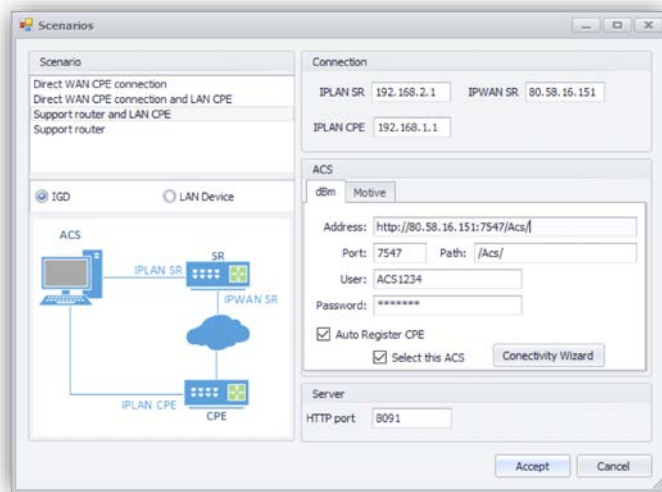


# MeTro-69



CPE Management everywhere



# Global Manufacturer telecom nodes & instruments



# CPEs are Everywhere



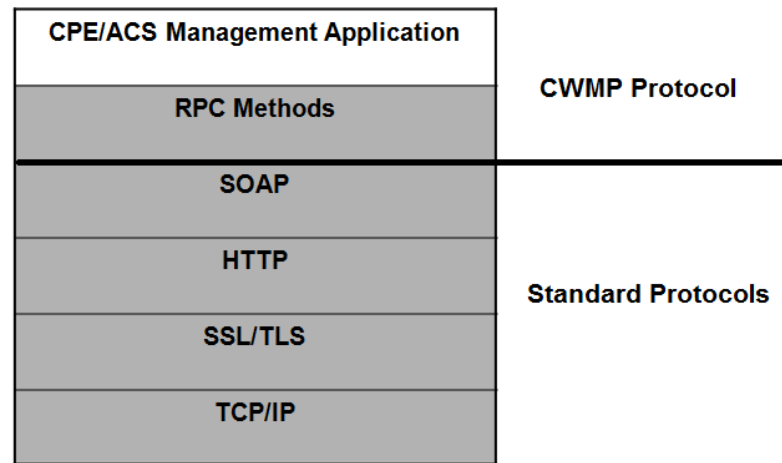
- ◆ CPEs (Customer Premise Equipment) everywhere
- ◆ They are produced in quantities of million of units every year
- ◆ Quick evolution:

new services  
new functionalities  
new standards

They must be deeply tested  
**(TR-069 protocol behavior also!)**

New models

# What is TR-069 protocol?



- ◆ Before: CPE vendors had proprietary mechanisms for management (SNMP, simple network management protocol)
- ◆ Now: TR-069
  - **Bi-directional** remote management protocol to allow **communication CPE-ACS**
    - includes many remote possibilities: get/set/reboot/FR/Download/Upload...)
  - Provides one common platform to manage through the Internet all CPEs
    - **Independent from CPE vendor or CPE type** -

