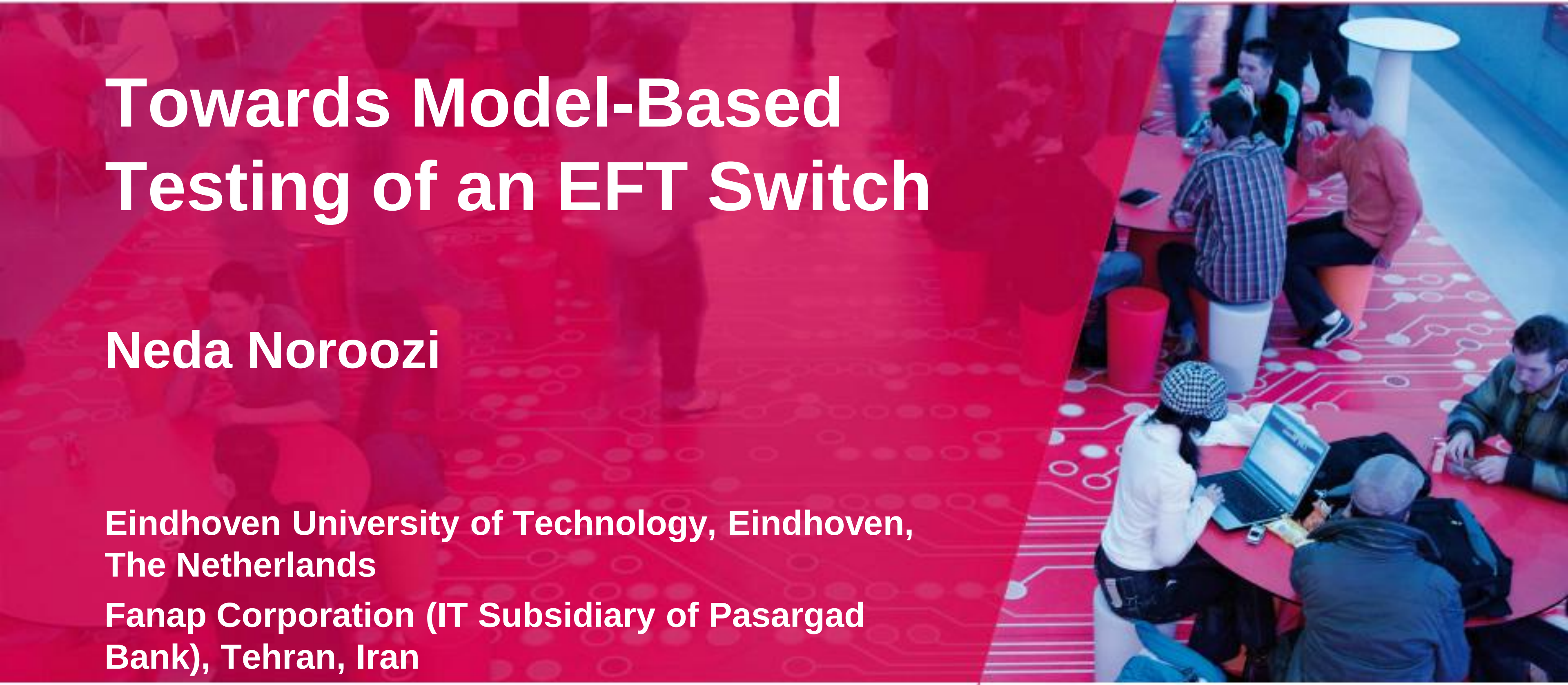

Towards Model-Based Testing of an EFT Switch

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