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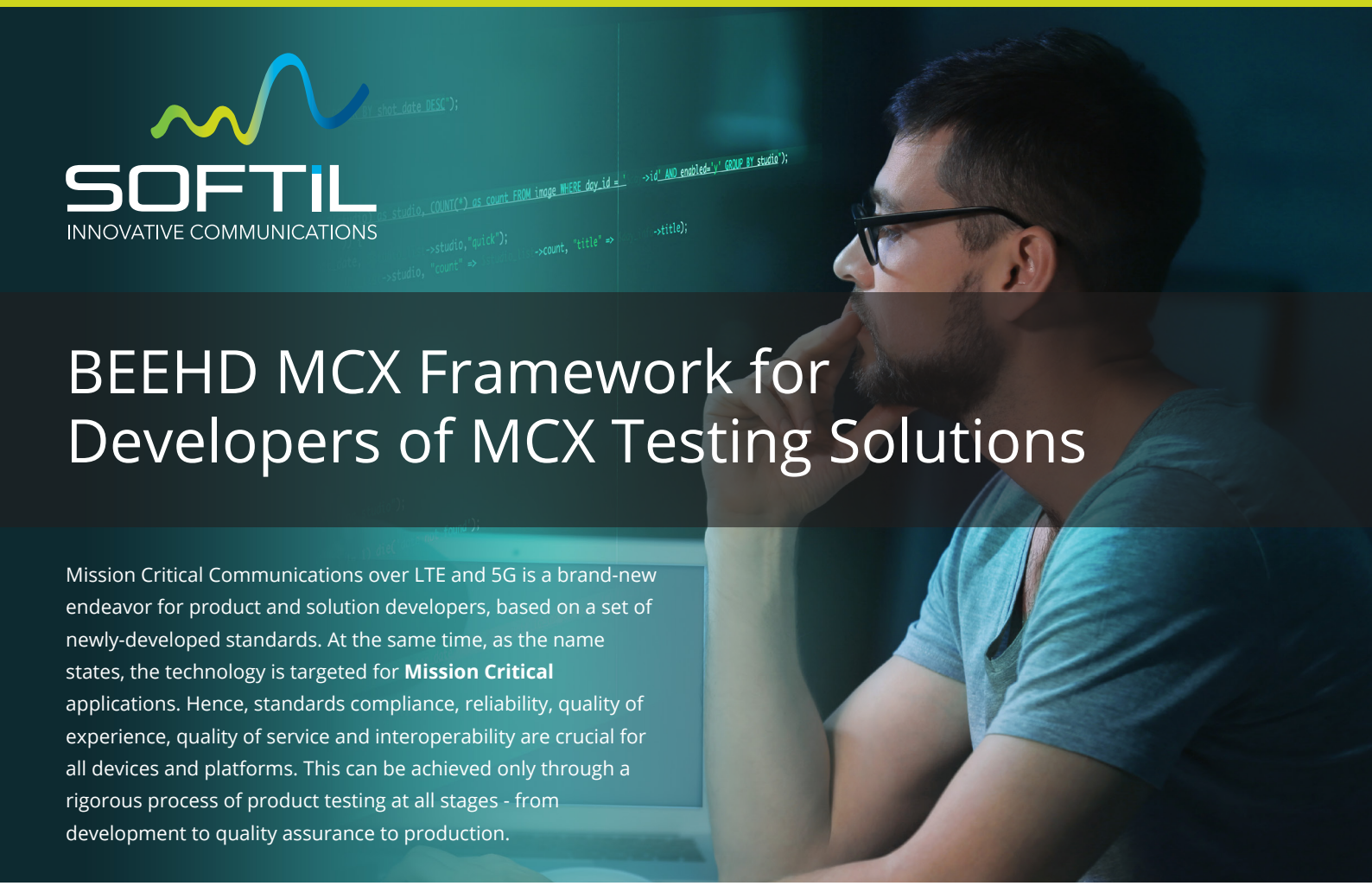


BEEHD MCX Framework for Developers of MCX Testing Solutions

Mission Critical Communications over LTE and 5G is a brand-new endeavor for product and solution developers, based on a set of newly-developed standards. At the same time, as the name states, the technology is targeted for **Mission Critical** applications. Hence, standards compliance, reliability, quality of experience, quality of service and interoperability are crucial for all devices and platforms. This can be achieved only through a rigorous process of product testing at all stages - from development to quality assurance to production.

Testing: Early and Often

When developing a solution, it is recommended to start testing as early as possible and to test as often as possible. The earlier issues are found, the easier it is to fix them.

Some examples of MCX testing include:

- Device Testing: Used to test and verify implementation of individual features of the device before they are brought into the service according to the system requirements for a given deployment, such as KPIs, ad-hoc group calls, chat groups versus pre-established groups, private call, or floor control request.
- System Testing: Used to test and verify the complete system functionality of the solution/service. This can include complex functional scenarios (interworking, migration and interconnection), KPI/performance testing, load testing, reliability, media quality of service, and more.
- Interoperability Testing: Focused on ensuring that the system under test is interoperable with various standards-based implementations, typically based on the specific testing plan. It is particularly important when multiple MCX systems or networks are involved.
- Automated Testing: Typically conducted as part of the release routine. Daily builds of the system under test (SUT) can be verified through regression testing. Also often used in post-deployment scenarios to verify continuous operation of the installed SUT. Automated testing is usually orchestrated using testing scripts, so the ability to control testing elements remotely, let's say, using RESTful APIs, is important.
- Field Testing: Testing is done at the location of the user. Used to verify or map service coverage and quality in the given geographic area. To implement field testing solutions, both manual and automated testing approaches are possible. In case of automated field tests, let's say, to asses quality of the coverage, orchestration capabilities are required. Once again, RESTful APIs offer a great advantage here, enabling full automation of the test execution.

