DECLARATION OF WILLIAM HOGG AND MARK AUSTIN

I. BIOGRAPHICAL INFORMATION

1. William Hogg is the Vice President, Network Strategic Planning, of Cingular Wireless LLC ("Cingular"), and is responsible for planning activities concerning radio, core network, and standards. In that position he is responsible, among other things, for network and technology strategic planning in the areas of core network switching and 2G and 3G radio access. He received his M.S.E.E. from the Georgia Institute of Technology and his M.B.A. from the University of South Florida. From 2001 to 2003 he was Cingular's Vice President–Network Transformation, in which position he was responsible for overseeing Cingular's conversion from TDMA to GSM technology. Previously, he has been the Chief Technology Officer for Cingular Interactive and held various technical management and planning positions with Verizon Wireless, GTE Wireless, and GTE Airfone. He is the holder of six U.S. patents.

2. Mark Austin is a radio technology and communications manager with over 17 years of experience, 14 of which relate to RF engineering and planning of wireless systems, and is highly experienced with respect to both planning and operations involving TDMA and GSM deployment. He received his Ph.D. with Sigma Xi's thesis award from the Georgia Institute of Technology in 1994. From 1986 to 1988 he co-developed and deployed the first transmission system for HDTV over fiber while at Bellcore. From 1989 to 1991 he developed a software defined radio for radar systems while at Georgia Tech Research Institute. From 1994 to 2001 at BellSouth Cellular Corp. he managed the headquarters advanced technology team, had substantial responsibility for the company's technical planning for TDMA and GSM, and also was a contributor to the TDMA and GSM/EDGE standards evolution as chair of the signal processing working group in the TIA standards committee. From 2001 to 2003 he was Director of Radio Planning Technology at Cingular, a position in which he was responsible for the radio planning strategy and implementation for Cingular's GSM/EDGE overlay. Since 2003 he has been the Director of Operations for Puerto Rico/US Virgin Islands for Cingular Wireless. He has published over 20 reviewed papers, has 5 patents granted, and recently served as the technical program chair for the 2003 Wireless and Personal and Mobile Communications (WPMC) Conference.

II. INTRODUCTION

3. The merger of Cingular and AT&T Wireless Services, Inc. ("AWS") under a single parent, Cingular Wireless Corporation, will provide the combined company with the coverage and spectrum necessary for making significant improvements in the quality of service each company currently provides its existing customers while simultaneously making it possible to offer advanced broadband services sooner and in more places. It will also enlarge the area where the two companies' customers can receive full-featured service, providing a more complete on-network service area needed to compete in today's national wireless market.

4. As discussed in the Declaration of Marc Lefar ("Lefar Declaration"), quality of service, scope of coverage, and, increasingly, the ability to offer advanced services are key elements of competition among wireless carriers. Quality of service and scope of coverage are the leading factors causing wireless customers to change carriers. This merger is designed to address the service quality and coverage issues faced by both companies, as well as speed the availability of advanced services.

5. Both Cingular and AWS have legacy analog and TDMA digital customers whose needs have to be accommodated for years to come. This obligation limits the amount of spectrum that either company can devote to the more efficient GSM digital technology or to the evolution from GSM to more advanced broadband services, and it takes a toll on the quality of service they can offer. As a result, both companies face a competitive disadvantage, because none of the other national wireless carriers needs to support customers relying on two legacy technologies in addition to a digital technology which offers a viable path toward the new services customers want.

6. The merger offers several important technical efficiencies that flow from the combination of these two companies' networks and furthers the interests of wireless consumers:

- ***Improved Service Quality.*** By combining the two companies' networks and spectrum, the merged company will be able to address service quality issues that are aggravated by the need to support multiple legacy technologies, reducing blocked and dropped calls, improving voice quality, and better accommodating customer growth in the voice and data services currently offered.

- ***Faster, More Extensive Deployment of Advanced Services.*** Integrating the two companies' multiple networks and spectrum holdings to serve a unified customer base will provide the necessary spectrum "headroom" for rolling out the advanced services consumers increasingly demand, more quickly and in more areas than either company could achieve on its own, and permitting advanced services to be delivered in rural as well as urban areas.

- ***Better National Coverage.*** Combining the companies' networks will also provide customers of the merged company with a more extensive nationwide service area, especially in rural areas, than either company can offer on its own.

III. TECHNOLOGICAL OVERVIEW

7. Wireless service has been under constant redevelopment since cellular service was introduced in the early 1980s, in response to continued growth in subscribership and usage patterns, both in the United States and throughout the world. As the number of users has grown, so have their expectations for service quality, coverage, and access to new features and functionalities. Wireless vendors and service providers have responded to customers' demands by producing new generations of handsets and infrastructure, and each new generation of wireless equipment and service has resulted in increasing competition among providers to offer the new features and services to customers, while continuing to serve the needs of their existing customers. This merger provides Cingular with the ability to provide broadband third generation wireless service, featuring ubiquitous high-speed digital connections that will enable customers to access broadband video, music, information, and entertainment, while still supporting customers' continuing need for first-generation analog voice services and second-generation digital voice and data services.

8. ***Analog Cellular Service.*** The first generation of high-capacity wireless service in the United States came into being in the early 1980s with the establishment of analog 850 MHz cellular networks. The FCC required cellular system operators to provide analog service, following the Advanced Mobile Phone Service ("AMPS") standard. All 850 MHz cellular licensees are required by the FCC to offer analog service available throughout their coverage areas until February 2008, when the analog requirement is scheduled to sunset. Analog cellular service is less efficient in how it uses spectrum and more susceptible to interference than the digital technologies that followed it. Analog cellular service was designed for voice transmission but can also be used, with a modem, for low-speed data connections.

9. ***Second-Generation Digital Cellular Service.*** Several digital technologies were subsequently developed for the second generation ("2G") of wireless services. Carriers in the United States initially relied on two digital technologies: Time Division Multiple Access ("TDMA") and Code Division Multiple Access ("CDMA"). TDMA fits three voice channels into a paired 30 kHz channel and thereby provides a 3× increase in capacity over analog. CDMA uses a more complex scheme, spreading multiple voice channels across a paired 1.25 MHz channel, yielding about a 6× advantage over analog.

10. A different 2G standard, Global System for Mobile Communications ("GSM") was developed in Europe, where it was deployed in the early 1990s. It grew rapidly there and was subsequently deployed in numerous other parts of the world, becoming a worldwide standard. GSM places multiple voice channels into separate time slots in a paired 200 kHz channel and employs frequency-hopping; its capacity is about 4-6× that of analog service, but can be increased to 10× that of analog by employing adaptive multirate ("AMR") voice coders. To reach this maximum level of efficiency, GSM requires 20 MHz of spectrum; with less than 20 MHz, a GSM network uses a higher proportion of its spectrum for control channels that reduce its overall efficiency.

11. In the United States, 2G service was not deployed until the mid-1990s, when digital service was both incorporated into existing 850 MHz cellular networks and employed as the basis for the all-digital 1900 MHz personal communications service ("PCS") networks that were licensed starting in 1995. TDMA technology was the first 2G technology available for deployment in the 850 MHz band; GSM was not available for the U.S 850 MHz cellular frequency band until 2002, and CDMA's availability lagged behind TDMA by several years. All three technologies were available for use in the 1900 MHz band soon after licenses were awarded.

12. When the predecessors of Cingular and AWS had to choose a 2G technology for their 850 MHz networks, their choices were limited. GSM was not then available at 850 MHz. CDMA was largely unproven, and it was unclear when it would become viable. As a result, the predecessors of Cingular and AWS were required to roll out TDMA technology in markets with a large number of minutes or see service quality decline precipitously. The introduction of digital technology had other advantages — digital phones were smaller and lighter than analog handsets, with longer battery life due to reduced power consumption, and offered text messaging capabilities.

13. Given the advantages of TDMA over analog, and driven largely by capacity constraints, the predecessors of Cingular and AWS were among the first to deploy digital service at 850 MHz. By choosing TDMA, they were not only able to improve their service quality and ca-

pacity but were also able to claim a marketing advantage by deploying digital service before CDMA digital equipment was widely available.

14. After the 1900 MHz PCS licenses were awarded, the companies constructing these networks could choose between GSM, CDMA, and TDMA. Vendors had adapted GSM to the 1900 MHz band, so GSM was readily available as a basis for 1900 MHz networks, unlike 850 MHz. As a result, the earliest PCS systems on the air used GSM technology, and one of Cingular's predecessors constructed an early 1900 MHz GSM network in California and Nevada. T-Mobile and its predecessor companies used GSM exclusively for PCS deployment. Other nationwide operators used CDMA to construct PCS systems — Sprint and Verizon Wireless have built exclusively CDMA networks at 1900 MHz.[1] Cingular and AWS, and their predecessors, used combinations of TDMA and GSM technologies in building their 1900 MHz networks.

15. ***Third-Generation and "2.5G" Digital Technologies.*** During the late 1980s and the 1990s, a variety of third-generation ("3G") technologies were under development, with the objective of meeting consumers' demand for a wide variety of new, innovative services requiring increasingly higher bandwidth. Appendix 1 illustrates the data speed requirements for a variety of these types of services. As shown in that Appendix, services such as interactive text messaging require only relatively low speed data communications (up to 10 kbps), which can be provided by any of the 2G technologies. Elementary (non-graphics-intensive) web browsing, simple game downloads, and email typically require somewhat higher speeds (10-35 kbps), and are only marginally acceptable when using 2G technologies. 2.5G service provides the increased bandwidth (35-70 kbps) needed for more data-intensive applications, such as mobile-to-mobile photo messaging, sending and receiving email with complex attachments, such as word-processing documents and spreadsheets, synchronizing a personal digital assistant with one's desktop computer, and interacting with corporate web-based applications. The next step up is to applications and services such as video and audio streaming, downloading songs, and using a laptop computer for remote access to a home or office desktop through a virtual private network, which will typically require early 3G technology's speeds, (70-200 kbps). In the near future, consumers will demand broadband 3G services with sufficient bandwidth (200 kbps to 22 Mbps) to be able to download entire albums and movies, participate in videoconferences, engage in real-time multiplayer games, and transfer high-resolution pictures and graphics. High-bandwidth services such as these are currently available in Japan and South Korea, where they are in high demand, and are increasingly popular in Europe as they become available.

16. For GSM and TDMA, the path for evolution toward 3G is illustrated in Figure 1:

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[1] The only exception is Sprint's first PCS system, which was built as an experimental system before the PCS rules were adopted, when CDMA was not yet ready for deployment. That system initially used GSM.

