

White Paper: Successfully Navigating Mobile Challenges in the Health Care Landscape

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Mobile: A Platform for Intelligent and Personalized Care

With health reimbursement increasingly tied to outcome-based models and the emergence of the Internet of Medical Things (IoMT), the era of remote patient monitoring and management is upon us. Advances in wireless connectivity and the widespread adoption of mobile devices have opened the door to new care models.

The substantive and long-term value of connected health may be its enabling role in learning health systems. Mobile technologies, electronic health records (EHRs), and data interoperability will be integral elements in creating a “smart health care system” that systematically captures and disseminates findings from every clinical interaction into a continuous feedback loop.

In addition, a successful smart health care system requires patient engagement, collaboration among providers and researchers within and across institutions, and policies that incentivize knowledge sharing and accountability. Mobile will enable more seamless care team coordination, and speed the transition from episodic to continuous care models that will activate patients, align data with clinical decisions, and lead to better outcomes.

While the benefits of connected health are understood, this white paper will outline the many challenges and considerations a health care enterprise should be aware of when deploying a connected health strategy and making mobile health a reality.

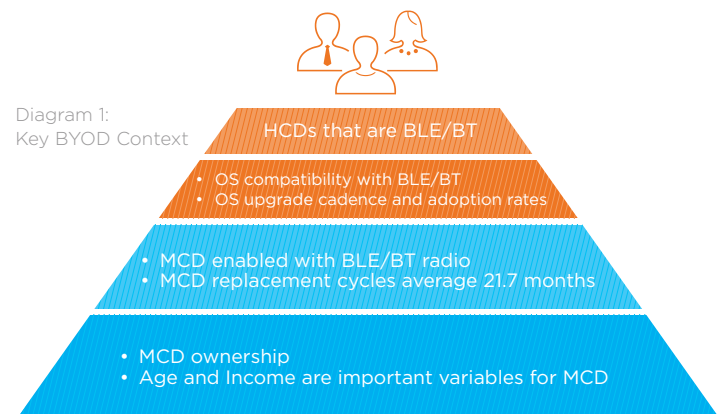
The Art and Science of ‘Bring Your Own Device’ (BYOD) Implementations

The mobile device itself is at the heart of any mobile application or service. The benefits and the challenges will flow directly from the decision an enterprise makes in terms of its mobile strategy. By definition, bring your own device (BYOD) means that there is little control over what device is used. Therefore, a clear understanding of connected device roadmaps and market dynamics is imperative. By offering BYOD flexibility, companies can make their user experience more effortless, and cost-effectively deploy at scale.

Companies that implement BYOD programs featuring Apple and Android products can, in theory, capture 96.7% of the worldwide market¹. Insufficient testing, medical device regulations, and uneven upgrade cycles are some of the challenges faced in a BYOD deployment. It is also critical to understand the market and demographics of the intended consumer, trial participant, or patient.

While it's easier to develop for the closed iOS system than the highly fragmented Android Operating System (OS), it is vital to employ a strategy and plan that accounts for both systems. The complexity of BYOD and the speed at which mobile changes can be overwhelming for most companies. Qualcomm Life applies its digital and mobile know-how to minimize the BYOD challenges and to work consultatively with health care companies to smart enable devices, future-proof roadmaps and to help implement successful BYOD solutions.

Key Variables To Consider For BYOD



** Demographics, mobile phone and OS fragmentation, and a shift to BLE are key variations in BYOD*

HCD: health care devices BT: Bluetooth
MCD: mobile computing devices BLE: Bluetooth Low Energy

Making Connected Health Effortless

Device hardware and operating software are just a few of the many challenges to consider when it comes to implementing a mobile health solution. Tens of thousands of factors exist and these issues are magnified when deploying for an elderly, chronically ill and/or tech averse patient population. Qualcomm Life leverages its experience in wireless to develop and test its solutions for real-world application so when a patient uses the technology at home, it is **effortless and “just works.”**

We work with global medical device companies to help future-proof their designs and protocols to ensure they are compatible with the current and future phone and tablet makes and models. We are engaged with companies to develop roadmaps that leverage an open, extensible platform that will power the devices two or three generations from now, so they can connect with future technologies.

