

WI-FI VS. BLUETOOTH

TWO OUTSTANDING RADIO TECHNOLOGIES FOR DEDICATED PAYMENT APPLICATION

Ingenico is often asked:

- what are the differences between Bluetooth and Wi-Fi technologies,
- which is the best one,
- why has Ingenico decided to utilize both technologies.

The answer is quite simple: Bluetooth and Wi-Fi are prevailing communication technologies that provide two different solutions for two different Indoor wireless applications. In short, both Bluetooth and Wi-Fi provide the needed functionality, performance and security that are required for secure local wireless transaction communication. While Bluetooth is the perfect turn-key solution for dedicated payment system, Wi-Fi leverages the existing WLAN infrastructure. Using both technologies, Ingenico has tailored an innovative solution to address our customers' specific needs.



PORTABLE WIRELESS TRANSACTION REQUIREMENTS	3
TRANSACTION SECURITY	3
BLUETOOTH: PROPRIETARY SOLUTION...	3
... VS. WI-FI MARKET STANDARD	3
SECURE TECHNOLOGIES SECURELY IMPLEMENTED	4
POWER CONSUMPTION	4
DATA RATE	4
INTEGRATION AND NETWORKING CAPABILITIES	4
COVERAGE AND PERFORMANCE	5
SUMMARY	5

WI-FI VS. BLUETOOTH

PORTABLE WIRELESS TRANSACTION REQUIREMENTS

In a hospitality environment such as a restaurant or other business that needs customer-convenient payment, the wireless solution must provide the following:

- Optimal transmission security over open airwaves
- A high degree of transmission completion success
- Operational and ergonomic hardware
- Sufficient number of transactions and sufficient range in order to effectively cover the premises

In today's market, there are two outstanding standards of radio technology for local network applications -Bluetooth and Wi-Fi. Each technology within Ingenico's implementation, deals with:

- Enhanced security
- Strong radio performance
- Data transmission and power consumption
- Designed for network use

TRANSACTION SECURITY

Security is definitely one of the main factors to consider when assessing a wireless solution. But depending on the technology, security is not defined by the same criteria. Wi-Fi security is defined by market standards, while Bluetooth security relies on a proprietary solution and thus on Ingenico's own implementation.

BLUETOOTH: PROPRIETARY SOLUTION...

"People who use Bluetooth, if they use short PINs, are exposing data on the device", said Ollie Whitehouse, a researcher for digital security consulting firm @Stake Inc., as quoted in an April 2004 CNET News.com report. This is why Ingenico terminals are not based on a 4-digit PIN but rather on a 16-digit PIN. Furthermore, this PIN code is generated through the Diffie-Hellman key agreement protocol meaning that there is no way

to "guess" the PIN Code. In other words, cracking this Bluetooth implementation is simply not economically feasible.

Even if a hacker is located within range of the Bluetooth wireless LAN, Ingenico terminals can not be addressed by unauthorized Bluetooth devices because they do not "listen to" incoming messages from any other Bluetooth devices and are not configured to be "discoverable". No "BLUESNARFING" and no "BLUEHACKING" are possible with the Ingenico implementation of Bluetooth.

With Bluetooth, as well as Wi-Fi, base stations are discoverable and "connectable" but only if the adversary can guess the 16-byte (128-bit) PIN, which is different for each base station (there are over 3×10^{37} different possible PINs).

Bluetooth works within the spectrum of 2.4GHz to 2.4835GHz and is segmented into 79 different 1 MHz sections or channels, enabling Bluetooth to leverage Frequency Hopping Spread Spectrum (FHSS). The terminal and the base will hop through those channels in a pre-agreed sequence while transmitting and receiving data to ensure transaction completion even if interference is detected. This hopping technique also complicates eavesdropping (Eavesdropping is the intercepting of conversations by unintended recipients).

...VS. WI-FI MARKET STANDARD

Wi-Fi's security level is not the result of Ingenico's implementation but rather the standards established by the Wi-Fi Alliance (an industry trade group, which owns the trademark to the Wi-Fi name). When introduced, WEP (Wired Equivalent Privacy) security became the first security standard for Wi-Fi implementation but it became quite quickly an obstacle to widespread business adoption of Wi-Fi when security experts showed that hackers equipped with off-the-shelf tools could easily break it. The relatively robust WPA (Wi-Fi Protected Access) supports user authentication by a dedicated server on a corporate network.

One of the key technologies behind WPA is the Temporal Key Integrity Protocol (TKIP). TKIP addresses the encryption weaknesses of WEP. Another key component of WPA is built-in authentication that WEP does not offer. With this feature, WPA provides roughly comparable security to VPN tunneling with WEP, with the benefit of easier administration and use.

In order to provide a recognised security level on its Wi-Fi solution, Ingenico implemented the WPA enhanced security feature according to 802.11i.

SECURE TECHNOLOGIES SECURELY IMPLEMENTED

In addition to the security offered by Bluetooth such as 16-digit PIN authentication, frequency hopping and data encryption, or to the WPA security offered by Wi-Fi, Ingenico terminals are Visa PED online and offline approved and utilize Ingenico's High Security Core (HSC) for unparalleled transaction security. They can also support SSL as an option. In other words, these two technologies implemented in Ingenico terminal's ensure secure payment transactions.

