Improving Performance and Monetising Mobile Data for the Smartphone Generation

How can network operators better understand, manage, and profit from mobile data usage?

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Problem Statement
There is a need to better monetize data services, but without including the user device there is a danger that a poor user experience will hinder the benefits that can be achieved.

Existing Solutions
Existing solutions focus on the core network and are not addressing the need to minimize RAN signaling and enhance user involvement.

Roke’s View
Implementing policy on the device is something that can be supported within existing mobile devices and does not need network operators to invest in additional infrastructure.
Executive Summary

With mobile network operators keen to better manage and monetise data usage on mobile networks, vendors already offer a range of policy-based solutions that support new approaches in billing, user managed data plans and traffic offload onto the fixed network. In the world of mobile data, the challenge is to determine which solutions will deliver the best results in a real deployment - and incorporate the ability to quickly adapt to user feedback. Indeed, the development of network-centric solutions is slowed by the need for significant infrastructure investments at a time of continued uncertainty in global economies.

Does the answer lie in an alternative approach in which policy management and offload are supported within a mobile device client, to the benefit of both operator and user? Such a solution should enable a user to keep control, to stay informed and more fully enjoy their mobile experience; at the same time, the operator could explore different policy-based offerings and also develop more robust (and realistic) business cases for capacity enhancements through additional infrastructure.

Operators can, right now, draw on device-centric solutions in a way that improves CAPEX and OPEX commitments while enabling them to generate new revenue and improve the user experience; smarter use of technology can bring new mobile data concepts to life more rapidly and without depending on uncertain infrastructure procurement schedules. In this way, extending core network policies to mobile devices is an immediate and cost-effective route to building the value of data usage in mobile networks. In other words: real commercial benefits are available to operators without first having to procure “yet another box” in the network. Simple updates to existing policy equipment, coupled with deployment to the device can deliver more profitable traffic management founded on more profound and accurate insights into users’ needs and behaviours.

“For a couple of years now, telcos have provided the functionality for customers to make billing inquiries and payments from their handsets and other devices – there are apps for that. The difference is that the customer has to request information from a centralized resource... putting a personalized policy manager into a device – now there is an idea.”

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**Background and challenges**

Keeping customers happy - improving profitability

There is no question that adopting more efficient and profitable approaches in traffic management must also address the user experience. This process should ensure that the smart devices in the user’s hands are included more effectively for traffic management and billing control; delivering high-value and long lasting results from minimal investment. Simply speaking, happy users and a happy network will come out of inclusion and collaboration; the users feel in control while the network gets the opportunity to actively tailor data plans for profitability whilst reducing unnecessary signalling and data load on the infrastructure.

The industry is always keen to explore new business models for data plans that encourage a higher value proposition, but how much can we really anticipate the needs of mobile device users? Consumers today live in an era when mobile data is so easily available and rich applications are changing how they access and use information and resources, both personally and professionally. It is acknowledged the combination of emerging applications and fast data networks makes the typical monthly limit easy to exceed. How can network operators and service providers cope with the inevitable tension between providing or pushing the latest content for smartphones and preventing users getting annoyed by unplanned data charges or undesirable service quality from network congestion?

Service providers face a multitude of challenges, not least encouraging free and open application development and new services whilst also ensuring the underlying data service is profitable (while not irritating their customers through such policies). At the same time, money for investment is tight: recent press reports have suggested that continuing turbulence in global financial markets has made fundraising for telecom network expansion far more difficult. The last few years have also taught us that the nature and growth of mobile data is unpredictable – all of which means long-term profitability requires highly flexible and adaptive business solutions. Simplicity, at least in the models used and approach taken, should be the name of the game.

What really matters in mobile traffic management and monetization is: “How can I keep my customers happy whilst improving profitability?” Apple demonstrated that an approach centred on the user experience is required to change the game, to influence user behaviour in ways that are both desirable and
profitable. So what technology concepts are now being defined to facilitate new business propositions that add real value to data services? While the most discussed techniques are in policy for charging and traffic management within the core network, a number of key areas remain to be addressed:

(a) Prioritising user needs: data traffic often originates from applications that are not core to a user’s immediate needs, costing them money and battery life. It also costs the network in wasted resources. Configuring a device to use the network only when a user really wants the data and only when the network is going to support the data service is very valuable. Technically, why should the RAN (radio access network) support signalling for data that is not allowed within the configured core network policies and why should the user get an unexplained error for attempting to access a disallowed service?

(b) User acceptance of new data plan concepts: whilst policy-based charging implemented in the mobile core network can yield real benefits in traffic reduction, it is essential that the mobile user’s experience must be considered fully. User messaging, notifications, experience indicators and opportunities to dynamically adjust a data plan are only possible if the policy system communicates with the device.

