



World Class Standards

# TTCN-3 Tutorial

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## What is TTCN-3?

- ❑ **Testing and Test Control Notation Version 3**
- ❑ **Internationally standardized testing language**
  - **Product of the ETSI Technical Committee MTS (Methods for Testing and Specification)**
- ❑ **A programming language that has been used for more than 15 years in standardization as well as industry**
  - **Specifically designed for black box testing and certification**
  - **Constantly developed and maintained at ETSI by a team of leading testing experts from industry, institutes, and academia**
- ❑ **A testing technology that applies to a variety of application domains and types of testing**
  - **Knowledge of TTCN-3 is valuable both for employees as well as employers due to its wide applicability**
  - **Offers potential for reducing training and test maintenance costs significantly**
  - **Proven to work in very large and complex industrial tests, e.g., 3G network elements**

## What makes TTCN-3 different ...

- ❑ **From conventional programming or scripting languages?**
  - Rich type system including native list types and support for subtyping
  - Embodies powerful build-in matching mechanism
  - Snapshot semantics, i.e., well defined handling of port and timeout queues during their access
  - Concept of verdicts and a verdict resolution mechanism
  - Support for specification of concurrent test behaviour
  - Support for timers
  - Allows test configuration at run-time
  - Tests focus only on implementation to be tested
- ❑ **From a test tool or vendor proprietary testing language?**
  - Not tied to a particular application or its interface(s)
  - Not tied to any specific test execution environment, compiler or operation system
  - TTCN-3 as such is not executable and requires a compiler/interpreter, adapter as well as codec implementations

## TTCN-3 Benefits

- ❑ **TTCN-3 is easy to learn**
  - Look and feel of a regular programming language
- ❑ **Unambiguous specification and execution of tests**
  - Well defined syntax, static - and operational semantics
  - Enables completely automated test execution
- ❑ **Off-the-shelf tools and test systems are readily available**
  - Five different commercial TTCN-3 tools on the market
- ❑ **Open source community now taking shape**
  - Tools as well as test suites and useful modules
- ❑ **Can be used to specify tests for standardization as well as proprietary product features**
- ❑ **Flexible testing technology**
  - Virtually no limits to adapt a test system to your needs
  - Scalable – allows test systems to grow over time

## TTCN-3 Success stories

### ❑ At ETSI

- Used for development of any new conformance and interoperability test suite, e.g., SIP, IPv6, WiMax, 3GPP IMS, ...

### ❑ In industry

- Applied in a variety of application domains, e.g., telecom, automotive, financial, ... (see [www.tt-medal.org](http://www.tt-medal.org))
- Ericsson reported 1,500 active licenses at TTCN-3 User Conference 2007
- Motorola reports doubling of testing productivity
- Huawei introduced TTCN-3 in 2005, 200 000 test cases written

