The GSMA’s SIP Trials

A guide to the GSMA’s SIP Trials focusing on practical interworking of IMS using SIP over the evolved GRX

February 2007

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1 Introduction

Convergence of the communications and computing worlds

The communications and computing worlds are converging. Access networks in both fixed and mobile environments are evolving to all Internet Protocol (IP) - a fundamental change with profound implications.

In this 'IP world', telecommunications services are no longer intimately linked to access network technologies and service-related functions are becoming increasingly independent from the underlying transport-related technologies. This separation of services from access is two-fold, acting at the commercial and technical level.

Once broadband connections are established, many services can be implemented through applications loaded on client devices without any contractual arrangements with the end users' access network providers. In response to this, a new breed of alternative service providers is already emerging, liaising directly with end users and bypassing the network operators. This is a significant challenge as mobile operators in this scenario could easily be relegated to mere bit pipes.

Some fixed service providers are now taking advantage of the separation of services from access by adding limited mobility functionality to their multimedia services. Coverage and high-speed mobility may be restricted but customer expectations are also limited and pricing can be attractive.

Mobile operators have to compete with these new entrants while simultaneously meeting customer expectations of ubiquitous service with full mobility. In this competitive environment the luxury of evolving service functionality over time no longer exists. Multimedia services offered by mobile operators now have to match customer expectations of interworking and interoperability across fixed and mobile networks, platforms and devices. Experience has shown that such universal availability should be present at the launch of service and that interworking and interoperability should be a prerequisite - not an afterthought.

Challenge for mobile operators to implement interoperability

Implementing interoperability requires a sophisticated network infrastructure. Session Initiation Protocol (SIP)-based session management, complemented with critical mobile network capabilities such as authentication, charging, roaming and interworking provided by IMS (IP Multimedia Subsystem), is capable of delivering the required service infrastructure.

The GSM Association (GSMA) recognises the importance of SIP/IMS as the platform for next-generation mobile multimedia using the evolving GRX (General Packet Radio System (GPRS) Roaming Exchange) to interwork the service providers. In order to promote the technical and commercial interoperability of mobile multimedia services from "day one" of commercial service. The GSMA, in partnership with project sponsor TeliaSonera, brought together the world's leading mobile operators, vendors and GRX carriers in October 2004 to conduct SIP trials. The GSMA's initiative recognises that mobile operators can deliver a full service portfolio adding value through their relationships with customers, billing capabilities, and their ability to deliver personalised services across a wide range of networks and delivery platforms. It also recognises that interoperability is not only a prerequisite. As mathematicians would say, it is a necessary but not sufficient condition. The mechanisms in place to deliver interoperability must also accommodate management, security, accounting and billing functions within and between operators.

Enabling global interoperability – the GSMA SIP Trials

The GSMA's comprehensive programme of SIP Trials addresses all of the requirements to assist mobile operators deliver a full service portfolio.

The practical result of this industry-coordinating initiative (described in detail in this report) is a series of international multi-operator, multi-vendor, multi-carrier SIP trials designed to enable the global interoperability of SIP services. This will ensure that services will work smoothly right from launch and discouraging the formation of isolated islands of connectivity.

2 SIP and IMS

2.1 What is SIP?

Originally developed by the Internet Engineering Task Force (IETF) for initiating interactive user sessions involving multimedia elements, SIP is a text-based request-response signalling protocol.

It can be used for multimedia call control - initiating, managing and terminating multimedia communications sessions in an IP network. SIP negotiates the type of session, the transport and encoding mechanisms, and is designed to support multimedia in a unified fashion, which allows a wide range of call types to be mixed and matched in a single session. For example SIP can help establish simultaneous audio and video conferencing as well as services like interactive gaming, instant messaging, video share, and Voice over IP (VoIP).

SIP therefore enables the delivery of converged services across multiple networks.

2.2 Why is SIP important?

SIP has become the preferred solution for managing session-based IP communications services and applications in both fixed and mobile environments.

It has been chosen by the mobile industry (both 3GPPand 3GPP2) to support multimedia platforms such as IMS and is also an essential element of the Next Generation Network (NGN) activities being developed at the European Telecommunications Standards Institute (ETSI).

The SIP protocol as used in the IMS is completely interoperable with the SIP protocol as used on the Internet or any other network based on IETF specifications.

This widespread adoption of SIP facilitates service interworking across networks, platforms and devices, providing a uniform user experience and driving service take up and growth.

2.3 Combining SIP and IMS

The rise in importance of IP services over the last years has focused operators' attention on the integration of these services into their environment. This integration needs to be in accordance with the same requirements that have been developed for voice services while leveraging the flexibility of IP services. These services are:

- Service control: Maintaining session state and providing control mechanisms for session handling (call state model, session setup, re-direction, transfer)
- Implementation of a new and flexible charging model: The changing nature of data services has put new requirements on charging in the form of event charging, session charging, and content charging. A mechanism is required for differential charging based on content, rather than solely byte counts, and which allows the visited and home networks for roaming users to agree on the charges due to each other

- Development of one single framework for the interworking of services. Networks can be interconnected not only at "bit pipe" level but also at the service level with a proper business model and Inter-Operator Tariffs in place.

