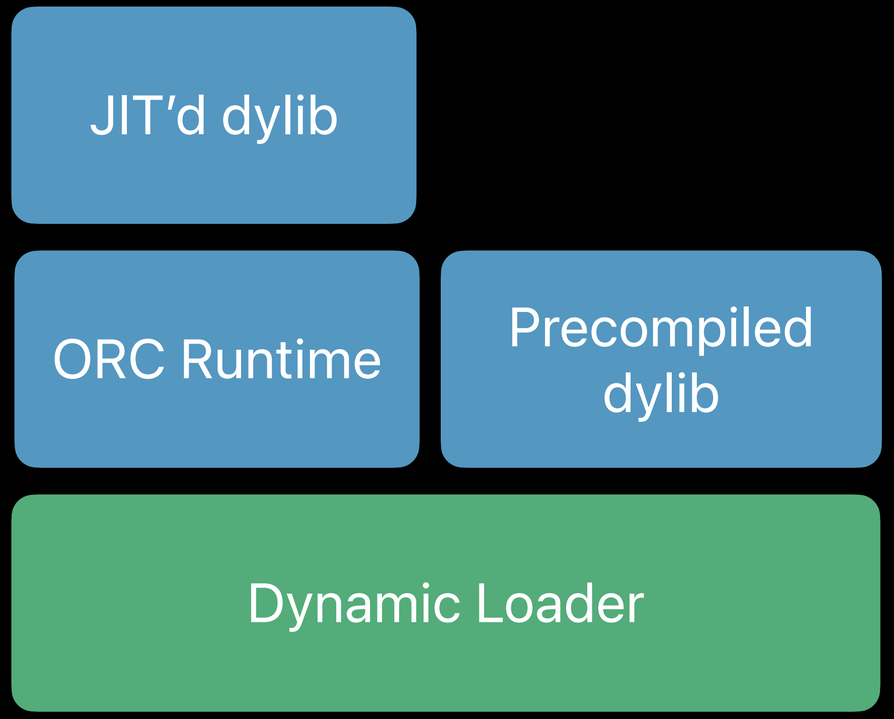
- Target Support
  - Improve Windows Support
    (Need a maintainer!)
    - MCJIT-style `dllimport` handling
    - Structured Exception Handling on by default
  - JITLink backends
    - e.g. Windows/aarch64

Integration and Tooling

- Debugger Support
  - Works, but off by default due to cost
  - Protocol redesign — pass debug info on disk, symbol table in memory
- Crash Reporting
  - General solution for symbolication

