Eiffel Testing Framework (ETF): Acceptance Tests via Abstract User Interface

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Bank ATM

The ATM application has a variety of *concrete* user interfaces.

Separation of Concerns

- The (Concrete) User Interface
  - The executable of your application *hides* the implementing classes and features.
  - Users typically interact with your application via some GUI.
    e.g., web app, mobile app, or desktop app
- The *Business Logic (Model)*
  - When you develop your application software, you implement classes and features.
    e.g., How the bank stores, processes, retrieves information about accounts and transactions

In practice:

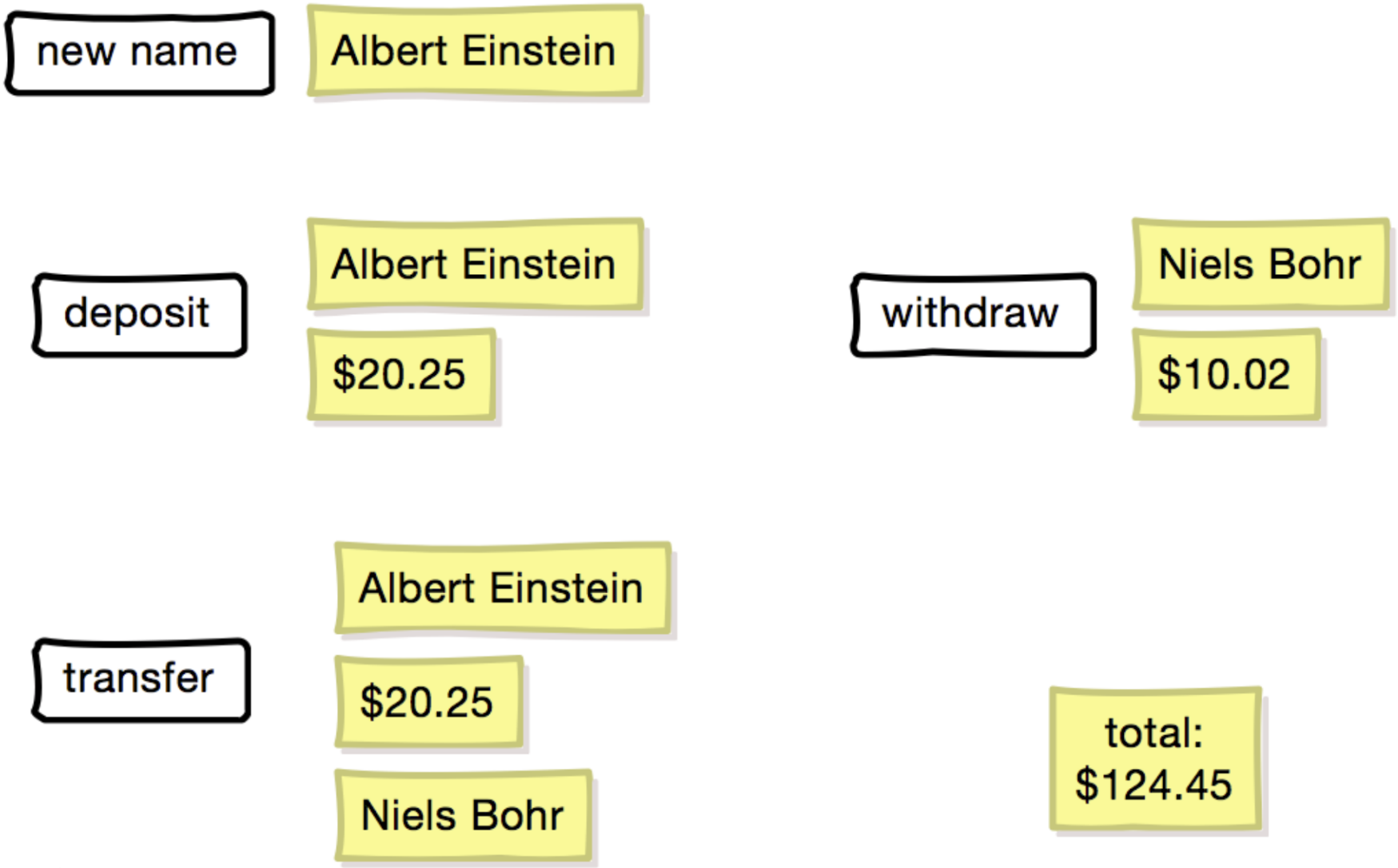
- You need to test your software as if it were a real app ***way before*** dedicating to the design of an actual GUI.
- The model should be *independent* of the View, Input and Output.