The IMS was developed in response to this and is seen as the technology that will join the IP services world with the mobile world.

Furthermore the IMS is seen as a strong driver enabling convergence across different access networks. IMS enables interoperability between fixed and mobile networks and, therefore, holds the promise of seamless converged services. Many mobile and fixed operators are implementing it as their future multimedia services control platform.

The key advantage of IMS is that it opens up new service possibilities spanning the traditional telecommunication and Internet worlds. IMS technologies enable telecommunication operators to provide all the services - including multimedia - which the Internet does while allowing for control and the capability to charge for each service.

The combination of SIP and IMS delivers high levels of service integration, including the integration of real time and non-real time multimedia services, and provides the capability for services to interact with each other. Service integration is the ability to dynamically modify the media types active during a multimedia call session and bundle services together.

Users can easily set up multiple services in a single session using more than one medium. For example users could make a voice call, then add a video session and then start sending instant messages to one another. The integration and interaction of media types enabled by SIP and IMS opens up new possibilities for rich services. Typical SIP-based applications include: Voice over IP (VoIP), instant messaging, gaming, video telephony, video share, and push-to-talk over cellular.

2.4 Advantages and challenges of SIP

SIP offers significant advantages to mobile operators but also raises significant challenges.

By deploying SIP, devices and software applications can set up and control end-to-end multimedia sessions independently of the media types involved or the underlying transport protocols. Voice becomes just another software application. This is a radical development that separates services from the underlying access technology and is already transforming service provision in many markets.

However SIP also enables alternative service providers such as Internet Service Providers (ISPs) and web-based companies to deliver a wide range of communications services, including fixed and wireless voice. This brings a new breed of competitors into the market that can afford to offer services at very low prices - or even for free.

Mobile operators need to ensure they can address all of the technical, management, security and billing functions to ensure they are competitive in a multi-operator environment.

2.5 Why has SIP become so important now?

A range of new multimedia services - including 3G mobile - have now launched in many markets. But unlike messaging services such as Short Message Service (SMS) and Multimedia Messaging Services (MMS), these services are generally only available to users within their operator's own network.

This leads to market fragmentation, which is not a desirable situation. Mobile multimedia services such as instant messaging, push-to-talk over cellular, video sharing, presence and online gaming will never be truly successful in such a restricted environment. These services need to be universally available across all platforms, networks and terminals – fixed as well as mobile.

Experience with SMS has demonstrated that significant service growth only occurs once interoperability across platforms and networks has been implemented. And experience with MMS illustrates that conformance to a standard does not always deliver the anticipated degree of interoperability.

Both SIP and IMS are standards-based solutions. But conformance to a standard rarely guarantees interoperability or vendor independence. Interoperability is frequently compromised by the multiple ways of accomplishing a specific function often embedded in standards. Protocols such as SIP are also open to different interpretations by various vendors, resulting in non-interoperable services. Despite the fact all products are claimed to be compliant with the standard.

Widely adopted standards such as SIP often become victims of their own success. Vendors can develop their products in a way that enhances functionality but runs ahead of the standards process. This can deliver short-term competitive advantage for the vendor but at the risk of potential interoperability problems in the future.

SIP originated in the fixed Internet environment and is not an inherently wireless-friendly protocol. It tends to be 'chattier' than most other signalling protocols in wireless communications. The wireless air interface is also a hostile and unpredictable environment – it cannot be assumed to be a stable and reliable transmission path as in fixed networks – so SIP in the mobile environment has to accommodate additional complications such as connections failing due to poor signal quality or users moving out of range.

Many extensions have been made to the core SIP protocol to accommodate management, security and billing functions in the mobile environment. However, such standards rarely cover all the commercial aspects of service deployments, which are essential to ensure viability in a multi-operator environment.

Given all these complexities, it is clear that the only way to deliver interoperability in a reliable fashion is to conduct end-to-end tests in a real service environment. The GSMA believes that for mobile multimedia services such tests should be conducted before commercial launch of service to promote the technical and commercial interoperability of mobile multimedia services from "day one" of commercial service and, in turn, ensure service growth opportunities are maximised.

2.6 Promotion of interoperability – the GSMA's role

Given the significance of next-generation mobile multimedia services and the important role of SIP/IMS as the platform for these services using the evolving GRX networks to interwork the service providers, the GSMA and project sponsor TeliaSonera established the SIP Trials. These trials have brought together the world's leading mobile operators, vendors and GRX carriers in a series of international multi-vendor SIP trials designed to enable the global interoperability of SIP services, ensuring that services will work smoothly right from launch and discouraging the formation of isolated islands of connectivity.