Mobile and Health Care Device Integration: Navigating the complexities

Paramount to delivering medical-grade solutions is the testing of the core connectivity components (e.g., data formats, interfaces, and security protocols) of mobile computing devices (MCD) and health care devices (HCD).

MCD connectivity testing requires precise understanding of the OS, radio stack, expected interactions with the HCD, and attention paid to the changing nature of the OS and connectivity landscape. Close collaboration with the Mobile Handset OEMs and the Qualcomm Chipset division is also essential.

HCD connectivity requires similar activities and ecosystem relationships. Collaboration with HCD OEM’s pre-product release is important in the implementation of connectivity standards, along with pairing methods, security approaches, and use of available methods to protect proprietary and confidential technologies.

Effortless and reliable health care connectivity requires experience, resources, and skill. Over the past 5 years, Qualcomm Life has integrated over 100 health care devices into the 2net™ Platform. Qualcomm Life also developed an Acceptance Test Plan (ATP) that includes stringent quality control for individual devices, but more importantly, integration for the combination of HCDs. This rigorous field-tested methodology also applies to 2net Hub and 2net Mobile to ensure compatibility across an expansive array of mobile computing and health care devices.

Qualcomm Life’s Open, Device-Agnostic Ecosystem



Diagram 2: Example Connected Health Care Devices. For an up-to-date list across Hubs, iOS, Android devices and to learn how these devices might work well together when used in combinations (e.g. “kits”), please consult Qualcomm Life.

2net is a product of Qualcomm Life, Inc.

Demystifying Broadband Connectivity

Mobile broadband data (MBB) is even more challenging than it sounds. Most mobile operators are oriented around consumer services, and assisting enterprises is sometimes an afterthought. On smartphones there are data caps and security concerns, roaming, and overages, which can all cause headaches for end-user patients and their tier 1 support teams.

Tablet deployment also poses a significant challenge as the estimated attach network connected rate for tablets in the U.S. and Europe is only around 30-35%. Wi-Fi without MBB is problematic, as BYOD requires the end user to configure the necessary parameters for Wi-Fi home routers. In assisted living facilities, this might be shared with active security, making it nearly impossible to manage remotely. This can be a burdensome task for users, especially those who are elderly or chronically ill.

Customers and collaborators are seeking comprehensive solutions to alleviate the burden of piecing together networks, connectivity, and data plan agreements. Qualcomm Life oversees the network and manages its own private APN network to provide flexible and scalable mobile health solutions. Advantages include device-specific IP addressability, Peer-to-Peer (P2P), two-way connectivity, SIM-based network management and control, VPN capability, control over authentication mechanisms, shared infrastructure for multiple applications and customers, and convenient integration to customer back-end systems.