Integration and Tooling

Dynamic Loader Emulation



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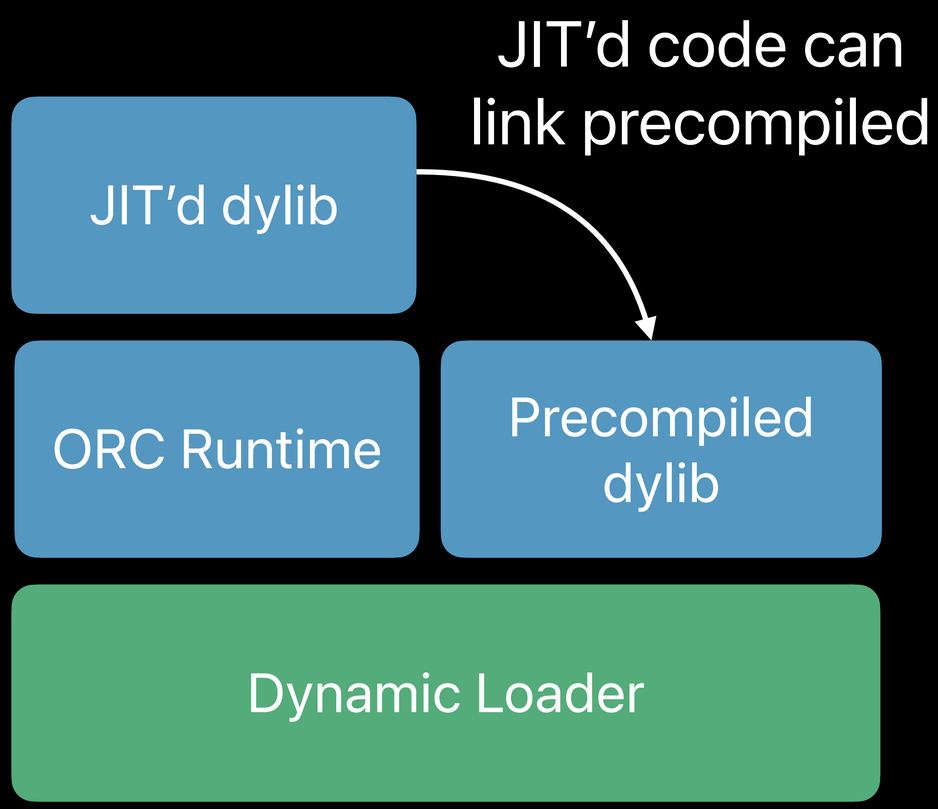
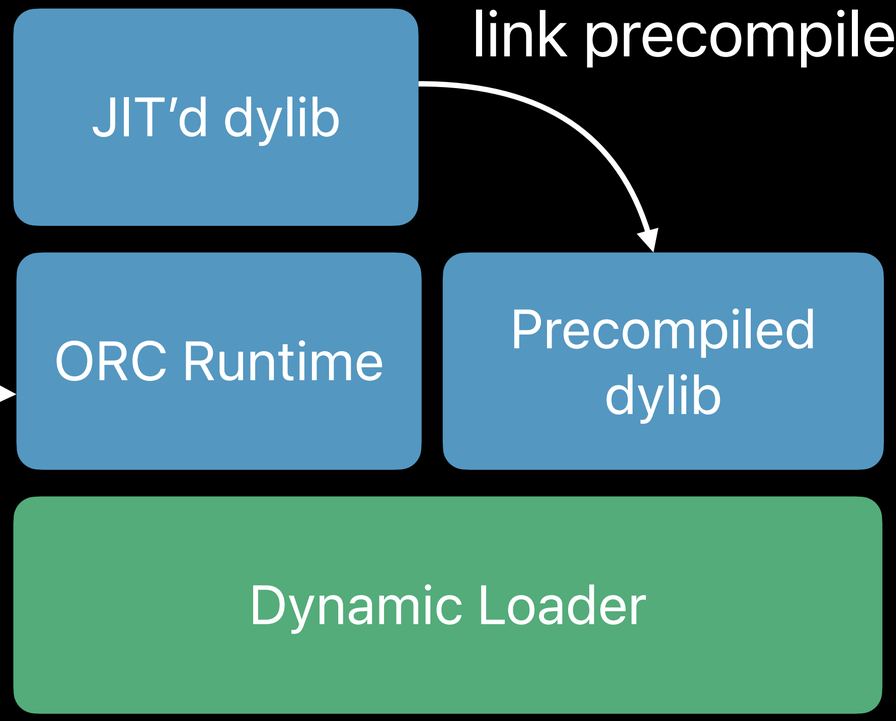