(c) Simple measures to ensure quality and profitability: data usage already causes congestion that results in annoyance and expense - yet modern device architectures are already capable of supporting concepts such as offloading data to WiFi and limiting (perhaps postponing) unnecessary data transfer. Increasing collaboration between network, device and individual user preferences will add value for all parties.

So, if this is the background, what can we actually do with mobile devices to achieve a step change in both the management and potential monetisation of data traffic?

Policy and traffic management solutions have strong potential if they consider;

Prioritisation of user needs, User acceptance of data plan concepts and willingness to facilitate collaboration between the mobile network, mobile device and the individual user
How to incorporate mobile devices
Deployment, Scalability, Security, Support and Co-existence

While data usage (and calls for more effective traffic management) has increased, the way that resources and information are presented to users has not developed at the same rate. Presentation of information has to improve. Smartphones and rich connected devices already support capabilities including user messaging, notifications and icons to indicate “connectivity”. This sets a precedent of informing a user about connectivity through the device display; introducing core policies that are noticeable by the device user must also be considered too. To accurately represent traffic management in the core to a device user, some communication between core and device is required - and this can already be enabled by numerous technologies already supported by many smartphones including XMPP (Extensible Messaging and Presence Protocol) and OMA-DM (Open Mobile Alliance – Device Management). Many smartphones and M2M (machine-to-machine) devices already support these mechanisms as well as the mechanism for supporting traffic management policies and user awareness. This includes restricting data on the device, but this particular aspect usually (and rightly so) demands privileged access to the device (this must typically be enabled via a preloaded application rather than one accessed via a consumer app store).

Five critical issues should be considered in terms of incorporating the mobile device: deployment, scalability, security, support, and user acceptance.

Deployment
Deploying applications to mobile devices is typically done using app stores, but it is also possible to preload apps to give them higher level privileges. To achieve access through app store delivery, a user needs to have a desire for the app itself, which can come from advertising and association with key user needs. In a situation where the app is closely linked to a core service like billing, there’s an opportunity to direct the user to an app on the promise of personal gain. To provide further advantage in on-device traffic management, you can also install the app with a high level of privileges (root level). This is generally done through preloading the app into the operating system installed on the device at purchase time or included in a subsequent over-the-air update. Various apps are concerned with traffic management; the user may want to define part of the big picture such as Wi-Fi network selection, anti-malware applications and data

Presentation of traffic management information has to improve. Conforming to the user expectations for messaging, notifications and icons to indicate “connectivity” is a must.

The time has come for the industry to consider allowing privileged applications that are allowed to actively manage mobile device traffic. It would be a lost opportunity if the operator’s policies were not part of that application.
compressing services. Deploying general traffic management capability to the device is going to become a necessity and however this happens, the inclusion of policy management with other traffic management functions is an opportunity that should not be passed up. Successful deployment is recognised with user acceptance of the app and no desire to circumvent or remove it.

**Scalability**
The growth of mobile devices using data connections means any system based on communication between a service and the device must be able to scale to high degree. This creates the need for many concurrent connections to the core service that, in turn, can result in adverse impacts on service quality. Given that user adoption is a priority, apps should set a sustainable user experience. Many solutions today depend on technologies that rapidly connect a vast number of devices to a web-based service in a real-time, power efficient way, such as mobile device management apps, email clients and messenger apps using “push” technologies. Basing a policy delivery service on such mechanisms builds upon technologies already known to scale - and that may already be inside the operator’s network.

**Security**
Mobile operators are likely to have already come to terms with trusted device apps that give privileged access to the data stream for malware protection, billing management, QoS management or seamless offload. In light of this, consolidating all traffic management applications into a single framework can be a suitable way to build trust and make further progress in achieving the benefits of on-device traffic management. A good way to deal with security concerns on a mobile device is to create a value proposition that does not feature a dependency on information flowing from a device to the network. Some apps require data to be routed via servers in the cloud, which raises concerns in privacy and data export. If the device plays a role itself in augmenting the capability of the home network then many typical security issues do not appear.

Defining policy on a mobile device which is supportive of core network policies is the key; circumvention then becomes less of an issue. If a device is jail-broken (loaded with a custom operating system build) or the app is simply circumvented, the policies in the core network will work as usual. Circumvention only

To avoid the difficult decisions around scalability, security and support, on-device policy should simply augment the network policies whilst offering enhancements to the user experience and be based on existing tried and tested techniques.
bypasses the (on-device) supportive policies and will result in a loss of user experience enhancements (improved battery life, customer messaging).