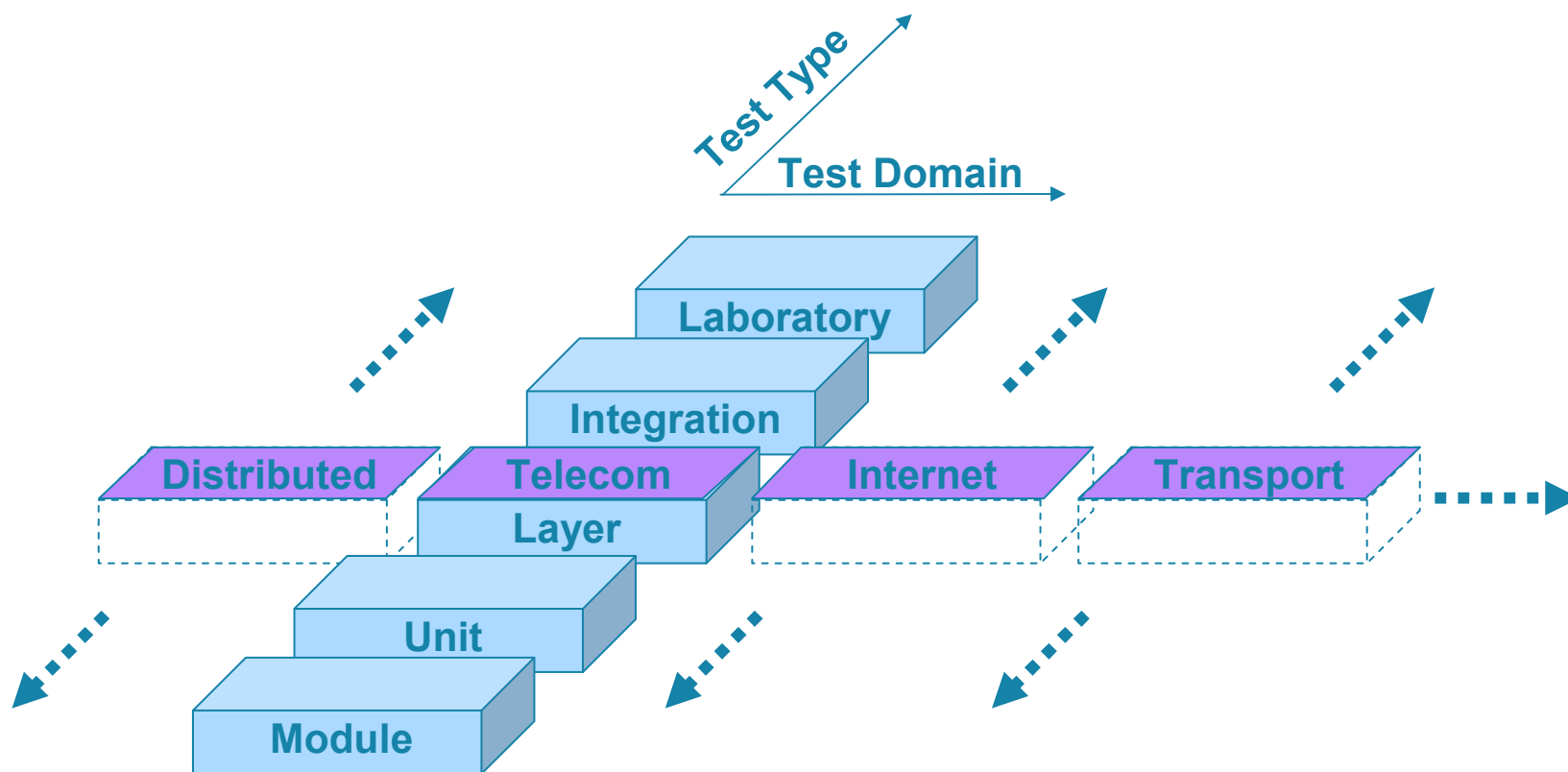
### ❑ In academia and research institutes

- Bluetooth roaming algorithms, web services & project mgmt system, IMS benchmark, RIPng, GRID application testing, ...