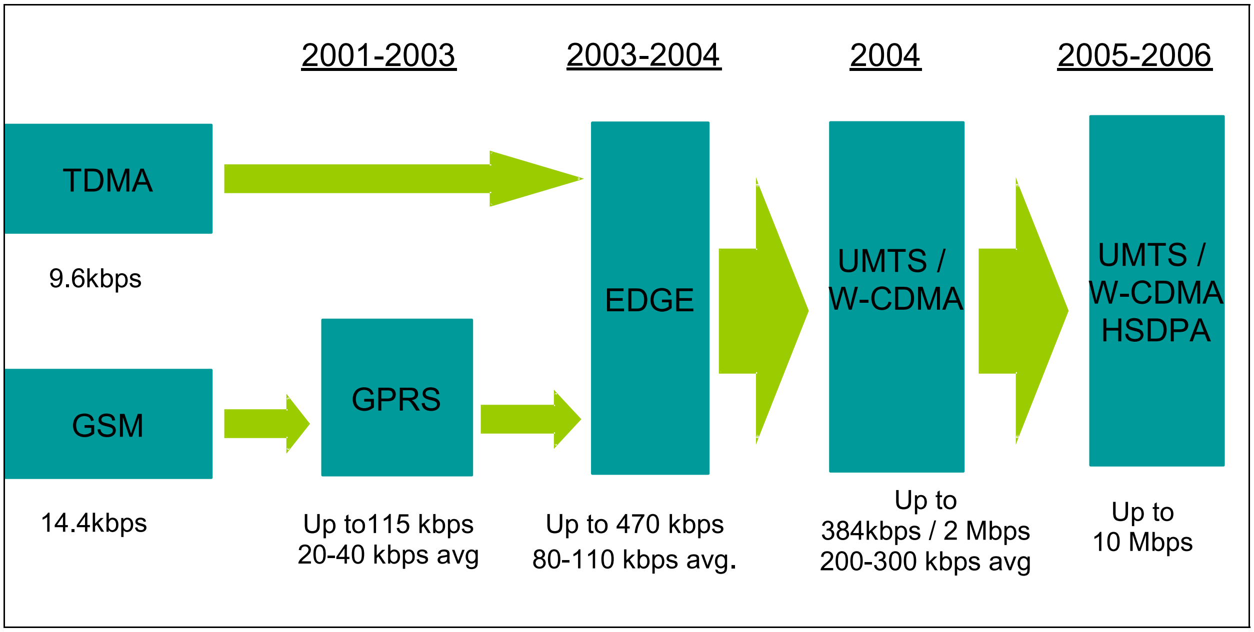

Figure 1. GSM and TDMA 3G Evolution

17. As illustrated above, the General Packet Radio Service ("GPRS") standard is a intermediate "2.5G" technology providing low- to medium-speed data transmission capability. Enhanced Datarate for Global Evolution ("EDGE") is an initial stage of 3G technology providing medium-speed data transmission capability. These technologies use the same channelization as standard GSM, so they can be integrated with existing GSM networks.

18. The broadband 3G standard for GSM, variously known as Wideband CDMA ("W-CDMA") and Universal Mobile Telephone System ("UMTS"), provides high-speed data transmission. Since GSM/GPRS/EDGE uses a different radio access technology and wideband channelization, it requires clear spectrum and cannot be integrated into existing GSM radio networks. UMTS can provide varying rates of data transmission, initially ranging from 384 kbps to 2 Mbps depending on the users' distance from the base station, and can be upgraded to 10 Mbps by implementing High Speed Downlink Packet Access ("HSDPA"). UMTS also can be used to provide highly efficient, high-quality voice service.

19. EDGE was originally seen as the evolutionary path to 3G for TDMA networks, but EDGE was more closely related to GSM. Given the relatively low global penetration of TDMA compared to GSM and CDMA, vendors' concentrated their development efforts on GSM 3G migration as compared to TDMA 3G migration, and TDMA development efforts, ultimately, faltered completely. Moreover, the substantial delay before EDGE services would be available meant that there would be a considerable time before TDMA-based networks would be able to offer data communications at the necessary increased speed levels. Given the expected demand for increasingly fast data services, the vendors' inability to deliver TDMA-based 3G services was one of the factors that led them to discontinue efforts to develop TDMA-based 3G services and capabilities.

20. Meanwhile, the developers of the 2G CDMA standard, now known as cdmaOne, developed 3G technologies that were capable of being integrated into existing CDMA networks. This suite of technologies, known as cdma2000, included a 2.5G technology known as 1xRTT (single carrier radio transmission technology), that made it possible to offer medium-speed data

transmission before 3G services are deployed and offers a 12× capacity increase over analog. The principal 3G services in cdma2000 are 1xEV-DO (single carrier evolutionary, data-only) and 1xEV-DV (single carrier evolutionary, data and voice). 1xRTT and 1xEV-DO provide a CDMA carrier the ability to offer medium- and high- speed data, respectively, while 1xEV-DV can be used to provide both high-speed data and voice services. All of the CDMA-based technologies utilize paired 1.25 MHz channels and can be implemented within existing cdmaOne networks.

21. ***Cingular's and AWS's 3G Evolution Path.*** Faced with the technological obsolescence of TDMA and the need to be able to offer upgraded services to remain competitive, AWS and Cingular had little choice but to overlay a different technology over their TDMA networks as a path toward 3G. This required AWS and Cingular, unlike their CDMA competitors, to divide their spectrum among multiple technologies. As a result, constructing an overlay requires more spectrum than a single-technology network that can be migrated directly to 3G.

22. Cingular chose GSM as its overlay transition path to 3G service. GSM offered considerable advantages over the only other alternative, CDMA, because GSM is closest to a worldwide technology standard. The global deployment of GSM promised the advantage of worldwide roaming for GSM subscribers.[2] Also, GSM is widely supported by vendors and is the focus of vigorous 3G development efforts. As a result, GSM offered 3G deployment sooner and at a lower cost than CDMA. Also, the technical similarity of GSM to TDMA meant that dual-mode TDMA/GSM handsets could be developed more quickly than TDMA/CDMA handsets. Thus, Cingular found that GSM was the most realistic choice for its overlay. As discussed in the declaration of Greg Slemons of AWS ("Slemons Declaration"),[3] AWS reached similar conclusions.

23. In 2000, after TDMA had reached its limits in terms of 3G development, AWS announced that it had chosen GSM as the basis for its evolution to 3G services. As a result, AWS began deploying GSM and GPRS, and later EDGE, in its 1900 MHz networks. AWS's 850 MHz networks have remained largely TDMA-based, but AWS is in the process of deploying GSM/GPRS/EDGE technology at 850 MHz, as well as the already deployed system at 1900 MHz.

24. In 2001, Cingular announced that it had chosen GSM as the basis for its evolution to 3G services and that it would deploy GSM and GPRS in its 850 MHz networks as well as at 1900 MHz. Cingular was the first company in the world to use GSM at 850 MHz. In March 2002, vendors began making 850 MHz GSM infrastructure available, and by October 2002, handsets were available. Cingular integrated GPRS into all of its GSM networks from the start,

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[2] A number of different frequency bands are used around the world for GSM. Vendors have facilitated worldwide roaming in spite of the varying bands by offering multiband handsets. In addition, a customer who does not have a multiband handset may roam by switching his or her Subscriber Identity Module ("SIM card") from the handset used at home to a handset compatible with the host country's frequency plan. The SIM card is a GSM-standardized "smart card" containing the subscriber's number, dialing directory, and related information.

[3] The Declarants' references to the Slemons Declaration are based on review of a March 16, 2004 draft that is in substantially final form.

and all of its GSM overlay networks were designed to be EDGE-compatible. By summer of 2004, Cingular will have GSM technology deployed in all of its 850 MHz networks.

25. The GSM overlay employed by Cingular and AWS provides a path toward 3G at the cost of dividing limited spectrum up among different technologies, as discussed below. In most areas, the companies' need to support multiple technologies poses a potent obstacle to implementing 3G services on a broad scale. While each company would be able to introduce 3G services in a limited number of urban centers, they would be unable to do so on a national scale without acquiring more spectrum. This transaction will provide the merged company with the spectrum needed to bring broadband 3G services to consumers nationwide.

IV. LIMITATIONS IMPOSED BY CURRENT CINGULAR SPECTRUM AVAILABILITY

26. Cingular faces spectrum constraints that hamper its ability to provide the high quality its customers want in existing voice and data services in many metropolitan areas. These same spectrum constraints, aggravated by the need to support multiple legacy technologies, present major challenges with respect to responding to increased demand in the short term and introducing 3G services in the future. In many areas, Cingular will simply be unable to clear even a single 10 MHz block of spectrum needed to introduce UMTS without acquiring additional spectrum.

27. The most obvious constraint Cingular faces is that its spectrum holdings are limited. Even after Cingular completes its pending acquisition of spectrum from NextWave, Cingular will still hold 25 MHz or less of spectrum in a majority of the top 50 MSAs, including several where it will have no spectrum at all.

28. Cingular's spectrum shortage is aggravated by the need to support multiple technologies, which requires subdivision of its spectrum. In many of its 1900 MHz systems Cingular's spectrum is divided among TDMA and GSM, and in all of its 850 MHz systems Cingular has to divide its spectrum among analog, TDMA, and GSM. Cingular will complete the installation of GSM technology in all of its 850 MHz systems by this summer (currently 93% of pops covered), but must continue devoting spectrum on these systems to legacy analog and TDMA digital service for some time. The need to keep spectrum set aside for analog and TDMA limits the company's ability to take advantage of the efficiency of GSM technology — and even reduces the efficiency of the company's GSM service, which does not reach its maximum potential efficiency of 10× analog until 20 MHz of spectrum is devoted to GSM.

29. The amount of spectrum that is needed to support these legacy technologies is significant. In urban areas where Cingular provides 850 MHz service, a typical system currently uses about 4 MHz for analog service (two voice channels and one control channel per sector, which ensures that there is one voice channel available even if one fails) and about 11 MHz for providing TDMA service (including a guardband between TDMA and GSM). This leaves only about 10 MHz for Cingular's provision of GSM service, including GPRS/EDGE — and in order to offer GPRS/EDGE it is necessary to dedicate a minimum of two time slots to data service, making them unavailable to handle GSM voice traffic. The precise allocation of spectrum to the

different services varies from area to area and is frequently revised in response to technology deployment, usage, and other factors.[4]

30. Spectrum will have to be reserved for legacy services for a substantial period, placing long-term limits on Cingular's expansion into UMTS. At a minimum, Cingular must continue providing analog service until February 18, 2008, the sunset date established in Section 22.901(b) of the FCC's rules. The attrition of analog-only customers before analog service is terminated would permit only a slight savings of spectrum,[5] and even the elimination of analog service will save only about 4 MHz. Moreover, Cingular anticipates that it will be required to continue supporting TDMA for several years until it can transition its TDMA customers to GSM.

