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Title: **Liaison statement to ECTRA and 3GPP on Mobile Virtual Network Operators**

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Date: **12 June 2001**

Document for: **Action**

Note: *This liaison statement was initiated at the closing plenary of the SPAN11 interim meeting, 14 to 18 May 2001, but was revised following debate on the SPAN11_NAR exploder after the meeting.*

Through this liaison, SPAN 11 kindly requests your assistance with providing information about the definition, nature and current regulation of Mobile Virtual Network Operators (MVNOs). The information needed covers the definition and the nature of MVNOs and also the regulation applied to them in the different European countries.
This need arises because SPAN 11 is contributing to work on the possible use of 3-digit E.212 Mobile Network Codes (MNCs) within Europe generated by possible future needs, particularly those of MVNOs. In this view, it is essential to know if MVNOs need their own MNCs or not.

Background

The format and use of MNCs is specified in ITU Recommendation E.212 ("The international identification plan for mobile terminals and mobile users"). Being the second field of the

International Mobile Station Identity (IMSI), the MNC uniquely identifies the home network of a mobile terminal or a mobile user within a country or a group of Networks.
For countries, the number of digits of the MNC may be 2 to 3 digits : the choice of this length is a national matter.
Up to now, European countries have chose to use MNCs exclusively in 2-digit form .

Arising from work in the UMTS Forum on naming, addressing and identification issues associated with the commencement of third generation mobile services, there is concern in some circles, including the European Commission and some national regulatory authorities, that the quantity of MNCs available under a 2-digit scheme in a given country may, in the medium- to long-term, be exhausted for the following reasons mainly related to the arrival of new actors :
- existing mobile networks which may need additional MNCs due to exhaustion of their stocks of International Mobile Station Identities;
- third generation mobile networks which will need new MNCs;
- TETRA networks providing inter-system roaming capabilities;
- MVNOs;

– and in the longer term –
- m- and e-commerce providers;
- fixed networks with mobility requirements.

MVNOs are the group of actors from which some people believe the greatest demand for new MNCs will come.

A major difficulty faced by a number of forums which have attempted to address the possible introduction of the use in Europe of 3-digit MNCs is understanding what are MVNOs and under what circumstances they will require MNCs.
This liaison seeks your assistance in improving this understanding.

Assistance Sought

SPAN 11 sums up here what they know about MVNOs :
SPAN 11 understands that a MVNO is generally regarded as an organisation that offers mobile subscription and call services to customers, without having an allocation of spectrum. Consequently, a MVNO would contract with one or more mobile network operators for the use of their networks. Within this definition, there is potentially wide scope for different types of mobile virtual network operation, and for different modes of interaction between MVNOs and mobile networks.

It has also been postulated that MVNOs would integrate different elements of fixed and mobile voice, data and content services in a way that might be more difficult for conventional mobile network operators.

About regulation of MVNOs, SPAN 11 is only aware of the UK national regulatory authority statement published in 1999 regarding the approach it should take to regulation of the mobile market in relation to the establishment of mobile virtual network operations (see http://www.oftel.gov.uk/publications/1999/competition/mvno1099.htm). Even if highly valuable, this information does not give a comprehensive view of all the different regulating approaches.

Other information about MVNOs is available on the ITU web-site at http://www.itu.int/osg/sec/spu/ni/3g/Resources/MVNO/ .

SPAN 11 seeks your advice on the following questions:
- From a perspective of technical feasibility, what types of mobile virtual network operators may emerge in the mobiles market?
- What would be the infrastructure profiles of these different types of virtual operators?
- Taking account of the different infrastructure profiles, to what extent would it be necessary for these different types of virtual operators to have a MNC separate from that the mobile network operator or operators whose network or radio facilities they each use?
- Taking account of the different infrastructure profiles, to what extent would it be desirable for these different types of virtual operators to have their own MNC? The answer should encompass the perspective of a MVNO, of an operator whose facilities they use and also the perspective of the regulators
- What are the different national approaches for regulation of MVNOs (e.g. definitions, licenses, fulfilment of particular points, roaming)?

SPAN 11 proposes to use the information that you provide to:
- Improve its own understanding of possible market structures involving mobile virtual network operators, and the numbering, addressing and routing implications of these market structures;
- Incorporate it into work being progressed about the possible use of 3-digit MNCs within European countries.

