ETSI

World Class Standards

Solve the Challenge of Interoperability!

CTI

Centre for Testing and Interoperability

Supporting ICT Standardization

www.etsi.org

www.plugtests.org

Market Drivers for Interoperability

In a world of converging yet diverse technologies, complex ICT systems must communicate and interwork on all levels – this is interoperability. One of the key motives for the development of ICT standards is to facilitate interoperability between products in a multi-vendor, multi-network and multi-service environment. Standards need to be designed and tested to ensure that products and services complying with them do indeed achieve interoperability.

Interoperability ensures that users have a much greater choice of products and that manufacturers benefit from the economies of scale that a wider market brings. Testing and interoperability are therefore crucial factors in the success of modern technologies, and it is market demand that has ensured that interoperability has maintained its prominent position in standardization.

The Challenge

The trend towards a globally interconnected world, demonstrated by the potentially huge growth in the Internet of Things (IoT) and Machine-to-Machine Communication (M2M), brings its own challenges for standardization and interoperability. No longer may a single standards body be responsible for an entire technology. Complex products and systems are often based on multiple standards from, for example, ETSI, the IETF, the IEEE or the ITU-T, as well as on requirements published by industrial fora. Furthermore, interoperability problems may be compounded by the fact that standards are being used in contexts that the original specifiers did not foresee.

Good technical quality is essential in any standard. Ambiguities, errors, unclear requirements, conflicting options and other factors that could lead to non-interoperability must be reduced to a minimum.

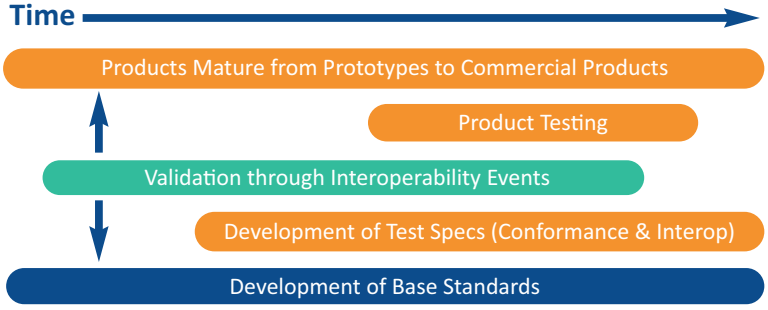
The Solution

Within ETSI, it is the task of the Centre for Testing and Interoperability – CTI – to support the Institute's Technical Committees in the use of best practices for the specification and validation of base standards and the development of test specifications for key ETSI technologies. In doing this, the CTI has become a world leader in the use of specification languages, the application of validation, analysis and simulation techniques and in interoperability testing.

The CTI promotes best practices which encompass techniques which are pragmatic (including the validation of standards through interoperability events) as well as technically advanced (for example, using languages such as TTCN-3 to define test scenarios). These techniques have the added benefit of being applicable well beyond the world of standardization. Good practice incorporated into standardization can be carried through to proprietary development processes.

Experience proves that the application of these best practices does indeed help to develop interoperable standards which, in turn, lead to interoperable products.

Relationship between Standards, Validation & Testing



Determining the Ability of Products to Interoperate

Testing is an important part of providing a guarantee of interoperability. There are two different types of test activity:

1 **Conformance testing** involves connecting a device to a test system and operating a set of stringently defined tests. This ensures that a (single) product correctly implements the requirements laid down in a standard.

2. **Interoperability testing** involves connecting devices from different vendors and operating them in a variety of real-life scenarios. Often this will be done at so called interoperability events (or Plugtests™). For ETSI, the feedback from such events is extremely valuable in helping to validate the standards themselves. In addition there are obvious benefits gained by product developers from this type of testing.

Conformance testing and interoperability testing are complimentary to each other. Each has its strengths and weaknesses but together they can provide the best assurance that products will interoperate.

One method, currently gaining in popularity, is to combine interoperability testing with conformance checking. While this should not be regarded as an adequate replacement for comprehensive conformance testing, it does add a further level of confidence to the interoperability testing.

