Technical Article Assignment
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What happens when you tap-and-pay with your phone?

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Apple Pay has been available in Canada for over a year now. Samsung Pay is crawling into the Canadian market (currently supported only by CIBC Visa cards)[1], and while Android Pay remains out of reach, recent code leaks suggest that Google is preparing a Canadian launch soon[2].

But what happens when you use one of these services?

A lot, it turns out. All within the span of a few seconds.

Some background information

It all started with the chip cards. In 2008[3], Canadian banks started issuing chip-enabled debit cards, requiring customers to remember a four-digit PIN (personal identification number) and merchants to upgrade their payment terminals. It was cumbersome for consumers and expensive for businesses, all in the name of security. Fast-forward to today and you will see that 8 out of 10 Canadian businesses are equipped with chip-reading terminals[4] and most of us question a business's legitimacy when we have to pay by swiping.

The chip-and-PIN method gave way to tap-and-pay, powered by a technology called Near Field Communication (NFC). This is what allows two NFC chips (like the ones in our

[1] (Samsung)
[2] (Bonifacic, 2016)
[3] (Bielski, 2010)
[4] (MONEXgroup, 2016)

bank and transit cards) to communicate when placed within a few centimetres of each other.[5]

When the technology was first deployed, it allowed only one-way communication—a powered terminal reads the chip on a card and handles everything on its own.

With the advent of mobile payment services like Apple Pay, we are now seeing two-way communication, whereby two powered devices (e.g. a smartphone and a terminal) engage with each other.

Which brings us back to the security question

If smartphones are prone to security breaches due to software flaws, how do manufacturers ensure the security of the banking and credit card data we store in our devices to facilitate mobile payments?

The first line of defence is a fingerprint lock on your device. If your phone does not have a fingerprint reader or you would rather not use it, then a strong code or password will do. Mobile payment services will not work unless you have a locking mechanism enabled in your device.

But the real magic happens behind the scenes. When you tap your device on a terminal, your device will not send your actual card number. Instead, it will send a single-use, randomly generated token—a 16-digit dummy number that the terminal will transmit to the bank and the bank will match with your real card number.[6]

[5] (Profis, 2014)
[6] (Profis, 2014)

Regardless of whether the tokens are created in a Secure Element (SE)—a hardware component within the device—or a cloud-based Host Card Emulation (HCE) system, the tokenization process ensures that no real banking or credit data is transferred from the device to the terminal. A hacker who snoops your token would therefore be unable to do anything with it, as the token would not reveal any real information and it can be used only one time.

Things to consider

It's important to note that no payment system, mobile or of another kind, is 100 per cent foolproof. As technology evolves, security measures improve but new security flaws are found as well. Still, the current state of mobile payments is a promising one.

And even if you don't intend to use your smartphone as your main method of payment, it's a viable backup if you ever forget your wallet at home.

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