### ❑ Beyond Europe

- Strong community in China

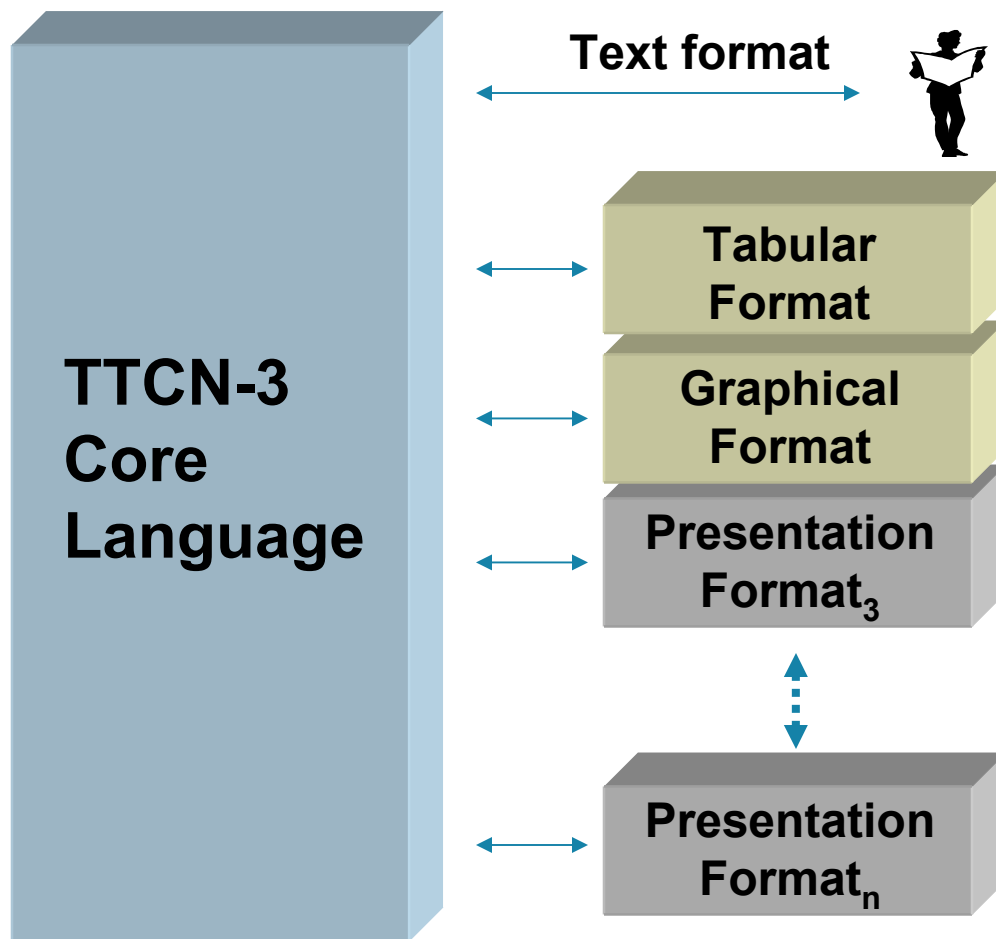
## Expansion of TTCN-3 Use



## Main Capabilities of TTCN-3

- Dynamic concurrent testing configurations
- Various communication mechanisms (synch and asynch)
- Data and signature templates with powerful matching mechanisms (including regular expressions)
- Attributes for encoding, display or user-defined information
- Test suite parameterization
- Control of Test Case execution and selection mechanisms
- Control of complex test configurations
- Assignment and handling of test verdicts
- Harmonized with ASN.1 (XML and IDL coming)
- Different presentation formats
- Well-defined syntax, static - and operational semantics

# The Core Language and Other Presentation Formats



- Core format is text based (most popular)
