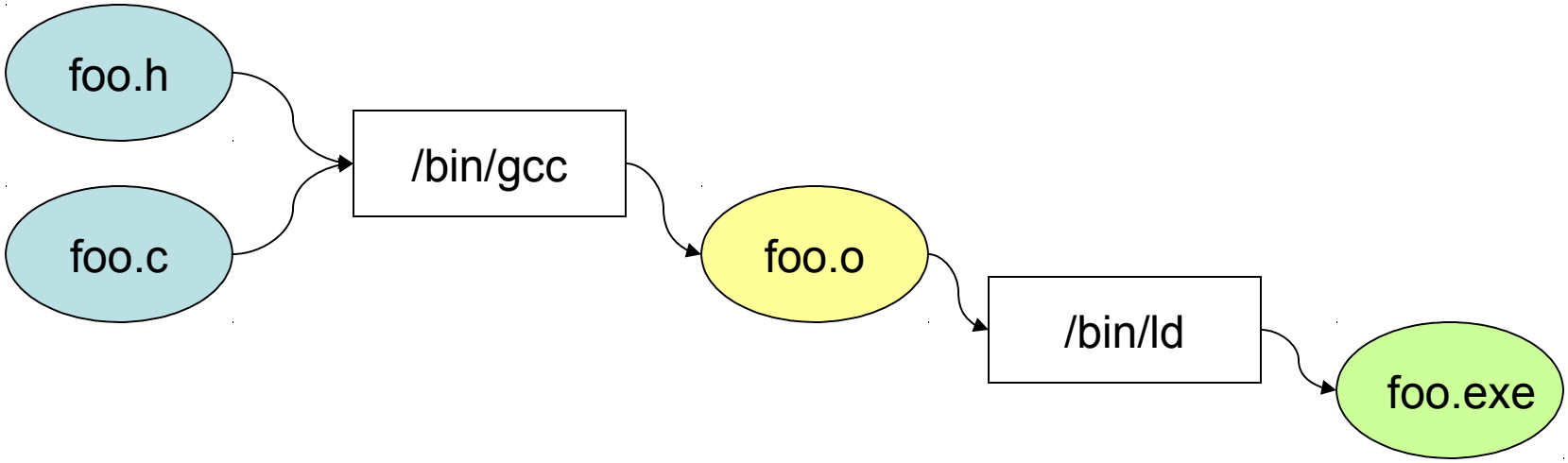
Back to sources: what's in your binary?

FOSDEM 2017: Tracing back from a binary to its corresponding source code



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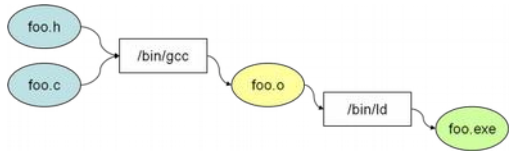
Corresponding Source?

- You build and distribute binaries, right?
- What is the corresponding source code?
- Why?
  - license compliance and/or enforcement
  - code hygiene and build sanity



Techniques to get there

- Forward tracing
  - Dynamic build tracing
- Backward tracing
  - Dependencies analysis
  - Symbols and debug symbols
  - Shared string content
  - Build log analysis
  - Compiler conventions (e.g. Java)

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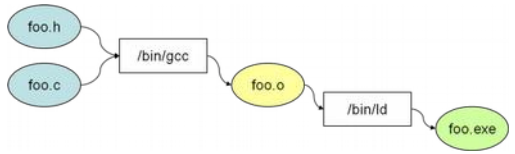

The problems

- Static analysis is not an exact science
- Difficult to obtain what is needed from dev teams
- Debug builds are not the norm
- Builds are complex and hard to modify
- Hard to conclude that something is NOT built
- Built != Deployed

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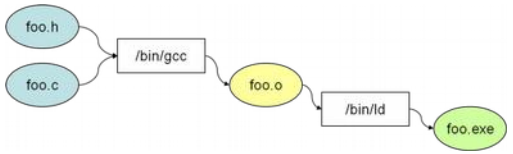
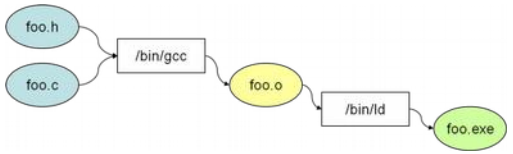


The ideal solution

- Should be very easy on the dev team
- NO CHANGE to the build and config
- Should provide 20/20 vision in analysis
- Should be 100% accurate



Syscalls to the rescue!

