HardBlare: a Hardware-Assisted Approach for Dynamic Information Flow Tracking
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HardBlare proposes a software/hardware codesign methodology to ensure that security policies are preserved all along the execution of the system but also during files storage. The general context is to address Dynamic Information Flow Tracking (DIFT) that generally consists in attaching marks (also known as tags) to denote the type of information that are saved or generated within the system.

Let’s suppose that “print” function is public and the tag of a variable x is underlined variable x.

### Example code

| p = 3; | p ← public |
| a = 42; | s ← secret |
| x = p + s; | x ← p + s = x |
| print(x); |

### Tag initialization

- p
- a
- x

### Tag propagation

- p
- s
- x

### Tag check

- if (x /= public) raise interruption

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**State of the art**

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<th>Software</th>
<th>Flexible security policies</th>
<th>Overhead (from 300% to 3700%)</th>
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<td>Dedicated CPU for DIFT</td>
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**Main Contributions at a Glance**

- Hardware-assisted DIFT system with limited time overheads.
- Approach based on a non-modified CPU with a standard Linux and generic binaries.
- Could be implemented by industrial partners in medium-term.
- Hardened with hardware security mechanisms: trusted coprocessor storage and bus protection in terms of confidentiality/integrity.
- Contributions on software-related issues as well (static/dynamic IFC analysis, i.e. hybrid analysis).
- Perspectives on runtime reconfiguration and multicore/manycore systems.

**Advantages**

- Flexible security policies
- Overhead

**Disadvantages**

- Multiple attacks detected
- Invasive modifications
- Fixed security policies
- Invasive modifications
- Wasting resources
- Energy consumption (x 2)
- Between CPU and DIFT Coprocessor

**Definitions**

- **Tag dependencies**: block contains annotations loaded when the program is launched.
- **Memory tags**: block contains tags related to information containers.
- **Tag register file**: contains tags related to CPU registers.

### DIFT step-by-step

- ARM CoreSight Components export trace (for both CPUs) towards PL in PFT (Program Flow Trace) protocol.
- PFT Decoder decodes trace in usable format.
- Using decoded trace, DIFT Coprocessor reads tags dependencies block.
- DIFT Coprocessor looks for the tags either in memory or tag register file.
- DIFT Coprocessor computes tags depending on propagation rules.
- DIFT Coprocessor updates corresponding tags.
- DIFT Coprocessor checks for security policy violation and raise an interruption.

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**Some References**