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ALTO cellular addresses
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Abstract

This draft proposes to use the cellular address format composed of elements as specified by 3GPP and called ECGI. ECGI stands for E-UTRAN Cell Global Identifier and is used in Public Land Mobile Networks based on E-UTRAN.

Requirements Language

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 [RFC2119].

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1. Introduction

Cellular networks are present in a number of use cases investigated in the ALTO WG and it is useful to specify a format for Cellular addresses. In these cases, Endpoints, PIDs and entities may be cells. In order to specify services such as Network Maps, Cost Maps, Endpoint property or Property Maps, it is necessary to order to specify an ALTO format for Cell addresses.

For the sake of efficiency, a preferred option is to use the cell identifier format as specified by 3GPP [TS 36.300] and called ECGI, as already proposed in [draft-rauschenbach-alto-wireless-access-00] and in other discussions. ECGI stands for E-UTRAN Cell Global Identifier and is used in Public Land Mobile Networks based on E-UTRAN, see [TS 36.331].

The purpose of this document is to be completed by the ALTO WG and in particular:

- Amend and finalize the specification for the ALTO Cell identifier format proposed in the present version,
- define a placeholder for this specification, identify related ALTO features and ALTO WG documents.

2. Relevant ALTO services and documents

Particular services and drafts where an ALTO address type for cellular networks is needed include:

- o - Endpoint property service: extended to allow endpoints to be cells on which properties can be requested,
- o - (Filtered) Cost Map Service: where PIDs can be cells within and among which cost values can be requested, see also[draft-randriamasy-alto-cost-context-01],
- o - "Mobility Network Models in ALTO" defined in [draft-bertz-alto-mobilitynets] propose to identify network points of attachment (PoA) such as cells to PIDs.
- o - "ALTO Performance Cost Metrics": being defined in [draft-ietf-alto-performance-metrics-01], they will be extended to performance costs in cellular networks,
- o - "Extensible Property Maps for the ALTO Protocol", being defined in [I-D.ietf-alto-unified-props-new] are applicable to entities that may be cells which are identified by their addresses. In this document a domain identifier for cells will need to be accordingly defined, and the entity domain identifier "ecgi" is proposed.

3. Cell addresses, ALTO Address types and ALTO Entity Domain names

This section reflects ALTO WG discussions. The ALTO Address Type Registry is detailed in Section 14.4 of RFC7285 specifying the base ALTO protocol. It currently lists ALTO address types "ipv4" and "ipv6". These ALTO address types can be used in the Endpoint Property Service and the Endpoint Cost Service. They can also be used to list the endpoints covered by a PID. The ALTO base protocol however does not preclude other address types, See RFC7285, section 2.2 Endpoint Address.

The draft [draft-ietf-alto-unified-props-new] introduces and specifies two new information services called Property Map and Filtered Property Maps. They specify two media types, called "alto-propmap+json" and "alto-propmapparams+json". A Property Map exposes values of properties that are defined on Entities, where an Entity is an object that extends the scope of an Endpoint having an individual IP address to groups of Endpoints, PIDs, network elements abstracted from one or more network elements of arbitrary nature. An Entity has a unique address or name and is defined as belonging to a Domain that has a unique identifier. To this end, [draft-ietf-alto-unified-props-new] specifies an Entity Domain Registry. An entity can thus potentially be a cell.

Example entities are Endpoints with addresses in the ipv4 or ipv6 domain, or PIDs with a name in the "pid" domain.

The draft points out that that "Entity domains and property names are extensible. New domains can be defined without revising the messages defined in this document, in the same way that new cost metrics and new endpoint properties can be defined without revising the messages defined by the ALTO protocol."

As a consequence, RFC7285 and draft [draft-ietf-alto-unified-props-new] provide the background to allow Endpoints and Entities to be cells with well-specified addresses.

3.1. ALTO Address Type for cellular networks

Registering cellular addresses in the ALTO Address Type Registry allows conveying Endpoint Costs and Properties and (Filtered) Cost Maps with PIDs and Endpoints being cells.

RFC7285 specifies endpoint address formats for ipv4 and ipv6 and the purpose of this draft is to agree on a format for cellular endpoints. When a cell is mapped to a PID, say "MyCell3" the ALTO Cell Id will be used to specify the endpoints within this PID.

