Calypso
Networks Association

MaaS for All:
Everyone has a right to ride.

Three key steps that transport authorities need to consider to ensure their travel system stays open to all

Mobility-as-a-Service (MaaS) aims to connect passengers with integrated public transport options from the first mile to last.

Newer transport choices must link seamlessly and reliably from start to finish, without excluding passengers by accepting only one ticketing medium, which would cut off certain categories of users and restrict access to the MaaS offer.

The success of MaaS centres on two main challenges facing the public transport sector:

1. Full integration of existing public transport infrastructure with newer MaaS models.
2. Inclusive, reliable, sustainable ticketing that is simple for passengers to use and manage.

In this eBook you will learn:

Why...

...inclusion is critical to MaaS moving mainstream

How...

...to enable choice and inclusion with open standard technologies, such as Calypso

Who...

...is responsible for enabling mobility inclusion - Hint: local authorities have a huge role to play!

What...

...a successful, integrated MaaS and public transport network looks like - including three key commitments networks need to make

What is MaaS?

The MaaS Alliance defines Mobility-as-a-Service (MaaS) as integrating various forms of transport and transport-related services into a single, comprehensive, and on-demand mobility service.

As the UITP identifies, MaaS requires “a business ecosystem where multiple organisations act in collaboration, mixing the traditional boundaries of business sectors and companies, and involving users in the co-creation.”

At CNA, we know that integrating multiple transportation modes into one ticketing system presents a number of complex challenges around revenue sharing, tariffs and scalability.

An effective MaaS solution must therefore seamlessly blend public and private mobility offerings, creating a unified, complementary network based on truly open standards.

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Why is inclusion critical to MaaS moving mainstream?

Transport ticketing is not a typical consumer purchase. It is not a 'product' that consumers buy, it is a gateway. Operators and authorities provide passengers with the power to move; to go places; to exist and be part of society.

This distinction is important. Why? If a consumer cannot buy a product using the payment method they want, they either simply do not get the product, or they can shop elsewhere. In mobility, if a passenger is unable to purchase their ticket because of technological barriers, they lose their 'right to ride'.

As mobility services grow, networks that do not enable access for all risk deterring passengers. This costs them revenue. But worse, it also denies people the basic right to travel to work or see friends and family. Public authorities must ensure they can deliver this to their citizens.

Those denied access to travel can feel much stronger feelings of exclusion and isolation. Not only are they rejected from mobility services, but as a result they are absent from the places and people they intended to visit.

Public transport has often mixed different technological solutions together in order to provide mobility services. Today, MaaS and public transport, together, offer the potential for a unique, joined-up solution for payments across systems and modes of travel.

THE UNIQUE ROLE OF PUBLIC MOBILITY SERVICES

The importance of public transport services to society was summarised perfectly by Nikolaus Lang of Boston Consulting Group, writing for the World Economic Forum:

> *"The quality of life in any community has a lot to do with everyone's ability [...] to get to work, meet with people they care about, and find access to health care, education, shopping, and culture.*
>
> *Mobility doesn't just mean having more roads, trains, subways, bike paths and walkways. It means having them designed so the greatest numbers of people can comfortably and conveniently get where they want to go, in line with their personal preferences and taking account of any personal conditions that may limit them."*

Public transport today must meet three major societal goals:

1. Climate sustainability
2. Freedom of choice
3. Inclusion

1 Climate sustainability

Going green: Recognising mobility's role in climate sustainability

Sustainable transformation is a business necessity, not just an ideal. It affects every business and every person. Climate change is a major factor driving change in public transport and we have no choice but to adapt.

There are countless ways we can all reduce our carbon footprint. Undoubtedly, as passengers we can make smarter mobility choices, moving away from individual cars to other more environmentally friendly solutions.

But what about those running mobility services? Public transport may be a key component in reducing emissions, but without better integration to MaaS, it will not answer to the challenge. Neither can MaaS go it alone and succeed.

Public transport services and MaaS need to link seamlessly together with agile ticketing. This is what Calypso intends to do.

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Five priorities for going green with public transport and MaaS:

1. **Target net-zero and beyond in emissions and waste**
   Embrace low-emission modes of transport, including electric buses, bicycles, eScooters and even ride sharing, as well as reducing paper ticket waste where possible

2. **Board-level readiness for sustainable transformation and collaboration**
   Ambition to deliver greener networks must come from the top, with a desire to act now and begin delivering change through partnerships – even with traditional competitors*

3. **New regulations driving sustainability strategy**
   Countries and regions worldwide are aiming to reduce transport-related greenhouse gas emissions by up to 90% by 2050. Authorities need to ensure regulation demotes use of the car and promotes space for public mobility options. Networks can also consider providing details of the carbon footprint for each mode of transport so passengers can make informed choices

4. **Data-driven sustainability and investing in new ticketing technologies**
   Data must be shared in an interoperable format so that all stakeholders can access and use it to optimise services, enhance sustainable mobility options and monitor live movement across the network

5. **Earlier adoption of dematerialisation where possible**
   Smartcards and mobile ticketing are helping reduce waste from public transport, but networks must offer a full range of accessible ticket options to ensure that no-one is excluded from using public transport because of a lack of payment options being available

What does MaaS mean for competition in public transport?