# Which are the **aims** of TR-069 protocol? (i)



- ◆ **Auto-configuration and dynamic service provisioning**

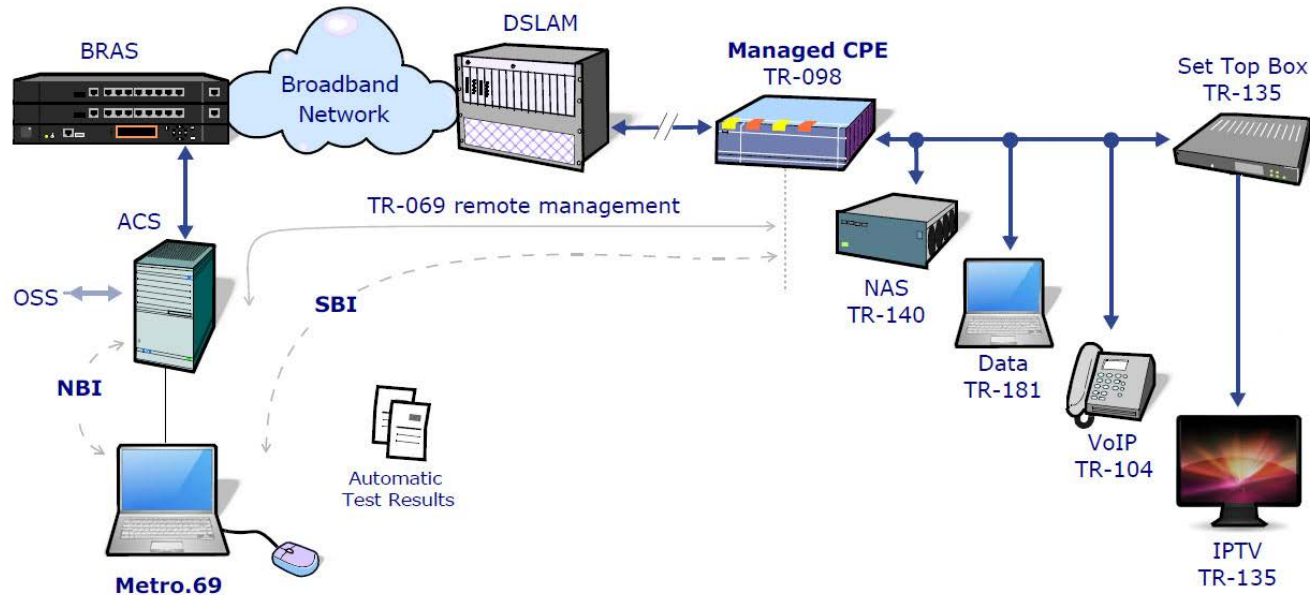
Configuration of a set of CPEs with a common criteria.

- ◆ **Software/firmware image management.** Including:

- Identification of SW/FW versions
- Download/upload of SW/FW versions
- Notification of the success or failure of the upload/download

- ◆ **Diagnostics.** The ACS can perform diagnostics (e.g. Ping, Traceroute....)

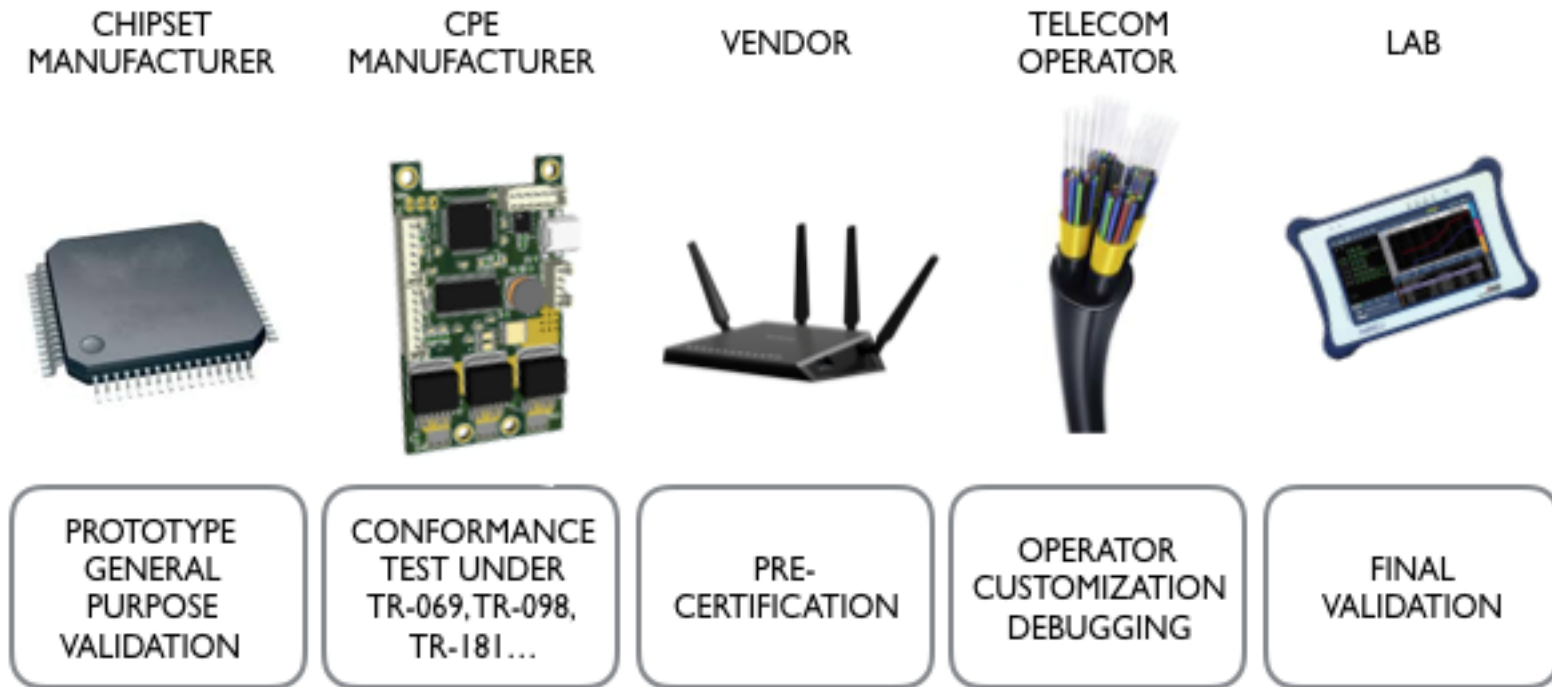
# Which are the aims of TR-069 protocol? (ii)