These SIP Trials are organised and managed by the GSMA and have been conducted in Europe, Asia and North America. (Refer section 4 for more information about these trials).

3 IPI and IPX

3.1 What is IPI?

Enabling global interoperability of SIP services requires the exchange of IP traffic between mobile operators and other service providers in order to provide an end-to-end-service to the consumer. This exchange process is referred to as IP Internetworking (IPI).

The GSMA SIP Trials were developed as part of the GSMA IP Program, which has proposed a solution to the challenge of enabling global IP interworking and interoperability based on four key concepts:

- **Openness:** the solution is entirely open to all IP service providers to provide ubiquitous services
- **Quality**: end-to-end Service Level Agreements (SLA) will ensure reliable delivery of IP services for consumers, as well as billing transparency and security
- **Cascading Payments**: cascading value and obligations through the chain of delivery ensures quality and fair distribution of value from the customer through to the providers
- **Efficient Connectivity**: efficient routing of IP services starting with one connection from the service provider and no more than two interconnections to the other service provider.

However it is not necessary to develop entirely new network technologies for this purpose. The open standard GPRS Roaming Exchange (GRX) platform is IP-based and well placed to develop into what the GSMA terms the IP Packet eXchange (IPX).

3.2 What is the IPX?

The IPX will be a global, trusted and controlled IP backbone that will interconnect service providers according to mutually beneficial business models. It is designed to offer highly efficient and commercially attractive methods of establishing interworking and roaming interconnection arrangements for IP services.

The IPX is different from the Internet and the GRX in that only service providers under contractual agreement may use it and it is service aware. The market for the IPX features and functions is expected to exist from mid-2007.

The IPX environment will consist of a number of IPX carriers operating in open competition, selling interconnect services to service providers. The IPXs will be mutually interconnected where there is demand by service providers and both IPX carriers and service providers will be subject to IPX governance which, on basis of transparent, objective and qualitive rules, aims to ensure that the quality, security, technical and commercial principles of the environment are maintained. Please note: the definition and nature of IPX governance is not in the scope of this paper.

Both models of interconnection using the IPX (on-net model) or some external alternative, such as the Internet, leased-line or an autonomous private network (off-net model) are legitimate and will co-exist. For many services and interconnection scenarios, the IPX will have clear advantages and will make it the solution of choice.

With the requirement for roaming in the packet services domain, the GSMA developed the GRX. The current GRX is a network that supports GSM, 3G and WLAN (authentication) data roaming traffic between GSM Mobile Network Operators (MNOs) for the best-effort traffic class.

The GRX also supports the emergence of interworking services handling MMS and unnamed best-effort traffic class services using any control protocol. The GRX is documented in the GSMA's IR.34 *Inter-PLMN Backbone Guidelines*. The IPX builds on the GRX concept adding:

- Connectivity to non-GSM operators
- A variety of charging models over and above volume-based
- End-to-end Quality of Service (QoS) for roaming and interworking (currently QoS for roaming is not supported by all GRXs)
- Interworking support for certain specified services
- Multilateral support for these specified services over a single Service Provider to IPX connection (in addition to the existing MMS Hubbing), and
- Support for any IP services on a bilateral basis with end-to-end QoS charging models.

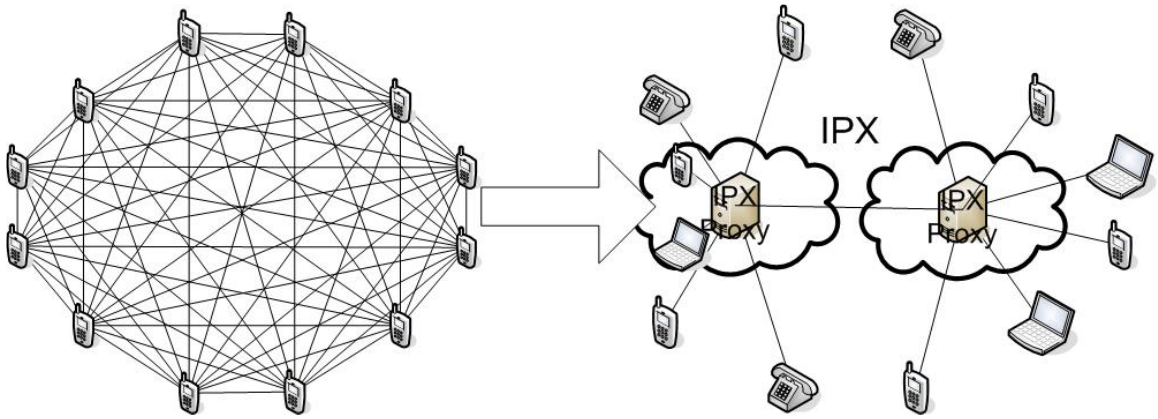
IPX networks could carry a significant proportion of IMS traffic between service providers of many different types in the future e.g. GSM operators, CDMA operators, fixed players, cable companies etc. The introduction of these networks does not require any changes to existing 3GPP compliant IMS core systems.

