Optimum Wireless Network Selection for Business Applications

NETWORK SELECTION WHITE PAPER

Introduction

QUALCOMM Wireless Business Solutions (QWBS) provides highly reliable and scalable solutions for mobile and remote business applications using a wide variety of wireless technologies. These solutions become an integral part of the IT infrastructure of the businesses served; therefore, the long-term assurance of service availability is also a critical characteristic. QWBS applies a rigorous process in selecting the best wireless technology and carrier for each application.

The Basics of Network Selection

QWBS seeks to apply the "right tool for the job." In order to do this, a clear understanding of the "job" is needed. This means that a profile of the application must be created to specify how technology solves the problems of remote connectedness, information timeliness, and customer service, which then drives decision making regarding the following:

- **Human and Vehicle Interfaces**: A description of device constraints such as size, weight, and power, which may preclude certain technology choices before beginning network assessment.
- **Longevity, Scalability, and Reliability:** A projection of the typical expected ownership cycle for the devices that will be applied, which dictates the required time horizon for service availability.
- **Quality of Service and Timeliness of Delivery:** A traffic model that describes the data communications requirements as a function of time and place. In other words, where and when does data need to be transmitted, and how much?

For each application and its accompanying traffic model, QWBS selects an optimum wireless network based on the "5 Cs": Capacity, Coverage, Continuity, Cost, and Consistency. The network selection includes consideration of technology and available carriers. A methodical assessment of the 5 Cs against the requirements of an application will clearly yield different choices for different applications—there is no single choice that is always best. On this basis, QWBS applies a wide variety of technologies including satellite, various cellular technologies, and WiFi (IEEE 802.11).

Stepping Through the Process

1. Network choices are first screened based on which can provide the necessary ***capacity*** for the application. The traffic model indicates how much data must be transmitted, and how the traffic is dispersed over time and space. Networks that can provide the necessary capacity can be considered further.
2. Choices of networks and carriers are evaluated based on ***coverage***. The traffic model includes the spatial dispersion of the application. The traffic profile can be overlaid with network coverage models to determine which networks can provide acceptable coverage. In mobile applications using a store-and-forward architecture, coverage shortcomings contribute to latency of information delivery. Therefore, communications urgency can be assessed as an element of coverage analysis.
3. Among networks that can provide adequate capacity and coverage, long-term network ***continuity*** must be evaluated. Network continuity includes assessment of the availability of network service and corresponding devices at reasonable cost levels. This requires an assessment of the technology and business trends that are impacting the candidate networks over time. Eventually, networks become obsolete and are replaced based on economic considerations. The expected network continuity must be substantially longer than the typical device ownership cycle that is expected and required in the target application.

4. Having screened based on capacity, coverage, and continuity, a set of candidate network choices remains. Among these, an analysis of total ***cost*** of ownership (TCO) is conducted. To understand TCO as it relates to wireless communication, the analysis must consider the costs of airtime, devices, infrastructure to make use of the network, and implementation costs. When weighing costs of airtime versus devices, the volume of communications traffic (based on the profile) greatly affects the proper choice. If a low volume of communication is expected, then device cost is more important than airtime. With higher communications volume, airtime cost becomes more important than device cost. An effective application profile is essential to assessing these cost trade-offs.
5. As a final important selection criterion, the ***consistency*** of network performance (i.e., reliability and availability) can often be a key determinant in selecting a carrier. In general, network consistency is more a function of carrier operations and implementation than of technology. However, significant differences in the consistency of performance among carriers may drive trade-offs in cost or coverage. Layering of networks within a single product category increases system performance consistency by mitigating unexpected network availability issues on terrestrial carrier networks through redundancy and diversity of network providers.

Examples of Wireless Choices in Platforms

QUALCOMM has recently developed an asset management platform that is applied to trailers (T2™ Untethered TrailerTRACS® asset management solution), and a mobile computing platform that is applied in the cab of commercial vehicles including a user interface for the driver (OmniVision™ mobile computing platform). These platforms require very different wireless choices to achieve an optimum result.

The T2 application requires seamless coverage, high reliability, and long-term network availability. In normal use, the quantity of data transmitted is small; short messages are sent infrequently, typically only 1-2 per day. However, it is critical to be able to transmit a large amount of data occasionally, to provide over-the-air software upgrades. (Unlike many systems that claim "software upgrades" over-the-air, but only change various parameters, the T2 solution requires the ability to update the entire application image over-the-air.) The antenna must be very flat and unobtrusive mechanically. The device must be extremely power efficient. There are no available satellite technologies that meet the requirements of size, power, and still provide adequate bandwidth to upgrade software over-the-air. In the judgment of QWBS, the satellite technologies capable of meeting most of the requirements have substantial risk to long-term infrastructure availability. With cellular technologies, analog is required to achieve near ubiquity. However, analog is beginning to degrade in certain areas (mostly large cities) and being replaced by digital. This defined a requirement for a multi-mode configuration. A platform using control-channel messaging can meet coverage, cost, and longevity requirements, but again does not provide adequate bandwidth to update software over-the-air. Therefore, control channel messaging may be desirable to enhance cost and network availability, but only when applied in conjunction with other cellular communication modes. In completing the cost modeling for the platform, the weighted-average cost for communications is unfavorably impacted by analog usage for ubiquity, but is still viable. Furthermore, the low cost of cellular hardware favorably impacts the total cost of ownership. Since airtime usage is low, the favorable hardware cost is a larger percentage of the total cost of ownership than airtime.

The OmniVision platform also requires seamless coverage, high reliability, long-term network availability, and over-the-air software upgrades. The quantity of data transmitted is 10x that of T2. Also, the constraints on antenna packaging and power are far less significant, providing the possibility to apply QUALCOMM's Ku-band satellite technology. The Ku-band technology provides ubiquity, reliability, and long-term assurance of service, but the Ku-band hardware platform is more expensive than cellular devices. However, the communications cost is far more important in the cab-based application because 10x more airtime is consumed than in the T2 application. Communications costs over the Ku-band platform is actually lower than the weighted average cost of cellular because of the unfavorable impact of analog usage when near-ubiquity is a requirement. It should be noted that if ubiquitous coverage were not a requirement, the total cost of ownership would favor cellular by using a digital-only configuration. Given the requirement for ubiquity, which is driven by the competitive need for near real-time information, selection of the Ku-band technology yields lower total cost of ownership due to lower average communications cost. QUALCOMM also achieves higher reliability than cellular networks with its satellite network because it is designed and operated specifically for mission-critical business applications. Therefore, if the total cost of ownership is comparable between QUALCOMM's satellite network and cellular, the satellite network provides higher value through consistent reliability.

Conclusion

QWBS applies a business philosophy of choosing the "right tool for the job" in technology selection. Optimum wireless network choices (technologies and carriers) are made by first profiling the application, then assessing network choices using the 5 Cs. Optimization of Capacity, Coverage, Continuity, Cost, and Consistency yields the best possible performance and total cost of ownership for each wireless business solution. QUALCOMM makes these choices in favor of our customers to ensure the highest quality, reliability and service in the industry.

About QUALCOMM Wireless Business Solutions

QUALCOMM provides companies around the globe with industry-leading mobile platforms, applications, and services that are ideal for mission-critical applications and enhanced security. Products include the OmniTRACS® and OmniExpress® mobile communications solutions and the GlobalTRACS® equipment management solution. QUALCOMM solutions feature location monitoring, security alerts, productivity-enhancing applications, and wireless advisory and managed network services. These products serve a variety of industries including transportation and logistics, third-party logistics, and construction.

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