- The “machine” language of the Kernel
- 100% accurate
- Everything that touches a file, access the network ends up in a syscall
- Very low level e.g.:
  - open/read/write file
  - spawn process and run executable

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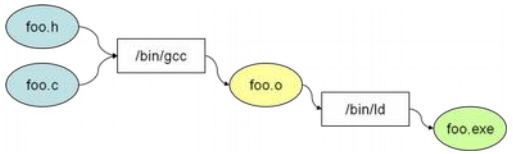

TraceCode

- Run a build under “strace”
- Collect a trace of EVERY syscalls
- Parse the trace
- Rebuild a graph of the file transformation that took place during the build
- Query the graph for fun and profit!

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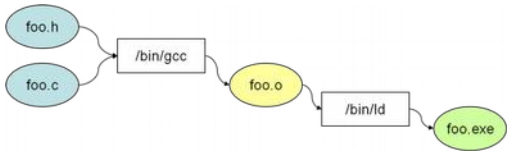

TraceCode (2)

- Completely agnostic wrt. toolchain or programming language
- Does not require *ANY* change to the build process
- Only need to run a traced build
- Can provide 20/20 vision in the build process

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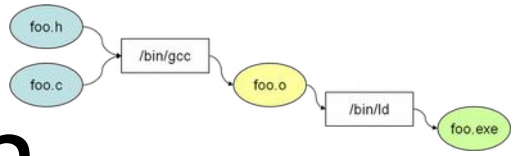
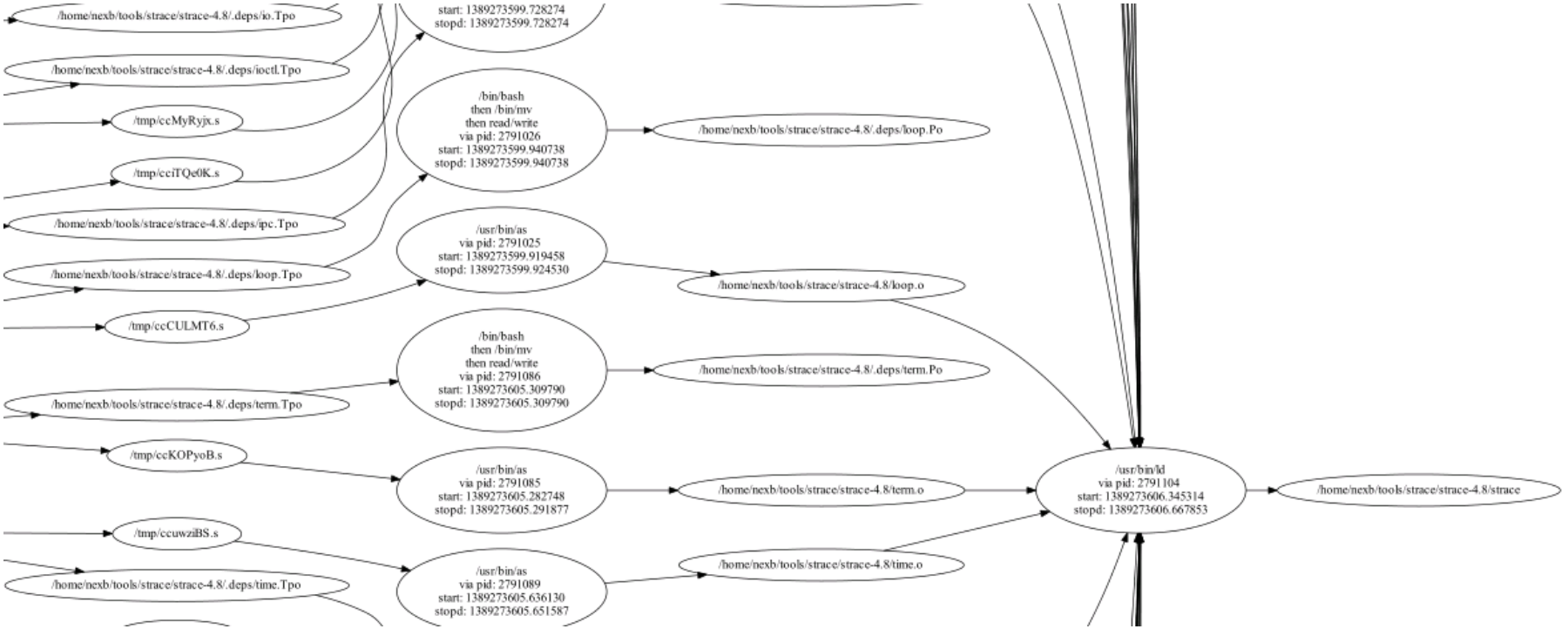
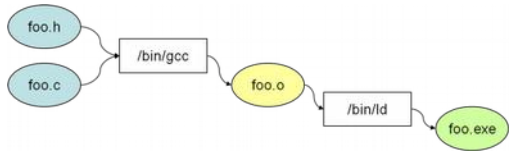


