

The History and Future of TTCN-3

TTCN-3 User Conference
Stockholm 2007

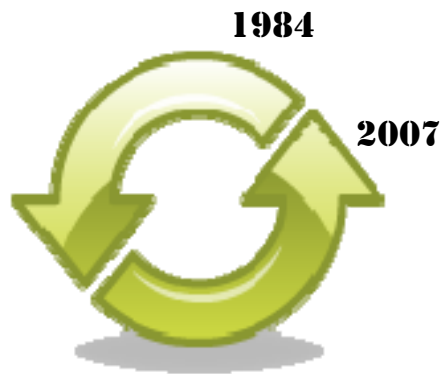
Anthony Wiles
Director
ETSI Centre for Testing and
Interoperability

T3UC 2007

ETSI Centre for Testing and Interoperability

- Development of test specifications (ATS) for a wide range of ETSI technologies
- Organisation of interoperability events – Plugtests™
- Contribute to the development of TTCN-3 and other techniques and methodologies

What Goes Round Comes Round



"History is merely a list of surprises. It can only prepare us to be surprised yet again" -- Kurt Vonnegut

- History is about Dates, Places and People**
- Standards are about people, as much as they are about technology**
- So here is a short story of a few dates, a few places, some artefacts, plenty of people**
- ... and some Ducks**

It all began at a time when ...

- Apple was a Beatles label, not a computer company
- Mobile phones were the size of mobile homes
- Pods were things with seeds in them, not music players
- Bluetooth was still only a Scandinavian king
- 1984 was a good book, not a tacky reality TV show
- And OSI was the future of networking, not this thing called TCP/IP

What has Survived?

- Well, among other things ...
- The OSI reference model
- ASN.1
- ISO 9646 Methodology and Framework for Conformance Testing
 - Dr. Dave Rayner (Rapporteur for ISO 9646)
 - Seven part standard
 - Much of the concepts, process and terminology is still used
 - IUT
 - PICS
 - Test Purposes
 - Etc.
 - And especially part 3: TTCN

The Beginning

- ❑ Idea first raised in Manchester early 1984

- ❑ Firm proposal for some form of standardised test notation decided in Florida, November 1984, as a section in the main document

- ❑ Mature draft in 1985, our work was nearly done

Secretariat: ISO/TC 97/SC 21/WG 1: 65
Project: 97.21.23
Date: September 1995

ISO/TC 97/SC 21
OPEN SYSTEMS
WG 1
GST-AYABHLSLHVA

TITLE: New Text for Section 13 of 8021/8010 on Test Notation
SOURCE: Editor appointed at confirmation testing rapporteur group meeting held in Manchester, UK, 8-12th July 1985.
NOTES: 1. This document originated from the Manchester rapporteur group meeting. Minor revisions have been made to correspondence with interested experts, in accordance with recommendation 5.20 made at that meeting.
2. For those present at the Manchester rapporteur group meeting, this is 1985-10-Revision 2. Minor typographical changes have been made to Revision 1, the late output from Manchester.
3. The table areas requiring further attention are that on variables and their use, and that on predefined events.
4. Known Deficiencies
- The text is not well directed. At times it is definition, at others guidance, etc.
- Some parts are deliberately ambiguous!
- There is (still) a lack of examples.

Address to Secretariat (ISO/TC)	Telephone	Fax
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Trees and Tables

- ❑ Tree notation (i.e., alternatives)
 - Process algebra: LOTUS
- ❑ Tabular format
 - Teletext
- ❑ Typical standards compromise!
 - Tree and Tabular Combine Notation
- ❑ BNF invented as a transfer syntax
 - No XML at that time!
- ❑ The TTCN BNF was invented and developed, here in Kista, at the Institute of Computer Science (SICS)
 - C.a. 1985
- ❑ ITEX prototype developed here in Kista
 - Later taken over by Telesoft (now Telelogic) in Uppsala

We didn't have Versions, we had Places

- ❑ And so time and meetings went by
- ❑ More beer
- ❑ More late nights
- ❑ More places
 - :
 - Vancouver version
 - Tokyo version
 - Sydney (far too much beer, there!) version
 - :
 - **Stockholm version, and TTCN was under pressure ...**

TTCN-1 or The Sitting Duck



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Welcome to Hell

- Heidelberg version, 1990
- Spent most of the time trying to get the ASN.1 connection right
- And the standard just got bigger and bigger and ...

