TorXakis

A Tool for MBT with LTS

MBT : Many Tools

- AETG
- Agatha
- Agedis
- Autolink
- Axini Test Manager
- Conformiq
- Cooper
- Cover
- DTM
- fMBT
- G∀st
- Gotcha
- Graphwalker
- JTorX
- MaTeLo
- MBTsuite
- M-Frame
- MISTA
- NModel
- OSMO
- ParTeG
- Phact/The Kit
- PyModel
- QuickCheck
- Reactis
- Recover
- RT-Tester
- SaMsTaG
- Smartesting CertifyIt
- Spec Explorer
- StateMate
- STG
- tedeso
- Temppo
- TestGen (Stirling)
- TestGen (INT)
- TestComposer
- TestOptimal
- TGV
- Tigris
- TorX
- TorXakis
- T-Vec
- Tveda
- Uppaal-Cover
- Uppaal-Tron
- . . . . . .

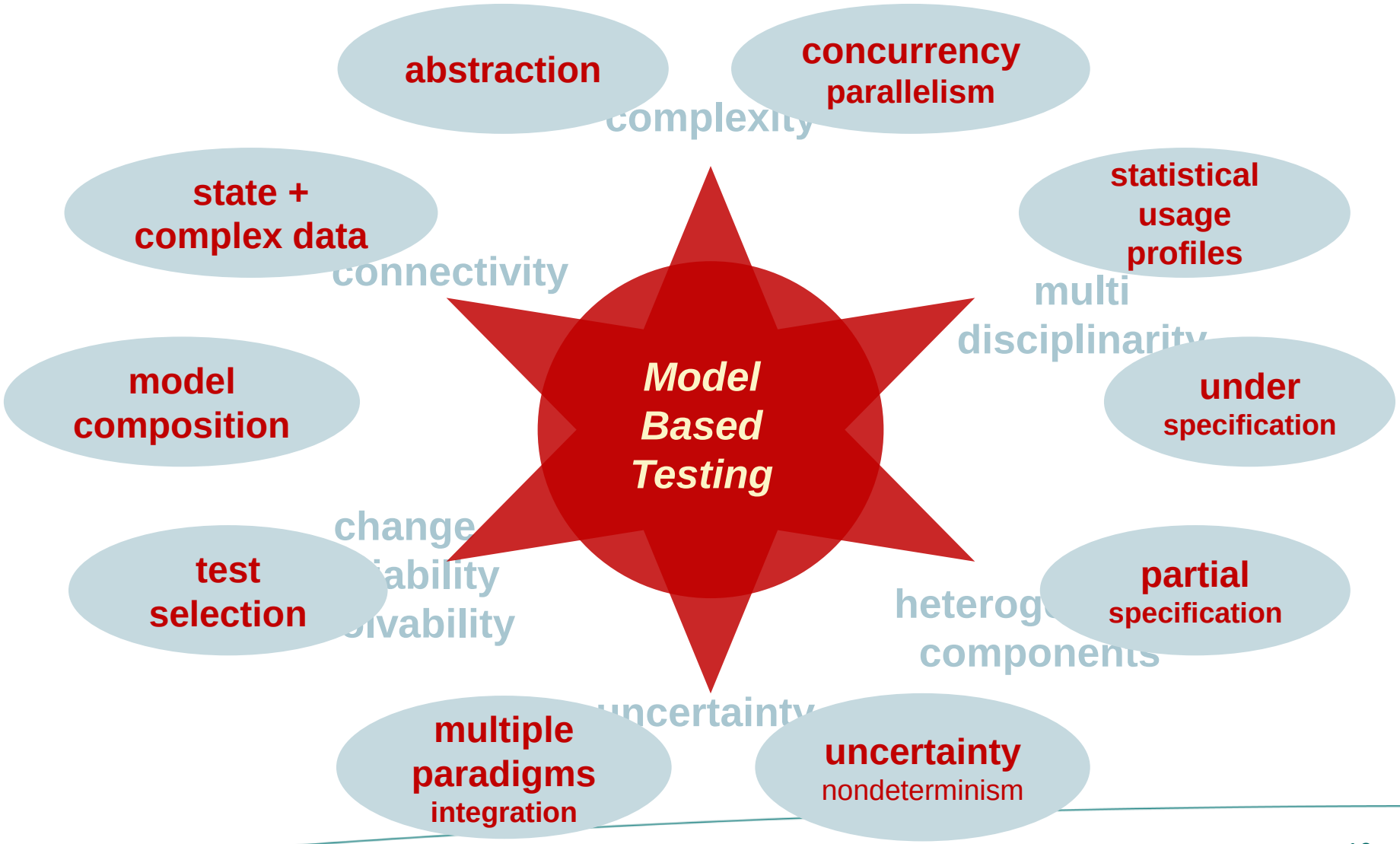
MBT Tools *u/ioco*

- AETG
- Agatha
- Agedis
- Autolink
- Axini Test Manager
- Conformiq
- Cooper
- Cover
- DTM
- fMBT
- G∀st
- Gotcha
- Graphwalker
- JTorX
- MaTeLo
- MBTsuite
- M-Frame
- MISTA
- NModel
- OSMO
- ParTeG
- Phact/The Kit
- PyModel
- QuickCheck
- Reactis
- Recover
- RT-Tester
- SaMsTaG
- Smartesting CertifyIt
- Spec Explorer
- StateMate
- STG
- tedeso
- Temppo
- TestGen (Stirling)
- TestGen (INT)
- TestComposer
- TestOptimal
- TGV
- Tigris
- TorX
- TorXakis
- T-Vec
- Tveda
- Uppaal-Cover
- Uppaal-Tron
- . . . . . .

