Guaranteed Trade-Offs in Dynamic Information Flow Tracking Games

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From the previous talk

Stochastic Games

Motivation

Motivation

Target, which averages 30 million customers a week, said Friday that an ongoing investigation found that "the stolen information includes names, mailing addresses, phone numbers or e-mail addresses for up to 70 million individuals."

"I know that it is frustrating for our guests to learn that this information was taken, and we are truly sorry they are having to endure this," Target CEO Gregg Steinhafel said in a press release.

In December, the retailer disclosed that data thieves hacked 40 million accounts, stealing encrypted PIN data, customer names, credit and debit card numbers, card expiration dates and the embedded code on the magnetic strip on the back of cards used at Target between Nov. 27 and Dec. 15.

Motivation

Compromised a third-party vendor

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Stayed there for 2 weeks

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Defence

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DIFT: Dynamic Information Flow Tracking

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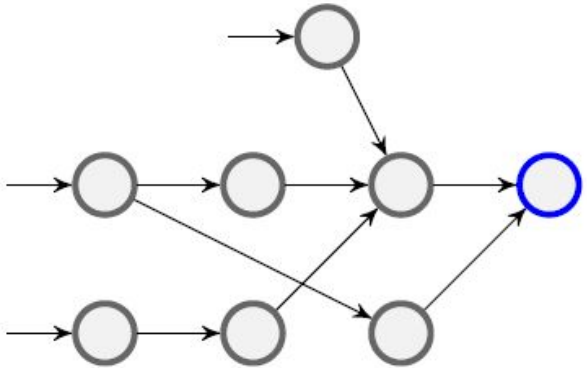
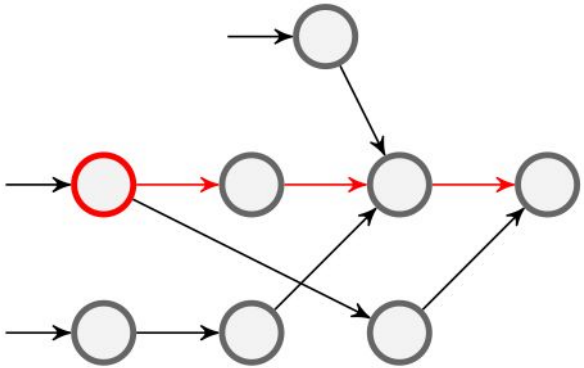
Track user’s movement in the system using information flow graph



Defence

DIFT: Dynamic Information Flow Tracking

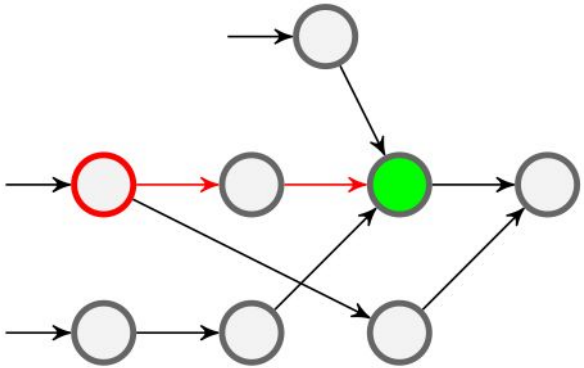
Tag suspicious data I/O channels.



Defence

DIFT: Dynamic Information Flow Tracking

Perform security analysis on a node.



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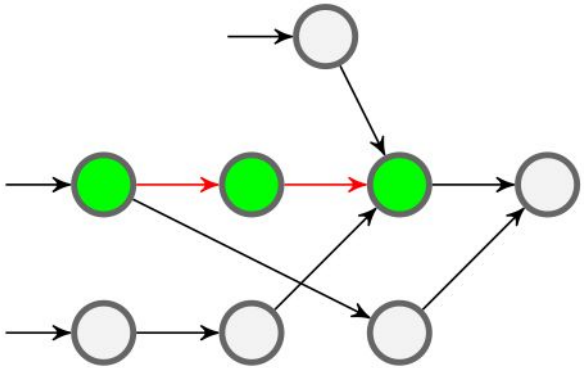
DIFT: Dynamic Information Flow Tracking

Tracking and analyzing information flow induces a memory and performance **cost**.



