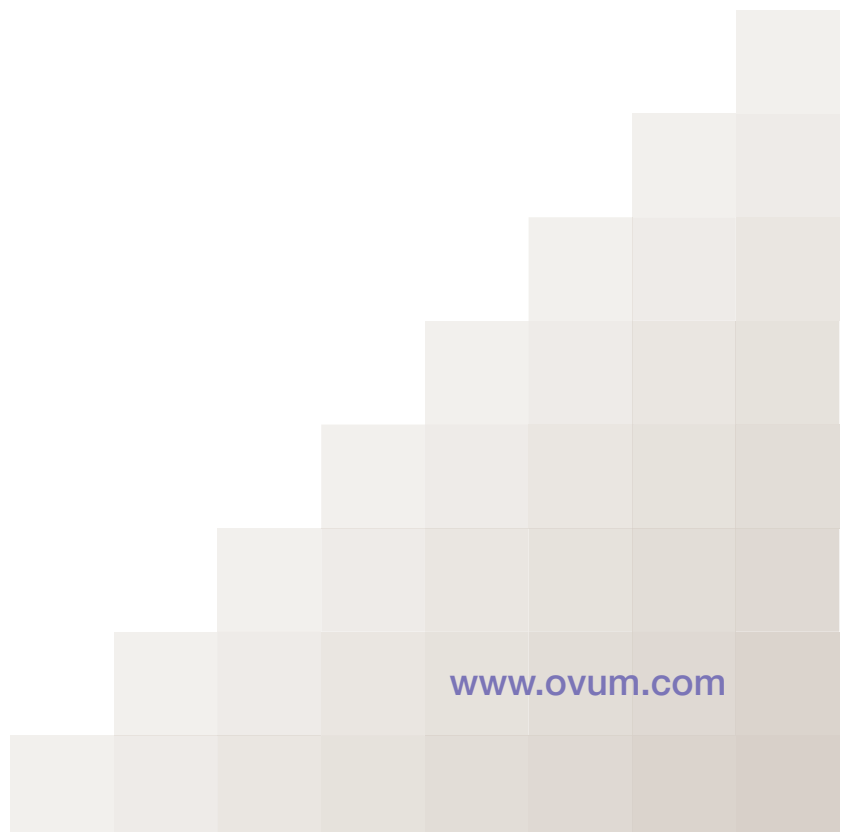




Driving efficiencies in the provisioning of SIM cards

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Table of Contents.....1

Driving efficiencies in the provisioning of SIM cards.....2

 Executive summary2

 Market context.....3

 SIM cards and operational inefficiencies require a solution.....9

 Improved SIM card process unlocks new revenue opportunity.....11

 Potential solutions: How to optimize the process.....13

 Competitors for operational solutions.....13

 Potential developments16



Driving efficiencies in the provisioning of SIM cards

Executive summary

In a nutshell

Saturation in mature markets, and low ARPU levels in emerging markets, is pushing operators to re-examine the provisioning process for SIM cards. The tendency for most customers to stay with one operator can no longer be assumed, and purchase patterns for airtime are becoming much more like those of fast-moving consumer goods. Implementing technological, and possibly commercial, changes to the provisioning process can result in significant cost savings and increased revenue opportunities.

Ovum view

In developed markets, operators are facing increased competition, a slowdown in growth, and steady if not dropping ARPU levels. In emerging markets, growth is stronger but ARPU levels are lower. In response, SIM cards are being widely deployed in large volumes, but the costs for this deployment are not as easily covered as in years past, leading operators to scrutinize the SIM card supply chain.

In fact, in many markets there is no longer a one-to-one correspondence between SIMs, devices, and subscribers. The automatic tendency for most customers to stay with one operator can no longer be assumed, and purchase patterns for airtime are increasingly mirroring those of fast-moving consumer goods. In this context, a new approach to provisioning becomes a necessity.

Therefore, a significant opportunity for optimization is to reconsider the point at which SIM cards are provisioned with a telephone number (MSISDN), and the associated provisioning of network elements, such as the HLR (home location register). Implementing technological, and possibly commercial, changes to this process can result in significant cost savings as well as revenue-generation opportunities.

Fast-moving companies such as Evolving Systems are taking advantage of this opportunity and bringing solutions to market. Incumbent providers like Ericsson may also alter their product roadmaps accordingly.