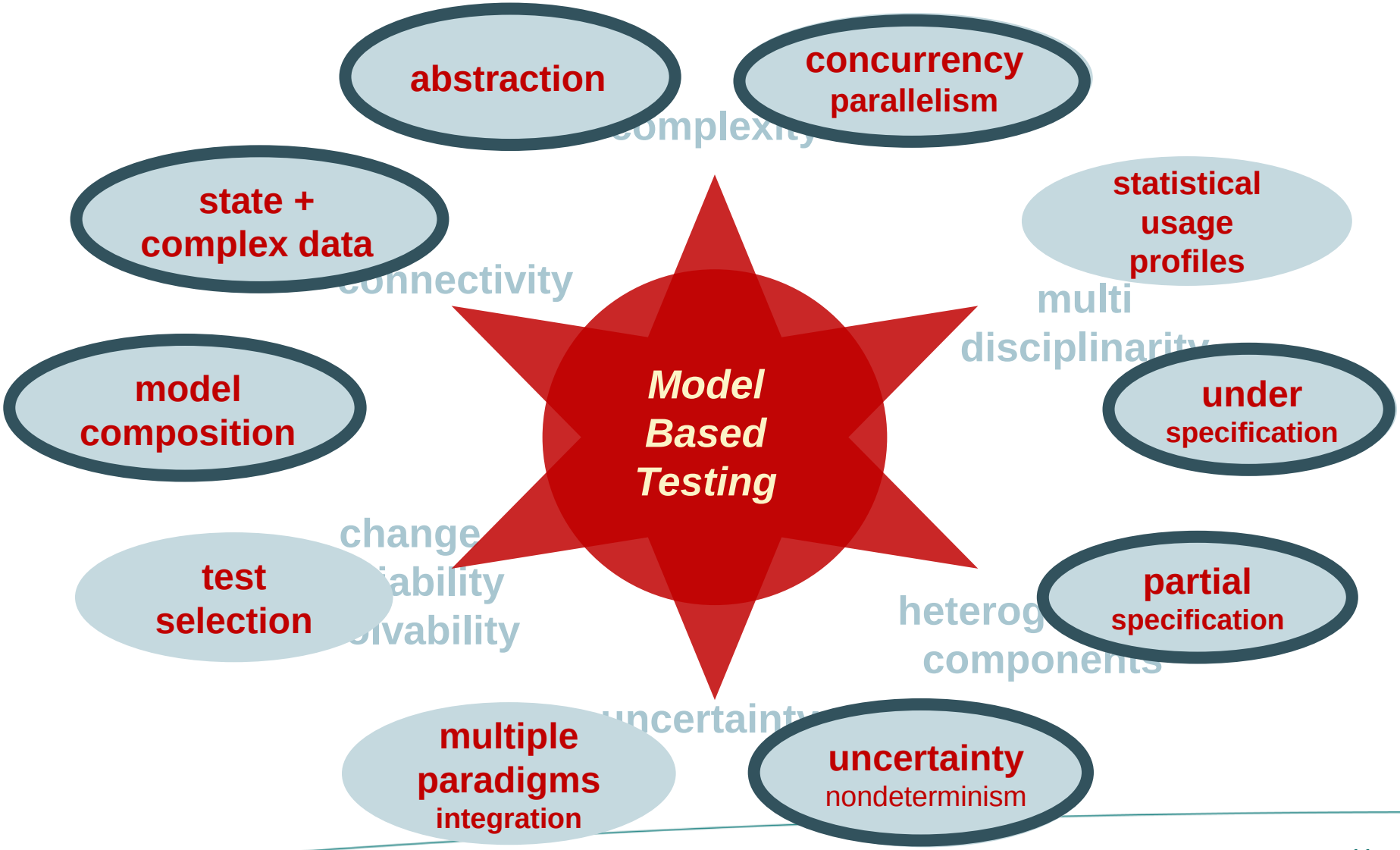
Yet Another MBT Tool

- AETG
- Agatha
- Agedis
- Autolink
- Axini Test Manager
- Conformiq
- Cooper
- Cover
- DTM
- fMBT
- G∀st
- Gotcha
- Graphwalker
- JTorX
- MaTeLo
- MBTsuite
- M-Frame
- MISTA
- NModel
- OSMO
- ParTeG
- Phact/The Kit
- PyModel
- QuickCheck
- Reactis
- Recover
- RT-Tester
- SaMsTaG
- Smartesting CertifyIt
- Spec Explorer
- StateMate
- STG
- tedeso
- Temppo
- TestGen (Stirling)
- TestGen (INT)
- TestComposer
- TestOptimal
- TGV
- Tigris
- TorX
- **TorXakis**
- T-Vec
- Tveda
- Uppaal-Cover
- Uppaal-Tron
- . . . . . .

MBT : Next Step Challenges



MBT : Next Step Challenges



TorXakis : Overview

Models

- state-based control flow and complex data
- support for parallel, concurrent systems
- composing complex models from simple models
- non-determinism, uncertainty
- abstraction, under-specification

Applications

- several high-tech systems companies
- experimental level

But ....

- research prototype
- poor usability

Tool

- on-line MBT tool

Current Research

- test selection
- partial models & composition

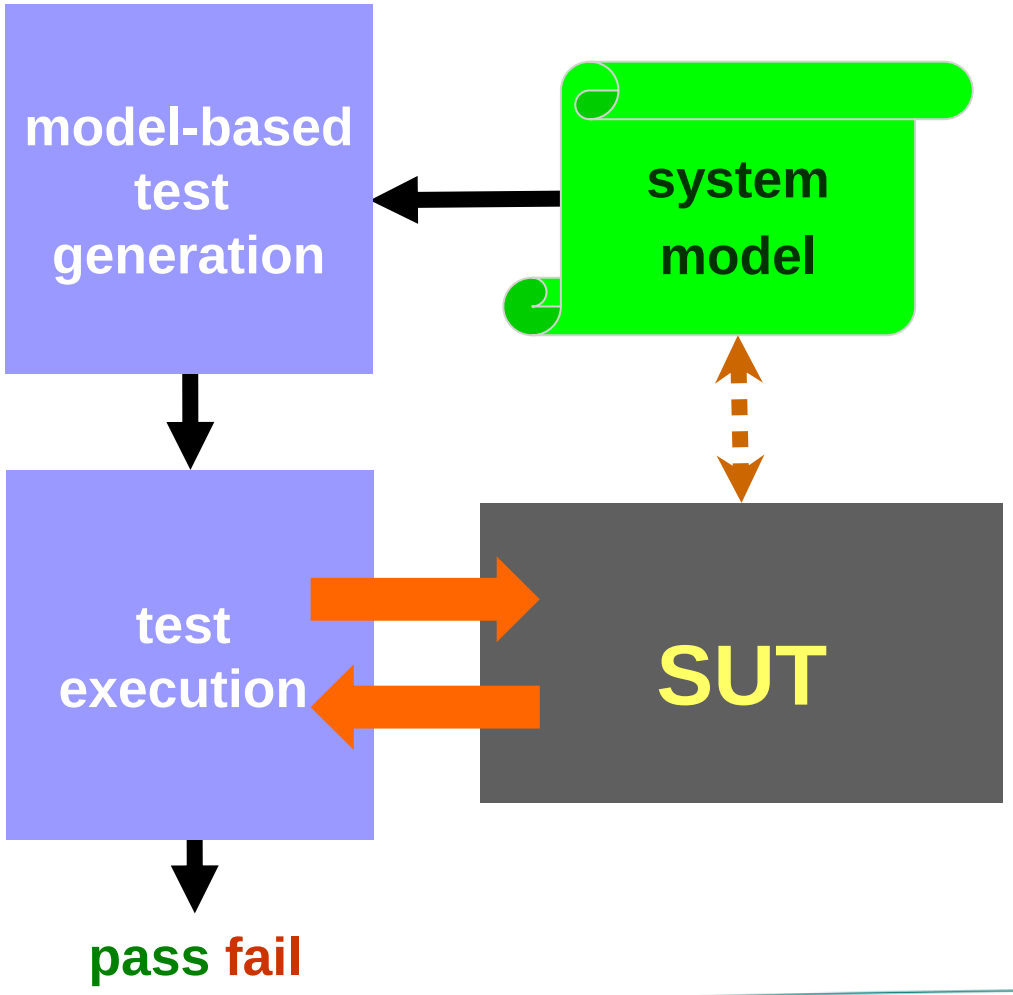
Under the hood

- powerful constraint/SMT solvers (Z3, CVC4)
- well-defined semantics and algorithms
- **ioco** testing theory for symbolic transition systems
- algebraic data-type definitions