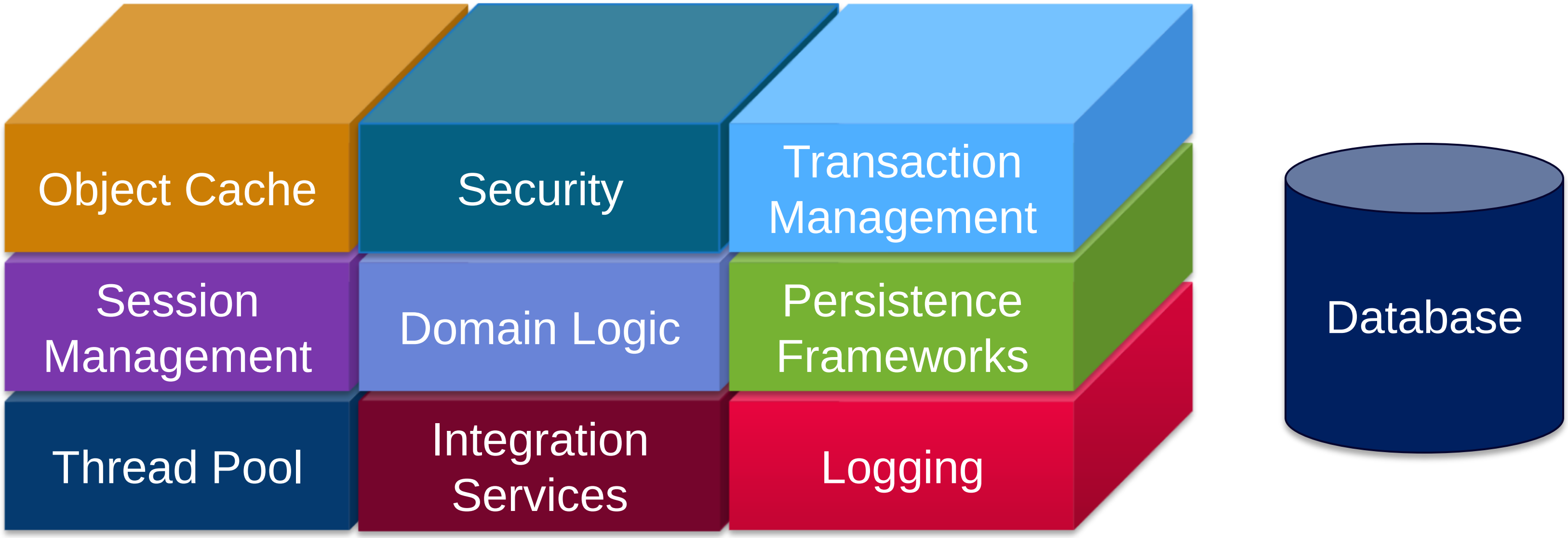
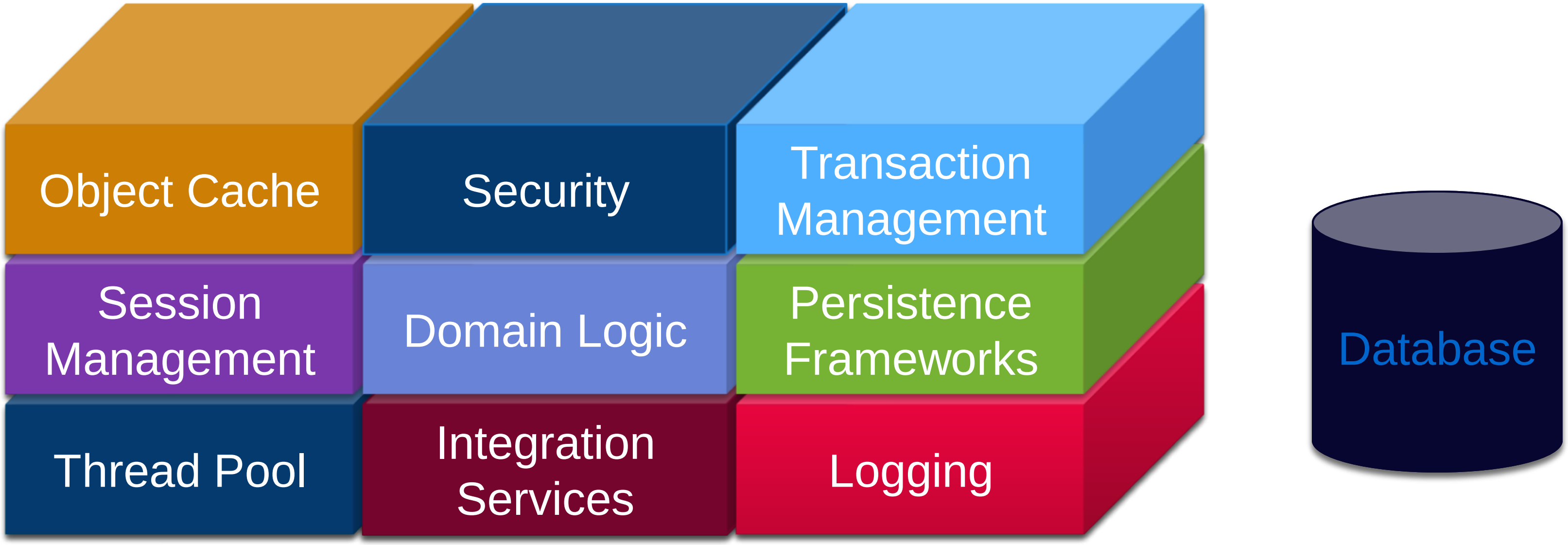
Where innovation starts