Prototyping System with Abstract UI

- For you to quickly prototype a working system, you do not need to spend time on developing a fancy GUI.
- The *Eiffel Testing Framework (ETF)* allows you to:
  - Focus on developing the business model;
  - Test your business model as if it were a real app.
- In ETF, observable interactions with the application GUI (e.g., “button clicks”) are ***abstracted*** as monitored events.

Events	Features
interactions	computations
external	internal
observable	hidden
acceptance tests	unit tests
users, customers	programmers, developers

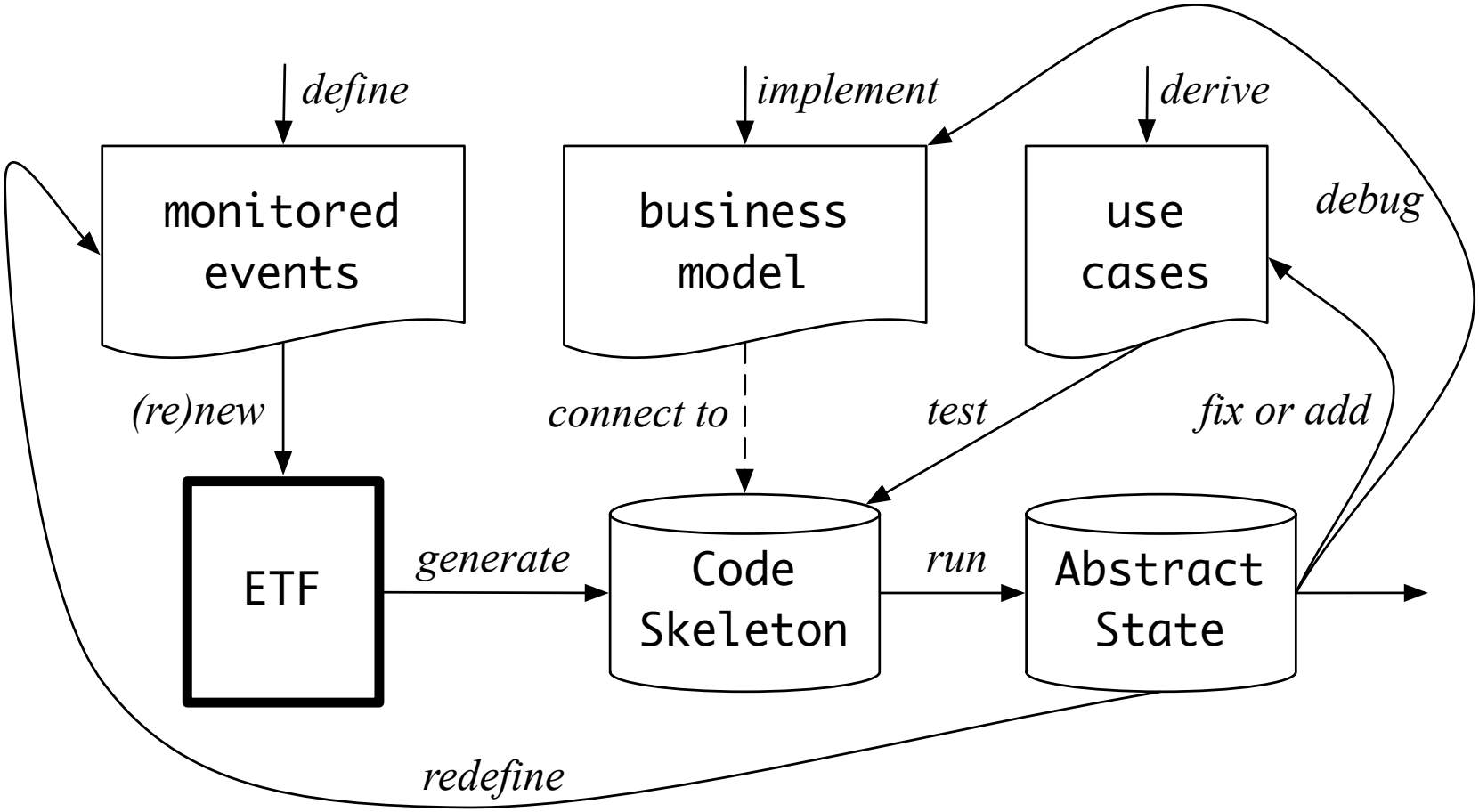
Abstract Events: Bank ATM



ETF in a Nutshell

- *Eiffel Testing Framework (ETF)* facilitates engineers to write and execute ***input-output-based acceptance tests***.
  - ***Inputs*** are specified as traces of events (or sequences).
  - The ***boundary*** of the system under development (SUD) is defined by declaring the list of input events that might occur.
  - ***Outputs*** (from executing events in the input trace) are by default logged onto the terminal, and their formats may be customized.
- An executable ETF that is tailored for the SUD can already be generated, using these event declarations (documented documented in a plain text file), with a default *business model*.
