WHITE PAPER
ENTERPRISE MOBILITY

Embedded 3G/4G LTE: Addressing the IT hurdles in mobility deployments

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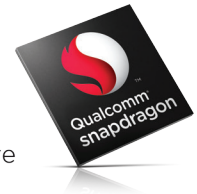
In collaboration with Macheen, a wholly owned subsidiary of Good Technology Corporation



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EXECUTIVE SUMMARY

Enterprise leaders face tough challenges when providing always-on, always-available Internet access to their mobile employees. Historically, embedded Wi-Fi has been the default method to enable mobile connectivity in notebook PCs and in tablets. More recently, with the growth of smartphones and advanced high-speed 4G LTE networks around the world, many companies are now offering their employees alternatives to traditional Wi-Fi, such as smartphone tethering, 4G mobile hotspots, external 4G adapters and embedded 4G.

Qualcomm, similar to other enterprises, faces these challenges to equipping its own mobile employees while managing large scale deployments and controlling recurring costs. Qualcomm, over the years, has offered and tested all variants of mobile connectivity solutions across the good/better/best spectrum:

+ Smartphone tethering: good
+ 4G mobile hotspots or external 4G adapters: better
+ Embedded 4G: best

As the world leader in 3G/4G wireless technologies, Qualcomm more recently undertook a pilot deployment within the Qualcomm enterprise IT organization to test many assumptions around the benefits of embedded 4G connectivity in commercial notebooks and tablets, specifically:

+ Security and remote device management
+ Cost control with company paid and personally paid data plans
+ Sponsored data for mobile access limited to specific corporate business applications

Qualcomm IT worked closely with Macheen, Inc., a leading global mobile application service provider for connected devices and services, and Verizon in the development and testing of new innovative mobile broadband solutions for notebooks and tablets in the commercial enterprise environment.

The goal of the pilot deployment was to evaluate the technical feasibility of delivering

1. Application-specific (i.e. security, email, and corporate intranet) mobile access to a broader set of notebook computers.
2. Cost-effective mobile broadband service to all employees who travel and don't have monthly data plans for PC data connectivity, including those who only travel occasionally.

The key outcome was a validation of the benefits associated with embedded 4G connectivity over alternative mobile access methods as well as the ability to deploy and activate new data lines at scale without excessive added IT workload. This has led to a decision to expand deployment to the notebook PCs of all U.S. employees currently without a mobile broadband service plan.

THE APPEAL OF BUILT-IN MOBILE BROADBAND

In today's enterprise environment, loss of connectivity is loss of productivity. Computing devices are communication devices and virtually all knowledge workers depend on connecting to the cloud to get their jobs done, whether in or out of the office. This applies to occasional travelers as well as road warriors, because all users benefit from Internet access whenever and wherever they need to use their computers.

For years, embedded Wi-Fi has been the default method to enable mobile connectivity in notebook PCs and, more recently, in tablets. However, Wi-Fi access away from the office and home comes with its own negatives, frequently adding cost and complexity while introducing increased security risks for enterprise deployments. Many enterprises have instead encouraged smartphone tethering or externally attached mobile broadband modems available from most cellular service providers—USB wireless adapters or mobile hotspots—as alternatives so employees can take the Internet with them wherever they go without needing to search for Wi-Fi hotspots.

While some enterprises have used this approach to provide mobile broadband connectivity to selected workers who need that connectivity, the cost of the monthly data plans associated with these external modems can be significant and unjustified for all but the most frequent travelers. Tracking and monitoring the usage of external modems and smartphone tethering is also an issue, since they can be easily shared with friends and family outside the work environment. As a result, there is no practical way to distinguish between company and personal costs.

Moreover, the external wireless adapters can be lost or stolen, creating inventory churn and management costs. While smartphone tethering provides a good temporary solution for mobile access without requiring a new device, it requires an often-cumbersome configuration process and drains phone batteries rapidly while acting as a mobile hotspot.

In contrast, embedded mobile broadband connectivity built into computing devices at the factory represents the next step in the evolution of wireless networking for notebooks and tablets. By deploying notebooks and tablets with embedded 3G/4G connectivity, IT managers can take advantage of significant performance, cost and flexibility benefits. Effective data connectivity coverage alone is significantly improved over external modems; studies have shown a 19 to 36 percent superiority in radio frequency performance by integrating the modem into the notebook itself and using its greater available volume for antenna placement.*

The tight integration within the device itself also helps reduce the misuse, theft and loss associated with external modems. Plus, built-in mobile connectivity enables an easy, efficient and consistent user experience by avoiding the multiple registrations

and activations required for Wi-Fi access, as well as the need to remain within the limited coverage range of a Wi-Fi hotspot.

