An Automata Based Approach for Verification of Information Flow Properties

Deepak D'Souza, Raghavendra K.R., Barbara Sprick

Indian Institute of Science, Bangalore, India

Framework

Events. Visible, Confidential, Neither

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Trace: finite sequence of events

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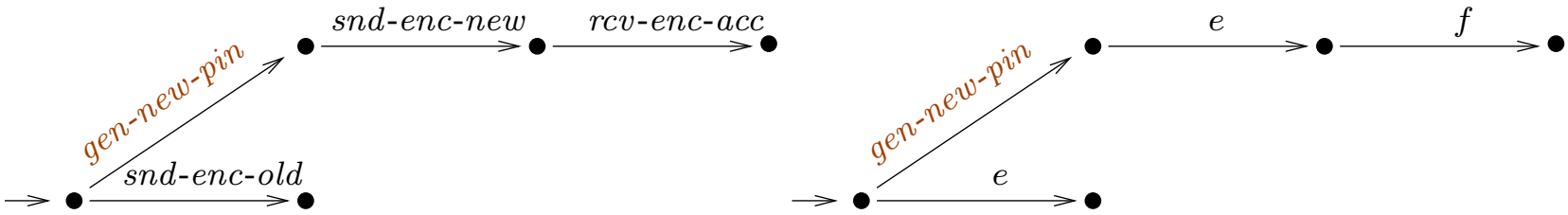
Non-Inference(NF)

$\forall \tau \in L \Rightarrow \tau \restriction_V \in L$

An Example



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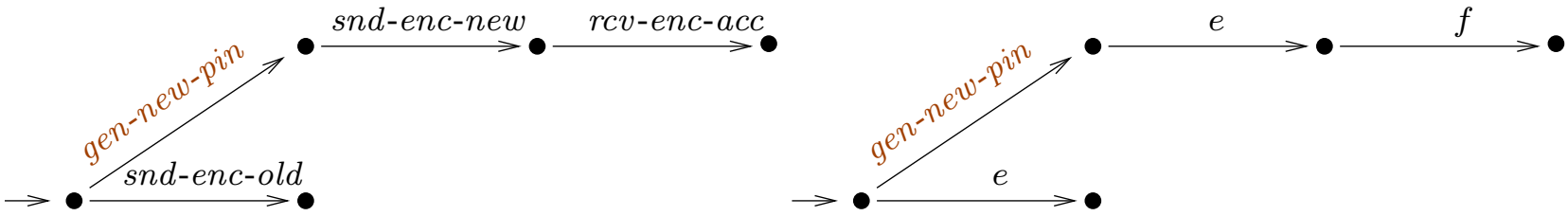

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$C = \{gen\text{-}new\text{-}pin\}$

$N = \phi$

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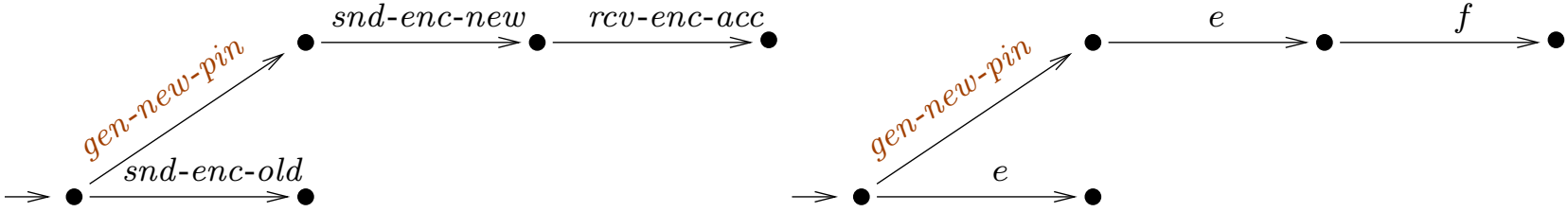

