Conformance Testing and TTCN

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Outline

- **Introduction and Terminology**
- Conformance Testing Process
  - Test generation
  - Test realization
  - TTCN Introduction
    - Overview part
    - Declaration part
    - Constraint part
    - Dynamic Part
  - Test execution
- 3GPP conformance testing and test cases – A real world example

Introduction (1)

- A ***protocol*** describes the rules with which computer systems have to comply in their communication with other computer systems.
- How to make sure that these implementations really behave according to these standards protocol specifications, i.e. ***conform*** to these standards ?
- An implementation of a protocol entity is tested with respect to its specification.
- The aim is to gain confidence that during normal use the system will work satisfactory.
  - To ***Certify*** the implementation with respect to the standard.

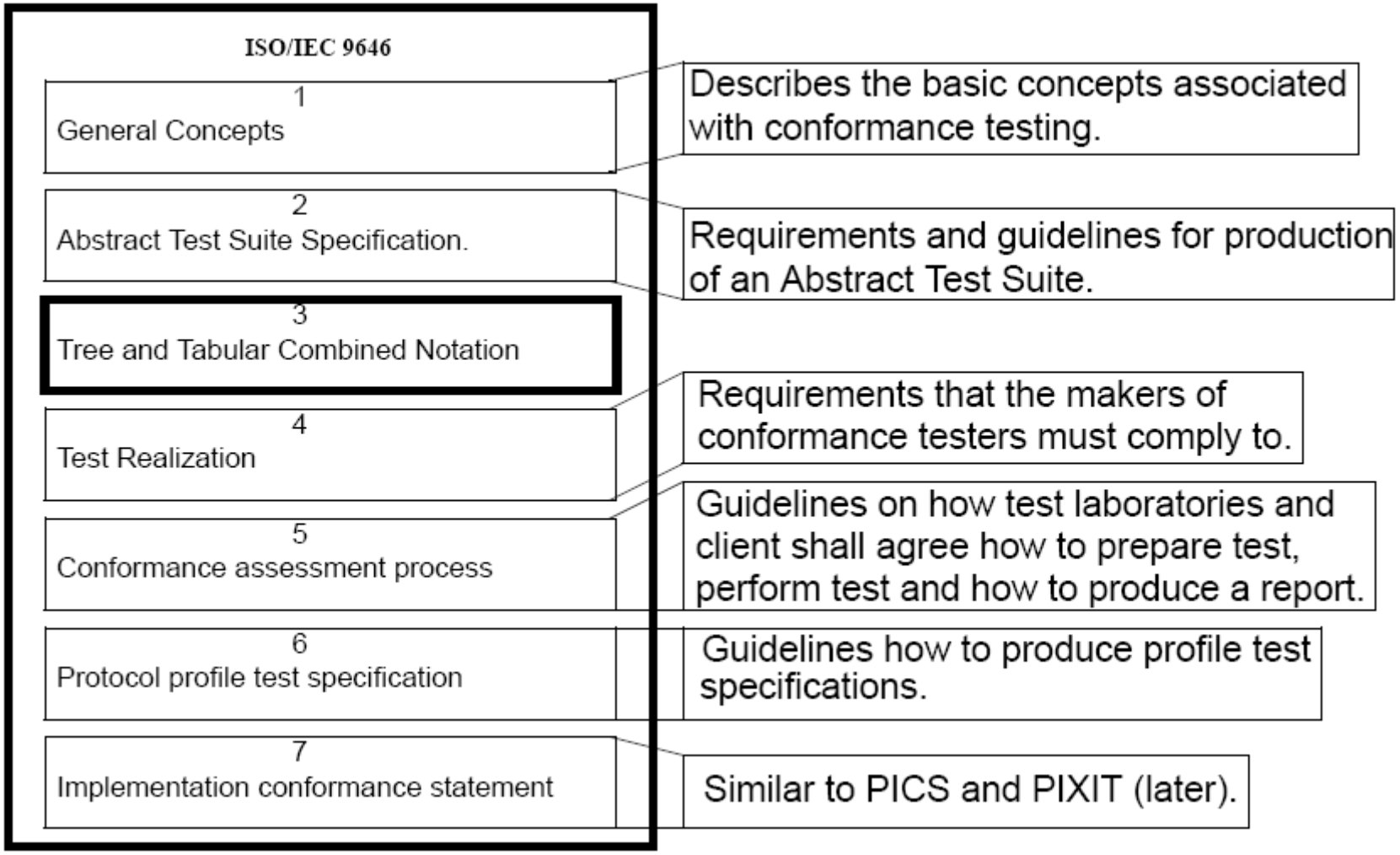
Introduction (2)

