All in the Family:
The New Requirements of Shared Data Plans

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INTRODUCTION: ONE DEVICE IS NO LONGER ENOUGH

Worldwide mobile broadband subscribers have overtaken fixed line subscribers, and one of the key drivers of mobile broadband adoption, other than the obvious benefit of mobility, is the attractiveness of mobile devices. Mobile operators have seen healthy adoption of devices such as smartphones, netbooks, and tablets—users want the convenience and features of these devices and are willing to pay for them.

Exhibit 1: Worldwide Mobile Broadband Device Forecast
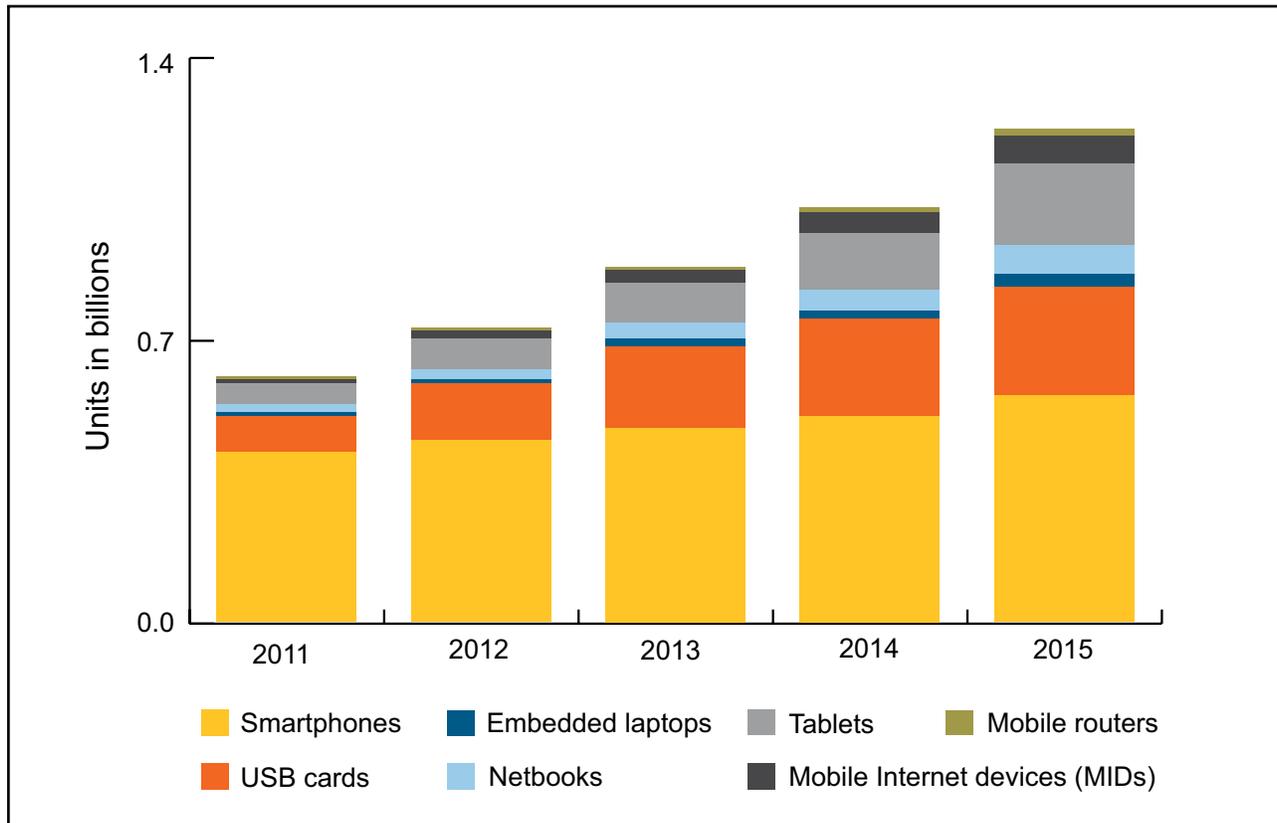
Source: Infonetics Research, *2G/3G/4G (LTE and WiMAX) Broadband Devices and Subscribers - Quarterly Market Share, Size and Forecasts*, September 2011

In fact, in many cases one device is no longer enough; users are increasingly adopting multiple mobile broadband devices, each with different usage characteristics covering the range of an individual's need for voice, messaging, e-mail, browsing, content download, and mobile applications.