31. In addition to regulatory requirements applicable to analog service, the phase-out of analog and TDMA service will need to take into account customer needs, including reliance on legacy systems by public safety and homeland security organizations.[6] Cingular anticipates that, over a period of years, improvements in technology and GSM network deployment will make customers less dependent on legacy technologies.[7]

32. Eventually, the addition of new GSM cell sites and retrofitting of existing cell sites with GSM equipment will make GSM service more universally available, and customers will replace their phones with GSM models in order to take advantage of new features, functions, or price plans. As this occurs, it will be possible to phase out analog and TDMA service without significant customer disruption. Converting all of the analog and TDMA service to GSM in a short time in a "flash cut," on the other hand, would be unnecessarily disruptive to customers.[8] It would also be uneconomic, requiring a huge capital investment in replacement GSM facilities and writeoffs of facilities before the end of their useful life. Moreover, the upgrade of Cingular's

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4 For example, in rural areas, where high-powered (3 watt) analog phones are often still used due to their increased transmission range, cell sites may be configured with a larger amount of spectrum reserved for analog service.

5 By eliminating one voice channel in each sector, 1.26 MHz could be saved, but there would be no redundancy to ensure service if the remaining voice channel failed.

6 Many customers find the need to replace handsets when converting to a new technology to be inconvenient and costly, especially when an organization may use a large number of units. In addition, certain customers are currently dependent on the availability of analog service (*e.g.,* the embedded base of customers having automobiles using OnStar or similar assistance services based on analog cellular technology and hearing-impaired users relying on analog phones for compatibility with assistive devices until hearing-aid-compatible digital phones are widely available). Moreover, there may be differences in coverage among the different technologies that are important to particular customers, depending on where they use their phones.

7 For example, vendors are making progress in designing digital phones that are compatible with assistive devices for the hearing impaired, and the planned February 2008 sunset of the analog requirement will result in automobile assistance services transitioning to digital service.

8 A flash cut could also have a disparate impact on rural customers, who are generally more reliant on analog and TDMA phones than urban customers. Cingular's rural 850 MHz systems often have more spectrum allocated to analog and TDMA than its urban systems, where Cingular concentrated on early GSM deployment; also, 3-watt analog vehicular and transportable phones have greater transmitting range, which is useful in some rural areas.

entire analog and TDMA subscriber base to GSM can not be accomplished in a short time. It has taken three years to roll out GSM as an overlay network; to expand it to the point where it would have the capacity to accommodate all analog and TDMA users would also take years. For all these reasons, a "flash cut" of analog and TDMA customers to GSM/GPRS/EDGE is neither currently planned nor feasible at any time in the near future.

33. With GSM/GPRS/EDGE usage growing, the amount of spectrum needed for analog and TDMA will decline over time, as Cingular readjusts the spectrum subdivision among these technologies several times a year, and eventually these services will be terminated. When this process is complete, all of the analog and TDMA spectrum will be recovered and dedicated to more efficient uses. In a 25 MHz block of 850 MHz spectrum, this would allow Cingular to increase the amount of GSM spectrum from 10 MHz to the full 25 MHz. This will also improve the efficiency of the GSM network, because as the amount of GSM spectrum reaches 20 MHz, a higher percentage of the spectrum is reused in every sector of every cell to carry voice and data traffic, instead of control channels that are not reused as intensively. Thus, at 20 MHz, the efficiency of the GSM network will approach its full potential (10× analog capacity), as shown in figure 2, below:

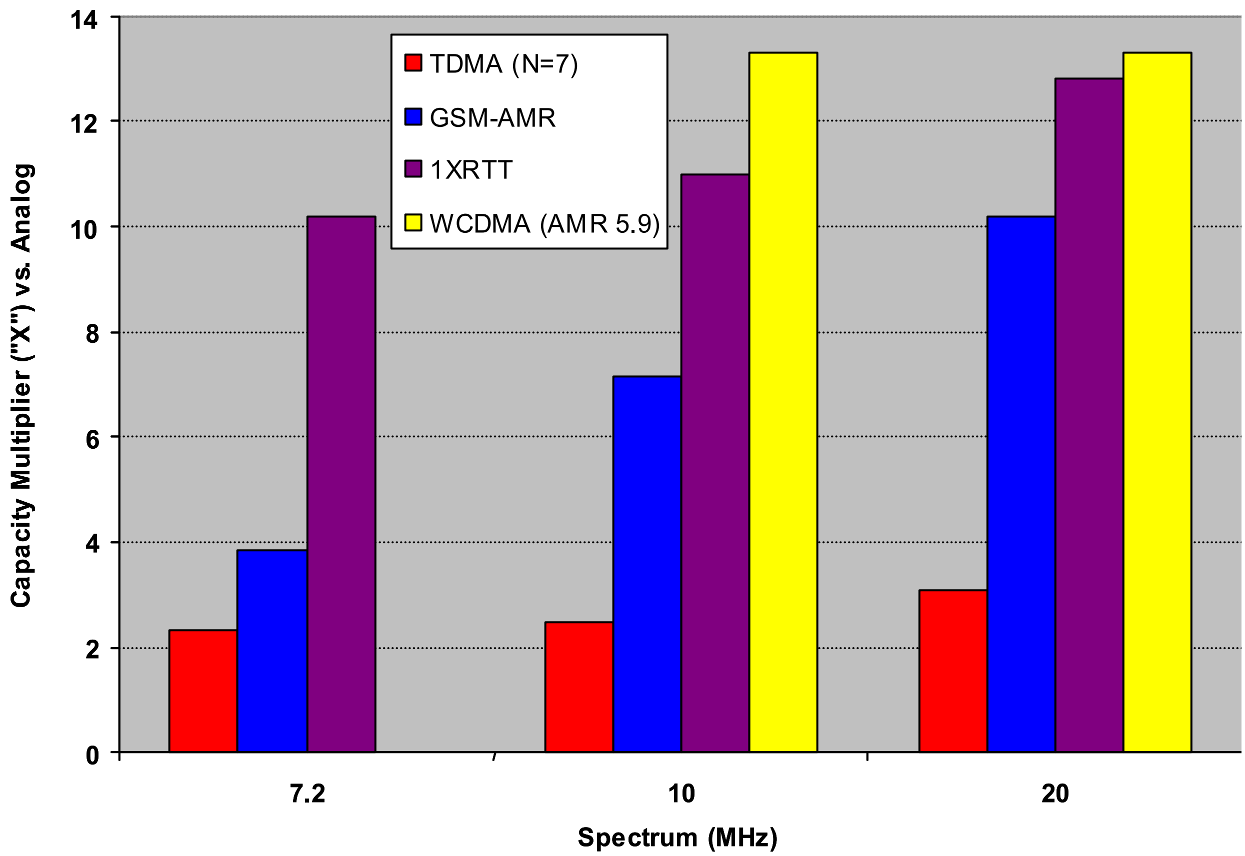

Figure 2. Efficiencies of Technologies Relative to Analog with Varying Amounts of Spectrum

34. Even with the phase-out of analog and TDMA, however, it is unlikely that even a single channel of UMTS will be feasible in a 25 MHz block of 850 MHz spectrum. First, that would reduce the GSM spectrum below the 20 MHz level that maximizes efficiency. Second, the continued growth in demand by Cingular's customers for GSM/GPRS/EDGE voice and data

services would likely require the use of all 25 MHz of that block to provide a quality level that remains competitive. A similar situation is presented in areas where Cingular holds a limited amount of 1900 MHz spectrum — virtually all of that spectrum is used today and will be needed in the future to provide GSM/GPRS/EDGE minutes of use or data services.

35. As a result, without additional spectrum, Cingular is not, and will not be in the foreseeable future, in a position to offer UMTS in many areas.[9] UMTS requires a minimum of 10 MHz of clear spectrum (paired 5 MHz channels) for a single channel, and two or three channels (*i.e.,* up to 30 MHz) will eventually be needed where there is a high demand for high-speed service, such as in high-density urban areas. This is because a given UMTS channel has a fixed maximum download bandwidth that is shared among all of the customers demanding bandwidth at any given time in the area served by a single base station. As a result, a UMTS base station (prior to the introduction of HSDPA) that is capable of providing 384 kbps download speed over a wide area may only provide 38.4 kbps to each of ten users simultaneously; the same base station may provide a total of 2 Mbps download speed to all users located close by, or 200 kbps to each of ten close-in users simultaneously (up to 1 Mbps in bursts). While a single channel will be adequate in the early stages of 3G service, as customers become accustomed to using high-bandwidth devices away from their homes and offices, and more users are attempting to use the service from a given cell, they will have to share the bandwidth with an increasing number of users, resulting in lower download speeds, as shown in Figure 3 below:

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9 In a limited number of areas where Cingular holds 1900 MHz spectrum in addition to 850 MHz spectrum, it would be possible for Cingular to dedicate some 1900 MHz spectrum for UMTS (*i.e.,* some of the areas where Cingular is in the process of acquiring spectrum from NextWave). As discussed below, there are relatively few markets where this could be accomplished, due to the need to accommodate customer needs for existing voice and data services.