- TTCN-3 can be edited or viewed in other formats
  - Tabular format (for TTCN-2 people)
  - Graphical format (good for visual overview)
  - Other standardized formats in the future?
  - Proprietary formats possible



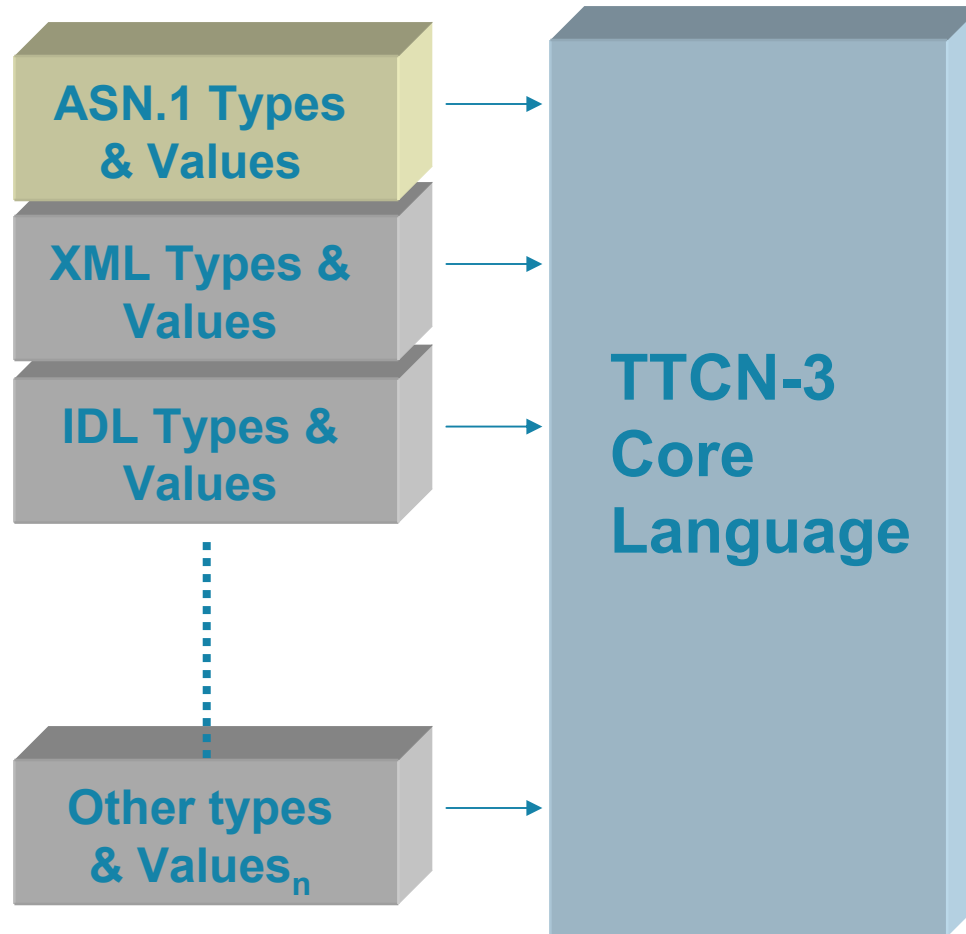
## Example Core (Text) Format

```
testcase TC_resolveEtsiWww() runs on DnsClient
{
    timer t_ack;
    serverPort.send(m_dnsQuestion("www.etsi.org"));
    t_ack.start(1.0);
    alt {
        [] serverPort.receive(mw_dnsAnswer("172.26.1.17")) {
            setverdict (pass);
        }

        [] serverPort.receive { // any other message
            setverdict(fail);
        }

        [] t_ack.timeout {
            setverdict(inconc);
        }
    }
    t_ack.stop;
}
```

