

## Dual-Mode Phones: A Smart Call for Higher Education

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### Introduction

Higher education has become the platform for collaboration, critical thinking, and creativity, making the integration of information technology (IT) on college campuses not only essential, but also inevitable. In the past few years, there has been a remarkable increase in the use of IT on college campuses everywhere, primarily in the interest of improving efficiencies in administration and among faculty, and for enhancing teaching and learning. The development of technologies has advanced as campus populations, particularly students, become increasingly technology-savvy and mobile.

Higher-education institutions are now exploring the benefits of transmitting voice-over-IP (VoIP) phone calls over a Wi-Fi network, using dual-mode phones that can switch between the cellular carrier and the Wi-Fi hotspot. In this manner, an administrator, professor, or student can keep a single phone that functions as both a “desk” phone and cell phone. Within the college Wi-Fi network, which ideally covers the entire campus area, the dual-mode phone makes calls through the campus VoIP system; it is only when the dual-mode phone is not within reach of the campus network that the cellular carrier is used to make phone calls.

This paper explores the viability of using dual-mode phones in higher education by reviewing a pilot conducted at Bryant University in Rhode Island. The pilot was conducted in collaboration with Nokia, a manufacturer of dual-mode phones; T-Mobile, a cellular service carrier; and Cisco, provider of Bryant’s IP communications network.

The future direction that dual-mode phones may take in higher education is further explored in this paper.

### Mobile Telephone: Ubiquitous and Evolutionary

Since the first commercial mobile phone service was launched in Japan in 1978, the mobile phone has become the most widely used gadget in the world. As of November 2007, global cell phone penetration reached 50 percent, with more than 3 billion mobile telephone subscriptions.<sup>1</sup> Fifty-nine of the 224 countries with operational mobile phone networks have a penetration rate of more than 100 percent.<sup>2</sup> More than 1 billion mobile phones were sold in 2007, up 12 percent from 2006.<sup>3</sup>

1. “Global Mobile Penetration Hits 50% Today,” Telecoms.com, November 29, 2007.

2. Ibid

3. “IDC Finds Slower Growth in the Mobile Phone Market in 2007, While Samsung Captures the Number Two Position for the Year,” IDC, January 25, 2008.



The mobile phone is evolving from a voice communications device into one that includes data. The worldwide mobile data services market—also known as the “infotainment” market—was worth US\$32 billion in 2007, and is projected to grow to \$64 billion in 2011.<sup>4</sup> (These figures exclude the market for Short Message Service.) The number of cellular data users will grow from 1.7 billion in 2007 to 2.5 billion in 2011.<sup>5</sup> Feature-rich mobile devices that allow users to check email, update their calendar, browse the Internet, and view documents will account for nearly 21 percent of worldwide mobile phone shipments by 2010.<sup>6</sup>

## Mobility and Higher Education

College students are becoming more mobile: 78 percent of full-time students work,<sup>7</sup> and 43 percent do not live on campus but instead reside with their parents or other relatives.<sup>8</sup> As a result, college students depend heavily on their mobile phones, PDAs, and mobile computers. One-third of the 97 percent of college students who own a cell phone no longer use land lines to make voice calls.<sup>9</sup> The freedom, convenience, and cost savings that mobile phones provide are invaluable to students, whether they are living away from home or commuting daily to and from school, home, and work.

Adults ages 18–26 typically are the first to accept new technologies. Many of them are also in college and are some of the earliest adopters of smartphones. In 2007, 12 percent of college students owned a smartphone, compared with 7.8 percent in 2006.<sup>10</sup> The ability of these phones to access the Internet allows students and faculty to perform tasks virtually anywhere that they have cell phone service—tasks that ordinarily would require the use of a computer.<sup>11</sup>

With the proliferation of this new generation of network-capable mobile devices on campus, colleges everywhere are reevaluating their networks to support the many features of dual-mode phones.