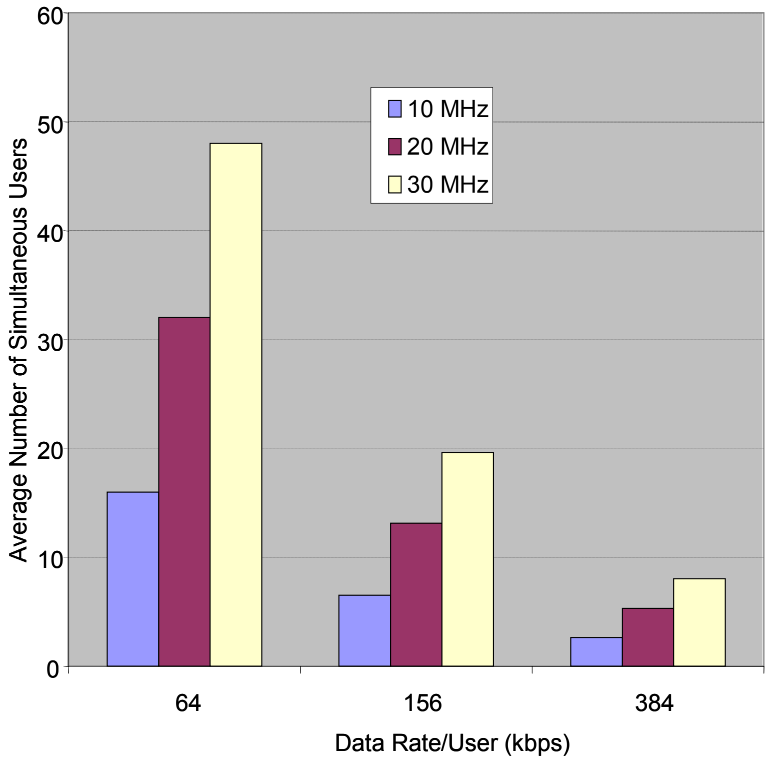

Figure 3. Number of Simultaneous UMTS Users that Can Be Accommodated at Varying Data Rates, Using 10, 20, and 30 MHz of Spectrum

36. Accordingly, Cingular expects that a second UMTS channel will be needed to serve a growing bandwidth-hungry user base. A third channel will be necessary to provide sufficient bandwidth within a given cell when usage has grown and many customers require simultaneous access to reliable high-speed data service, which will be needed for applications such as streaming video, mobile desktop access, and interactive graphics-intensive online games. How quickly the second and third UMTS channels will be needed will depend on the usage at a particular cell site and will vary from city to city. Multiple channels will likely be needed at the outset in some locations where usage is predicted to be intensive, while other locations may have less initial demand and will require a second or third channel only after a period of growth in usage. The subsequent deployment of HSDPA at selected high-usage cell sites will increase the maximum total download speed of a single UMTS channel to 10 Mbps in the 2007-08 time frame, but the embedded base of terminals will not be able to take advantage of the additional capacity of HSDPA, which will only benefit customers on a going-forward basis, and multiple UMTS channels will still be needed at these locations because both the number of users and the bandwidth demands of applications are likely to continue growing.

37. Even when the transition of analog and TDMA customers to GSM is complete, the need to serve Cingular's GSM/GPRS/EDGE customers will prevent Cingular from clearing the two 5 MHz paired blocks of contiguous spectrum needed for a single UMTS channel within a single 25 MHz block of spectrum, much less the two or three that will be needed to accommodate a growing user base. As noted in paragraph 26 above, this fact alone will prevent Cingular from introducing UMTS in most of the top 50 MSAs unless it acquires additional spectrum. As

discussed below, it would also be difficult for Cingular to clear sufficient spectrum for UMTS even in many areas where it holds 35 or 40 MHz.

38. Cingular's nationwide competitors, on the other hand, are not hampered in this way. The two national CDMA providers have already begun introducing high-speed 3G technologies, which can be intermixed with their ubiquitous 2G and 2.5G CDMA services, unlike UMTS and GSM. For example, Verizon Wireless currently offers the CDMA-based 1xEV-DO "BroadbandAccess" data service in the Washington, D.C. and San Diego, California areas, with end-user speeds averaging 300-500 kbps, and has announced plans to introduce this service nationally, starting in "many major U.S. cities" this summer.[10] Sprint PCS is gearing up to deploy 1xEV-DV technology, which permits the transmission of both voice and broadband data, with a possible average data rate of 400 kbps to 1 Mbps.[11] Moreover, T-Mobile has sufficient spectrum available for its nationwide GSM network to deploy UMTS most places when it chooses to do so, and it is already a major provider of wireless broadband service via Wi-Fi. Nextel, which currently uses SMR spectrum and the proprietary iDEN technology to provide its nationwide service, is conducting a trial of a "next-generation technology, FLASH-OFDM," which it says is "capable of realizing typical download speeds of up to 1.5 Mbps."[12]

39. While Cingular has a 10 MHz block of 1900 MHz spectrum in a limited number of cities where it provides 850 MHz service, that spectrum is currently used to provide GSM service. As a result, that spectrum could not be used for UMTS without moving customers to 850 MHz spectrum, which would degrade service for *all* customers in the area affected. Similarly, Cingular has a limited number of systems that are 1900 MHz-only (*e.g.,* New York BTA, California/Nevada, and the Knoxville and Charlotte MTAs). These systems use 20-30 MHz of spectrum to provide GSM/GPRS/EDGE service to customers, and do not have 10 MHz to spare for implementing UMTS. With the acquisition of spectrum from NextWave, some markets will be capable of limited UMTS deployment, but the spectrum to be acquired from NextWave will also be needed for improved GSM/GPRS/EDGE coverage or for an initial deployment of these services.

40. Given these constraints, Cingular has estimated that it would be able to introduce UMTS in only 38 of the top 100 service areas even after it acquires the NextWave spectrum, but to do so it would have to accelerate the transition of customers to GSM, squeeze existing voice and data services into less spectrum, degrading the quality and capacity of existing services, and limit the growth potential of both existing services and UMTS. This will place Cingular at a distinct disadvantage to other nationwide providers who do not face the same spectrum constraints and either have begun to introduce high-speed 3G services or are able to do so when demand warrants. As described in the Slemons Declaration, AWS is subject to similar constraints.

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10 *See* Verizon Wireless News Release, *Verizon Wireless Announces Roll Out of National 3G Network* (Jan. 8, 2004), *available at* <http://news.vzw.com/news/2004/01/pr2004-01-07.html>.

11 *See* Bob Brewin, *Sprint PCS Signs $1B Cell Network Upgrade Deal with Lucent,* Computerworld (July 22, 2003), *available at* <http://www.computerworld.com/mobiletopics/mobile/-story/0,10801,83320,00.html?f=x68>.

12 *See* Nextel Wireless Broadband FAQs, available at <http://www.nextelbroadband.com/lrn_about_faqs.html>.

V. BENEFITS OF THE MERGER

41. The merger of Cingular with AWS addresses Cingular's need for access to spectrum to deploy 3G services both faster and in more areas than is possible now. This will benefit the public by making advanced wireless services available in more places, sooner, and in a more competitive environment. It also provides the merged firm with sufficient spectrum to address service quality issues that both companies have encountered that are largely rooted in their need to support multiple legacy technologies, unlike competing national carriers. This will greatly benefit subscribers of both Cingular and AWS who may have been dissatisfied with the quality of service the companies have been able to offer standing alone. Finally, Cingular will also fill out its national footprint and become able to provide service in a comparable number of the largest markets to the other national carriers. Cingular currently has coverage in 87 of the top 100 metropolitan areas. The combined company will have spectrum in 49 of the 50 states and coverage in 97 of the top 100 metropolitan areas.[13] As a result, the merged company will be able to provide its customers with "home market" coverage, with full access to features and functions, more places than either company can offer alone — Cingular's customers will have full access to areas now covered by AWS, and *vice versa*.

A. Technical Benefits of the Merger, Generally

42. Customers require reliable, high-quality mobile service. Both Cingular and AWS have been unable, in some areas, to supply the level of reliability and quality that customers want. Even though the GSM technology the companies employ is comparable to competing technologies, both companies must at the same time devote a substantial part of their spectrum to multiple legacy technologies that are not highly efficient. Without more spectrum, AWS and Cingular are limited in what they can do to improve service quality. Moreover, they are severely constrained in their ability to free up spectrum to deploy the advanced services that will be central to satisfying customers' demands in the future.

43. The merger addresses this problem by allowing the combined companies' spectrum to be used more efficiently. When their spectrum is combined, the quality and reliability of service for the existing customer base will be greatly improved as a result of these efficiency gains. In addition, the increased spectrum efficiency will give the merged company more capacity to accommodate growth in minutes of use and in data services using the 2G and 2.5G technologies already in place, as well as the ability to dedicate spectrum to accommodate demand for more advanced 3G services.

1. Trunking Efficiency Gains

44. In general, the engineering of any wireless network involves a series of tradeoffs and compromises among various factors. For example, capacity, quality, and coverage are interdependent — with a given amount of spectrum, a system's capacity can be increased only at the expense of quality and/or coverage, and to increase quality, there must be sacrifices of capacity or coverage.

45. The amount of spectrum available directly affects all aspects of system design. With sufficient spectrum, a network's capacity, quality, and coverage can all be improved, with

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13 *See* Lefar Declaration.

the improvements often being disproportionately advantageous in comparison to the spectrum added. In particular, trunking communication channels together leads to a nonlinear increase in capacity and improvement in service quality. In essence, 1 plus 1 equals more than 2. For example, two channels trunked together can provide 0.223 Erlangs[14] of capacity at 2% blocking, while four channels trunked together can provide 1.09 Erlangs of capacity at the same blocking rate, which is more than double the capacity of two two-channel blocks, an increase in efficiency (Erlangs per channel) from 11% to 27%.[15] This is true because the caller is more likely to find a vacant channel when a larger number of channels are pooled together in a trunk group.[16]

46. The trunking efficiencies resulting from combining the companies' spectrum in areas where there is a spectrum overlap will typically permit the overall service quality of the combined company to exceed the best service either company provided prior to the merger, while providing room for additional growth in customers and usage. Moreover, spectrum that either company, standing alone, might have needed to accommodate short-term growth will become available for earlier deployment of more advanced services.

47. The combination of the Cingular and AWS spectrum holdings will result in increases in spectrum efficiency that will directly benefit customers. If all the channels of both carriers at a given location are combined in a single trunk group, a larger number of vacant channels will be available to handle new calls attempts, instead of calls being blocked when one carrier has channels available and the other does not, which is the case pre-merger, with entirely separate trunk groups.

48. If the channels are divided into separate pools for AWS and for Cingular customers as they are now, an AWS customer attempting to make a call will be unsuccessful if the AWS channels are all in use, whether or not there are vacant Cingular channels. Trunking the

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14 Communications traffic is often measured in Erlangs, representing call-hours during a given period, typically the busiest hour of the day. A single call 60 minutes long, 20 three-minute calls, and assorted calls of varying length totaling 60 minutes, would each represent one Erlang of traffic.

15 The computations above are based on the Erlang B formula, one of several commonly used to calculate the effects of trunking together discrete channels. This formula, premised on call attempts being blocked due to the lack of an available channel, describes the efficiency with which a given number of channels, trunked together, can provide capacity at a given blocking rate (which affects call quality, through blocked or dropped calls). Under this formula, an increase in number of channels produces a greater than proportional increase in capacity at the same blocking rate, or a greater than proportional decrease in blocking rate for the same amount of call attempts, in both cases reflecting an increase in efficiency.

16 A good analogy is to the lines for bank tellers. A single line feeding customers to four tellers will result in more prompt and efficient service for customers than two separate lines each leading to two tellers, if customers cannot change lines. In the four-teller line, whenever a teller is available, the next customer will be served. With two two-teller lines, if there is no line for one group of tellers, the tellers serving that line remain unutilized even if there is a long line for the other two tellers. Combining the two lines into a single "trunk group" results in better service to the customers as a whole, uses the tellers more efficiently, and provides the capacity to serve more customers.

two carriers' channels together ensures that the channels will be used more effectively (*e.g.,* a Cingular channel that would have been vacant absent the merger would be available to accommodate a former AWS customer, or *vice versa*), increasing spectrum efficiency and reducing the overall likelihood of a call attempt being blocked.

