POSITION PAPER

Android POS Terminals

Everything you need to know

ingenico

From point of sale to pretty much everything else

Ingenico has estimated that within the next four years, half of all new payment terminals will be based on the Android operating system. A recent study by Juniper Research[1] predicts that smart POS terminals will increase from 16.3 million in 2022, to 45.5 million units globally in 2027. It's an incredible rate of change, but what does it mean, and why is the payment industry moving in this direction?

The advent of Android has unlocked the ability to move beyond proprietary ecosystems. Put simply, modern payment terminals provide an exciting opportunity to dive into the business application economy. By combining apps with the creativity of Fintechs, ISVs, Wallet Operators, and other Business Application Developers, a true differential advantage can be gained, providing new value for merchants.

During the past few months, Ingenico has looked at the role of Android in payment and considered the new opportunities afforded by the next generation of terminals. We have delved into the security aspects, provided technical insights on application development, considered the ecosystem and the social impact of touch screen devices.

This guide draws together all the information in one handy resource, providing informative and instructive advice through expert insights, analysis, and use cases.

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[1] Juniper Research (2022) POS Terminals: Key Opportunities, Competitor Leaderboard & Market Forecasts 2022-2027

00 Introduction

It's strange how **the best technology is never used the way it was intended**

In September 2021, one of the great pioneers of computing, Sir Clive Sinclair, died. Despite the sniffy obituaries in many of the British papers about his less successful ventures, for many Brits of my age, he did something heroic; changing our lives by making us realise that computing is something open to everyone. Sinclair's home computers took the digital world out of the academic and banking domain and put it in the hands of the masses. It's hard to overstate the impact it had on the lives and careers of many of my generation.

But Sir Clive was deeply disappointed that his radical innovations in cheap home computing ended up being used mainly as a games machine rather than a playground for the mind. There again, if you have an IQ like his, then I suppose you must get used to being disappointed with the rest of us.

A couple of weeks earlier, we saw Linux' 30th anniversary. It was modestly introduced by Linus Torvalds who said that it would "probably never support" anything other than the IBM PC/AT.

And when the mobile phone first appeared, no one predicted its uptake... or just how little time the device would actually be used as a "phone".

QR codes were designed to help factories track raw goods through the supply line – not to enable millions of people to buy their groceries, enter cinemas and catch flights every week.

It seems that what drives usage then, is little about intent and a lot to do with **utility**. If a device has the right characteristics and enough users, then the wisdom of crowds will work out what to do with it - whatever the inventor thinks. Mobile phones are powerful computing devices deployed in astonishing numbers. Who cares whether they can make and receive phone calls?

I mention all this, because in my small corner of the technology industry: **payment devices,** we are experiencing the same shift right now. Yes, payment terminals are designed to handle card payments safely and securely and in the face of some pretty prolonged rough treatment. But at a time when the way we pay is getting more varied, that may not be their most important characteristic in the future.

Like mobile phones, a modern payment terminal is a powerful computer. Unlike a mobile phone, a payment terminal is also:

- The one ubiquitous computing device to be found in every retail shop, bar, restaurant, and coffee shop across the planet: if payment terminals were people, they'd be one of the 15 biggest nations on earth.
- Reasonably robust.
- Relatively low cost.
- Designed to last for several years.
- Usually includes a printer as well as a screen and online connection.

The big catalyst here is **Android.** Until recently, in order to ensure security, most terminals were highly proprietary making it very difficult for mainstream developers to even consider them. Android changes everything, democratising access. Sure, that access has to be very carefully controlled and managed, but there is still plenty of scope for innovation now. According to OS Today (citing information from Evans Data), there are 5.9 million Android developers out there today. 5.9 million brilliant minds coming up with ingenious ways to make technology work for us. Even Sir Clive Sinclair would have struggled to compete with that.

There are

5.9 million

Android developers

And what brilliant minds they are. Here are some innovative use cases that our partners around the world have applied on our payment devices. It's all a long way from taking card payments:

- **In Australia,** our payment terminals have been used to manage Covid testing. The devices have the power to track a patient, scan a code, print a label to make sure the right test results are tied to the correct people and connect back to the hospital. This could have been done with a mobile phone, a printer and a few other devices, but terminals are cheap, robust and easy to carry and operate. They are also easy to integrate.

- **In Kenya,** our payment terminals are being used to enable village shopkeepers to provide real banking services to the local population. Equity Bank allow the shopkeeper to become an agent and equip them with a terminal with which they can manage deposits and cash payments bringing financial inclusion to the poorest and remotest workers.

- **Across 6 countries in Africa,** Finca is using terminals to provide microfinance services to the previously unbanked, finally making secure saving a possibility for everyone.

- **And in Europe,** many smart start-ups are starting to see that they can treat the millions of smaller merchants as a mega-sales channel for new services. From lottery and gaming to financial services and remittance, they are asking the question: why should I have five or ten branches when I could potentially have a million or more?

So, **here's a challenge:**

There are almost **100 million point of sale terminals in the world,** all sitting at the very place where trust is being created between seller and buyer. More and more they will be powerful, always on-line Android computing devices.

"It's a massive, massive opportunity. What can we invent together to make it work for all of us?"

Ian Benn
Global Head of Strategy
and Market Development
at Ingenico

Why Android is **the future of POS**

Android has become a hot topic in payments acceptance with the market already seeing a significant shift in volumes to the new platform. So, why Android, and how can banks, acquirers, and merchants, gain real value from it?

What is the Android difference?

Until now, the changes between payment terminal offerings from one generation to another have been incremental. Excluding PCI and security upgrades, from a merchant's point of view, we are speaking of Wi-Fi, wireless communication evolution, ergonomics, colour screens, and a few other features. But the Android ecosystem changes all that. It unlocks the ability to move beyond proprietary ecosystems and allows acquirers and value-added providers to develop their own applications, thus opening a new universe to banks and acquirers. By combining these apps with the creativity of ever-increasing networks of Fintechs, ISVs, Wallet Operators, and other Business Application Developers, a differential competitive advantage can be developed.

What are the benefits for banking partners?

In our eyes, banks and acquirers have a few key priorities. One of them is to reduce the total cost of ownership of the hardware they supply to retailers. Another is improving customer retention. With Android, a single product can replace multiple devices instore, reducing the total cost of ownership for both acquirers and merchants. It also provides acquiring businesses with the opportunity to offer a superior, and sometimes cheaper service to merchants, boosting their relationship over the long term.

Additionally, it enables banks and acquirers to increase stickiness by developing their own apps for merchants: for example, if a merchant has three years of loyalty scheme data with their bank, they will think long and hard before changing their provider.

How can businesses harness Android?

There are few limits to the types of applications that can be deployed on Android devices, however, there are a couple of key ways to gain real value from the platform. The first, is to complement payments with business applications. Android carries with it a large developer community, with a plethora of application types that can be deployed on an Android based POS. These might include front-office apps, such as store applications, loyalty, click and collect and ticketing, while back-office apps can deliver reporting, staff management and more.

Second, is the ability to accept alternative payment methods, leveraging extended device capabilities, such as cameras, scanning and NFC. Android also unlocks the ability to easily port new applications, including QR codes and digital wallets – on top of traditional payment methods.

How secure is the Android Payment Terminal?