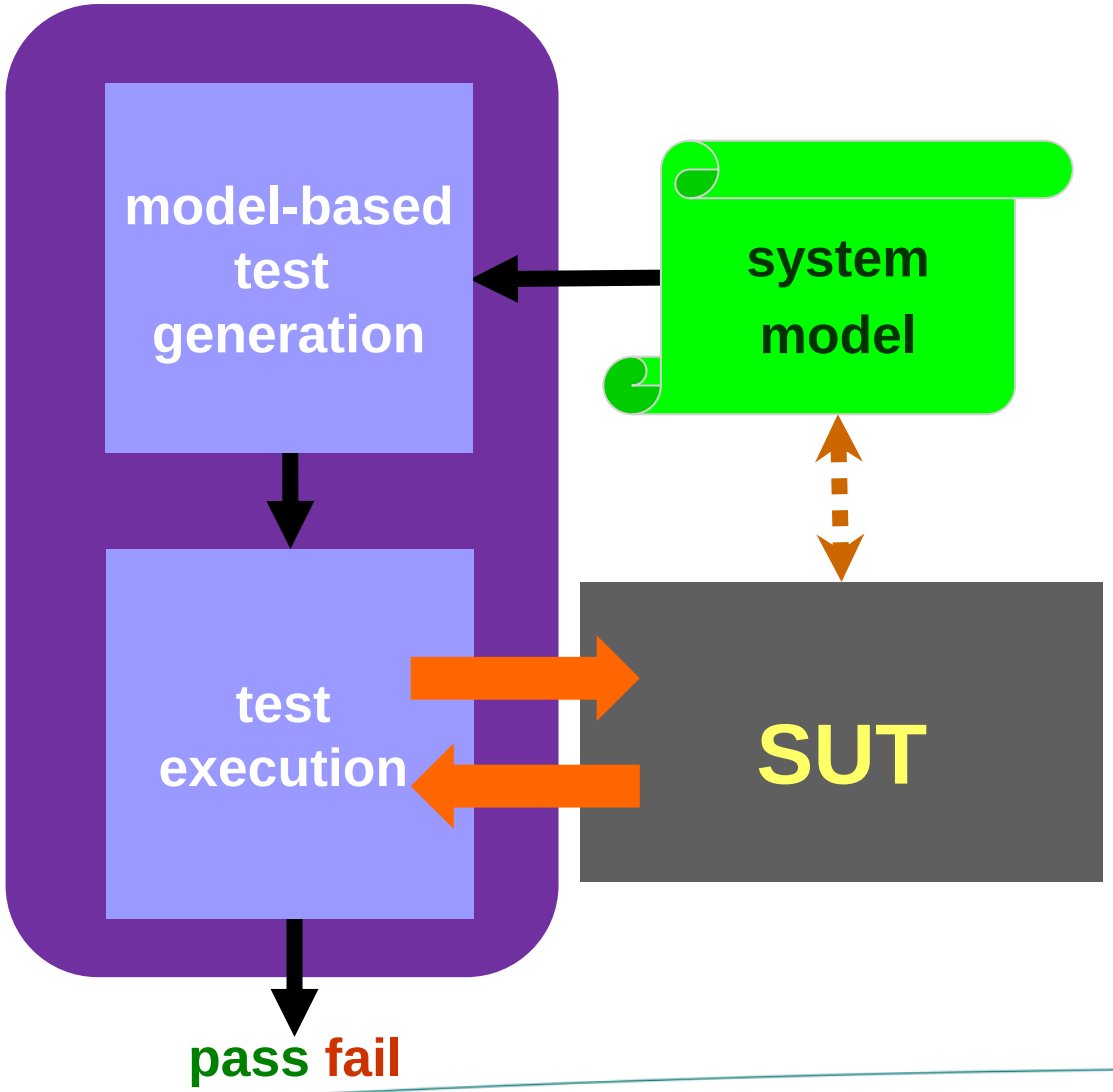
TorXakis

Online MBT

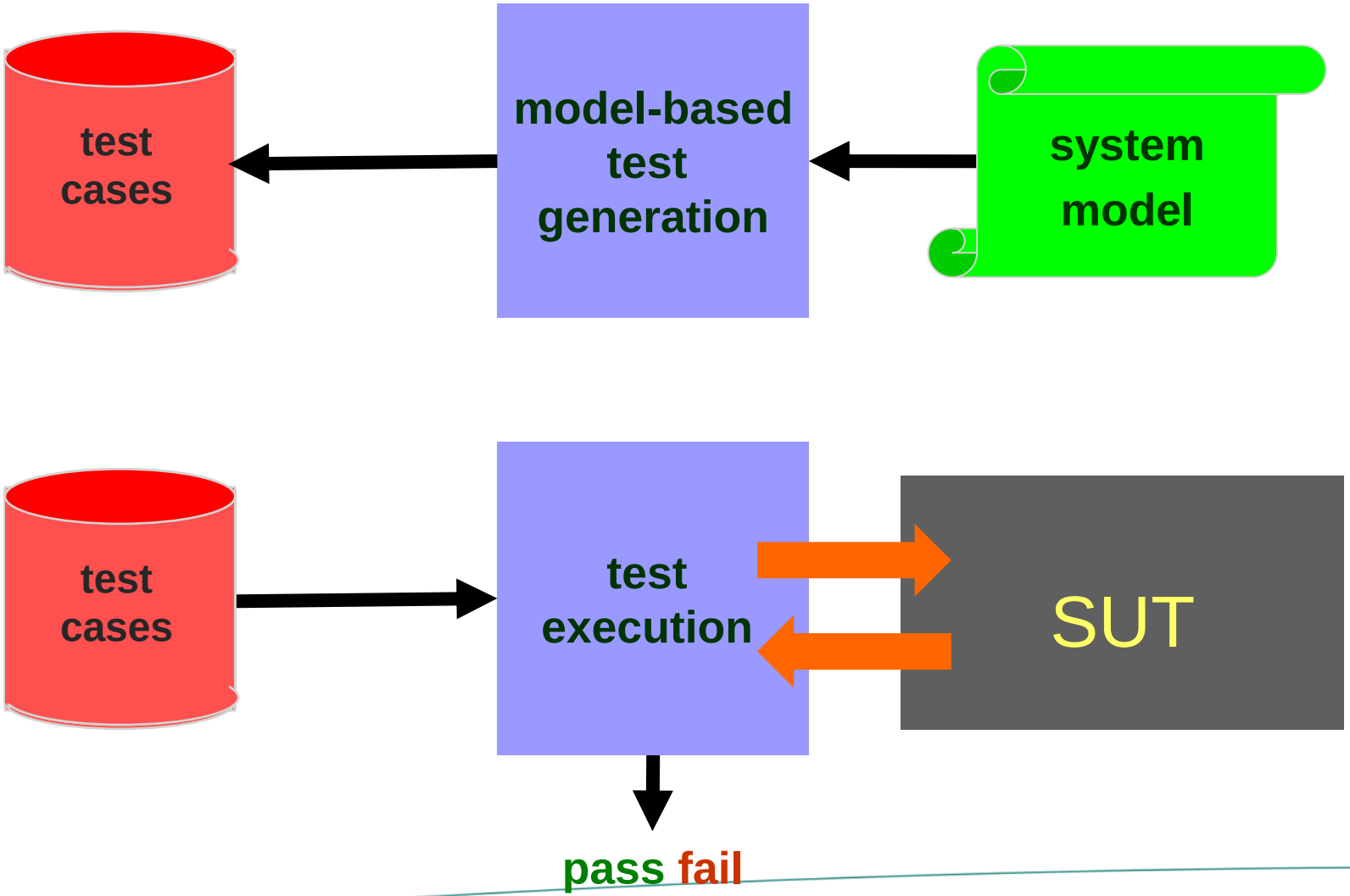
MBT


model-based test generation
system model
test execution
SUT
pass fail

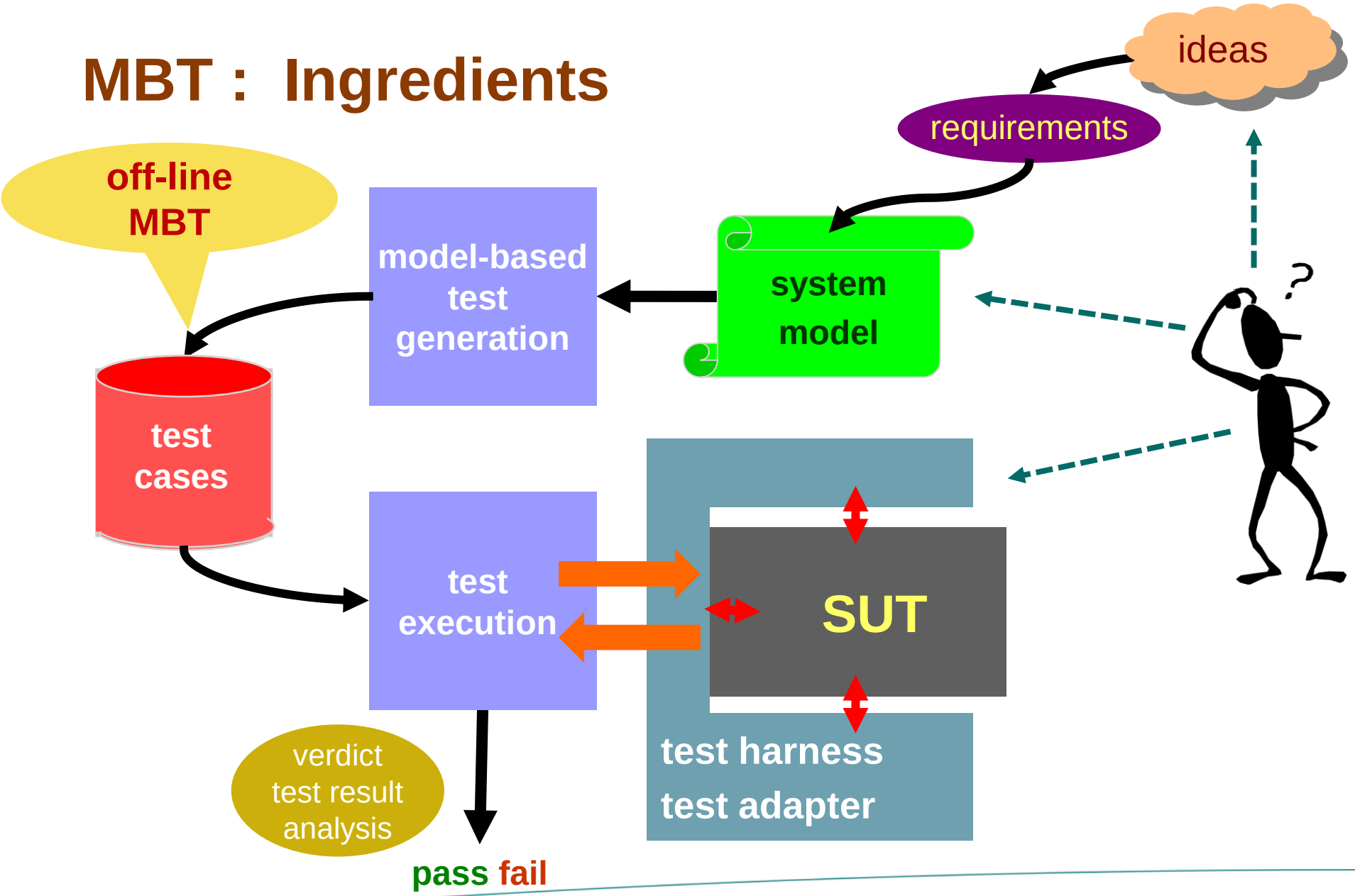
MBT Tool


model-based
test
generation
system
model
