Is Near-Field Communication Close to Success?
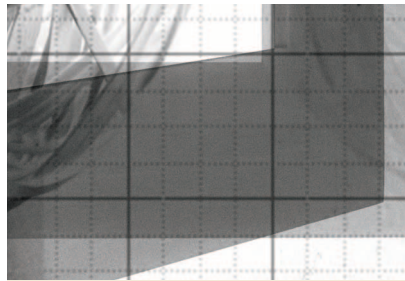
Sixto Ortiz Jr.

Asports fan attending a game breezes through the front gate, paying for his ticket by waving his cell phone near a point-of-sale reader. On the way to his seat, he downloads wallpaper to his handset by touching it to a poster of his favorite player. And after the game, he pays for fast food at another POS reader by using electronic coupons stored in his phone.

These transactions are part of the promise behind *near-field communication* (NFC), a new wireless technology that could unite various standards and proprietary technologies found in the millions of stand-alone contactless cards. Contactless technology lets users pay for transactions by simply holding cards close to, rather than swiping them through, a reader.

NFC is a short-range wireless technology that lets devices communicate when in close proximity. The technology allows for the development of devices, including mobile phones, that can be used like contactless cards.

A shorter transmission range and slower data rates distinguish NFC from other short-range wireless technologies such as Bluetooth, radio-frequency identification (RFID), and Wi-Fi.

NFC could be used in many ways, including merchandise and service payments, event ticketing, and facil-

ity- and computer-access control, noted Kay Irwin, senior enterprise-practice manager for the inCode consultancy. The technology could even enter information from a buyer's NFC phone to a suitably equipped PC for e-commerce transactions, she added.

The technology would also work well for embedding information about consumer products, accessible by shoppers' NFC phones, in packaging, said Cingular Wireless spokesperson Clay Owen.

And some day, an NFC telephone could communicate with PCs and other enabled devices in a home and act as a universal remote control, noted Irwin.

Nonetheless, NFC faces several challenges, such as potential users' current lack of familiarity with and demand for the technology.

CLOSE LOOK AT NFC

NFC was jointly developed by Philips and Sony in late 2002 for contactless communications. Europe's Ecma International adopted the technology as a standard in December 2002. The International Organization for Standardization (ISO) and the International Electrotechnical Commission adopted it in December 2003.

In 2004, Nokia, Philips, and Sony founded the NFC Forum to promote the technology.
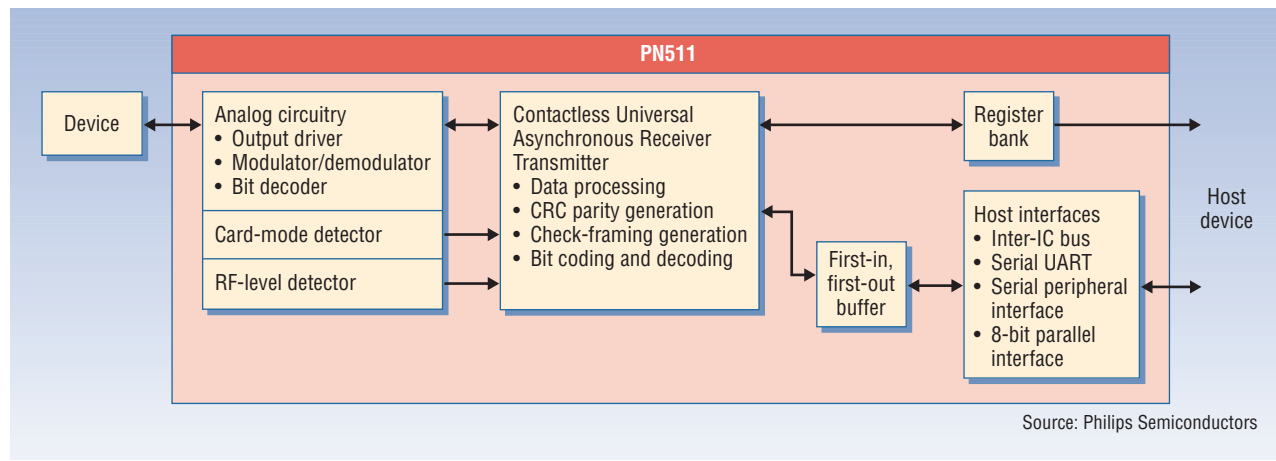
How it works

