Field trials

A critical element in “test once, use anywhere” certification for mobile devices

A white paper from the Global Certification Forum
www.globalcertificationforum.org

By complementing conformance and interoperability tests undertaken in laboratories with field trials on multiple live commercial networks, GCF Certification confirms that a mobile phone or wireless device is interoperable across different network elements and infrastructure equipment from different suppliers.

Initially on GSM and latterly on 3G, for more than a decade, the Global Certification Forum has underpinned international roaming. The benefits of GCF Certification are currently being extended to LTE.

This white paper examines the important role played by field trials in GCF Certification.

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Introduction

Mobile phones and wireless devices are becoming ever more sophisticated. It is now commonplace for a device to incorporate multiple radio technologies – GSM, 3G, HSPA and WiFi. LTE is the latest technology to be added to the mix. Functionality and capabilities are increasingly diverse: text, multimedia, email and web browsing are fast becoming as ubiquitous as voice.

Mobile operators want to be sure that any new device works well on their own networks and those of their roaming partners. As technologies and functions multiply, the complexity and cost of conformance and interoperability testing increases exponentially.

It is neither practical nor economic to test each and every detail of such complex devices. GCF's scheme has been designed, and is maintained, to maximise test coverage while managing the overheads associated with testing. The result is that GCF Certification provides an assurance that customers' expectations with regard to interoperability of services will be fulfilled.

GCF delivers:

- A pragmatic and relevant testing regime - based on tests defined by standards organisations - that is agreed collectively by the industry to meet market needs
- Global best practice to ensure consistency of testing
- A clear distinction between core device capabilities and operator-specific features to define a boundary between the testing responsibilities of manufacturers and operators
- Opportunities to reduce overheads for interoperability, conformance and functionality testing for manufacturers and operators
- Faster mass-market adoption of new technologies.

GCF enables certification of mobile devices of all types: from handsets, PDAs and smartphones to wireless broadband USB dongles, data cards and

embedded modules for use in laptop and netbook PCs, consumer electronic devices or machine-to-machine (M2M) applications.

By drawing together leading players from across the mobile industry, GCF maintains an independent and industry-accepted certification scheme for mobile devices that are based on 3GPP radio bearer technologies.

The transparency, rigour and integrity of the certification processes contribute to the credibility and global recognition of GCF Certification. As of December 2010 nearly 50 mobile device manufacturers and more than 100 operators - including the large operator groups from every region of the world - were members of this voluntary scheme.

Alongside Operator and Manufacturer Members, Observer Members also make an important contribution to GCF. Observer membership is open to any company that has a genuine interest in 3GPP mobile devices: test equipment manufacturers and test laboratories, component suppliers, software and application developers. The committed involvement of the test community ensures the required test systems and facilities become available in a timely manner. Around 70 companies participate in GCF as Observer Members.

This very active GCF partnership works closely with Standards Organisations such as 3GPP, ETSI and OMA and is reliant on the test specifications these organisations define. GCF also co-operates with relevant industry associations such as GSMA, the NGMN Alliance and IMTC.

GCF Certification – an overview

GCF Certification encompasses two distinct processes:

- Scheme definition and maintenance
- Implementation

The scheme – which combines laboratory and field testing – is defined and maintained by GCF members collectively.

Lab-based testing

Certification criteria to be assessed through laboratory testing are identified by GCF's Conformance and Interoperability Group (CAG).

As organisations such as 3GPP and OMA define and specify new technologies, they also develop a multitude of test cases which may be used for demonstrating compliance with the new specifications.

For Certification purposes, CAG identifies a subset of the available tests to ensure that Certification incorporates the optimum combination of rigour and pragmatism. The test industry develops appropriate test platforms and tools and implements the agreed conformance test cases.

Working with independent test houses, GCF *validates* the conformance test cases against two independently developed reference terminals. This process ensures the selected test cases will correctly test the end-user device.

CAG also selects the interoperability testing criteria to be included in Certification.

Field Trials

Field trials are a unique feature of GCF Certification, complementing laboratory testing with real-world testing of mobile devices across multiple commercial networks and evaluating the interaction of the device with a variety of network infrastructures, SIM cards and other devices.

GCF's Field Trial Agreement Group (FTAG) is responsible for defining the field trial criteria to be included within Certification. FTAG draws on the collective experience of operators that has been collated into the comprehensive field trial guidelines[1] maintained by the GSMA Devices Group.

[1] GSMA Device Field- and Lab Trial Guidelines can be found at http://gsmworld.com/newsroom/document-library/technical_documents.htm
Current version at time of this publication:
http://www.gsmworld.com/documents/DG11_8_0.DOC

FTAG selects and prioritises field trial requirements that are capable of providing a high level of understanding into a device's real-world operation while ensuring that the process doesn't become unwieldy.

In addition, FTAG also seeks to prove a device's interoperability with the various network architecture implementations that now exist. In doing so, field trials often provide valuable insight into differences in the interpretation of standards between different vendors – whether of network systems or devices.

Implementation

The agreed certification scheme is implemented by GCF's Manufacturer Members. When all conformance, interoperability and field test certification criteria relevant to a new device have been met, and detailed corroborative evidence has been uploaded to GCF's members' portal, the device may be declared 'certified'.