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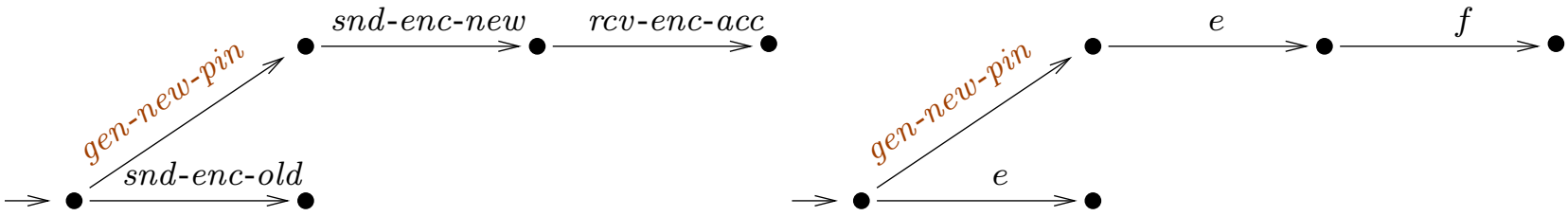

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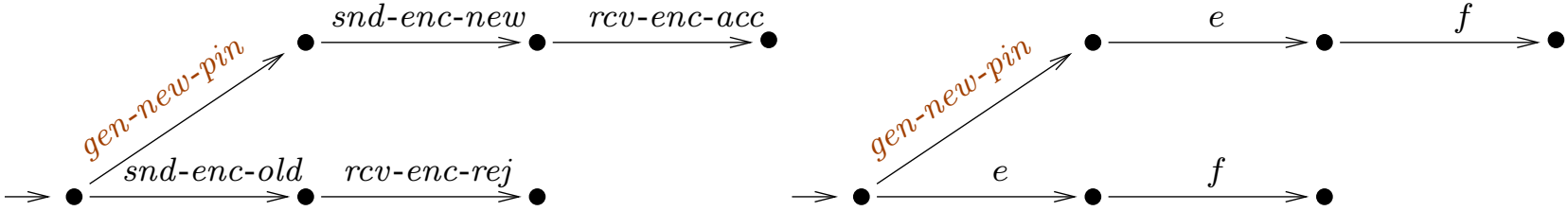
Confidentiality compromised. Noninference fails

Example ...contd



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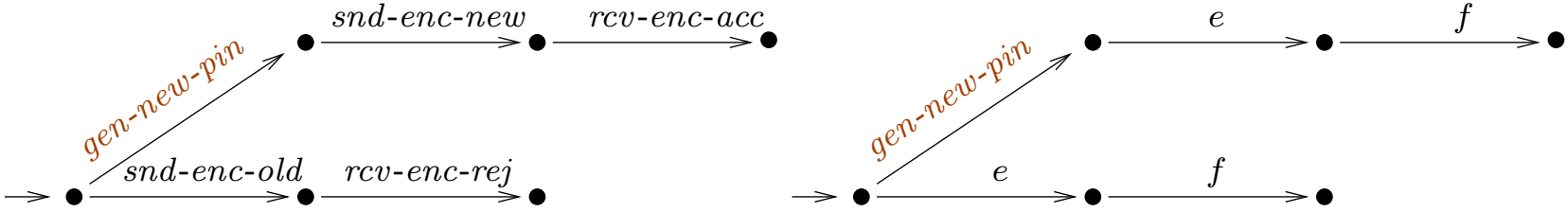

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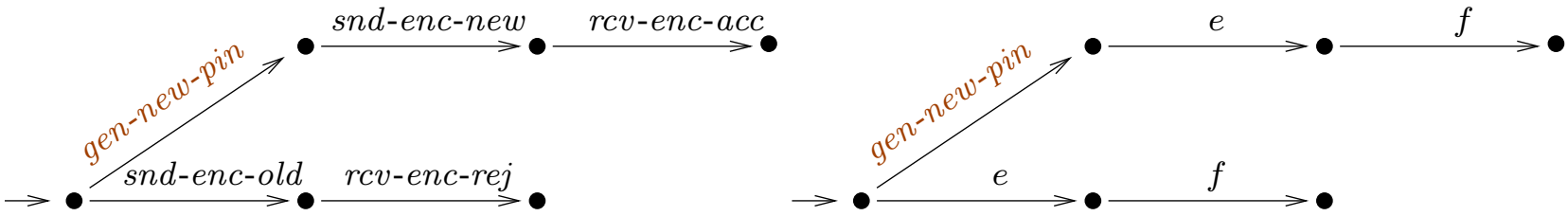