In NFC, a device generates a low-frequency radio-wave field in the 13.56-MHz spectrum. When another NFC device gets close enough to contact the field, *magnetic inductive coupling* transfers energy and data from one device to the other. The use of magnetic coupling is a principal difference between NFC and technologies such as Bluetooth and Wi-Fi.

An NFC device with an internal power supply is considered *active*. A device with no internal power supply, such as a smart card, is considered *passive*. Inductive coupling causes a passive device to absorb energy from an active device when it gets close enough. Once powered up, the passive device can communicate and exchange data with the other device.

"The ability to act as both passive and active devices makes NFC devices unique among contactless communications technologies," said Tariq Shahab, Philips Semiconductors' business development and marketing manager for identification technologies. This enables NFC devices to function as either contactless cards or readers. Thus, an NFC phone could be used, for example, to send payment information to a reader to make a purchase or to read information from an enabled advertising sign.

Proponents designed NFC to be compatible with other contactless approaches, such as ISO 14443A, implemented in Philips' Mifare and Inside Contactless' PicoPass products; and ISO 14443B, the most popular standard, used with Sony's FeliCa

PN511

Device	Analog circuitry • Output driver • Modulator/demodulator • Bit decoder	Contactless Universal Asynchronous Receiver Transmitter • Data processing • CRC parity generation • Check-framing generation • Bit coding and decoding	Register bank
	Card-mode detector		First-in, first-out buffer
	RF-level detector		Host interfaces • Inter-IC bus • Serial UART • Serial peripheral interface • 8-bit parallel interface

Host device

Source: Philips Semiconductors

Figure 1. Philips Semiconductors' PN511 near-field-communication transmission module illustrates how elements of an NFC system can be integrated on a single chip within a host device. The analog circuitry processes signals coming from or going to another device. The contactless UART element handles the technology behind the communications itself. The FIFO buffer allows data transfer between the host and contactless UART. The PN511 works with numerous host-system interfaces.

technology. Like NFC, both operate in the 13.56-MHz frequency range.

Components on a chip. Magnetic-inductive coupling is a simple technique that is easy to implement in silicon. Thus, vendors can handily integrate an NFC system's antenna, analog modulator/demodulator (for sending and receiving signals), and digital circuitry onto a single chip, as Figure 1 shows.

Other components of the chip include an *RF-level detector* that is tuned to recognize 13.56-MHz signals and that can thus identify the presence of a nearby NFC radio field.

The *card-mode detector* recognizes what type of contactless technology—such as Philips' Mifare or Sony's FeliCa—is sending the incoming signal and prepares the receiver to demodulate it.

Range and data rate. Because inductive coupling works only at short distances, NFC's operating range is just 10 cm, compared to Bluetooth's 10 meters and Wi-Fi's 100 meters.

NFC transfers data at a maximum of 424 Kbits per second, compared to Bluetooth's 3 Mbps and Wi-Fi's 54 Mbps. Thus, NFC is not suitable for many types of data transfer.

Security. Because NFC requires the close proximity of two devices, intercepting signals is difficult, which gives the technology some in-herent security, said Christopher Duverne, chair of the NFC Forum, an industry association.

Also, contactless payments eliminate the need for a purchaser to give a credit card to a merchant, thereby reducing fraud opportunities, noted Marcus Torchia, senior analyst with the Yankee Group, a market research firm.

Growing its popularity

Vendors—such as Motorola, Nokia, Philips, and ViVOtech—make money from NFC by selling chips to device makers, by selling enabled phones and PDAs to cellular service providers or directly to users, and by selling NFC readers to businesses, explained Juniper Research analyst Alan Goode.