49. A significant improvement in service quality occurs due to trunking with the number of channels used in a typical cell site. For example, a typical cell site in an urban area will have about 40 trunked channels per sector, with a capacity of 31 Erlangs at 2% blocking. If Cingular and AWS have sites that can be combined and operated as a single 80-channel trunk group instead of two 40-channel trunk groups, there would be an increase in total capacity from 62 Erlangs to 68.7 Erlangs at 2% blocking. As a result, if at a given site and sector AWS and Cingular each have 40 voice channels deployed and serve the same number of subscribers at the same quality level, the combination of their 80 channels into a single trunk group will provide a 10.8% increase in capacity for serving new traffic at the same quality level as before. Until that traffic is added, the increased efficiency would serve the same level of traffic at an even higher quality level (lower rates of blocked and dropped calls).[17] Alternatively, the efficiency gain could be used to reduce the number of channels needed to accommodate the combined traffic. In the example, the total number of voice channels could be reduced from 80 (in two separate trunk groups) to 73 (in a combined system) to serve the combined customer base with no reduction of the existing quality level, thereby recovering 7 channels for alternative uses, *e.g.,* GSM.

50. How the efficiency gains due to trunking are manifest to the subscribers will depend on how heavily loaded the two systems are. There will be an overall improvement in all situations, but the most dramatic results would occur if one system has a high level of traffic and the other has a low level of traffic, in which case, all customers would experience both a decrease in blocked calls and a significant improvement in voice quality, while the customers of the previously more congested system would also enjoy a significant decrease in dropped calls. Appendix 2 summarizes the relative benefits to customers. If Cingular's and AWS's differing mix of consumer and business customers results in the two separate networks having different busy hours, for example, then combining the networks will result in a more even distribution of calling, producing significant improvements during the times when each company's separate network was most heavily utilized.

51. Moreover, the combination of systems would likely result in significant improvements with respect to dropped calls,[18] which will greatly benefit consumers. The chart in

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17 Moreover, the increase in service quality would be even more dramatic if the two systems are unequally loaded. For example, if one company is serving 31 Erlangs of traffic with 40 channels at 2% blocking and the other company is serving 47 Erlangs of traffic on its 40 channels at a very poor quality level, 21.1% blocking, the combined traffic (78 Erlangs) can be served from a combined 80 channel trunk group at 2% blocking, representing a huge improvement in quality for the customers of one network previously receiving poor-quality service without any degradation of the high quality service offered to the other customers. The improvement in call blocking resulting from trunking systems with various customer call attempt levels is shown by the graph in Appendix 3.

18 Dropped calls occur in part due to blocking, as when a handoff to another cell is required but there is no channel available to handle the call in the new cell. Another cause of dropped

(continued on next page)

Appendix 4 illustrates the reduction in dropped calls as the result of efficiency gains due to combining Cingular and AWS facilities with varying usage levels pre-merger. Dropped calls are an important factor in customers' perception of service quality. In our experience, most carriers seek to keep the dropped call metric at 2% or less, but carriers have to balance this against the availability of additional sites, spectrum constraints, and other factors in optimizing their networks. As Appendix 4 shows, the merger will give the combined company the engineering capability to better serve customers through improvements in service quality. If the systems being combined in a given area are equally loaded, dropped calls could be reduced by up to 20%, but if one system is more highly loaded than the other, customers of the system with higher usage would see an improvement of up to 40% in dropped calls without any decrease in service quality received by customers of the less congested system.

52. To illustrate how customers will benefit from the trunking efficiency gains that may be possible by combining the Cingular and AWS networks, we have analyzed Cingular's actual switch data from a number of urban and rural areas where Cingular and AWS both provide service. Assuming for the sake of illustration that AWS's traffic volumes, network configurations, and service quality levels are the same as Cingular's and that all sites can be combined, the trunking efficiencies produced will result in much better service to the combined customer base. The following graphs show that when two systems are combined the blocked and dropped call rates improve:

(footnote continued)

calls is that the customer may be in a weak reception area for which there is no other cell available for a handoff; in such cases, the serving cell continues handling the call until the signal is too weak and the call drops. Finally, dropped calls occur due to interference caused by transmissions from other cells. In combining two GSM networks, all three reasons for dropped calls are diminished: (1) Drops due to handoff failures will be reduced if the recipient cell has additional capacity due to trunking efficiencies resulting from the combination of the two networks; (2) Lack of a cell to which the handoff can be made is rendered less likely because the combined network is likely to have more diverse coverage; and (3) Interference is diminished because the use of a greater number of "hopping" channels at each site due to combining the networks' spectrum results in a reduced likelihood of frequencies being used simultaneously within interference range.

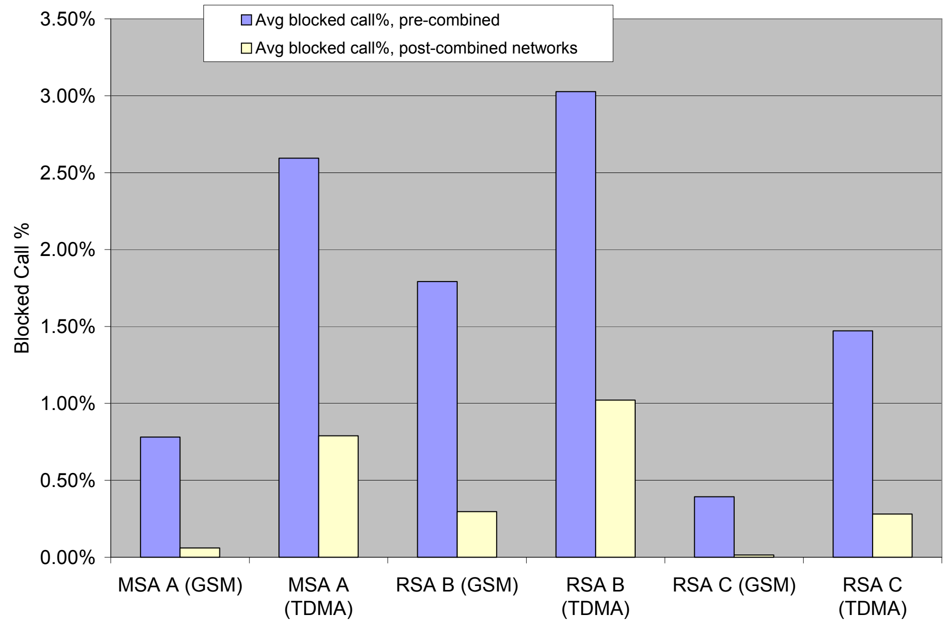

Figure 4. Blocked Call Reduction in Urban and Rural Areas

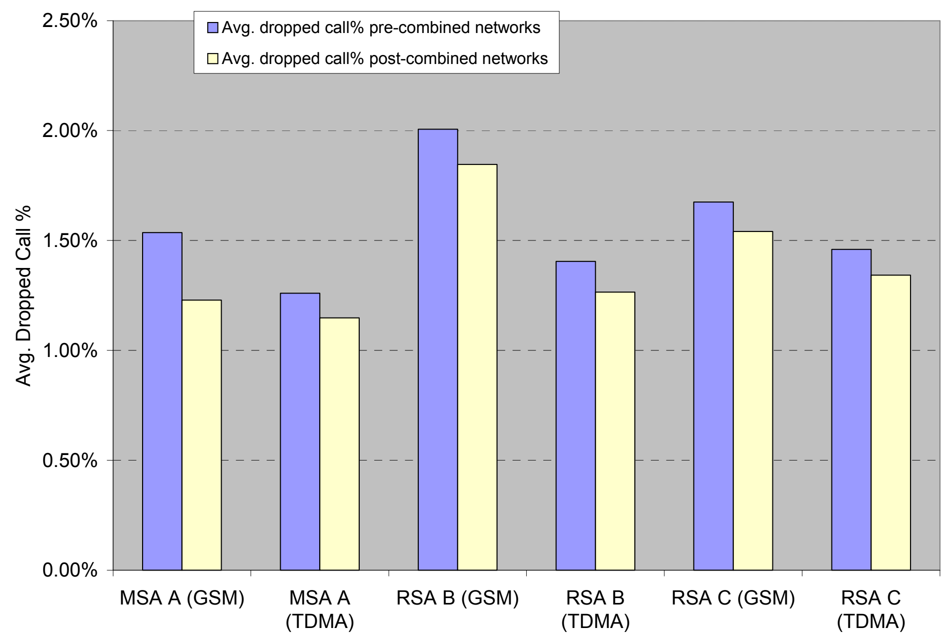

Figure 5. Dropped Call Reduction in Urban and Rural Areas

53. Graphs of bare percentages, however, fail to make clear just how much consumers will be benefit from efficiency gains when systems are combined. The figures in the highlighted columns of Table 1, below, provide measures of the concrete benefits to customers in improved service quality that are possible when two cellular systems are combined:

Table 1		Pre-Merger, per system				Post-Merger, both systems combined					
Service Area		Blocking Rate	Blocked Calls per day	Dropped Call Rate	Dropped Calls per day	Blocking Rate	Blocked Calls per day	**Additional Calls Completed on First Attempt per Day**	Dropped Call Rate	Dropped Calls per day	**Reduction in Dropped Calls per Day**
MSA A	GSM	0.78%	25,928	1.54%	50,071	0.06%	3,964	**47,891**	1.23%	40,057	**10,014**
	TDMA	2.59%	96,551	1.26%	47,104	0.79%	58,840	**134,263**	1.15%	42,912	**4,192**
RSA B	GSM	1.79%	1,517	2.01%	2,124	0.30%	635	**2,401**	1.85%	1,954	**170**
	TDMA	3.03%	5,720	1.40%	2,615	1.02%	3,809	**7,633**	1.26%	2,354	**262**
RSA C	GSM	0.39%	394	1.67%	1,702	0.01%	29	**760**	1.54%	1,566	**136**
	TDMA	1.47%	2,748	1.46%	2,715	0.28%	1,047	**4,449**	1.34%	2,498	**217**

54. These figures show that in one metropolitan area alone, the trunking efficiencies resulting from combining two identical systems could result in a reduction in blocked calls by more than 180,000 calls per day. In other words, about 66,000,000 calls per year that would have been uncompleted on the first attempt due to lack of capacity if the two systems remained separate would, instead, be completed as a benefit of combining the two cellular systems. Up to 5,000,000 calls per year that would have been dropped on separate systems due to system load would not be dropped if the systems were combined.