Integration and Tooling

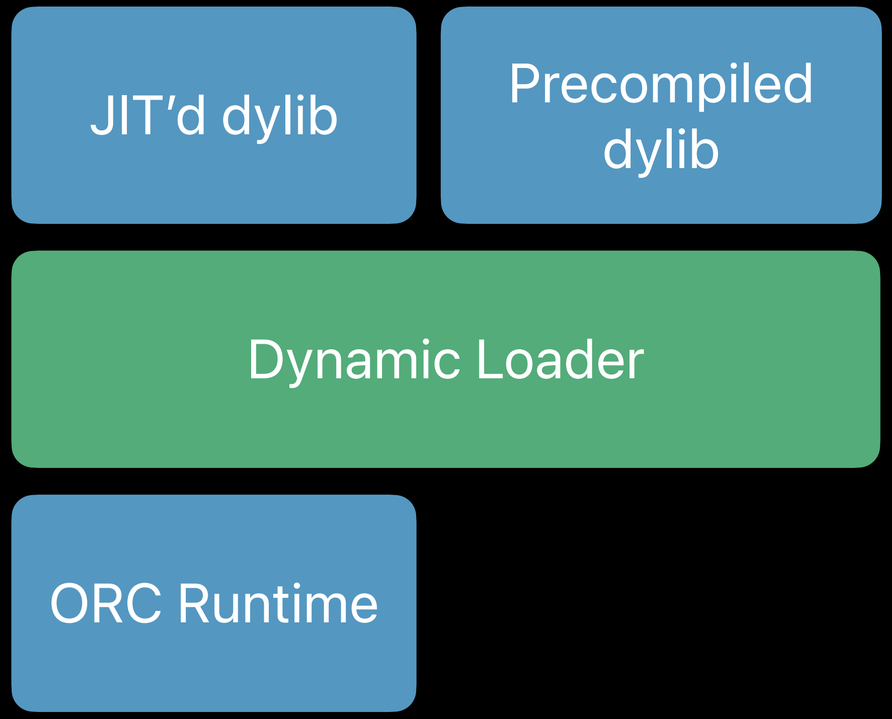
Dynamic Loader Emulation

ORC Runtime emulates Dynamic Loader APIs (`dlopen`, `dlsym`, etc.)



Integration and Tooling

Dynamic Loader *Integration*



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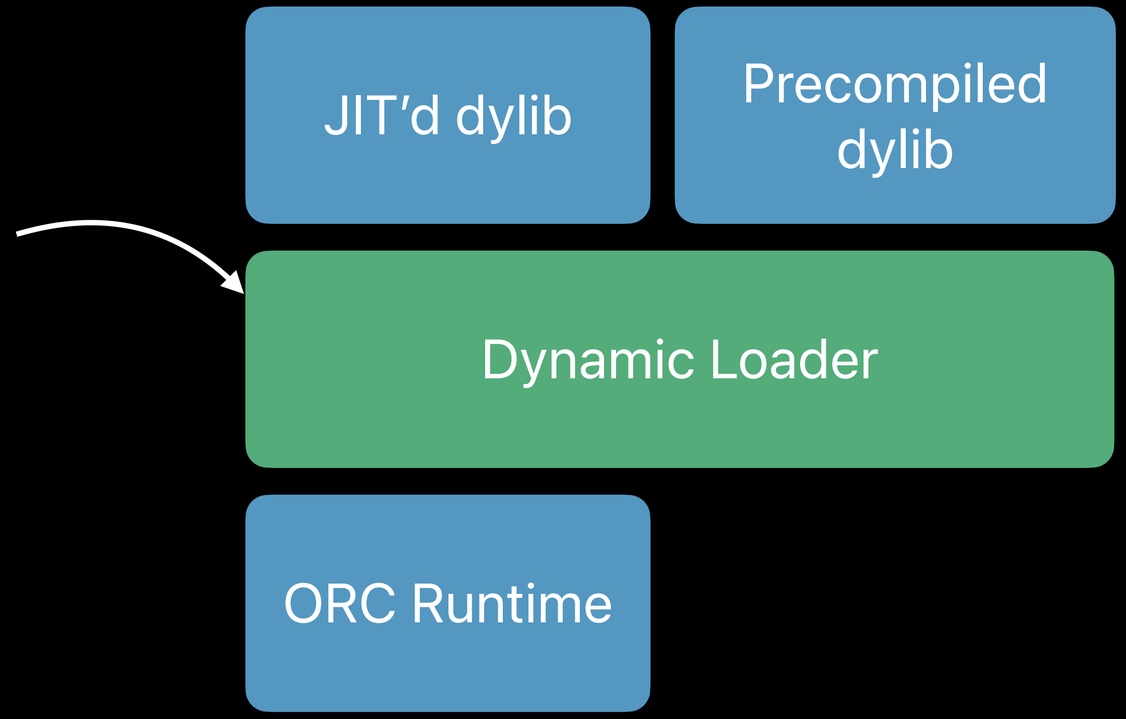
JIT-aware Dynamic Loader