Businesses benefit by increasing throughput at each POS, reducing wear and tear on terminals, and providing simplicity and security that could generate more customer expenditures, said inCode's Irwin.

According to Irwin, adding functions to a cell phone is attractive to consumers who want to reduce the number of devices they carry.

Japan's NTT DoCoMo, a mobile communications carrier, recently bought a 34 percent stake in Sumitomo Mitsui Card Co., Japan's second-largest credit-card issuer, for use in offering mobile-wallet functionality in their Sony FeliCa phones, noted the Yankee Group's Torchia.

US cellular carriers probably won't do this but instead will have to reach agreement with credit-card companies to share revenues from NFC transactions, he said

In the US in December 2005, Cingular Wireless, the JPMorgan Chase financial-services firm, Nokia, Philips Semiconductors, Visa USA, ViVOtech, and Atlanta Spirit, owner of two professional sports teams and an arena, launched a six-month NFC mobile-commerce field trial in Atlanta, Georgia.

The trial used Nokia's NFC-enabled 3220 mobile phones, which include Philips NFC chips and ViVOtech mobile-wallet software, and about 150 ViVOtech NFC POS readers. The readers captured credit-card information from a user's mobile wallet and transmitted it via Visa's IP-based payment network.

The trial was promising, but Cingular wants to assess the results before committing further resources to NFC, explained company spokesperson Owen.

NEAR-TERM BARRIERS

Juniper's Goode said one problem NFC is facing is that major hardware manufacturers outside of

Motorola, Nokia, and Philips are not yet supporting it.

Wireless carriers don't currently have much incentive to embrace NFC because consumers are not demanding its functionality, noted Torchia.

Also, said Goode, NFC uses credit-card companies' payment networks and thus bypasses cellular networks. This reduces a revenue stream for mobile carriers and has made them lukewarm toward the technology. Thus, he explained, NFC's success might hinge on the willingness of credit card companies to share revenue with carriers.

Carriers' support of the technology is critical because they decide which handsets, and thus which features, to distribute to subscribers.

Potential users might be reluctant to adopt the technology because they don't know much about it, said David Chamberlain, principal analyst for wireless applications with In-Stat, a market research firm. And they might not understand how it differs from the similar RFID, added Goode.

In addition, while NFC has the inherent security that comes with close-proximity transmissions, vendors must still provide security in the phones and PDAs that could transmit users' payment information in the open to credit card and other companies.

In the future, said Philips' Shahab, NFC could help users work with other wireless protocols, such as Bluetooth and Wi-Fi. Currently, users frequently must spend considerable time manually inputting settings to configure wireless devices to work with the two technologies. Instead, Shahab explained, users could put two devices near each other and let them exchange the required settings via NFC.

This approach could become even more popular if PCs, TVs, and other devices besides cell phones and PDAs become NFC enabled, said the Yankee Group's Torchia.

During 2006, stated Goode, more NFC trials and data analysis will occur. "It will be a critical year for NFC," he explained, "with data determining whether the technology has legs." Negative results of pilot programs could hurt the technology's adoption, he explained.

Meanwhile, vendors are using trial results to determine how best to design devices and user interfaces to work with NFC, said Richard Fletcher, senior vice president of MasterCard International's Mobile and Wireless Center of Excellence.

inCode's Irwin predicts that within four years, NFC will be a standard feature in most cell phones. Adoption might occur first in East Asia and Europe, which are a couple of years ahead of North America in using contactless technology, said Irwin.

ABI Research, a market analysis firm, predicts shipments of NFC-enabled devices will surge from 3.7 million in 2006 to 672 million in 2010. This could be driven by mobile commerce. ABI Research predicts that contactless payments worldwide will rise steadily from $226.1 million last year to $303.3 million this year to $1.08 billion in 2010.

"I certainly expect contactless payments to be successful," Fletcher said.

Torchia agreed that mobile commerce might dictate NFC's future, but he said that its future might not be as bright as some industry observers predict. "There is a market for people wanting to use phones instead of credit cards," he explained, "but it may be pretty modest." ■

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