Security is vital for retailers, acquirers, banks and consumers. There has been huge progress in Android security in the past few years, it's one of the reasons we chose the platform. In addition, Ingenico offers extra layers of security. Whilst the platform is open, the payment side is not. The two environments are distinct and segregated and everything related to payments sits behind a firewall with dedicated connection layers. Most importantly, all of Ingenico's Android terminals are fully PCI compliant, meeting the strictest payment security standards.

What is the future?

Android unlocks the door to secure transactions, value-added services, and ongoing operational availability that merchants need to create exciting, engaging, and differentiated experiences for customers. It also enables the POS to use thin-client software, in combination with cloud functionality. Applications that live on both the POS, and in the Cloud, could provide real value.

For example, the ability of Android POS to automate and enable many maintenance, software update and self-care functions, can significantly reduce the total cost of ownership for the estate owner. Merchants benefit from unlocking a digital sales process – checking out, checking inventory, and finding product information through the Cloud.

How does Ingenico's portfolio fit in this Android picture?

Ingenico's Android solutions and services are built upon proven capabilities in delivering **best-in-class and reliable devices,** as well as the strong, **local capabilities** acquirers need to effectively deploy and sustain their solutions. With ongoing trust and collaboration, customers can draw on our ideas, innovations, and network of partners, continually improving their offerings and helping them to deploy solutions that meet the requirements of their rapidly evolving merchant and consumer needs.

Jose Luis Arias
EVP – Head of EMEA Region at Ingenico

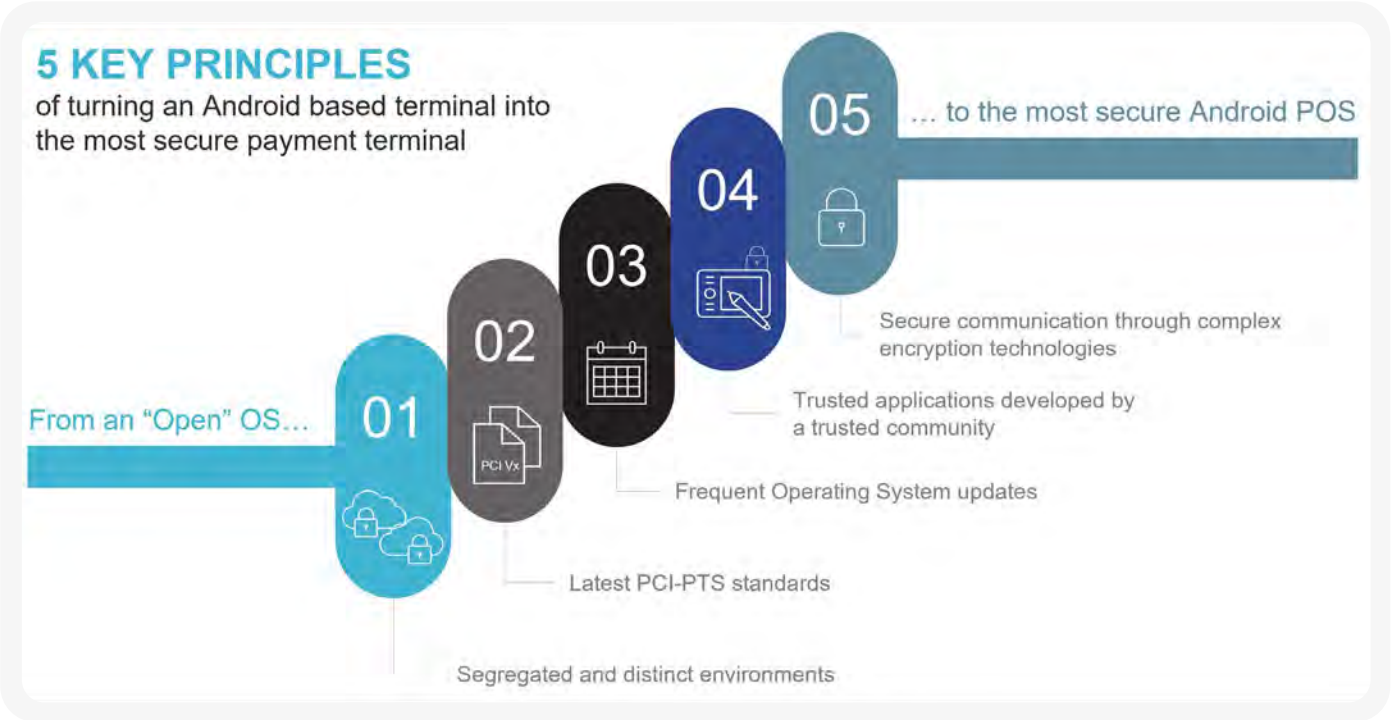
Are Android terminals safe?
Ingenico's 5 key principles driving payment security

The security of payment systems, cardholder data, and personally identifiable information is paramount, and the regulatory environment increasingly complex. Any technology that resides at the heart of commerce must be both secure and trusted. The opportunities presented by Android are clear, but are payment transactions safe on the platform?

Ingenico has an essential philosophy at its core - to stay up to date with the latest security standards and promote the most secure cryptographic elements for our customers.

These principles lie at the foundation of Ingenico's approach to developing its solutions, including those using Android. This point is perfectly illustrated by the AXIUM platform, which was designed to provide secure payment alongside the Android environment.

But whilst significant progress has been made in Android security in recent years, the following key principles remain vital to ensure a safe, secure, and trusted ecosystem:



01. Segregated and distinct enviroments between everything related to payment, and non-payment aspects of the plataform

Android applications created for consumer devices are usually published on Google Play™, the public Appstore managed by Google. Google provides developers with a set of tools to sign their application allowing the Google Play service to recognise and validate the signed software. This is needed to give the 'green light' for the software's distribution.

However, an application authorised with the Google signing toolchain cannot be loaded on an AXIUM terminal. Instead, Ingenico designed a complete ecosystem to manage AXIUM business applications, creating a security red line that connects an app through the software development kit (SDK) and signature tools to the Ingenico Appstore on the Terminal Estate Manager (TEM) for the software distribution.

The AXIUM platform segregates business applications from the payment application environment, opening it up to a **large community of Android developers** who can **build and run their business apps** while **preventing access to payment features.**

Looking at this in more technical depth, the Ingenico SDK manages the PCI-PTS SRED (Secure Read and Exchange Data) compliance requirements for Point of Interaction devices, respecting the wide set of security rules required by the PCI Council standard.

These include:

- Protection against attempts to disclose cryptographic information.
- Uniqueness of the secured keys.
- Avoidance of sensitive data retentio.n
- Cryptographic protection of firmware updates and remote access.

to name just a few...

All these features are commonly used by the payment application and are authorised by the signature tool during the application signature process. However, non-payment applications can be signed to run on AXIUM without access to the payment environment and to the secured memory areas.

Managed interaction between non-payment applications with payment services is also possible, driven by specific payment APIs under a 'payment as a service' model, whilst still meeting the security principles described.

02. The certification of technology developed to the latest PCI-PTS standards

The AXIUM operating system (OS) is proprietary designed and dedicated to payment use cases. This provides the right level of security for both the user experience and the customer environment and is totally separate to any business applications.