> *“ If you've got some trades going through at 10 milliseconds and some at 1 millisecond, that's a problem. Our customers don't like variance.”*
>
> Steve Rubinow (NYSE Group CTO)

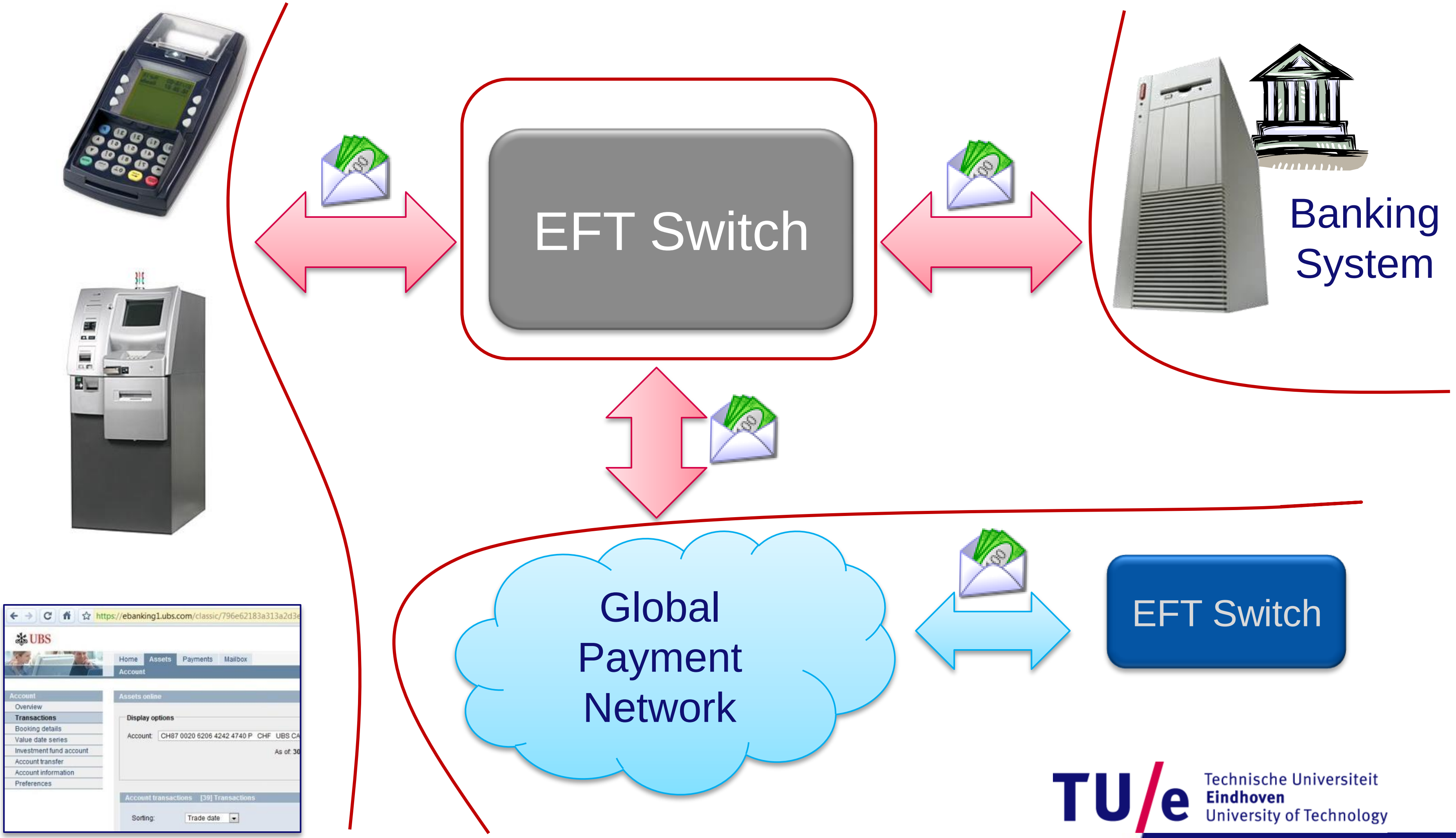
Overview- why testing?



Overview- why testing?