Rather than replacing one type of mobile device with another, users are showing a clear appetite for adding to their stable of devices; however, this does not mean they want a separate data plan for each device. This has proven to be an inhibitor of what might be even stronger adoption. Not only are separate data plans per device expensive, they also frequently give users a higher total data allowance than they can actually use across devices.

"Data sharing is important because tablets will not replace smartphones."

John Boynton, Chief Marketing Officer, Rogers Wireless (December 2010)

Yet operators have been slow to roll out new pricing models, in part due to their legacy mind-set about how they generate revenue. Without a shared plan, a family might have multiple individual subscriptions for each member, or an individual might have one plan for his smartphone and a second one for his 3G-enabled tablet—all contributing revenue to the operator's bottom line. By replacing multiple accounts with a single shared one, the operator risks not being able to recoup the revenue generated by separate subscriptions.

However, for revenue generation over the long term, operators need to take a more strategic view of shared data plans. These new pricing models can drive device adoption and uptake of new services, particularly among price-sensitive customers reluctant to upgrade to smartphones. Simplifying the customer's billing environment by eliminating multiple bills on separate billing cycles can improve loyalty. Finally, consolidating services into a single subscription can make data plans more "sticky" and reduce churn.

Though the term "shared data plans" generally refers to a volume of data, generally megabytes or gigabytes, shared among family members, the flexibility afforded by a shared plan would also appeal to many small and medium businesses that want to provide their employees with smartphones but are afraid of high monthly bills and potential abuse. Another option might be to provide a single subscriber with a bucket of data that can be used across the subscriber's devices, which would further operators' goal of creating a multi-screen experience for the customer while providing an incentive to consolidate all devices with a single service provider.

3G/4G-CONNECTED CONSUMER DEVICE TRENDS: THE END OF FLAT-RATE DATA DRIVES SHARED PLANS

Having a single data plan and sharing that data allowance across two or more devices gives the user bill clarity and usage flexibility. These plans could take different forms:

One user, multiple devices

- This type of plan would allow a mobile broadband subscriber to leverage a tiered package of data across more than one device, such as a smartphone and a tablet. For example, in several countries, Orange offers plans in which a user can dip into the same data pool from an iPhone and an iPad, a package with obvious appeal. This is not the same as tethering, though Infonetics notes that this might also become more widely available and affordable, and could play a role in driving device adoption and data revenue for mobile operators.

- The real benefit of this type of plan is that the user sees only a modest additional cost for the adoption of a second device, such as a $5/month provisioning cost for multiple devices; also, the user actually gets to select a data allowance he might actually use, giving a much stronger sense of value for money.

Multiple users, multiple devices

- This plan would not only include more than one device, as above, but also multiple users, such as a family or a small business. This would give those users a pool of data to share. For example, a family of four (mom, dad, two teenagers) could have a range of devices (a tablet, two USB dongles, and several smartphones, for example) bundled with a single data allowance.

- This plan enables users to take advantage of their preferred device (or shared devices, such as a family tablet), without the need to monitor/reconcile usage against multiple data plans or manage/pay for multiple subscriptions. This gives users a greater sense of control over their data usage and account, in turn making adoption of multiple devices more desirable.

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One of the keys to the success of these types of plans is the ability of the user to better understand data usage. This is important because shared data plans are not flat-rate all-you-can-eat plans as have been common with single device subscriptions in recent years. However, mobile operators have rightly realized they need to monetize data more effectively, and can no longer afford to support unlimited usage and must charge more appropriately for data.

Many operators have already eliminated flat-rate data plans, and most others are expected to phase them out as well. The move away from unlimited mobile data plans is one factor that will make shared data plans more commonplace. Another is the desire to give users more clarity regarding their data usage and reduce the bill shock that can put operators at odds with their customers.

OPERATOR STRATEGIES FOR SHARED DATA PLANS: MORE FLEXIBILITY FOR USERS

Shared data was an unformed concept until it crept into the market in 2009 with offerings mostly for small enterprises. Even in 2010, very few such plans were in the market, but things are changing.