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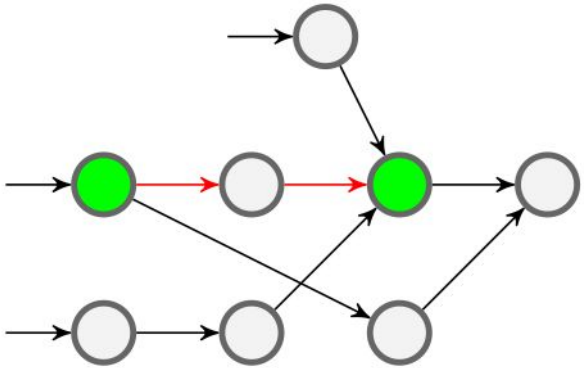
DIFT: Dynamic Information Flow Tracking

It is critical to optimally select, on which nodes to perform the security analysis.



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- Model the interaction as a concurrent stochastic game.

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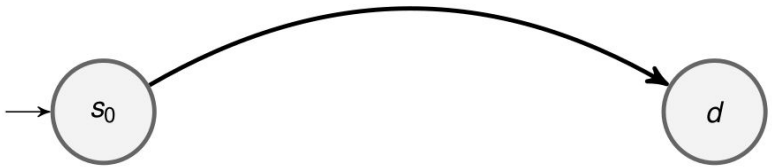

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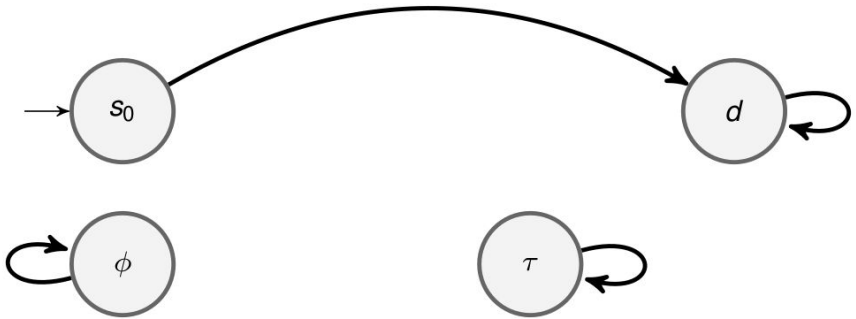

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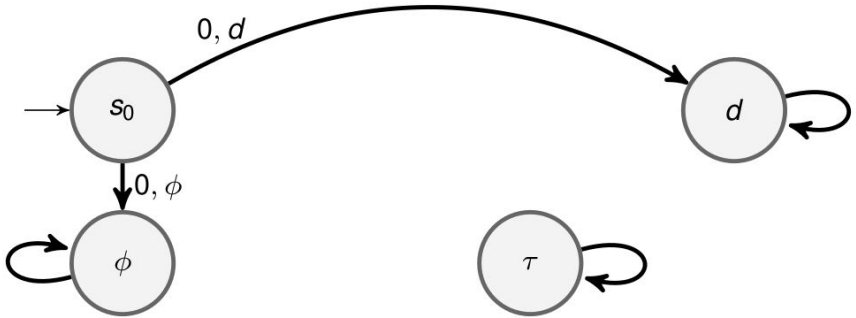

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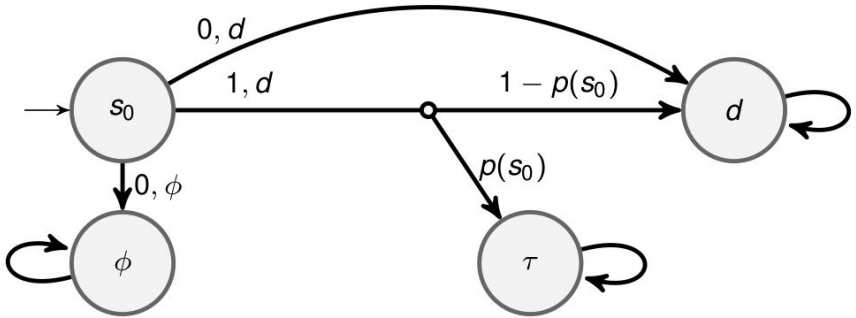