## Turning College Campuses into Wireless Hubs

Ninety-eight percent of students own computers.<sup>12</sup> Because of their need for mobility, more students own laptops than desktops: nearly three out of four students own laptops compared with 63 percent of students with desktops (36 percent own two computers).<sup>13</sup> Ninety-two percent have high-speed Internet connectivity, and

4. “Global Cellular Data Market Forecast (2001–2011),” P. Taylor, Strategy Analytics, February 7, 2007.

5. Ibid

6. “The Worldwide Smartphone Market,” B. Hsuing, Market Intelligence Center, June 2007.

7. “At What Cost? The Price that Working Students Pay for a College Education,” T. King and E. Bannon, The State PIRG’s Higher Education Project, April 2002.

8. “Crucial Choices: How Students’ Financial Decisions Affect Their Academic Success,” J. E. King, Center for Policy Analysis, American Council on Education, 2002.

9. “Cell Phone Usage Continues to Increase,” *The Harris Poll*, No. 36, April 4, 2008.

10. “The ECAR Study of Undergraduate Students and Information Technology 2007,” G. Salaway and J. B. Caruso, with M. R. Nelson, EDUCAUSE Center for Applied Research, 2007.

11. “21st Century Trends for Higher Education: Top Trends, 2008–2009, Tracey Wilen-Daugenti, Cisco Internet Business Solutions Group, 2008.

12. “The ECAR Study of Undergraduate Students and Information Technology 2007,” G. Salaway and J. B. Caruso, with M. R. Nelson, EDUCAUSE Center for Applied Research, 2007.

13. Ibid

22 percent of students use wireless as their primary Internet connection,<sup>14</sup> as most laptops sold in the past five years have shipped with wireless capability.<sup>15</sup>

The increase in wireless connectivity among student populations reflects the increase in personal/home and corporate wireless networks, as well as the progress that colleges and universities are making in turning their campuses into wireless hubs. In a report<sup>16</sup> by the Campus Computing Project, 555 participating U.S. higher-education institutions were asked, "How well developed are campus network connections and the instructional infrastructure?" (The report differentiates between classrooms and campuses.) Wireless networks were a particular focus. As of 2007, 60 percent of the respondents said that their college classrooms had wireless network access; 64 percent had a wireless network across the entire campus.

## Voice over IP

Campuses are embracing VoIP technology, despite the fact that cell phones are ubiquitous on colleges campuses and cellular services are less expensive. VoIP is a cost-effective way to transmit voice over the Internet. Since 2008, nearly 54 percent of higher-education institutions have campus networks that are VoIP-capable, with almost 9 percent installing VoIP networks during the 2007–2008 academic year.

Voice over IP has saved Bryant University \$126,000 per year in personnel costs alone. In 2004, Bryant integrated multiple communications networks on campus into one comprehensive network using a Cisco IP communications solution, reducing the amount of personnel needed to manage more than one network. The Cisco solution, which includes VoIP services in student resident halls and sophisticated messaging applications, is expected to generate \$265,000 in savings for the university every year beginning in 2008.<sup>17</sup>

## Smartphones Are Getting Smarter

Dual-mode phones are forecast to grow 198 percent worldwide between 2006 and 2010.<sup>18</sup> The dual-mode cellular/Wi-Fi phone market reached nearly \$27 billion in 2007 and is forecast to nearly triple by 2011.<sup>19</sup> The number of seamless fixed-mobile convergence subscribers is forecast to reach 64 million in 2011, representing more than 35 percent of the dual-mode Wi-Fi/cellular phone market by 2010, versus 3 percent in 2006.<sup>20</sup> Consequently, mobile phone service providers are creating converged mobile, wireless LAN, and VoIP solutions across enterprise, public, and home networks.<sup>21</sup>

14. "The ECAR Study of Undergraduate Students and Information Technology 2007," G. Salaway and J. B. Caruso, with M. R. Nelson, EDUCAUSE Center for Applied Research, 2007.

