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Using the International Mobile station Equipment Identity (IMEI) Uniform Resource Name (URN) as an Instance ID

Abstract

This specification defines how the Uniform Resource Name (URN) reserved for the Global System for Mobile Communications Association (GSMA) identities and its sub-namespace for the International Mobile station Equipment Identity (IMEI) can be used as an instance-id. Its purpose is to fulfill the requirements for defining how a specific URN needs to be constructed and used in the '+sip.instance' Contact header field parameter for outbound behavior.

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1. Introduction

This specification defines how the Uniform Resource Name (URN) reserved for the Global System for Mobile Communications Association (GSMA) identities and its sub-namespace for the International Mobile station Equipment Identity (IMEI) as specified in RFC 7254 [1] can be used as an instance-id as specified in RFC 5626 [2] and also as used by RFC 5627 [3].

RFC 5626 [2] specifies the '+sip.instance' Contact header field parameter that contains a URN as specified in RFC 2141 [4]. The instance-id uniquely identifies a specific User Agent (UA) instance. This instance-id is used as specified in RFC 5626 [2] so that the Session Initiation Protocol (SIP) registrar (as specified in RFC 3261 [9]) can recognize that the contacts from multiple registrations correspond to the same UA. The instance-id is also used as specified

by RFC 5627 [3] to create Globally Routable User Agent URIs (GRUUs) that can be used to uniquely address a UA when multiple UAs are registered with the same Address of Record (AoR).

RFC 5626 [2] requires that a UA SHOULD create a Universally Unique Identifier (UUID) URN as specified in RFC 4122 [6] as its instance-id but allows for the possibility to use other URN schemes. Per RFC 5626, "If a URN scheme other than UUID is used, the UA MUST only use URNs for which an RFC (from the IETF stream) defines how the specific URN needs to be constructed and used in the "+sip.instance" Contact header field parameter for outbound behavior". This specification meets this requirement by specifying how the GSMA IMEI URN is used in the '+sip.instance' Contact header field parameter for outbound behavior, and RFC 7254 [1] specifies how the GSMA IMEI URN is constructed.

The GSMA IMEI is a URN for the IMEI -- a globally unique identifier that identifies mobile devices used in the GSM, Universal Mobile Telecommunications System (UMTS), and 3rd Generation Partnership Project (3GPP) Long Term Evolution (LTE) networks. The IMEI allocation is managed by the GSMA to ensure that the IMEI values are globally unique. Details of the formatting of the IMEI as a URN are specified in RFC 7254 [1], and the definition of the IMEI is contained in 3GPP TS 23.003 [10]. Further details about the GSMA's role in allocating the IMEI, and the IMEI allocation guidelines, can be found in GSMA PRD TS.06 [11].

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [7].

3. Background

GSM, UMTS, and LTE capable mobile devices represent 90% of the mobile devices in use worldwide. Every manufactured GSM, UMTS, or LTE mobile device has an allocated IMEI that uniquely identifies this specific mobile device. Among other things, in some regulatory jurisdictions the IMEI is used to identify that a stolen mobile device is being used, to help to identify the subscription that is using it, and to prevent use of the mobile device. While GSM was originally a circuit switched system, enhancements such as the General Packet Radio Service (GPRS) and UMTS have added IP data capabilities that, along with the definition of the IP Multimedia Subsystem (IMS), have made SIP-based calls and IP multimedia sessions from mobile devices possible.

The latest enhancement, known as LTE, introduces even higher data rates and dispenses with the circuit switched infrastructure completely. This means that with LTE networks, voice calls will need to be conducted using IP and IMS. However, the transition to all IP SIP-based IMS networks worldwide will take a great many years, and mobile devices, being mobile, will need to operate in both IP/SIP/IMS mode and circuit switched mode. This means that calls and sessions will need to be handed over between IP/SIP/IMS mode and circuit switched mode mid-call or mid-session. Also, since many existing GSM and UMTS radio access networks are unable to support IP/SIP/IMS-based voice services in a commercially acceptable manner, some sessions could have some media types delivered via IP/IMS simultaneously with voice media delivered via the circuit switched domain to the same mobile device. To achieve this, the mobile device needs to be simultaneously attached via both the IP/SIP/IMS domain and the circuit switched domain.