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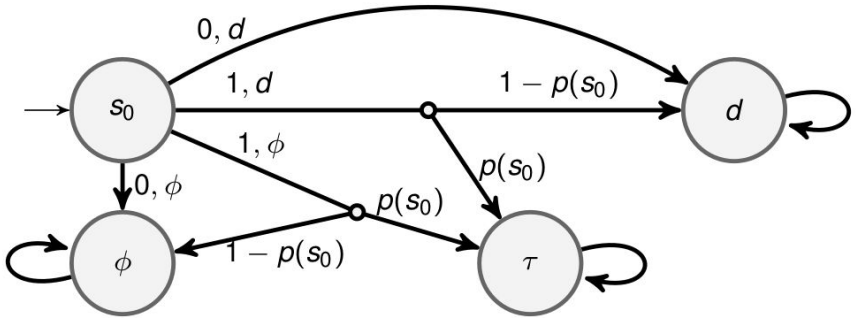

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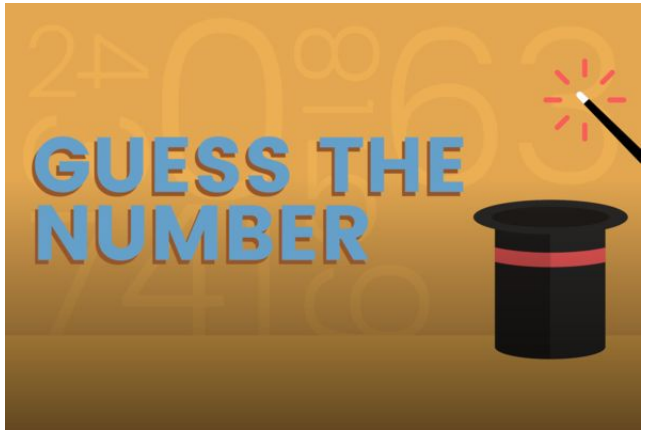

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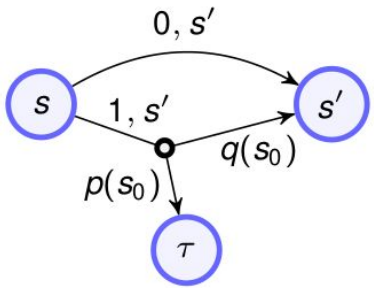
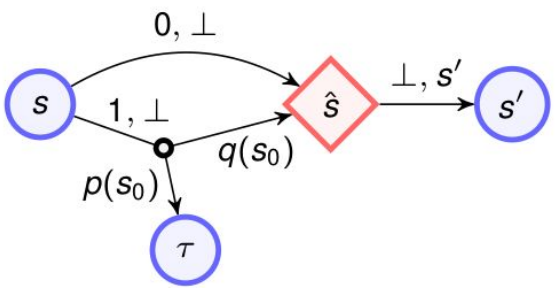
1 reward for multiple objectives.

Our Approach

- Turn it into a turn-based game. [**Our**]





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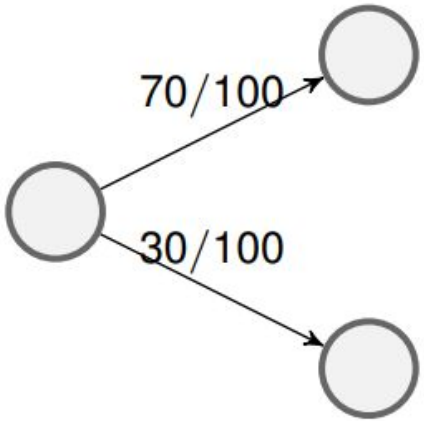

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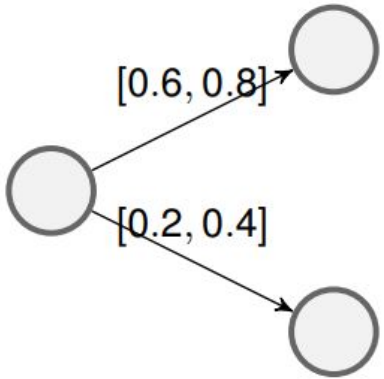

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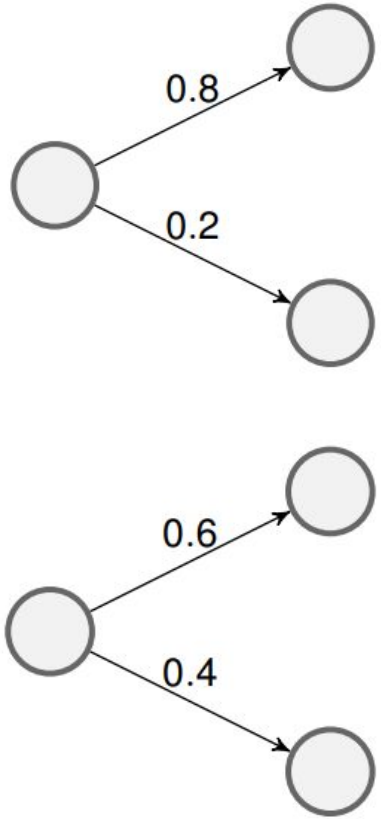