Standardization and Interoperability – the ETSI Approach

Standardization and interoperability are closely interrelated in ETSI's activities. Typically, products and standards evolve in parallel, with development feedback in both directions. The relationships between the various activities which constitute the development of a standard (or set of standards) are quite straightforward although there are some significant overlaps in both content and time. The activities involved in validating a standard and specifying appropriate test specifications should be interleaved with the development of the standard itself. All of these stages in the development of a technology take place within ETSI but the actual testing of a product is outside of ETSI's responsibilities.

Ever since its foundation in 1988, ETSI has been a pioneer among the standardization bodies in recognizing the importance of achieving interoperability through testing. Many key ETSI technologies have an accompanying set of standardized test specifications that can be used in a variety of contexts ranging from in-house product development to industrial certification schemes.

ETSI White Papers on Interoperability and Testing
Available to download free from:
www.etsi.org/WebSite/AboutETSI/HowWeWork/Testingandinteroperability.aspx

- "Achieving Interoperability – The ETSI Approach"
- "Experiences of Using TTCN-3 for Automated Interoperability Testing"

The ETSI Centre for Testing and Interoperability – CTI

ETSI's Centre for Testing and Interoperability (CTI) provides hands-on expertise and support to the Institute's Technical Committees and the Third Generation Partnership Project (3GPP™).

The CTI's principal task is the planning and development of conformance and interoperability test specifications. While of direct use to ETSI Members, many of these specifications are also used in external certification schemes such as those of the Global Certification Forum (GCF) and the DECT™ Forum.

In order to ensure the quality of the tests, they are validated either in-house in collaboration with commercial test laboratories and recognized test tool suppliers, or among ETSI Members.

The CTI also organizes and runs ETSI Plugtests, and specializes in the organization of interoperability events for any ICT standard or set of standards. Since the late 1990s, ETSI has organized an average of 12 such events every year, worldwide.

The CTI provides support for:

- Standards validation (focusing on Plugtests interoperability events)
- Planning and defining validation and testing strategies
- The development of test specifications (conformance and interoperability)
- The application of protocol specification techniques
- The application of best practices in interoperability and testing
- The application of best practices in protocol specification
- The advancement of methodologies and best practices, including TTCN-3

The CTI works on behalf and at the request of ETSI's Technical Committees. This applies equally to traditional technologies as well as exciting new areas of standardization. The CTI meets this challenge by keeping up with the latest testing methodologies (such as Model-Based Testing) as well as technical developments and their special needs for testing.

Typical areas covered include:

Broadcasting

Cloud and Grid

eBusiness

eHealth

Electronic Signatures

Energy Efficiency

Fixed and Mobile Communications

Intelligent Transport Systems

Internet of Things

M2M

Networking and Broadband

Security

Speech Quality

U(SIM) cards

Supporting Public Policy

The CTI plays a significant role in supporting ETSI Members by promoting and leading the production of conformance test specifications and by organizing interoperability events in response to EU mandates and other public policies (especially the EC ICT Standardization Work Programme).

These events and ETSI's high quality test specifications are accepted at the international level and thus benefit individual users, industry and the public sector worldwide.

Many interoperability events and test specifications activities are supported by the European Commission.

Interoperability events

The use of interoperability events, so called Plugtests™, is a well-proven and cost-effective approach to achieve interoperable standards – and subsequently interoperable products.

Plugtests are highly technical events where engineers from different companies get together on neutral ground to test their products and their implementations (both early prototypes and market-ready products) in a large variety of real-life testing scenarios. The events test the products' ability to interoperate with others while also providing a non-rigorous assessment of their level of conformance to the standards.

Plugtests cover a wide range of technologies, including telecommunications, Internet, broadcasting, multimedia, security, services and applications.