As a complement to certification, GCF has also recently introduced 'performance criteria' which give manufacturers the option of declaring device attributes such as battery life or acoustic performance in a standardised way.

Examples of Certification Criteria

An understanding of the principles that underpin GCF field trials can be gained by looking at some certification criteria examples.

- GSM mobile devices supporting more than one frequency band need to be field trialled in each supported frequency range. At least one dual-band network configuration - such as GSM 900/1800 – should normally be included.
- Mobile devices incorporating more than one 3G frequency band have to be field trialled in each supported frequency range. At least one dual-band 3G network configuration - such as WCDMA 900/2100 - should be included.

- 3G devices that also support 2G have to be regression tested against a GSM infrastructure combination. Ideally, this should be a dual-band network.
- Effective end-to-end testing needs to monitor a device's ability to establish and maintain communication across key interfaces within mobile networks. GCF requires that testing across the base station / mobile exchange interface in GSM networks and across a 3G RAN / Core network interface is undertaken on five different infrastructure combinations.
- SMS tests are required to involve SMSCs from at least three suppliers.
- Comprehensive field trial regimes for GPRS, HSDPA and HSUPA devices reflect the rapid and global growth in the importance of packet data services. GPRS and HSPA devices need to be field trialled against five relevant infrastructure combinations.
- End-to-end testing has also been developed to test the interaction between the device and its smart-card to a high degree of confidence. Specific tests have been defined for both the SIM used in GSM and the SIM application in a 3G UICC. Depending on the radio characteristics of a device, this testing has to be undertaken with five different SIMs and/or UICCs from four different operators. 3G devices also have to be tested for the situation where they are used with a 2G SIM.
- Trialling naturally covers the making of a variety of voice, emergency and video telephony calls as well as the operation of supplementary services such as call diverts. By assessing these high-level services, lower layer signalling and radio access is implicitly tested.

Field Trial Qualified Operators

GCF Operator Members who wish to offer their networks for field trials are required to demonstrate that they actively embrace quality management practices in order to become 'Field Trial Qualified'[2].

[2] http://www.globalcertificationforum.org/WebSite/public/FTQO_list.aspx

A Field Trial Qualified Operator (FTQO) is required to deal with any Manufacturer Member – or test house commissioned by a manufacturer to manage field trials - on a non-discriminatory basis.

The Field Trial Officer appointed by an FTQO acts as a central point of contact and helps manufacturers run field trials efficiently by providing information on the network, its infrastructure and smart card configurations, the service features supported and the geographical location of different examples of infrastructure needed for field trials. In addition, the Field Trial Officer is responsible for providing the manufacturer with network access.

Benefits of GCF's field trials

Over ten years, GCF's comprehensive field trial scheme has delivered real benefits to operators and manufacturers.

It assures an operator that they can have a high degree of confidence in the overall performance of a new device offered by a manufacturer. This enables operators to focus their own assessment of new products on aspects such as customisability - that allow them to differentiate their device portfolio within their markets - rather than having to dedicate resources to checking basic operation and functionality.

Once a device has successfully passed field trials and achieved certification, its manufacturer can confidently offer it to a wide audience of operators and so realise greater economies of scale and accelerate its time to market.

Field trials also promote closer co-operation between a manufacturer and a number of operators on whose networks they are testing. Both manufacturers and FTQOs can benefit from access to valuable test logs. For the manufacturer, these can be fed back into the product development cycle.

For each certified device, GCF Operator Members gain access to details of the equipment deployed in the radio access and core of the networks used for the field trials.

Extending GCF Certification to LTE mobile devices

Long Term Evolution (LTE), the next step in the ongoing evolution of mobile phones and services, is designed to deliver further bandwidth and performance improvements compared with existing 2G and 3G technologies. LTE is attracting interest around the world from mobile operators with GSM, CDMA and 3G legacy networks.

A global certification scheme incorporating conformance, interoperability and field testing is a key milestone along the road to mass market LTE. The foundations for an effective certification scheme are:

- Stable core specifications
- Readiness of test specifications from the relevant standards organisations
- Availability of mature LTE reference terminals for test case validation
- Effective prioritization of LTE test cases for conformance testing and field trials
- Investment from the test industry in test platforms

Requirements for field trials have been prioritised into two phases by FTAG. Phase 1 requirements include new field test scenarios consistent with the functionality anticipated in the early commercial LTE devices.

Since early 2008, GCF's role[3] has been to focus the efforts of operators, manufacturers, standards organisations and the test industry to bring the necessary building blocks for LTE certification together in a timely fashion. LTE device certification was activated for the 700 MHz and 800 MHz frequency bands in December 2010. The scheme will be extended to other LTE bands during the first half of 2011. In delivering LTE certification, GCF will continue to underpin global interoperability in the next generation of mobile devices.

[3] Updates on LTE Certification can be found at http://www.globalcertificationforum.org/WebSite/public/news_events.aspx

About the Global Certification Forum
GCF is an active partnership between network operators, device manufacturers and the test industry. In the decade since its inception in 1999, GCF has created an independent certification programme to help ensure global interoperability between mobile devices and networks. By providing the focal point for the world's most experienced practitioners in conformance testing, field trials and certification, GCF maintains the benchmark for best practice in the certification of mobile phones and the ever-expanding range of devices that incorporate wireless broadband connectivity.

For more information, visit **www.globalcertificationforum.org**