- ◆ **Software module management** Allows install / uninstall / update... CPEs' SW modules.
- ◆ **Status and performance monitoring** Allows CPE to publish some information that the ACS can use in order to monitor CPE state and to know throughput statistics.



# Who needs to test TR-069



- Telecom Operators: Home Devices, Homologation, Test Lab...
- CPE & chipset Vendors: R&D, Q&A, customer support, Marketing.
- CPE Manufacturers: Q&A, customization.
- Test Labs: Any external lab who works for the SP.
- ACS Vendors: Product certification, interoperability test, Q&A

# Common issues around TR-069 behavior

Wrong implementation of a mandatory RPC method

Different kind of notification (Off / Active / Passive) do not work as expected

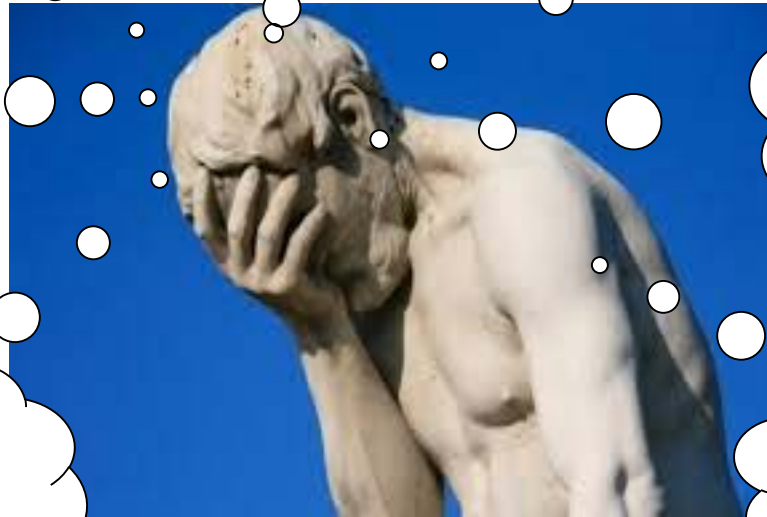
Mandatory parameters are not defined in the Data Model

Can't change values of some parameters defined as writeable

Notification of some parameters incorrectly defined

The CPE loses the connection with the ACS sometimes

Not possible to create some multi-instance objects




... and many more!



# Why TR-069 behavior **must** be tested?



- ◆ Remote CPEs management vs Sending a technician to home premises
- ◆ Each ISP has particular TR-069 needs according to their configuration.
  - Vendor specific parameters  They need to be tested
- ◆ Need to check the limitation of info provided by the CPEs through TR-069
  - such as not sending a password even if the ACS requests it-
- ◆ TR-069 error can cause serious and expensive problems

# A software Solution



- ◆ MeTro.69 is a software tool that runs in a PC
- ◆ Automates the testing of the TR-069 protocol behavior of a CPE
- ◆ Reduces testing time from 3-4 weeks to 3 days (200 test cases Test Plan)

# All included

STUN Server for testing STBs,  
Videobridges...