Whereas IP addresses are associated to domains ipv4 and ipv6, a Cell Id will be associated to the domain "ecgi".

The domain name "ecgi" stems from the term ECGI -- E-UTRAN Cell Global Identifier, defined in 3GPP.

3.2. ALTO Entity Domain for cellular networks

Applications may want to query (Filtered) Property Maps on Cellular Networks or on networks comprising cells. In which case cells would have to be identified as Entities with an entity address specific to

a domain registered in ALTO Entity Domain specified in [I-D.ietf-alto-unified-props-new].

The domain "ecgi" is suitable for Entities as well.

3.3. Consistency between ALTO Entity Domain and ALTO Address Type

Actually, the cell address format proposed in section Section 4 is suitable for both Endpoints and Entities. Likewise, ipv4 and ipv6 addresses. Whereas cellular and IP Endpoint addresses can also be Entity addresses, an Entity is not necessarily an Endpoint. This is the case for instance for entities like PIDs or ANEs. Therefore there is a consistency issue to be solved, and this is done in the ALTO Entity Domain specification of the draft [draft-ietf-alto-unified-props-new].

4. Proposed format for ALTO cell identifiers

4.1. Endpoint address canonical string format

'ecgi:' MCC '.' MNC ':' ECI

Where:

- o MCC: Mobile Country Code, as assigned by ITU. A 3 digits decimal number without leading zeros.
- o MNC: Mobile Network Code, as assigned by National Authority. A 2-3 digits decimal number without leading zeros.
- o ECI: E-UTRAN Cell Identifier. A 7 digits lower-case hexadecimal number.

Example:

- o ecgi:940.978:1234abc
 - * MCC value 940 stands for country or geographical area "Wonderland"
 - * MNC value 978 stands for Network N1 in Wonderland and other networks in other countries
 - * A same MNC value, say 020 may be associated with several MCCs.
 - * Some MCCs have MNCs encoded with 2 digits and MNCs encoded with 3 digits.

4.2. ALTO Cell Id formats

Three formats are proposed:

- o 'ecgi:' MCC
- o 'ecgi': MCC '.' MNC
- o 'ecgi:' MCC '.' MNC ':' ECI-MASK '/' MASK-LEN

where:

MASK-LEN is a decimal number.

ECI-MASK is a string of lower-case hex digits, of which all but the first MASK-LEN bits are zero.

Prefix ecgi:P-MCC.P-MNC:P-ECI/N matches ecgi:MCC.MNC:ECI iff

MCC == P-MCC, and

MNC == P-MNC, and

ECI has the same number of hex digits as P-ECI, and the first N bits of ECI match those of P-ECI.

5. Examples

- o ecgi:940
 - * Matches every cell address with MCC 940.
- o ecgi:940.978
 - * Matches every cell address with MCC 940 and MNC 978.
- o ecgi:940.978:1234800/18
 - * Matches every cell address with MCC 940, MNC 978, and a 7-digit ECI that starts with the 18 bits 0x12348. Thus it matches ecgi:940.978:1234abc and ecgi:940.978:1234800, but does not match ecgi:940.978:1234d00.

6. IANA Considerations

This document extends: the ALTO Address Type Registry defined in section 14.4 of RFC7285 and the ALTO Domain Entity Registry defined in [I-D.ietf-alto-unified-props-new]. If the latter is considered a superset of the former, it seems consistent to register only a new Entity Domain named "ecgi". This requires that implementations not willing to use the (Filtered) Property Map Service and related Entities should still be cognizant of the ALTO Domain Entity Registry. Potential extensions are as follows:

- o The ALTO Address Type Registry defined in section 14.4 has an additional item with the following properties:
 - * Identifier : ecgi
 - * Address encoding: see section Section 4
 - * Prefix encoding: TBC
 - * Mapping to/from IPv4/v6: none
- o The ALTO Domain Entity Registry has an additional element with the following properties:
 - * Identifier : ecgi
 - * Entity Address encoding: see section Section 4
 - * Field to be updated as [I-D.ietf-alto-unified-props-new] progresses: indicating that this entity domain can also be used as an ALTO Address Type
 - * Hierarchy and inheritance: TBC

7. Security Considerations

TBC

8. Acknowledgements

Great thanks to Wendy Roome who initiated this document and Qin Wu for discussions.

9. References

9.1. Normative References

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9.2. Informative References

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Appendix A. An Appendix

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