test
execution
SUT
pass fail

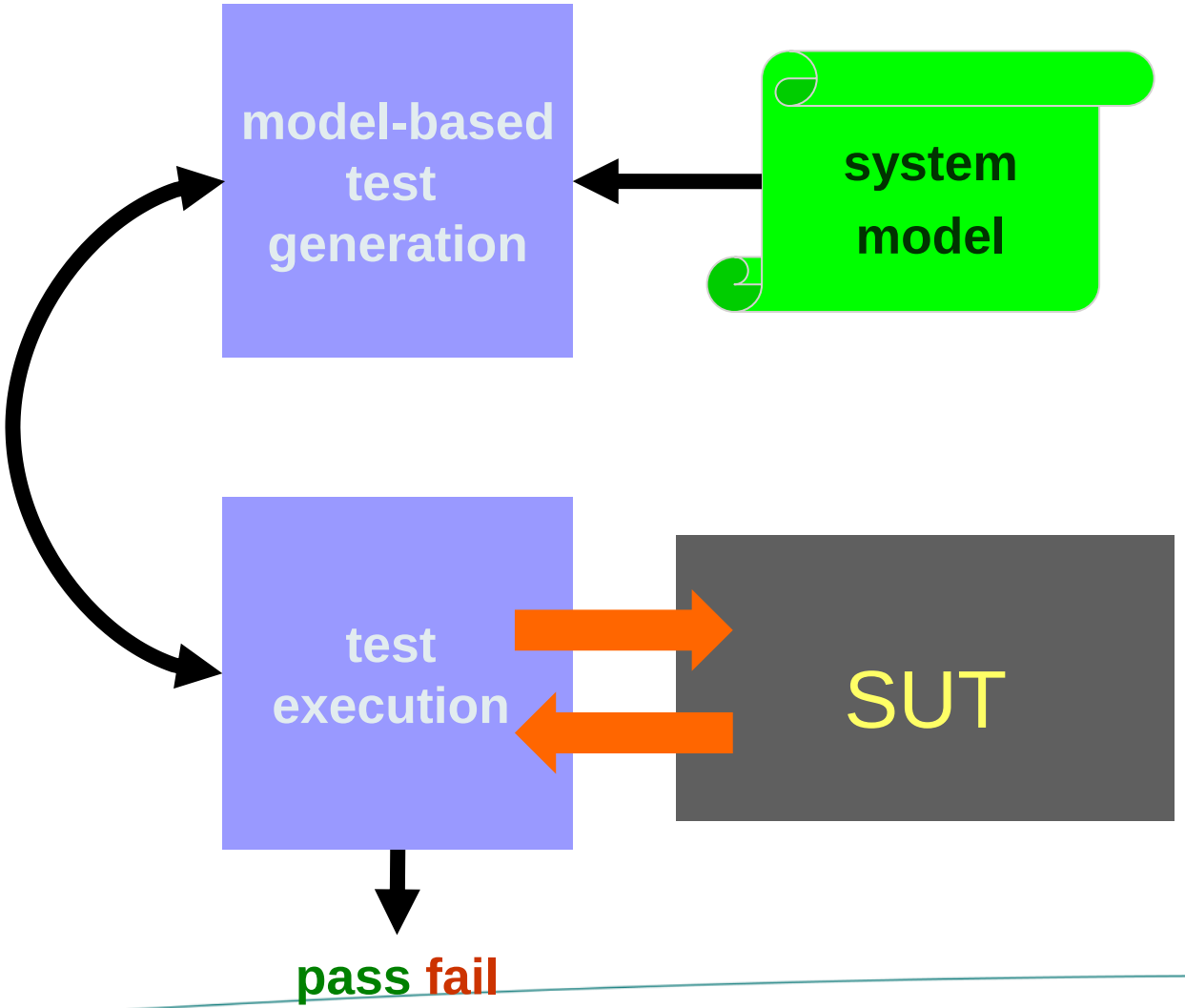
MBT Tools : Off-Line = Batch



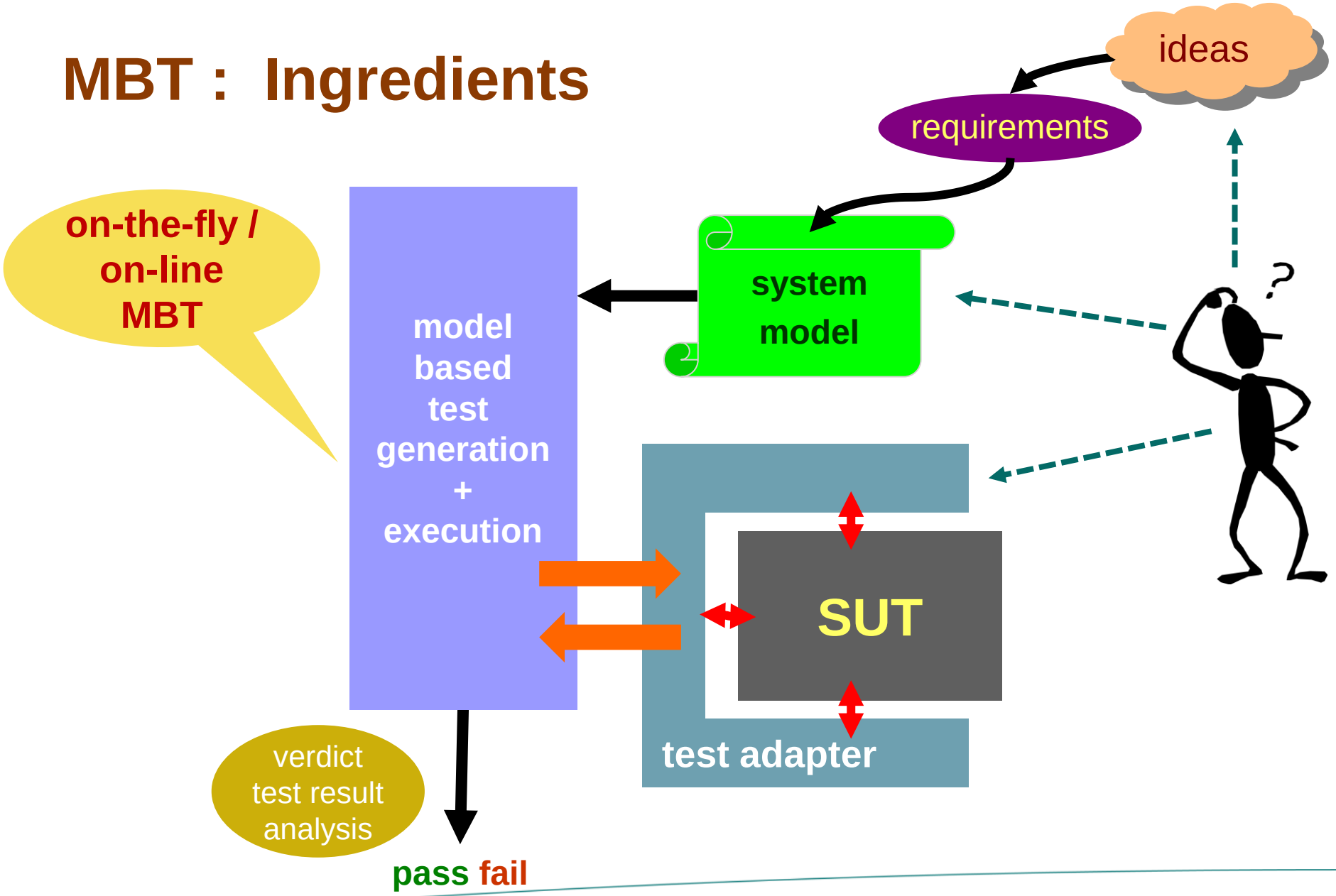
MBT : Ingredients



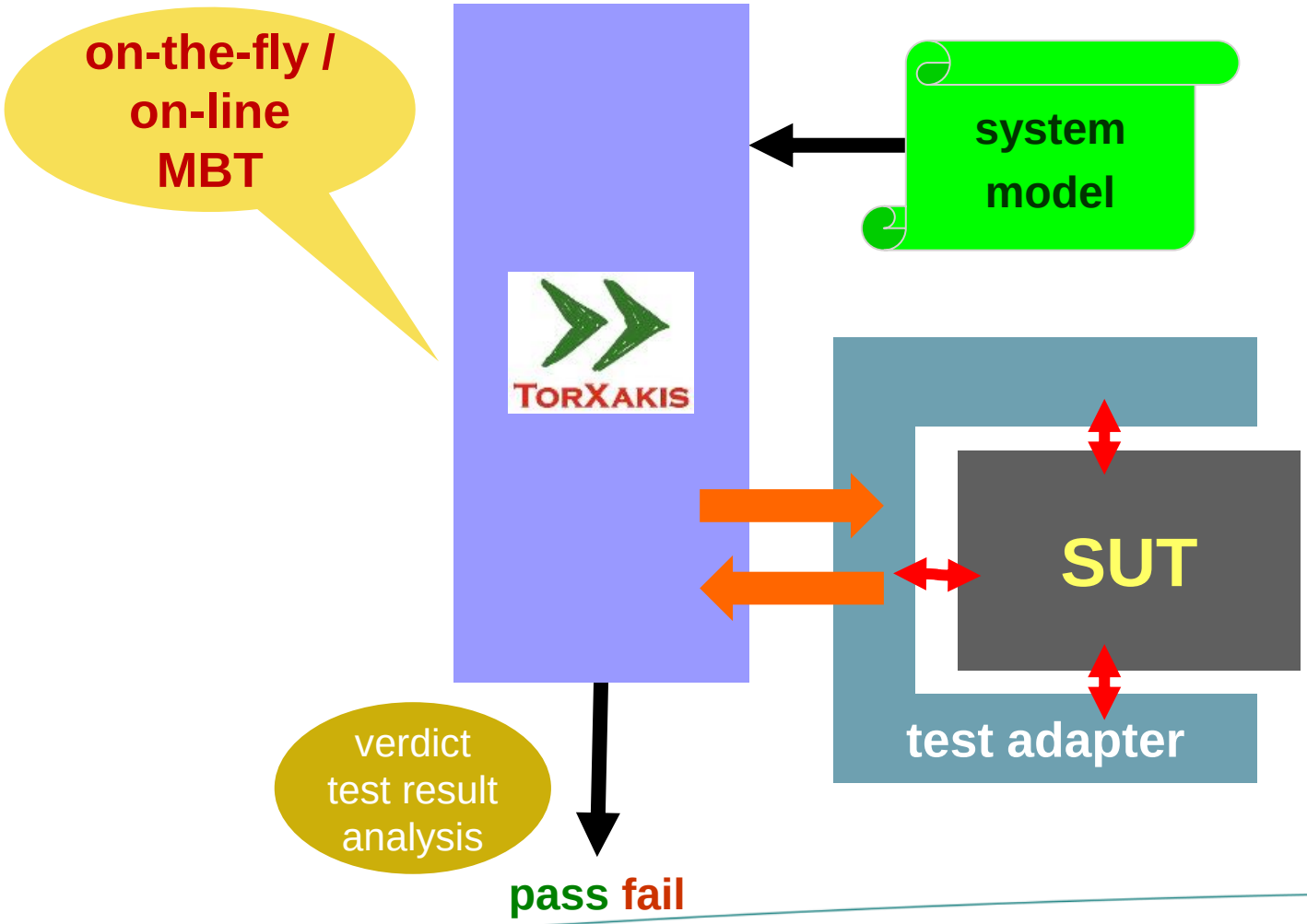
MBT Tools : On-Line = On-the-Fly



MBT : Ingredients