- Software testing
  - Structural testing = ***white-box testing***
    - Based on the internal structure of a computer program.
    - The aim is to exercise thoroughly the program code.
    - e.g. by executing each statement at least once, or trying to execute all paths through the program code.
    - *Structure tests are derived from the program code.*
  - Functional testing = ***black-box testing***
    - Testing the externally observed functionality of a program based on its specification.
    - No reference is made to the internal structure of the program.
    - Main goal is to determine whether the right (with respect to the specification) product has been built.
    - *Functional tests are derived from the specification.*

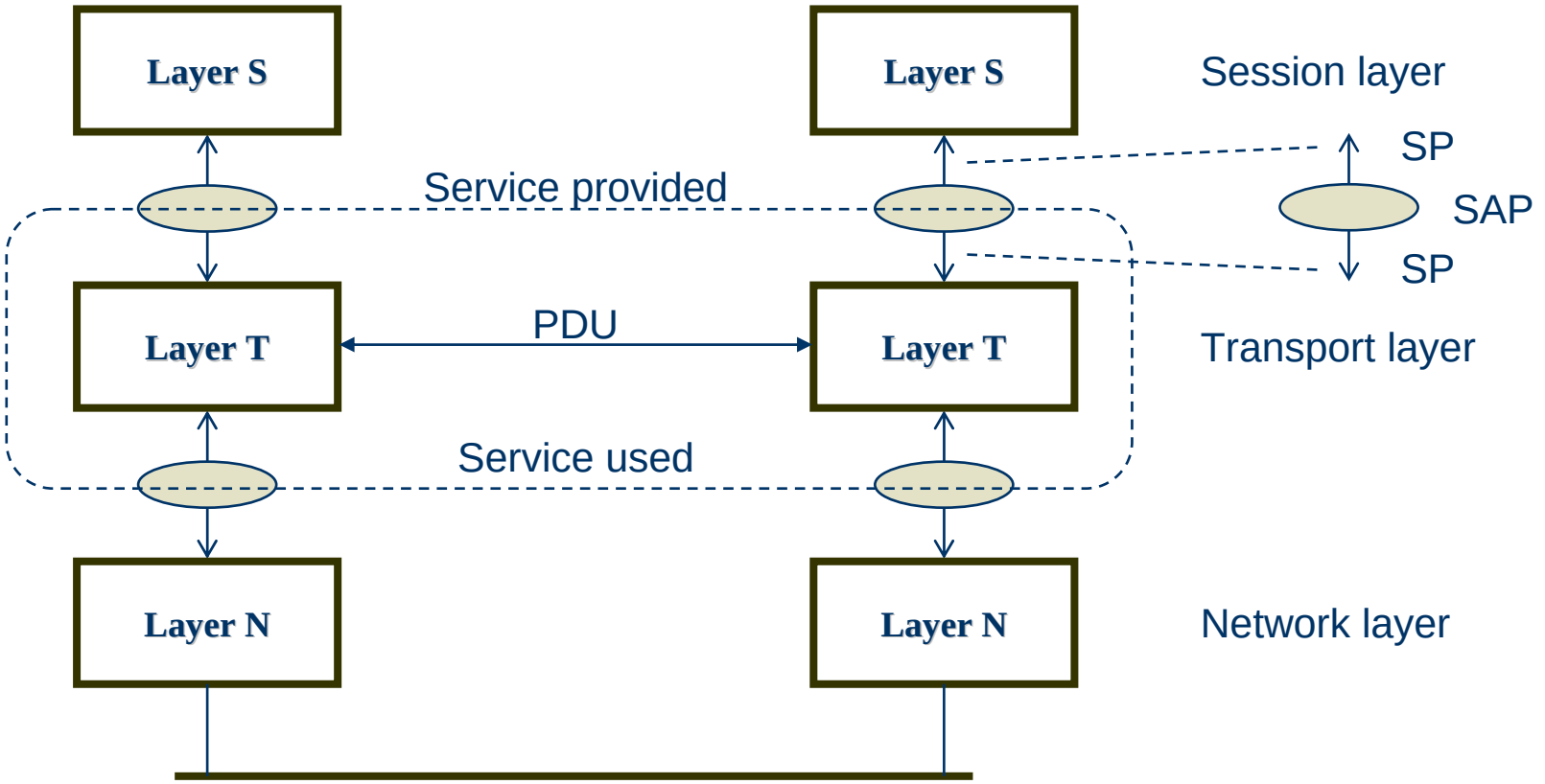
Conformance Testing

- A kind of functional testing