55. Even in rural areas, combining Cingular's and AWS's cellular systems would significantly improve customers' calling experience. In one rural service area (RSA B, above), the reduction in TDMA blocking rate from 3% to 1% means that some 10,000 calls per day — over three 3,000,000 calls in the space of a year — would be completed instead of being blocked. Combining systems would even produce noticeable improvements for customers in rural areas that already have better service quality. In RSA C, where fewer than 2% of all calls are currently blocked, combining the systems would allow as many as 5,000 calls to be completed each day on the first attempt — over 1,800,000 calls per year — that would be blocked if the two systems remained separate. In each of these rural service areas, hundreds of calls that would have been dropped every day if the systems were separate would continue, without being dropped, if the systems were combined.

56. While the actual benefits to consumers may be greater or lesser, depending on a host of factors,[19] these examples nevertheless indicate the order of magnitude of the consumer benefits flowing directly from combining two cellular networks serving a given area, whether urban or rural. Even if only a fraction of these service improvements could be realized in practice, customers would receive greatly improved service every day, and in any given area, millions of calls would be improved each year. Nationwide, hundreds of millions of calls would be favorably affected per year.

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19 As indicated above, the computations assume that the two networks are identical and serve the same number of subscribers. If the two systems are unequally loaded, as is likely to be the case in some areas, the customers could experience an even greater improvement. *See* note 17 above and Appendix 3. In addition, the computations take account of only TDMA and digital calls; trunking together analog channels will also yield improvements for the relatively small number of customers using analog service. The reductions in blocked and dropped calls would be less if the two systems' channels cannot readily be trunked together for technical reasons or if the efficiency gained through trunking is used to free up spectrum for other services or to accommodate additional customers.

57. In short, the trunking efficiencies resulting from merging AWS's and Cingular's voice channels in overlapping service areas result directly in economies of scale that can be used for a combination of (a) increase in traffic capacity (*i.e.,* accommodate growth), (b) improvements to service quality (*i.e.,* reduce blocking rate), and (c) freeing up spectrum for new services.

58. While it is not possible at this early stage to assess the overall capacity and quality improvements that will result from combining Cingular's and AWS's radio networks, our initial conservative estimate is that about 30% of Cingular and AWS sites are either already collocated or sufficiently close to be collocated, which would permit combining the sites and trunking their voice channels. If just these facilities can be combined during the rationalization of the two companies' facilities, permitting the radios to be included in larger trunk groups, the result would be a significant overall improvement in spectral efficiency and a very noticeable improvement in service quality for the combined systems' customers. Other sites, too far apart for collocation, may be able to trunk together the two systems' spectrum as well if interference does not result. Further, once the companies are combined, the network will be rationalized and the merged company will be able to achieve the efficiencies described above in substantially more of the restructured network than can be achieved based on current site locations. As a result, the spectrum of the combined companies will be used more efficiently, serving more customers with better quality service and expanded features and functions.

59. The benefits of combining the two systems' operations will also be enhanced because of the reduction in channels needed to service TDMA customers now and in the future, even while improving service for those customers. The trunking efficiencies resulting from combining TDMA operations will free up spectrum for redeployment in the combined company's GSM networks, which are naturally more efficient than TDMA due to the use of frequency hopping. Moreover, Cingular will take advantage of AMR technology in future GSM installations, as it has in its existing GSM networks, to provide a 10× increase in efficiency over analog, compared with TDMA's 3× efficiency edge over analog. As a result, the effect of the trunking efficiencies in combining TDMA operations will effectively be tripled once the TDMA spectrum can be rededicated to GSM use.

2. Additional Efficiency Gains Due to Eliminating Redundancy

60. An additional benefit of combining the AWS and Cingular networks where they overlap is that if the two companies' GSM, TDMA, and analog networks are fully combined, the number of total networks currently in operation would be reduced from six to three, reducing spectrum requirements not only through trunking efficiencies but also by eliminating redundant control channels. Eliminating one set of analog control channels would conserve 1.26 MHz; eliminating one set of TDMA control channels would save 800 kHz, and eliminating one set of GSM control channels would free up 4.8 MHz, thereby resulting in a savings of about 7 MHz. Further savings would result from trunking together the TDMA[20] and analog[21] channels, respec-

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[20] Table 1, above, illustrates the improvement in quality resulting from trunking together TDMA channels in illustrative urban and rural systems. That table assumes that all TDMA spectrum remains used for TDMA in the combined system. Alternatively, some of the spectrum can be rededicated to GSM, producing even more capacity and service quality benefits due to GSM's greater efficiency, while still improving TDMA service quality.

tively. This spectrum could then be used for additional GSM/GPRS/EDGE channels that can be used at every site to carry traffic, thereby significantly expanding the combined systems' capacity to handle voice and data traffic.[22]

B. Spectrum Requirements of the Merged Company

61. Where both companies have an existing customer base, the combined network post-integration[23] would require about 50 MHz of spectrum (assuming both carriers are currently using 25 MHz or more to serve their separate customer bases) to simultaneously serve the two companies' combined customer base with analog, TDMA, and GSM/GPRS/EDGE services, and allow for expected growth in customers using these services. Spectrum beyond 50 MHz would eventually be freed up for addition of UMTS in 10 MHz blocks, as needed. Absent the merger, both companies would be unable to create multiple free blocks of 10 MHz for UMTS in most of their service areas.

62. Fully integrating the two companies' networks will take a period of years. At the outset, there will remain two separate, stand-alone systems that will continue to require their existing spectrum complements just to maintain the status quo, *i.e.,* to continue to serve the two separate existing customer bases at pre-merger quality levels. Combining the companies' spectrum into a single network would, through increased trunking efficiency and elimination of redundant control channels, permit service quality improvements and provide some headroom for expansion. Over time, the combined company could achieve additional efficiencies by migrating customers from legacy technologies to GSM and making more extensive use of GPRS and EDGE technologies. These technologies will permit the combined company to handle data traf-

(footnote continued)

21 The total number of analog voice channels required in a single unified system could be significantly less than in two separate systems, for any given grade of service. At a minimum, a combined analog system would require only one set of control channels, instead of two. The total amount of spectrum saved by combining the analog operations will vary from service area to service area depending on analog channelization plans and analog utilization levels. In many areas, Cingular's analog service uses two voice channels plus one control channel per sector. If AWS uses only one voice channel and one control channel per sector, combining the service into a single network would permit elimination of a redundant control channel, thereby saving 1.26 MHz. If both carriers use two voice channels, a total of three voice channels would be sufficient to maintain at least the same grade of service in a combined system, reducing the total spectrum requirement for analog by 2.52 MHz. If each company used four voice channels plus one control channel per sector in a rural service area with high analog usage, six voice channels in a combined system would do the work of the eight required by two separate systems, while actually improving the grade of service, permitting the conservation of two voice and one control channel per sector for a savings of 3.78 MHz over separate systems.

22 A portion of the capacity of the new channels would be occupied by voice and data traffic previously carried in some of the frames of the GSM control channels, and some GSM frames would also be occupied by control frames. The effects of such usage are largely counterbalanced by the efficiency gains due to fact that the new channels are used in each sector of each cell, while the control channels are unique to each sector within a 4-cell reuse pattern.

23 Pre-integration, the two networks would require their existing portfolios of spectrum.

fic more efficiently and thus improve the quality of its existing voice service and handle increased voice traffic.

63. Even with continued support for legacy technologies, 50 MHz of spectrum in a combined system, on average, would be sufficient for several years to support a customer base for existing voice and data services that, pre-merger, required 60-80 MHz of spectrum. For example, in a city where one carrier used 25 MHz of 850 MHz spectrum and 10 MHz of 1900 MHz spectrum to serve its customers and the other carrier used 40 MHz of 1900 MHz spectrum, a unified, optimized network would likely be able to serve the combined customer base, at an improved level of quality, in about 50 MHz.[24]

64. The 50 MHz of spectrum used to accommodate the customers of two combined systems would not, however, be sufficient for the merged company to simultaneously roll out new, innovative, high-bandwidth 3G services such as UMTS and HSDPA (high-speed downlink packet access). By reducing the amount of spectrum needed to support existing voice customers and current low- to medium-speed data offerings to about 50 MHz, the combined company's additional spectrum would become available over time for expansion into advanced high-speed services.[25] This will be accomplished by devoting spectrum in 10 MHz blocks above and beyond the 50 MHz to advanced services in a building-block fashion, without impairing existing services. While a single clear block of 10 MHz is needed to begin offering advanced services, additional 10 MHz blocks of spectrum would permit the provision of higher-speed services to a larger number of simultaneous users. In areas of high demand for broadband service, three 10 MHz blocks will likely be necessary to satisfy this demand over the next five years or so. As discussed in paragraphs 71-73 below, three blocks of 10 MHz are also likely to be needed to provide UMTS in many rural areas.

65. As discussed above, Cingular's experience with the growth of 2G and 2.5G data services and the growth rate of 3G services in other countries indicates that there will be burgeoning demand for higher and higher bandwidth services. As Figure 3 above suggests, at least two 10 MHz blocks of UMTS spectrum will likely be necessary to provide high-capacity broadband data service in many areas, because the use of only 10 MHz imposes limits on the speed of data transfer and the bandwidth must be shared among multiple simultaneous users. A minimum of 20 MHz is needed to provide high-speed service to even a moderate number of users, and 30 MHz will be needed where usage is high. Without this additional spectrum made available through the merger, customers in areas with a large number of users demanding high-speed service would contend for limited bandwidth — where any UMTS bandwidth is available at all — with the result that no customer would receive truly high-speed data transfers at times of peak

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24 The speed with which the two systems' spectrum can be fully combined and existing customers consolidated in 50 MHz to realize trunking efficiencies will, of course, depend on the extent to which the two companies' customers have handsets capable of operating on the spectrum that is to be used for the 50 MHz of non-UMTS operations.

25 Increasing site density through cell-splitting is not a viable option for making spectrum available to offer UMTS, because each site would still need to maintain spectrum blocks for analog, TDMA, and GSM/GPRS/EDGE, as well as necessary guard bands. Moreover, adding sites is economically unjustifiable in many areas and often poses environmental and zoning issues as well as other difficulties.

usage. For UMTS to provide high-speed service (400 kbps and above) to multiple customers simultaneously, multiple UMTS channels would be needed.

66. As a result of combining Cingular's and AWS's spectrum, Cingular has estimated that the post-merger company would be able to offer UMTS in 75-80 of the top 100 metropolitan areas, versus Cingular's ability to do so in only 38 areas (estimated) on a standalone basis. According to the Slemons Declaration, AWS would be able to launch UMTS in limited metropolitan areas as a stand-alone entity. By comparison, we estimate that both Verizon Wireless and Sprint PCS have sufficient spectrum to introduce high-speed 3G service in essentially all urban areas they serve; T-Mobile also appears to have sufficient spectrum to do so in many areas, although for now T-Mobile has made the business decision to provide high-speed service via Wi-Fi technology. Moreover, the post-merger company would be in a position to roll out advanced services using the combined spectrum much more quickly, because blocks of 10 MHz could be cleared more rapidly, and in more areas, than either company could accomplish alone.

