# A Decentralized Model for Information Flow Control Andrew C. Myers and Barbara Liskov, 1997

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#### Introduction

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The result of this paper is a model for controlling information flow: Decentralized Label Model (DLM).

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It is not:



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### It is not:

► Access Control



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### It is not:

- ► Access Control
- ► Authentication, Authorization, Confidentiality, Integrity.



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### It is not:

- ► Access Control
- ► Authentication, Authorization, Confidentiality, Integrity.

This means that DLM will not ensure:



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### It is not:

- ► Access Control
- ► Authentication, Authorization, Confidentiality, Integrity.

This means that DLM will not ensure:

secure communication between applications



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### It is not:

- ▶ Access Control
- ► Authentication, Authorization, Confidentiality, Integrity.

This means that DLM will not ensure:

- secure communication between applications
- ▶ limited access to data once released



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### It is:

► Information Flow Control



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### It is:

- Information Flow Control
  - Decentralized



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### lt is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:



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### 3 It is:

- ► Information Flow Control
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This means that DLM will help ensuring:

not releasing sensitive data



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### It is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:

- not releasing sensitive data
- not implicitly releasing sensitive data



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### lt is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:

- not releasing sensitive data
- ▶ not implicitly releasing sensitive data
- ► not giving away hints of inner workings



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DLM differs from previous solutions as it is:

decentralized



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- decentralized
- ► less restrictive of allowed computations



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- decentralized
- less restrictive of allowed computations
- not completely disallowing inter-application communication



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How it differs

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- decentralized
- less restrictive of allowed computations
- not completely disallowing inter-application communication
- meant to extend current programming languages with data flow annotations



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DLM provides both static and dynamic checking of data flow.

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Principals represent users and other authoritative entities.



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Principals represent users and other authoritative entities. Values are entities computations can manipulate.



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Slots are value-holders (e.g. variables, objects, and other storage locations).



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Input channels are read-only sources that allow information to enter the system.



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Input channels are read-only sources that allow information to enter the system.

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Values are entities computations can manipulate.

Slots are value-holders (e.g. variables, objects, and other storage locations).

Input channels are read-only sources that allow information to enter the system.

Output channels are information sinks that transmit information outside the system.

Labels are attached to values, slots or channels (more to follow).



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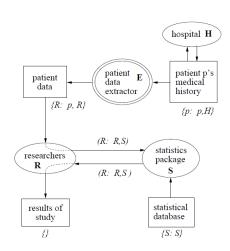


Figure 1: Medical Study Scenario



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```
pinfo = record [ names, passwords: string{chkr: chkr} ]
check_password (db: array[pinfo{\bot}]{\bot},
                 user: string \{\bot\},
                 password: string{client: chkr})
   returns (ret: bool{client: chkr})
   % Return whether password is the password of user
   i: int {chkr: chkr} := 0
   match: bool {client: chkr;
                 chkr: chkr} := false
   while i < db.length() do
     if db[i].names = user &
       db[i].passwords = password then %
          match := true
                                         % {client: chkr;
     end
                                         % chkr: chkr}
     i := i + 1
   end
   ret := false
                                              % ⊥
   if_acts_for(check_password, chkr) then
     ret := declassify(match, {client: chkr}) % \( \pm$
   end
end check-password
```

Figure 6: Annotated password checker



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# Questions?