Market context

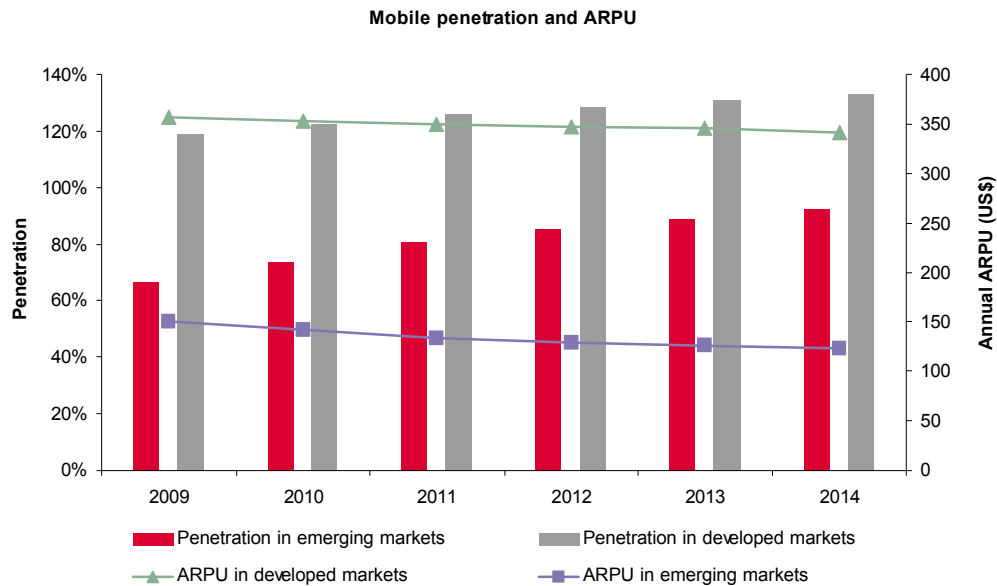
Revenues and margins shrink as the number of mobile connections and usage grow

Both emerging markets and developed markets have reached a point where mobile telecom operators are forced to scrutinize operational processes in order to find new efficiencies and cost-control measures. In total, the number of connections is expected to rise by 50% from 2010 to 2014, while revenues will grow only 33%. Mobile outgoing minutes of usage are set to rise by nearly 100% between 2010 and 2014, with voice revenues rising by just 15%.

In established markets, mobile penetration rates are at or approaching saturation and tough competition is forcing margins down. In emerging markets, while growth is still strong, some regulators are drawing a share of the revenues, and lower levels of spendable income preclude higher ARPU levels. These pressures are driving operators to review their operations for wasteful processes and cost-reduction opportunities.

Developed markets face market saturation and steady revenues

In the case of well established markets, profit margins have declined. In Western Europe, most European mobile operators experienced negative revenue growth in 2009, and growth for 2010 to 2014 is expected to be 2% compounded annually – roughly on par with inflation levels. Mobile penetration in developed markets is already over 100%.

Figure 1 **Increasing pressure on revenue and growth, 2009–14**

Source: Ovum

While operators continue to explore new avenues for growth, none of these seem to provide the cover for operational costs that a consumer growth market once did. Consumers seem generally anchored to current ARPU levels, and many new mobile offerings are ultimately viewed as points of competitive differentiation used by operators to reduce churn (a cost) rather than drive higher ARPU. Furthermore, while laptop-driven mobile broadband connections and iPhones are driving mobile data usage, associated backhaul costs have increased.

Faced with saturated consumer markets, requirements for new revenue, and the fight against churn, mobile operators are embedding SIMs in new devices such as dongles and laptops, and using “helicopter” marketing schemes whereby operators give away many SIM cards for a low price or even free. In some cases, topping up an existing SIM card effectively costs more than buying a new one – customers often get benefits such as free texts or minutes with their first purchase and do not get the same benefit once they top up. Ironically, this fuels more market churn, all the while requiring the issuance of more SIM cards, which are now being sold through many channels.

Operators are also exploring M2M and other non-handset uses for SIM cards. Markets for such offerings hold inherently less margin and force operators to scrutinize the costs associated with SIM card distribution.

The physical and business processes used by operators for provisioning are also less well suited to M2M devices. Operators have less visibility of the devices, and often of the SIM cards that are inserted into them; this is likely to become an even



bigger issue with the advent of M2M-friendly microSIMs and “solderable SIMs.” Moreover, the complexity of the supply chain for M2M, which can involve multiple partners from hardware integrator to application developer, can make for a long delay between pairing with the SIM and deployment of the M2M module.

Emerging markets face rapid growth with less margin

In emerging market economies, there is still significant growth in subscribers, and many subscribers also have multiple SIM cards in order to ensure they get the best price on calls they make or receive. This trend is embodied in the rise of the multi-SIM device, which can accommodate multiple SIM cards and allows the user to toggle between them.