- Once the *business model* is implemented, there is only a small number of steps to follow for the developers to connect it to the generated ETF.
- Once connected, developers may re-run all use cases and observe if the expected state effects take place.

Workflow: Develop-Connect-Test



ETF: Abstract User Interface

Input Grammar

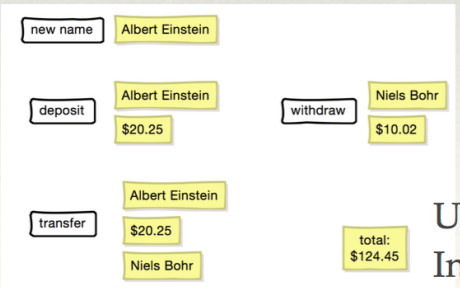
```
system bank
type NAME = STRING

new(name1: NAME)
  -- create a new bank account for "id"

deposit(name1: NAME; amount: VALUE)
  -- deposit "amount" into the account of "id"

withdraw(name1: NAME; amount: VALUE)
  -- withdraw "amount" from the account of "id"

transfer(name1: NAME; name2: NAME; amount: VALUE)
  -- transfer "amount" from "id1" to "id2"
```



User Interface

```
%bank -b at1.txt
 init
->new("Steve")
name: Steve, balance: 0.00
->new("Bill")
name: Bill, balance: 0.00
name: Steve, balance: 0.00
->deposit("Steve",520)
name: Bill, balance: 0.00
name: Steve, balance: 520.00
->new("Pam")
name: Bill, balance: 0.00
name: Pam, balance: 0.00
name: Steve, balance: 520.00
->deposit("Bill",100)
name: Bill, balance: 100.00
name: Pam, balance: 0.00
name: Steve, balance: 520.00
->withdraw("Steve",20)
name: Bill, balance: 100.00
name: Pam, balance: 0.00
name: Steve, balance: 500.00
```