3.3 Why is an IPX

As the number of service providers grows, the bilateral point-to-point nature of GPRS roaming agreements begins to cause problems. Adopting the bilateral model for interworking IMS systems between the more than 700 GSM operators, and potetnially thousands of non-GSM IMS systems, worldwide would present an operational and financial burden.

One way to avoid this is to expand the current bilateral model with a hubbing model using IPX Proxies and multilateral network agreements. Interworking IMS systems through IPX Proxies, which provide the ability to hub and can manage routing is the GSMA's preferred alternative to the bilateral approach.

Figure 1 Bilateral to Multilateral IPX Model



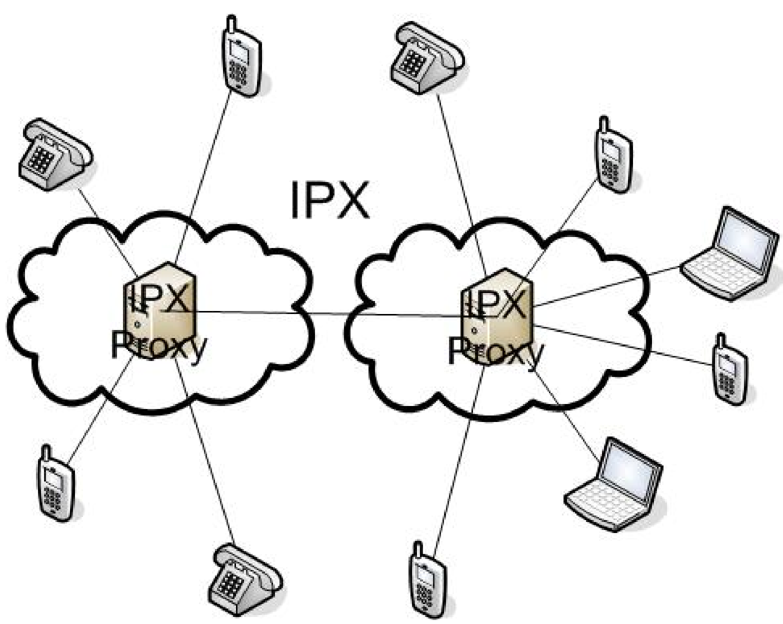
The Multilateral IPX Model – the GSMA's preferred solution for interworking IMS systems.

3.4 IPX Proxy – what is it?

An IPX Proxy acts as a hub between IMS networks and facilitates interworking and interoperability from both technical and commercial perspectives. An IPX proxy is a SIP proxy with additional functionality to meet mobile operator requirements, including key functions such as accounting, brokering, security, routing, protocol conversion and the capability of transporting, and mediating where necessary, control plane and user plane packets between different IP multimedia networks.

IPX Proxies are independent of applications or services. It is possible to run any SIP-based service via IPX, including new Peer-to-Peer (P2P) applications regardless of protocol. Using an IPX proxy does not automatically mean using a commercial broker model. It is entirely possible to use an IPX proxy just for routing traffic and make agreements bilaterally or via contact brokering.

Figure 2 IPX Proxy as a hub

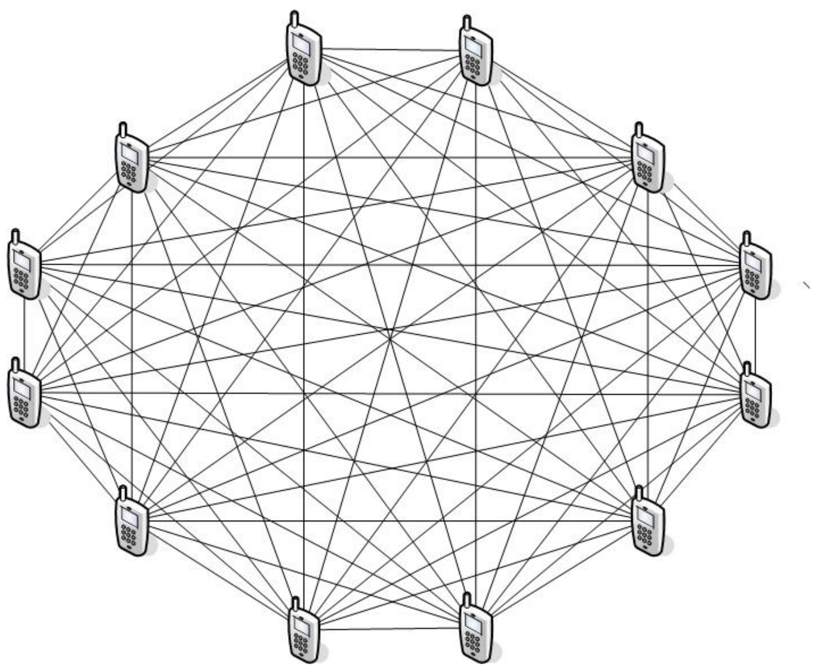


3.5 Benefits of an IPX

Building on an existing GRX model to add SIP hubbing facilitates global interoperability by making the establishment of roaming and interworking agreements quick, simple and affordable. The hub concept and supporting principles have already been proven in commercial MMS interworking deployments.