Several factors raise the short-term emphasis on cost controls. ARPU levels are significantly lower overall, and there is a large proportion of prepaid subscribers, who have higher churn rates and generally lower ARPU. Mobile operators can also use a widespread SIM card distribution model to sell to prepaid users. In emerging markets, SIM cards are often sold from a variety of different retailers (and even from the backs of bicycles). This widespread distribution chain invites problems with SIM card storage, wastage, and misalignment of the SIM’s location to its designated network coverage area.

There is also an uncommon but growing trend among regulators in emerging markets to require fees from the operators for the issuance of MSISDNs (telephone numbers), thereby increasing the need for efficient distribution. Finally, a sparser retail network means that potential subscribers may not be reached by the operators.

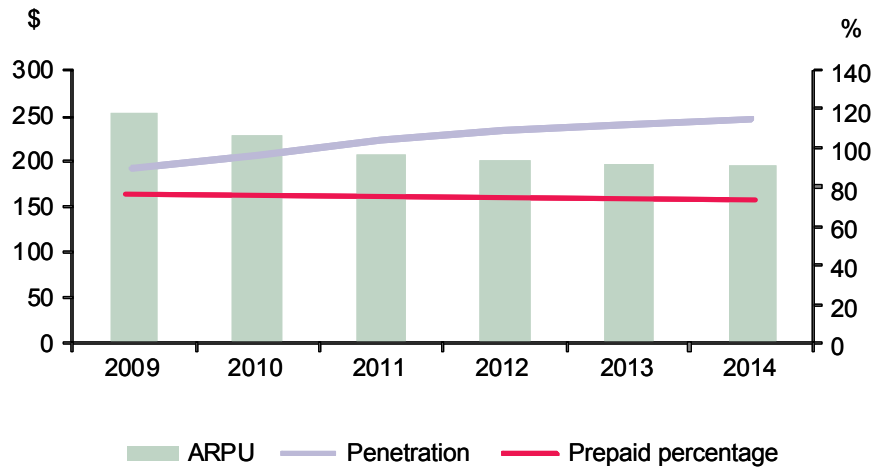
All of this demands that operators consider costs in general, and guides their attention to costs of SIM card distribution across the supply chain.

Middle East and Africa

The proportion of prepaid subscribers in Africa is very high – over 90% currently. In the MEA region as a whole, the subscriber “land grab” is slowly coming to an end. Instead, we expect the beginning of a shift to new services and a refinement of market segmentation models.