To meet this need, the 3GPP has specified how to maintain session continuity between the IP/SIP/IMS domain and the circuit switched domain in 3GPP TS 24.237 [12], and in 3GPP TS 24.292 [13] has specified how to access IMS hosted services via both the IP/SIP/IMS domain and the circuit switched domain.

In order for the mobile device to access SIP/IMS services via the circuit switched domain, the 3GPP has specified a Mobile Switching Center (MSC) server enhanced for IMS Centralized Services (ICS) and a MSC server enhanced for Single Radio Voice Call Continuity (SR-VCC) that control mobile voice call setup over the circuit switched radio access while establishing the corresponding voice session in the core network using SIP/IMS. To enable this, the MSC server enhanced for ICS or the MSC server enhanced for SR-VCC performs SIP registration on behalf of the mobile device, which is also simultaneously directly registered with the IP/SIP/IMS domain. The only mobile device identifier that is transportable using GSM/UMTS/LTE signaling is the IMEI; therefore, the instance-id included by the MSC server enhanced for ICS or the MSC server enhanced for SR-VCC when acting on behalf of the mobile device, and the instance-id directly included by the mobile device, both need to be based on the IMEI.

Additionally, in order to meet the above requirements, the same IMEI that is obtained from the circuit switched signaling by the MSC server needs to be obtainable from SIP signaling so that it can be determined that both the SIP signaling and circuit switched signaling originate from the same mobile device.

For these reasons, 3GPP TS 24.237 [12] and 3GPP TS 24.292 [13] already specify the use of the URN namespace for the GSMA IMEI URN as specified in RFC 7254 [1] as the instance-id used by GSM/UMTS/LTE

mobile devices, the MSC server enhanced for SR-VCC, and the MSC server enhanced for ICS, for SIP/IMS registrations and emergency-related SIP requests.

4. 3GPP Use Cases

1. The mobile device includes its IMEI in the SIP REGISTER request so that the SIP registrar can perform a check of the Equipment Identity Register (EIR) to verify whether this mobile device is allowed to access the network for non-emergency services or is barred from doing so (e.g., because the device has been stolen). If the mobile device is not allowed to access the network for non-emergency services, the SIP registrar can reject the registration and thus prevent a barred mobile device from accessing the network for non-emergency services.

2. The mobile device includes its IMEI in SIP INVITE requests used to establish emergency sessions. This is so that the Public Safety Answering Point (PSAP) can obtain the IMEI of the mobile device for identification purposes if required by regulations.

3. The IMEI that is included in SIP INVITE requests by the mobile device and used to establish emergency sessions is also used in cases of unauthenticated emergency sessions to enable the network to identify the mobile device. This is especially important if the unauthenticated emergency session is handed over from the packet switched domain to the circuit switched domain. In this scenario, the IMEI is the only identifier that is common to both domains, so the Emergency Access Transfer Function (EATF) in the network, which in such cases coordinates the transfer between domains, can use the IMEI to determine that the circuit switched call is from the same mobile device that was in the emergency session in the packet switched domain.

5. User Agent Client Procedures

A User Agent Client (UAC) that has an IMEI as specified in 3GPP TS 23.003 [10] and that is registering with a 3GPP IMS network MUST include in the "sip.instance" media feature tag the GSMA IMEI URN according to the syntax specified in RFC 7254 [1] when performing the registration procedures specified in RFC 5626 [2] or RFC 5627 [3], or any other procedure requiring the inclusion of the "sip.instance" media feature tag. The UAC SHOULD NOT include the optional 'svn' parameter in the GSMA IMEI URN in the "sip.instance" media feature tag, since the software version can change as a result of upgrades to the device firmware that would create a new instance-id. Any future non-zero values of the 'vers' parameter, or the future definition of additional parameters for the GSMA IMEI URN that are intended to be

used as part of an instance-id, will require that an update be made to this RFC. The UAC MUST provide character-by-character identical URNs in each registration according to RFC 5626 [2]. Hence, any optional or variable components of the URN (e.g., the 'vers' parameter) MUST be presented with the same values and in the same order in every registration as in the first registration.