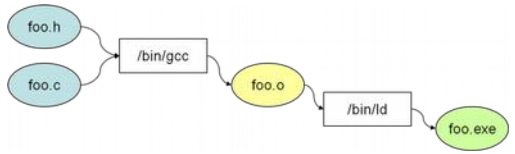
TraceCode graph





Step by step

- Install strace
- Run the build run under strace
- Install and run TracCode on the trace



Other techniques

- Debug symbols: DWARFs and similar
- Symbols: ELFs and similar
- Build logs: brittle, messy
- Shared string content: quite promising!
  - Collect sources and builds
  - Find the unique strings present in both
  - Index these strings (e.g. hashes or aho-corasick)
  - Scan an arbitrary binary for matching strings

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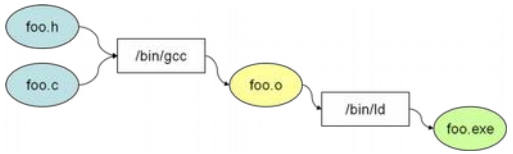

Credits

- strace rocks!
- TraceCode is implementing this paper "Discovering Software License Constraints: Identifying a Binary's Sources by Tracing Build Processes" http://www.st.ewi.tudelft.nl/~sander/pdf/publications/TUD-SERG-2012-010.pdf
- By Sander van der Burg, Julius Davies, Eelco Dolstra, Daniel M. German, Armijn Hemel.

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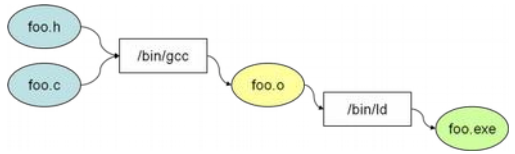

Get TraceCode

- https://github.com/nexB/tracecode-build/
- Written in Python, Apache-licensed.

- Other tools “about code”: http://aboutcode.org
  - **ScanCode**: Scan your code for license, copyrights, packages, etc.
  - **AboutCode manager**: GUI to Review scans. Document origin and license conclusions
  - **AttributeCode**: Document the origin and license of thirdparty code. Collect inventories, generate attribution notices

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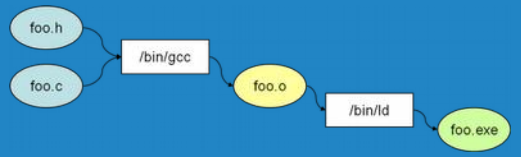

Thank you!

Questions?

Credits

Special thanks to all the people who made and released these awesome free resources:

- Presentation template by SlidesCarnival
- Photographs by Unsplash
- And all the software authors that made TraceCode possible