Plugtests may involve just a few or many hundreds of participants. Participants do not have to be ETSI Members. Events are open to different types of companies (large or small) and engineers: operators, vendors, equipment manufacturers, content providers and application providers – basically any company developing a product, as well as standardization bodies, fora and interest groups. Research organizations are also welcome.

The Benefits of Plugtests

Plugtests accelerate the standardization process. They validate ETSI standards and help improve their quality. Plugtests complement ETSI's support to other testing activities (such as the development of conformance testing standards). The results of these events also provide valuable feedback to other international organizations and fora.

For the participants the payback is considerable. Plugtests reduce time to market – the testing improves both the quality and features of implementations and enables speedy product debugging. The events also provide a unique opportunity to meet partners and competitors and to demonstrate end-to-end interoperability to operators or other customers. In this way both the technology and its community is promoted.

Organizing Plugtests

The Plugtests team provides a professional, fully customizable service with complete organizational and logistical back-up and continuous technical support including:

- **Event management**
  - Dedicated Event Supervisor
  - Event communication and promotion
  - Event website, event Wiki, online registration and payment
  - Local and logistical arrangement (hosting site, hotel, catering, shipment etc)
  - Legal aspects (MoUs, NDA, rules of engagement)
  - Press publicity
  - Participant care

- **Technical management**
  - Dedicated Technical Supervisor
  - A customized test-bed, as required
  - Test specifications (scenarios)
  - Test session scheduling and supervision
  - Test infrastructure design, installation and teardown
  - Final test report
  - Collecting feedback from the Plugtests event for the standards process
  - IT support

Interoperability events

Different forms of event

Plugtests can take place at a single venue or at several interconnected locations. Fully remote events can also be organized. Depending on the needs of participants, they may take place in hotels or partner test labs all around the world, as well as at ETSI. Some events may involve long term testbed activities.

Plugtests can take various different forms, depending on the scope of the event.

Standards Validation events, where test scenarios derived from a base standard are executed and potential problems are fed back into the relevant Technical Committee.

Technology Evaluation events, where the goal is to gain an understanding of the maturity of a technology and where alternative technical solutions may be investigated with a view to potential standardization.

Co-existence events, where the focus is on questions such as 'Can two technologies co-exist without interfering with each other?'.

Workshops or Interoperability Demonstrations, to promote standards and the technology and its community.

Examples of interoperability events

Machine-to-Machine Events

M2M is a rapidly growing area. Such ubiquitous technology demands interoperability and ETSI's M2M Technical Committee (TC M2M) is playing a key role in defining standards to ensure this. The first in a planned series of M2M Plugtests demonstrated the interoperability of products based on ETSI's M2M standards, covering architectural components including M2M devices, gateways with associated interfaces, applications, access technologies and M2M service capabilities.

The interoperability scenarios executed during the event covered a cross section of application domains such as Smart Energy, Environmental Sensing, eHealth, Intelligent Transport Systems, Ambient Assisted Living, Robotics, Home Automation, Medical Appliances, Advanced Smart Metering, Entertainment and Safety.

Interoperability events

Co-operative Mobility Services Plugtests

Intelligent Transport Systems (ITS) must be interoperable. This was the message delivered by members of the ITS community gathered for a special Interoperability Week which incorporated an ETSI Plugtests event and workshop. ETSI and the European Road Transport Telematics Implementation Co-ordination Organization (ERTICO) jointly organized this first ITS Co-operative Mobility Systems Plugtests event to verify the interoperability of ETSI standards-based ITS systems. Supported by the European Commission research projects, DRIVE C2X and eCoMove, and hosted by the Netherlands Organization for Applied Scientific Research (TNO) and the Dutch Integrated Testsite, Co-operative Mobility (DITCM), this Plugtests event brought together 14 ITS vendors to test the interoperability of their solutions in face-to-face configurations. More such events are planned in the future.