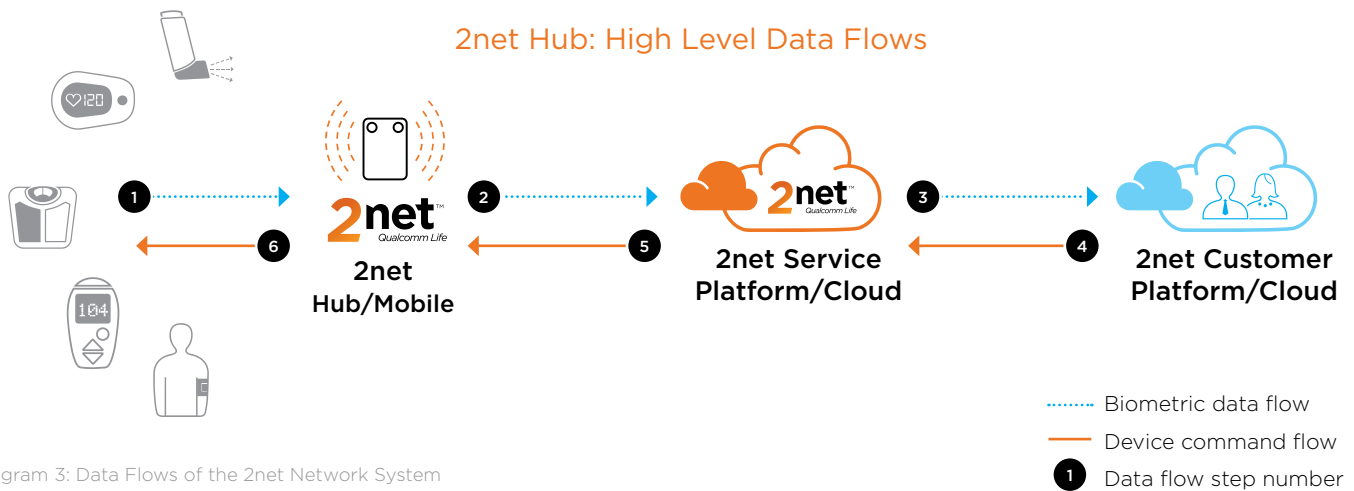


Diagram 3: Data Flows of the 2net Network System

Dependable Uptime and World-Class Operations

Reliability of services is mission critical for any business, but even more important when your service is enabling remote care for an at-risk patient population. Alerts should be generated at both the device level and the service level, to allow for proactive and rapid intervention. Depending upon the escalation processes of alerts, a system should offer appropriate SMS/email notifications to be generated for responsible support groups.

Qualcomm Life is a premier enterprise data mobile virtual network operator (MVNO), leveraging Qualcomm's scalable and reliable service infrastructure that is designed to provide a high degree of security. The 2net medical grade infrastructure is supported by Qualcomm's worldwide dedicated Network Operations Centers, which manage nearly 16 million mobile data messages or transactions daily. The centers support customers on four continents and across over 40 countries.

During the 2003 and 2007 Southern California wildfires, much of the infrastructure in and around the San Diego area was offline, including a large portion of the electrical grid. However, Qualcomm's redundant and independent nature allowed it to maintain network connectivity and support mobile and land line operators throughout the emergency.

Qualcomm's worldwide dedicated Network Operations Centers



- Operating for **25+ years**
- **40 countries** on **4 continents**
- **8 dedicated Network Operations Centers** worldwide
- Nearly **16 million** mobile data messages/transactions daily

Diagram 4: Qualcomm Operations

Qualcomm Life: Powering Intelligent Care Everywhere

For 30 years, Qualcomm has led the mobile evolution, with ideas and inventions that have shaped what is now the fastest-growing technology platform in human history². Qualcomm Life is carrying on this rich tradition by powering and scaling connected health.

Qualcomm Life works with industry-leading medical device companies and Qualcomm technology is embedded in the majority of mobile computing devices. Qualcomm Life works with medical device manufacturers to help **future-proof** their designs, protocols, and roadmaps by applying rich insights into mobile trends, challenges, and breakthroughs. To effectively leverage investments and ensure successful, scalable deployments, we are helping global customers mitigate the fast pace at which technology changes and navigate the longer medical device cycles in the highly regulated health care industry.

Qualcomm Life's focus and investment will be a catalyst in connected health and will make intelligent care everywhere a reality. This leap forward in care will connect one of the world's largest ecosystems and securely stream data, analytics, and patient information to deliver the right care, at the right time, in the right location.

About the Author

James Pyers is the Director of OEM Relations at Qualcomm Life, Inc.

Jim is responsible for health care device manufacturer relationships, custom device integrations to the 2net Platform, and the development of the 2net device ecosystem.

Jim joined the Qualcomm Life team in 2012, bringing 20+ years of global computing and mobile experience, more than a decade of which was with Qualcomm. Jim's background includes working for Qualcomm's chipset business and assisting global mobile and computing device OEMs in the integration of Qualcomm mobile technology into their products. He also worked to develop advanced connectivity services and platforms for all types of mobile devices. Jim has contributed to and collaborated with some of the world's premier companies in mobile, computing, and networking.

Jim holds several technology patents, including development of the first "hybrid" computers, and in the areas of computing processors and mobile communications. Prior to Qualcomm, Jim ran his own software consulting company, based in Switzerland. He holds a bachelor's degree in computer science from Grand Canyon University in Phoenix, Arizona.

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- Qualcomm Life and Qualcomm Inc.



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¹ IDC, Aug 2015

² The Broadband Commission for Digital Development. The State of Broadband 2014: Broadband for All. September 2014