Executive summary

Following a first white paper drawing upon interviews with mobile network operators in 3Q 2014, EY decided to perform a second round of interviews to understand market changes following recent announcement by companies in the mobile telephony ecosystem.

This second round of interviews during Q2 2015 was extended to include device and SIM card manufacturers. Our seven key findings were:

1. Embedded SIMs are now a mainstream technology in the machine-to-machine market, especially in the automotive/connected cars arena, because this technology brings multiple benefits for car manufacturers.

2. Adoption of embedded SIMs now appears a credible scenario in consumer markets (including smartphones), since some original equipment manufacturers (OEMs) are now willing to launch devices containing them, and some mobile network operators are willing to participate in these commercial launches.

3. Commercial solutions will not necessarily be embedded SIMs but may be reprogrammable but removable SIMs such as the Apple SIM. This may prove a transition technology, allowing the ecosystem to move smoothly from traditional to embedded SIMs without major changes in mobile network operators’ operations.

4. The likely operating model remains to be decided. Several scenarios are possible: the solution may be operated by one mobile network operator for its own network, by a consortium of mobile operators (in a given country or region) or by an OEM worldwide.

5. Whichever model is chosen, cooperation of SIM card manufacturers will be essential since they alone master the technology and are independent third parties, able to manage multiple network encryption keys from participating mobile network operators.

6. Lack of standardization remains an obstacle to large commercial deployments – though this may be resolved by GSMA before 2016.

7. One additional commercial opportunity could encourage adoption by mobile network operators without an agreement on standardization. The sale of devices with embedded SIMs on by MNOs in developing markets would allow them to subsidize devices and accelerate smartphone take-up, thereby accelerating growth of their data revenues.
Context, objectives and survey methodology

Following issuance of the embedded SIM technical specification for M2M connections by GSMA in December 2013, EY surveyed 11 mobile network operators in three regions in 3Q 2014 and published a white paper in 1Q 2015\(^1\).

This white paper focused on five use-cases: two related to machine-to-machine and were based on GSMA technical specifications, and three related to consumer markets.

These were:

- Initial device provisioning
- Change of device connectivity provider during device lifespan
- Simplifying logistics
- Ability to connect on demand, anytime, anywhere, to any connected device
- Adapting subscriptions to device location

Our survey findings were summarized in the white paper “Mobile network operator on-demand subscription management study – March 2015”, available on EY’s website. However, since 3Q 14, the market has evolved significantly.

In particular:

- Car manufacturers have deployed remote provisioning solutions widely, making this a common technology in the M2M segment\(^2\).
- Apple launched the Apple SIM for iPad in October 2014 in the US and the UK, in partnership with four mobile network operators. Use of the Apple SIM was extended in July 2014 to mobile virtual network operators (MVNOs) such as GigSky and to around 10 other countries\(^3\).
- GSMA has started to work on further embedded SIM specifications, which are expected to be published in early 2016\(^4\).

Since these factors will change market dynamics significantly, EY decided to perform a second round of interviews, examining market changes between 2014 and 2015.

Note for the reader: Embedded SIM cards and Remote Provisioning SIM cards are not ‘Soft SIM’: The recent evolutions in Embedded SIMs and Remote Provisioning cannot be considered to be ‘Soft SIMs’ – the term ‘Soft SIM’ should not be used to describe any of the solutions identified in this report. The physical hardware element is always present and adds an indispensable layer of security. A ‘Soft SIM’ would be a solution with no SIM hardware and where all SIM functionality is carried out by a software layer\(^5\).

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\(^1\) Mobile network operator on-demand subscription management study – EY, March 2015
\(^2\) Source: Cars manufacturers
\(^3\) Source: Apple
\(^4\) Source: Financial Times
\(^5\) Source: GSMA – Understanding SIM evolution – March 2015
Our interviews generated seven key takeaways:

1. Embedded SIM is now a mainstream technology in the machine-to-machine arena, especially in automotive/connected cars applications, because this technology brings several benefits for car manufacturers. Latest forecasts from GSMA suggest that within a few years the majority of connected cars will use embedded SIM technology.