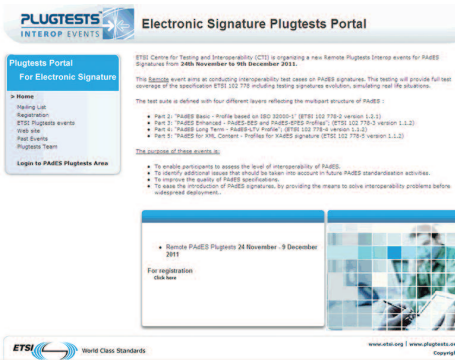
Air Traffic Management VoIP Events

Air Traffic Management (ATM) systems are key to the implementation of the Single European Sky. In co-operation with the European Organization for Civil Aviation Equipment (EUROCAE), ETSI's Aeronautics Technical Committee (TC AERO) has organized a series of Plugtests to test a wide range of Air Traffic Services (ATS) features specified by EUROCAE ED 137 and EUROCAE ED 136. The aim has been to ensure that the relevant requirements have been correctly implemented by the suppliers and interwork with systems from other suppliers over a Local Area Network.

These events have ensured better interoperability by enabling the identification of areas for improvement, by detecting errors and ambiguities within the current standards at the earliest stage, and finally by speeding up the process of providing ATM VoIP products to the market as a contribution to the implementation of the future European ATM system defined in the framework of Single European Sky ATM Research (SESAR).

Electronic Signature Events

Interoperability is of great benefit to the creators of electronic signatures (such as toolmakers) and service providers (such as Certification Authorities). The CTI has developed an Electronic Signature Portal that facilitates the fully remote interoperability testing of Advanced Electronic Signatures for XML, CMS and PDF documents (XAdES, CAdES, PAdES). In co-operation with ETSI's Electronic Signatures and Infrastructures Technical Committee (TC ESI), numerous remote Plugtests events have been held, usually lasting several weeks at a time, with participants connecting as and when required. The facility also provides tools for conformance checking and interoperability.



Interoperability events

UMTS Femtocell Plugfests

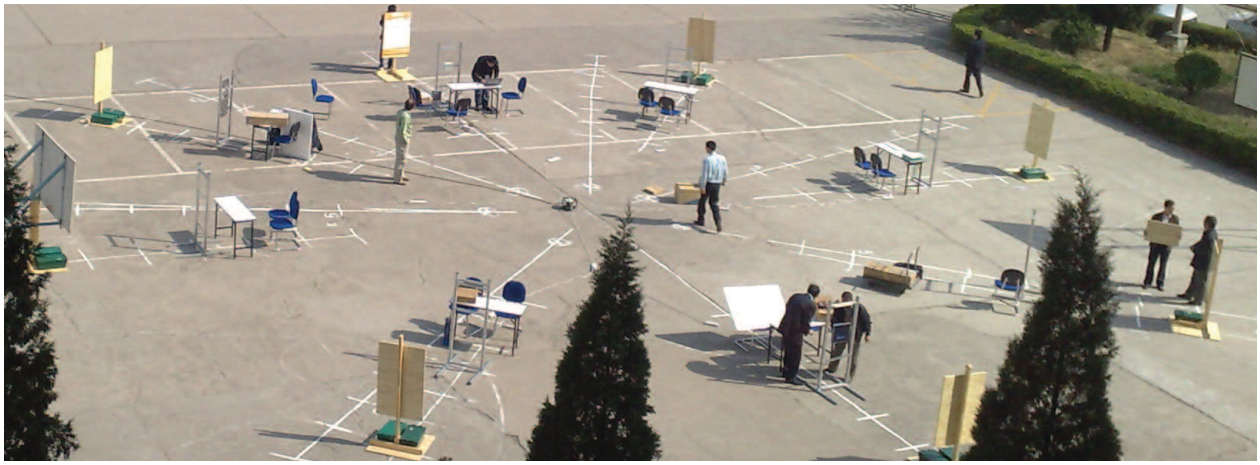
3GPP femtocell standards are already being deployed. To ensure interoperability, a series of femtocell Plugtests has been carried out to successively test various aspects of femtocell systems. The feedback from these events has improved the role of femtocells in seamless roaming between the mobile and fixed environment both at home and in the workplace.