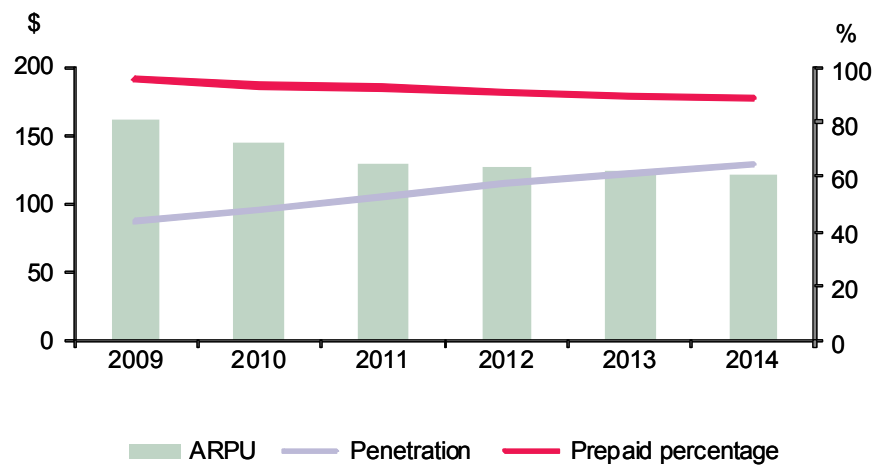


Figure 2 Key indicators in the Middle East, 2009–14



Source: Ovum

Figure 3 Key indicators in Africa, 2009–14

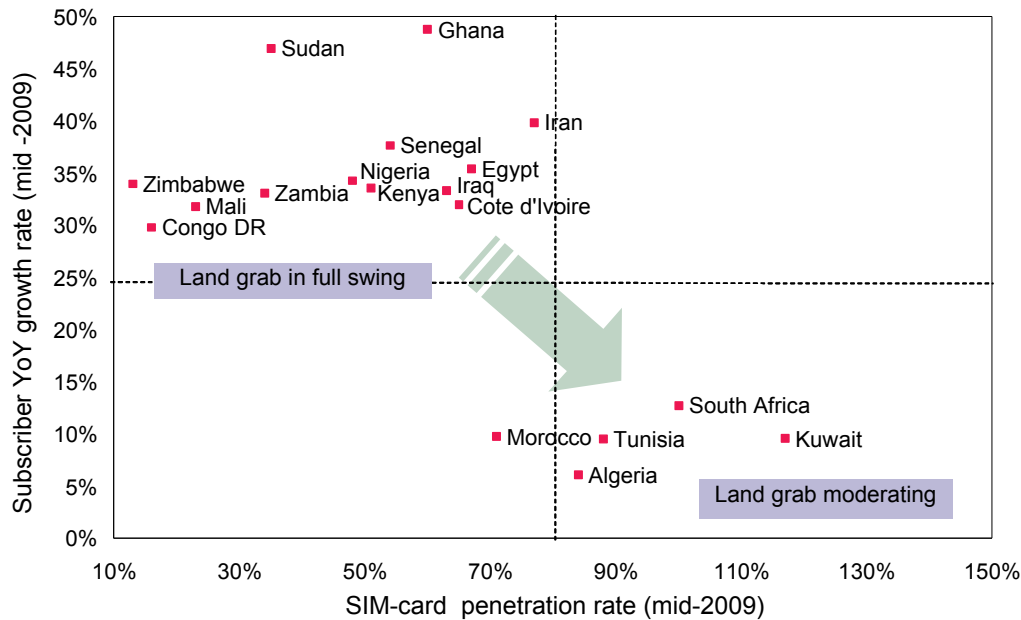


Source: Ovum

At the same time, especially in Africa, spendable income will not support high ARPU levels, particularly now that operators have gleaned the higher-value ARPU customers and are expanding into rural areas for subscribers. This again points to the need to control costs in an environment with a high volume of SIM cards.



Figure 4 Pursuit of subscribers shifts from high-growth strategy to greater sophistication



Source: Ovum

Regulators in Africa are also seeking tighter control over SIM cards, driven primarily by a desire to reduce fraud. In 2009, countries like Botswana and South Africa began urging SIM card registration, and Egypt, Ghana, and Nigeria are indicating a similar agenda. The overall interest in precluding SIM cards from fraudulent use could generate more interest in more efficient, “just-in-time” SIM card distribution.

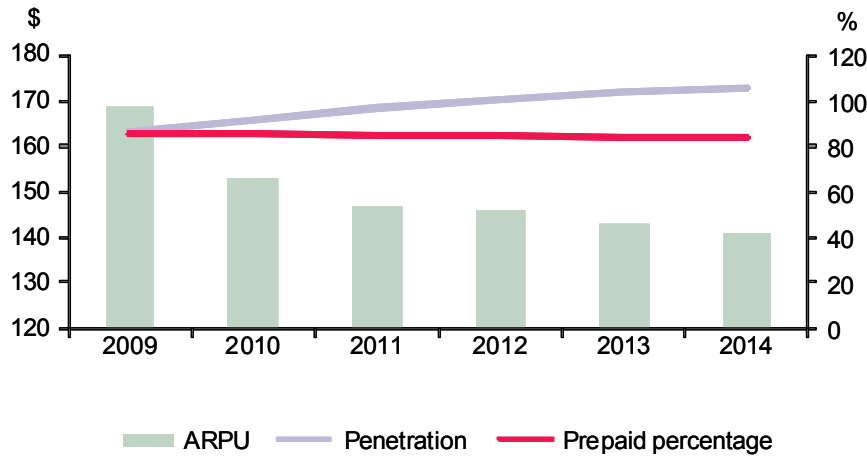
Within this context, various points within the SIM card supply chain can be improved to address issues with number-range costs, HLR and AUC (authentication center) costs, and efficient distribution of SIM cards to their designated service regions.

South and Central America

In South and Central America, subscriber growth is slowing in certain geographies as the region approaches 93% penetration in 2010. Still, there is robust 7.5% regional growth overall, and ownership of multiple SIM cards is a growing phenomenon (though certainly a weaker force than in MEA).



Figure 5 Key indicators in South America, 2009–14



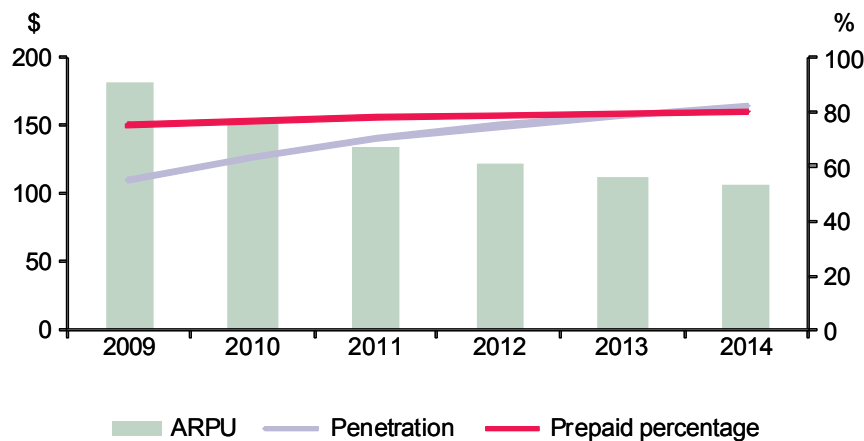
Source: Ovum

Regulators in Latin America, similar to their counterparts in African countries, are increasingly requiring customers to register for specific phone numbers. Mexico’s and Brazil’s regulators, in particular, are pushing this agenda.

