Towards Binary Diversification

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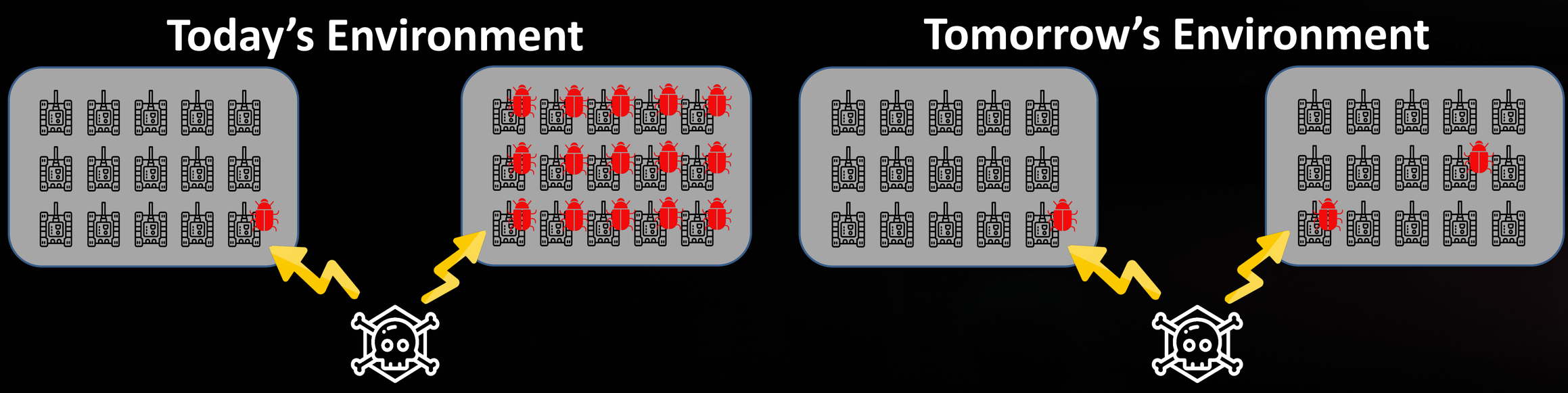
Problem Statement:

All software programs released to consumers, corporations, and governments targeting desktop, mobile, or embedded systems will have a monolithic binary structure. Specifically, Building Diverse Computer Systems [1] discusses software monoculture being the reason why computers are vulnerable to large scale and repeated attacks. This monolithic binary culture leaves systems open to software exploitation across any number of computer systems in many environments.

Clipart from flaticon.com by Freepik



Research Questions:

RQ1: Can a generalized tool to generate binary variants be developed to provide passive protections to computer systems?

RQ2: How do we measure binary diversification?

RQ3: Can we measure the efficacy of binary diversification's ability to make an appreciable difference in preventing binary exploitation?

Research Plan:

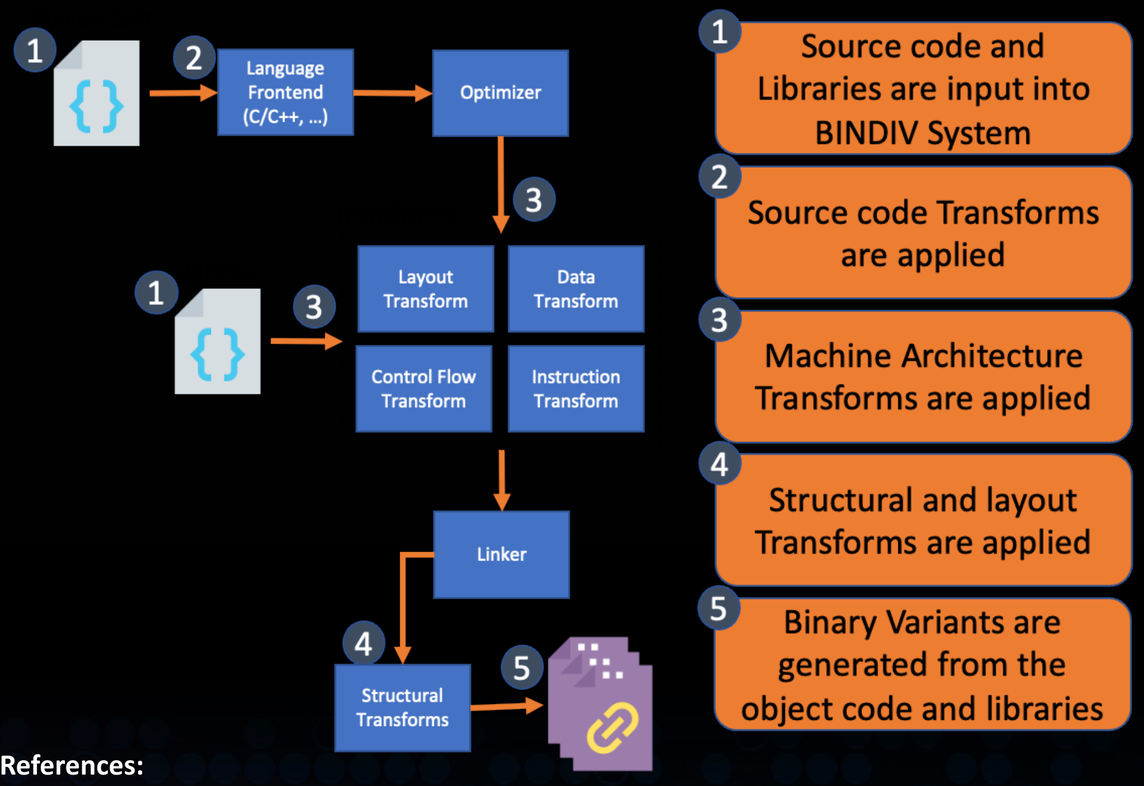
Generate binary variants

- Build Tooling with LLVM/CLang compiler

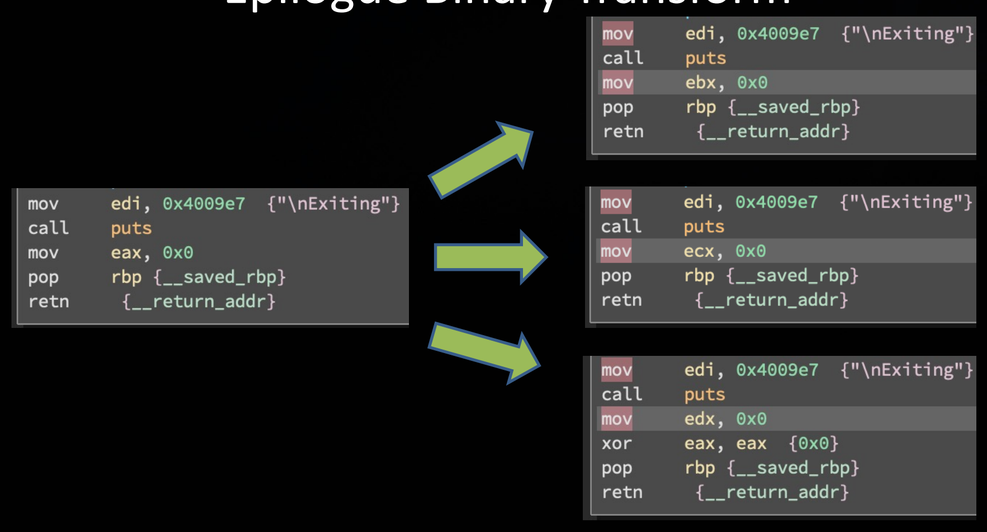
Measure binary diversification

Measure the efficacy of binary diversification

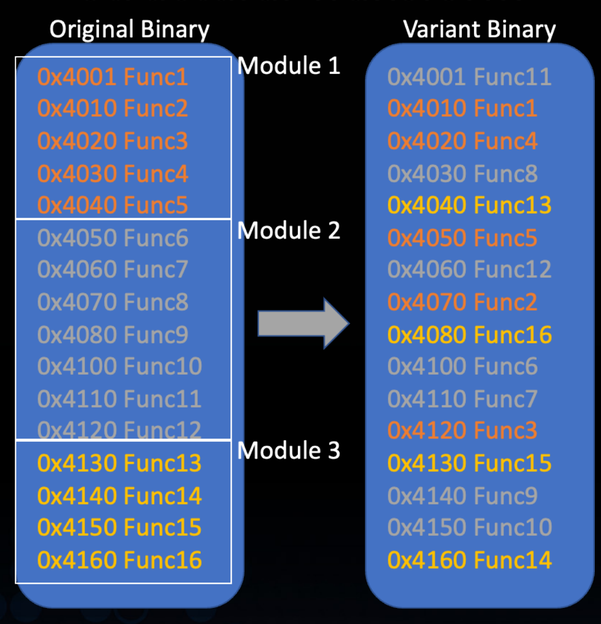
- Build Tools to measure researcher's process
- Use The Space Heroes CTF



Epilogue Binary Transform



Structural Transform



References:

[1] Stephanie Forrest, Anil Somayaji, and David H Ackley. Building Diverse Computer Systems. Technical report, 1997.

Publications:

Christopher Stricklan and TJ O'Connor. "Towards Binary Diversified Challenges For A Hands-On Reverse Engineering Course" ITiCSE '21: Proceedings of the 26th ACM Conference on Innovation and Technology in Computer Science Education V.1 June 2021 Pgs 296–302

TJ O'Connor, Carl Mann, Tiffanie Petersen, Isaiah Thomas, and Chris Stricklan, Proceedings of the 27th ACM Conference on on Innovation and Technology in Computer Science Education Vol. 1 Pgs 442-448

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