



GSM Association

Subject: Mobile Network Codes (MNCs) – Change from 2digits to 3 digits

The GSM Association (GSMA) has recently been following the developments on the expansion of Mobile Network Codes (MNCs) from 2 to 3.

The GSMA, as the premier global body behind the world's leading wireless communications standard, protects and enhances the interests of 678 GSM mobile operators from 209 countries and territories with more than 1 billion customers throughout the world today.

The GSMA has concerns related to the allocation of MNCs and its change in some cases from 2 digits to 3 digits and would like governments and regulatory authorities to take these concerns into account when allocating numbers to operators.

European operators have been issued 2-digit MNCs by their regulators for many years, therefore they have built their systems/infrastructure to support 2-digit MNCs.

In the past only North America and a few other countries have used 3-digit MNCs. These 3-digit MNCs always ended in '0' (zero) and therefore could be treated as 2-digit MNCs. The '0' (zero) is dropped/ignored and operators are able to uniquely identify their roaming partner based on the first two digits of the MNC.

The GSMA is now aware of countries where multiple 3-digit MNCs have been issued by regulators where the first two digits are exactly the same. Although according to the specifications this is acceptable it is a problem for many operators whose systems are only set up to accept 2-digit MNCs.

Enlarging the length of the MNC to accommodate 3-digit MNCs (filename length, field and record length) is a major change to the entire systems such as the rating engine, the TAP engine, the billing system and the data warehouse.

Further to its preliminary analysis, the GSMA shares such concerns and believes a change in MNC from 2 to 3 digits is most likely to have severe implications for almost

the entire GSM system (please see Annex). The main consequences from our point of view would be:

- **Call back of the released 2-digit SIM card** – this could affect all current GSM users (around 500 million in Europe).
- **The handset display may not be ready for such a change** – this could cause severe confusion with all existing GSM handsets.
- **Change of all existing roaming agreements** with the need to re-run all the performed tests.
- **Enormous efforts in terms of investment and manpower** in order to change network elements and billing systems, thereby reducing the innovation power of mobile operators.
- **Inability for many operators to roam with the second operator** where 3-digit MNCs have been issued in a country with no ability to identify an operator by the first 2 digits.

Therefore we strongly encourage governments and regulators to undertake a cost/benefit analysis when allocating MNCs. We would suggest allocating either 2-digit MNCs or alternatively 3-digit MNCs where the operator can be uniquely identified by the first 2 digits.

You will find attached an analysis paper expressing the views of the GSMA operators. The paper seeks to outline the technical issues relating to the introduction of 3-digit MNCs and the possible consequences associated to this change.

I hope the attached document will be of interest to you.

Yours sincerely,

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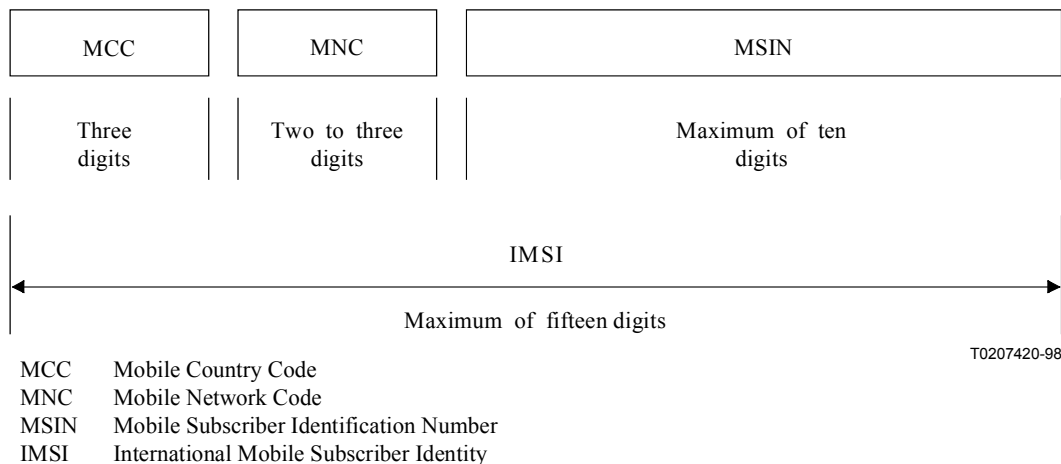
Annex

Technical Issues Relating to the Introduction of Three Digit Mobile Network Codes (MNCs).

1 Introduction / Background

According to IMSI structure defined in ITU E.212 an MNC can have two or three digits.

The IMSI structure and format are as shown in Figure 1.



(Figure 1 IMSI Structure)

The MNC is an inner element in the IMSI with a defined length of 15 digits. The whole IMSI is marked on the SIM-card. To this extent, the IMSI must not be mismatched with the subscriber's number which is e.g. in GSM an E.164 number.

Various GSM entities will interpret the extra MNC digit as part of another field (MSIN), which will consequently lead to inconsistencies within the interaction between various parts of the whole GSM System.