Asia-Pacific

Overall, Asia-Pacific has the lowest ARPU levels of all the regions covered, and there is significant churn in countries such as the Philippines, where Globe averaged over 7% churn per month the last three quarters of 2009, and especially Indonesia, where 3 (an MNO) reported a striking 24%+ churn per month in 2009 (source: Wireless Intelligence, 2010).

Figure 6 Key indicators in Asia-Pacific, 2009–14



Source: Ovum



Certain parts of Asia-Pacific also have geographic characteristics that impact SIM card distribution, such as distinctive regions and islands in Indonesia. By assigning network elements, such as an HLR, to specific regions, operators have in the past incidentally assigned certain SIM cards to those regions. Coupling this with a widespread distribution, while distributing the right SIM card to the right region, can become problematic for operators.

SIM cards and operational inefficiencies require a solution

“Wastage” within SIM card distribution model

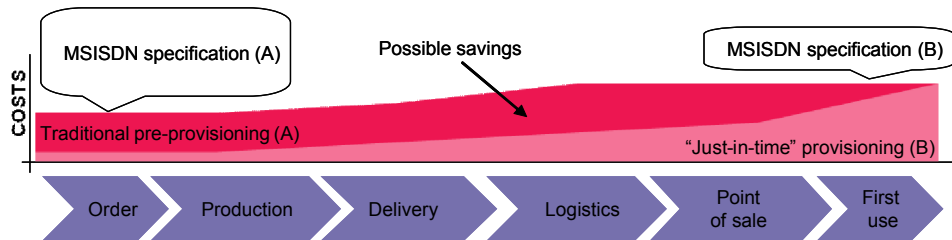
Overall, strategies offering extremely cheap new-customer packages and the dumping of SIM cards have significantly increased SIM card “wastage,” which now accounts for well over 50% of all manufactured prepaid SIM cards. In this context, the process of distributing SIM cards from the manufacturer, through the mobile operator, and to the end user is receiving particular scrutiny.

The SIM card supply chain and pre-provisioning

The process for provisioning SIM cards early in the supply chain, referred to as “pre-provisioning,” was designed for an era of high growth and higher ARPU, where costs were of secondary concern. In summary, pre-provisioned SIM cards are created by the manufacturer, fully loaded with relevant information, and then warehoused by the mobile operator or by the retailer until a customer decides to buy them as part of a prepaid connection package.

This simple process has the advantage of allowing for quick and massive distribution of SIM cards to growing markets. When launched, it replaced a slow manual activation process which led frustrated buyers, wondering when their service would become active, to call customer care centers. With the phone number already determined, operators can sell a new prepaid subscriber a phone (with the SIM card) that already works, with a phone number written on the package – a quick and easy user experience.

Moreover, network operators are increasingly gravitating toward “SIM-only” offers, which require users to bring their own handsets. This trend is most clearly felt in emerging markets, where parallel imports and “recycled” phones are common, but is becoming more pronounced in mature markets too, as a cost-cutting strategy by operators responding to the economic recession.

Figure 7 **The journey of the SIM card**

Source: Ovum

This process, however, has several specific points of inefficiency that are now being reviewed.

Costs and availability of number ranges

Every SIM card ordered by the operator needs to have the international mobile subscriber identity (IMSI) specified at the time of production. The IMSI, stored in a SIM card, is a unique number necessary in all GSM-based networks. Along with the IMSI, the operator specifies the mobile subscriber ISDN number (MSISDN) – the actual phone number. The MSISDN is thus specified very early in the process, before a SIM card actually arrives at the operator.

MSISDN number ranges can come with a cost. Some regulators charge for a number range, and can require the operator to show good usage levels or network quality before providing the operator with additional numbers. Regulators may choose to simply not issue new numbers as a tool for negotiation or enforcement. Both the cost of a new network range, and the threat of no new numbers, drive operators to value numbers they already have, and use them more efficiently.

HLR and AUC costs

For a SIM card to be able to access the operator's network, a valid entry must be entered in the operator's databases – first and foremost in the HLR and authentication center (AUC), but potentially also in other network databases, including the IN platform and prepaid charging platform. The HLR includes details about each authorized subscriber and is a network component usually sold and licensed by network companies such as Ericsson and Nokia Siemens Networks. Though there are different licensing schemes, costs for the HLR are bound to the number of records in the database. Fewer entries therefore require fewer costs.