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HEIDELBERG, 1990

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Publish and be Damned!

- TTCN-1 was published in 1992 as an ISO standard and an ITU-T recommendation (X.292)
 - Os Monkewich took over as ISO Editor for part 3
- The all important tools started to arrive
- Adopted by GSM
- Difficulties with new tools and methodology,
- But it did drive the development and uptake of TTCN

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TTCN

- ❑ **TTCN had OSI concepts hardwired into it**
 - Strict layered approach
 - Abstract Service Primitives (ASPs)
 - Protocol Data Units (PDUs)
- ❑ **Designed specifically for Conformance Testing**
 - Syntax 'forced' ISO 9646 methodology
- ❑ **Limitations**
 - No parallelism
 - Poor interface with ASN.1
- ❑ **Strengths**
 - PCO concept
 - Did abstract from real test system
 - Very sound software engineering approach – successive abstraction
 - Test purposes – TTCN code (ATS) – Executable code (ETS)

Benefits of TTCN

- ❑ **Specifically designed for testing**
- ❑ **Concentrates on the test not the test system**
- ❑ **Commonly understood syntax and operational semantics**
- ❑ **Constantly maintained and developed**
- ❑ **Off-the-shelf tools and TTCN-based test systems are readily available**
- ❑ **Single language for many (all?) testing activities**
 - Education and training costs can be rationalized
 - Maintenance of test suites (and products) is easier
- ❑ **Allows the application of a common methodology and style, both on a corporate level and within standardization**

TTCN-2

- TTCN-2 came a year or so later
- Basically added parallelism
- Improved operational semantics
- And the tools got better
- Complete take-up by ISDN, GSM, DECT, INAP and other telecoms technologies

Formal Testing was IN!

- Spec – implementation – conformance testing – certification
- CTS – Conformance Testing Services
 - By third parties
 - EC driven
 - Failure, that unfairly impacted on TTCN
- But the basic concepts were good



From ISO to ETSI

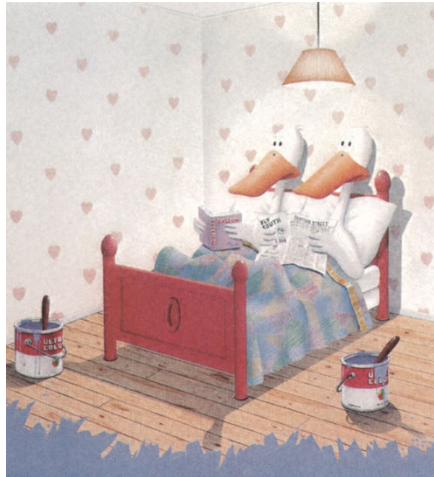
- ❑ By 1995 standardised testing expertise, and especially TTCN had migrated to the South of France, to ETSI
- ❑ All development in ISO had ceased – taken up by TC MTC (Methods for Testing and Certification)
 - Current chair: Prof. Dieter Hogrefe
- ❑ TTCN-2 and even developed further
 - Famous TTCN-2++ (1997)
 - Had nothing to do with OO
 - Just TTCN-2 with a bit more



But the Times Were a'Changing ...

- ❑ One 'side'
 - 'Internet' approach
 - No formal testing, ad-hoc interop considered adequate, no conformance, no certification
- ❑ Other 'side'
 - Mobile communications
 - Complex radio technologies
 - Convergence
 - New technologies
 - New application areas (outside telecom/datacom)
 - Demanding rigorous testing
- ❑ TTCN-2 adequate for the task but limited in its use and application
 - No appeal to a new generation of programmers

Time to Put TTCN-2 to Bed?