Hubs maintain roaming and interworking connections with operators so that operators only need to connect to a single hub to access all other operators within the hub. Interconnection agreements between hubs themselves allow operators to access any operator connected to any hub.

Hubbing is a natural evolution to the way relationships between operators are managed and the market is already moving in this direction for SMS and MMS. Hubbing enables widespread connectivity through a single commercial agreement, ensuring interoperability and accelerating service growth.



4 Trials

The ongoing SIP Trials were launched in October 2004, as part of the IP interworking initiative, and were led by the GSMA and sponsored by TeliaSonera that originally proposed the concept.

The trials consist of a number of test campaigns designed to demonstrate practical and operational deployment of SIP/IMS, as well as the interoperability of terminals and IMS platforms.

The test campaigns focus on end-to-end service delivery and service interoperability using the IMS and an IPX Proxy. They are tests in a real service environment rather than plug fests in laboratories – practical rather than theoretical exercises, focusing on technical and functional considerations through hands-on work. The emphasis in all the trials is on practical interworking and not on detailed conformance testing.

The SIP Trials test the interworking of IMS systems at the network-to-network level and end-to-end interoperability at the service level. They validate the actual user experience.

4.1 Goals

A two-pronged philosophy underpins the SIP Trials: SIP/IMS is a key enabler for mobile multimedia services and the manner of its deployment is critical.

End users expect ubiquitous service availability. These expectations have been reinforced by the experiences of the launches of services such as MMS, which have demonstrated the importance of interoperability as a key driver for adoption and growth. Services that initially fail to satisfy rarely get a second chance. The proposition therefore is that interoperability is essential to drive service adoption and ensure commercial success.

To assist in achieving this, the goals for the SIP Trials are to:

1. Demonstrate interoperability of SIP-based services across networks, platforms and devices – an essential, practical step towards ubiquitous service delivery
2. Confirm services can be delivered to end users with a low and predictable latency and with the appropriate QoS
3. Verify that necessary accounting information can be captured at the IPX level – an important objective as the standards process often neglects such key commercial considerations.

The SIP Trials are establishing foundations that will ensure the technical and commercial interoperability of SIP-based services from the commencement of commercial launch.

4.2 Scope of the SIP Trials

The trials have focused on the technical and operational aspects of interworking and basic SIP interoperability testing, including the ability to obtain necessary billing and inter-network accounting data. The main SIP-based services and applications tested to date are peer-to-peer IMS services such as instant messaging, Video Share and gaming and client server services such as Push to Talk over Cellular (PoC).

The scope of the trials has included non-standardised services such as Video Share and standardised services such as PoC with 3GPP compliant IMS core systems.

The initial focus has been on interworking with roaming considered to be out of scope. Current procedures for data roaming tend to concentrate on bandwidth and are not session based. Other areas considered to be out of scope at this stage include interconnections over the Internet, security, interworking with the Public Switched Telephone Network (PSTN), conformance testing and number portability.

4.3 Campaign approach

The campaign approach adopted for the SIP Trials focuses on flexibility and cooperation. Individual trial members can decide to cooperate on a test campaign for a particular SIP-based service. This allows campaigns to be run in parallel and gives trial members the freedom to tailor their involvement to suit their specific needs and circumstances.

Test campaigns are conducted by dedicated participants who are each represented on the Trial Management Group (TMG), which oversees the scope and scheduling of all campaigns and the Technical Expert Group (TEG), which provides technical input.

Each campaign is focused on specific technical and functional topics and a systematic approach has been adopted so that campaigns both leverage and extend the experience of previous trials.

The test campaigns conducted to date are listed in Table 1. The campaigns have been structured to be incremental in both technical and geographic aspects to allow participants to learn step by step.

Table 1: Test campaigns conducted to date

Campaign	Description	Timing	Europe	Asia	USA
First European Campaign	Basic IMS interworking	Q1 2005	X		
Second European Campaign	Advanced IMS interworking	Q2 2005	X		
First Asia-Pacific Campaign	Basic IMS interworking	Q2 2005		X	
Second Asia-Pacific Campaign	Advanced IMS interworking	Q3 2005		X	
First tel URI Campaign	tel URI End-User Addressing	Q4 2005	X	X	
First Video Share Campaign	Interoperable P2P SIP service	Q1 2006	X	X	X
Second Video Share Campaign	Interoperable P2P SIP service	Q2 2006	X	X	X
PoC Campaign	OMA PoC Client Server service	Q4 2006	x		

4.4 Participants and roles

Three main stakeholder groups are involved in delivering interoperability across networks, platforms and devices:

- Mobile network operators (service providers)
- GRX/IPX carriers (the inter-operator backbone)
- Vendors (infrastructure, platform and terminal suppliers).