To help organizations deliver 3G/4G connectivity to their workforce, many commercial notebook and tablet vendors like Dell, Fujitsu, HP, Panasonic, and Toshiba have integrated Qualcomm® Snapdragon™ 4G LTE technology into their notebooks and tablets. Snapdragon is the same wireless chipset built into leading smartphones for fast mobile broadband access on 3G and 4G LTE networks around the world.

Qualcomm® Snapdragon™ modems (a product of Qualcomm Technologies, Inc.) are multimode and support numerous wireless standards, such as GSM/UMTS/HSPA+, CDMA/EVDO, DC-HSPA+, and 4G LTE, with backwards compatibility to legacy 2G/3G networks. Support for multiple wireless standards in one chipset enables a single stock-keeping unit (SKU) solution that works across multiple carriers and regions worldwide. Because Snapdragon is unlocked and multimode, enterprise users can procure a single notebook or tablet SKU with built-in 3G/4G connectivity and then configure mobile broadband services based on price and coverage on an area-by-area basis without needing to change modem hardware.

This single-SKU device solution helps reduce support and qualification costs because IT managers no longer need to manage region-specific configurations locked into one carrier or technology. Since 4G LTE networks are designed to deliver reduced latency and data speeds up to 10 times faster than 3G, fast response times, rapid downloads and high quality streaming video and audio are enabled.

Because of this innovative network-agnostic approach to 3G/4G integration, Snapdragon has become the gold standard for large scale enterprise mobility deployments.

THE CHALLENGES OF MOBILE BROADBAND

Notwithstanding the advancements in 3G/4G integration, there are also economic and operational challenges to broader deployment of mobile broadband for tablets and notebook PCs in an enterprise environment:

+ On an ongoing basis, mobile broadband service is too expensive for most users who only travel occasionally. The customary fixed cost monthly data plans are only suitable for the heavy traveling road warrior, but for the larger numbers of infrequent travelers, the cost can't be justified for their much lower data usage.
+ Activating data lines for large enterprise mobility deployments is complex and costly. IT visits or user interventions are required to provision, configure and activate each wireless modem. This is a major challenge at enterprise scale with large numbers of devices, many of which may be in distant locations.

These impediments are why many enterprise customers have chosen to delay procuring tablets and notebook PCs with embedded mobile broadband capability and/or not to activate devices on cellular networks even if 3G/4G capability is already built in. In Qualcomm's case, prior to the solutions reported in this paper, mobile broadband had only been activated in 8% of the company's notebook PCs, consistent with a strategy of only enabling service plans for the heaviest traveling employees.

ADDRESSING THE ONGOING COST OF SERVICE

Historically, the major cost problem with mobile broadband, especially when compared to Wi-Fi, has been its fixed monthly subscription cost. In contrast, Wi-Fi service has been available on an ad hoc basis, providing the needed service and cost flexibility suitable for the majority of users who travel only occasionally.

Many cellular service providers and mobile virtual network operators (MVNOs) have recently addressed this concern by offering new innovative flexible data plans for corporate customers.

These new flexible data plans are designed to make built-in mobile connectivity more accessible, efficient and cost-effective than before, and in multiple ways. Contract-free, pay-as-you-go plans provide temporary access to 3G/4G networks, allowing employees to connect only when needed, so costs are incurred only when justified. In addition to "on/off" flexible plans, shared data plans enable organizations to pay for a pool of data and share it across multiple smartphones, tablets and notebooks. A third flexible plan option—sponsored data plans—enable organizations to limit internet traffic to specific enterprise sites or apps, creating a customized secure 4G internet connection for their employees to access corporate resources when traveling. In these plans, data charges related to eligible use are billed directly to the sponsoring company, instead of the user, with the ability to do split billing, allowing both corporate paid and personally paid data plans on the same device. This range of flexible data plans opens up new opportunities for organizations to deploy 4G LTE more broadly across their workforces by addressing the core economic issue of service costs.

