Data Confidentiality and Integrity
Scott A. Carr and Mathias Payer - Department of Computer Science

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
• CPI [2]: protecting 6.5% of memory accesses -> 8.4% overhead

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

Future Work:
• Performance Optimization
• Automatically identify sensitive variables

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

sensitive key *secret;

<table>
<thead>
<tr>
<th></th>
<th>x Slow Down</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCI</td>
<td>7.28</td>
</tr>
<tr>
<td>SoftBound</td>
<td>11.4</td>
</tr>
</tbody>
</table>

---

1. SoftBound: Highly Compatible and Complete Spatial Memory Safety for C. Santosh Nagarakatte et al. PLDI 2009