Calls to `dlopen`, `dlsym`, etc. forwarded to ORC runtime for JIT'd code



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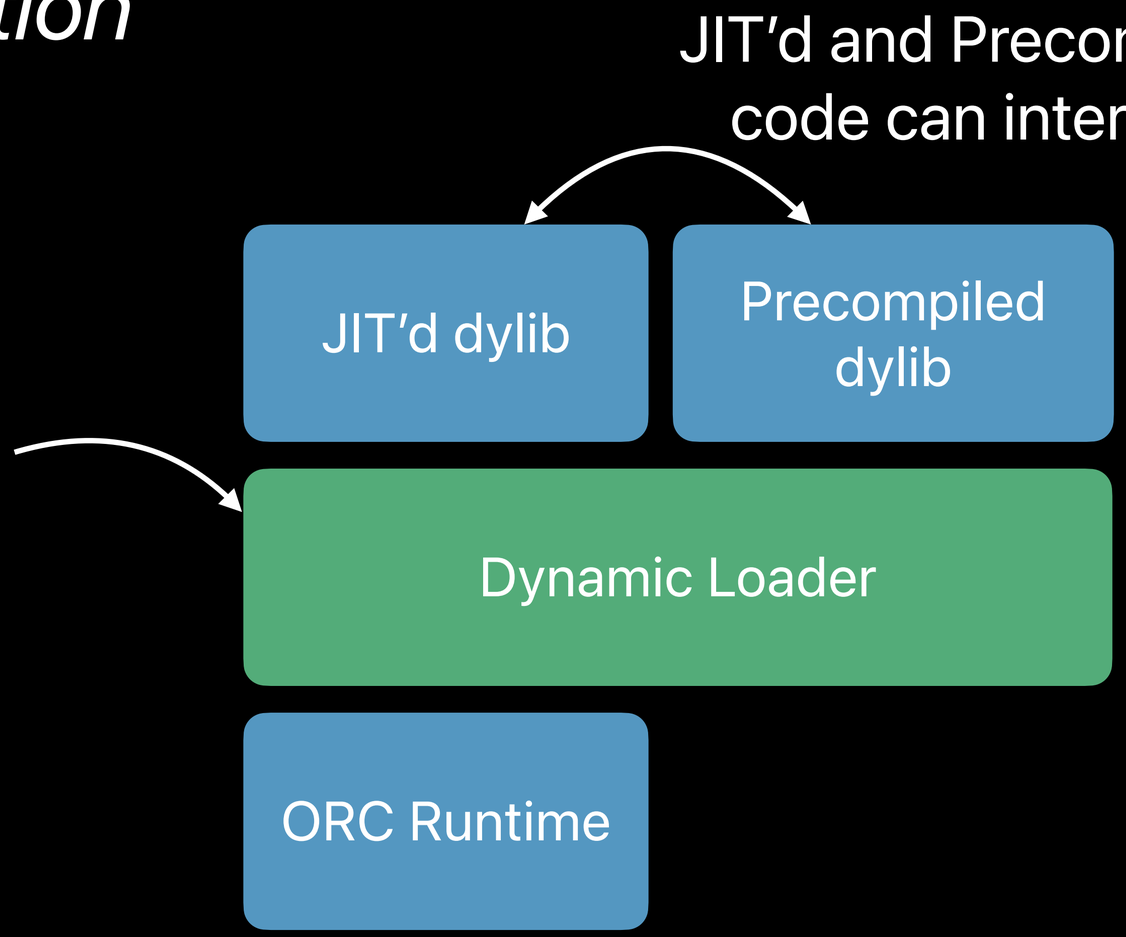