As an example of these new current data plan flexibilities, Macheen, Inc.—who collaborated in the work described in this white paper—provides a cloud-based global data service network that runs on Verizon's 4G LTE network. Macheen's service provides "pinpoint" mobile broadband services

*Source: Comparative field performance benchmarking, P3 Communications GmbH, September 2009.

tailored to different usage requirements and applications. Macheen has the flexibility to price their mobile broadband services at multiple levels, including pay-as-you-go pricing for full Internet access and/or pricing for ongoing access to specific applications, such as e-mail, CRM and device security applications. This innovative approach allows enterprise customers to choose from multiple flexible data plans that are tailored to their own usage patterns, so they only pay for the data they use. These pay-as-you-go, on-demand, no-contract plans help deliver mobile broadband cost effectively to a broader set of users who travel only occasionally.

As an example of a specific deployment of flexible service plans, Qualcomm worked with Macheen and Verizon to pilot a new balanced approach to enterprise mobility by tailoring mobile data plans to meet Qualcomm's specific business needs, as follows:

+ For all notebook PCs: Device and data security, enabling ongoing mobile broadband Internet access to one security application for remote device security management. This application, executed when the device is turned on, forces the device to report in over the cellular network, so any device reported lost or stolen can be identified much more quickly than alternative approaches, and its data can be remotely wiped by IT. The cost of this limited basic service across all devices is typically low, especially in comparison with other methods or the risks associate with having a non-automatic method or no security method.
+ For selected users based on role policies and travel frequency: Ongoing mobile access to specific company network resources or applications such as e-mail, CRM, or corporate intranet. This is an example of sponsored data or "pinpoint" services, and the cost of these services can be tailored on a per-application basis.
+ For all users: Access to pay-as-you-go full Internet access plans, with split billing for corporate and personal expenses. Costs are broken out by line item, to separate charges within the system's internal tracking and reporting. Various time period-based access plans are defined and exposed to employees through the IT portal. Based on the individual's title, job type and other policy-based mappings, plans pre-authorized for purchase at company expense are identified, with the flexibility to add data plans at personal expense.

In the Qualcomm case, moving U.S. employees to these flexible data plans has produced significant savings compared to prior costs associated with Wi-Fi access at airports and hotels. Additional savings are also realized by reducing the manpower required to report, review, approve and pay expense report line items, which are now pre-approved and controlled by advance policy, and automated by the expense accounting system included in the service plans. Moreover, the ability to now activate all notebooks with pinpoint data service for remote manageability has allowed Qualcomm to protect and secure sensitive data in hours versus weeks or months with prior solutions, and at a fraction of the cost of any traditional monthly data plan. The average cost of a lost notebook is just over $49,000 but if the loss is discovered the same day, the average cost is reduced to less than $9,000.*

Significantly, these savings exceed the incremental costs of embedded mobile broadband modules in tablet and notebook PC purchases.

More detailed insights into the enterprise benefits and cost savings of deploying embedded mobile broadband connectivity, including an ROI calculator customizable to individual enterprise employee profiles, are available at snapdragon.com/enterprise.

ADDRESSING THE DEPLOYMENT HURDLE

In addition to the cost of mobile broadband service, the complexity of activation and the related user and/or IT staff workload have been major hurdles to broader deployment of embedded mobile broadband in an enterprise environment.

While technically skilled users might be capable of successfully activating their individual PCs in person, the thousands of PCs of less skilled users can't be physically brought in to central IT locations for setup and configuration one by one. One by one remote activation is also prohibitive, since it requires coordinating live connections between IT staff and individual users, in addition to the time required for each PC's activation.

So, while the attractive economics of mobile broadband vs. Wi-Fi are compelling, the activation problem has been largely insurmountable at an enterprise scale. To address this hurdle, Qualcomm IT and Macheen developed and launched a centralized IT solution.

To be viable at enterprise scale, as core requirements, the solution needed to include both remote and automatic activation. In addition, this no-touch activation also needed to work with existing devices already in the field. Various existing connection managers had been tested but none proved capable of meeting all requirements.