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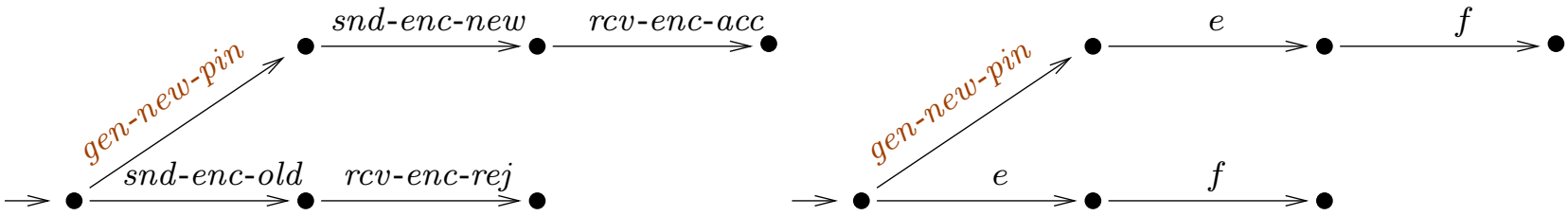

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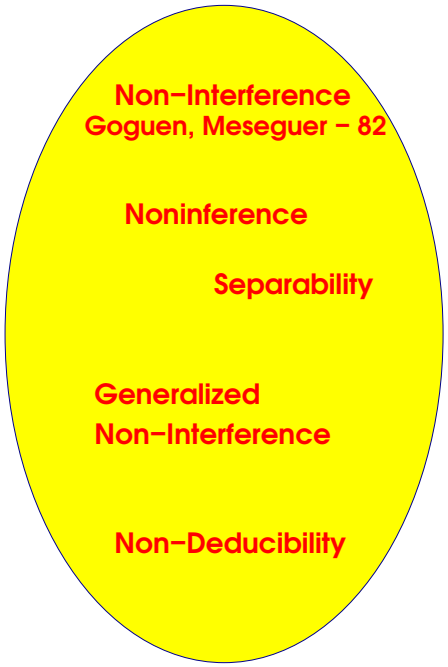
Confidentiality maintained. Noninference holds

Background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Goguen, Meseguer − 82
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Separability
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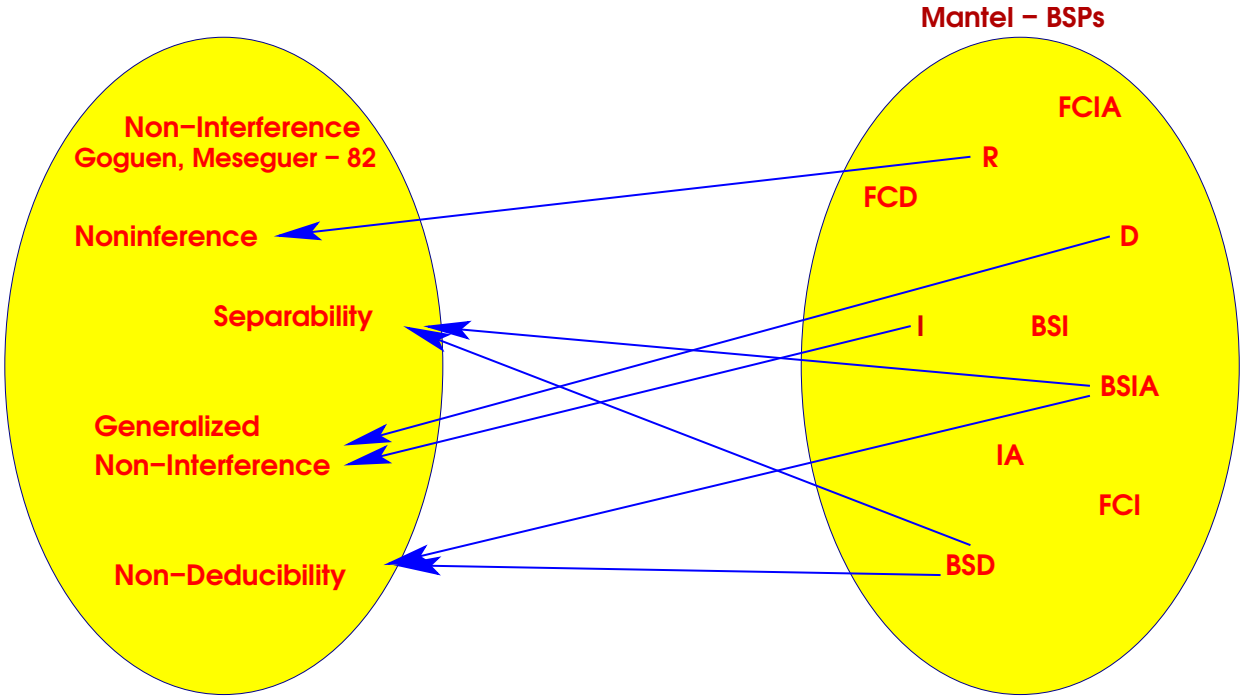
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FCIA
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Basic Security Predicates (BSPs)