Based on this architecture, the AXIUM OS and the overall platform have been certified with the most recent certification, **PCI PTS version 6.**

However, compliance is only one aspect of platform security...

03. Frequent updated, ensuring that Android POS, and connected devices, are protected from evolving threats

Android is a giant with worldwide reach. It is no surprise therefore that it represents an appealing target for security threats. Whenever system weaknesses are discovered and resolved, or new security standards take shape, Android gets updated with security patches to prevent hacking or fraud. This is part of the natural life cycle of an operating system.

AXIUM is a business platform built on Android and has been designed to ensure the highest protection against any software threats. And just like Android, Ingenico has in place a continuous assessment process, to evaluate Android threats and solutions to keep AXIUM up to date, secure and trustworthy.

Compliance continues with updates to our customers' estates supporting the terminal's life cycle. One of the pillars of the AXIUM platform is that it is always connected. Through its proprietary Estate Manager platform (TEM), Ingenico delivers updates and security patches to AXIUM terminals seamlessly without interrupting the device. This ensures business continuity and provides the best performance to the end user without any compromise on security.

04. Trusted applications developed by prople who understand the complex regulatory environment

Whilst Android is an open development platform, **an Android based payment system must comply with PCI-PTS requirements** and meet strict security restrictions.

So, how do you protect the payment environment, (card readers, security, pin entry etc.) to ensure they meet the associated security restrictions whilst at the same time providing app developers with safe access to payment features?

This is achieved by **preventing an application from directly accessing card payment peripherals,** a key obstacle that would otherwise prevent the creation of generic applications. Indeed, Android applications that only use communication channels, screen and touch functions can be ported onto AXIUM quite effortlessly.

In this case, what really differentiates an AXIUM app from a standard Android app, is the signature process and software distribution that must be managed through Ingenico's tools. This signing toolchain manages the Android permissions, according to the partnership level, thereby balancing the application approvals with the application's purpose.

Third party app developers benefit from Ingenico's Payment APIs which give them access to card payment features without getting involved in payment regulation complexity. The APIs provide the bridge to card payment processes in applications, leveraging Ingenico's experience and opening up routes to new use cases.

The platform application signature scheme is designed to ensure that customers can build partnerships with third parties application providers, without interfering with the payment platform and its strong security constraints.

05. The use of terminal, ecosystem, and encryption technologies, to ensure secure communication between all parts of the payment and sensitive data chains are protected, and safely integrated

The AXIUM platform is **designed for devices already built to manage sensitive information** and communication.

Data protection may not be as fascinating or exciting as other aspects of a product, such as the design or user interface, but it sits at the core of a payment terminal and must withstand any threat: breaking the data protection wall would mean full access to sensitive information or money.

Sensitive data on a payment terminal is protected using cryptography. Commonly, cryptographic algorithms use one secret key (symmetric cryptography), or a pair of keys composed of a public/private key couple (asymmetric cryptography) to cipher and decipher data. The keys are secrets held by the parties allowed to safely exchange information, i.e., the credit card and the terminal.

As machine calculation performance grows over time, the main challenge for cryptographic algorithms is to keep secret keys complex enough to avoid reverse engineering (brute force attack resistance) whilst preserving quick data encryption/decryption processes. If a key is violated, this could allow access to data, such as transactions, credit cards, bank accounts, emails – all of which would be compromised, opening up the potential for users to become a victim of fraud.

The **RSA key,** (named after the surnames of Ron Rivest, Adi Shamir and Leonard Adleman, who first described the algorithm in 1977), is probably the most used asymmetric cryptographic algorithm in SSL/TLS communication security today: when we access a web portal or login to an authenticated service, RSA is working behind the scenes to prevent fraud and reduce risk. However, research in cryptography continues to search for new concepts to solve the conundrum of fast encryption/decryption while preserving a strong key brute force resistance.

Elliptic Curve Cryptography (ECC) is one of the most enhanced asymmetric cryptographic algorithms and will probably replace RSA in time. ECC key pair generation is simple as private and public keys are a randomised point of an elliptic curve over a finite field. The ECC encryption algorithm, uses the elliptic curve math theory to cipher information. The reverse engineering of the ECC algorithm must solve a high-complexity math problem called "discrete logarithm over finite fields": this reinforces the ECC brute force attack resistance, whilst reducing the key size and preserving a high level of performance in the encryption/decryption processes. For example, a proven elliptic curve cryptography key of 384 bit achieves the same level of security as an RSA key of 7680 bit.

The AXIUM platform is built with strong cryptography, including AES (Advanced Encryption Standard) symmetric keys and Elliptic Curve Cryptography (ECC)

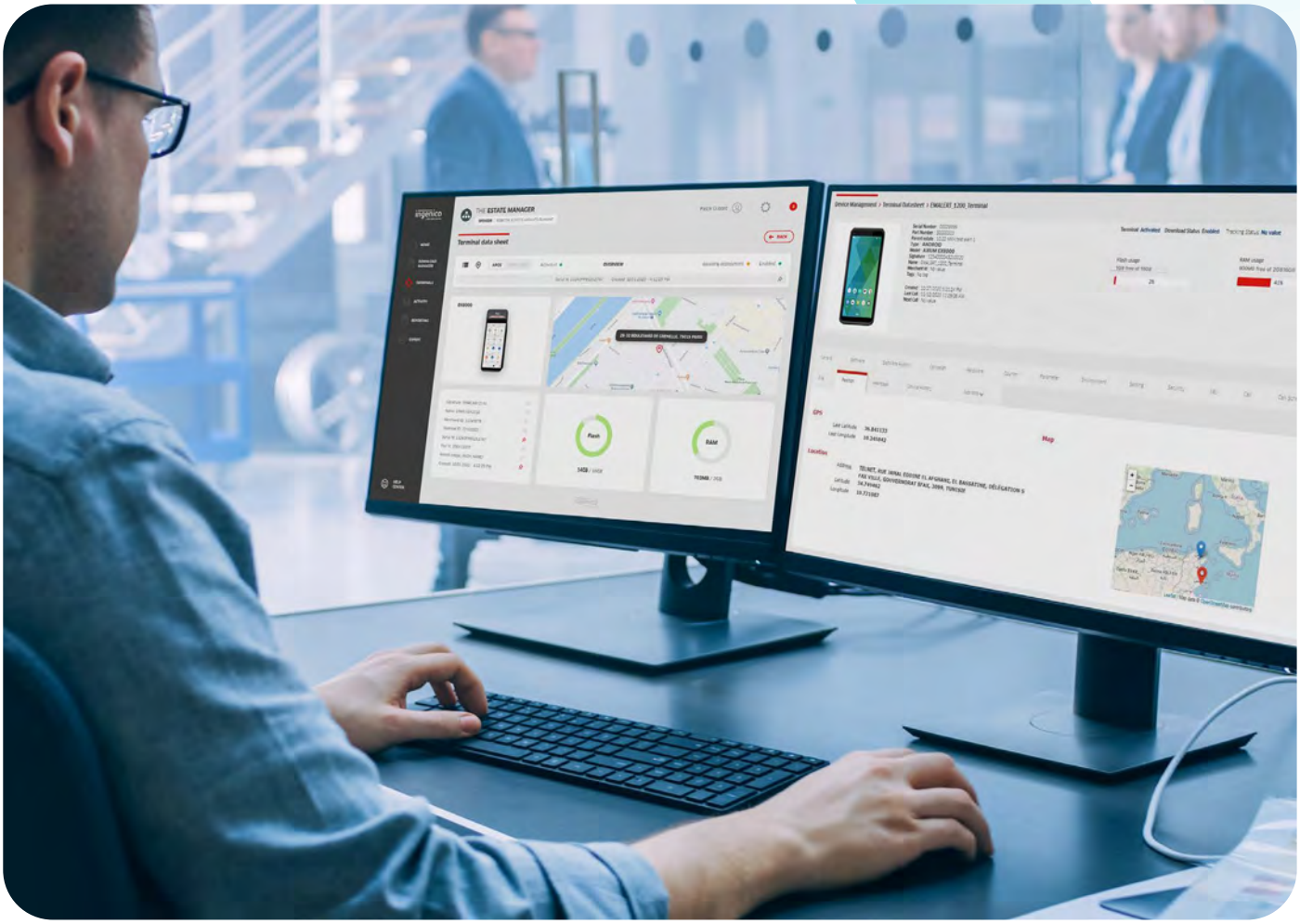
These security solutions are also compliant with the relevant security standards for PCI PIN and PCI P2PE.