TorXakis : An On-the Fly MBT Tool

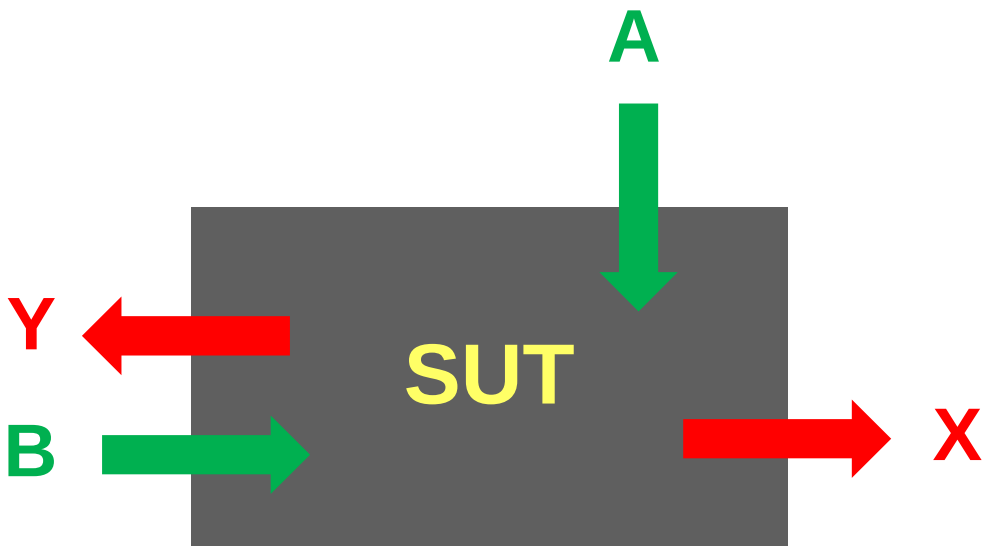


TorXakis

A View on Systems

TorXakis : A Black-Box View on Systems

- **Inputs Channels: A; B**
- **Output Channels: X; Y**



TorXakis : A Black-Box View on Systems

Channels with messages

- **Inputs Channels:**

