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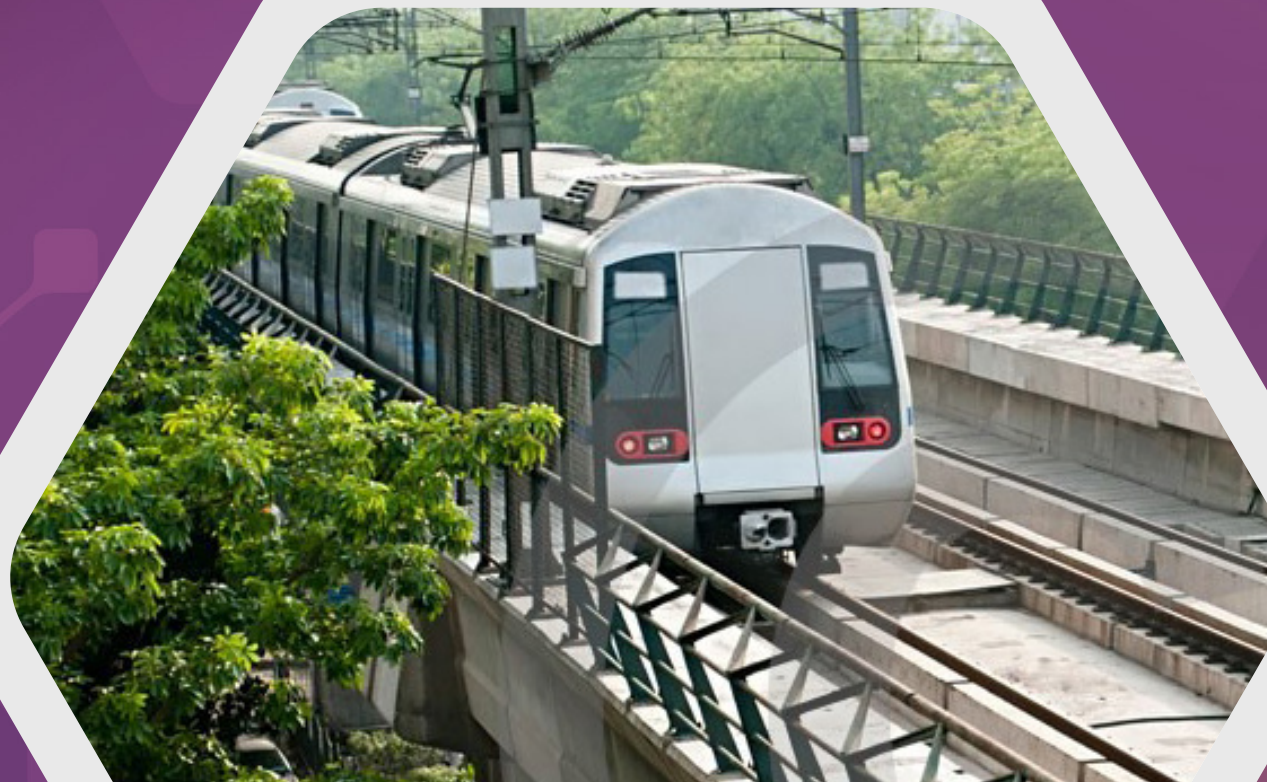
One Action. **A billion transactions.**