Recently, leading mobile operators including Rogers Wireless and Bell Mobility in Canada, Telefónica Movistar in Spain, and Orange Mobistar and Proximus in Belgium have launched multi-device plans. SFR France launched an extra SIM option on one of its mobile data plans during the summer this year. In the US, market leaders Verizon Wireless and AT&T have both said they envision family data plans in the near future. AT&T Mobility President and CEO Ralph de la Vega said in July 2011 that the carrier is seriously considering a move to shared family data plans, though he declined to give a timetable. Sprint Nextel CEO Dan Hesse has also indicated in the past that Sprint is considering launching shared data plans.

A few public announcements from major mobile operators:

- **Orange Austria, France, Spain**: Since Spring 2011, Orange has been offering two devices per data plan, bundling 600 minutes, unlimited texts, unlimited BTZone WiFi access, and 2GB shared data across both devices—iPad and iPhone are named specifically as available devices; cost is £99/month at 16GB rate.

- **Vodafone Ireland** offers shared mobile broadband for business users with a 5GB limit, shared across however many users is required, for a fee of €7.50 per connection per month, with each additional increment of 5GB being another €10.

- **Optus** offers a plan connecting five users each on a 4GB shared plan, with 20GB of data pooled between those five users each month; in addition, if the subscriber has a mobile connected to a Business Mobile Advantage plan, she will be able to share even more data across the account.

- **Rogers Wireless** offers various plans: 1GB + unlimited social networking to seven popular sites for $30/month; 4GB + unlimited social networking to seven popular sites for $50/month; options to add an additional 1GB for $15/month or to add voice.

From a regional perspective, it seems likely that shared data plans will see more immediate implementation in countries with advanced 3G competition—for example, North America, Western Europe, and parts of Asia Pacific such as Japan, South Korea, and Australia. These regions have already experienced strong mobile broadband device growth, and with that comes demand for more flexible usage schemes.

By contrast, regions that have not fully deployed 3G or have not seen rapid data-oriented device adoption are less likely to implement shared data plans within the next couple of years, but may introduce such schemes beginning around 2014 or 2015. Over the long term, Infonetics believes shared data plans will become an integral weapon in the operator arsenal of packages designed to attract new subscribers and reduce churn.

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IMPACT OF SHARED DATA PLANS ON DEVICE ADOPTION: DEVICE GROWTH BOOSTED BY SHARED DATA OFFERS

For the past several years, Infonetics Research has been tracking the mobile broadband device market and producing quarterly reports forecasting growth for a range of devices, including: smartphones, USB cards, devices with embedded mobile broadband (such as notebook PCs, netbooks, tablets, and mobile routers—aka "mobile hotspots"), and mobile Internet devices with mobile broadband connectivity (such as eReaders, mobile gaming consoles, etc.), as shown in Exhibit 1 above.

We factor several trends into our forecasts for mobile broadband device growth, including the following:

- **New mobile broadband subscribers**: users purchasing a device for the first time

- **Replacement purchasing**: existing users upgrading to a newer model of smartphone, for example

- **Multiple device purchasing**: users adopting a second device, with a second contract

- **Availability of new networks, devices, price points**, all of which can make device adoption more attractive

- **Shared data plans**: though the effect has been limited to date, shared data plans will become more prevalent and will play a stronger role in driving device growth moving forward

