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

September 23, 2015

Mikael Elkiær Christensen michrill@student.aau.dk





Mikael Elkiær Christensen

#### Introduction

What it is not What it is

DLM Basics

Terminolog

Labels

Operation

#### Example

Code Example

#### Advanced

Future Works

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



> Mikael Elkiær Christensen

Introduction What it is not

What it is How it differ

How it differs

DLM Basics

Terminology

Example

Advanced

Conclusion

It is not:



> Mikael Elkiær Christensen

Introduction What it is not

What it is

DLM Basics

Labels

Operatio

Example Code Example

Advanced

Eutura Warka

### It is not:

► Access Control



Mikael Elkiær Christensen

#### Introduction What it is not

What it is How it differs

How it differs

DLM Basics

Terminolo

Operation

Example

Advanced

Future Works

### It is not:

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



Mikael Elkiær Christensen

#### Introduction What it is not

What it is

----

### DLM Basi

Labels

Operation

#### Code Evam

Code Examp

### Advanced

Future Works

### It is not:

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

This means that DLM will not ensure:



Mikael Elkiær Christensen

#### Introduction What it is not

What it is

now it dille

### DLM Basi

Labels

Operation

### Example

Code Examp

#### Advanced

Conclusion

### It is not:

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

This means that DLM will not ensure:

secure communication between applications



Mikael Elkiær Christensen

#### Introduction What it is not

What it is

DIM Dee:

### Terminolog

Operation

Example

#### Code Examp

Gode Examp

### Advanced

Conclusion Future Works

### 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



> Mikael Elkiær Christensen

Introductio

What it is no

What it is

....

JLIVI Basio

Terminolog

Onoratio

Example

Advanced

\_ . . .

Department of Computer Science Aalborg University Denmark ) It is:



> Mikael Elkiær Christensen

Introductio

What it is

How it diffe

DLM Basics

Terminology

Labels

Operation

Example

Advanced

Conclusion

### It is:

► Information Flow Control



> Mikael Elkiær Christensen

What it is

**DLM Basics** 

Advanced

### It is:

- Information Flow Control
  - Decentralized



Mikael Elkiær Christensen

### Introductio

What it is no

What it is How it diffe

DLM Basics

#### Torminology

Labels

Operation

#### Lxample

Code Exampl

Advanced

Euturo Works

### lt is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:



Mikael Elkiær Christensen

### Introductio

What it is no

What it is

How it diffe

### **DLM Basics**

Terminolog

Labels

Operation

#### Example

Code Exampl

Advanced

Eutura Works

### 3 It is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:

not releasing sensitive data



Mikael Elkiær Christensen

Introductio

What it is no

What it is

How it diffe

DLM Basi

Terminolog

Labels

Operation

Carla Francia

Code Examp

Advanced

Conclusion

### It is:

- ► Information Flow Control
- Decentralized

This means that DLM will help ensuring:

- not releasing sensitive data
- not implicitly releasing sensitive data



Mikael Elkiær Christensen

Introduction

What it is n

What it is

How it diffe

DLM Basic

Terminolog

Labels

Operation

Example

Code Examp

Advanced

Conclusion

### 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



> Mikael Elkiær Christensen

Introduction
What it is no

What it is How it differs

DLM Basics Terminology

Operation

Example
Code Example

Advanced

Euturo Works



Mikael Elkiær Christensen

### Introductio What it is no

What it is

How it differs

DLM Basics

Lahels

Operatio

### Example

Code Examp

Advanced

. . .

DLM differs from previous solutions as it is:

decentralized



Mikael Elkiær Christensen

### Introductio What it is no

What it is

How it differs

DLM Basics

Termino

Cooretie

C. . . . . . . . .

### Code Examp

Advanced

Mavancca

Future Works

- decentralized
- ► less restrictive of allowed computations



Mikael Elkiær Christensen

How it differs

Advanced

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



Mikael Elkiær Christensen

How it differs

Advanced

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



Mikael Elkiær Christensen

### Introduction

What it is not

How it differ

#### DLM Basics

Terminology

Labels

Operation

### Example

Code Examp

Advanced

Future Works

DLM provides both static and dynamic checking of data flow.



> Mikael Elkiær Christensen

Introduction
What it is not

What it is How it differ

DLM Basics Terminology

Labels

Example

Example
Code Example

Advanced

Future Works

Principals represent users and other authoritative entities.



> Mikael Elkiær Christensen

Introductio What it is no What it is

How it differ

DLM Basics Terminology

Labels

Operations

Example Code Examp

Advanced

Future Works

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



> Mikael Elkiær Christensen

Introduction
What it is no

What it is How it differ

DLM Basics

Terminology

Labels

Example

Code Exampl

Advanced

Euture Works

Principals represent users and other authoritative entities.

Values are entities computations can manipulate.

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



Mikael Elkiær Christensen

Terminology

Advanced

Principals represent users and other authoritative entities.

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.



Mikael Elkiær Christensen

Introductio What it is no What it is

DLM Basics Terminology

Labels Operations

Example

Code Examp

Advanced

Conclusion Future Works Principals represent users and other authoritative entities.

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.



> Mikael Elkiær Christensen

What it is no What it is

How it differs

Terminology Labels

Example

Code Exampl

Advanced

Conclusion Future Works Principals represent users and other authoritative entities.

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).



> Mikael Elkiær Christensen

Introduction What it is not

Writer it is

DLM Basic

Terminolog

Labels

.

Example Code Example

Advanced

Conclusion

Department of Computer Science Aalborg University Denmark



> Mikael Elkiær Christensen

Introduction What it is not

What it differ

DLM Basic

Terminolog

Operations

Example

Advanced

Conclusion

Department of Computer Science Aalborg University Denmark



Mikael Elkiær Christensen

### Introduction

What it is not

How it differ

#### DI M Pagio

Terminology

. . . . .

Operation

#### Example

Code Example

Advanced

Euturo Worke

Department of Computer Science Aalborg University Denmark



Mikael Elkiær Christensen

Introduction

How it differ

DI M Rasio

Terminolog

Labels

Example

Code Example

Advanced

10

13

Future Works



Mikael Elkiær Christensen

### Introduction

What it is not What it is

How it differ

#### DLM Basic

Terminolo Labels

Operation

### Example

Code Example

### Advanced

13



## Conclusion

#### Decentralized Label Model

Mikael Elkiær Christensen

### Introduction

What it is no What it is

How it differ

#### DLM Basic

Terminolo

Labelo

### Example

ode Evampli

Advanced

### Conclusion

Future Works

12

13



> Mikael Elkiær Christensen

Introduction
What it is no

How it differ

DI M Ponio

Terminolog

Lahels

Operation

Example

Code Examp

Advanced

Conclusion Future Works

Department of Computer Science Aalborg University Denmark

# Questions?