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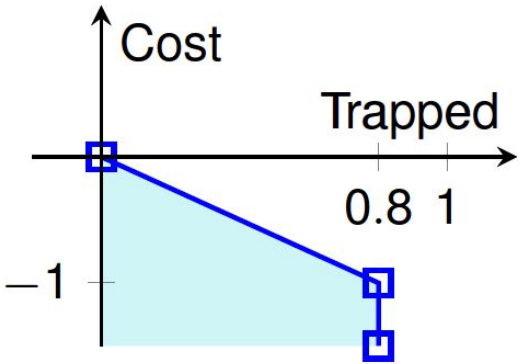

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Solved all the problems.

Experiments

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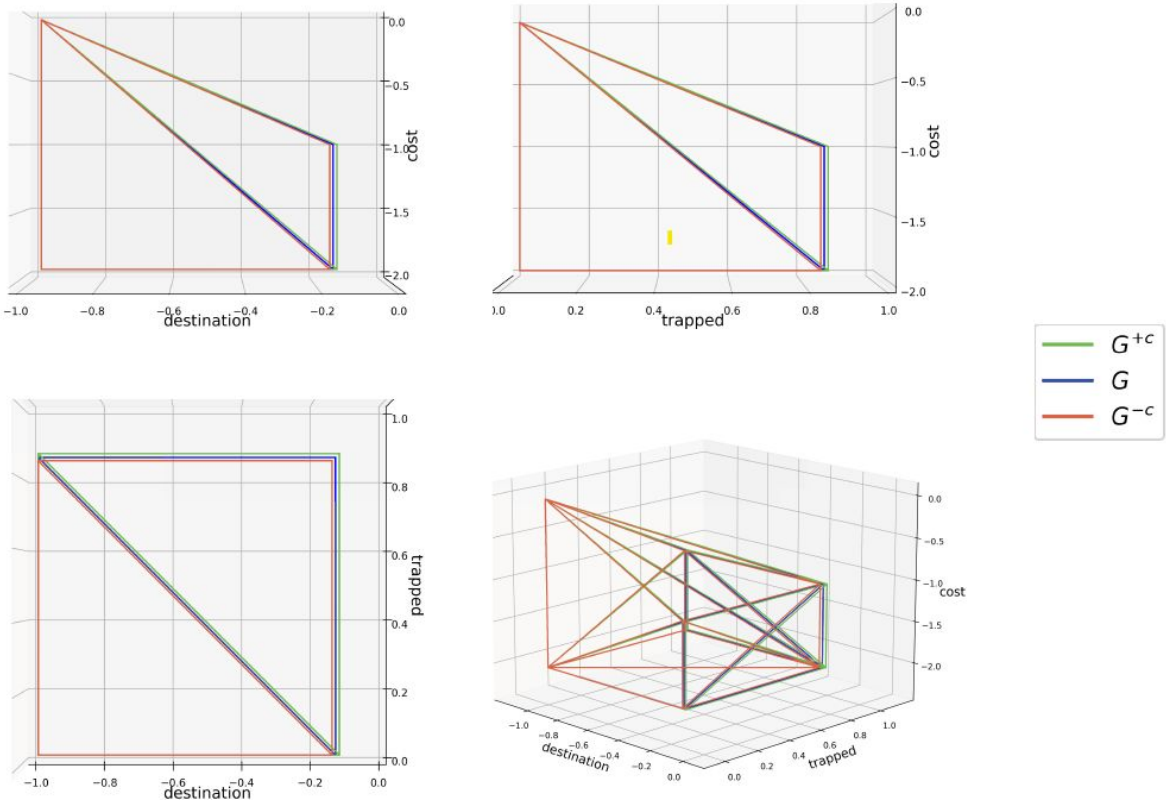

Experiments

Example	Size	Cyclicity	Time taken (s)
Random	10	No	7.78
	100	No	11.90
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ScreenGrab	9	No	7.95
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Thank You!