C. Additional Benefits of the Merger in Rural Areas.

67. The merger will especially benefit rural areas. The merged company would have access to more spectrum and coverage in more areas, permitting it not only to improve existing services and extend rural coverage, but also to introduce advanced services more quickly to rural areas than either company, standing alone.

68. The benefits are most readily apparent in the eleven rural service areas ("RSAs") where Cingular and AWS already provide overlapping 850 MHz service. In those areas where the systems of the two companies overlap, the merged company can achieve trunking efficiency gains in a single network using 50 MHz of spectrum that are comparable to those in metropolitan areas. There will also be quality improvements from combining the systems. As discussed above, combining rural systems can result in a significant reduction in dropped calls; voice quality will also be improved because the merged system would be able to dedicate additional spectrum to individual cell sites, thereby reducing intrasystem interference.

69. There are other benefits of a technical nature from combining the two companies' rural 850 MHz systems. Not the least of these benefits derives from that fact that the coverage footprint of 850 MHz systems in rural areas tends to be more differentiated than that of systems in urban areas. As a result, combining two 850 MHz systems in a rural area will typically result in the geographic coverage of the combined system being more extensive than either system's coverage standing alone. Consequently, the merger will benefit the customers of both Cingular and AWS by allowing them to use all of the features of their phones in a larger local area than is the case at present, where customers of one carrier roaming onto the other carrier's network do not have full access to their home-market features and services.[26] In addition, customers of other carriers roaming in these service areas will have the ability to roam on a substantially expanded area in the RSA than is, or is likely to be, available from either company on a stand-alone basis.

70. Moreover, a combined company may have the ability to build out service in marginal sections of rural areas with low potential traffic levels and high build-out costs where nei-

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26 For example, roaming customers cannot take full advantage of their voice mail and message notification features, and may not be able to use some of the data services that are available in their home areas.

ther company, standing alone, might have been able or willing to do so. The merged company may be able to justify doing so in order to fill in holes in the combined systems' coverage footprint.[27]

71. This is even more true with respect to advanced services. The cost for a single combined company to provide advanced services to rural areas with marginal demand is less than it would be for two companies to enter such an area separately. As a result, the merger is likely to result in the extension of 2.5G and 3G services into rural areas more quickly and more extensively than would occur without the merger.

72. In rural areas where both companies are already providing service, the merged company is likely to require 50 MHz to continue providing existing services and use the headroom gained due to trunking efficiencies and elimination of control channel redundancy to accommodate growth in GSM/GPRS/EDGE usage, for the reasons already discussed. The post-merger Cingular will be able to use up to 30 MHz of spectrum beyond that needed for analog, TDMA, and GSM/GPRS/EDGE (*i.e.,* spectrum beyond 50 MHz where multiple existing systems are combined) to roll out advanced services.

73. In rural areas, each cell or sector typically provides service to a much larger area than in urban areas, because subscribers are spread more thinly. The towers are higher, with broader geographic coverage than in urban areas because rural areas are less densely populated.[28] At the same time, rural customers are less likely to have other sources of high-speed data service, because they may not have cable modem service available and be located beyond the reach of DSL. As a result, it is expected that rural high-speed wireless data subscribers will be more likely to use UMTS or similar services as a primary high-speed access link at rural residences and businesses than in urban areas. This may result in rural customers having a demand for higher speeds and faster transfer rates than typical urban subscribers; the greater bandwidth hunger in rural areas is likely to counteract the lower user density and result in a demand for UMTS bandwidth comparable, per site or sector, to that provided in urban areas. Accordingly, one to three blocks of 10 MHz of spectrum are likely to be needed in rural areas for UMTS, just as in urban areas. Thus, the merger will make it possible for rural areas — including those where the two companies are both present at 850 MHz — to receive UMTS more quickly and in a broader geographic area than would have occurred without the merger.

74. The merger will also provide public benefits in RSAs where either Cingular or AWS provides 850 MHz service and the other carrier provides only 1900 MHz service. The merger will benefit the customers who are currently receiving only 1900 MHz service, because 850 MHz service generally has broader coverage in rural areas than 1900 MHz service due to superior propagation. 850 MHz coverage typically extends further from populated areas, provid-

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[27] To a limited extent, Cingular and AWS have already begun extending GSM service into rural areas where neither carrier, standing alone, could justify the cost of building out, through a joint venture. A merged company will be able to extend GSM service into even more areas.

[28] Despite the wider spacing of rural cells, cell-splitting alone will not yield enough spectrum for UMTS for the reasons discussed in footnote 25 above. Moreover, cell-splitting can be more difficult in some rural areas than in urban areas, because rural towers are higher (and thus more visible) and many rural areas contain historically, culturally, or environmentally significant locations that pose challenges to timely siting of towers.

ing more seamless service in areas where 1900 MHz signals do not carry. Many 1900 MHz customers, including those roaming from other areas, would immediately benefit from the merger in such areas, given that a substantial portion of both companies' customers have dual-band phones.[29] Thus, Cingular's and AWS's 850 MHz operations would substantially increase the areas where 1900 MHz-only customers would receive full-featured "home" service and make it possible for the availability of new innovative services that neither company would be likely to roll out in these areas as quickly on a stand alone basis.

D. Overall Benefits of the Merger

75. The net result for customers will be improved quality of service, faster deployment of advanced, high-bandwidth 3G services in more places, and a more extensive full-featured national service area. These benefits and providing for future growth of GMS/GPRS/EDGE services are attainable only by retaining 80 MHz of spectrum where both companies currently provide service.

76. In addition, combining the AWS and Cingular networks will allow the customers of the merged company to take advantage of improved technologies currently employed in only one company's network. For example, Cingular's entire GSM network incorporates AMR voice coders, while AWS is nearing completion of the deployment of AMR this technology.[30] AWS customers with dual-band, AMR-capable handsets who do not already have the benefit of AMR would immediately benefit from the improved service, and the remaining portion of the AWS customer base (less than 25%) who do not have AMR-capable devices[31] would receive this benefit if they obtain a replacement handset from the merged company. Other similar technological benefits are likely to be identified in the course of combining the two companies' networks. In short, customers will benefit from having access to the best technological practices of both companies.

77. Moreover, in the process of rationalizing and combining the two networks, Cingular would upgrade the small portion of AWS facilities that have not already been upgraded with AMR capability. This would result in more efficient spectrum utilization and better quality of service to subscribers. Other benefits of combining the companies' spectrum into a single network include improvements in service made possible by rationalizing the two systems' radio networks and making redundant tower space available for other uses. Cell site locations will be

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29 *See* Slemons Declaration.

30 *See* Slemons Declaration. AMR improves the quality of speech transmission while ultimately increasing capacity over GSM implementations lacking AMR. It continually varies the speech encoding used for a given link based on the real-time radio link quality, providing the best-quality speech encoding when the link is good, while providing more robust encoding (*i.e.,* more error correction) when the radio link becomes marginal. This allows the network to improve the acceptability of voice transmission on signals that are subject to interference while providing higher fidelity voice transmissions on strong signals without interference. Because of AMR's ability to maintain acceptable quality calls with impaired radio links, the efficiency of a GSM system with AMR can reach 10× that of analog, while without AMR, a GSM system can only reach about 4-6× the efficiency of analog.

31 *See* Slemons Declaration.

rationalized during the process of combining the networks, using the best combination of the two companies' site portfolios to improve service. Sites will be combined when combining them will result in better service for customers, while in other cases overlapping sites could be engineered as split cells if that would improve service. This process is expected to reduce the total number of cellsites needed to maintain the two systems' current overall coverage while improving overall coverage by eliminating dead spots. Tower space no longer needed would be freed up for other uses (*e.g.,* public safety and competing wireless providers), reducing demand for new towers and thus alleviating environmental and zoning concerns.

78. As this process takes place, there will be a net increase in service quality for customers of both of the formerly separate networks. Blocked and dropped calls will decrease, and areas with poor reception will be minimized. Moreover, funds previously budgeted for developing new internal sites could be redirected toward expansion of coverage areas, bringing new service to unserved or underserved areas, including rural areas. For example, Cingular's two-year construction budget, pre-merger, was 65% directed to filling in existing service areas and 35% directed to expansion of geographic coverage. Because of the overlap of Cingular's and AWS's coverage, a significant portion of the fill-in budget could be redirected to expansion. In one preliminary examination of Cingular's southern region, there were 154 planned fill-in sites overlapping with AWS coverage. Instead of building a majority of those sites, it may be possible to redirect the funds for construction of new sites covering an expanded area or to roll out new 3G services more quickly.

79. Redirecting funds from filling in existing coverage toward expansion of coverage into new areas permits the combined company to grow its coverage footprint in urban, suburban, and, especially, rural areas. This benefits not only the existing subscribers of Cingular *and* AWS, but also the people in those expansion areas, who would have a new choice of wireless service and, in some cases, bringing them reliable coverage for the first time. Moreover, the nation as a whole would benefit by receiving expanded availability of wireless service in underserved rural areas, as well as having more intense competition at the national level to provide broad-based geographical coverage in rural areas as well as urban centers and suburbia.

VI. THE MERGER PROVIDES THE SPECTRUM NECESSARY FOR WIDE-SCALE DEPLOYMENT OF GSM-BASED BROADBAND 3G SERVICES, LEADING TO INCREASING EFFICIENCY, WITHOUT FORECLOSING OTHER COMPETING CARRIERS FROM INTRODUCING WIDEBAND 3G SERVICES

80. As discussed above in paragraph 15 and illustrated in Appendix 1, consumers are increasingly demanding wider bandwidth to access richer content and a wide variety of information sources, from multimedia messaging to full-motion streaming video and album downloads.

81. In planning for innovative new 3G services, Cingular and AWS face an impediment not faced by their national competitors: They are burdened with the need to support four different technologies. Over the next four or more years, they need to continue providing legacy analog *and* digital services that have no long-term future, as well as providing 2.5G and 3G services based on the worldwide GSM standard. The two national CDMA carriers are free to provide advanced digital services and move toward broadband 3G — one (Sprint) has no legacy services to support at all, because it operates only at 1900 MHz and has no analog service obligation, and the other, (Verizon Wireless) only has one legacy service obligation, analog service,

and that obligation only exists in a limited number of areas. T-Mobile, the third national GSM-based carrier, is free of legacy service obligations because its network operates exclusively at 1900 MHz. Nextel, the only other nationwide carrier, operates an all-digital network with no analog service obligation, because it is licensed as a Specialized Mobile Radio operator instead of a cellular carrier.