Exhibit 2: Proportion of Mobile Broadband Devices Sold on Shared Data Plans

Legend:
- Total mobile broadband devices sold
- Mobile broadband devices sold on shared data plans
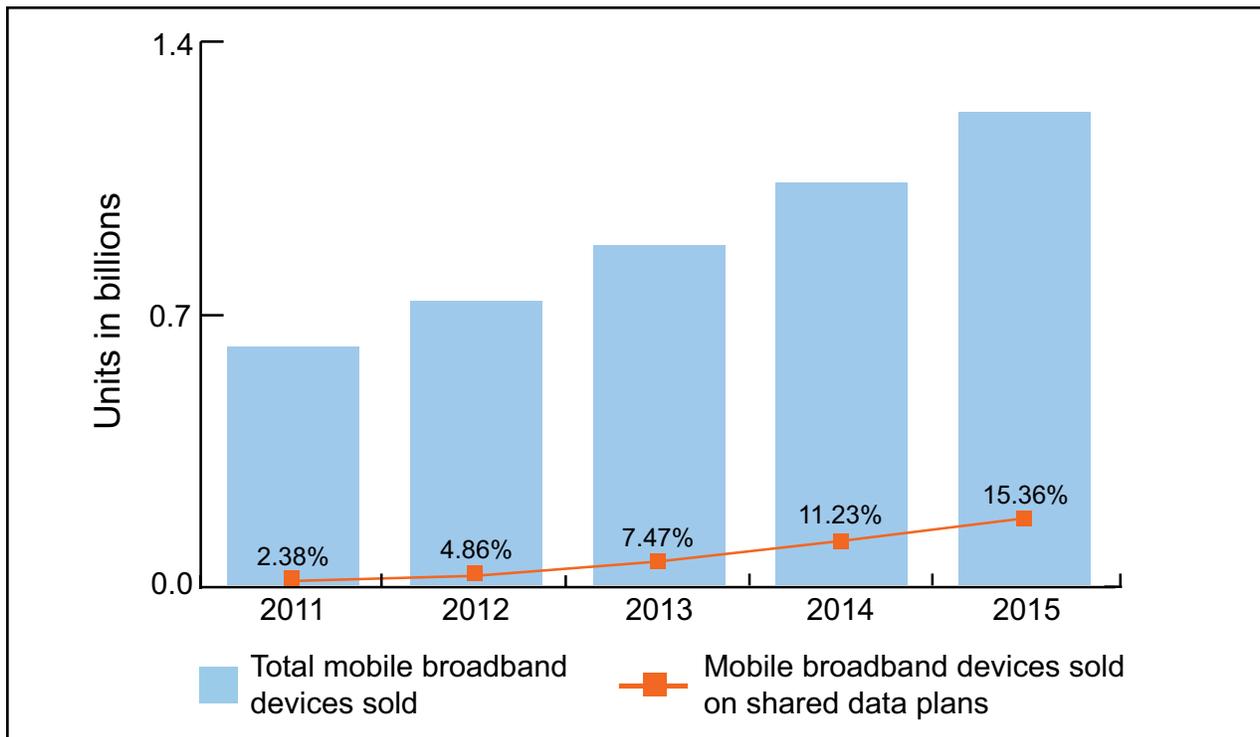
Though it is clear that shared data plans are far from being the only factor in mobile broadband device growth, their impact is set to become more pronounced over the next few years. For this paper we have specifically considered the extent to which shared data plans drive growth in various mobile broadband device segments.

Because shared data plans will become more commonplace, and highly attractive to users, they will account for an increasing proportion of devices sold; in other words, the number of devices sold as part of a shared data package will increase rapidly in the coming years. As a consequence, the cumulative total of active devices on a shared data plan will also increase rapidly: We estimate that **by 2015, there will be over quarter of a billion active devices on shared data plans, rising from a few million in 2011**.

The proportion of devices bundled with shared data plans will vary between categories, as some will be more often available, or attractive, as part of such a plan than others. For instance, Infonetics expects USB cards to be widely available as part of a shared plan because they are cheap for operators to bundle in, with almost one in every five USB cards being sold in a shared plan by 2015.

As another example, the combination of voice and portability means smartphones will remain the primary mobile device for the majority of users, and Infonetics forecasts that **approximately 15% of all smartphones (with some regional variation) will be sold as part of a shared data plan by 2015**. Mobile routers could well be popular in such plans as well, as these devices are specifically designed to enable broadband sharing and would be a logical fit with group sharing of data usage.

Tablets are currently among the most sought-after device types, and their appeal will only increase if they are offered as part of a shared data plan; they are often purchased by users who already own smartphones and USB cards but do not want another data subscription. This has meant that a high proportion of tablets are sold as WiFi-only, without 3G mobile broadband connectivity (and as such, arguably are not 'mobile broadband' devices, but rather 'wireless broadband' devices that will never come into contact with the mobile network). Shared data plans will encourage adoption of 3G tablets, and beyond that, 4G—again, **15% of tablets will be sold as part of such a plan by 2015, and that percentage will continue to grow beyond this point**.

Shared data plans enable the operator to capture opportunities that are missed with individual subscriptions. For example, a teen could have a prepaid data plan that a parent keeps topped up, but without that information, the operator could be missing out on the opportunity to sell additional features and services to the actual bill-payer. Understanding the usage of the household as a whole opens the door to potential cross-sell and upsell opportunities; moreover, the more services and users that the operator has tied to a shared data plan, the "stickier" that subscription is, and the less likely it is to churn.