15. "Dell Makes Wi-Fi Standard on Laptops," E. Griffith, *Wi-Fi Planet*, January 14, 2003.

16. "Campus Computing 2007," Kenneth C. Green, Campus Computing Project, December 2007.

17. "Bryant University Enhances Learning and Student Career Opportunities with Converged Network and Cisco IP Communications," Cisco Internet Business Solutions Group, 2007.

18. "Wi-Fi, Mobile Phone Sales Soar in 2006: Dual-Mode Wi-Fi/Cellular VoIP Phones Ramping Up," Infonetics Research, January 24, 2007.

19. "T-Mobile USA, Orange Heat Up FMC Infrastructure Market: Dual-Mode Cellular/Wi-Fi Phones Hit \$27B in 2007," Infonetics Research, April 11, 2008.

20. "Smartphone Adoption Growing Fast: Wi-Fi Phone Sales Expected to Top \$145 Billion in 2010," Infonetics Research, July 25, 2007.

21. "Wi-Fi Mobile Phone Sales Soar in 2006: Dual-Mode Wi-Fi/Cellular VoIP Phones Ramping Up," Infonetics Research, January 24, 2007.

## Bryant University Pilot

Cisco, Nokia, and T-Mobile conducted a dual-mode phone pilot at Bryant for six weeks, from April to June 2008. Nokia E61i dual-mode phones were distributed to 54 key university staff members.

Participants took part in two phone conferences with Cisco, Nokia, and T-Mobile, expressing any urgent issues and concerns about the phones and carrier service. Cisco also conducted an online survey halfway through the pilot. At the end of the pilot, Cisco invited the participants to a phone interview. Of the total participants, 34 responded. Results from these efforts are described in this section.

### User Habits

Twenty-four said they used the dual-mode phone as their primary phone for the duration of the pilot. Almost all respondents spent more than half of their workday on campus; roughly one in three was mobile during this time. One-third of the respondents used up more than 300 minutes per month; this figure includes 6 percent of the respondents who consumed more than 1,000 minutes per month. Forty-seven percent of the respondents made more than half of their phone calls while on campus; 53 percent made more than half of their calls to other campus colleagues.

### Comparison with Previous Phone and Service

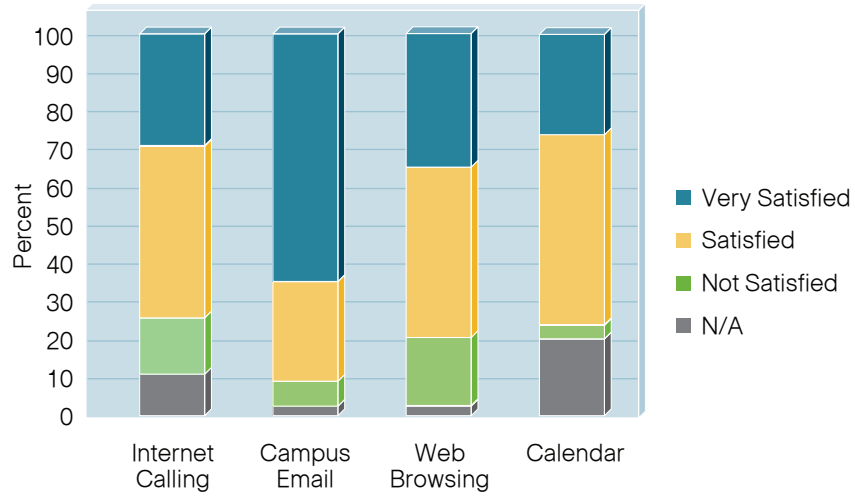
Eighty percent of the respondents found that the transition from their previous phone to the Nokia phone was moderate or easy. More than 75 percent said that the quality of off-campus phone coverage from T-Mobile was the same or better than coverage provided by their previous carrier. Half of the respondents considered the dual-mode phone better than their previous phone.