Overview- Electronic Funds Transfer



https://ebanking1.ubs.com/classic/796e62183a313a2d3e

Account: CH87 0020 6206 4242 4740 P CHF UBS CA

As of: 30

Sorting: Trade date

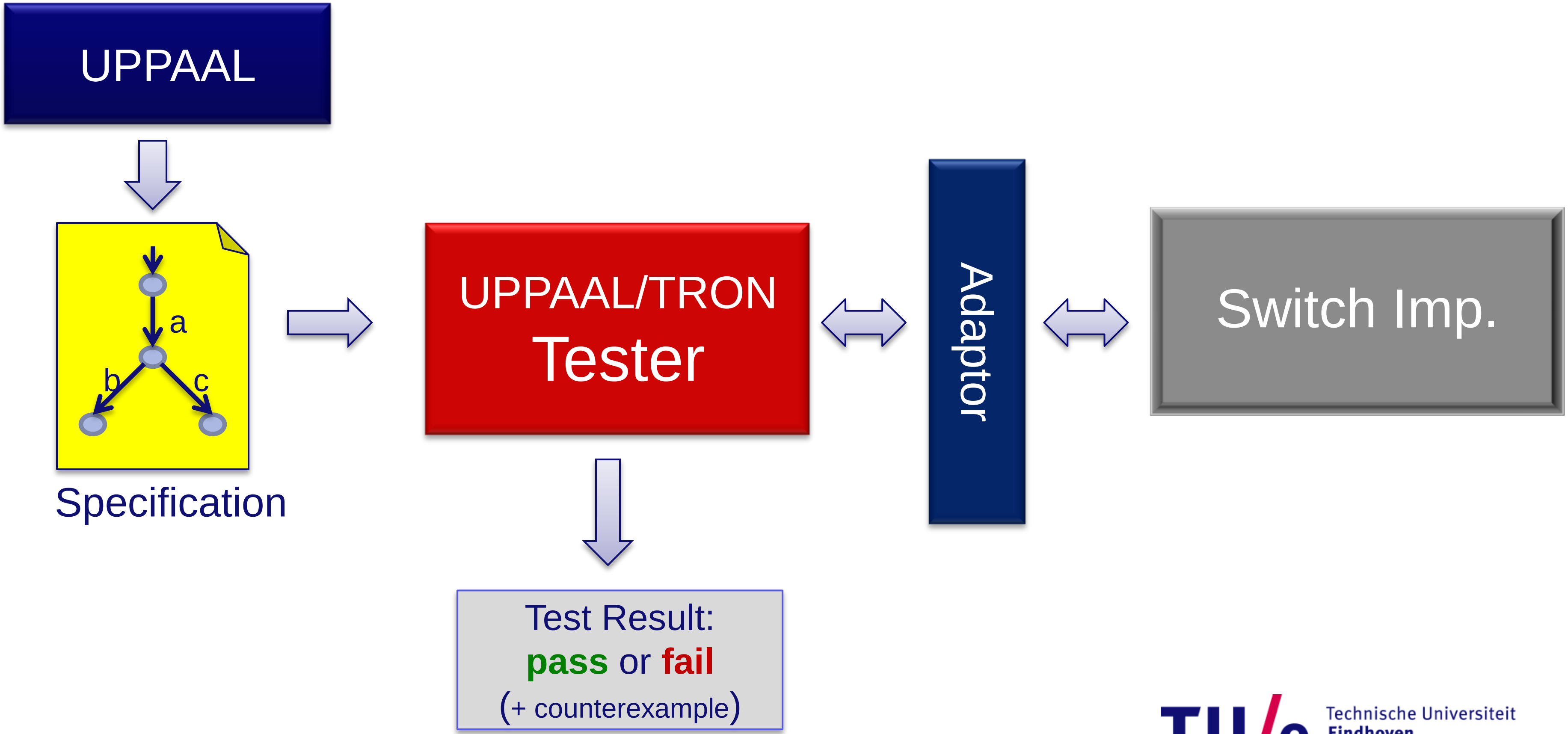
Overview- Desired qualities

- **Highly available**
- **Highly concurrent**
- **Highly secure**
- **High performance**
- **Highly extendable**