Exhibit 3: Growth of Mobile Broadband Devices Sold on Shared Plans

| Product Segment | Number of Units Sold on Shared Plans (in Millions) | | | % Change | 2011 to 2015 |
	2011	2012	2015	2012 vs 2011	CAGR
Smartphones	9.86	20.20	89.32	105%	73%
USB cards	3.20	8.53	47.10	166%	96%
Embedded laptops	0.00	0.13	2.68	NA	NA
Netbooks	0.25	0.80	8.99	213%	144%
Tablets	1.07	3.25	29.50	205%	129%
Mobile Internet devices (MIDs)	0.00	0.15	6.26	NA	NA
Mobile routers	0.13	0.38	2.98	189%	117%
Total	**14.52**	**33.44**	**186.83**	**130%**	**89%**

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This level of control requires operators to rethink many of their operational systems.

ADDING INTELLIGENCE TO THE CONTROL PLANE

To provide subscribers with a range of plan options, operators need to be able to deliver group plans to user groups, and individual plans to subscribers with multiple connected devices. This customer-centric approach entails a radical change from the way in which customers have been managed to this point. Without a shared plan, a family, a business, or even an individual might have multiple subscriptions, representing a one-to-one relationship between the device and the service. Once those individual subscriptions are converted to a single plan, that subscriber or user group becomes a more valuable customer entity for the mobile operator, but managing this across multiple devices adds complexity.

Multiple users and devices all drawing from a single "bucket" of data could result in that bucket being drained quickly by a single plan member at the expense of others, driving the need for more advanced visibility and control capabilities. A household may want to cap teenagers' usage at a certain point or force them to use WiFi when consuming high-bandwidth services like video to ensure that the adults in the household are able to get their fair share. Or a small or medium business may want to limit usage for certain employees, or implement limits with time-of-day controls; for example, restricting mobile gaming to an hour in the evenings, or allowing an employee access to social networking sites only after work hours.

Overcoming Gating Factors on the Back End

This level of control requires operators to rethink many of their operational systems. The traditional all-you-can-eat model for data pricing typically relies on legacy billing systems and very little service control beyond basic bandwidth management. Shared data plans require more sophisticated capabilities on the part of the various systems impacted by these plans. These include the ability to track usage in real time, issue alerts as users approach the monthly data cap, differentiate among different users of the plan and possibly impose different usage allocations or restrictions.

Existing systems are significantly hamstrung when it comes to enabling those capabilities. Though many operators have solutions in place that can support basic network traffic management, these systems tend to support a specific access network type and are limited to supporting static rules such as QoS requirements or security rules. If an operator is to put in place the subscriber controls described above, it needs a far more dynamic policy management solution that includes the following characteristics:

- **Real-time**: A shared data plan may look and feel like a postpaid offering—a subscription for a certain allocation of data per month for a specified price—but if Dad decides to watch a baseball game on his tablet while commuting home from work at the same time Mom is doing a Skype call on her smartphone, the relevant systems need to consolidate and account for the usage in real time to avoid hitting the cap and incurring overage charges. The operator could send out an alert to warn the subscriber that he's close to reaching his limit, or offer the opportunity to purchase additional bandwidth on an as-needed basis, or to upgrade the plan on a permanent basis. The operator might also want to roll out promotions targeted to specific family members, such as zero-rating the kids' gaming traffic, which requires the charging system to be able to communicate with the policy system in real time.

For more sophisticated service control, such as parental control or video optimization, it becomes increasingly important to have access to subscriber information, such as history, entitlements, and preferences.

- **Flexible rules engine**: Many of the first generation policy solutions were built to be specific to certain network types, with hard-coded rules designed for basic bandwidth management and little else. However, shared data plans require operators to go far beyond those more static rules, implementing rules associated with more dynamic criteria, such as time of day, usage, subscriber profile, and real-time network conditions, across network types, service types, devices, etc. For example, a parent would likely want content restrictions to be applied consistently regardless of whether a child is accessing a service from a laptop over a home WiFi network or from a tablet over the 3G network. This necessitates a high performance rules engine flexible enough to allow the operator to implement a wide range of policies that can span devices, services, etc., without sacrificing performance. It also requires an intuitive user interface that enables the operator to easily create rules on a per-service and per-subscriber basis without needing to go back to its PCRF supplier.

- **Contextual**: The power of a policy management system lies with the information supplied to it. Basic network QoS information is valuable as a data source when policy management is used for bandwidth management and traffic control. But when operators are looking to do more sophisticated service control, such as parental control or video optimization, it becomes increasingly important to have access to subscriber information, such as subscriber history, entitlements, and preferences.