ftp and http server provided to  
upload and download files

Traffic generator  
analyzer



Standard or customized  
Libraries

Execution engine for  
**automatic testing**



Criteria engine for  
automatic **Pass / Fail**

Data base for results  
storage



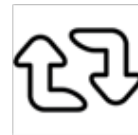
Automatic Report  
Generator

Conformance and  
Performance Tests



Functionality  
Tests

Proprietary ACS for  
conformance testing

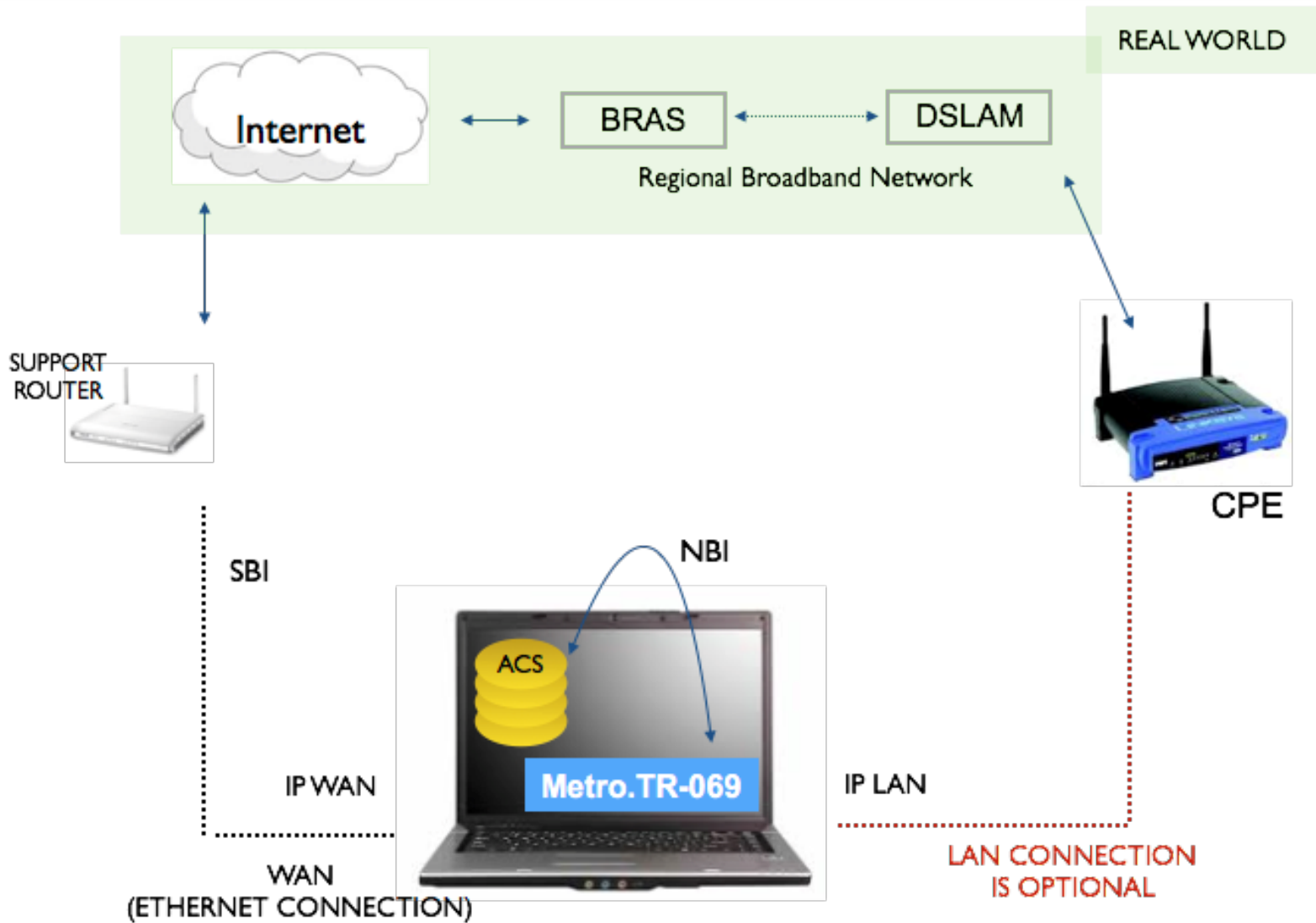


Interface with commercial ACS  
for interoperability testing

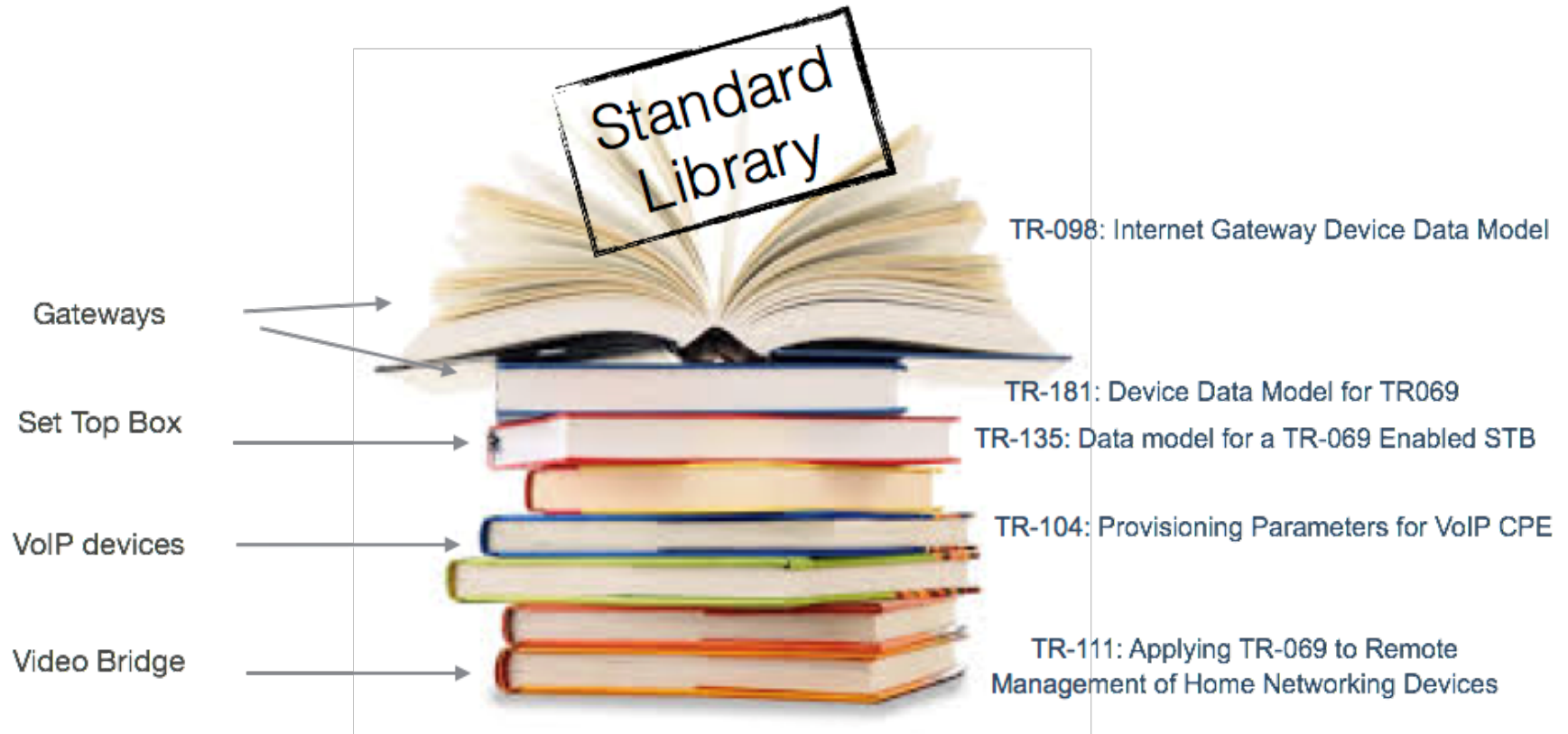


WireShark connected for  
easy debugging task.

# Testing Scenario



# Standard Libraries: all data models supported

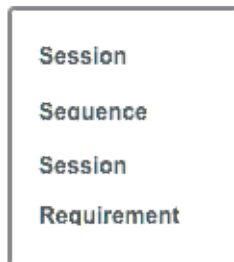


# Custom Libraries

**TEST CASES CAN BE EASILY IMPLEMENTED AND STORED IN LIBRARIES**

GENERIC TEST CASES CAN BE USED AS A REFERENCE TO CREATE SPECIFIC TEST CASES

TYPICAL  
dBm069  
TEST CASE  
STRUCTURE

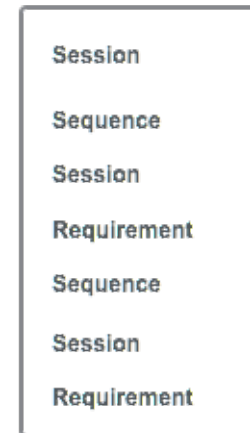


GENERIC

COPY / PASTE TO CREATE A NEW TEST CASE



CUSTOM  
dBm069  
TEST CASE



SPECIFIC

**THERE IS NO NEED OF A SW ENGINEER**



# MeTro.69: main interface

## I. Test Plan: Tests cases list

## 5.a Test Steps includes test steps as defined in the library

## 5.b Packets tab shows a summary of Wireshark capture of the test

The screenshot displays the main interface of the MeTro.69 Protocol Certifier. The interface is divided into several sections:

- Test Plan:** A table listing test cases with columns for Test Order, Reference, Group, Name, Start, End, Sta..., Message, Test..., Capture, and Notes. A red circle '1' highlights a row.
- Test Log:** A table showing execution logs with columns for time, status, and message. A red circle '2' highlights a row.
- Grid:** A structured view of test data, including a table with columns for Name and Value. A red circle '3' highlights a row.
- Test steps:** A panel showing the current test step, including a Session, Parameter, and ExecVars. A red circle '5' highlights a parameter value.
- Execution details:** A table showing the results of test steps with columns for Function..., Result, Message, Status, Expected, Date, and Remarks. A red circle '4' highlights a row.
- Events:** A table showing events during execution with columns for Type, Date and time, and Message. A red circle '6' highlights a row.

**2 & 3. Test log:** ACS logs of the test showed in a structured view.

**6. Events** shows events during execution

**4. Execution Details** shows detailed steps execution

# MeTro.69 is WireShark linked

The screenshot displays the dbm069 TR-069 Protocol Certifier application. The main window shows a Wireshark capture of network traffic. The capture is filtered to show packets from 172.16.0.10 to 80.58.61.250. The captured packets include:

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	172.16.0.10	80.58.61.250	DNS	84	Standard query 0x83cf A s1s.update.microsoft.com
2	0.000366	172.16.0.1	172.16.0.10	ICMP	112	Destination unreachable (Network unreachable)
3	0.006912	comtrend_ec:ac:ab	Broadcast	PPPoED	60	Active Discovery Initiation (PADI)
4	1.000006	172.16.0.10	80.58.61.250	DNS	84	Standard query 0x83cf A s1s.update.microsoft.com
5	1.000397	172.16.0.1	172.16.0.10	ICMP	112	Destination unreachable (Network unreachable)
6	3.000119	172.16.0.10	80.58.61.254	DNS	84	Standard query 0x83cf A s1s.update.microsoft.com
7	3.000469	172.16.0.10	80.58.61.250	DNS	84	Standard query 0x83cf A s1s.update.microsoft.com
8	3.000481	172.16.0.1	172.16.0.10	ICMP	112	Destination unreachable (Network unreachable)
9	3.000975	172.16.0.1	172.16.0.10	ICMP	112	Destination unreachable (Network unreachable)
10	3.010961	comtrend_ec:ac:ab	Broadcast	PPPoED	60	Active Discovery Initiation (PADI)

The bottom of the screenshot shows the hex and ASCII representation of the first packet (Frame 1):

```
0000 f8 8e 85 ec ac aa 38 ea a7 fb e6 a1 08 00 45 00 .....8. ....E.
0010 00 46 51 bc 00 00 80 11 00 00 ac 10 00 0a 50 3a .FQ....P:
0020 3d fa cd d7 00 35 00 32 3a 92 83 cf 01 00 00 01 =...S.2 :.....
0030 00 00 00 00 00 00 03 73 6c 73 06 75 70 64 61 74 .....5 ls.updat
0040 65 09 6d 69 63 72 6f 73 6f 66 74 03 63 6f 6d 00 e.micros oft.com.
0050 00 01 00 01 ....
```