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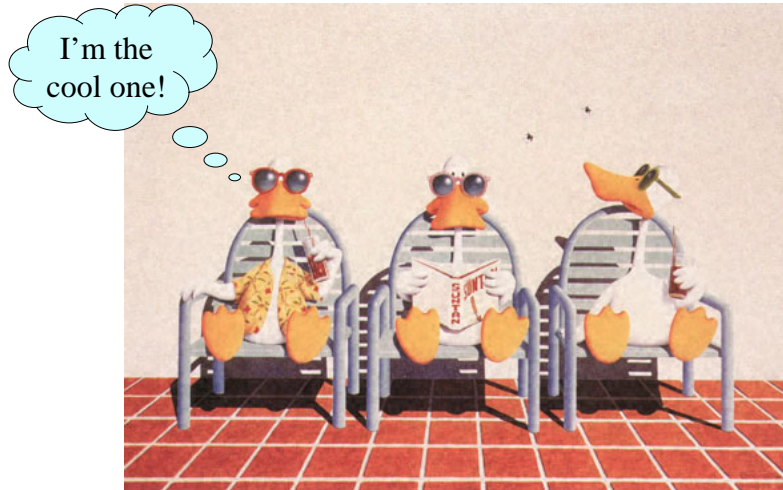
Well, probably not

- Still a significant legacy in TTCN-2
- Large users such as GSM/3GPP reluctant to change
- But none-the-less, it was understood that there was a large 'untapped' market of users out there.
- So TC MTS opened a Work Item for the next version of TTCN

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TTCN-3: 1998 – 2001 and Counting



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TTCN-3

- Why 3?
 - Well -3 comes after -2
 - STF 133
 - Original team comprised 3 members (Jens, Colin, Anthony)
 - Firm commitment to complete the task in 3 years
- So why not?
- After one of the most prolific debates ever, the name was decided as *Testing and Test Control Notation*
- And the logo was born

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TTCN-3 – Best of TTCN-2 and More

- Syntax like a 'proper' programming language
- Dynamic concurrent testing configurations
- Various communication mechanisms (synch and asynch)
- Different presentation formats
- Data and signature templates with powerful matching mechanisms (including regular expressions)
- Simpler specification of encoding information
- User-defined attributes
- Control of Test Case execution and selection mechanisms
- Control of complex test configurations
- Fully harmonized with ASN.1 (XML, IDL, C are coming)

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The Rest is (modern) History ...

- TTCN-3 STF very soon grew to include
 - Ina, Gyorgy, Andreas, ...
- Dedicated maintenance task
 - Now at version 3.2.1
- 1st TTCN-3 User Conference
- Translated to Chinese
- Start-up companies, many more tool vendors etc.
- Growing community
 - Different synergy than there was with TTCN-1



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And What of TTCN-4?



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TTCN-3 is a *Brand*

- ❑ Major updates of TTCN-3 will be new *editions*
 - TTCN-3 edition 4 etc.
- ❑ No further new editions in 2007
 - Change requests (not a large number) are being archived
- ❑ ETSI TC MTS will probably start a maintenance STF (Specialist Task Force) starting early in 2008
 - May be some functional additions
 - Real time aspects
 - Performance
 - Continuous signals
 - Stability is important
 - Package concept

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The Future of TTCN-3

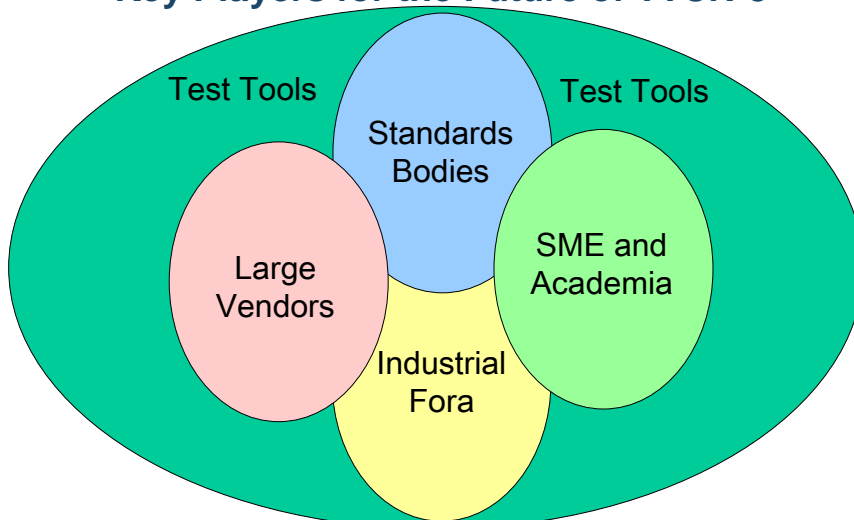
My name is TRI and I bite!