  That contextual information becomes even more important—and complex—in shared data plans. When there is a one-to-one relationship between a subscription and a customer, it is relatively easy for the operator to understand who the customer is and what device she is using. However, with a shared data plan, the operator must be able to segment which user or which device is actually consuming the bandwidth, and must also be able to make that information available to the subscriber, who may want to track how his bucket of data is being consumed and who is consuming it within the shared plan. Along the same lines, if the device itself is shared among multiple family members, such as a tablet or a gaming system might be, the back-end systems will need to go even further, and be able to correlate a specific user with access to specific applications and services that are resident on the device.

  This necessitates a centralized subscriber profile that consolidates data, particularly subscriber data that has traditionally been stored across a range of databases throughout the network. The operator must be able to take a more holistic approach to subscriber data management, which includes being able to maintain a single profile of the customer and his preferences, digital rights, entitlements, etc., that spans multiple devices and SIM cards.

  Once the operator has access to that view of the user and his usage, it could analyze that contextual data for a variety of uses. If the owner of a shared data plan is a small business owner, the operator might provide him with that data to better understand how his employees are using their mobile devices. The operator could also leverage the information for its own internal use, to better understand usage patterns and use that knowledge for network optimization purposes, such as identifying spikes in tablet-related traffic during certain times of day. The operator's customer care department could draw on that information to better handle inbound call center calls, and the marketing department could use it to determine cross-sell and upsell opportunities, such as offering a special gaming package to children on the plan or creating a sports promotion for Dad. The operator can also potentially leverage that granular information on subscriber usage internally for its own analytics purposes; for example, evaluating the impact of a new service on network utilization, or tracking downloads of a specific application among a certain demographic.

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Driving the Need for Diameter Routing Agents

Yet even as these capabilities—more sophisticated billing and charging models, more advanced customer segmentation, and the ability to handle highly targeted subscriber control—can help operators deliver richer and more innovative services, they can also create a significant challenge. The necessary interactions among the next generation network elements described above is creating a steady rise in signaling traffic that threatens to put a strain on existing networks. As operators transition their networks to all-IP, implementing Diameter as the interface to handle the exchange of policy-related information among various network elements, the strain will only get worse as the number of signaling transactions increases exponentially.

For example, if a member of a family plan tries to download a movie via his tablet, that request will trigger multiple Diameter request/ answer transactions in the control plane, including querying any relevant subscriber data management systems to identify who the user is and what device he is using, checking with the policy management system to confirm that the user has no restrictions on accessing the content, and querying the real-time charging system to identify the credit balance.

We anticipate that this rapid ramp-up in Diameter transactions will drive demand for Diameter Routing Agents (DRAs), a functional element first introduced in 3GPP Release 8 to better manage the onslaught of Diameter messages exchanged among network elements. DRAs are intended to eliminate the "spaghetti factor" associated with one-to-one interactions among control plane elements—both Diameter-based elements and legacy elements—by acting as centralized routers for Diameter traffic. As operators expand their networks in the control plane and in the data plane, the DRA can help operators maximize the value of their PCRF investments by ensuring that the network load is balanced across available PCRFs.

DRAs can also play an important role in enabling shared data services by providing consistent routing of messages associated with the same subscriber to a single PCRF. As noted earlier, the operator must be able to identify which user or which device within a shared plan is actually requesting access to the bandwidth, then make policy decisions based on specific entitlements and/or restrictions. By supporting the "binding" of subscriber information to a single PCRF, the DRA can ensure that all messages associated with the same subscriber or device are routed to the same PCRF, thus enabling that PCRF to make consistent policy decisions based on all available subscriber information.

Though the DRA opportunity remains a nascent market, the introduction of new network elements combined with increased data traffic, particularly with the emergence of LTE, will drive growth over the next several years.

CONCLUSION

Shared data plans represent a prime opportunity for operators to reduce churn, drive device adoption, and generate more revenue than they have been able to from individual subscriptions—provided they are executed correctly. As is often the case with new service offerings, the systems required to support them risk being a significant bottleneck—in this case, solutions such as policy, subscriber data management, charging, and Diameter routing. Flexible, real-time capabilities in the control plane are the key success factor to the successful implementation of these new service models.

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