ETF: Generating a New Project

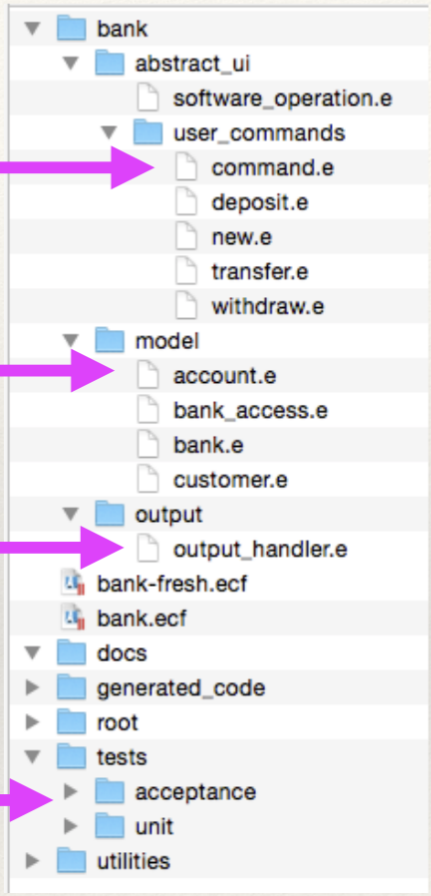
etf -new bank.input.txt <directory>

User Input
(from command line)

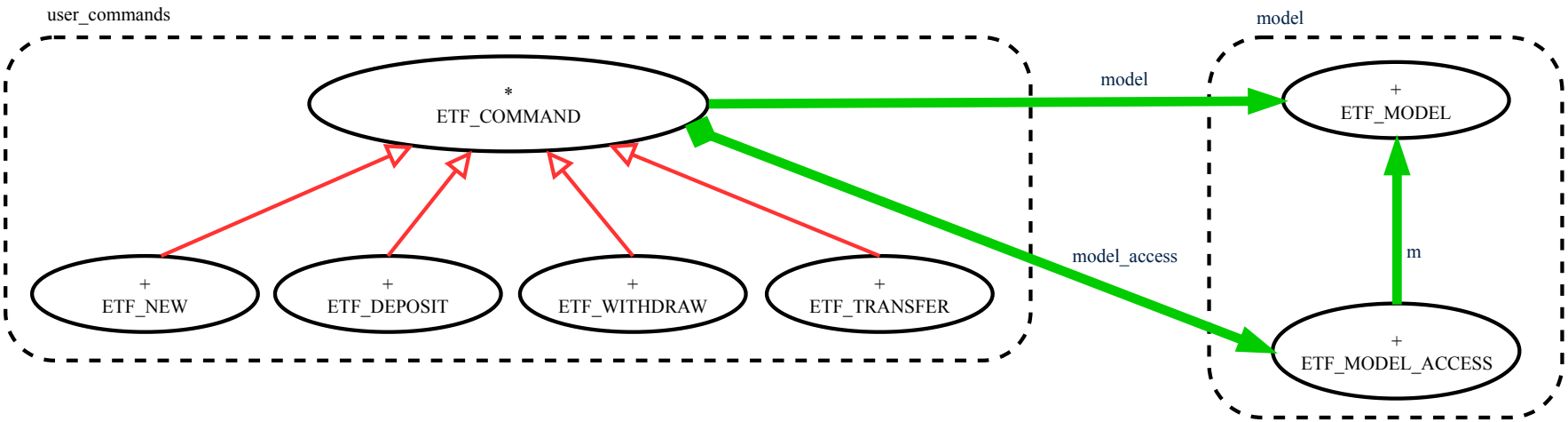
Model
(business logic)

Output

Unit Tests
Acceptance Tests



ETF: Architecture



- Classes in the `model` cluster are hidden from the users.
- All commands reference to the same model (bank) instance.
- When a user's request is made:
  - A ***command object*** of the corresponding type is created, which invokes relevant feature(s) in the `model` cluster.
  - Updates to the model are published to the output handler.

ETF: Input Errors

```
class
    ETF_DEPOSIT
inherit
    ETF_DEPOSIT_INTERFACE
        redefine deposit end
create
    make
feature -- command
    deposit(id: STRING ; amount: REAL_64)
        do
            if not model.has_user (id) then
                -- Set some error message
            elseif not amount <= model.get_balance (id)  then
                -- Set some other error message
            else
                -- perform some update on the model state
                model.deposit (id, amount)
            end
            -- Publish model update
            etf_cmd_container.on_change.notify ([Current])
        end
end
```

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