## Use of TTCN-3 With Other Languages

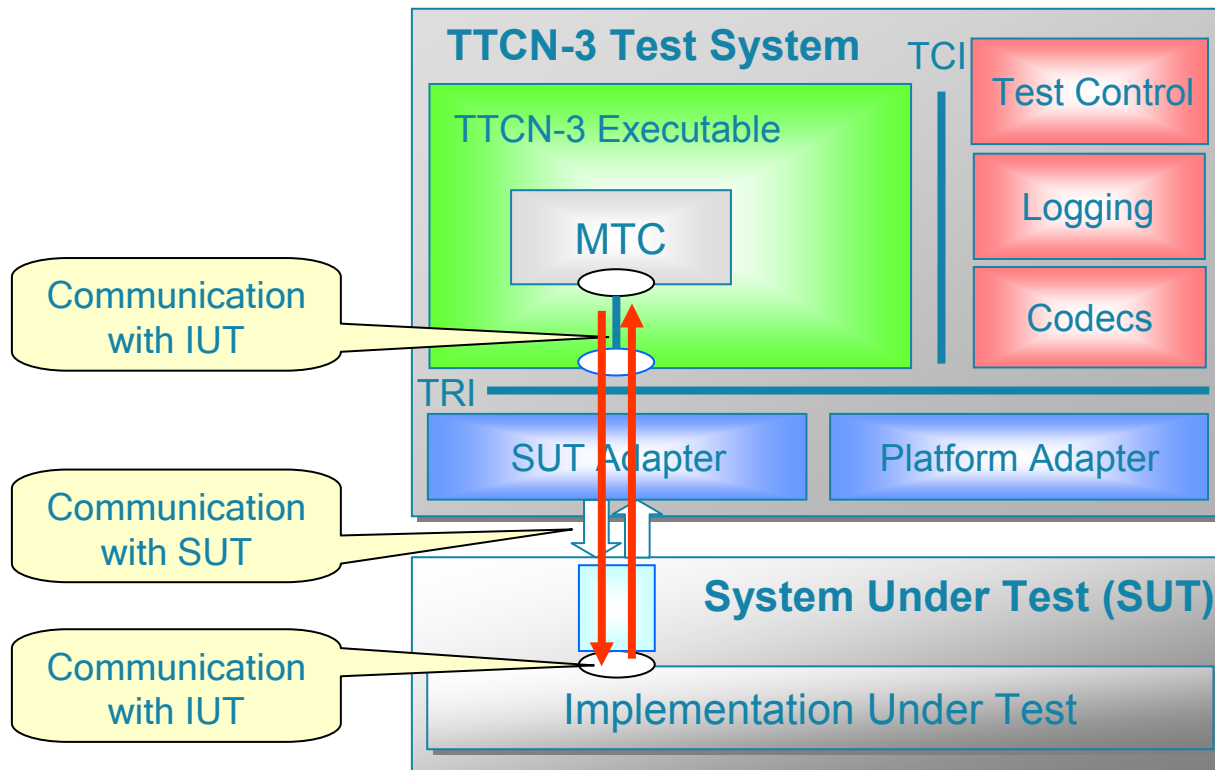


- TTCN can be integrated with types systems of other languages
- Fully harmonized with ASN.1 (1997)
- Harmonized with other languages
  - IDL, XML, C/C++