Specification

Informal	Specification	Formal
☺	Writing	☹
☹	Test case generation	☺

First attempt

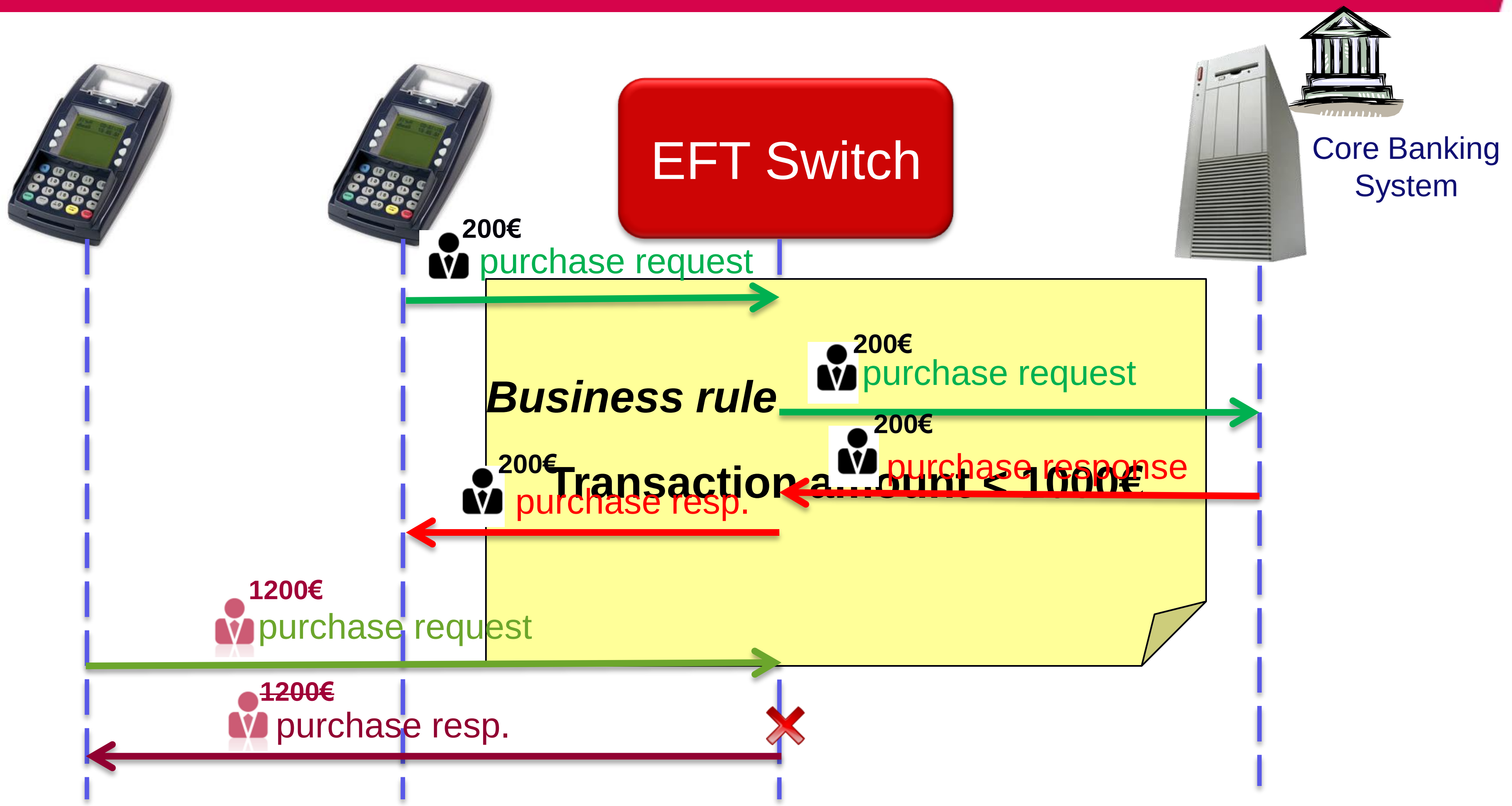


Test Result:
pass or **fail**
(+ counterexample)

First result

- **Modeling is time-consuming**
- **Not all possible scenarios is generating**

Data on transaction



EFT Switch

Core Banking System

200€ purchase request

Business rule

Transaction amount < 1000€

200€ purchase request

200€ purchase response

200€ purchase resp.

1200€ purchase request

~~1200€~~ purchase resp.