TRANSPORT TICKETING IN INDIA

How to create a sustainable ecosystem



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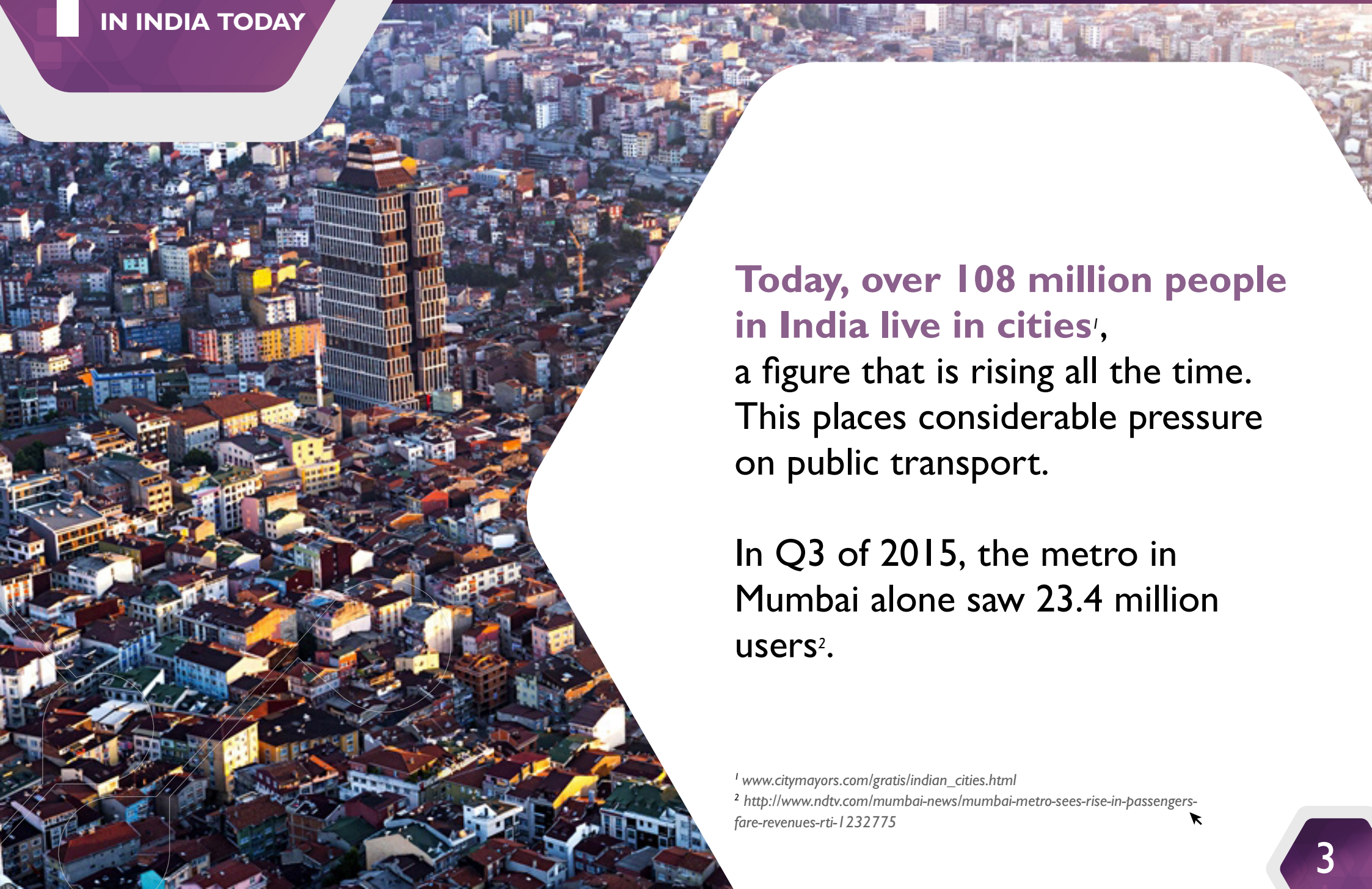

Today, over 108 million people in India live in cities[1], a figure that is rising all the time. This places considerable pressure on public transport.

In Q3 of 2015, the metro in Mumbai alone saw 23.4 million users[2].

[1] *www.citymayors.com/gratis/indian_cities.html*
[2] *http://www.ndtv.com/mumbai-news/mumbai-metro-sees-rise-in-passengers-fare-revenues-rti-1232775*

1 PUBLIC TRANSPORT NETWORKS IN INDIA TODAY

To meet this demand, a growing number of Indian cities have introduced metro systems. These form part of India's **multi-modal public transport networks**, incorporating metro, bus, train and ferry systems. There are multiple operators: metro systems are managed by the Ministry of Urban Development, the railways by the Ministry of Railways, buses by local agencies specific to each state and ferries are privately operated. This leads to **many connections** between modalities, operators and lines.

Together these factors create considerable complexity.

There is therefore a clear need to enable seamless, efficient, multi-modal travel for the growing urban population and to integrate payment collection across these different modes and organizations.

At the same time there is also a desire in India to **move away from cash for other low value retail payments.**

So, what is the future of transport ticketing in India and how can the operators create a sustainable ecosystem that is able to develop to meet long term user and national requirements?