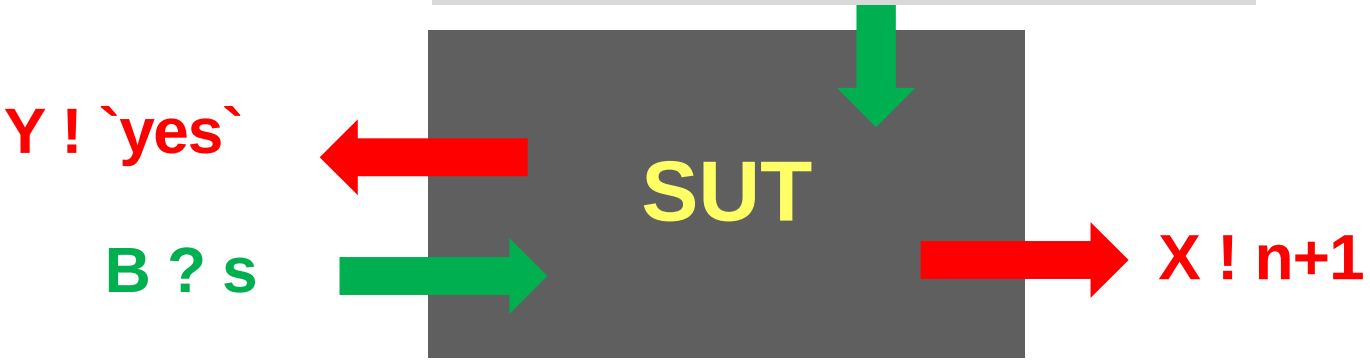
  A :: Int; B :: Struct

- **Output Channels:**

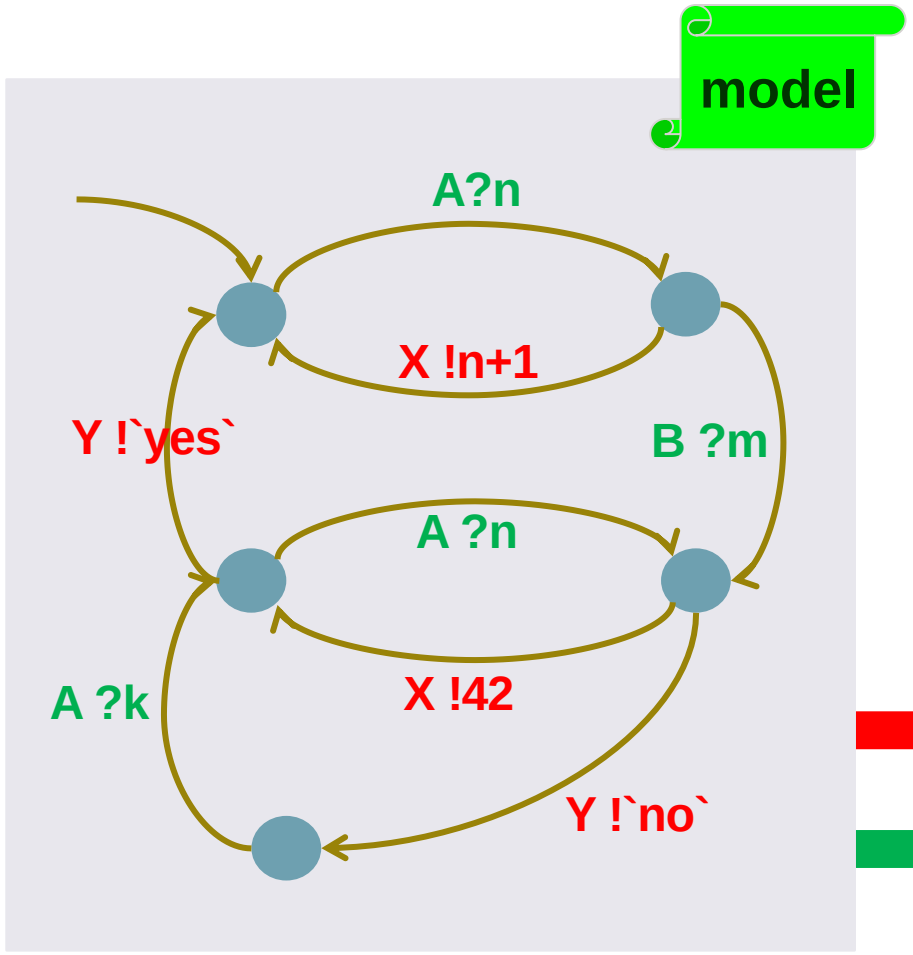
  X :: Int; Y :: String

SUT

real, black-box system communicating with its environment via messages on input- and output channels