All the security elements described here are not only available on the AXIUM platform, but also on Ingenico's Tetra platform too, helping to facilitate the integration, user experience and the overall estate management for our customers.

Ingenico's proven experience in the payment industry has helped to bring together the benefits of all the latest technologies, cementing its position as a one of the world's most trusted and reliable payment providers.

We remain focused on our customer needs and will continue to work closely with them to deploy the latest features, guiding them through their use to ensure the most secure payment experience in new environments.

Mario Perciabosco
EMEA Project Coordinator
at Ingenico



Developing POS terminal applications: from “A” to... “T”

With the Android “shift”, the humble payment terminal evolves from a traditional, proprietary embedded operating system, into an open-source point of sale (POS) utilising Android. This new paradigm comes with the ambition to accelerate customers’ digital transformation and reshape the traditional “point-of-sale” into a “point-of-interaction”.

Android is a giant that needs no introduction. Developed and released in 2008, this open source Linux-based operating system has been a worldwide success: in 2021, Google announced that some **3 Billion of Android-based devices were active.**

3 BN

active Android-base devices in 2021

Today, Android is considered the de facto standard for the mobile phone industry, also penetrating other electronic consumer device industries such as cars, entertainment, and wearables.

Indeed, Android now plays a key role in the entire electronic devices market, bringing its service offer to end users and simplifying feature usage through its user interface (UI) and communication facilities.

Android and Tetra: two market-leading propositions for two different purposes

Understanding the value of this evolution, Ingenico launched AXIUM – its next generation of Android payment terminals -

to flank the more traditional core offer based on its proprietary operating system, Tetra. Both architectures meet the strictest payment industry standards (EMV and PCI-PTS), so how do the two architectures differ?

The main difference between Tetra and AXIUM reflects the purpose for which they were designed. Tetra is based on a payment-centric operating system. AXIUM has been created to speed up application development and portability, opening the way for different players.

The Tetra proprietary operating system is tailored for payment industry needs. Operating on customized hardware, it supports any payment method, enhancing customer experience with multimedia and HTML5 value-added services (VAS). Developing for the proprietary Tetra operating system requires advanced C or C++ development skills and detailed knowledge of the dedicated peripheral and graphics libraries. Whilst this gives the developer immense freedom, it is a barrier to third parties wanting to develop their own applications for use on their own terminal estate or as VAS for other estate owners.

AXIUM is a pure Android operating system. The innovation remains in coexisting an open operating system with the strictest EMV and PCI-PTS security levels. Whilst some specific knowledge is required to leverage the card payment processing, (readers, EMV) most of the development environment on AXIUM terminals will be familiar to existing Android developers with their skills almost instantly transferable and opening the terminal as a platform for business applications.

Android success is based on Java, APIs and an open-source code. Features not easily accessible on traditional embedded systems, like databases, rich communication frameworks, JSON/XML, camera and QR Code management, enhanced graphics, A2A, etc... are natively available. This increases the integration possibilities, reducing development time and costs and adding impressive features to the apps.

Regardless of the technology, Tetra and Android applications have a key point in common: as the architecture of both is secured, applications must be signed with an Ingenico tool to be loaded onto the payment terminals.

It is also important to note that all Android features compromising PCI-PTS security requirements have been removed. For instance, Google Play Services aren’t available on AXIUM. Similarly, Android apps signed with the Ingenico toolchain cannot be loaded on Google Play and vice versa. Instead, the software distribution service is provided by Ingenico’s Estate Manager which allows developers to remotely manage application evolution on all Ingenico products.

Developing on Android has become a “common” skill...

When you look at Google statistical data on Android, one of the standout figures is **the impressive number of applications already published** on its Play Store. This was most recently placed at 2.67 million apps, after surpassing 1 million apps in July 2013.

2.67 BN

published applications
on Android Play Store

This is clear evidence of a massive developer community working on Android. Not only this, but resources are accessible worldwide, with multilanguage documentation provided by Google’s developer website, providing a rich source of coding examples.

The Android Developer Community is very active, with forums, blogs, video tutorials and free training just some of the support mechanisms in place to ease the development process. Developers can choose from a wide variety of programming languages, starting with NDK with C/C++, evolving to more abstract and runtime-controlled environments like Java and Kotlin, but also C#, Python, and Ruby etc.

...thanks to the resources accessible to developers

There are several resources available to developers, here are some of the most important to consider:

- **Android Studio,** the killer RAD (rapid application development) open-source IDE (integrated development environment) based on IntelliJ IDEA. It offers component management (Gradle/Maven), Android ROM emulators, Android Debug Bridge (ADB) to run applications and useful features like material design. It’s a great tool which is constantly evolving to support its community.

- **“Hello world!”** applications can be created in just a few clicks in the IDE, and it also supports debugging. Starting development has never been so easy!

- For demos, code samples tutorials, **GitHub** offers lots of open-source resources to get inspired.

As a result, developing on Android is considered straightforward...

Android offers the reassurance of a future proof technology. It is common sense, for example, to consider that recent technologies like 5G will be supported by newer versions of Android. Indeed, when you consider the number vendors who continue to integrate with the OS, Android is a safe bet when it comes to applications design.

Android continues to develop and lead the art of user experience, the user interface design, the accessibility of the touch screens, the operating mode of the graphic controls, widgets, virtual keyboards, styles, multimedia and so on. Each innovation is lapped up and appreciated by millions of end users.

A simple application can be implemented on Android in just a few days by skilled developers. Several resources for developers have already been highlighted, however full stack competencies are key in finding simplified ways to do things in a straightforward way.

This is all part of the innovation process; development full-stack skills, solutions and graphic resources portfolios are all capable of boosting Android development performance and results, helping to reduce the time to market and improving software quality.

...offering undeniable advantages

Code reusability

is a key advantage of the Android platform, mainly due to the Java support offered only on Android. The development stack on the payment terminal benefits from open-source libraries, adding new development concepts like dependency injection, reactive programming, data persistence, increasing solution complexity to meet a variety of needs.

