2018 - PDR - 294-594 - HexCFI: Fully Context Sensitive Control-Flow Integrity - Priyam Biswas

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HexCFI: Context Sensitive Dynamic Control-Flow Integrity

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Motivation

- Despite hardening with LLVM-CFI, Chrome is still vulnerable to control-flow hijacks
- Attacks target *indirect* control flow transfers that are computed at runtime
- LLVM-CFI *statically* computes allowed target sets for indirect control-flow transfers and is **over-approximate**

Motivating Example

```
void foo() {  }
void bar() {  }
void fun() {  }

int main( ) {
  void(*fnptr)();
  int a = 2;
  if(a % 2 == 0)
    fnptr = &bar;
  else
      fnptr = &foo;
  fnptr();
  return 0;
}
```

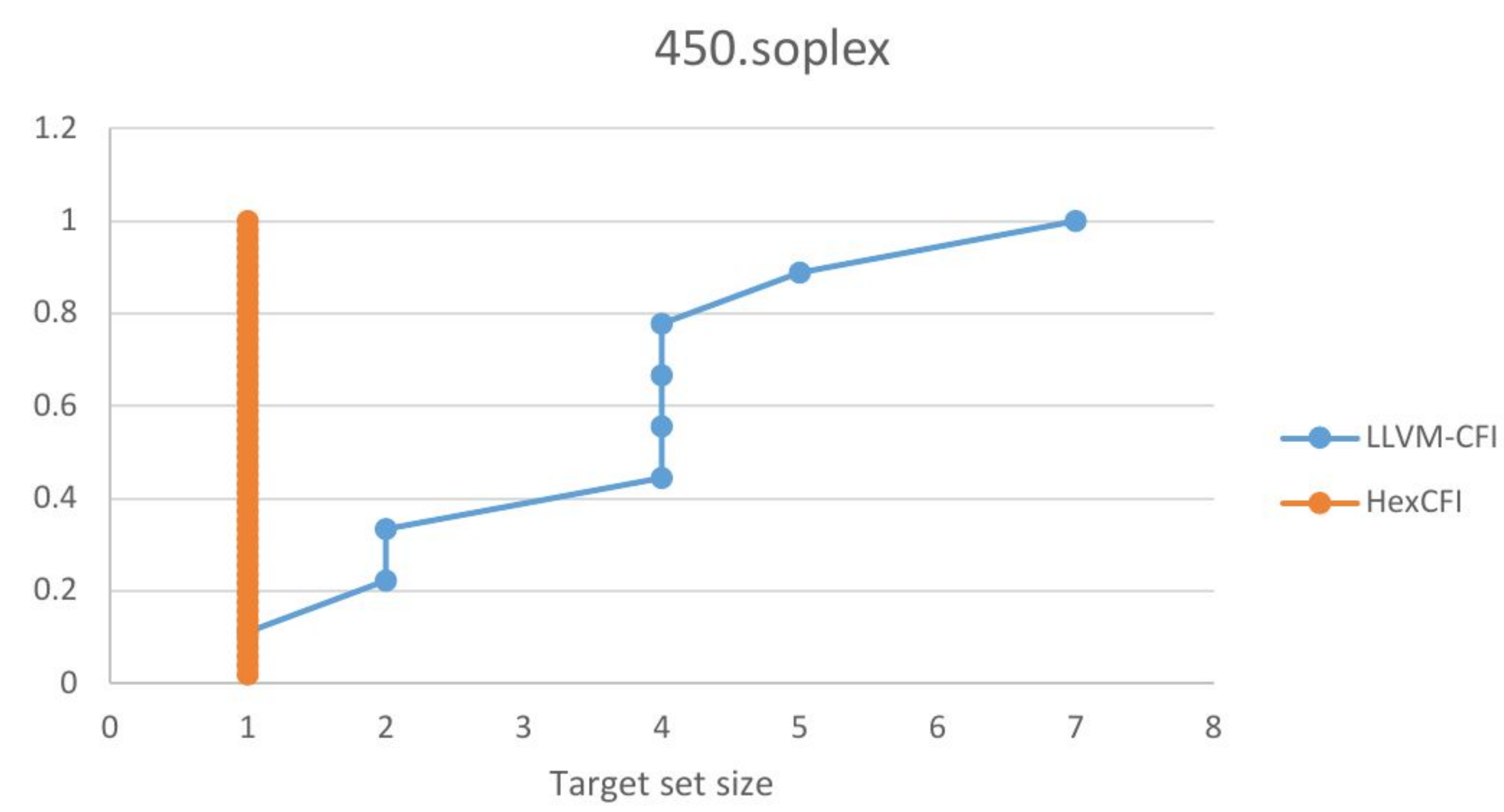