  - An implementation of a protocol entity is solely tested for conformance with respect to the requirements given in its specification
- The process of testing the extent to which implementations of protocol entities adhere to the requirements stated in the relevant standard or specification
  - Concerned with external behavior (black box)
  - Prerequisites for interoperability
    - The primary objective of conformance testing is to increasing the probability that different product implementations actually interoperate.
  - Testing of implementations
  - But NOT with performance, reliability, fault tolerance, efficiency, etc.

ISO/IEC 9646 – The standard

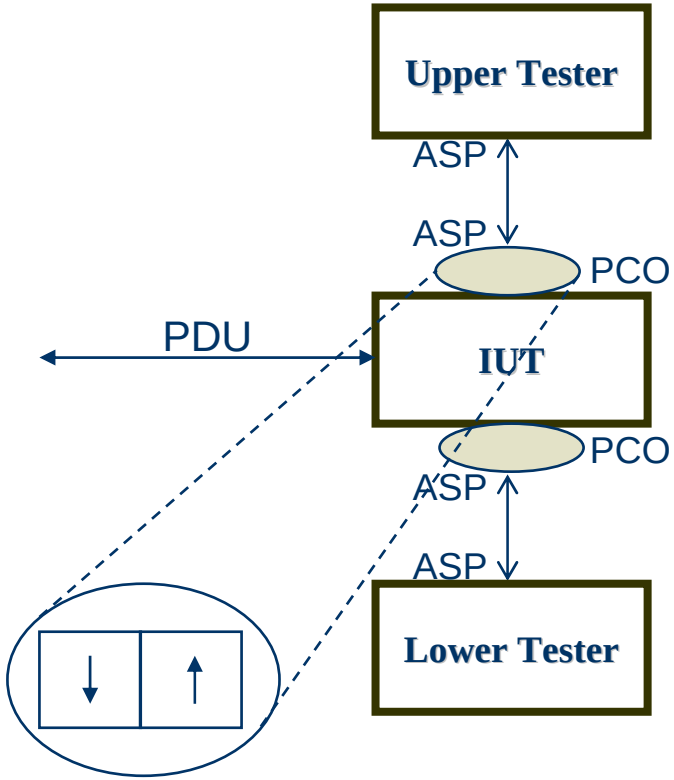


OSI Terminology



SP : Service Primitive
SAP : Service Access Point
PDU : Protocol Data Unit

Conformance Testing Terminology



The PCO has two FIFO queues:

- Send (from tester to IUT)
- Receive (by tester from IUT)