Android applications can be designed for testing,

with a large range of tools on offer to manage automated testing. These can be used to boost the application’s quality and value to the user.

APIs service design

can accelerate integrations with external services or managing 'App to App' communication. Android also offers opportunities to use Apps features through the services of third parties, opening the potential for other revenue streams by reselling apps services to others.

Android's development environment

is another key benefit, providing graphic standard formats which include integrated features to design UIs. Logging and online/offline debugging aid coding and the troubleshooting processes. This is further supported with a library to run multithreading, synchronization, exceptions and database frameworks.

But, is there a bridge between Tetra and Android?

The first purpose of using an Android-based terminal is to offer a rich portfolio of business applications. These applications can certainly be developed from scratch, but they can also be leveraged from an existing environment. After some enhancement, open Android applications become applicable to a POS terminal while meeting the strictest levels of security.

The other way around, is to consider all the existing Tetra applications. Would it be possible to port them onto Android?

For developers already familiar with Ingenico's Tetra terminals, one of the key questions is whether it is more straightforward to develop on Android? However, there isn't a simple answer as many variables are involved in both development processes, namely: skills, application architecture, complexity, expectations, and expertise.

A solid knowledge of Android and an existing application portfolio would bring a significant advantage and speed up the development process. Combine this with access to free solution examples covering most common app development issues, and Android starts to accrue considerable value.

One of the options to consider when porting an app from Tetra to Android, is to explore the source code conversion of Tetra C/C++ into Android project native libraries. The porting of large business logic applications could benefit from this approach, even if it results in some architectural cons.

More generally, rewriting an entire application using more recent and abstract coding language like Java/Kotlin brings hidden benefits. Coding accelerators, such as automatic garbage collector, concise syntax, Elvis operator (Null safety) and lambda expression - all cover aspects of development that would be very time consuming in C++.

Investing time in learning these new techniques can speed up development and reduce workload.

However, certain attributes such as application lifecycle (background management), tasks, data management, communication and asset management, use completely different models on Android: this must be understood and accepted.

Ingenico is committed to continued support for the range of Tetra terminals running our proprietary operating system and they will remain the product of choice for environments where business applications aren't necessary. In that guise the terminal is a tool for payment. However, for some merchants and environments, a range of business and productivity applications on the terminal will bring significant benefits to businesses and the user experience.

The Android based AXIUM range brings a familiar user experience and an open platform whereby the multitude of skilled Android developers and the vast array of Android applications ripe for porting, offer a bright future for the 'humble' terminal - as a secure and trusted platform for payments...and more.

Mario Perciabosco
EMEA Project Coordinator
at Ingenico

From Payment centric to Business centric; the radical shift

The innovation race has started with the emergence of the next generation of payment terminals based on the Android operating system. So, what are the drivers for this momentum, and why is Android gaining traction? Here are four key reasons why Android is making such a significant difference in the world of payment...

01. All-in-one approach

What is Android bringing to payment to facilitate change?

It all started with Android creating a niche in the payments ecosystem: **value-added applications.** As the name implies, value-added applications provide additional value and revenue streams to the payment terminal, developing their traditional payments function into a broader, more 'business centric' role, where payment is no longer the sole purpose.

The Android environment offers the technological capacity to design and adapt new functionalities, transforming the payment terminal to support both merchant and customer needs, and the range of potential applications is vast. Here are some of the areas which stand out for their ability to create greater value for businesses.

Example 1

Innova TaxFree: bridging security and business into a seamless user experience

Partnering with Innova TaxFree, Ingenico has been working on the implementation of an application that processes a tax free transaction in a matter of seconds. This is achieved by capturing the Passport number in the MRZ (machine readable zone) using the camera incorporated in the terminal, removing the hassle of extensive forms that travellers would normally complete on their return.

Example 2

Touché: turning the POS terminal into an ubiquitous professional device

In the HORECA (HOtel REstaurants and CAfes) environments, our goal is to integrate and facilitate operations in a single device.

Touché, through its certified integration with point of sale (POS) systems such as Oracle Micros Simphony, developed an application that takes a customer's order directly through the Android POS terminal and sends it straight to the kitchen. At the end of the meal when it's time to pay, guests can split the bill in the way that suits them, directly on the payment device. The waiter can process any kind of payment, apply loyalty entitlements and send the customer an electronic receipt, all while the POS updates in the background. Offering a fluid experience in this way benefits both the customer and the business, delivering operational efficiency and improving the guest experience.

In both of these examples, the requirement to manage several devices has been removed. Instead, **this all-in-one approach simplifies the experience** for both waiters and TaxFree employees, whilst reducing estate management costs significantly.

02. Developer familiarity

Android-based applications open the door to a myriad of business opportunities, but is their development as straight forward as it seems?

One of the key advantages of Android is that there are already millions of apps in existence, meaning that you don't necessarily need to create one from scratch. The Android platform is popular, flexible and provides a better user experience, so the potential to create high quality applications on a payment terminal is already there.

In most cases, porting an existing Android application onto a payment terminal requires few tweaks as both are based on the same operating system. Ingenico has invested significant time investigating ways to make app development a seamless experience, and these efforts are paying off. Ingenico customers are already enjoying user-friendly Android apps whilst benefitting from the most secure environment.

The appetite for Android payment applications has seen Ingenico partner with a range of leading providers. This strategy has helped to create an apps ecosystem, a marketplace that offers a "ready-to-upload" portfolio of business products, bringing real value to merchants in the shortest time possible.

03. From points-of-sale to points-of-trust

Android is a common technology, so how has Ingenico ensured their POS terminals continue to meet the strongest PCI standards?

Bridging a "popular" operating system such as Android with rigorous payment security standards was not an easy task. But security is part of Ingenico's DNA and we continue to make it central to our Android offering by managing compliance at a global and local level.

Indeed, all of Ingenico's Android terminals are fully PCI compliant, meeting the strictest international payment security levels. For example, our AXIUM range includes the DX8000 which offers PCI PTS V6 compliancy.

Huge progress has been made in Android OS-related security over the past few years, but the following principles remain vital to ensure a safe, secure, and trusted ecosystem:

- **Creating segregated and distinct environments** between the payment and non-payment aspects of the platform safeguards the value secured through Android's data analytics, but without compromising on PCI rules.
- **By keeping the software up to date,** the Android POS and connected devices are protected from any evolving threats.
- **This can be further bolstered by the latest encryption technologies,** securing communication between all parts of the payment ecosystem so that sensitive data chains are protected and safely integrated.
- **The use of signature keys,** to ensure that only authorised people can access the terminal's environment, offers further reassurance.
- **And finally, trusted applications,** developed by people who understand the complex regulatory payments environment, are essential.

04. New income streams

How do these applications generate revenues?

The new "business centric" opportunities delivered by value-added applications also bring additional revenue streams into play.

Banks are already creating their own ecosystem of apps to sell and differentiate from competitors,

providing value on top of payments and generating higher revenues than traditional acquiring.

A great example of this is Innova TaxFree, where the additional income comes from the ability to offer Tax free refunds, providing an additional 'hook' to bring customers into the store. Because the application deals with an existing form of tax, it improves the speed and overall user experience, making it more efficient and reducing transaction times.