2 OPEN INTEROPERABLE TICKETING FOR INDIA

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Given the complexity of transport networks in India and the possible services that could be integrated, **it is essential to have an open interoperable specification for automated fare collection (AFC)** that also supports low value in-store payments and other applications such as loyalty programs or couponing.

Any proposed specification should address issues of interoperability related to passes and business rules of transport operators.

This interoperability should make it easy to validate the passes in an offline environment as well as ensure that the same cards can be used seamlessly across metros in different cities.

2 OPEN INTEROPERABLE TICKETING FOR INDIA

Enabling **stored value functionality**, which allows money to be stored on the card, along with transit services, which focuses on service user needs, would also allow other services to be introduced without additional infrastructure changes.

This approach would make it possible to add road toll payments, healthcare payments and other forms of retail payments, as well as loyalty and more on secure chip cards running these specifications.

This could be done easily and without additional investment in re-issuing cards.

3 WHAT ARE THE OPTIONS?

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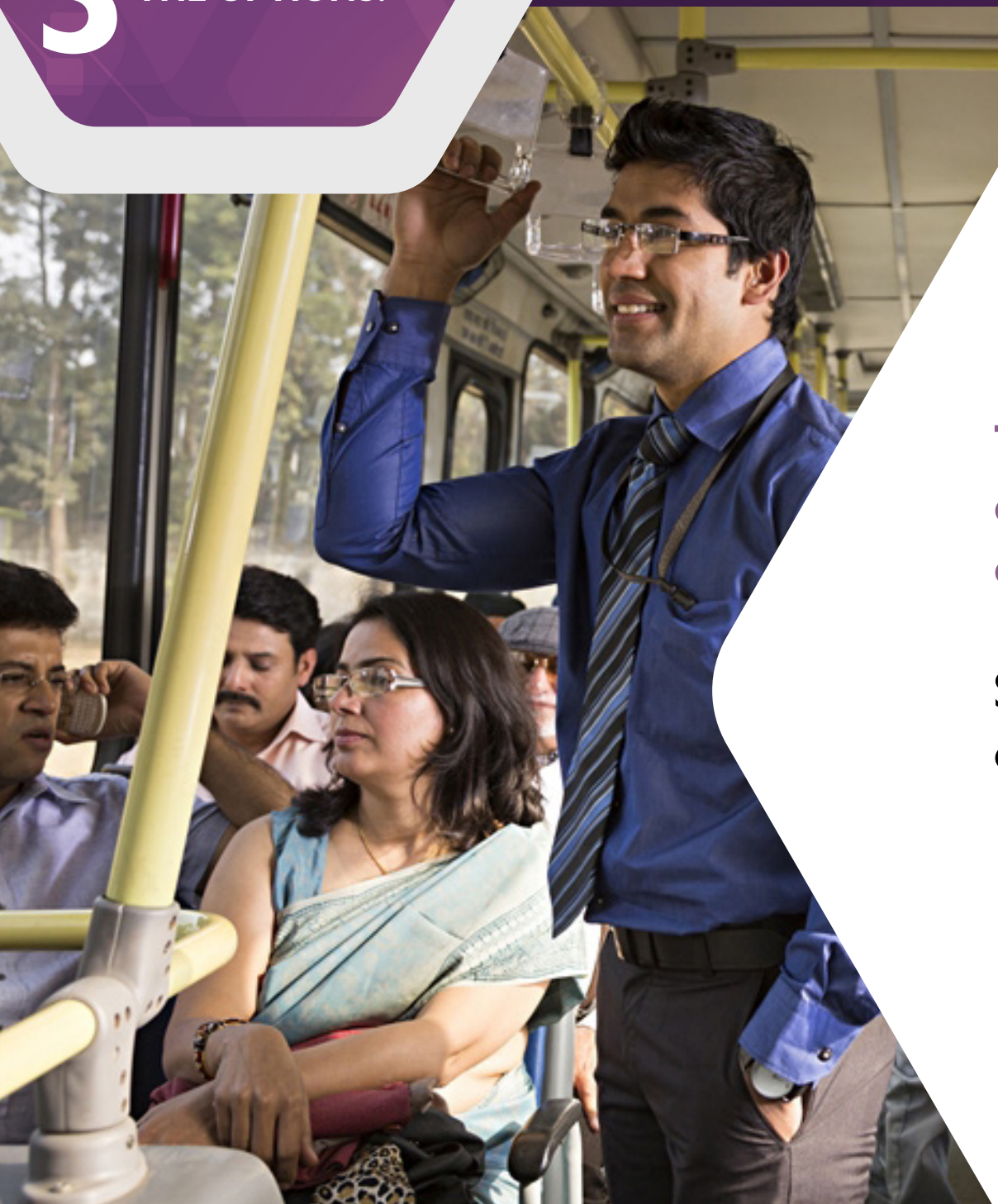
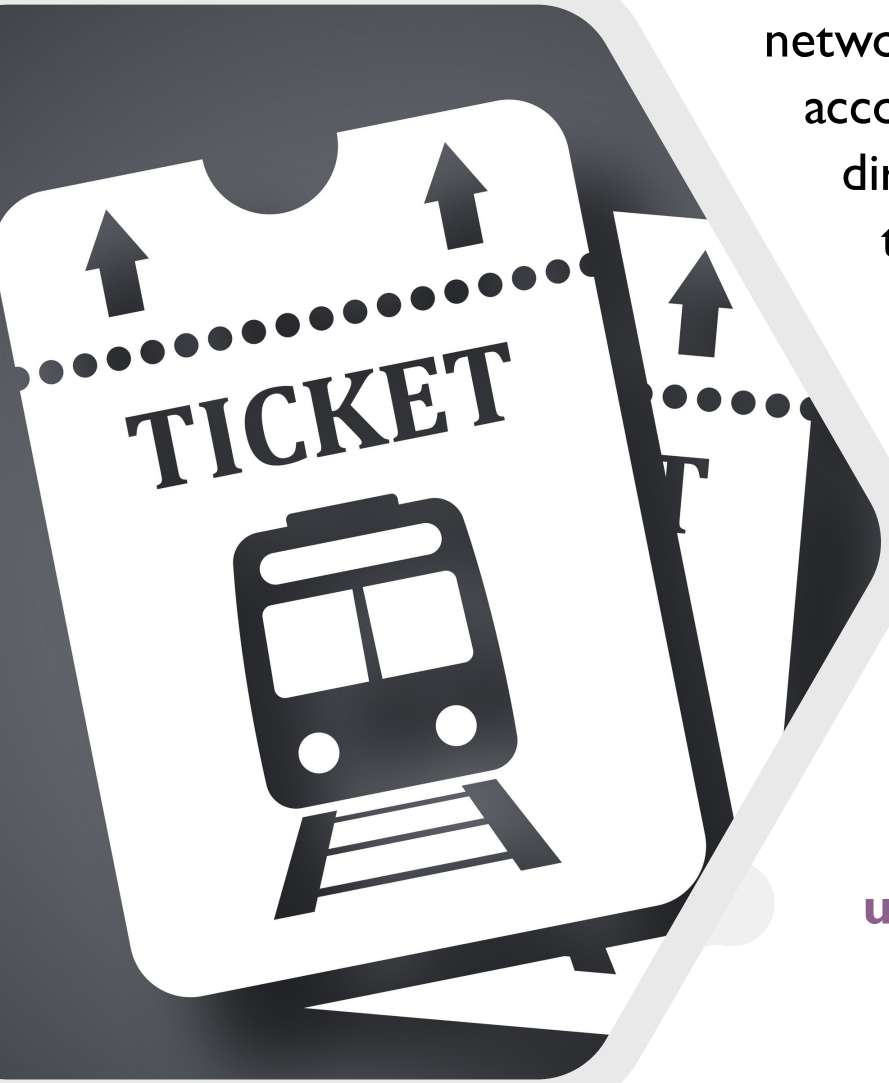


There are several options commonly used for smart card transport ticketing.

Systems can be account-based or card-based stored value.



Account-based services process and reconcile transport network access rights remotely, on a backend system. The account-based model can work in online mode, connecting directly to the backend, as well as offline. Usually, for throughput reasons, this is done on a daily batch basis, meaning that access turnstiles must store account information locally in order to check ticket validity. This approach allows for a wide range of ticketing types, from single use, decrementing a prepaid or post-paid account balance, to season tickets.