Trace based information flow properties in BSPs

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BSP Removal (R)

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BSP Deletion (D)

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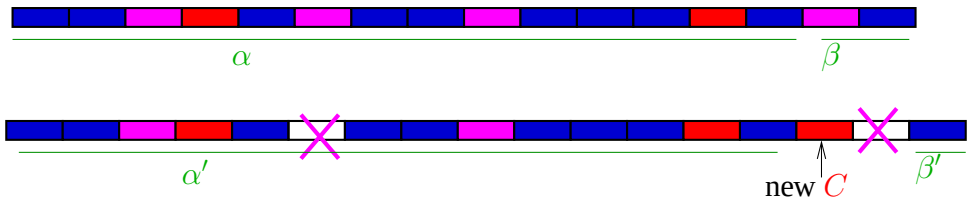
BSP Insertion (I)



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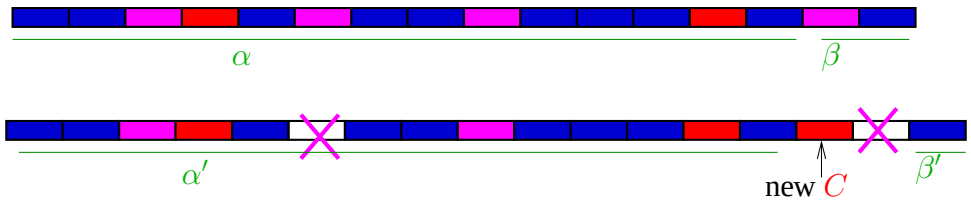
Trace based information flow properties in BSPs

BSP Insert-X Admissable (IA)



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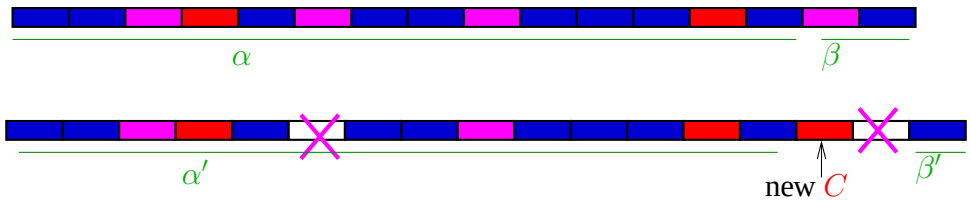

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Generalized Non-Interference - I and D

Noninference - R

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Model Check - BSP on Finite State Automaton

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- Removal R iff $L \restriction_V \subseteq_N L$.
- Deletion D iff *l-del*$(L) \subseteq_N L$.
- Insertion I iff *l-ins*$(L) \subseteq_N L$.
- Strict Removal SR iff $L \restriction_{\overline{C}} \subseteq L$.
- Strict Deletion SD iff *l-del*$(L) \subseteq L$.

