



Information – Using a shared MNC for M2M

This document contains background information based on recent implementations by m2m operators and on earlier research by Stratix on the use of a shared MNC. Using a shared MNC for m2m gives flexibility with regards to the use of public mobile networks and allows large-scale m2m deployments to switch network operator without replacing SIM-cards.

Introduction

An important open question regarding regulation for M2M services is the lock-in that the current IMSI numbering scheme creates. The inability to switch between network operators is an important obstacle for large-scale M2M applications, in particular those are supposed to work without being serviced very often. In the Netherlands these challenges for large-scale M2M applications using mobile networks have been recognized by the ministry of Economic Affairs. Basically, there are two options for the ability to switch. One is to use a reprogrammable sim-card that can be reprogrammed over-the-air to accommodate a new IMSI and keys after the initial deployment. The second is to assign a dedicated (sub) MNC range for specific applications to the M2M-user (for example smart meter providers) instead of to the mobile operator.

Stratix has investigated this second solution for the issue of switching between operators for the Dutch Ministry of Economic Affairs, and the ministry has in 2015 adapted the IMSI number plan to allow for such use of shared MNC. This allows for the use of operator-independent IMSI numbers for large-scale M2M applications, based on a shared Mobile Network Code. This allows M2M operators to negotiate contracts for capacity on the commercial networks using a sub IMSI-range of this shared MNC, providing flexibility without replacing SIM cards.

Using a shared MNC for M2M

In order to allow users to choose mobile networks and providers separately from client devices (like phones), SIM-cards (Subscriber Identity Modules, or SIMs) are used. Switching between providers is done by replacing the old SIM with the one provided by the new network provider.

However, in the case of machine-to-machine communication (M2M) switching between network providers is more problematic: M2M applications are often harder to access, for example in the case of sensors 'in the field', underground, or behind closed doors, making a SIM-swap more difficult. Also, the actual SIM might not consist of a card, but be soldered on a printed circuit board inside the machine. This inability to switch between mobile network providers is a problem for M2M operators, especially if applications are meant to work independently for a period of time longer than the contract with the mobile provider. For example, automated energy meters in homes are supposed to be operational for at least 15 years without intervention by a mechanic.



A solution is to assign a Mobile Network Code (MNC) to a large scale M2M operator. This gives them control over network choice and allows “wholesale access” through a roaming/MVNO model. However, the number of available MNCs is limited, in the case of 2-digit MNC’s there are just 100 MNC’s possible, with a number of the MNC’s already in use by the MNO’s and MVNO’s.

Assigning a specific MNC for M2M-applications to be shared by various M2M operators can solve this issue of ‘mnc scarcity’. Each M2M-operator is assigned a sub IMSI-range of this shared MNC to identify their devices and to buy access to the mobile networks of one of the commercial network providers, see figure 1.

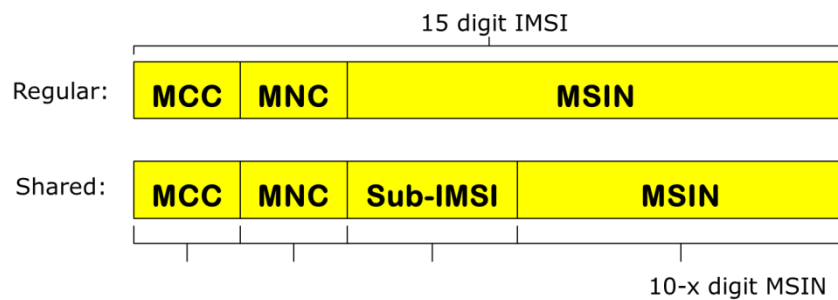


Figure 1: The first digits of the MSIN of the regular IMSI-number (top) can be used to create sub-imsi ranges for the use for various M2M-operators (bottom).

This ‘shared MNC’ can be implemented in the form of a ‘proxy-HLR’ which takes all requests for the MNC as if it were a ‘regular’ MVNO, and then forwards the requests depending on the sub range involved to the user of that sub range. In this way the users of the shared MNC can act in a similar way as an MVNO, allowing them to operate their own core, and to negotiate contracts and switch network providers without swapping SIM-cards. See figure 2 for a high level overview of the architecture of such a system with a proxy-HLR.

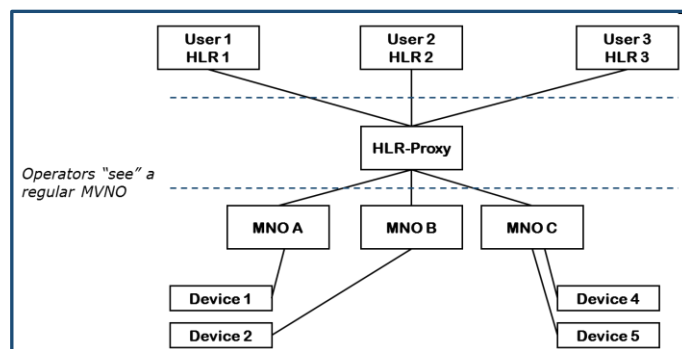


Figure 2 The use of an intermediate, independent ‘HLR-proxy’ allows the operators to ‘see’ a regular MVNO, while there can be multiple parties, each with a sub-IMSI range in their own HLR, behind this proxy.



First implementation

In the Netherlands it is (since 2015) possible to use a specific MNC for M2M-applications that can be shared by various M2M operators. Each M2M is allowed to use a sub IMSI-range of this shared MNC to identify their devices and to buy access to the mobile networks of one of the commercial network providers. A first implementation of a shared MNC for M2M is now realised in the Netherlands. Enexis, an energy grid operator, implemented the necessary systems to use a shared MNC that allows them to switch operator at a later stage. This reduces the risk of needing to change sim-cards in millions of smart meters being deployed.

Summary

The Netherlands has changed the IMSI number-plan last year (2015) to allow for more flexible use of MNC's and to allow for the use of sub-range for M2M. The first implementation of a system to support this kind of usage is implemented for connecting millions of smart meters. Although the first large-scale migration of devices using a shared MNC has still to take place, the use of a shared MNC promises to give the M2M operator the flexibility to switch at a later stage.

Appendices

Documents related to use of shared MNC's:

- "Shared MNC for M2M", presentation, Stratix, 2013 (English).
- "Gedeeld gebruik MNC's voor M2M toepassingen", Stratix, 2013 (Dutch)
- "Onderzoek flexibel gebruik MNC's", Logica, 2010 (Dutch)
- "Nummers voor machines, implicaties van M2M toepassingen voor het nummerplan.", Stratix 2009 (English summary, Dutch report)

Related documents:

- "Internet of Things in the Netherlands: Applications, trends and potential impact on radio spectrum", Stratix, 2015 (English)

More information

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