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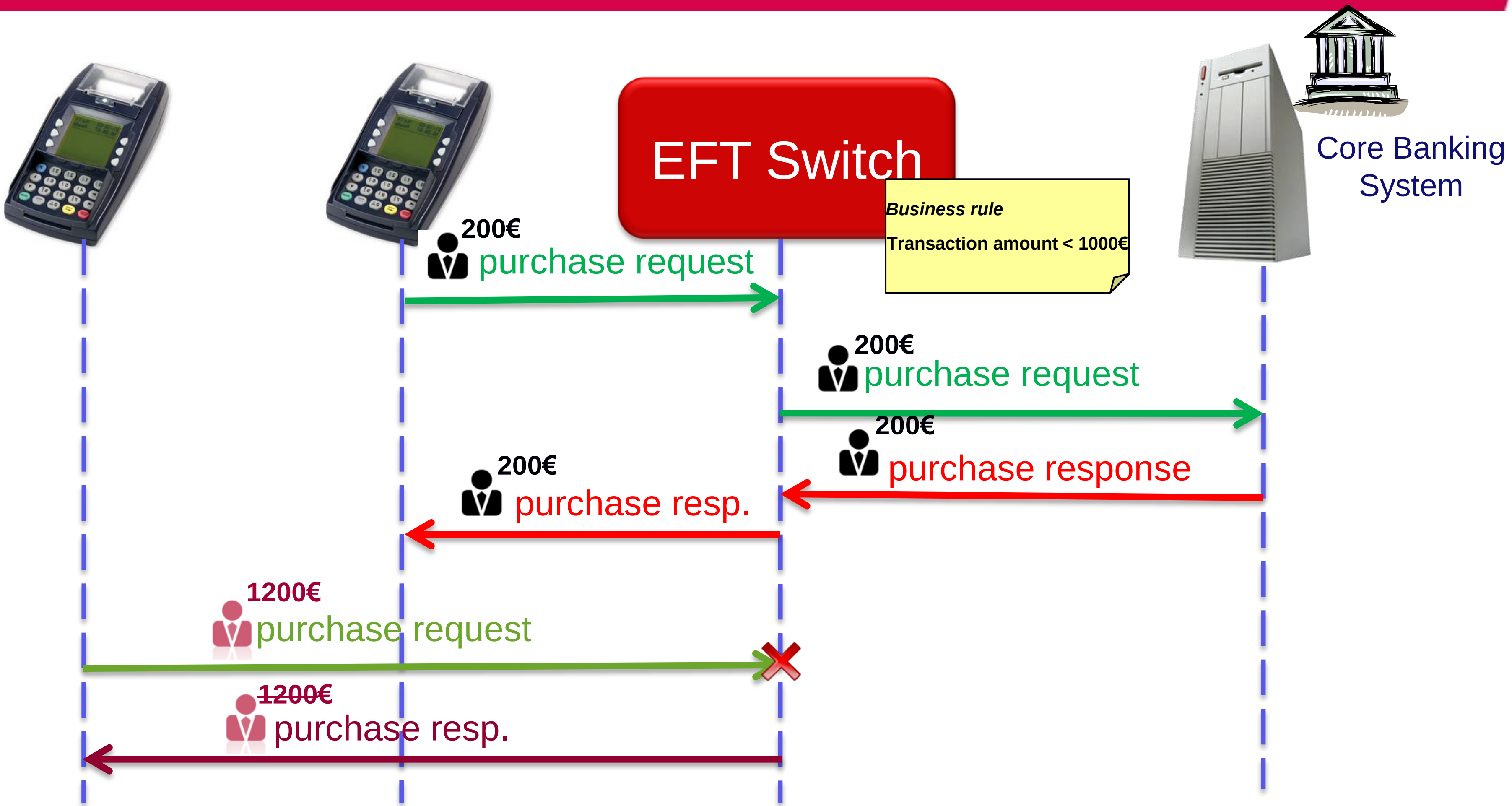
Concurrent transaction



EFT Switch

Core Banking System

Business rule

Transaction amount < 1000€

200€ purchase request

200€ purchase request

200€ purchase response

200€ purchase resp.

1200€ purchase request

~~1200€~~ purchase resp.

Asynchronous transaction

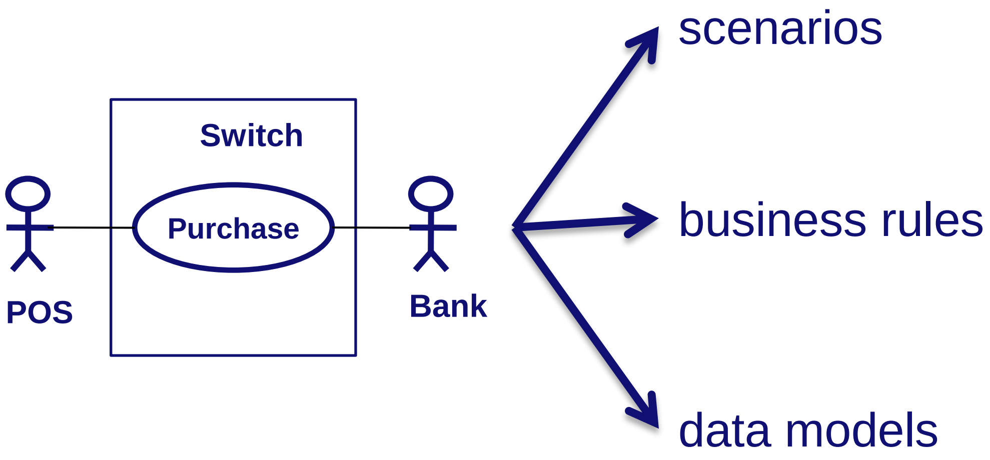
The theory of testing is mostly devoted to *synchronous* testing.