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Annex B – Technical issues

Background

1 For background information, the non-technical reader is advised to read the original consultation technical Annex. Figure 1 below is a diagram of a typical Global System for Mobile Communications (GSM) network that was used in the initial consultation, and it is included here to help clarify the discussion below.

2 If Oftel were to ever become involved in any regulatory intervention on this issue it would not seek to get involved in detailed technical negotiations in the first instance. Oftel would only seek to make a determination on those technical issues that cannot be resolved. Commercial negotiation and agreement are preferable to regulatory intervention.

Fig. 1
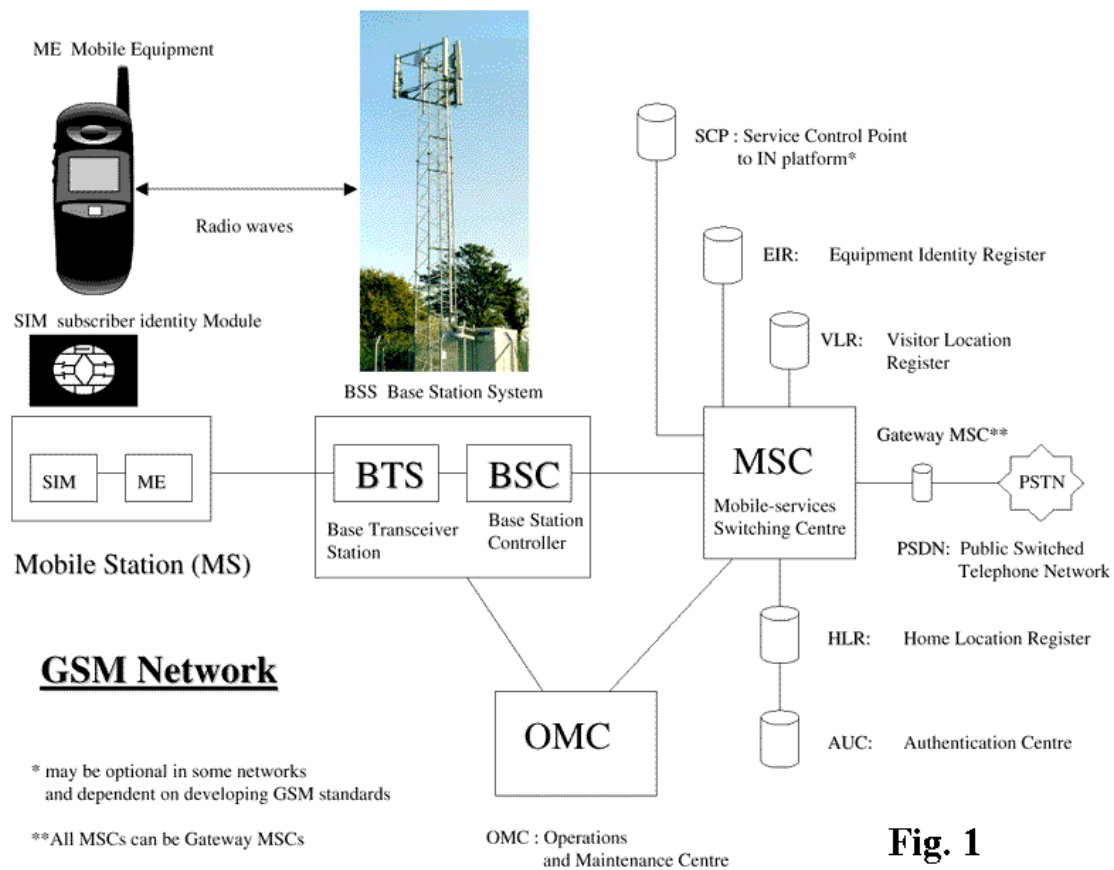
What is an MVNO?

3 An MVNO [mobile virtual network operator] is an organisation that provides mobile telephony services to its customers but does not have an allocation of spectrum. The MVNO must use part of the MNO's [mobile network operator] network in order to provide services. The extent to which the MVNO would use the network elements of the MNO was discussed

in the consultation document. Most proponents of MVNOs indicated that there was the most interest in 'full MVNOs'. A full MVNO is one with a Home Location Register (HLR), Mobile Switching Centre (MSC), Authentication centre (AUC), Equipment Identity Register (EIR) and associated signalling capabilities. A Subscriber Identity Module (SIM) card controlled by the MVNO is recognised as a key requirement of an MVNO. The MVNO would probably also require an Intelligent Network (IN) platform if it wished to provide its customers with its own value-added services rather than relying on those available from the host MNO.