## TTCN-3 Key Concepts

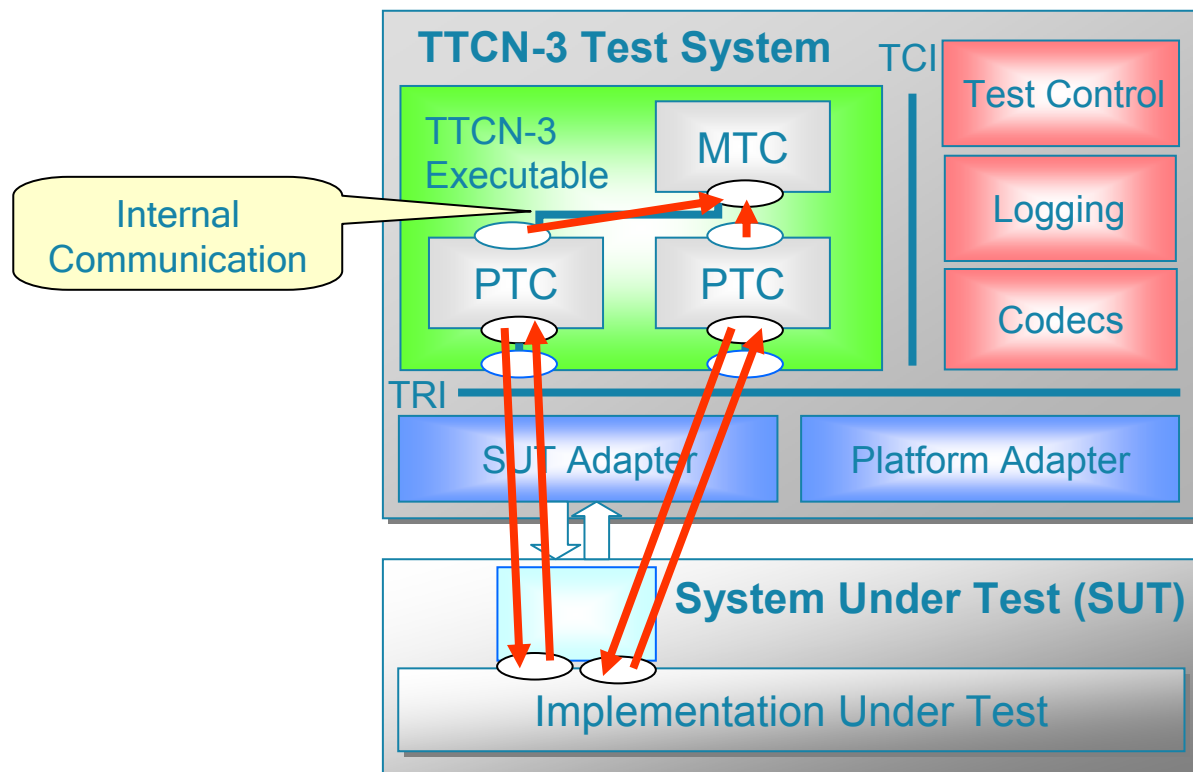
- Black-Box Testing**
- Test Configuration**
- Test Components**
- Communication Ports**
- Test Verdicts**

## Minimal Test Configuration



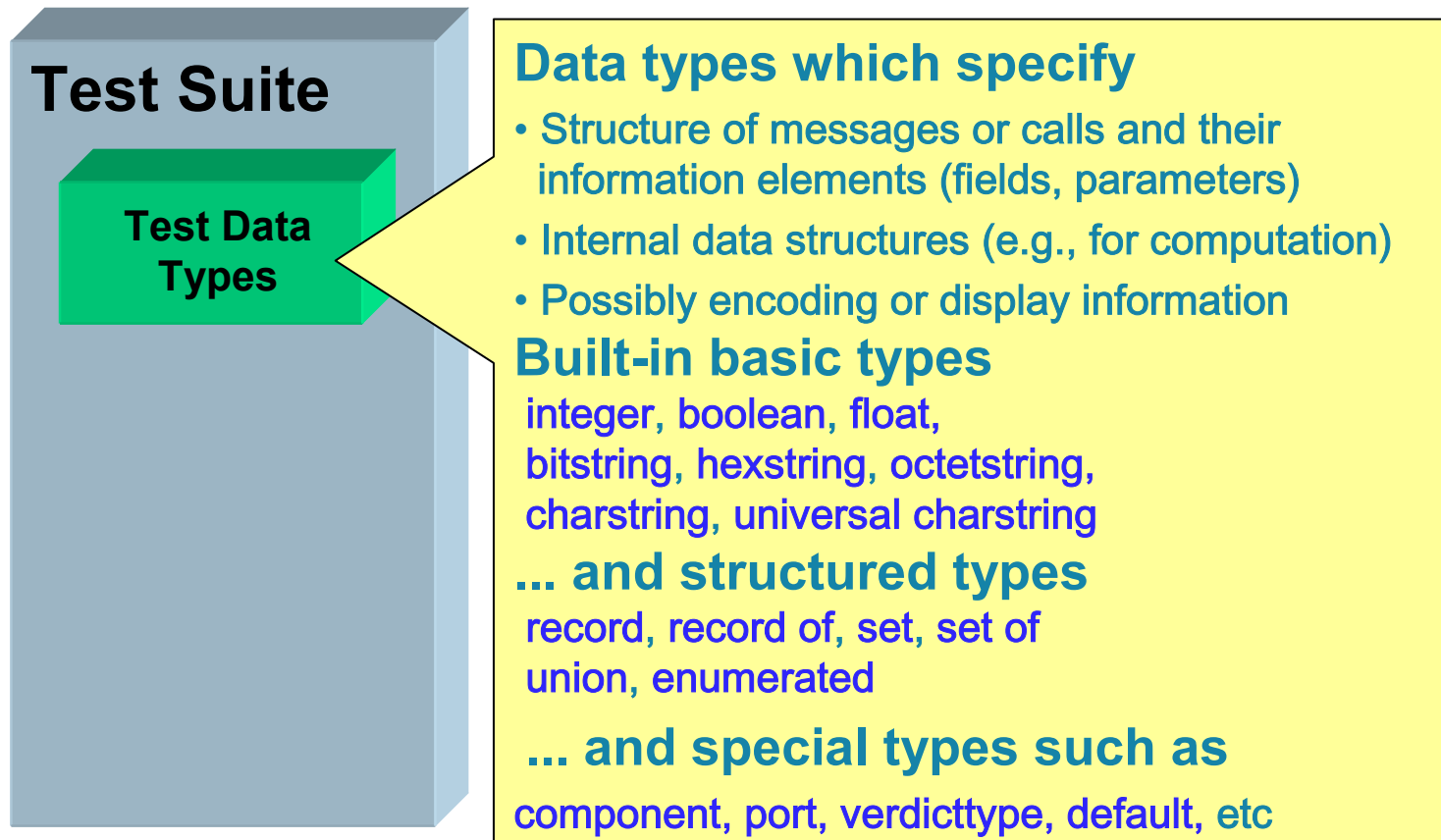
- All test behavior is executed on one (main) test component