The solution developed and tested consisted of two components:

+ An enterprise deployment utility pushed to notebook PCs attached to the enterprise's network, which activates the embedded mobile broadband capability
+ A web-based deployment utility dashboard to report the status and exceptions for every device's activation to a centralized IT interface

The first component—the enterprise deployment utility—was pushed to client PCs when they connected to the network, using the network's device configuration manager. (Figure 1)

As a courtesy to users, an email announcement of the impending mobile broadband activation was sent in advance to alert them that their device is being enabled with mobile broadband connectivity, and that they'll need to reset their password after installation. The installer then ran on the user's device to perform the five steps for activating mobile broadband connectivity (Figure 2):

1. Capturing the mobile equipment identifier (MEID) from the device's mobile broadband module (embedded in the Snapdragon modem). The value of capturing this MEID remotely and automatically is significant. Prior approaches to locating this unique device identifier have involved specialized software utilities, physically examining the underside labels of the PCs, and even opening up the PCs to locate this number on the mobile broadband module.
2. Provisioning the MEID on the service provider's network. This is also a significant improvement over the manual process of sending a CSV file of MEIDs to the service provider, waiting for them to provision the modem on their network, and then waiting for confirmation that the device is ready for activation.
3. Switching the Snapdragon firmware to match the type of the service provider's network. This is a major improvement over manual firmware change processes.
4. Running the activation and testing to verify successful connection.
5. Setting up the user's individual Macheen Pinpoint Services account on the network, and notifying users that setup was successful, and they should reset their passwords.

While running on the user device, the deployment utility application responded to failures in the activation steps with automatic re-tries. This automatic retry is a major feature of the utility, given the variability of connection conditions between the central deployment server and the individual client device, since it allows multiple attempts without manual intervention in a large scale deployment prior to escalation of attention. Other configuration managers (if present) were uninstalled by IT remotely when pushing out the deployment utility. Once the utility is installed, activation is started and modem power switched on. Some notebook PCs in the deployment had a software switch, which the installer application turned on without user action. Some notebook PCs had a physical switch to turn on modem power; the installer application sensed that and prompted the user to locate the hardware switch and turn on modem power manually.

Figure 1:
Push deployment utility application to PCs.

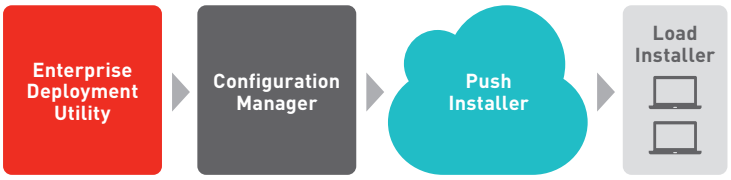
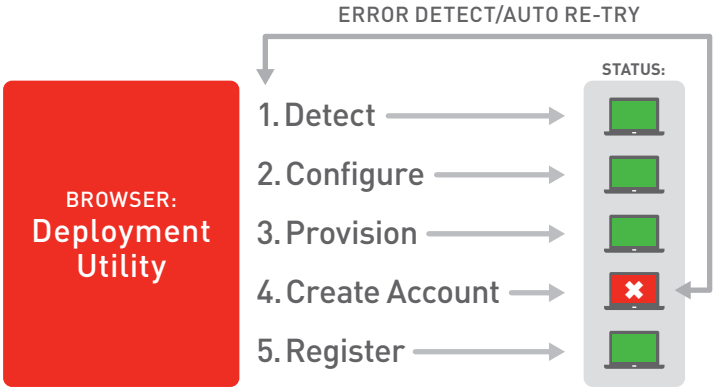


Figure 2:
Installer steps, error correction and status reporting.



As device provisioning and activation ran across target devices, the remote deployment utility application reported the status of each step in the activation process to the second component of the solution—the web-based deployment utility dashboard—where Qualcomm IT technicians monitored progress of the deployment in the aggregate and were alerted to any exceptions that required intervention. Results could be filtered by step completed, full completions, and errors. Since installations across thousands of devices can be expected to occur over a period of time, depending on when devices are connected to the network, this management dashboard has been designed to enable IT to monitor the progress toward full deployment and focus its interventions only on those units that require special handling. (Figure 3)

The setup history of any individual device can be examined to identify where and when failures of the activation steps have occurred, including automatic re-tries, to clarify any special handling requirements.

*Source: Ponemon Institute

In the initial pilot test of the automated remote activation process, 98% of the PCs targeted were activated successfully without the need to physically touch the machines or to have IT staff deal with them remotely on an individual basis. The 2% that did not deploy successfully on the first pass had pre-existing issues unrelated to mobile broadband deployment such as driver update and global OS/image issues. These issues were identified as part of the automated deployment process, and after these issues were addressed, these devices also activated successfully. The identification of these anomalous devices was a useful diagnostic benefit that wound up returning these devices to full function.