2. Recent announcements however have mostly focused on consumer applications, drastically modifying the main conclusion of our previous white paper. Operators are no longer unwilling to deploy embedded SIMs in smartphones. Some MNOs would weigh opportunities to partner with device manufacturers to launch and sell smartphones with embedded SIMs. The impact on the mobile market will be significant as smartphone shipments (about 1 billion units in 2016) greatly exceed sales of M2M and connected object (Internet of Things, IoT) shipments (about 50 million units in 2016).
3. Form factor remains an open question, since reprogrammable SIMs will not necessarily be embedded, but can be removable (e.g. Apple SIM). There may be a transition period in which multiple models coexist:
   • Near term, we may see the launch of reprogrammable but removable SIMs inserted by default in all devices sold. This will allow non-participating mobile operators and vendors in countries where reprogramming is not used to sell the same device without changes in the smartphone manufacturing process.
   • In parallel we may see the launch of embedded SIMs in devices with an additional slot for standard SIMs (since not all mobile operators will launch embedded SIM programs simultaneously).

4. However lack of standardization remains a challenge for large commercial deployments, since it is essential that companies in the mobile ecosystem have a fully-interoperable solution. Publication of a technical specification for consumer devices by GSMA would solve this problem.
5. Ownership of the solution is critical, however. We see various possible scenarios:
   - The solution may be led by one OEM (e.g. Apple SIM). This is relatively easy to set up since parties do not need to cooperate closely. However, this becomes complicated as take-up increases, since each OEM will set up its own solution.
   - Alternatively, the solution may be led by one operator (e.g. a multi-purpose SIM). This is also easy to implement, and does not require technology standardization.
   - Or the solution may be led by several MNOs and/or OEMs (in a consortium). This can be quickly scaled-up, but would be complex to set up since it requires standardization and cooperation between multiple stakeholders.

6. Reprogrammable SIMs are more an opportunity than a threat for SIM card manufacturers, since these solutions need an independent third party to connect participating mobile operators and device manufacturers, and to manage network encryption keys securely - which is the core business of SIM card manufacturers. Leading SIM manufacturers have proven solutions which can be deployed easily and quickly. Reprogrammable SIMs offer SIM card makers an opportunity to grow their solutions and services revenues, benefiting their profit margins.

**Illustrative: Operating model and main activities which need to be handled by subscription manager**

- **OEM-led**
  - Operating model: 1 OEM
  - Form factor: Removable or embedded
  - Scalability: 
  - Level of Cooperation: 
  - Example: Apple SIM

- **MNO-led**
  - Operating model: MNO
  - Form factor: Removable
  - Scalability: 
  - Level of Cooperation: 
  - Example: No market example

- **Consortium/hybrid**
  - Operating model: MNO
  - Form factor: Removable or embedded
  - Scalability: 
  - Level of Cooperation: 
  - Example: No market example

Source: EY Analysis & interviews
One additional use-case, not covered in the first study, would accelerate adoption of embedded SIMs, especially in emerging markets: the sale by mobile operators of devices with embedded SIMs in prepaid markets would allow them to subsidize devices, since the device will be locked into a particular network and swapping the SIM will be impossible.

- This use-case would solve a significant hurdle to adoption by mobile network operators in emerging markets – the risk that customers might acquire multiple devices or SIMs which would enable them to switch between operators on a daily basis, putting airtime prices under pressure.
- This model would also allow mobile operators to sell smartphones at a lower (subsidized) retail price, increasing the uptake of smartphones in emerging markets, and accelerating switchover from voice to voice and data usage in emerging markets.
- Modelling subsidies (see below) shows possible returns on investment for mobile operators from such a solution.

Illustrative: High-level economics of eUICC subsidization model on prepaid markets

Main assumptions

- No impact of eUICC on voice ARPU
- Development of a new data usage due to smartphone ownership (+1$/month)
- Decrease of churn rate due to the usage of a smartphone locked on the network: (from 6% to 5% churn per month) lifetime value increase from 16 months to 20 months
- 20$ subsidized on a 100$ Smartphone (-20$/acquisition)

Source: EY Analysis.
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Glossary

MNO: Mobile network operator
SIM: Subscriber identity module
eUICC: Embedded SIM
OEM: Original equipment manufacturer
M2M: Machine-to-machine
SMDP: Subscription manager - data preparation
SMSR: Subscription manager - secure routing
IoT: Internet of Things
Tethered: Smartphone used in modem mode
CLTV: Customer lifetime value

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