TorXakis : A View on Models



MODEL

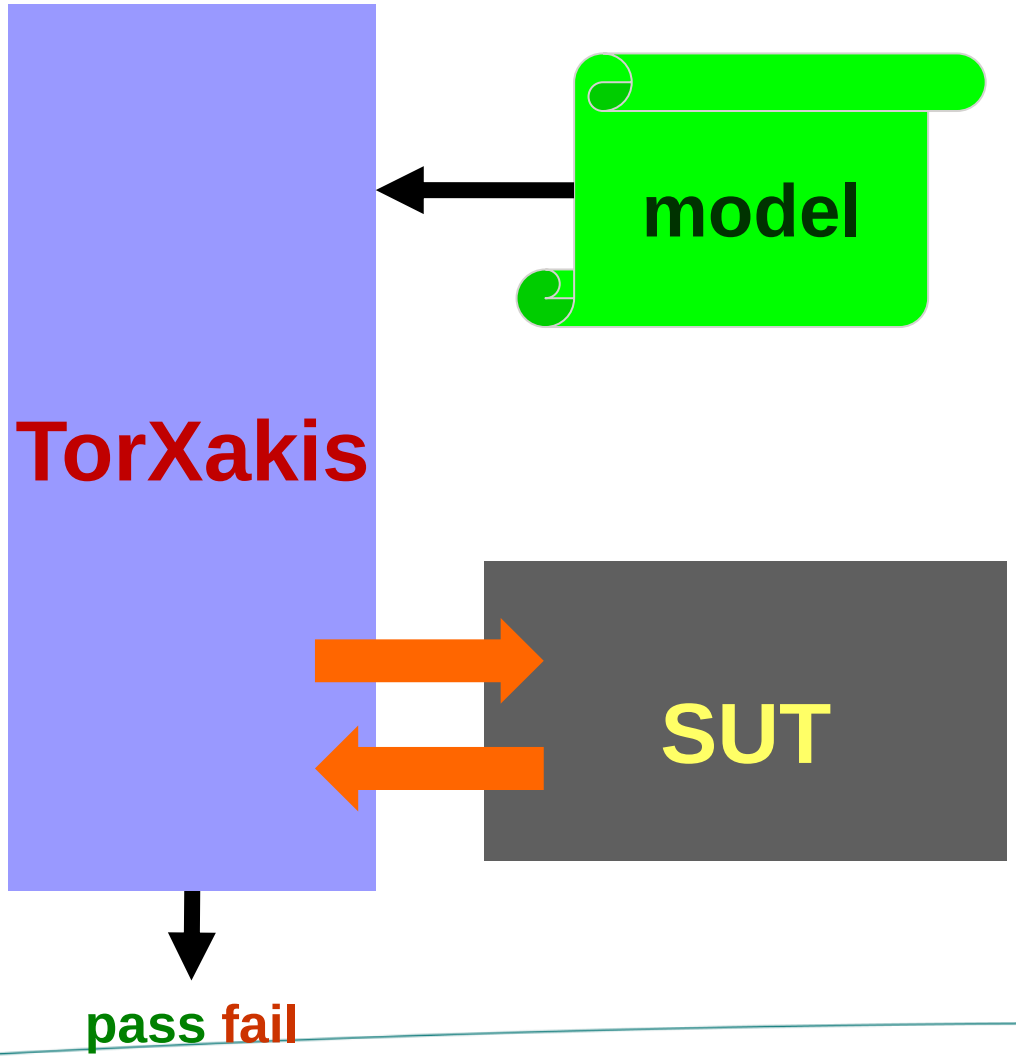
labelled transition system with parameterized actions on input- and output channels

A ? n

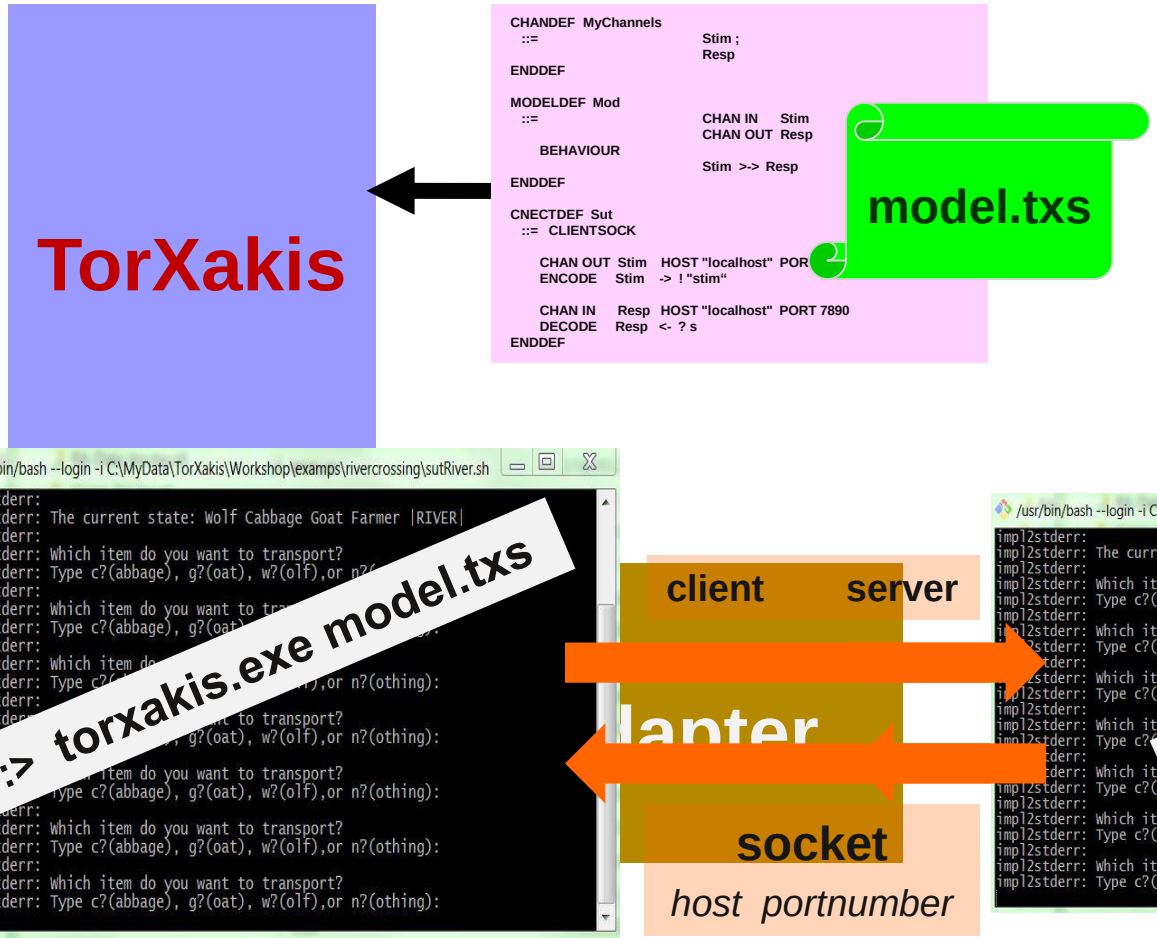
Not (yet) in TorXakis:

- **real-time**
- **probabilities**
- **derivatives (hybrid)**

TorXakis : An On-Line MBT Tool



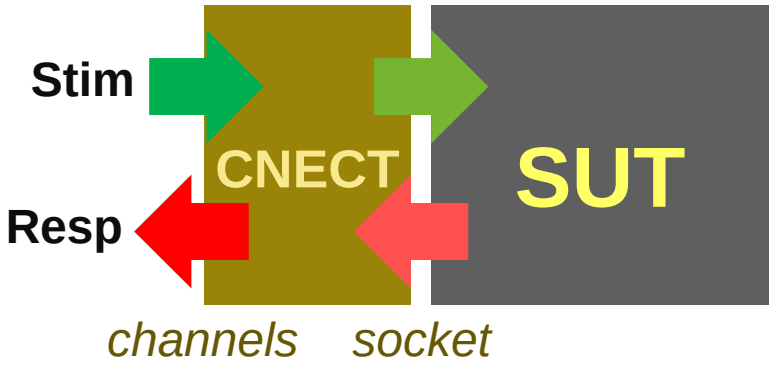
TorXakis and SUT



Model-Based Testing

TorXakis - Definitions

TorXakis : Definition of Channels



MODEL

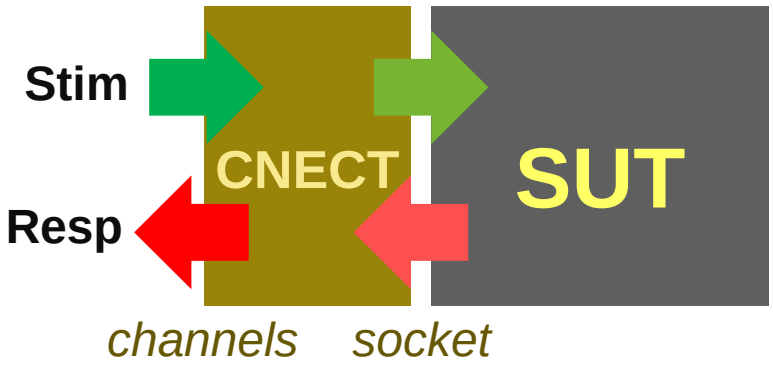
labelled transition system

with parameterized actions on

input- and output channels

```
CHANDEF   MyChannels
   ::=
            Stim    ::   String
          ; Resp    ::   String
ENDDEF
```