Stored-value systems in contrast hold a prepaid balance on the card, rather than a backend system, and simply decrement it when used.

3 WHAT ARE THE OPTIONS?

Proprietary systems	Cross vendor specifications	Open ticketing standards	The EMV® Chip Specifications
From individual vendors.	Such as Calypso, which have been developed by a consortium of European transport operators.	Such as CIPURSE, managed by industry association OSPT Alliance.	Which encompass both contact and contactless payments, and are global payment industry specifications that describe the requirements for interoperability between chip-based payment applications and acceptance terminals to enable payment.*

* The specifications are managed by the technical body EMVCo. While originally designed for retail payments, these can also be used for transport ticketing.

4 THE INDIAN CASE FOR EMV ACCOUNT-BASED PAYMENT

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There is a strong business case for the specification to be based on EMV® contact specifications, with specific extensions for contactless operations enabled. This will allow factoring in both contact and contactless modes of operations and the support of smartphone use in the future.

Multiple forms of transactions – account based as well as stored value cards – should be supported. While **metro operators** are likely to be most attracted to the account-based model because of the range of ticket types it enables, **bus operators** will prefer stored value as it allows for offline transactions, essential for moving vehicles without online connections.

This choice provides the flexibility for transit operators to choose the model most appropriate for their operational challenges and future opportunities.

4 THE INDIAN CASE FOR EMV ACCOUNT-BASED PAYMENT

Using EMV, with its concepts proven in the payments world, will guarantee security without compromise or reduction in usability. The specification can achieve this through advanced cryptograms and, to support authentication, keys that have to be shared between acquirers and issuers with relevant security mechanisms.

Another important factor is that **EMV chip cards are now accepted for payments throughout India with all banks issuing EMV cards.** The migration is scheduled to be completed in 2016. Bank account use is growing too, with a massive push launched in 2014 to reduce financial exclusion.

These arguments all added up to a convincing case for choosing an EMV-based open loop system, rather than locking India into a proprietary closed loop system.

5 HOW WOULD STORED VALUE ON THE CARD MAKE THE DIFFERENCE?

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Using an EMV account base would allow transit passes to be stored locally, on the cards. Without this, all terminals would need to be updated with pass information for every cardholder in the city on a regular basis.

This is not just impractical in a city with millions of passes and thousands of terminals, but would also mean that any system failure could bring the entire system to a grinding halt.

Storing passes on the card is likely to offer a more cost-effective and easier rollout of the system. However, while the intelligence is kept on the card, the backend should retain control of spending and usage limits.

In addition to payment data on the card, transit passes also should be stored on the cards, making it easily available, and guaranteeing entry and exit from the transport network.

6 SUCCESSFUL IMPLEMENTATION

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Successful implementation requires **extensive pre-launch testing to ensure interoperability and reliability.** This is vital to deliver security without compromising usability.

A recommended approach is to **run a pilot with one metro system** initially before extending the programme to other metros. A pilot implementation of this nature should provide a clear view of the benefits of the system as well as highlighting good practice to follow in extending the implementation across further metro systems, operators and cities.

Once this is successful, then **bus operators** should be added to the ecosystem, followed by further applications.

The end result is a single card, with which nearly all of a customer's low value payment needs can be addressed.

7 EXISTING ACCOUNT-BASED TICKETING SYSTEMS

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India will not be first to implement account-based ticketing. In 2009 **Salt Lake City** in Utah introduced contactless open loop ticketing and similar systems were launched later in **Chicago** and trialled in **New York**, although these were not based on EMV Specifications.

The reference implementation for many operators is **London**, where TfL added EMV-based fare collection to its existing Oyster Card scheme in 2012 for buses and 2014 for the metro (the London Underground). This system allows customers to use their existing contactless bank cards and implements daily and weekly capping of fares to ensure that bank card users do not pay more than Oyster Card holders.

In **South Africa**, Transport for Cape Town also uses contactless EMV cards for anonymized ticketing. There is an intention to extend the scheme throughout the country.

8 HOW AN INDIAN IMPLEMENTATION WOULD DIFFER

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The proposed implementation in India would not be a direct copy of any previous system. **It will have to be adapted to meet local conditions and requirements**, such as catering for the complexity described in sections 1 and 2 of this ebook.