Target Sets

- LLVM_CFI
  { foo(), bar(), fun() }
- HexCFI
  { bar() }

Goals

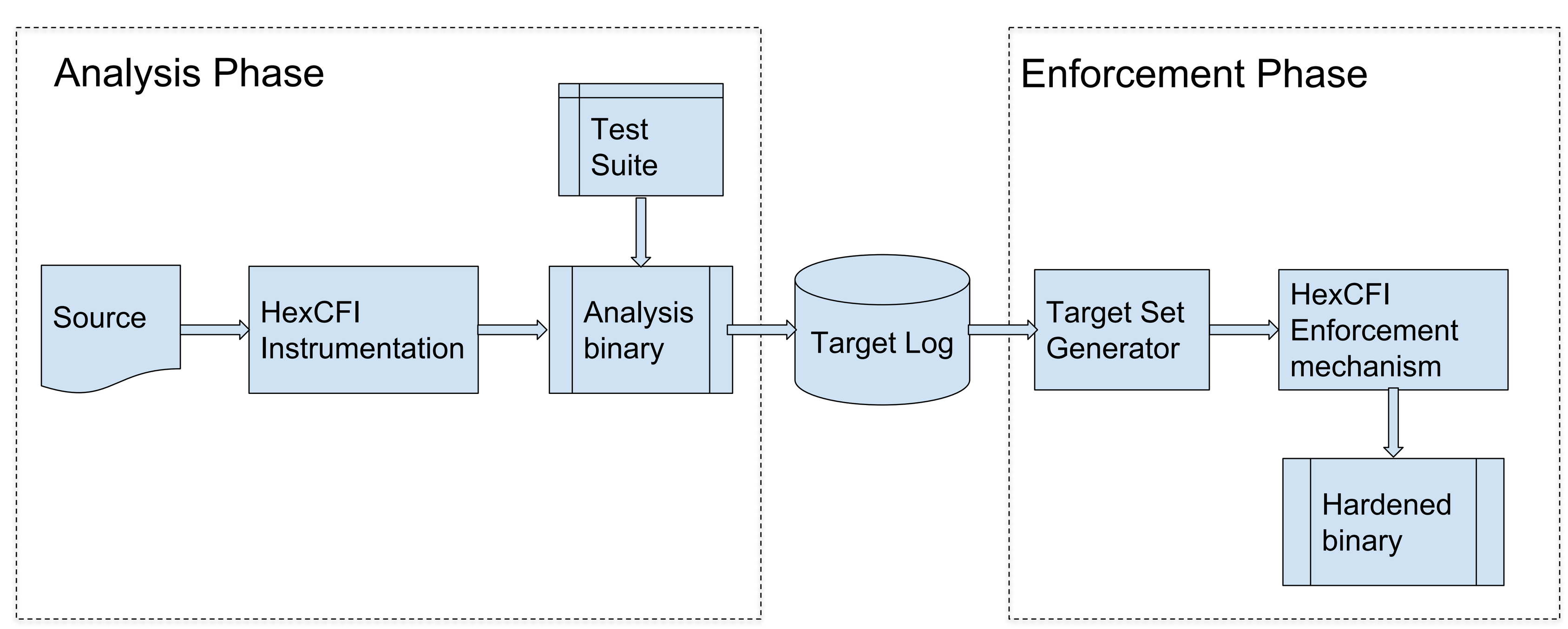
- Compute an **optimum** target set per indirect call site
- An optimum target set is the smallest set such that the program can still execute correctly
- This will provide the strongest possible CFI security policy
- Promote call sites with one target to direct calls

Evaluation



HexCFI Architecture

- **Analysis Phase**
  - Instrumentation logs targets for each indirect control-flow transfer
  - Test Suite / fuzzing used to observe all valid execution paths
- **Enforcement Phase**
  - Computes target set per callsite from Target Log
  - Instruments indirect call sites to enforce valid target set



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