For restaurant apps like Touché, the focus is also on improving the customer experience, with banks benefitting from additional revenues by cross selling these service bundles to merchants.

These opportunities and others that are clearly aligned with additional income, are great examples of application innovation designed to get the most from the payment terminal.

The payment terminal is here to stay

Some people believe that traditional payment terminals are on borrowed time, with alternative payment methods (APMs) and cloud services lining up to take their place. However, the reality is that payment terminals and APMs actually complement each other and can run more easily on Android. This, combined with the four key reasons I've just described, highlight exactly why Android terminals are gaining traction every day.

Android relies on the successful partnership between the secure terminal and its business-applications to take traditional payment to the next level, and the story is only just beginning...

Hernán Moya
TaaS Global Business Development Director at Ingenico

Estate management: remoter than you think?

In the dim and distant past, to change the channel on the TV, people used to have to get up off their seat, walk to the television, and press the button on the box. Then came the revolution, the remote control! This revolution increased our appetite to find other ways to save effort and enjoy more time sitting on our sofas.

So, in the light of all things remote, how does this apply to the payments industry? We still go to stores, reach for a wallet or a phone when we want to pay, and input our PIN on a terminal to make things happen. Does this mean that the remote revolution has bypassed payment terminals and the payment industry? Not so! Dig a little deeper and you can quickly see how far payment solutions and services have come and how much can be achieved remotely.

Meet Mark...

Mark is a merchant who has never taken card payments, but his business has grown to a point where his customers are asking to pay by card, and if he doesn't offer them this option, he's going to lose business. He wants some personal advice, so he books a virtual appointment with his bank to speak to someone online over a video chat. This answers all his questions and Mark is ready to place his order for his new AXIUM Android payment terminal from Ingenico.

Getting started is quite simple and something he can do online. With a few clicks, Mark's shiny new terminal is on route and should be with him in a couple of days. He tracks its journey as it works its way towards him and once delivered, takes it out of the box and plugs it in. He follows the on-screen instructions and before long his new DX8000 terminal is up and running and he's ready to take payment.

As the days pass and his customers make use of card payments on his new terminal, Mark realises he's still missing out on some sales. There are lots of tourists who visit his shop who want to use more exotic payment methods, like Alipay or UnionPay, that he doesn't offer. Mark wasn't ready for this, however being a curious sort, he decides to message his bank to see if they can help. After a few minutes of online chat with his bank, he discovers that these payment options are available and decides it would be worthwhile to add one of them. He simply needs to wait for the software download to update his terminal. To avoid disruption to trading, he chooses to receive the update overnight when his shop is closed. Morning comes and his terminal is ready to go, a paper receipt printed out telling him that the software has been successfully downloaded and he's able to accept payments with Alipay.

Adding this new payment option gets Mark thinking. What else could his terminal do? After all, his customers seem to naturally trust this powerful little device and the role it plays without asking questions, maybe it could do more? With his curiosity piqued, Mark reaches out again to his bank, asking what else is available.

The answer surprises him, as there is a wealth of different actions the terminal can perform that never even crossed his mind. In fact, thinking about his terminal solely for payment seems a narrow view. He contemplates all the tasks he must do during the day and the opportunities and challenges his customers present, considering ways to help his business. He browses Ingenico's App Showcase and finds an app that can track what's been sold to better manage his inventory, as well as another to reward customer loyalty. In the blink of an eye, Mark's signed up and two new apps have been downloaded and are ready to go on his terminal. Just like finding new solutions on his mobile phone, this has all been remarkably easy.

Mark's business continues to thrive, and his payment terminal gets on with its job. But this past week, Mark has noticed a couple of error messages. Nothing that has stopped him taking payments, but enough to be a nagging concern. What would he do if it stopped working, how could he get it fixed, what if he ended up without it for a few days? The thought of not being able to use all the services that he's introduced to his day-to-day business gives Mark the cold sweats. He picks up the phone to call the Ingenico helpdesk number he remembers receiving when he signed up with his bank. Better to deal with it now, so he dials the number and gets connected to John.

John reassures him that he can help and starts by checking the terminal's self-diagnostic report. Mark had thought that to fix the terminal he would have to work through a bunch of menus guided by John, or at worst make a trip to the post office to ship the terminal back for repair. Instead, he can see that John has already connected to his terminal and is using remote diagnostics to figure out what's wrong and how to fix it. John quickly spots the problem; some rogue terminal settings are causing the terminal to misbehave. With the press of a few buttons, John has made some changes, pushed them to the terminal and Mark is back in business. Feeling relieved, Mark gets back to work, happy that his problem was solved so easily.

For Mark, starting and making the best of his payment journey has been straightforward. What's even better, he's been able to do it all whilst maintaining card payments for his customers and continuing to run his business. In fact, the only time he's had to take his terminal outside his door has been to use his new AXIUM EX6000 mobile terminal that he's just added for his outdoor café customers. Who said being remote meant foregoing the personal touch; for Mark it's all been plain sailing!

Simon Fairbairn
Head of Professional Services, EMEA at Ingenico

How Android terminals **can support the payment experience for people with a visual impairment**

The use of touch screens for PIN entry is increasing in popularity with consumers, accelerating the rollout of Android payment terminals. However, with no tactile markers or a physical keypad to navigate, this presents a challenge to people with a visual impairment. Ingenico worked closely with the Royal National Institute of Blind People (RNIB) to find a solution to support blind and partially sighted users...

According to the RNIB, more than two million people in the UK are living with sight loss[3], and with an ageing population, this figure is expected to grow significantly in the coming years.

Ingenico collaborated with the RNIB on the design of a new interface for its AXIUM DX8000 Android payment terminal to ensure financial inclusion for those using the next generation of payment terminals. This included an expert assessment and observed user testing with blind and partially sighted users to identify usability and accessibility issues.

Utilising the large colour touch screen on the DX8000 and its 'text-to-speech capability', Ingenico harnessed the power of the technology to propose a solution that would provide clarity to the card holder:

- The use of large, bold characters in a font recommended for character recognition provides good contrast and clarity, **supporting people with impaired vision to use the PIN pad more easily.**
- An internationally recognised icon for the visually impaired people launches the full 'Accessibility Mode', prompting the terminal to provide an **audible introduction, guiding the user around the keyboard.**
- The device reads out the amount to be paid, along with basic instructions supported by a **series of beeps to assist with keypad navigation.**
- A double tap anywhere on the screen is used to select the desired key, and the whole process has an extended time-out feature, **allowing the user to carefully complete their transaction in the time they need.**

By working closely with the RNIB, Ingenico has been able to implement a PCI approved solution for people with a visual impairment, that maintains the security of the PIN entry process, and provides trust at the moment of purchase.

"We are delighted to have supported Ingenico with their new AXIUM DX8000 Android payment terminal to ensure it is accessible for blind and partially sighted people. Ingenico has worked hard to implement a user interface that will work effectively for a range of visual impairment levels, incorporating all the recommendations from the RNIB's user testing. We look forward to our continued collaboration, ensuring financial inclusion for all".

David Clarke, *RNIB Director of Services.*

Martin Doherty
CSO for Northern Europe and DACH at Ingenico

[3] Key information and statistics on sight loss in the UK

Integrating value-add services through Android: **Moneynet's success story**

The Italian payments industry has experienced a major transformation in recent years. The birth of payment institutions and Fintechs, an influx of foreign multinationals, the concentration of the market and the introduction of PagoPA, have all fundamentally changed the payments ecosystem, creating new challenges for those who operate within it.