## Example Concurrent Test Configuration

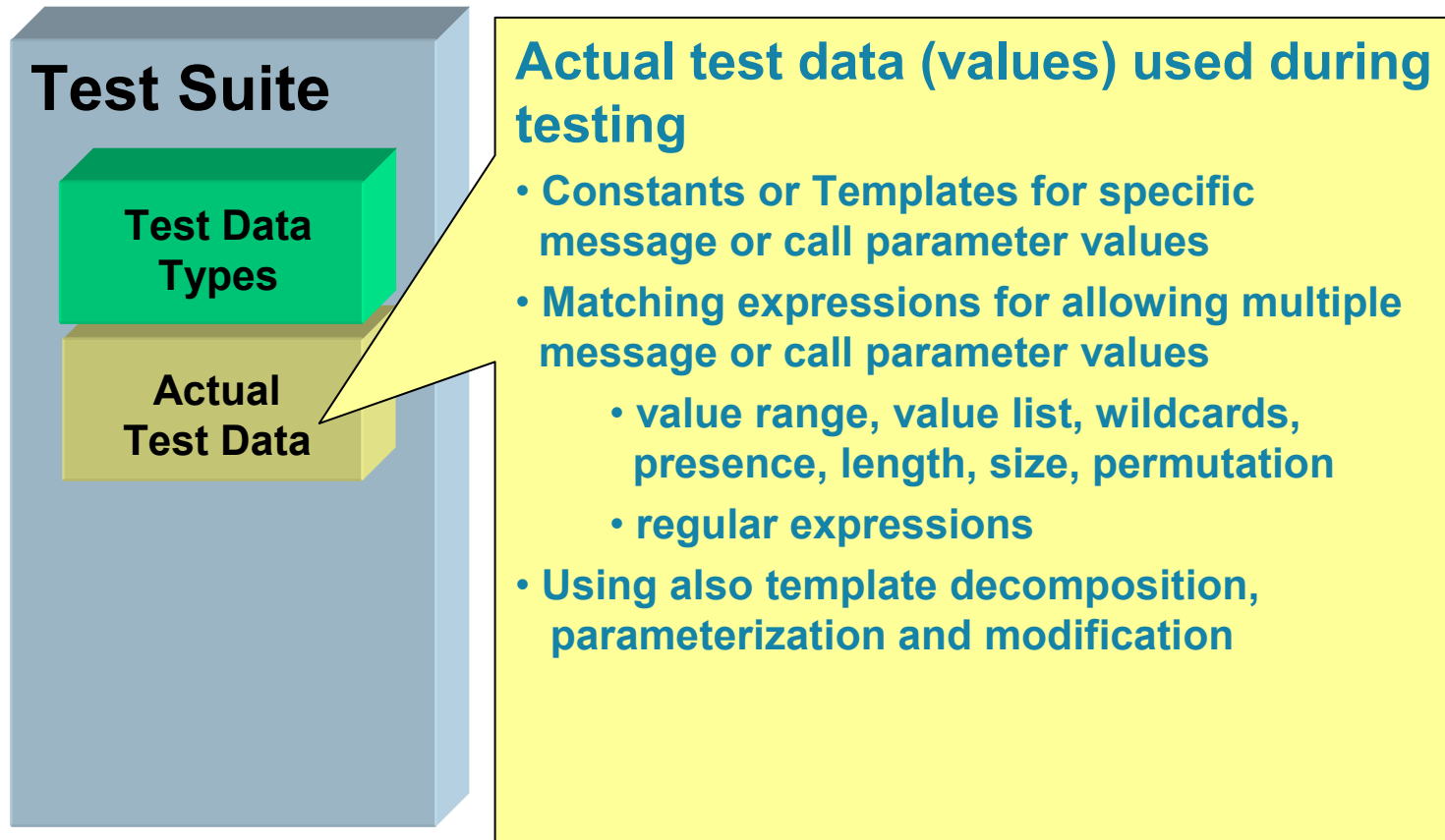


- ❑ A test involves execution of many parallel test components
- ❑ Dynamic instantiation of components and communication links

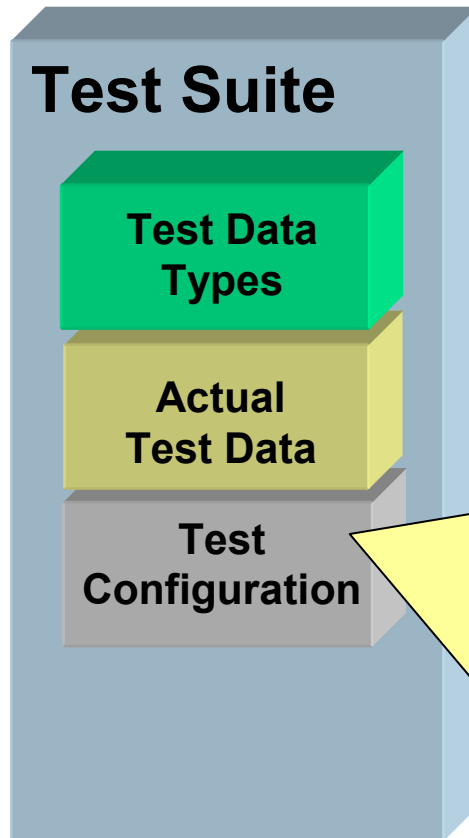
## Building blocks of a TTCN-3 Test Suite