Respondents were asked whether they used a data-capable phone prior to the pilot: 21 said they had not and 13 said they had. Sixteen out of the 21 respondents said they considered the Nokia phone as good as or better than their previous phone. Of the 13 respondents who used a data-capable phone before the pilot, eight considered the new phone to be as good as or better than their previous data-capable phone.

### Satisfaction with Dual-Mode Phone Features

Respondents were generally pleased with the phone's features. At least 75 percent reported that they were satisfied or very satisfied with access to campus email, web browsing, Internet calling, and calendaring. Access to email and their desk phone number when they were away from their desk was the feature that stood out the most. Only 6 percent of survey respondents reported that they were not satisfied with access to campus email, while 65 percent said that they were very satisfied with the feature.

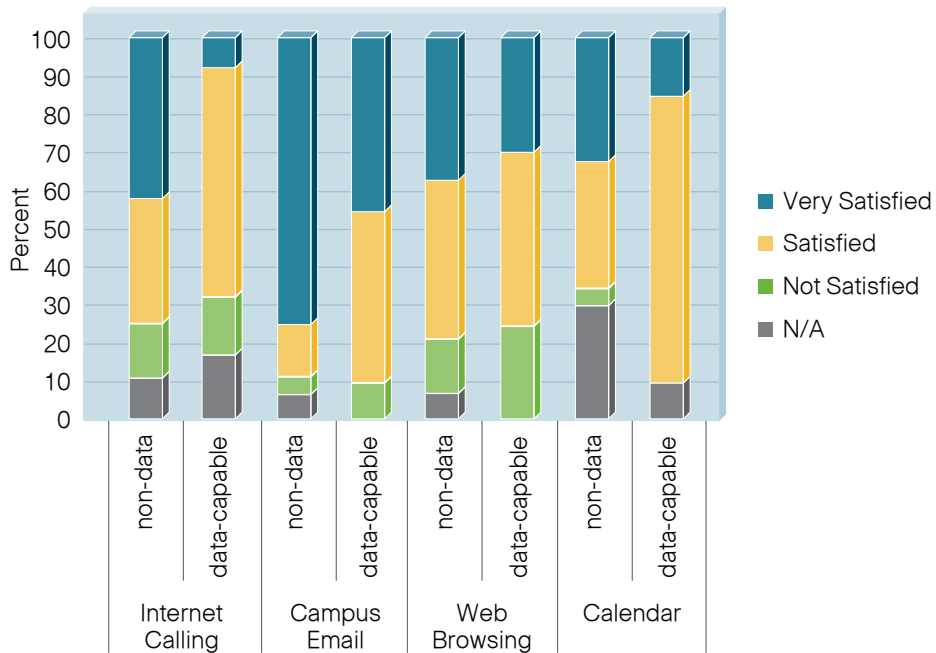
Figure 1. Satisfaction Rating of Popular Features of the Nokia E61i Dual-Mode Phone



Source: "Bryant University Dual-Mode Phone Pilot Midpoint Survey," Cisco IBSG Public Sector Practice, 2008

Access to campus email is popular among users who did not previously own a data-capable phone; 80 percent of them said that they were very satisfied with the feature.

Figure 2. Satisfaction Rating of the Nokia E61i Dual-Mode Phone versus Non-Data-Capable Phones



Source: "Bryant University Dual-Mode Phone Pilot Midpoint Survey," Cisco IBSG Public Sector Practice, 2008

Key benefits of the Nokia phone noted during the pilot include:

- **Smartphone features:** Access to campus email through the dual-mode phone allows users to effectively “keep a pulse on things” and not miss out on fast-paced discussions among colleagues; projects move faster as a result. One Bryant official said that when his team was working on a webcam project on a rooftop and needed access to email, they used the dual-mode phones instead of laptops to avoid the possible risk of damaging laptops in the field.
- **Increased productivity:** With the dual-mode phone acting as a wireless extension of the desk phone, fewer calls are missed because the “desk phone” essentially is always with the user. Before using the dual-mode phone, one participant said that he had to check as many as 20 voice messages with his old phone when at his office; with the Nokia phone, he checks only two to four voice messages. The Nokia phone reduced the amount of time participants spent in the office by as much as 35 percent, and their time was better used to address campus issues. The solution has also made it easier to contact other colleagues anywhere, anytime.
- **Full coverage on and off campus:** Bryant University is ranked the second most connected campus in the United States,<sup>22</sup> and is equipped with a Cisco wireless network that can support as many as 16,500 connections. The dual-mode phones were fully supported by Bryant’s wireless network. Off-campus cellular coverage was provided by T-Mobile.
- **Cost savings for VoIP “free” phone calls:** Approximately half of the participants’ calls during the pilot were made to noncampus phone numbers. Because each dual-mode phone is essentially a wireless extension of a desk phone, these calls do not route to the cellular network if made from the Bryant campus and, therefore, do not use up cellular minutes.
- **Emergency response capabilities:** The Bryant University network employs an enhanced emergency notification system that allows the university’s safety personnel to inform the campus population simultaneously in the event of an emergency. The dual-mode phone solution enhances the system’s effectiveness because users can receive these notifications wherever they are, and officials that need to respond immediately and/or help can be reached easily.

Other features that the participants liked are the big, bright screen that is viewable outdoors; message indicator lights; memory card compatibility; and QWERTY keyboard.

### Areas for Improvement

Participants requested several features during the course of the pilot, including:

- A visible sign (such as the backlight of the screen changing colors) that indicates whether the dual-mode phone is connected to the local or cellular network when the phone is on campus so that users know whether to dial the four-digit extension to call a campus phone number or use the phone as a regular cell phone.

22. “America’s Most Connected Campuses,” M. Noer and D. M. Ewalt, Forbes.com, January 20, 2006.

- A “smart” contact list so that the phone can automatically decide which number to use (four-digit extension or 10-digit number) when calling a campus phone number, depending on the network to which the phone is currently connected (local or cellular).
- One phone number to check both desk phone and cellular network voicemail.
- Windows-based browser to improve usability.
- True mobility: for instance, seamless connection transfers from the IP network to the cellular network and vice versa.
- Larger numerical keypad.
- Capability to connect a full-sized keyboard.
- Typing feature (sometimes referred to as “auto-complete typing”) that assumes the word the user is going to type once he or she starts typing.
- Longer battery life, especially when using the wireless LAN.
- Better voicemail indicator.

## Potential of the Dual-Mode Phone Solution in Higher Education

Smartphones have become powerful tools for higher education because they enable voice calls and Internet connectivity. Twelve percent of college students owned a smartphone in 2007, and the number is increasing every year. Students are using these devices to become as mobile as possible, decreasing the need to carry laptops. Students use smartphones to take notes, record lectures, create spreadsheets and presentations, track class schedules, use course-management systems, visit social networking sites, broadcast short blogs through Twitter, and use instant messaging.<sup>23</sup> Smartphones also have detailed and organized contact lists that include phone numbers and email / physical addresses. Some newer smartphones are equipped with real-time global positioning systems.

Unlike standard smartphones, dual-mode phones can connect directly to IP networks—in this case, to the campus network. Because of this, dual-mode phones can be used as a “wireless extension” of students’ IP phones (desk phones) in their dorm rooms. The dual-mode phone can also be used for myriad applications for learning both inside and outside the classroom, such as:

- **In-class polls/quizzes:** A professor may conduct a poll during a lecture and require students to submit their answers to the professor’s phone using their dual-mode phones over the campus network. A program on the professor’s phone would assess and analyze the results of the poll, and then broadcast the summary of the students’ responses to the lecture hall’s digital projector or send the results back to the students’ phones.