These trends have resulted in smaller companies searching for new forms of differentiation to create more customised and individually recognisable services. In this use case, we look at the experience of Moneynet to discover how they improved their service offering through Android and secured a brighter future.

Adaptability: the new competitive advantage

Moneynet is the Italian Payment Institute, authorised by the Bank of Italy. They provide payment services and integrated solutions for small and medium-sized businesses. Faced with significant changes to their sector, Moneynet analysed new strategies to help them survive in an increasingly difficult market.

The organisation's business model is focused on acquiring and value-added services (VAS), offering vertical solutions complimentary to pre-payment services and other functionalities to help grow a merchant's business. Moneynet identified the opportunity to offer their customers a single, all-in-one Android solution, providing several services integrated with new business Apps.

However, rather than gradually introduce new payment terminals to its range, Moneynet made a much more drastic choice;

to totally replace their existing technology and switch to Android in the shortest possible time.

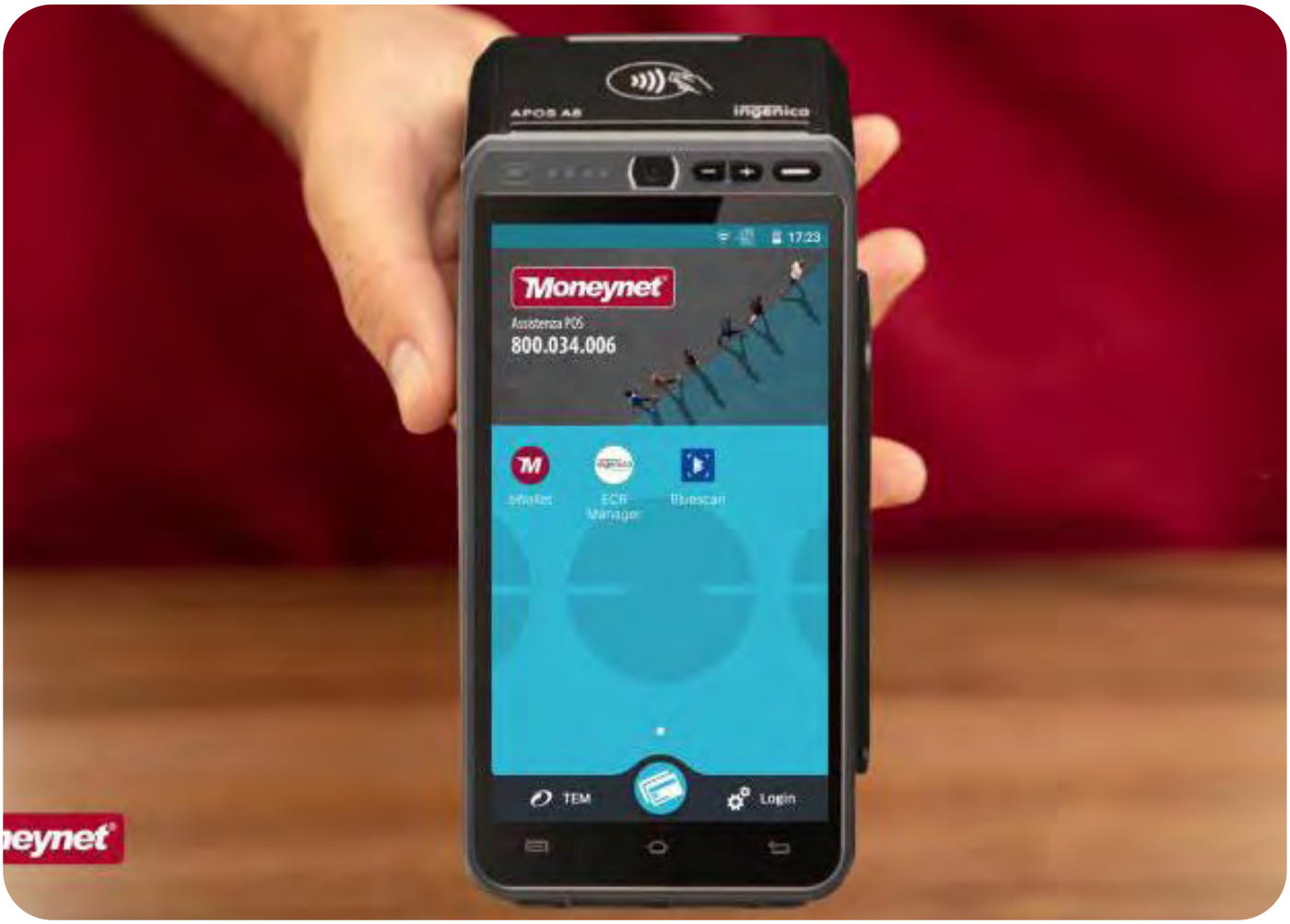
To do this, they would also need to rewrite and renew all their existing value-add solutions.

The project was high risk and not easy to complete in a short timeframe. But Moneynet knew that Android technology would guarantee an innovative and adaptable approach, allowing them to deliver in a more flexible and immediate way.

From point of sale to point of interaction

Moneynet wished to create an offer based primarily on customer loyalty, an essential requirement for their merchants. They wanted to offer payment services integrated with Android value added Apps, such as top-ups, electronic wallets, and bill payments. To do this, they would need a strong partner to support them.

Ingenico, the worldwide leader in payments, was identified as a strong match for the aims of Moneynet's strategic plan. Both organisations believe in success and Ingenico's Android technology would provide an excellent opportunity to achieve optimal results.



Working together, Moneynet leveraged Ingenico's Android smart terminals to accept digital payments and run multiple services directly at the point of sale (POS). Merchants select from a range of VAS on the terminal through a web platform or App, helping them to grow their business by offering multiple services to the end user. In this way, the point of sale has become a real point of interaction between the merchant and the consumer.

The benefits of Android in concrete use cases

The state-of-the-art user experience and functionality of Ingenico's payment terminals, combined with the easy programmability of Android, are already improving the portability of all the services running on the Moneynet network, enabling further business opportunities for their customers.