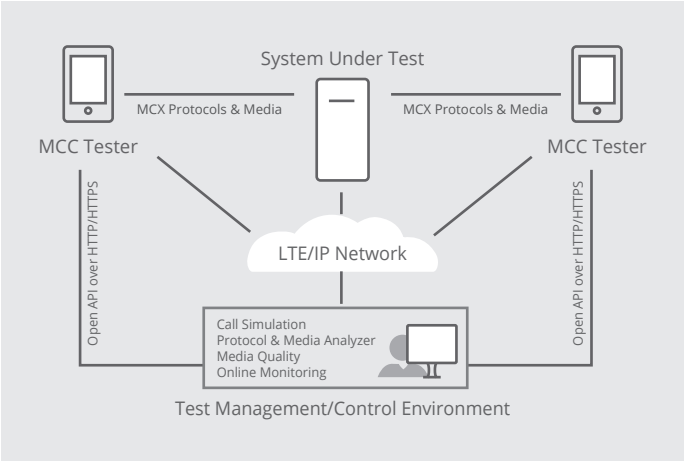
Softil BEEHD MCX SDK is a Foundation for Developing MCX Testing Solutions

Softil's BEEHD is the most advanced Mission Critical Communication SDK, supporting 3GPP Release 18 functionality across most mandatory services. The BEEHD MCX SDK can be used to implement testing solutions for testing and interoperability testing, allowing different mechanisms to be exercised individually. It can be used to develop solutions for system testing and test automation, as well as field testing solutions.

BEEHD MCX Framework for Developers of MCX Testing Solutions

Feature Testing and Interoperability Testing

Softil BEEHD MCX SDK offers an extensive set of MCX capabilities that enable developers of MCX testing solutions to exercise individual functions of a typical MCX client application, such as MCX client registration, joining a predefined group, requesting floor, releasing floor, changing the type of MCX call from immediate peril to emergency, and more. This enables testing solutions to conduct testing of MCX and interoperability testing scenarios of any complexity.



Open APIs

The Softil BEEHD MCX SDK offers RESTful Open APIs, a Web interface enabling the creation of a wide range of applications and automatic testing solutions that can remotely control any connected device running the instance of BEEHD MCX SDK (shown in the diagram as MCC Tester) through HTTP/HTTPS. The Open APIs includes support for standard functionality, such as Call-Dial, Call-Answer, Call-Reject, Identity-Register and more, as well as support for MC-specific functions, such as Start-MC-Session, Stop-MC-Session, MBCP-Send-Connect and other functions. Parameters can be set remotely for all Open API functions, allowing extensive flexibility of remote client deployment in a multitude of scenarios and environments.

Test Automation

Testing is one of the most tedious tasks that must be consistently performed when delivering a solution. A typical testing plan includes many repetitive tasks, making it perfectly suitable for test automation – using a control language, such as TCL or Python, or a system, such as Spirent iTest to perform repetitive tests according to predefined scenarios and without human intervention.

System Testing and Field Testing

Softil BEEHD MCX SDK offers an excellent platform for developers of MCX testing solutions. Depending on the type of testing solution, developers have the flexibility to decide on direct APIs versus Open APIs, or even use both if needed. The breadth of MCX functionality supported by BEEHD enables developers to create best-of-breed testing tools for feature testing, system testing, field testing, and all other types of MCX testing.

Product Specifications			
Supported Standards	■ TS 22.179, TS 22.280, TS 22.281, TS 22.282, TS 23.179, TS 23.280, TS 23.379, TS 23.281, TS 23.282, TS 24.379, TS 24.381, TS 24.382, TS 24.383, TS 24.384, TS 24.481, TS 24.482, TS 24.483, TS 24.484, TS 24.581, TS 24.582, TS 26.179, TS 26.281, TS 33.179		
Mission Critical	■ MCVideo ■ MCData	■ MCPTT ■ One-to-many Audio and Video	■ FRMCS
MC Management Interfaces	■ CSC-1 - IdMC - Identity Management Client ■ CSC-2 - GMC - Group Management Client	■ CSC-4 - CMC - Configuration Management Client ■ CSC-8 - KMC - Key Management Client	
Signaling Protocols	■ IMS/VoLTE/ViLTE SIP	■ HTTP/HTTPS	■ MBCP Floor Control
Test Specs	■ ETSI TS 103 564		
Test Management	■ Open APIs	■ MCC Test Scripts	
Security	■ AES-128 and AES-256 ■ TLS	■ IPsec ■ SRTP	■ Mikey-Sakke ■ IKE
Voice and Video Call Types and Services	■ Group Call (ad-hoc, pre-established) ■ Emergency Call ■ Immediate Peril Call	■ Push to Talk, Push to Video ■ Private Call ■ Ambient Viewing	■ 1-to-1, 1-to-Many ■ Group Chat ■ Hold, Mute, Transfer, Forward
Audio/Video	■ AMR WB, AMR NB, EVS	■ G.711, G.722, G.722.1, G.729	■ H.264 AVC, H.264 High Profile

For more information, contact Softil at info@softil.com

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