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Key Players for the Future of TTCN-3



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ETSI's Role?

- ❑ IOP is one of the ultimate aims of ICT standardisation
- ❑ IOP is the red thread running through the entire standards development process, it's not an isolated issue
 - Not something to be somehow fixed at the end
- ❑ Even more important when multiple standards organisations involved
- ❑ ETSI philosophy
 - Interoperability is built-in!
 - Testing is a key component in that philosophy

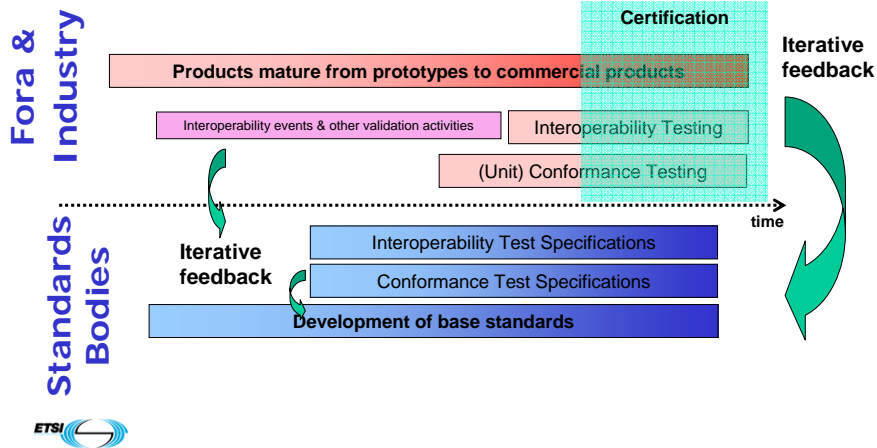


Take Up at ETSI Increasing

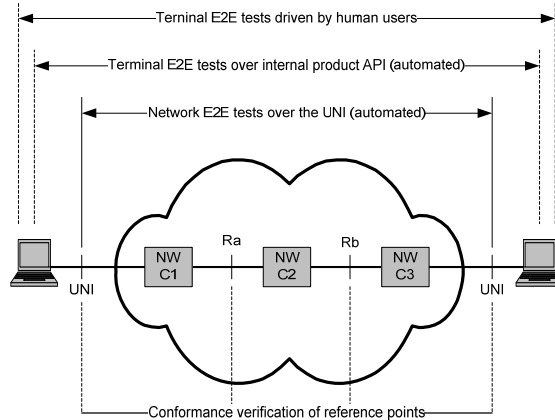
- ❑ IETF SIP (RFC 3261)
- ❑ TISPAN NGN
- ❑ UMTS IMS (SIP)
- ❑ IPv6 Core, Security, Mobility, Transitioning
- ❑ PMR (Public Mobile Radio)
- ❑ WiMAX.
- ❑ 3GPP LTE committed to TTCN-3
- ❑ New test suites will be in TTCN-3
 - E.g., WiMAX and IMS interoperability, UWB, ...
 - CONFORMANCE and INTEROPERABILITY testing
- ❑ Possibilities
 - eBusiness, eHealth, eCall
 - EUROCAE (European Skies)
 - SDR (Software Defined Radio)
 - GRID