The IMSI is used to identify a (roaming) customer, for network internal purposes used in all signalling in the PLMN, in interaction with the Mobile Terminal and for BackOffice applications like charging, billing and accounting.

As the National Regulatory Authorities (NRAs) are responsible for the establishment and publication of conventions for IMSIs ($IMSI = MCC + MNC + MSIN$), the change of the current MNC allocations (e.g. 03 may become 030 or 003) may lead to severe problems given that the length of the IMSI is fixed and the structure / usage of the MSIN is subject to each individual operator.

It should be noted that for the time being, out of a total of 300 MNCs actually in use, 14 are 3-digit MNCs. Furthermore, there are no assignments for 3-digit MNCs outside the US, where 5 US Operators were assigned such MNCs. In terms of operators this corresponds to 1.7 % of the GSM Operators.

2 Technical implications derived from the introduction of 3-digit MCNs

Below we find some of the technical applications derived from the introduction of 3-digit MCNs. However this paper does not in any case try to be exhaustive and further in depth analysis is required.

2.1 SIM Cards

The IMSI is an inherent part of all SIM cards. This would hence require a replacement of all existing SIM cards with new ones. Taking into account the number of mobile users and prepaid cards, such exercise is practically not feasible (e.g. in Germany about 35 million of SIM Cards are produced, or submitted to the customers, with a rapidly increasing proportion of prepaid cards). The costs of this procedure are expected to be quite high due to necessary production of new SIM cards, SIM card distribution and logistics, customer service, activation of the new SIM cards, and customer handling. The activation/provisioning part raises questions about the capacity of the IT and networks systems. It would be quite likely that most operators would be forced to build up additional capacity to be able to manage the migration. Some customers would experience problems and would temporarily be unable to use their mobile, which means loss of revenue from the operator's point of view. In addition to this, it is doubtful that SIM card chips, which are already due to the strong demand in short supply, can be produced to serve all carriers in due time.

As a result of this, the co-existence of 2 and 3-digit MNCs can only be the subject of further analysis.

2.2 Handsets

The introduction of a 3-digit MNC will certainly result in a number of compatibility problems between existing mobile equipment and the SIM, and also very likely between the mobile station (MS) and the network. With respect to compatibility problems in the interface between SIM and the software of mobile equipment (ME), two cases can easily be identified:

- 1) SIM with a new IMSI structure built up by three digits MNC combined with an ME running old software that isn't prepared for the new IMSI structure. The ME will in this case attempt to read the extra MNC digit as part of another field. This case will be difficult to solve, as there are about 250 Million legacy mobiles in operation throughout Europe.

- 2) SIM with an old IMSI structure build up by two digits MNC combined with a ME running new software, expecting the new IMSI structure. Here it is much easier to find a solution, but the problem has to be addressed in order to find some kind of IMSI type identification on the SIM.

In any case a large number of terminals would have to be replaced and very long lead time (longer than the typical life span of a mobile terminal) would have to be allowed.

2.3 Network

The IMSI analysis would need to be redefined. All subscriber records would need to be modified to change the MNC from 0X to 0X0 or 00X. In the case of multiple Home Location Registers (HLRs), as is the case with nearly all operators, the level of planning and coordination would be substantial.

In the case of redundant HLRs, the data would need to be changed on both the live and backup locations.

In addition to this, many of the operators would have to reconfigure their base station subsystem so that it transmits a Location Area Identity (LAI) which contains the new 3-digit MNC.

2.4 Billing & Customer Care Systems

The billing systems of most networks use the IMSI for the generation and gathering of billing information. A change in the MNC would require severe modifications to billing systems and protocols. All effected subscriber records would need to be modified TAP-Files (TAP-Incollect/Outcollect) TAP 2 / TAP 2+/TAP3.

2.5 Roaming

Regarding roaming, the IMSI analysis for all European operators will have to be changed in every MSC. All roaming testing would have to be redone and would be more complex. Finally, operators would have to change their roaming contracts with each of their roaming partners. This will have an effect on nearly every country using GSM. Hence, if the roamed-to network cannot scrutinise 3-digit MNCs, roaming would stop overnight.

2.6 Fraud Prevention / Management

The IMSI is a data element commonly used by the operator community to detect fraud. To change the format of the IMSI would render most detection and prevention useless thereby exposing networks to increased financial loss.

Historical searches for IMSIs spanning the transition will have to be split into two reports, one before and one after search. Usage variation alarms for all the numbers that change will effectively start from scratch. Similarly, any IMSIs that had previously been hot-listed for the purposes of fraud monitoring would need to be replaced.

One impact, from a fraud and security point of view, would be the cost of modifying fraud management systems that are currently used by home networks to monitor for fraudulent calling patterns based on individual IMSIs. It also likely that the length of time it would take to run the additional reports required would increase.

GSM operators currently have mechanisms in place that allow for the exchange of IMSIs, and other data, which may identify fraud. Such exchanges can be transacted electronically through the use of near real time data exchange systems across the SS7 signalling network. Such systems would need to be upgraded to accommodate changed MNCs.