A UAC MUST NOT use the GSMA IMEI URN as an instance-id, except when registering with a 3GPP IMS network. When a UAC is operating in IMS mode, it will obtain from the Universal Integrated Circuit Card (UICC) (commonly known as the SIM card) the domain of the network with which to register. This is a carrier's IMS network domain. The UAC will also obtain the address of the IMS edge proxy to send the REGISTER request containing the IMEI using information elements in the Attach response when it attempts to connect to the carrier's packet data network. When registering with a non-3GPP IMS network, a UAC SHOULD use a UUID as an instance-id as specified in RFC 5626 [2].

A UAC MUST NOT include the "sip.instance" media feature tag containing the GSMA IMEI URN in the Contact header field of non-REGISTER requests, except when the request is related to an emergency session. Regulatory requirements can require that the IMEI be provided to the PSAP. Any future exceptions to this prohibition will require the publication of an RFC that addresses how privacy is not violated by such usage.

6. User Agent Server Procedures

A User Agent Server (UAS) MUST NOT include its "sip.instance" media feature tag containing the GSMA IMEI URN in the Contact header field of responses, except when the response is related to an emergency session. Regulatory requirements can require that the IMEI be provided to the PSAP. Any future exceptions to this prohibition will require the publication of an RFC that addresses how privacy is not violated by such usage.

7. 3GPP SIP Registrar Procedures

In 3GPP IMS, when the SIP registrar receives in the Contact header field a "sip.instance" media feature tag containing the GSMA IMEI URN according to the syntax specified in RFC 7254 [1] the SIP registrar follows the procedures specified in RFC 5626 [2]. The IMEI URN MAY be validated as described in RFC 7254 [1]. If the UA indicates that it supports the extension in RFC 5627 [3] and the SIP registrar allocates a public GRUU according to the procedures specified in RFC 5627 [3], the instance-id MUST be obfuscated when creating the 'gr' parameter in order not to reveal the IMEI to other UAs when the

public GRUU is included in non-REGISTER requests and responses. 3GPP TS 24.229 [8] subclause 5.4.7A.2 specifies the mechanism for obfuscating the IMEI when creating the 'gr' parameter.

8. Security Considerations

Because IMEIs, like other formats of instance-ids, can be correlated to a user, they are personally identifiable information and therefore MUST be treated in the same way as any other personally identifiable information. In particular, the "sip.instance" media feature tag containing the GSMA IMEI URN MUST NOT be included in requests or responses intended to convey any level of anonymity, as this could violate the user's privacy. RFC 5626 [2] states that "One case where a UA could prefer to omit the "sip.instance" media feature tag is when it is making an anonymous request or some other privacy concern requires that the UA not reveal its identity". The same concerns apply when using the GSMA IMEI URN as an instance-id. Publication of the GSMA IMEI URN to networks to which the UA is not attached, or with which the UA does not have a service relationship, is a security breach, and the "sip.instance" media feature tag MUST NOT be forwarded by the service provider's network elements when forwarding requests or responses towards the destination UA. Additionally, an instance-id containing the GSMA IMEI URN identifies a mobile device and not a user. The instance-id containing the GSMA IMEI URN MUST NOT be used alone as an address for a user or as an identification credential for a user. The GRUU mechanism specified in RFC 5627 [3] provides a means to create URIs that address the user at a specific device or User Agent.

Entities that log the instance-id need to protect them as personally identifiable information. Regulatory requirements can require that carriers log SIP IMEIs.

In order to protect the "sip.instance" media feature tag containing the GSMA IMEI URN from being tampered with, those REGISTER requests containing the GSMA IMEI URN MUST be sent using a security mechanism such as Transport Layer Security (TLS) (RFC 5246 [5]) or another security mechanism that provides equivalent levels of protection such as hop-by-hop security based upon IPsec.

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