Call routing

4 The ability to have the SIM card route outbound calls without the need for customer input override codes is a major advantage, although this could be possible for an IA [indirect access] operator with control of their own SIM card. Swisscom has developed a SIM card application platform called NATELsicap that modifies the header of a mobile terminated SMS (Short Message Service). The SIM can then distinguish this SMS from normal text messages. The 'Sicap' message is used to modify the subscriber options in the SIM service table. This mechanism would appear to be most of the functionality required to realise the control of outbound calls. Developments within SIM-toolkit (next generation of SIM cards) would also seem to make this type of call control technically feasible (see below).

5 Inbound calls could be routed directly to the 'full' MVNO's Gateway MSC (GMSC) and then routed using data in the MVNO's HLR. If the MVNO had the use of more than one mobile network, the MVNO could choose over which mobile network to deliver the call. If the MVNO could update the SIM card remotely, the MVNO might select the mobile network to use based on the lowest call termination charge. Once the MVNO has decided over which mobile network an inbound call will be delivered, it will route the call to the relevant MSC of that mobile network. The call would be passed to the MNO and terminated in the normal manner. It could take around 30 seconds for a mobile to change 'connection' from one mobile network to another; this means that the MVNO's ability to switch its customers from one network to another in 'real time' (ie during call set up) could be limited.

6 For outbound calls, the MVNO would want to route the call away from the visited network to its own network at the earliest opportunity. This might involve some form of targeted transit type product provided by a third party (such as BT). This recognises on a call-by-call basis that certain calls (in this case outbound MVNO ones) should not be passed on in the normal manner by the MNO, but directly to a particular point (MVNO switch) regardless of the number dialled by the MVNO customer (except perhaps for emergency calls).

What is now possible for operators without MVNO status?

7 Technically, the majority of the services proposed for an MVNO could be implemented by using a combination of fixed telephone lines with cordless/ GSM handsets, with the added functionality of IA on mobiles and 'one number' or 'follow me' type services.

8 One could conceive of a fixed operator with a customer who had a DECT phone (Digital Enhanced Cordless Communications Telecommunications) with a base station at home and at the office. This type of service would have very limited geographic coverage compared to that offered by mobile networks. Inbound calls could be routed using one number and follow me type services, with outbound calls controlled by the consumer/ caller. With such restricted coverage however location based services are of limited value.

9 A customer could have a DECT/ GSM phone (such as BTCellnet's Onephone). With this type of phone, an outbound call could be routed via the DECT service when this is available (ie one is in range of the base station). The consumer would be able to manually select either the DECT or GSM routes. When a DECT outbound call is not possible the consumer would have the option to use IA (when available) on GSM to route his/ her call.

10 For an inbound call, the operator may have the ability to route the call from their switch to either the DECT or GSM element using a 'follow me/ one number' type service. An operator may be able to automatically determine if the customer's mobile is within range of the DECT base station and then using this information route the call over the fixed line instead of the mobile network. Without this ability the notification of where the consumer was would need to be sent manually. Another option might be to try the DECT phone first and then the GSM phone.

11 To date DECT/ GSM phones have not been widely available. This may be due to the extra cost of the handsets. Using a DECT/ GSM type solution means that the vast majority of consumers would not be able to currently use such a service unless they changed their handset. It may be that in the near future the cost of these combined handsets may come down in price as the price of DECT only phones has.

12 This combination of DECT and GSM could probably offer most if not all of the services mentioned for MVNOs in responses to the consultation, albeit in a less elegant technical manner. This would result in more inputs (access codes, changed location, etc) being required from the consumer. A DECT/ Fixed phone only combination would be limited in terms of coverage and hence location based value added services.

What services would an MVNO offer?

Fixed Mobile Convergence

13 Many proponents of MVNOs quoted the benefits of integrated fixed and mobile services, and one bill for fixed and mobile calls. An MVNO would have the capability to intelligently route inbound calls and outbound calls. MVNO functionality would obviate the need for consumers to enter manually a message to their service provider each time they changed location. With MVNO functionality this could be provided seamlessly. It would also do away with the need to enter override codes to control outbound calls.