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### Static aspects

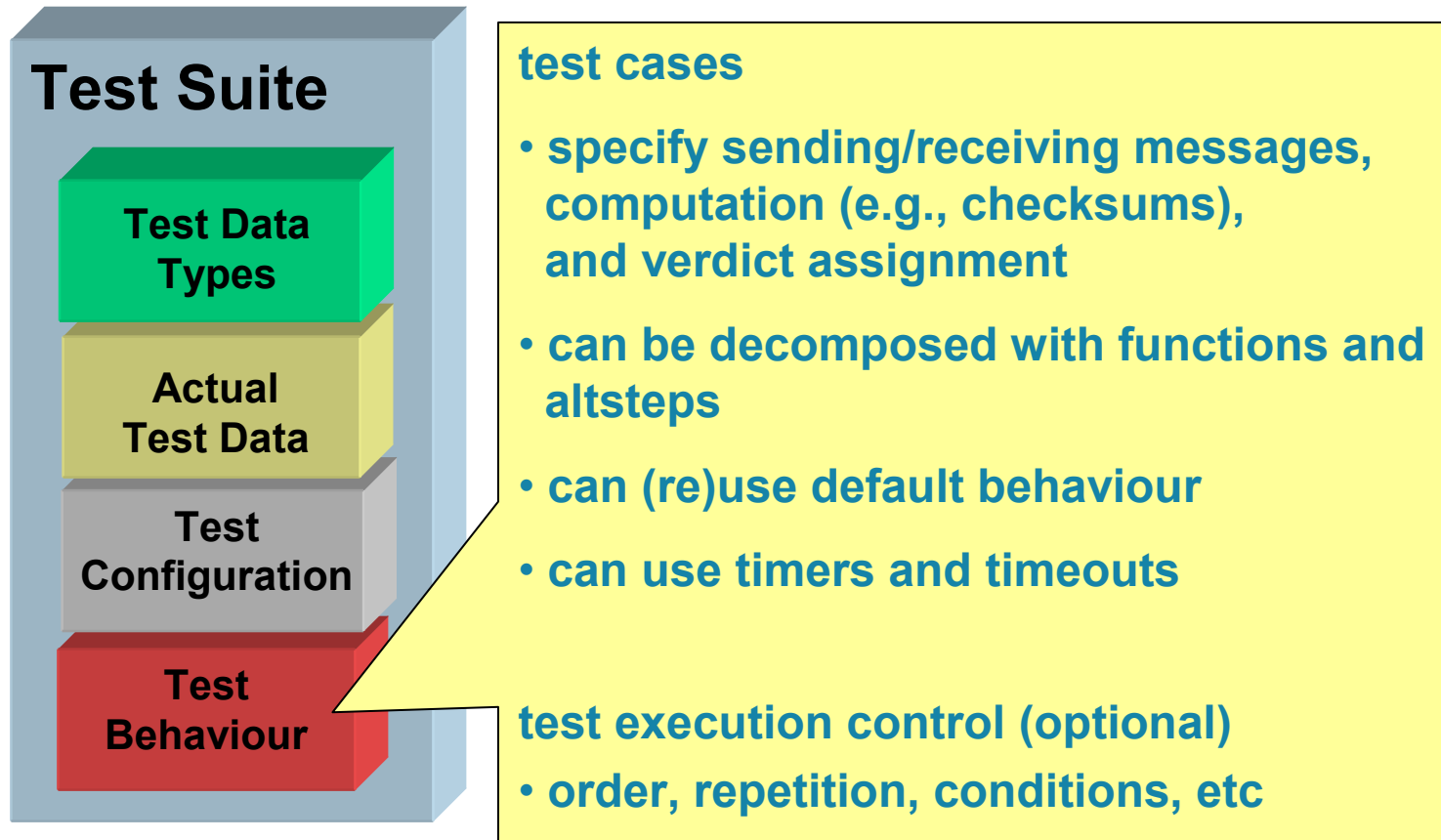
- Test component and port types

### Dynamic aspects

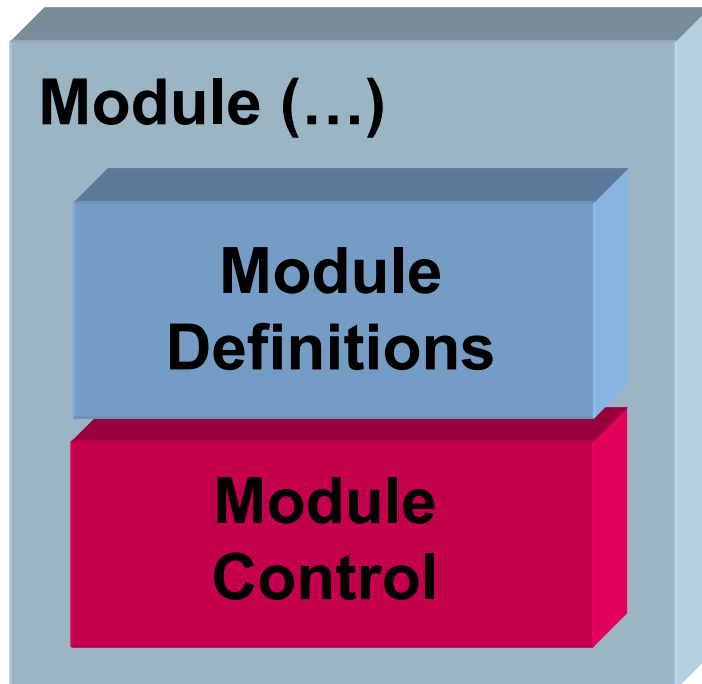
- Dynamic instantiation and management of test components
- Mappings of test components to abstract test system interfaces
- Connections between test component interfaces
- Management of test components



## Building blocks of a TTCN-3 Test Suite



## The Control Part



```

module EtsiDnsTests
{
    // Test definition part
    modulepar boolean mp_example;

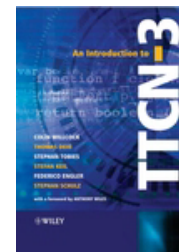
    testcase TC_resolveEtsiWww()
    runs on DnsClient
    {
        // .. as in previous slide
    }

    // Test execution part
    control {
        if (mp_example) {
            execute(TC_resolveEtsiWww());
        }
    }
}

```

## Where can I learn more?

- ❑ Visit ETSI's official TTCN-3 web site ([www.ttcn-3.org](http://www.ttcn-3.org))
  - Public TTCN-3 test suites, useful TTCN-3 modules
  - Links to commercial as well as open source tools
- ❑ Read well written TTCN-3 standard suite
- ❑ Join the ETSI mailing list ([list.etsi.org/TTCN3.html](http://list.etsi.org/TTCN3.html))
- ❑ Take a course (see [www.tt-medal.org](http://www.tt-medal.org))
- ❑ Read publications
  - Proceedings of Conference for Testing of Communicating Systems (TESTCOM)
  - Presentations of yearly TTCN-3 User Conferences in Europe or Asia (see [www.ttcn-3.org](http://www.ttcn-3.org))
  - Get a text book  
<http://www.wiley.com/legacy/wileychi/ttcn-3/>
- ❑ Register for the next TTCN-3 user conference!





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**Thank You!**