Motivations

- ❑Creating formal specification
- ❑Modeling data model
- ❑Running test efficiently
- ❑Modeling asynchronicity

Our Current Approach- Creating formal specification

- **Uses Software architecture products**

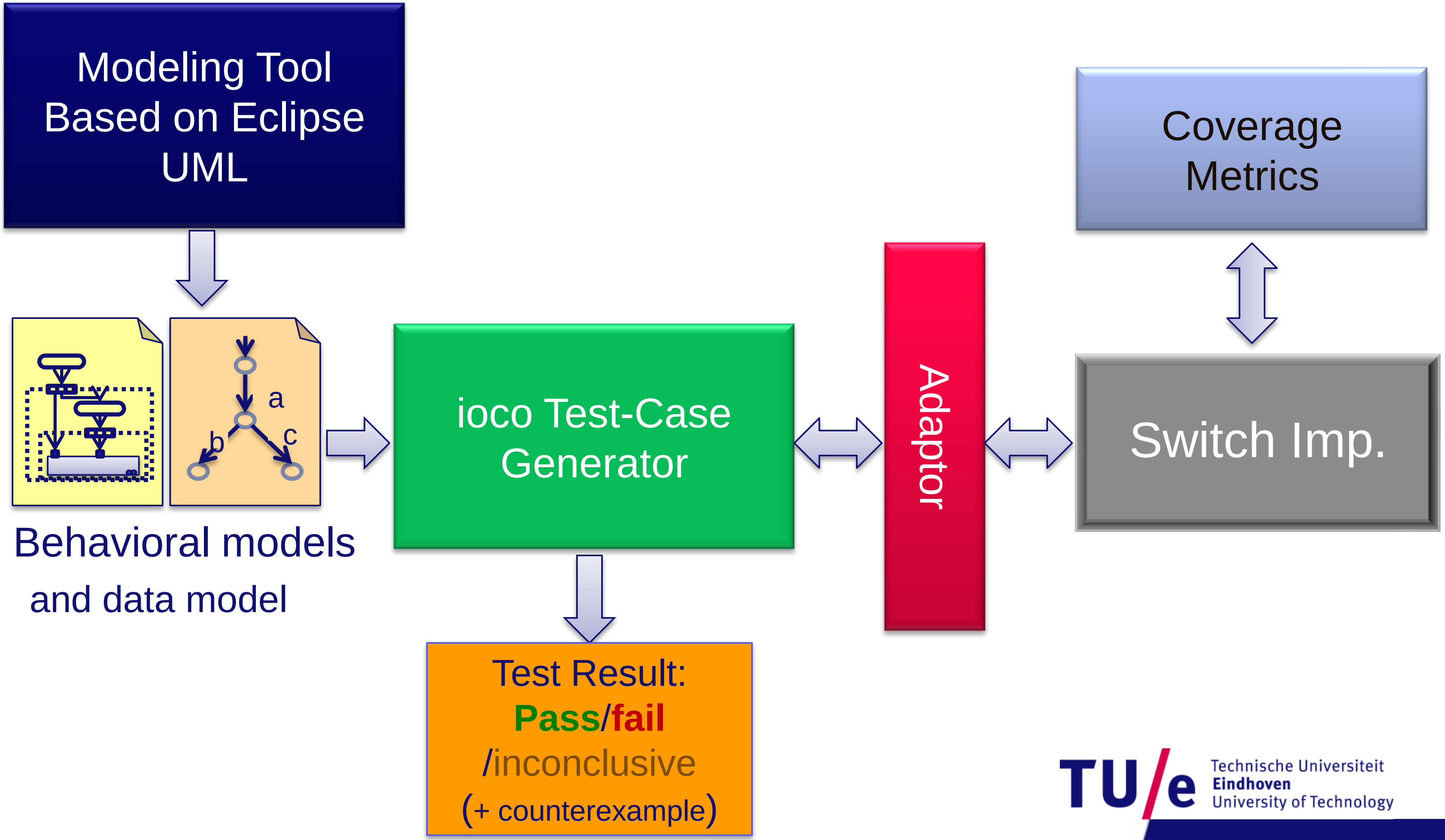


Our Current Approach- Modeling data and behavior

- Supports data modeling for test generation
  - Data types
  - Data relations
  - Data partitions

- Uses UML to express the models
  - System and environment behavior
  - Test Scenario

Implementation



Modeling Tool Based on Eclipse UML

Behavioral models and data model

ioco Test-Case Generator

Adaptor

Coverage Metrics

Switch Imp.