Every test campaign is managed by a lead operator and involves a set of interworking teams, each representing a pair of operators together with their respective vendors and GRX carriers.

Campaign results are summarised in a document based on reports from each participating company. The results are available to all GSMA Members. The substantial practical benefits generated by the trials remain with the participants.

Over 60 companies have signed up to the SIP Trials as listed in Appendix 8. These include 28 mobile network operators (15 in APAC, 12 in EMEA, one Americas), 14 GRX carriers and 19 vendors.

5 Trial outcomes

The eight campaigns undertaken as part of the SIP Trials to date have primarily focussed on IMS interworking and SIP/IMS services.

5.1 IMS interworking and tel URI

5.1.1 First European campaign

The first two campaigns, led by TeliaSonera, were conducted within Europe and were concerned with basic interoperability. The primary goals were to establish a test infrastructure and demonstrate interworking between IMS core systems from different vendors.

Particular emphasis was placed on testing the IMS network-to-network interface (NNI) as the GSMA focuses on the inter-operator domain. The first test campaign was executed in Q1 2005 with 13 test participants from Europe. The goals were to create a test infrastructure for SIP service interworking between multi-vendor IMS core systems, to introduce the GRX hubbing model known as IPX, and to prove that the IMS interoperability concept over GRX worked in practice.

This first European campaign used standardised IMS core systems from multiple vendors interconnected through the GRX routing domain. Three different peer-to-peer SIP applications from Nokia – voice instant messaging, video sharing and gaming – were tested over both 2G and 3G access networks.

In this first campaign inter-operator connections were established either via an IPX Proxy or with direct tunnels between the IMS networks. Control and user plane traffic was tunnelled with Generic Routing Encapsulation (GRE) between the IPX Proxy and other operators' networks.

All three IMS infrastructure vendor pairings were successfully tested for interoperability. Interoperability testing at the service level uncovered some time out issues caused by network timers expiring earlier than User Equipment (UE) timers – a problem easily rectified by aligning timer settings.

5.1.2 Second European campaign

The second European campaign was executed in Q2 2005 with 11 participants from Europe. It built on the interworking scenario introduced in the first campaign by demonstrating and testing several technical extensions of the IPX model:

- Connection between IPX Proxies
- IPv6 and IPv4/6 conversion
- Basic performance related measurements
- Accounting data collection by IPX Proxies

All the GRX carriers in the trial developed hubs to support IMS interworking and, as part of the testing, successfully demonstrated hub-to-hub connectivity including interworking between IPv6 IMS systems and between IMS IPv6 systems and IMS IPv4 systems.[1]

The campaign involved two operator test pairings and successfully demonstrated inter-hub connectivity including interworking between IPv6 IMS and IPX systems as well as interworking between IPv6 and IPv4. In addition, the billing capability of the IPX Proxy was verified, together with a performance study concentrating on delay components, in the interconnection path. This campaign validated the concept of an IPX Proxy as the primary building block for a hubbing approach – a concept that has since become widely adopted.

Some minor SIP level issues connected with case sensitivity in the protocol were uncovered in this second campaign. These were resolved by ensuring case sensitivity is respected across SIP, IMS and IPX components.

5.1.3 First Asia-Pacific campaign

The next two campaigns in mid-2005, led by China Mobile, extended the trials geographically by involving new participants from the Asia region and established the possibility for future tests on an intercontinental level.

The first Asia-Pacific trial involved 14 participants. It was based on the first European campaign and included IPX Proxy connectivity (hub-to-hub connectivity) and tested several IMS applications from both Nokia and Siemens. Nearly 40 test cases of real-time Video Share, peer-to-peer gaming and multimedia instant messaging were successfully tested among various IMS platforms.

Successful session establishment and overall user experience were obtained for all applications and the IPX Proxy to IPX Proxy connection was verified. This campaign established interoperability between applications from different vendors.

5.1.4 Second Asia-Pacific campaign

The second set of trials in Asia included additional trial participants from the Asia-Pacific region and had a similar scope to the second European campaign:

- Connection between IPX Proxies
- IPv6 and IPv4/6 conversion
- Basic performance related measurements
- Accounting data collection by IPX Proxies.

All connections in this second Asia-Pacific trial were established through two IPX Proxies provided by the GRX carriers, allowing the testing of the inter-Proxy interface with both IPv4 and IPv6 traffic.

Commercial terminals from Nokia were deployed in all tests. Each of the nine operator test pairs successfully completed end-to-end testing.