Interdependencies between specification and testing

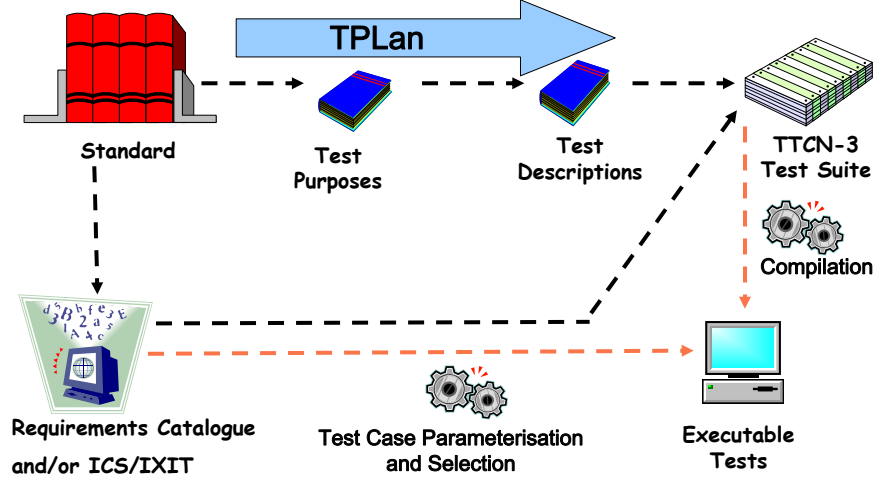


Combining Interoperability Testing with Conformance Verification



Test Specification Development

Successive Levels of Abstraction



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Synergy With ETSI Plugtests™



Future Initiatives?

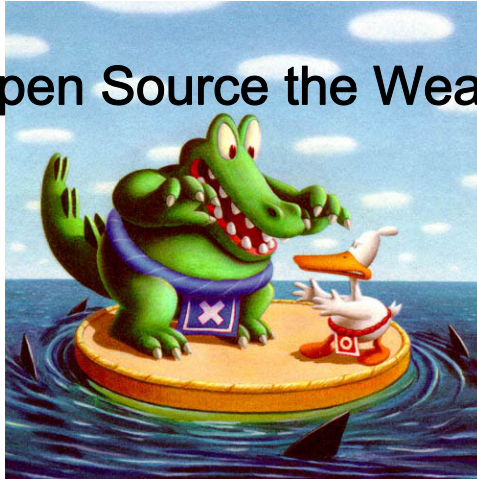
- Appoint TTCN-3 Champions
- TTCN-3 Foundation (Franck Le Gall)
- Ensure key uptake: 3GPP (LTE), WiMAX, Interop
- Other industries – auto, aerospace, rail, power, ...
- Encourage Open Source initiatives
- Provide entry-level tools
- Investigate promotional opportunities – market survey
- Spread beyond Europe - awareness in China, India etc.
- Continue with this conference - T3UC Asia, US?
- Universities
- European projects (e.g., Go4Three)

Future is in Quality

- Promote the TTCN-3 Certificate program
- Use of testing frameworks
 - e.g. TC MTS IP Testing Framework
- Introduction of Quality metrics?
- ETSI style guide?
- Benchmarking of tools?

We Need to Slay the Adaptation Demon

Is Open Source the Weapon?



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Some Simple Goals

- TTCN-3 User Conference Asia
- Make 1500 Users per (large) company the norm, not the exception
- Get TTCN-3 onto academic syllabuses
- We'll never get those 93 000 000 Google hits, but let's make TTCN-3 the Java of the testing world
 - So maybe 1 000 000 TTCN-3 hits by 2010 is something to go for
 - Already 894 000 Google hits for TTCN
- Make a (big) Open Source project for TTCN-3 happen

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Back to the Future Part III

We should all be concerned about the future because we will have to spend the rest of our lives there.

- TTCN-3 is not about a few persons, or one company, or a single organisation**
- In the end, its about you, the USERS!**
- If testing needs to be done then let's put TTCN-3 at the centre**
- Its up to us all, as a community, to create that future ...**

- Well, we've gone through some of the Places, Artefacts, Dates and all of the Ducks**
- So, now for the names ...**



Marsha Drubet
Jeff Watkins World Class Standards
Oz Monkewich
Bernd Baumgarten
Paul Baker
Thomas Wernitz
Stephan Tobies
Claude des Roches
Stephan Schulz
Thomas Deiss
Andreas Ulrich
Dieter Hogrefe
Colin Wilcock
Jens Grabowski
ina Schiefeldecker
Gyorgy Rethy



ETSI

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ISO

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