These Plugtests have been co-organized by ETSI and the Femto Forum and hosted by Orange in France. Interoperability testing of femtocell technology can cut across several domains, including broadband access (as a high speed wireless home access technology), applications (as a convergence technology supporting home network applications and services) and Next Generation Networks (as a radio network technology with its close relationship with LTE™).

The test plans included the interoperability of femtocell Home NodeB (HNB) and Home NodeB Gateways (HNBGW) equipment from all key vendors to verify the 3GPP's Iuh interface. All femtocell equipment was connected to Orange's Integration Network which enabled the tests to be carried out at a system integration level.

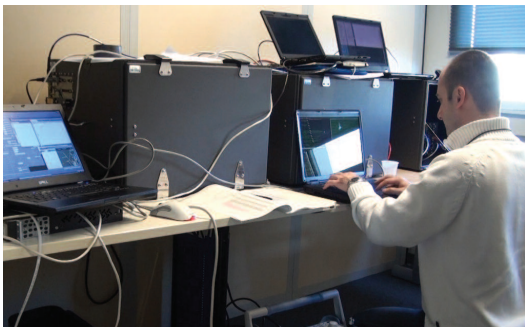
Radio Frequency Identification (RFID) Events

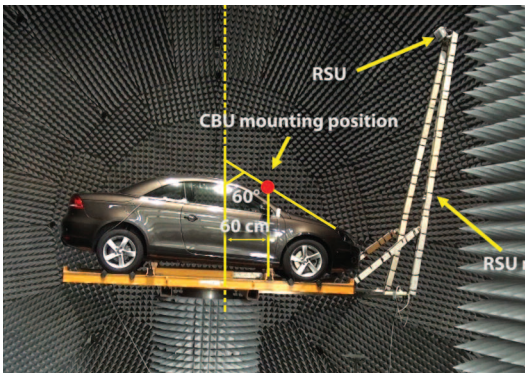
RFID is frequently used on products that move worldwide. It is therefore essential that equipment manufactured by different RFID vendors is interoperable. ETSI has organized a number of Plugtests for different RFID applications, such as conveyor belts or dock door portals. The most recent RFID Plugtest focused on the postal sector and in particular China Post applications. The event was co-organized with ETSI's Electromagnetic and Radio Spectrum Matters Technical Committee (TC ERM) and the China Electronic Standardization Institute (CESI), and was hosted at the China Postal Scientific Research and Planning Academy (CPST) in Beijing. Half a day of testing was devoted to assessing the ETSI four-channel plan. The report of the event and the results are publicly available in an ETSI Special Report (SR 002 787).



Further details of these events are available on the ETSI website:
www.etsi.org/WebSite/OurServices/Plugtests/History.aspx.

They came and said:





"The excellent testing environment provided by ETSI Plugtests allowed the 140 participants to focus on rigorous testing of the core protocols and the important ways SIP is used in deployed networks."

"Interoperability based on standards [is] a critical objective. ETSI Plugtests contribute to global interoperability of eBusiness systems, and we support their efforts."

"[There is] Nowhere else you can find an opportunity to test interoperability with so many vendors under one roof."

"This is a well planned /organized event; test cases are well written and acceptance criteria were clearly defined. Certainly a hugely successful event and I gained a great understanding of the maturity of products and the standards."

"The best place to go before you launch your product."

The CTI supports the activities of 3GPP and the following ETSI Technical Committees:

AERO

ATTM

BRAN

CLOUD

DECT

eHEALTH

ERM

ESI

HF

INT

ITS

LI

M2M

MTS

PLT

SCP

STQ

TETRA

TISPAN …

For further information please contact:
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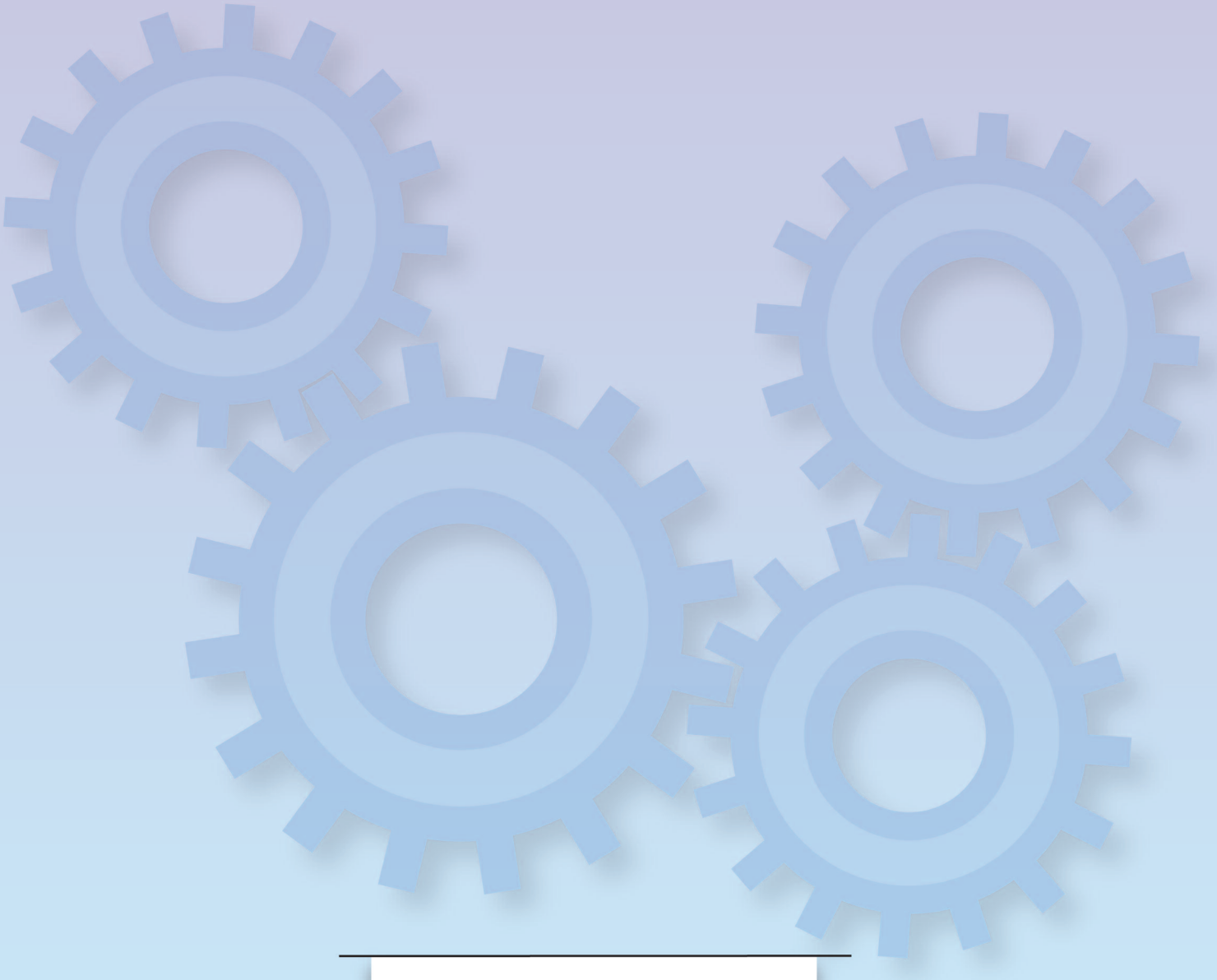
www.etsi.org/plugtests

About ETSI

ETSI produces globally applicable standards for ICT, including fixed, mobile, radio, converged, aeronautical, broadcast and Internet technologies. The Institute is officially recognized by the European Union as a European Standards Organization. It is an independent, not-for-profit association with more than 700 member companies and organizations, drawn from over 60 countries across five continents. The Members determine the work programme themselves and participate directly in the work.



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