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[1] Originally, 3GPP specifications defined IMS as IPv6 only. However, that decision has been changed and IMS core systems and terminals can be either IPv6 or IPv4 based.

5.1.5 First tel URI Campaign

The tel URI end-user addressing campaign in the fourth quarter of 2005, led by Vodafone, included participants from Europe and Asia and was the first intercontinental trial in the SIP programme. Tel URI support allows the reuse of existing telephone numbers and contacts to establish connections. It is an important function to support, as many customers don't have the SIP URI address of the party they wish to connect to.

The primary goal of this campaign was to leverage the interworking scenario by demonstrating and testing infrastructure TElephone NUmber Mapping (ENUM) architecture feasibility for tel URI / SIP URI flows. The trial also investigated the generation of accounting information from session data by the IPX Proxy.

A Video Share application from Ericsson and a gaming application from Siemens that support ENUM were used for the tests.

Within this trial ENUM queries could be performed by either the originating Serving-Call Session Control Function (S-CSCF) or the IPX Proxy to retrieve a SIP URI from the offered tel URI. The SIP URI is then used to set up a session with another IMS operator. Participating operators could decide which ENUM configuration to use and where records should be hosted.

The campaign proved that tel URI can be used successfully across continents as an addressing format for IMS handsets. This is a important result as mapping telephone numbers back to SIP URIs is a complex Domain Name System (DNS) application in a global context. Successful ENUM architecture interworking and end-to-end Video Share sessions were demonstrated.

5.2 SIP/IMS services

As part of the testing of SIP/IMS services to date, the trials have focused on Video Share and OMA PoC.

5.2.1 Video Share campaigns

Video Share is a one-to-one unidirectional combinational service that allows users to share live video over a packet switched connection in real time simultaneously with an ongoing circuit switched call. The session is set up using SIP and video is transferred using Real Time Transfer Protocol (RTP).

Video Share is not standardised anywhere, but terminal vendors have implemented an interoperable service based on a technical definition document produced in conjunction with the GSMA to stimulate the service.

GSMA Video Share is a vendor independent application, which should be interoperable between different terminals as well as between terminals and different IMS core systems. It uses a peer-to-peer model in which applications reside in the terminals. All the logic to handle the application functionality is in the handset and a separate application server in the network is not required.

5.2.1.1 First Video Share campaign

The two Terminal Interoperable Video Share campaigns, led by TeliaSonera, were designed to ensure that Video Share services would work between a large number of mobile and laptop devices.

An important initial step in the first campaign was the definition of a specification for an interoperable video share service. The resulting GSMA Video Share specification does not require specific application servers in the network.

The Video Share campaign included new trial participants from the USA and was the first trial to involve intercontinental testing across three continents: Europe, Asia and North America.

The extensive first campaign in Q1 2006 tested seven video share implementations based on the GSMA Video Share specification. IMS and terminal combinations were mixed and matched in all possible ways. Eight video share client combinations were tested successfully without the need for any modifications to IPX Proxies at the SIP level. Five IMS-to-IMS and 15 terminal-to-IMS combinations were verified.

Video Share interoperability enabled by IPX Proxies was successfully demonstrated and it was verified that the ENUM architecture supports the Video Share service.

This first Video Share campaign highlighted the desirability of comprehensive terminal-to-terminal pre-testing before commercial launch of service and the potential difficulties caused by simultaneous availability of different implementations of a single vendor's application at different operators.

5.2.1.2 Second Video Share campaign

The second Video Share campaign enhanced the Video Share service definition based on the results from the first campaign. It focused on Video Share charging principles and included specific IPX Proxy test cases on accounting, security and performance. Both tel URI and SIP URI end-user addressing schemes were tested.

An important feature of the second Video Share campaign was a test fest, hosted by China Mobile, which facilitated terminal-to-terminal and terminal-to-IMS interoperability testing between vendors before the operator tests. Some detailed software issues were detected and rectified during the test fest.

Dedicated accounting tests provided insight into the feasibility of potential charging principles. They demonstrated that the Session Detail Record (SDRs) generated by the IPX Proxies includes the information necessary for session and media based charging purposes.

Dedicated performance and security tests allowed the performance of IPX Proxies to be assessed against the specified IPX Proxy requirements.

5.2.2 OMA Push to Talk over Cellular

The previous campaigns had focused on IMS interworking and peer-to-peer services. This was the first campaign, which examined the use of a client-server based service and also how such a service then acts when inter-worked between different networks.

OMA PoC has been standardised by OMA and tested in several OMA test-fests. However the focus during that testing had been mostly on the User-Network (UNI) interface. The SIP Trials, as mentioned, focus on the NNI interface so this was the first time the interworking of an application server had to be considered.

The focus of the campaign was to ascertain the feasibility of this interworking and the acceptability of this service from a user perspective. As this was the first campaign on PoC, its scope was relatively limited and concentrated on one to one sessions, as opposed to also looking at group sessions. In general it can be said that the goals set out for the campaign were achieved and that PoC interworking is a reality.