Stock-management costs

Stock left in warehouses and retail branches costs the operator a significant amount of money as well. Though most of the costs of logistics are insignificant on



a per-card basis, the wastage, loss, and theft of SIM cards in large volumes are a clear worry for the operator. Wastage levels are suggested to have reached 80% in some cases (source: interview with Evolving Systems).

Improved SIM card process unlocks new revenue opportunity

Point-of-sale provisioning

While the initial driver for optimization of the SIM card supply chain is cost, new revenue opportunities may be unlocked through optimization. With a more "just-in-time" approach, provisioning can take place at the point of sale. This has various benefits.

Personalized or "vanity" numbers

There is a market for allowing subscribers to choose – or personalize – specific mobile numbers. Personalization can be driven by marketing requirements (e.g. a memorable number for a service) or a subscriber's personal interest in a "vanity number." Such numbers can command a high premium – monetary value that can only be realized when the right buyer has the opportunity to choose the specific number. Just-in-time provisioning can provide this opportunity.

In addition, the retailer has the chance to distinguish itself by giving customers greater choice and control at the point of purchase. This allows the retailer (a party outside of the operator) to benefit, but can also benefit the operators' retail outlets.

Indonesian example

In 2008, 99% of all new activations were prepaid in Indonesia. Fierce competition from around ten operators combined with regional numbering and geographic challenges (a population of 240 million spread across a vast archipelago) created a dynamic market. A strategy to increase new activations resulted in a new SIM card becoming cheaper than buying a top-up voucher. The result was subscribers using the initial credit on the SIM card, throwing it away and then buying a new SIM. This resulted in multiple SIM ownership and "rotational churn" (subscribers buying a SIM from an operator, using all the credit, throwing it away and buying another starter pack from the same operator). Most of the operators endured this situation, which resulted in significant top-line growth but churn of more than 100% per year. SIM card shipments increased dramatically, with operators distributing tens of millions of cards each per year. When combined with complex SIM card distribution and monthly ARPU of between \$3–6, it became clear that operators needed to look at both cost control and mechanisms to increase revenues.

One of the operators saw an opportunity to enhance its proposition by selling "vanity" numbers, aimed at increasing differentiation and attracting higher-ARPU subscribers. It took an early decision to implement Evolving Systems' Dynamic SIM



Allocation (DSA) solution, which offered new subscribers the ability to select a number with the handset, using a SIM toolkit application. This also improved the SIM card supply chain and reduced costs in other parts of the business.

Efficient distribution – reaching all audiences

Another issue that just-in-time provisioning can address is ensuring that all potential customers are reached.

The distribution imperative

Emerging markets have high growth rates and high levels of churn. Maintaining the widest possible distribution channels, including many informal outlets and small-scale retailers, is critical for competitive positioning. But this broad-brush approach comes at a price, since it multiplies many times the inherent inefficiencies of the pre-provisioning approach. All of these outlets need to hold stocks of SIM cards, with associated levels of wastage and misallocation.

Regional allocation of numbers

A specific issue that affects some countries is the allocation of MSISDNs on a regional basis. The pre-provisioning of SIMs means that operators in these countries need to ensure that retail outlets not only have sufficient numbers of SIMs, but that each customer can be given a SIM that is geographically appropriate. This is a particular problem for outlets that might serve customers from more than one region – for example, in a town close to a regional border. This further increases the need to maintain stock levels, and means that there will be times when a willing customer cannot be provided with the right SIM.

With just-in-time provisioning, the operator can provision the SIM card at the time of purchase, and is thus able to provide service associated with the customer's region.

While this case may seem unusual to people accustomed to buying mobile phones and associated services conveniently, the continuous availability of the "correct" SIM cards, appropriate for the potential customer's needs, can raise sales by as much as 5% through the just-in-time approach.

Telefónica Móviles México (Movistar) example

Telefónica Móviles México was facing regulations that required different MSISDN ranges for different country regions (in this case there were 350 local area codes), making the SIM card allocation process complex and wasteful. There were five different product lines that could be deployed across 350 different local area codes, for a total of 1,750 different stocks of SIM cards.

These complex demands on the supply chain meant that as much as 20% of all SIM cards were lost before they could reach the customer – roughly 2 million in total. Telefónica decided to work with Evolving Systems and use its DSA platform



to develop a single stock of SIM cards that could be used universally, helping to ensure the availability of stock at all times.