For ongoing user management post-activation, another web portal application—the service provider's admin platform (Figure 4)—enables IT to manage the "Pinpoint" service levels for individuals and roles, and to make changes over time as policies change and users are added or change roles.

The deployment utility has enabled Qualcomm (and by extension, any other enterprise undertaking deployment of embedded broadband) to remotely provision large numbers of users in a short time with minimal additional workload on IT staff. The dashboard management tool has simplified and scaled up IT's capabilities for ongoing management, troubleshooting and additions of new users. Taken together, this solution has substantially extended the reach of centralized IT management of connected users' computers with comparatively small changes to operating processes and workloads.

CONCLUSIONS

A balanced mobility strategy realizes immediate and increasing economic benefits by meeting both the demands of mobile users for fast, reliable connectivity in more places and the demands of the enterprise for data security and cost control.

Procuring mobile computing devices with embedded 3G/4G mobile broadband capability can maximize the business value of enterprise investments in tablets and notebook PCs through improved user productivity, tighter data security and lower operating costs.

The advent of more flexible service plans, combined with new mobile device management tools that simplify deployment, have removed two major obstacles to realizing the benefits of built-in 3G/4G technology embedded in tablets and notebook PCs.

With the vast majority of IT organizations currently investing in and supporting 3G/4G for mobile workforces, investments are increasingly extending to workers across more mobility profiles, including those who travel occasionally.

Figure 3:
Deployment utility dashboard for device activation tracking.

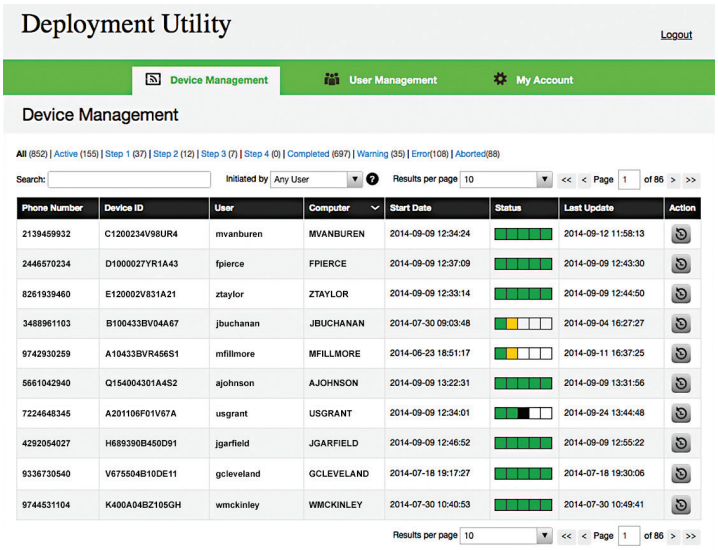
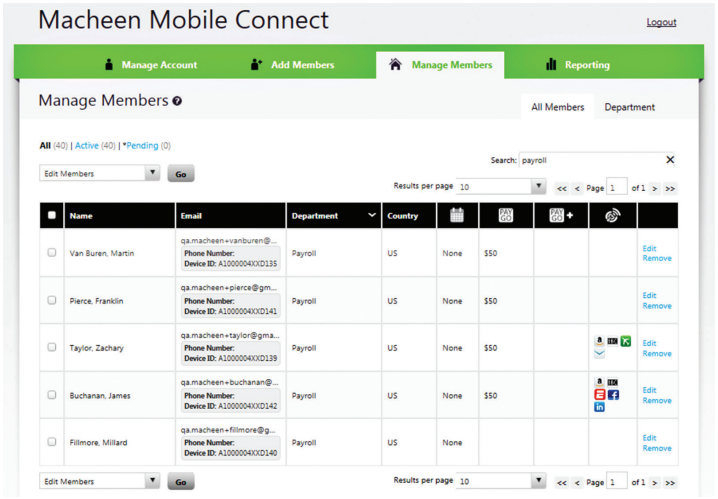


Figure 4:
Admin console for Pinpoint Services user management.



The unlocked multimode Snapdragon technology from Qualcomm Technologies provides IT organizations unprecedented flexibility in choosing preferred carriers and cost-effective data plans. These benefits make a client refresh that incorporates built-in 4G LTE capability a remarkably appealing way to heighten workforce productivity.

This whitepaper has been developed in collaboration with Macheen, Inc., a leading global mobile application service provider for connected devices and services, where Macheen has provided input to, and reviewed, the mobile broadband service plan and deployment utility aspects of the paper.