Data Confidentiality and Integrity

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Motivation:
Protect integrity and confidentiality of select data from memory safety vulnerabilities

Background:
- Vulnerabilities -> Memory errors
- Complete protection expensive
- SoftBound: 112% for SPEC CPU [1]

Insights:
- Not all data critical/sensitive
- Overhead proportional to amount of protected data

Idea:
- Programmer decides what is protected
- Annotations in C/C++
- Enforcement: compiler plugin, runtime

Implementation:
- LLVM Pass
- Runtime library creates and maintains metadata for each protected variable
- Memory regions enforced with SFI

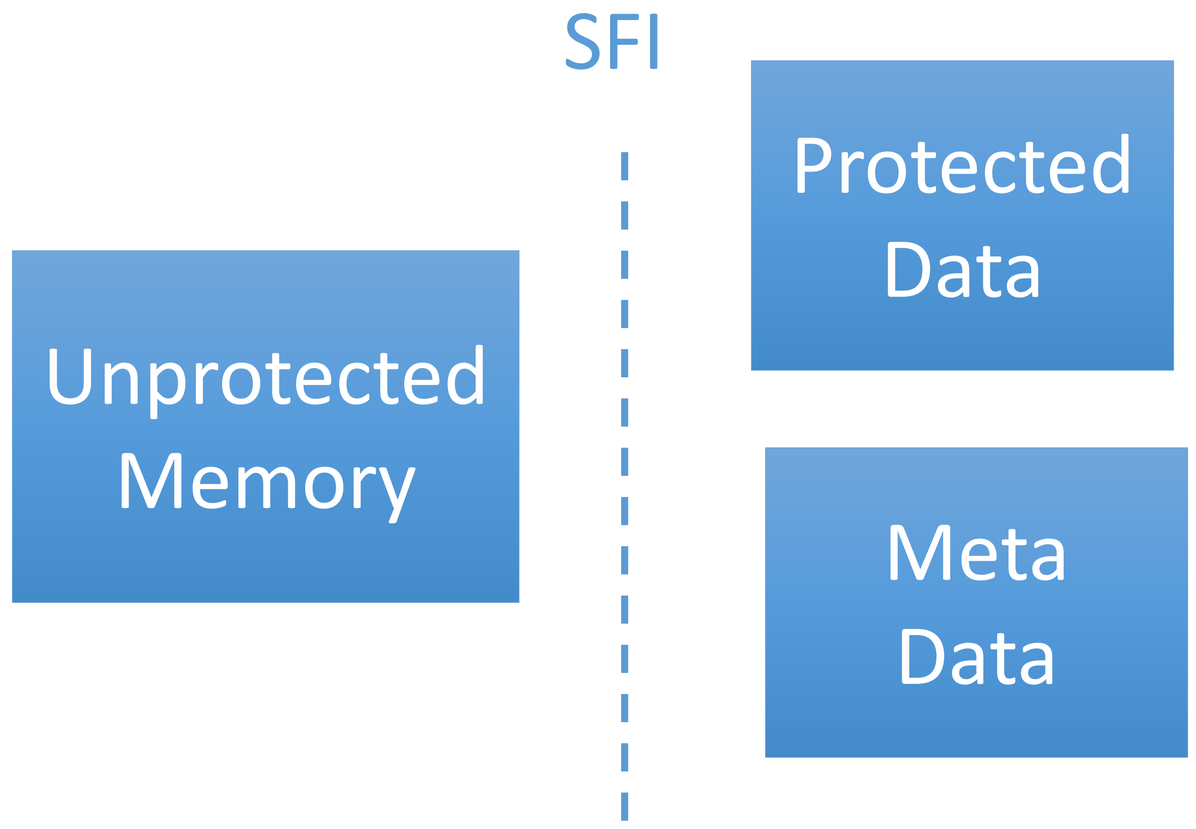
Case Study – PolarSSL:
- Prototype instruments library
- Passes all tests
- Lower overhead than SoftBound

Ongoing Work:
- Aggressive in-lining and optimization of security checks
- Automatically identify sensitive variables

```
void vulnerable() {
  struct key *secret;
  int cmd[5];
  secret = load_key();
  input(cmd); // vulnerability
}
```

sensitive key *secret;

	x Slow Down
DCI	7.28
SoftBound	11.4



1. SoftBound: Highly Compatible and Complete Spatial Memory Safety for C. Santosh Nagarakatte et al. PLDI 2009
2. Code Pointer Integrity. Kuznetsov et. al. OSDI 2014

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