ASP: Abstract Service Primitive

PCO: Point of Control and Observation

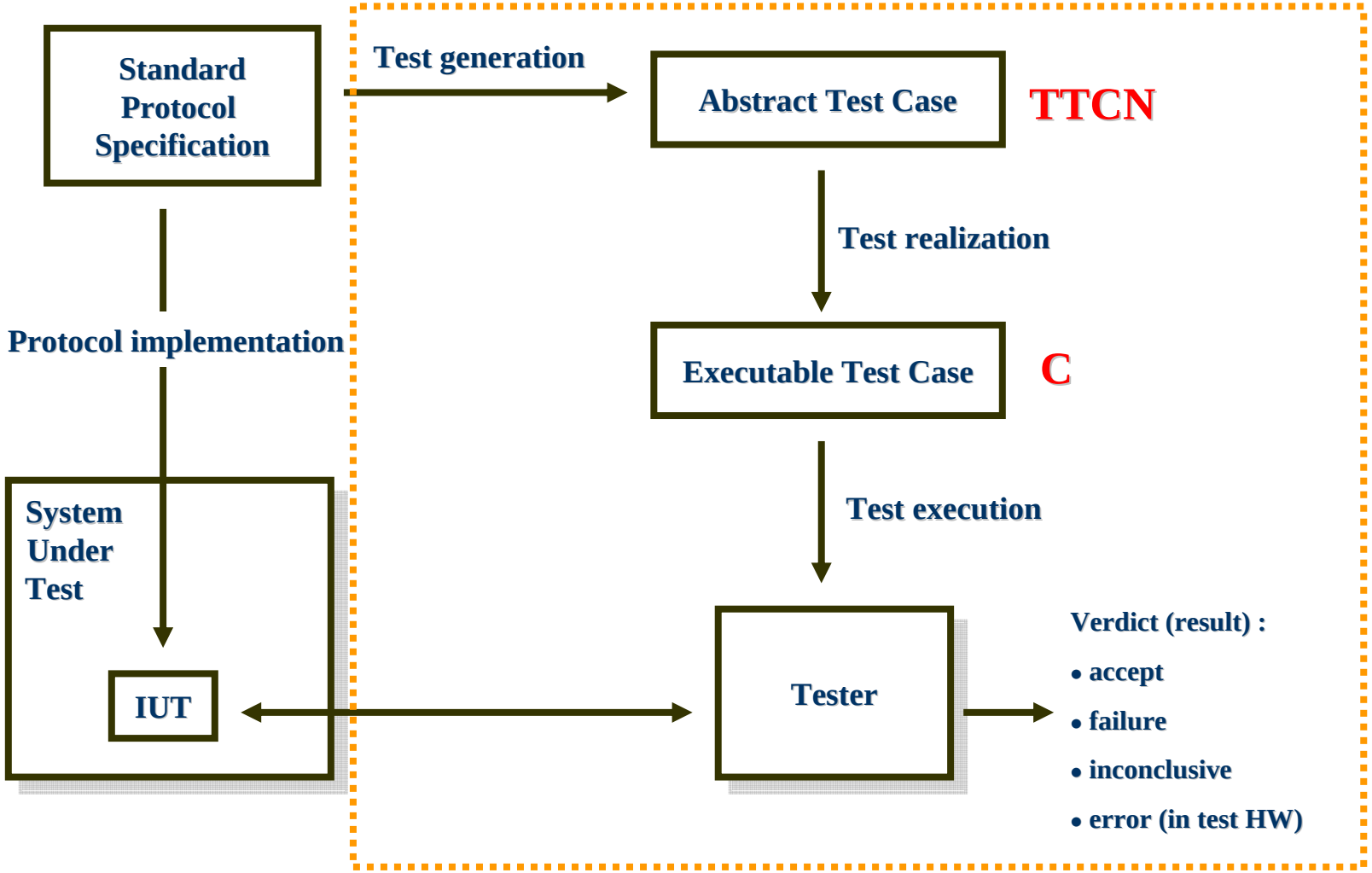
IUT: Implementation Under Test

PDU: Protocol Data Unit

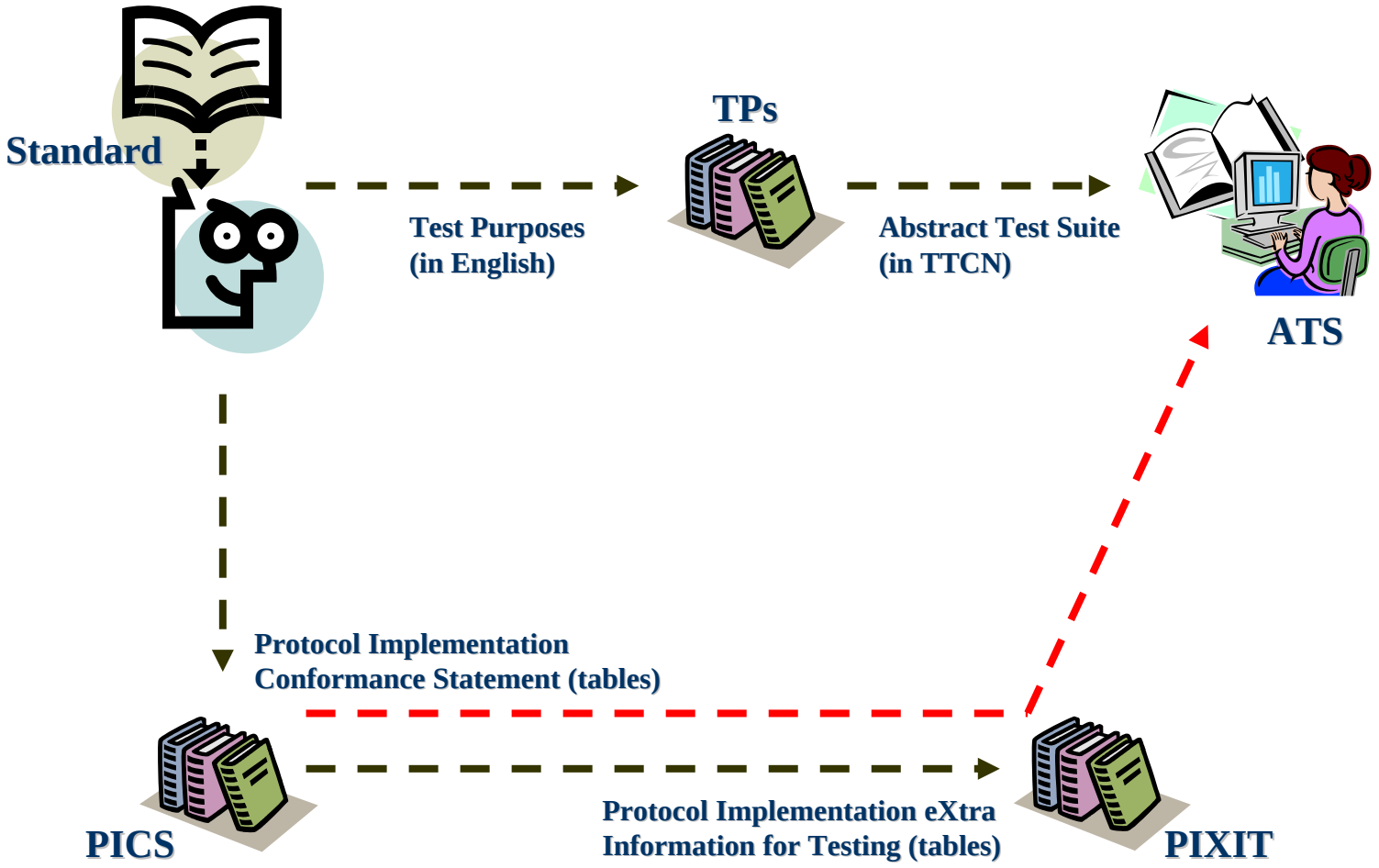
Tester: Test script written in TTCN

TTCN: Tree and Tabular Combined Notation (TTCN-2)

Conformance Testing Process



Test Generation



Test realization

- ATS is non-executable test suite. → has to be converted into ETS.
- ATS is specified independently of any real testing device.
- Test selection: the tests relevant to the IUT are selected based on the PICS
- Also information about the IUT and its environment must be supplied: PIXIT
- Use tools to convert the ATS in TTCN to C executable code.
- The C code generated has to be adapted based upon the target environment.

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