14 Outbound call control will be possible with IA, but the control of a SIM card does give the benefit of making this easier for the consumer. One of the other possible advantages of an MVNO would be access to customer location. Using information such as cell ID (ie which radio cell the customer is in) will give an MVNO the ability to offer targeted location information. Due to the large variation in cell size this may be imprecise (a cell may be a few kilometres in size). Future development work is ongoing within the GSM community to offer more accurate location information. This has been spurred on by regulatory requirements for location information for mobile emergency calls in the USA.

Value added services

15 An MVNO may rely on CAMEL (Customised Applications for Mobile Network Enhanced Logic see below) to provide its customers with value added services and features which require the MNO to use intelligence in the home network (the MVNO) throughout the duration of the call.

16 Some value added services that can be provided by an MVNO will only be dependent on the size of the 'bit pipe' that GSM offers. Services such as internet browsing and file download which are transparent, and will not rely on any specific GSM capabilities. These types of services could be offered by a fixed operator using a home or office cordless phone (such as DECT) connected to the fixed network or a GSM/ DECT phone. Others will be specific to GSM capabilities such as location based services or those reliant on the SIM card for authentication of financial transactions. Due to the inherent security of a SIM card it could be an ideal platform for e-commerce type applications.

17 Consultation respondents suggested that MVNO's will be more focused on delivering value added content services and will offer a greater variety than might otherwise be available.

Implementation

18 Respondents made the point that to date in the UK only two IN services have been implemented across different mobile networks; these are Mobile Number Portability (MNP) and SMS, which required extensive discussion within the industry and compatibility testing. Concern was raised that if MVNO type services are to be implemented they should go through the same form of process. This could entail the formation of a NICC (Network Interoperability Consultative Committee) group, along the lines of the one used to implement MNP. This would involve the industry trying to agree a technical implementation that would in all likelihood take many months.

19 The decision to implement such an approach (ie formation of NICC type group) could only be made if and when Oftel regulatory intervention on this issue occurred or appeared likely. It would depend (in part) on the technical complexities that presented themselves at that time. Oftel would need to be satisfied that any implementation had no significant detrimental effect on the mobile networks in terms of security or reliability or quality of service.

20 There would be costs involved with the implementation of MVNO type services. These would fall into two main categories: one off costs involved in adapting the MNO equipment, and ongoing costs involved in maintaining MVNO customers ability to use a mobile network. These might include software upgrades, extra switching capability, modification to billing systems, etc. An exact figure on such costs is not available to Oftel at this time. Without detailed work on how an MVNO would be implemented a more accurate figure is hard determine.

21 It appears to Oftel, however, that such costs would be in excess of those involved in IA that is the ability of a mobile subscriber to 'use' another network. In the fixed world, an example of IA would be a BT subscriber dialling a 132 prefix to make his/ her call via Cable and Wireless.

22 Unlike IA the MVNO would also handle the inbound call, and would probably wish to offer their own value added services. This would be likely to require more complex interworking processes to be implemented. Oftel has stated its intention to require IA under the European Union Interconnection Directive (for BTCellnet and Vodafone), but this has yet to be technically implemented on mobile networks within the UK.

Capacity planning

23 GSM network Quality of Service (QOS) could be undermined by extra traffic generated by an MVNO, so how will this be planned for? The MVNO could be required to provide forecasts of traffic to the MNO. This must be sufficiently accurate so as to allow any extra capacity that is required in specific areas to be catered for by the MNO. If the traffic forecasts did not prove accurate enough then agreed contingencies should be used. This would be the subject of commercial negotiation normally.

24 This issue of capacity might be aggravated by the projected growth in data services which would add extra parameters such as guaranteed delivery times and bit error rates needing to be considered.

Security

25 How will operators be able to maintain the integrity and security of their networks to full MVNOs with possible access to sensitive databases and signalling? Operators can take such measures as can be demonstrated to be required and proportionate. Oftel would expect reasonable measures to be possible by mutual agreement and inherent in GSM standards. Oftel hopes that the standardisation process within ETSI for CAMEL and SIM toolkit will help to address these issues. To an extent current international roaming means that security issues have already been addressed. It is recognised that they are voluntary agreements but might serve as useful templates in any future negotiations.

Mobile Network Codes

26 The current regime for allocating GSM Mobile Network Codes (MNCs), which are administered by the Department of Trade and Industry, does not appear to require significant amendment for MVNOs currently. Using the currently proposed principles should be sufficient to meet the projected MVNO demand for MNCs. These principles include that the applicant for an MNC being able to demonstrate that a roaming agreement is (or will be shortly) in place, and also a proposed 12 month 'use it or lose it' clause. Should MNC demand linked to MVNOs rise then other allocation methods may be required, as might the need for MVNOs to share MNCs.