To protect the core network, it is important not to send critical information inward to the core. If the device resident policies are standalone, the on-device policy engine evaluates device conditions and makes independent decisions. Working within an existing authenticated system is possible with minimal effort - for example, authentication of the device to a PCRF (Policy and Charging Rules Function) is already handled by the nature of policy system’s role in billing. If no extra boxes are being introduced into the network, the on-device policy system can reside within an existing trusted domain. Authorisation of the app can be tailored to that of a policy vendor’s existing supported authorisation methods. Again, there are no new security issues to deal with and, if authorisation is compromised, it removes the gain in user experience - reverting to the scenario in place today.

**Support**
Mobile device users can accurately judge whether an app is good or not. Apps that require the user to want support from the network are undesirable, so it’s important to keep the user experience at the forefront. Providing simple options for a user to self-regulate the perceived functionality is an important step. If awareness of billing or management of offload is not desirable to a particular user, simply give them the option to turn it off. The user can decide what is useful and what isn’t, and is likely to converge on enabling features that benefit their experience. A useful mechanism for implementing this is within the billing management portals that users are encouraged to visit. In this way, network and user work together to deliver a mutually agreeable experience, while the network also learns firsthand about a user’s data usage desires. Over-the-air updates are also useful in supporting the need to develop features, incorporate user feedback and evolve the traffic management and billing service in a way that addresses what a user actually wants.

**User Acceptance**
Co-existence with installed apps and preferred configuration is another consideration. Little will annoy a user more than an app that appears to be interfering with what they want to do. The optimal way forward is to provide a “gentle” level of network involvement in device operation - one that works well with a

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The optimal way to achieve user acceptance is to provide a “gentle” level of network involvement. From this starting point, the network can learn what a user really want in a live deployment and evolve the involvement to increase the benefits to everyone.
user’s ability to personalise their device. A prime example is offload, with many commercial, public and subscription Wi-Fi access points that a user may want to use. In many cases apps are used to control a connection to these in an automated way, with the user placing them on a device out of choice. If the network involvement is not full-blown offload but simply enabling an otherwise off Wi-Fi setting at a time of congestion, or when a data plan does not support an application, the user will get a strong benefit. Other apps or settings will define what hotspot to connect to and also deal with authentication.

**Conclusion**

Squaring the circle: happier consumers – and more profitable network operations?

This paper has discussed some of the issues associated with the user experience and adoption of policy controlled traffic management, and describes how extending policy to a mobile device can be a fast and low cost way to solve many of the issues involved. The reality is that users are now ready and technology is at a point - as smartphones and other connected devices proliferate and become ever more powerful – for the capabilities of those devices to be more fully utilised, to benefit both consumers in terms of their user experience, and network operators in terms of improved data and network management and opportunities to better monetise data usage.

Creating a link between core network and mobile device to extend simple policies effectively is an ideal mechanism to deliver fast performance gains, and enable operators to better understand what users will actually adopt; the benefits of policy awareness on a device are also seamless, hassle-free and clearly visible to today’s savvy users. Designed to connect easily to an existing network infrastructure, the ideal solution can support rapid shifts in billing, roaming control and offload, using the simple but elegant concept of augmenting core policies to improve user awareness, reduce congestion in the RAN, assist with WiFi offload and improve device battery life. Indeed, user experience is integrated into the systems that ultimately add value to data services for network operators.

Policy on the device is something that is achievable and offered today. It offers benefits in developing data plans that are better monetized and acceptable by the users.

Other benefits include; reducing RAN signaling congestions and improving device battery life.
Talk to Roke

The pace of change in mobile telecoms is relentless – and accelerating. As customer expectations increase and ever emerging mobile standards, new business models and opportunities are being created. Roke is at the forefront of these changes and has a deep understanding of the new business models and emerging mobile landscape. In particular, our Mobile Solutions team focus on offering fresh and forward looking solutions for immediate gain but with minimal impact to a network operator’s OPEX, CAPEX and strategic investment choices. Offering game changing products as well as consultancy services, Roke capabilities offer to future proof network operations – and to design, secure and build revenue streams.

About SmartSwitch™

Only available from Roke, SmartSwitch™ is the world’s first intelligent network congestion and traffic manager, requiring zero infrastructure investment by network operators and, uniquely, enables management of mobile device performance while enhancing the smartphone user experience, with intelligent data management also improving battery life and connection performance. Unlike some other connection managers, SmartSwitch™ only exists on the mobile device, so it can be configured for mass market deployment without the need for operators to invest in infrastructure or additional capability. Operators benefit from:

- Interactive inclusion of the user into the development of profitable data services
- User data plan management at home and roaming
- Intelligent congestion management (RAN awareness in the core)
- Intelligent context-aware selective offload
- Local device traffic shaping and scheduling
- Local policy engine with remote update capability