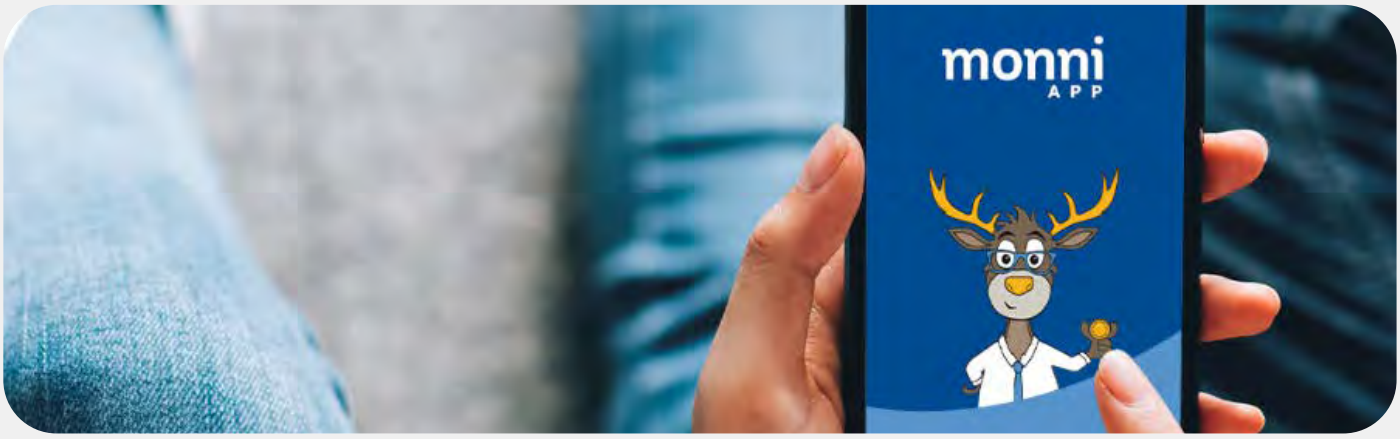
By providing innovative and vertical solutions, such as fidelity cards, wallets, top-ups, gift cards and bill payment, Moneynet is boosting merchant activity by ensuring a smooth uptake of Android applications through the cloud. The end user experience is smarter and streamlined, **enriching the shopping experience.**

The success of this implementation has already seen 3,000 Android payment terminals installed in Italian retailers and other applications are being planned for introduction to enhance the range of services.

Here are two examples of Apps that Moneynet is already offering to its merchants through Ingenico's payment terminals:

3,000

Android payment terminals in Italian retailers



01. "Monni" - a complete program for closed loop cards for payment, loyalty, and rewards

Using its synergy with two ISVs partners, Moneynet built an innovative ecosystem to manage the acceptance of closed loop virtual cards and physical cards using Ingenico's Android payment terminals as the point of interaction.

The eWallet application was designed by Ingenico's Android team together with Moneynet to manage their physical closed loop cards and enrich the final user experience, helping merchants to operate their day-to-day payments.

To accelerate the digitalisation process, the **Bluecode** application was included in the suite to enable the virtualisation of closed loop cards, creating a smartphone-based eWallet system for payment.

Each time a transaction is made, a new barcode is generated, triggering a direct payment process from the customer's bank account. The barcode is generated by the customer's Banking App, allowing them to pay and receive loyalty rewards. These are automatically recognised when payments are made with Bluecode.

The Bluecode App is a completely contactless solution – neither the payment terminal nor the PIN pad needs to be touched. The merchant simply scans the barcode on the customer's smartphone, and they are ready to pay!

By accepting Bluecode payments, merchants can reduce queues at the checkout and avoid handling cash or dealing with change. The App can also be used to pay at vending machines, online, and at self-service checkouts.

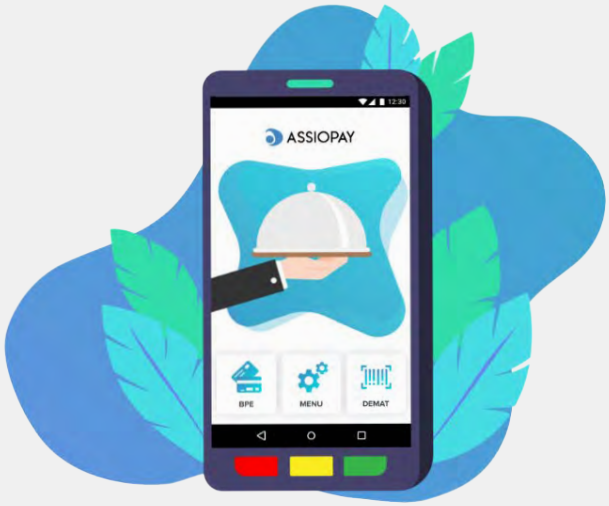
Smartphones are the future of customer loyalty programmes, giving the Bluecode App a decisive competitive advantage by helping merchants to offer digital customer programs.

02. iBP App for Meal Vouchers

iBP is a solution designed for the smart management of meal voucher spending processes. This innovative App works with all types of meal vouchers and issuers in both electronic and paper format, helping merchants to simplify the payment process, encouraging business, and increasing customer satisfaction.

With a single Android POS the merchant can validate meal vouchers from all the main providers, reducing queues at the checkout and working more efficiently. The solution is customisable and guarantees a simple and effective customer experience.

Through this App, the payment terminal can accept meal vouchers and offer several innovative features:



- Electronic Meal Voucher Expenditure & Balance Adjustment
- Paper Voucher Validation
- Reports Preparation
- Configuration of Operating Parameters

The partnership between Ingenico and Moneynet is based on Ingenico's new business model, **Terminal as a Service (TaaS).** This model provides a tailored programme of technical support, including maintenance and software, alongside traditional hardware services.

By outsourcing its estate management to one single partner, **Moneynet has reduced payment complexity,** allowing it to deliver value-added services and focus on growing its business.

All Moneynet's payment terminals are managed by Ingenico's estate manager, equipping them with reliable technology that can be managed remotely, reducing the cost of delivery and maintenance.

"Moneynet needs to continue to enhance and evolve its service offering to customers to be successful. But to win in the long term, we must have not only the best technology, but also imagination and courage.

Through partnership with Ingenico, Moneynet has been able to leverage the technology and experience of a worldwide leader, using our synergy for the benefit of Italian merchants who will be able to grow their business utilising value-added services directly from the point of sale."

Marco di Cosimo
CEO of Moneynet

"Ingenico is delighted that Moneynet has chosen our Android smart terminals to accept digital payments and provide differentiated services to its customers. Our partnership is already making a positive difference to thousands of retailers in Italy, and we look forward to implementing further innovations with Moneynet in the near future."

Paolo di Temporiti
Head of Italy, CESEE & Middle East at Ingenico

Conclusion

Android technology is a game changer. It will enable the shift from payment-centric terminals to business-centric devices supporting new payment features.

This swing may sound radical; indeed, it is, but it will not be at the cost of security. Rather, Ingenico's Android-based POS terminals are designed to allow business applications to co-exist with the payment application, avoiding any risk.

It is this new generation of terminals that will take payments to the next level, by placing the customer at the centre of a merchant's business, no matter their size. Running on Android 10, even the smallest business can offer new payment experiences to their customers.

In Africa for example, Android POS adoption has facilitated financial inclusion among small merchants, proving that payment terminals no longer equate to transactions fees, but with earned commissions from alternative services instead.

The Android journey began with a different operating system and arrived at a new ecosystem where new applications play a critical role in shaping the future of payment.

This is just the beginning. A new technology. A new user experience. A new ecosystem.

So, what's next?

To learn more about Ingenico's solutions that are changing the world of business, contact us here.

With special thanks to our contributors:

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About Ingenico

Ingenico is the global leader in payments acceptance solutions. As the trusted technology partner for merchants, banks, acquirers, ISVs, payment aggregators and fintech customers our world-class terminals, solutions and services enable the global ecosystem of payments acceptance. With 45 years of experience, innovation is integral to Ingenico's approach and culture, inspiring our large and diverse community of experts who anticipate and help shape the evolution of commerce worldwide. At Ingenico, trust and sustainability are at the heart of everything we do.

For further information:

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