It must allow for **extensibility** and **flexibility** as well as the ability to add acquirer or operator specific programmes.
It must also take into account the fact that India does not yet have consistent and reliable **high speed internet connectivity**.
Therefore, the system must allow for both:

- **A ful account-based approach**, where only authentication is performed at the gate and fare calculation and reconciliation is carried out at the back office.
- **A card-based model** where the fare is calculated at the gate and deducted from stored value on the card.

8 HOW AN INDIAN IMPLEMENTATION WOULD DIFFER

Nor should it simply leverage EMV alone, as ticketing necessitates a more complex set of requirements than just payment. **It also combines tracking and fare calculation with the payment, requiring additional functionality**. Of course fare entitlement is also subject to different business rules to retail payments.

The system must also allow for other form factors, such as key fobs and especially smartphones and other connected devices **to support the growing digitalization and connected nature of consumers.**

9 SYSTEM BENEFITS

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The system chosen has to appeal to all stakeholders – public transport operators, issuers and the users. Some of the **benefits** that the stakeholders can expect from the proposed system are:

PUBLIC TRANSPORT OPERATORS	ISSUERS	USERS
Reduced capital and operational costs	Opportunity to attract new banking customers	Convenience and ease of use
High speed and high volume abilities	Cross subsidization of costs with existing synergies between transit and payments	Helps passenger safety by managing throughput
Enhanced customer experience	Improved customer life cycle management	Multi-use and multi-functional
Better financial management	Integration with other smart city initiatives	Multiple top-up channels
Seamless integration with other operators and services		
Helps in nation building		

9 SYSTEM BENEFITS

The end result, if this guidance is followed, will be **a system that brings considerable value to India**. It will provide **costs benefits to operators**, as well as being **easy** and **secure** to implement and less burdensome than proprietary systems to administer.

Simplifying fare collection and multi-modal ticketing will just be the beginning.

In the future, the system may well extend into many other sectors, with low value retail payments seen as one of the first priorities.

10 CONCLUSION

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India is now proceeding with a national implementation of an EMV-based transit fare collection programme: the Smart National Common Mobility Card (NCMC) system. This is intended to enable **seamless travel** by different metro and other transport networks across the country and to enable **retail shopping and purchases**.

By choosing EMV, India has taken the first and biggest step towards creating a sustainable ecosystem. However, in order to fully achieve the goal of creating a system that is capable of meeting **long term national and user requirements**, the system must be able to evolve in a way that incorporates all the proposed features laid out in this ebook, including offering both account based and stored value fare collection.

In this way India can offer consider value to all stakeholders and can truly ensure that its mass transit future meets its needs in the years to come.

11 ABOUT FIME

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FIME offers comprehensive consulting services, technical training, technology design, test tools and certification testing, tailored to the needs of the Indian financial services, telecom, transit and identity sectors. Its experts support local projects from start to finish, resolving the technical challenges its customers face when implementing a complete portfolio of specifications, standards and multi-brand industry requirements.

Its consultants bring extensive EMV experience, knowledge and expertise to a range of projects, including terminal device and kernel development. Its testing expertise has also ensured the interoperability of RuPay, India's domestic payments scheme.

FIME's other transit references include:

- Work on a technical specification for AFIMB (Agence française pour l'information multimodale et la billettique, the French association for transit interoperability). The specification is now recognized by the EU as CEN TS 16 794 and by the Smart Ticketing Alliance.
- Development of a functional test plan for Calypso, the international electronic ticketing standard.
- Development of reader test benches for STIF (Syndicat des transports d'Île-de-France), the transport authority covering the greater Paris area.

11 ABOUT FIME

FIME is equipped and ready to support transit operators and other stakeholders across India in maximizing the benefit of their involvement in this crucial transit project.

This dedicated transit expertise is supported by FIME's ability to speak the language of its customers. It uses its 20+ years of experience to ensure that card and mobile transactions services are implemented efficiently and successfully. It supports a range of technologies including contact, contactless, EMV chip, near field communication (NFC), host card emulation (HCE), tokenization, secure element (SE), machine to machine (M2M), internet of things (IoT) and trusted execution environment (TEE).

Partnering with the international and national payment schemes, and industry bodies, FIME ensures its multi-brand offering is always aligned with the latest market requirements.

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