Potential solutions: How to optimize the process

Addressing operational inefficiencies and just-in-time or “dynamic” SIM allocation

Operators face higher costs because the MSISDN is assigned to a SIM card very early in the supply chain. Deferring the assignment of an MSISDN could significantly cut costs. Operators could strive for 100% MSISDN utilization and cut SIM wastage.

In order to do this, SIM cards would remain without a number until the latest possible moment, such as at the point of sale (or even afterwards). At this point, a customer would turn on the mobile phone and select a phone number (and possibly a tariff or other features). Only at this point would the MSISDN be required and a new record added in the HLR and AUC to accommodate the new user.

The technical challenge in this approach, of course, is finding a way for the SIM card to identify itself to the parent operator without the HLR being provisioned with that SIM’s information.

Renegotiation of current HLR contracts

A core component that drives waste in the pre-provisioning process is the early assignment of an MSISDN to an HLR (and AUC). This means early license fees to the HLR vendor. One purely commercial approach to reducing or eliminating these costs would be for the HLR vendor not to charge a license fee until such time as the SIM card becomes active.

This, of course, would defer the HLR vendor’s revenue stream. Furthermore, HLR licensing requirements are often tied up with large-scale network contracts between vendors and operators. An alternative solution, which does not involve large-scale commercial negotiations and can deliver additional benefits including streamlined logistics and the possibility of new revenue sources, may therefore be more attractive.

Competitors for operational solutions

Large vendors hold sway...for now

Several smaller vendors have devised more efficient, optimized processes for SIM card provisioning that prevent operators from incurring costs for unused inventory.



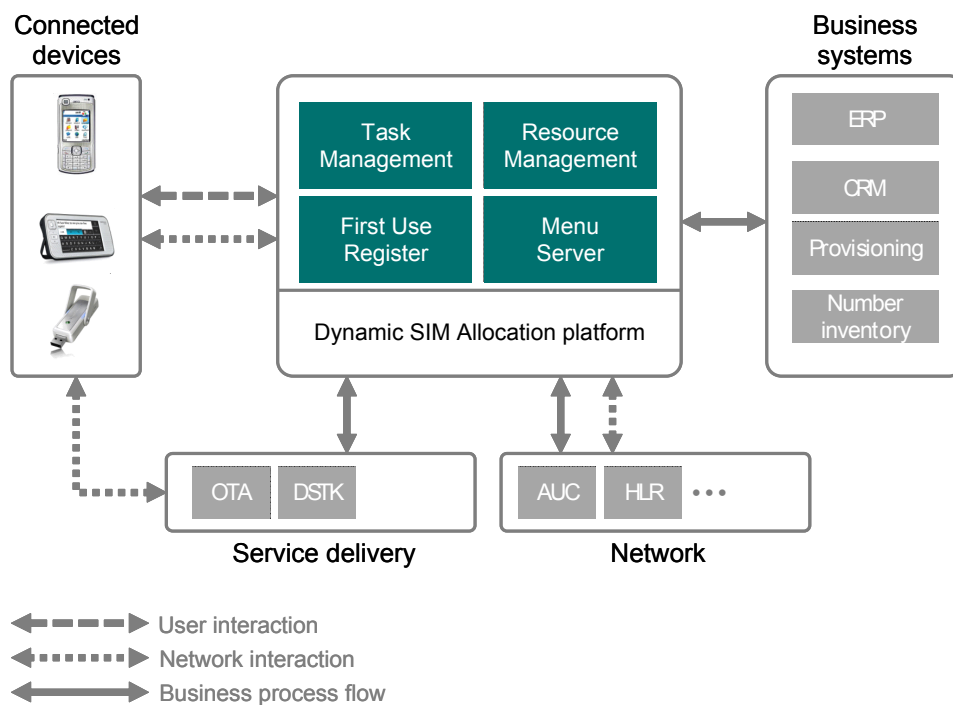
Perhaps the most promising solutions come from Evolving Systems and Pyro Group. The big HLR players, such as HP and Ericsson, however, will shape the domain of new service activations for the near future.

Evolving Systems

Evolving Systems introduced its Dynamic SIM allocation (DSA) platform in 2007 to address key points of the SIM card supply chain process.

The DSA platform is a new network element. It consists of a server running a number of databases, of which the most important is a "First Use Register", which is analogous to an HLR. The hardware interfaces with several other network components, and therefore includes standard signaling cards. The platform is illustrated in *Figure 8* below.

Figure 8 **The Dynamic SIM Allocation (DSA) platform**



Source: *Evolving Systems*

The First Use Register behaves like an HLR, but on a once-only basis for a defined set of SIM cards based on a pre-set IMSI range. When these SIMs first appear on the network, their first interaction is with the DSA platform. This enables the end user to provide the necessary information for provisioning, and to be activated and allocated a telephone number (MSISDN). As part of this, it may be possible for the user to choose a number from an available range (for a fee).