6 Conclusions

In general the outcome of the SIP Trials has been positive and has demonstrated the capability of SIP-based services to interoperate across networks and platforms.

6.1 Are the trials a success?

On the whole, the results were positive. No major issues were encountered - only a few minor issues typically revolving around network configurations.

Importantly, no insuperable technical problems were encountered during the campaigns. A few technical challenges occurred in the areas of traffic routing and network configuration. Others were raised by SIP level issues in terminals, IMS platforms and IPX Proxies. All of these technical challenges have either been resolved or are under further investigation. None are expected to present serious barriers to the interoperability of SIP-based services.

No issues were raised by any of the trials that affect the SIP or IMS standards.

The IPX hubbing model has been introduced successfully. Using IPX Proxy connections through the GRX routing domain, successful service interworking through IPX Proxies has been demonstrated. The trials have further shown that IPX Proxies are fit for purpose in the areas of end-to-end IPv6, IPv6/IPv4 conversion, charging and accounting, and performance measurements of IMS services in the interconnection environment. IPX has been shown to be a secure, reliable and controlled network suitable for IMS interconnection.

Outcomes from the Video Share interoperable SIP service were positive on the whole. But video share applications are still in the early stages of development and there is a need for close cooperation between application suppliers to resolve minor teething problems and ensure interoperability.

Participation in the test campaigns brings unquantifiable but vital benefits. Participants acquire significant competitive advantage through their practical experience with the deployment of SIP-based services across network and platform boundaries.

6.2 Where is this all going?

Further trial campaigns will be run during 2007 in order to accommodate the demand from operators, carriers and vendors who have not yet had an opportunity to join in the trials. More advanced testing of applications, initially video share, will be carried out. The GSMA's philosophy is to ensure that as many potential stakeholders as possible have the opportunity to participate in pre-commercial trials, as this will yield major benefits to users in terms of QoS when services are commercially launched.

6.3 Where to go for more information

If you would like more information about the GSMA SIP Trials, please contact Mark Hogan of the GSM Association mhogan@gsm.org

For more general information please visit the SIP Trials homepage on the GSMA's website: www.gsmworld.com/sip.

GSMA Members can also stay informed of progress by visiting the SIP Trial home page on the GSMA Infocentre: SIP Trial on Infocentre

7 Definitions

3GPP – Third Generation Partnership Project

3GPP2 – Third Generation Partnership Program (North America/Asia)

DNS – Domain Name System

ENUM – T*E*lephone *NU*mber *M*apping

ETSI – European Telecommunications Standards Institute

GPRS – General Packet Radio System

GRE – Generic Routing Encapsulation

GRX – GPRS Roaming eXchange

GSM – Global System for Mobile communications

GSMA – GSM Association

IETF – Internet Engineering Task Force

IMS – IP Multimedia Subsystem

IP – Internet Protocol

IPI – GSMA IP Interworking initiative

IPv4 – Internet Protocol version 4

IPv6 – Internet Protocol version 6

IPX – IP Packet eXchange

ISP – Internet Service Provider

MMS – Multimedia Messaging Services

MNO – Mobile Network Operators

NGN – Next Generation Network

NNI – Network to Network Interface

P2P – Peer-to-Peer

PSTN – Public Switched Telephone Network

QoS – Quality of Service

RTP – Real-time Transfer Protocol

S-CSCF – Serving-Call Session Control Function

SDR – Session Detail Record

SIP – Session Initiation Protocol

SMS – Short Message Service

TEG – Technical Expert Group

TMG – Trial Management Group

UE – User Equipment

UNI – User-Network Interface

URI – Uniform Resource Identifier

VoIP – Voice over IP

8 Appendix – SIP Trial current participants

Participant categories	Companies involved
MNOs (28) Asia 15 Europe 12 North America 1	CTM, China Mobile, CSL, FarEasTone, Globe, Hutchison HK, NTT DoCoMo, MobileOne, SKT, Smart, SmarTone-Vodafone, Singtel, Sunday, Vodafone KK, KT Freetel KPN Mobile, O2, Orange, Telenor, Telia Sonera, SFR, Vodafone, Telefonica, TIM, TMN, Jersey Telecom, Turkcell Cingular
Vendors (20)	Ericsson, Huawei, Motorola, NEC, Newport Networks, Nokia, Siemens, Neustar, Alcatel, Intel, Nextone, Lucent, Verisign, LGE, Samsung, Sony-Ericsson, Azaire Networks, Aylus, Comneon, Acme Packet
GRX Carriers (14)	Belgacom, Cable & Wireless, KPN, TeliaSonera Carrier, Aicent, France Telecom, CITIC 1616, Syniverse, Telecom Italia Sparkle, Telefonica Carrier Services, Portugal Telecom, Infocom, Telenor Global Services