82. The need to provide legacy analog *and* digital services at 850 MHz consumes more than half of the spectrum in a 25 MHz block of 850 MHz cellular spectrum, limiting the spectrum that can be used for more efficient GSM/GPRS/EDGE services, and there is not sufficient spectrum in an 850 MHz system to provide advanced, high-capacity services, as previously discussed. Moreover, the amount of 1900 MHz spectrum that each company, standing alone, could dedicate to UMTS is limited, making it impossible for either AWS or Cingular to roll out UMTS in a large number of areas with sufficient capacity to accommodate high levels of demand for high-speed services. As a result, for nearly the next decade, Cingular and AWS would be at a spectrum disadvantage in proceeding toward implementation of advanced services without a merger.

83. Nevertheless, spectrum efficiency demands that these companies move ahead with the implementation of more and more advanced GSM-based technologies. Each stage in the progression yields more efficiency, which increases capacity and data rates, permits continued growth, and lowers costs. GSM alone is much more efficient than the legacy TDMA technology, especially when AMR is deployed. The 2.5G GPRS technology adds data transmission capability, and EDGE produces higher data speeds and throughput per time slot than is available under GPRS. The next steps, UMTS and HSDPA, will yield additional speed, capacity, and efficiency — a 20% improvement in voice capacity over GSM and typical data rates 10× to 30× that of GPRS.

84. To move along this migration path to high efficiency nationwide network, while continuing to provide legacy services, Cingular and AWS require more spectrum at the outset than is currently available to either standing alone. The proposed merger is the best, and perhaps only, vehicle for this migration to move forward quickly.

The undersigned declare under penalty of perjury that the foregoing is true and correct.

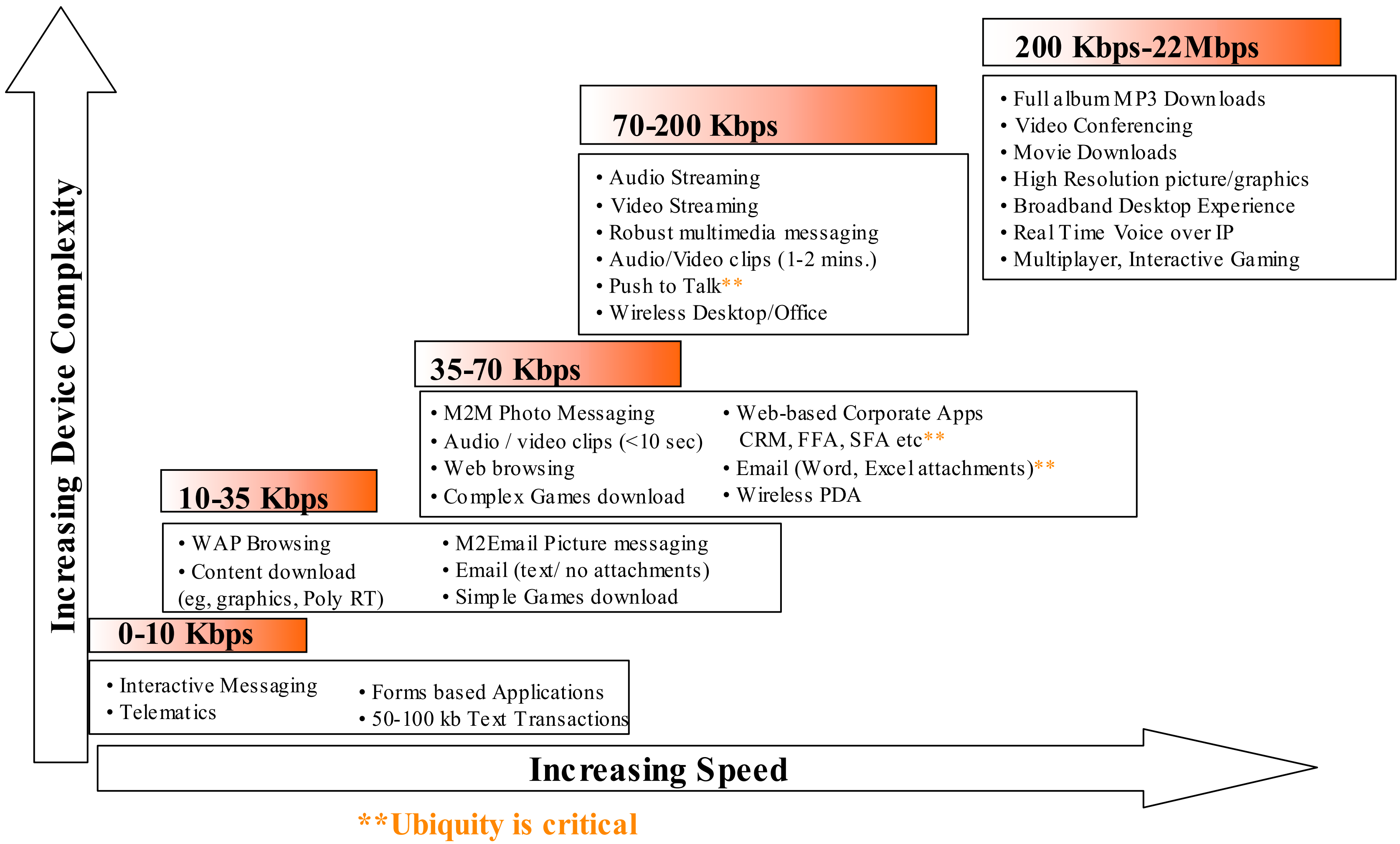
/s/ William Hogg
William Hogg

Executed March 17, 2004

/s/ Mark Austin
Mark Austin

Executed March 17, 2004

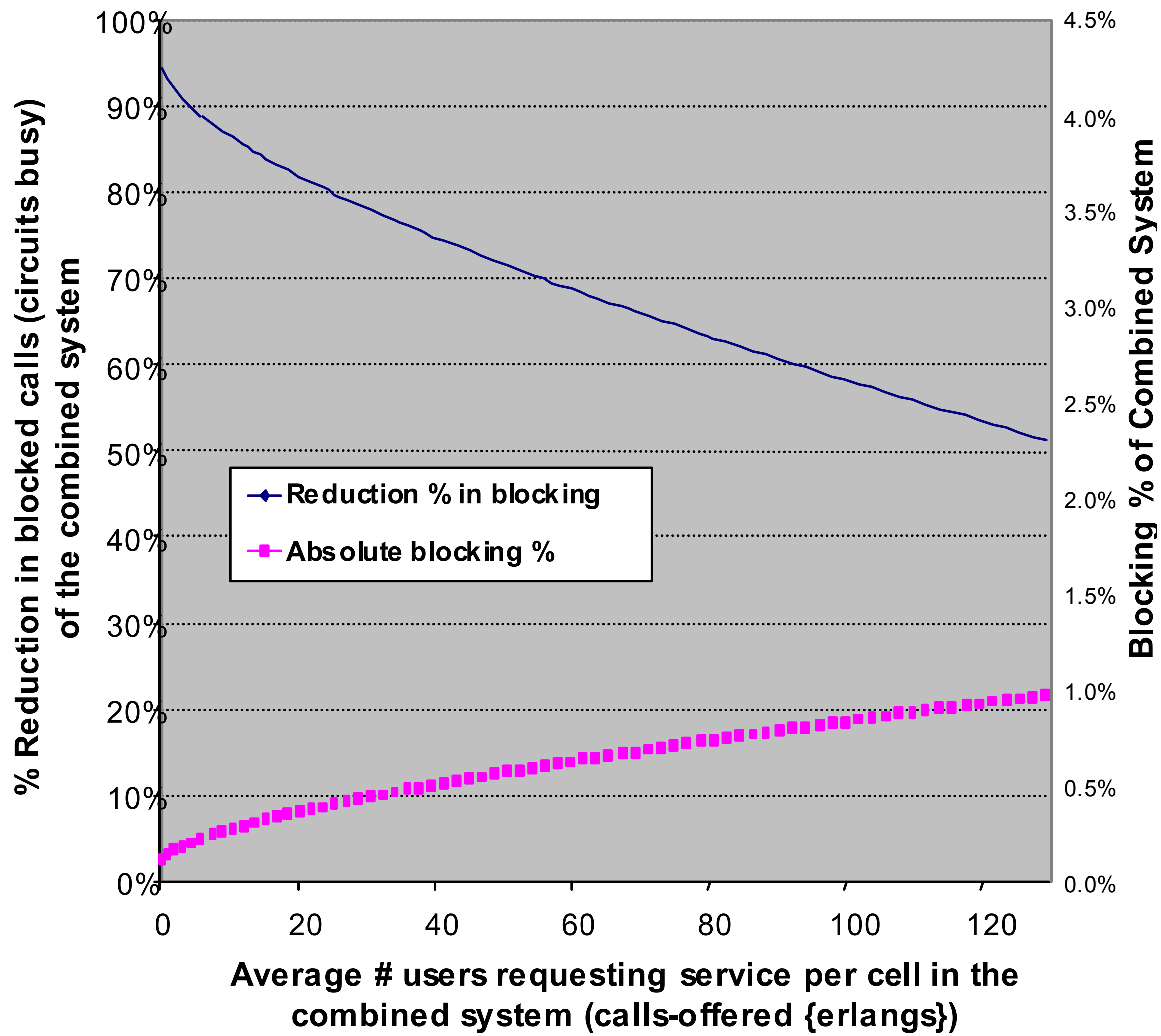
APPENDIX 1. MAPPING OF SERVICES TO PREFERRED SPEEDS



APPENDIX 2: BENEFIT TO CUSTOMER IN ALL SCENARIOS OF COMBINED NETWORK

		Cingular Spectrum Usage Pre-Combined Company	
		Low	High
AT&T Spectrum Usage Pre-Combined Company	Low	• Improved coverage • Significant decrease in blocked calls	• Improved coverage • Moderate decrease in blocked calls • Large improvement in voice quality • Significant decrease in dropped calls for pre-existing Cingular customers
	High	• Improved coverage • Moderate decrease in blocked calls • Large improvement in voice quality • Significant decrease in dropped calls for pre-existing AT&T customers	• Improved coverage • Moderate decrease in blocked calls • Moderate improvement in voice quality • Moderate decrease in dropped calls

APPENDIX 3. BLOCKING BENEFIT TO CUSTOMER AFTER COMBINING NETWORK (BEST CASE)



APPENDIX 4. APPROXIMATE DROPPED CALL REDUCTION IN COMBINED VS. EXISTING NETWORK