# Executive Summary

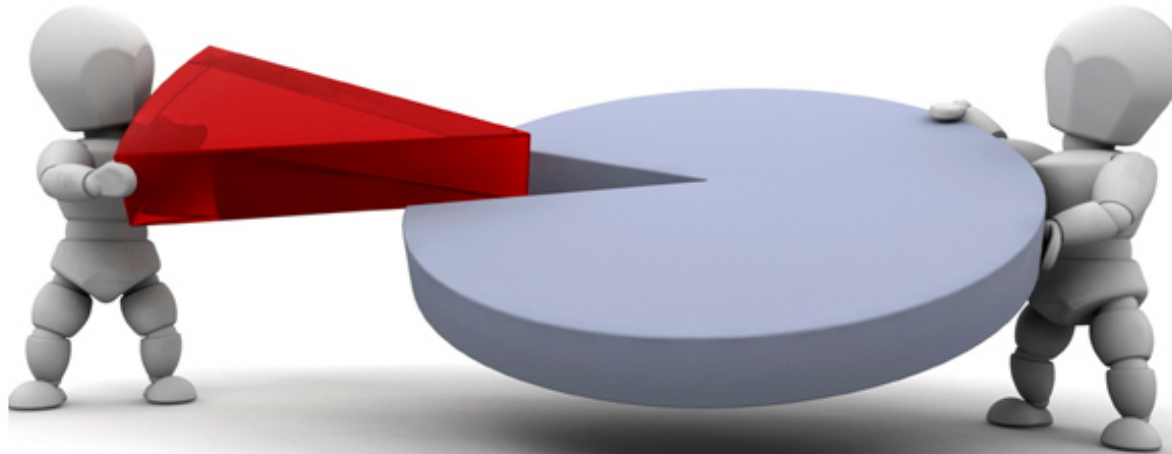
- ◆ Automatic execution of Test Cases
- ◆ Reducing dramatically TR-069 testing time (7 to 1)
- ◆ Includes its own proprietary ACS
- ◆ Includes an HTTP, FTP, and STUN server
- ◆ Includes a Traffic analyzer, and a HTML report generator
- ◆ Automatic Testing of a CPE against MeTro.69 or NOKIA ACS
- ◆ Ready to interface against any ACSs brand
- ◆ Increasing traceability and reliability of results
- ◆ Consolidating results interpretation based on the automated PASS/FAIL
- ◆ Test Cases can be customizer by user (no need to be SW engineer)
- ◆ PASS/FAIL criteria can be defined for the whole test case and subtest
- ◆ Providing debugging tools to help debugging TR-069 protocol functions
- ◆ Libraries can be shared between Service Provider and Vendor
- ◆ Saving thousands of dollars by testing a CPE on time



# TR-069 Test tools market

TR-069 Test tools *Market is a niche market*

- **ACS** manufacturers (e.g. Friendly Technologies)
- **QA CAFÉ**, CD Router
- **Albedo**, MeTro.69
- Home made tools based in iTest or similar
- Manual Tests



# ACS manufacturers



- **Internal use:** Proprietary tools to certify their ACS interoperability against CPEs.
- **External use:** To help their customers (ISPs) to perform basic tests for basic interoperability. They offer for free.

**NON-COMERCIAL TOOLS, VERY BASIC**



# QA Café CD Router vs. ALBEDO MeTro.69 (i)



Feature	QA Cafe, CD Router	Albedo, Metro.TR69
Only SW tool	Needs special proprietary HW .	YES. Runs on a PC
Operative system on which it is based	Linux	Windows
Focused to	General CPE Testing. Competes against other products like IXIA, Spirent, Candela to perform other CPE tests (connectivity, WiFi, IPV6...) that are usually more powerful than in CD Router.	Exclusively designed to test TR-069 protocol behavior in CPEs. All our efforts are focused to improve TR-069 testing with MeTro.69

# QA Café CD Router vs. ALBEDO MeTro.69 (ii)



Feature	QA Cafe, CD Router	Albedo, MeTro.69
Configuration to start testing	Can be performed editing a text file > 1000 lines (including around 700 variables) or through a configuration window.	Simple and friendly.
Test Edition user skills	TCL specialist SW engineer	No need to be a SW programmer.
INTELLI-TR-MODEL	NO	YES, by detecting <b>InternetGatewayDevice</b> or <b>Device</b> and forcing to use the right prefix, even in the case that there is another prefix in the Test Case.
CPE configuration with Scripts	Needs TCL programming	No need of TCL programming

# QA Café CD Router vs. ALBEDO MeTro.69 (iii)

## Test Plan Execution



Feature	QA Cafe, CD Router	Albedo, MeTro.69
Automatic	YES	YES
Only GUI required	NO (Linux commands required for some operations)	YES
Manual RPC method execution	Not possible	YES
Easy and friendly LAN side devices registration	NO	AUTOMATIC
Full Test Case configuration Visibility	NO	YES (via Configuration Window during Test Case execution)

That's all



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