27 The ability to have an MNC (or number subspace within one) would however allow an MVNO to issue its own SIM card and to have full control of that SIM card using over the air signalling.

MNO New Services

28 Will MNOs be prevented from implementing new services because of need to maintain backward compatibility with MVNOs? As Oftel is not currently proposing any determinations be made on MVNOs this would be a matter for commercial negotiation. GSM standards such as CAMEL would hopefully help overcome some of the technical problems and make it possible to implement new services for roamers without the need to extensively change the host network and vice versa. However should this be an issue for Oftel to determine, a view would need to be taken as to how proportionate the proposed action by the MNO is. Issues such as the purpose of the proposed change, how often such changes occur and the net benefit to consumers would need to be considered.

29 Oftel would not seek to unnecessarily deny new and innovative services to consumers. The two extremes might be changes proposed by the MNO to solely disadvantage MVNO,

and an MNO being held back from implementing new and innovative services by an MVNO with poor technical implementation.

Technology enablers

SIM toolkit

30 SIM toolkit is the GSM implementation of intelligent SIM cards in mobile networks. SIM Toolkit offers extra functionality than is available in older GSM SIM cards. Initially SIM cards were in effect 'slave' units within the handset. They provided information when the handset or network required it, and stored information that the networks required for authenticating and ciphering mobile calls. The original concept was that a subscriber would be able to use different phones on his/her subscription, rather than being tied to one particular phone.

31 The new generation of SIM cards with their increased processing power and memory can now act as 'master' units in the handset. That is they are proactive and can initiate calls/functions and override the handset commands and what appears on the handset screen. It would appear that the functionality offered by SIM toolkit will now or very shortly offer the capability to significantly enhance the services offered to roamers in the sense of keeping the functionality of the handset apparently the same. That is the SIM card will recognise when the user dials home network specific commands and may 'translate' them to those compatible with the host network. It should also be possible to alter the number dialled by the caller to include the IA type override codes if required.

32 Using SIM toolkit cards it should be possible for an MVNO to route customer outgoing calls on a call by call basis. With access to Short Message Service (SMS) facilities it should also be possible to change this profile over the air. That is by sending a radio signal to the mobile, and not require the subscriber to take his/her phone to a service centre. This could be a major advantage over IA due to the perceived customer unwillingness to enter override codes (although an IA operator with control of its customers SIM card might be able to overcome the need for the customer to enter access codes). This ability to route calls via different mobile networks would require an MVNO to have agreement with more than one MNO.

CAMEL-IN

33 Customised Applications for Mobile Network Enhanced Logic (CAMEL) represents the attempt of the GSM standardisation community to implement Intelligent Network (IN) technologies in mobile networks. The main concept of IN being the flexible implementation of services in public networks. This is done by having basic call functions within the MSC/ GMSC and having the intelligent service control functions in a centralised location that is connected to all the MSC/ GMSC. For MNO's this means that their own service can be implemented quicker and more easily because only one network node (one point in the network) needs to be updated, rather than many points (ie all MSCs). This can drastically reduce implementation times and costs. It also (in theory) reduces compatibility problems.

34 It is recognised that another benefit is to the services offered to roaming customers from another network. Currently services are limited to those available on the host network. When a subscriber roams his/ her service profile is transferred from the home network to the host one. This contains a profile of the value added services available on the roamer's home network. Subject to commercial agreement between the two networks and the services being

available on the host network, these will be available to the roamer. But they are the host network's implementation, and as such may appear 'different' to the roamer. That is different key sequences are required to access them. With CAMEL-IN the host network is only responsible for basic call processing, the extra intelligence to provide value added services resides in the home network. This means that each call relies on intelligence from the home network, and will need the home networks participation on a call by call basis. This does not necessarily happen currently for roamers, where information may be exchanged periodically (say every 24 hours) relating to billing only.

35 Value added services are seen as a key feature for MVNOs. It has been suggested that MVNOs will be able to provide such services to customers in shorter time scales than MNO's due to their main focus on such services. They quote SMS interconnect delays in UK and the relative lack of SMS based value added services in UK compared to abroad as an example of this.

Note: The photograph in Figure 1 has been reproduced with permission from *Mike P's UK GSM & UMTS Pages* at http://www.prattfamily.demon.co.uk/mikep/gsmnet.html