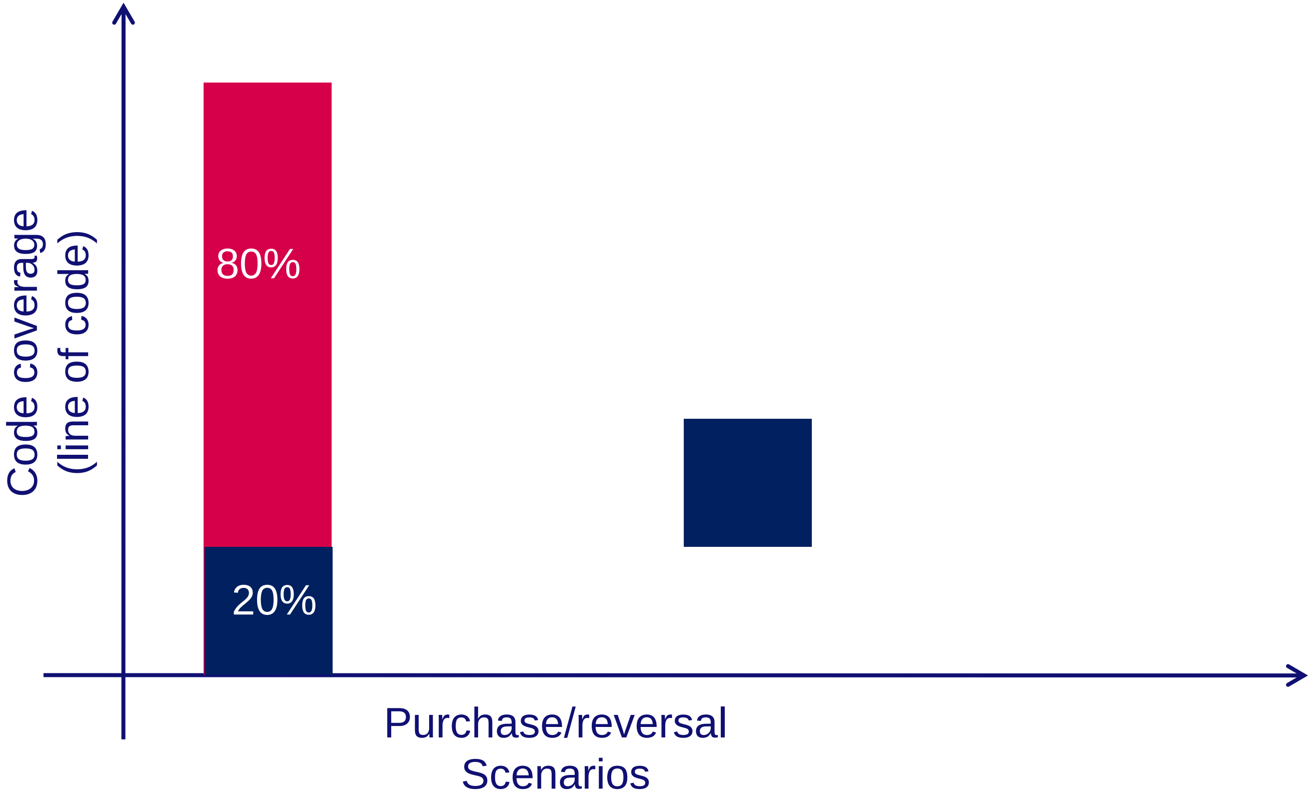
Test Result: **Pass**/**fail** /inconclusive (+ counterexample)

Achievements

- A method to generate formal specification
  - Behavioral model
  - Data model
- Managing test scenarios
  - Modeling the environment
  - Generating test case on-the-fly
  - Defining new goals
- Managing models

Achievements(cont.)

- **Data modeling**

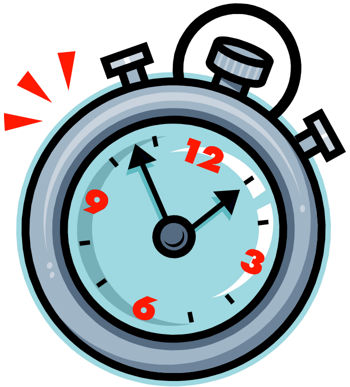


Results so far

- Have found a few bugs in the system
  - One traced back to null-pointer dereferencing
  - Poor exception handling
  - Problems in business rules
  - Resource pooling problems
  - A problem in concurrency

The Road Ahead

- **Checking database state**
- Avoiding a trace or a state
- Asynchronous testing
- Improving the modeling tool



THANK YOU

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