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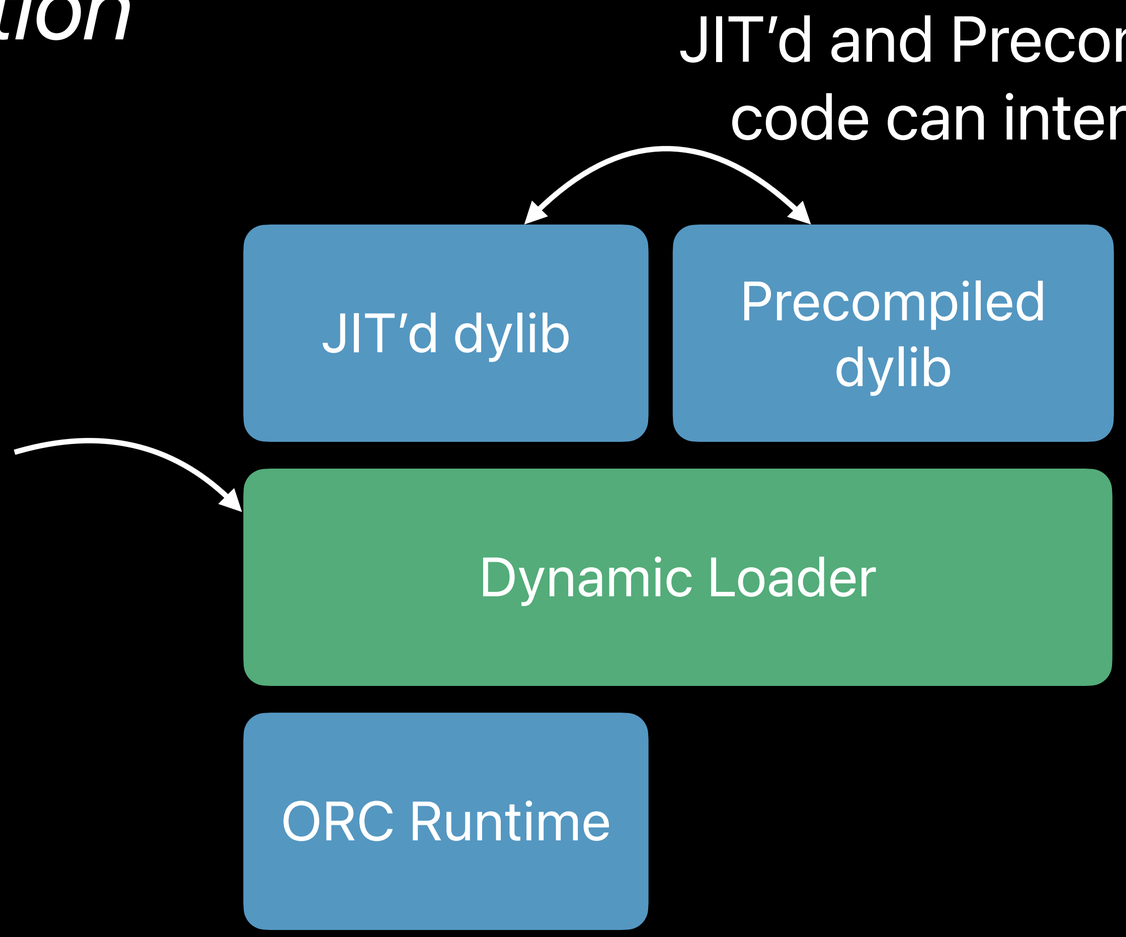

See "JIT-Loading Arbitrary Programs"

https://llvm.org/devmtg/2025-10/slides/technical_talks/hames.pdf

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- `clang-repl` UX opportunities: crash recovery, default include paths, ...

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- Many more…

Get Involved

- Check out the umbrella issue for this talk: https://llvm.org/PR189354
- Join #jit on the LLVM Discord
- Attend the monthly JIT Office Hours
  - Upcoming: Thursday 11:00am UTC, April 30th, 2026
- Come and chat at the conference!