TorXakis : Definition of SUT



SUT

real, black-box system

communicating with its environment

via messages on input- and

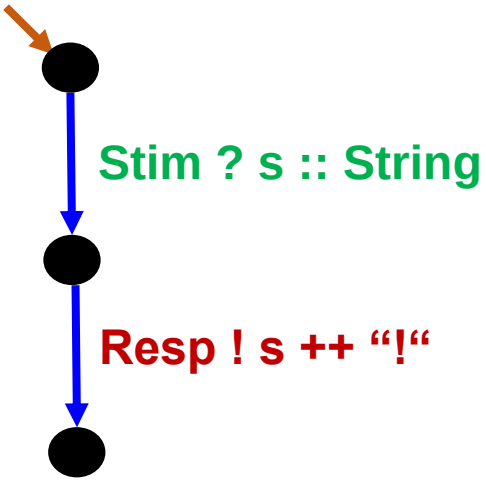
output channels

```
CNECTDEF  MySut
    ::=
        CLIENTSOCK

        CHAN OUT  Stim   HOST  "localhost"   PORT  7890
        ENCODE     Stim  ?s   ->   ! s

        CHAN IN     Resp  HOST  "localhost“   PORT  7890
        DECODE     Resp  ! s   <-   ? s
ENDDEF
```

TorXakis: Definition of Model



MODEL

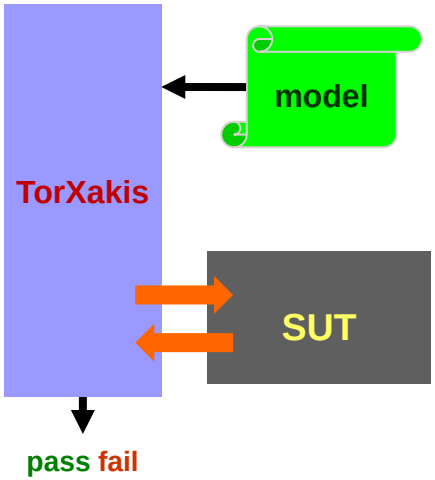
labelled transition system with actions on input- and output channels

```
MODELDEF  MyModel
  ::=
          CHAN IN        Stim
          CHAN OUT       Resp

          BEHAVIOUR      Stim ?s  >->  Resp !s ++ "!"

ENDDEF
```

TorXakis : Definitions



TorXakis input =

list of definitions

data

- type — TYPEDEF
- function — FUNCDEF
- constant — CONSTDEF

test architecture

- channels — CHANDEF
- model — MODELDEF
- connection — CNECTDEF

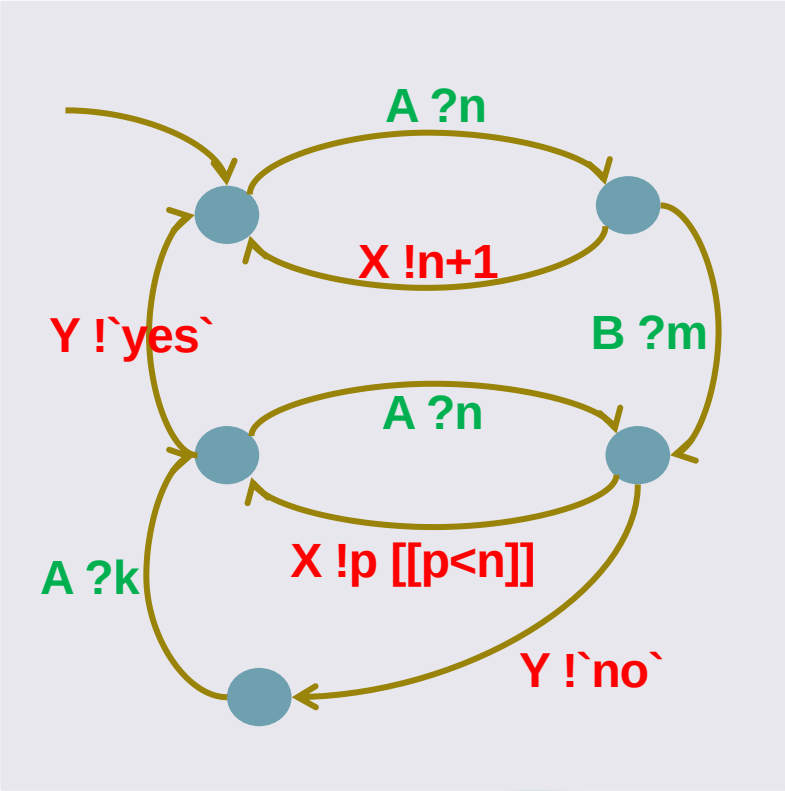
behaviour / labelled transition system

- process — PROCDEF
- state automaton — STAUTDEF

TorXakis : Defining Behaviour - LTS

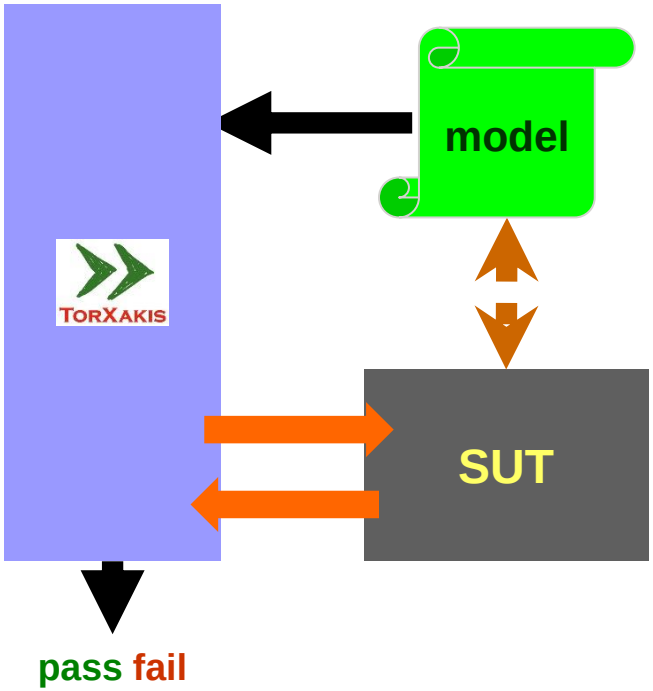
basic behaviour
= transition system

complex behaviour
= composition of transition systems



- named behaviour definition
- named behaviour use
- sequence
- choice
- parallel
- communication
- exception
- interrupt
- hiding/abstraction

TorXakis



The next step in

Model-Based Testing

TorXakis

Installation

TorXakis : Installation

Follow: *TorXakis : Getting Started*

in: *Model-Based testing and TorXakis – A Tutorial*

or on: https://torxakis.org → Getting Started