Language Inclusion Problem for BSP D

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τ' equivalent to τ modulo N-corrections

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$L \upharpoonright_X$

by replacing transitions $p \xrightarrow{a} q$, with $a \notin X$, in $\mathcal{A}$, by an ϵ-transition $p \xrightarrow{\epsilon} q$

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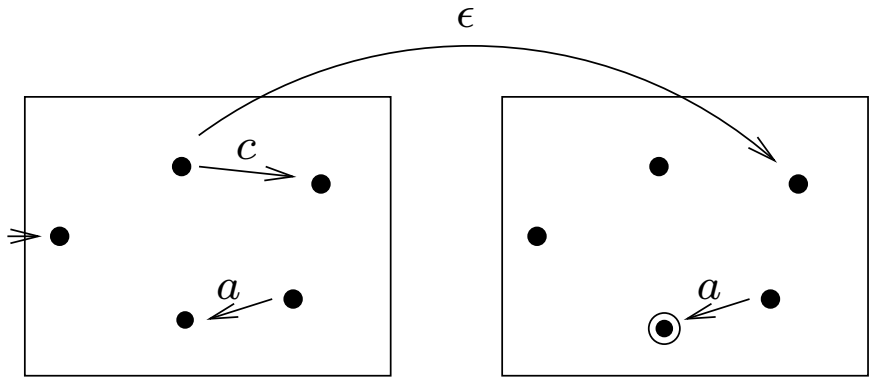

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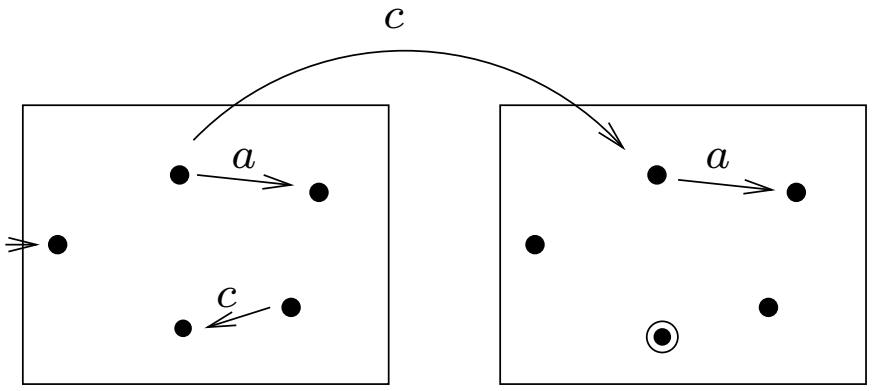

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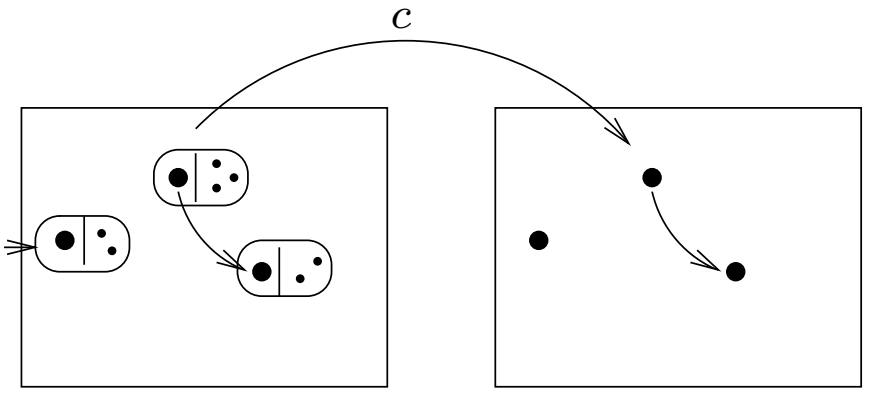

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BSPs - Special case of First Order Logic? Decidability?

Thank You