The customer's initial interaction can be based upon various mechanisms, including a SIM Toolkit (STK) application, which allows it to be supported on even the simplest and oldest devices. This is particularly important in emerging markets, where there is a large installed base of relatively old devices and also strong demand for pre-owned handsets imported from mature markets (see our recent report on handset recycling, ["Please replace the handset: mobile phone recycling in the UK"](#)). Potential extensions of the product might take it beyond a first-use context – to allow existing customers to choose a new number, for example.

The DSA platform allows operators to

- reduce costs, by saving on "wasted entries" in the HLR and other databases, and on unnecessary inventory of SIM cards – this latter can be a particular issue if cards are pre-provisioned to a particular product type or region
- increase revenues by facilitating the sale of special numbers, and perhaps other value-added services, at the point of activation.

Pyro Group

Pyro Group advertises a "Dynamic NUMS" product that is designed to provide dynamic allocation of MSISDNs for prepaid services through deferred MSISDN/IMSI pairing, in a fashion similar to that of Evolving Systems' DSA. A network element called Dynamic NUMS functions as a "first-time HLR" and allows new prepaid subscribers to activate their SIM card and choose an MSISDN through an SMS, IVR, or web interface. After this point, the final MSISDN/IMSI pair is created in the main HLR and AUC, and the job of Dynamic NUMS is complete.

The mobile phone number is therefore assigned at the very last moment, allowing the operator to save costs on licenses and any additional costs related to number ranges or maintenance.

Pyro Group is a mid-tier telecoms, value-added services solutions provider founded in India in 2000. Pyro's main focus lies in India and Africa, with little presence in Europe and North America. Apart from value-added services, Pyro also offers roaming solutions and managed services.

Ericsson, Nokia Siemens Networks, and other HLR vendors

Nimble companies such as Evolving Systems provide a quick technical solution to glaring market problems. However, it's also possible that incumbent HLR providers, such as Ericsson, Nokia Siemens Network (NSN), and even HP, can change their HLR's functions and resolve the problem.

This would require technical modification, which would reduce the vendors' revenue, as they will have to wait longer for MSISDNs to be registered on their HLRs.



HLRs are generally part of a hardware-led sale of several network components to a mobile operator. Therefore, they are inherently sticky, and come as part of a large contract, often three or even five years long. However, there is an opportunity for continuous change to such contracts and software updates (for instance, semi-annually) which operators can influence. In this manner, operators may work with vendors to implement new requirements for the HLR. One such requirement could be for the HLR to act in a just-in-time fashion.

Current technology roadmaps are, to some extent, addressing the issues of inefficient SIM card distribution. Incumbents are emphasizing the expanding capacity of HLRs, which can cover more subscribers, and therefore more regions, reducing the number of distinctive regional stocks of SIM cards necessary. In addition, incumbents emphasize that they can decouple the HLR database from the front-end logic that communicates with other OSS elements. This again allows for HLR capacity to be scaled up.

Thus far, incumbent HLR providers seem not to perceive the issue as significant to operators. Nevertheless, Ovum suspects that over time, operators will begin to push for more just-in-time SIM provisioning, as providers of competitive solutions draw more profit. In the meantime, incumbent vendors are embedded in the network and can enjoy a certain amount of supplier power without significantly altering their product roadmaps.

Potential developments

Nimble providers in best position in dynamic SIM allocation market

Network equipment vendors may respond to pressure on their own license revenues by renegotiating their charging principles, thus reducing the attractiveness to operators of dynamic SIM allocation as a cost-saving strategy. Of course, as we have indicated elsewhere, the cost of capacity and activations in network elements is only one of several drivers behind the move towards dynamic provisioning, and these will remain even if the activation price is reduced.

As discussed, in several emerging markets, and less commonly in developed markets, regulators are requiring that operators move away from anonymous registration of prepaid users. This is driven largely by an anti-fraud and anti-terrorism agenda and is only likely to increase. Moreover, the rapid growth of mobile in some emerging markets is driving some regulators to either restrict the supply of telephone numbers to operators or to levy charges. This in turn is making operators more aware of their processes for allocating (and withdrawing) numbers. All of this increases the requirement for a just-in-time approach to SIM allocation.

Dynamic SIM allocation is potentially a significant market, and Evolving Systems is currently the most prominent player. The window for expansion within this market is limited, however, as incumbent providers change to address market



requirements. The interest in doing this – shown by some bigger players such as HP and by comparably sized solutions providers such as SmartTrust – suggest that the window of opportunity may close within a few years. However, there is clearly a market opportunity for quick moving companies that have a solution in place, and who might even use just-in-time SIM provisioning as a way to drive further into the OSS stack.



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