23. “PDAs vs. Smartphones vs. iPods: Which Prevails with the mLearner?” S. Thornton, Information Technology & Computing Services, East Carolina University, 2006.

- **In-class media sharing:** Students can send images and other media directly to their classmates during a lecture by emailing the files to the lecture hall's projector and sound system as needed.
- **Course materials:** Professors can send course materials directly to students' phones during a lecture. This capability can be an effective incentive for getting students to attend class.
- **Attendance monitor:** Professors may require students to do a virtual "roll call" by transmitting a message from their phones.
- **Remote library privileges:** Exclusive library privileges are also granted to students who may use their phones to search for items without having to use a proxy server.
- **Positioning system:** Based on the location of the wireless hub to which the dual-mode phone is connected, the phone can serve as a virtual tour guide that helps students get around campus, sharing contextual information about the user's current location. Within large buildings, the phones can also work as navigational systems, pinpointing the exact location of classrooms.
- **Peer locator:** The phones can be used as peer locators, alerting users when their contacts are nearby. Depending on the network's accuracy, this feature can help students determine where a study partner is seated in a big lecture hall or where friends are congregating at a crowded place or campus event.
- **Free or inexpensive VoIP calling:** Universities could route all calls made from the campus using dual-mode phones—whether local, domestic, or international—through the campus IP network and offer these calls for free or for a less-expensive fee than those charged by cellular network carriers. This is especially beneficial to campuses that have an international presence and regularly communicate with their global offices and/or campuses.
- **Security/emergency notification:** A warning bulletin is sent immediately to every phone through both email and voicemail, advising the best way to exit the campus or a particular building based on the user's location.

## Switching to Dual-Mode Phones Is Worth the Investment

Today, even the most affordable family cellular-phone plans include "in-network" calling, which parents and students use to talk on the phone without time restrictions and additional charges. Student cell phones are provided mainly by their parents, who also pay 80 percent of the phone bills.<sup>24</sup> Students make about 11 calls per day, at least one-third of which are to people who are not campus peers but rather immediate family or relatives.<sup>25</sup>

24. "Professor Researches Cell Phone Usage among College Students," J. Elliott, *Virginia Tech News*, February 26, 2007.

25. *Ibid*

Higher-education institutions must find a way to compel students and their parents to switch from their personal cell phones to dual-mode phones, taking into account low-cost phones, calling plans, and high fees. Incentives include:

- **Discounts and free minutes:** From the carrier and/or phone manufacturer.
- **Portability of numbers:** Many students would prefer to keep their phone numbers even if they have to switch to a new contract and/or carrier to procure a dual-mode phone.
- **More phones from which to choose:** Students and parents may be more inclined to participate if the campus can provide and support more than one make and/or model of dual-mode phone. A touch screen, bigger keypad, better menu organization, and a trackball for easier browsing are just some examples of features that students would like to see in other brands.
- **Access to consumer resources:** Entertainment services and websites such as [www.ovi.com](http://www.ovi.com).
- **Integration:** Integrate campus resources such as class and administrative materials onto a single, portable device.

## Conclusion

Technology has profoundly enhanced the teaching and learning experience in higher education, improving productivity and transforming the way that students, faculty, and staff communicate and collaborate.

The dual-mode phone is no exception and is a viable, if not powerful, solution for higher education. Its many benefits, as seen in the Bryant pilot, include increased work productivity and efficiency, decreased communications costs, enhanced user satisfaction, improved mobility both on and off campus, enhanced campus security, and improved multimedia experience.

The dual-mode phone is not only an innovative solution for higher education, but also a desirable option for higher-learning institutions that want to be one step ahead in a connected world.

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### More Information

The Cisco Internet Business Solutions Group (IBSG), the global strategic consulting arm of Cisco, helps CXOs and public sector leaders transform their organizations—first by designing innovative business processes, and then by integrating advanced technologies into visionary roadmaps that address key CXO concerns.

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