POWER CONSUMPTION

Bluetooth and Wi-Fi both use second and third generation chips, with each communication method having reached a high level of maturity regarding design efficiency. However, due to the physical design of dies, Bluetooth is more efficient in terms of power consumption.

Theoretically Wi-Fi does consume as much as Bluetooth but in practice, with WPA security, the consumption of a Wi-Fi module is higher than Bluetooth.

DATA RATE

Ingenico has deployed Bluetooth version 1.2. As configured in Ingenico terminals, it ensures high levels of security and performance, while operating

with very low power consumption. This version of Bluetooth provides data rate (1Mbps) much slower than Wi-Fi standard 802.11b (11Mbps) and 802.11g (54Mbps).

On this point Wi-Fi overcomes Bluetooth and supports better transfer of large amounts of information. But, when Wi-Fi link quality gets worse (i.e. the further it goes from the access point), the data rate decreases (up to Bluetooth data rate level). Secondly, although the maximum communication speeds are less than Wi-Fi, Bluetooth's throughput is more than what is needed for payment transaction authorization, settlement transmission and software downloads.

In short, regarding data rate and taking into account today's requirements of the market, Bluetooth and Wi-Fi communications both answer the needs for Indoor wireless applications.

INTEGRATION AND NETWORKING CAPABILITIES

As stated earlier, Bluetooth uses frequency hopping technology to ensure transaction transmission by leveraging the entire spectrum of 2.4GHz to 2.4835GHz. This increases the likelihood of successful transaction transmission due to a low sensibility to radio perturbations. Wi-Fi does not use frequency hopping, therefore users may experience a change in performance in congested wireless environments.

In terms of network capacity, Wi-Fi is more flexible as theoretically it is only limited by the number of IP addresses, where as Bluetooth is limited to 7 devices (Piconet network). Practically, Wi-Fi network size depends on the access point (average of 32 devices). But clearly the more devices there are on the network, the more risk of congestion there is.

Note that both Bluetooth and Wi-Fi (802.11b/g) are using the same radio band (2.45 GHz) to exchange data. This used to be a problem when the two technologies had to coexist in the same

environment. However, with the new Bluetooth “adaptive frequency hopping” technology, Bluetooth and Wi-Fi can operate without significant interferences in the same environment.

Bluetooth and Wi-Fi present similar “networking” performances. The main difference comes from the fact that the Wi-Fi standard is much more popular for WLAN environment being a “wireless Ethernet”. For this reason, Wi-Fi implemented in a device makes it easy to integrate into an existing Wi-Fi infrastructure. But Bluetooth being a different standard, allows the customer to have an independent network for their payment application.

COVERAGE AND PERFORMANCE

“Which radio technology provide the furthest range, Wi-Fi or Bluetooth?” The answer is not that obvious as it is really based on environmental factors.

There are three classes of Bluetooth technology: Bluetooth class 1 (up to 20dBm), Bluetooth Class 2 (up to 4dBm) and Bluetooth class 3 (0 dBm). Ingenico Bluetooth modules are based on the class 1 and are designed to ensure exceptional transmission performance. Ingenico Bluetooth terminals have been tested in venues of far over 200 meters, with high customer satisfaction.

Wi-Fi ensures great coverage with 802.11b version. Announced at 100m for 11Mbps data rate, it can actually go further (not without decreasing the throughput) but does not overcome Bluetooth performance. The new version 802.11g improves coverage a bit, but it mainly impacts the data rate increasing it up to 54Mbps. For this reason and what was explained previously, version 802.11b is still completely in line with the market expectations.

In other words, today Bluetooth offers better coverage than Wi-Fi in single network configuration

(many terminals for one router). However unlike Bluetooth, Wi-Fi provides an essential feature with its parameterized roaming (for enhanced security) enabling to pass from one access point to another one without losing the connection.

As a conclusion, in terms of coverage Wi-Fi is the technology for big network environments while Bluetooth gives optimal performances in single network configuration.

SUMMARY

Ingenico’s Bluetooth implementation is far superior to the implementations on mobile phones. Bluetooth is one of the most secure wireless technologies available in the market and Class 1 devices are capable of long-range radio coverage supporting important data rate. Bluetooth’s architecture enables someone to configure a wireless network with up to 7 Bluetooth-enabled devices. For the customers that want a dedicated network for payment applications, Bluetooth is the selection of choice.

Wi-Fi is the most popular radio technology for WLAN. This “Wireless Ethernet” being implemented worldwide does not only offer good radio coverage and good data rate, but it also ensures secure transactions thanks to WPA security. Designed for networking, Wi-Fi is the perfect technology to integrate the payment system in an existing Wi-Fi infrastructure.

So which technology is the best one? Both! It depends completely on the application: either Bluetooth for dedicated network for payment, or Wi-Fi to leverage an existing WLAN infrastructure. In both cases, the technologies implemented into Ingenico’s terminals fulfill our customer needs for security, network functionality and performance.

Groupe Ingenico

192, avenue Charles de Gaulle
92200 Neuilly-sur-Seine - France
Tel : +33 (0)1 46 25 82 00
Fax : +33 (0)1 47 72 56 95
www.ingenico.com