The public transport space is not competing against buses, bikes or trains, it is competing always against the car. As an industry, we need to offer something as convenient as a private vehicle. This means joined-up services that can be accessed by anyone, so they can get from Point A, to Point B, sharing live passenger data and using a single payment method across the network for the optimal travel experience.

2
Freedom of choice

Providing choice: Enabling passenger freedom and flexibility

Today, passenger behaviours are less predictable than they were just a few years ago. We cannot forecast commuter travel patterns as we did before, as habits and preferences have changed to include more home working, and commuter journeys are now more inconsistent.

Networks need to cater for everyone and provide choice for all types of passengers, whenever and however they choose to travel. Critical to this is ensuring any and all complexities are managed in the back-end software, so that the passenger experience is as simple and easy to use as possible.

Open standards can affordably enable passengers to access a mix of every tariff type and medium.

Typically, these take the form of paper tickets, smartcards or digital offerings, such as via mobile or wearable devices.

Access to public transport and MaaS options will need to be possible via these methods. Passengers want to pay in their preferred way, and not allowing them to do so will drive them away from the network and toward private vehicles.

Enabling door-to-door travel will help passengers realise better value in public transport and encourage them to turn down private vehicle use and reduce non-renewable fuel consumption.

3
Inclusion

Enabling inclusion: True MaaS for all

No network deliberately restricts the right to ride, but it can be an unintended consequence of digitalisation. As networks embark on dematerialisation strategies, significantly cutting the volume of paper tickets issued each year, it may be good news for the environment but it could be bad news for some passengers.

Today, fewer paper tickets are printed and mobile ticketing is rising. But here is where the danger lies:

- Not everyone has a bank account and a bank-issued payment card; how can they travel unless the network enables other options?
- Not everyone has a mobile phone, and even where a majority do, assuming everyone will use these devices for ticketing is flawed. Although smartphone adoption is high, some people never use them for anything beyond phone calls and text messages; we cannot presume everyone uses devices in the same way.

Clearly, the industry needs to balance sustainability and innovation with access and openness. We must tackle this challenge together. Mobility should be equitable, enabling multi-modal ticketing irrespective of preferred payment methods.

This means offering cash payments for tickets, enabling kiosk purchases, facilitating online purchases and digital/mobile ticketing. The question for public transport and MaaS providers is how to offer this across multiple modes of travel, as part of a seamless, simple and safe passenger experience.

If MaaS is not “for all” then it is essentially “for none”.

We cannot let technical knowledge or ownership stop a single person from travelling.

Let’s look at three strategies that can help make this a reality ›

What does a successful, integrated MaaS and public transport network look like?

Three key commitments networks need to make:

1. Collaboration
2. Choice
3. Simplicity

1

Collaboration

Achieving a common ticketing experience across modes of transport is complex and currently very fragmented, lacking seamless, reliable integration. The challenge in integrating MaaS comes from the number of different providers now involved in passenger journeys.

Integrating multiple transportation modes into one ticketing system presents a number of complex challenges around revenue sharing, tariffs and scalability. Systems therefore must be well-designed for use on multiple modes of transport in multiple locations, with flexible ticketing free from vendor lock-in.

Collaboration is key, supported by strong governance

Operators need to be willing to securely share data in order to enable joined-up ticketing across a multimodal offering. But there is still a widespread reluctance to share this information, due to perceptions of passing competitive advantage to other providers.

Operators must see the wider picture: joined-up services based on large amounts of accurate data from across the entire network will improve services and the passenger experience.

It is imperative that ticketing media can act as an 'identifier' for passengers so that they can be registered at each stage of their travel and the appropriate fare calculated and applied. Account-based ticketing enables this setup and is already being implemented by a growing number of networks worldwide.

Authorities too, have a major role to play, putting regulation in place to answer to the needs of all passengers. Otherwise, MaaS risks just being a gimmick for tech-savvy passengers, while many others are forced to stay home or use private vehicles.

An effective MaaS solution must be adaptable to different existing setups and be able to integrate successfully between public transport and complementary mobility services.

2

Choice

MaaS means mobility, but it doesn't necessarily mean mobile.

Many networks see mobile as the golden ticket for MaaS integration. However, smartphone ownership varies around the world. In France and Germany, for example, around 82% of the population own a smartphone; in Vietnam this drops to 67% and in Mexico, 62%.

No matter where you go, there is also always a proportion of the population that does not own a smartphone. Even owning a smartphone does not guarantee an inclusive experience.

Transport networks therefore cannot depend on mobile ticketing to answer all their problems of sustainability and usability. **Any network aiming to integrate access to MaaS and public transport services only via the mobile phone is on a path to failure.**

This is why CNA launched Calypso Basic, enabling contactless paper tickets, done the right way, at the lowest cost, for a full contactless ticketing experience accessible to all.

In France, around two thirds of smartphones use Android OS and a third use iOS. Yet the proportion of smartphone owners using their device for travel information is split roughly 50:50.

This suggests that a large proportion of Android users consistently do not use the full functionalities of their smartphone for travel, further limiting mobility access to certain demographics.

3

Simplicity

If it is simple for the developer, it is complex for the user.

If it is simple for the user, it is complex for the developer.

Customers want a joined-up service that enables them to take whatever transport mode they want or need to reach their destination quickly and comfortably.

While choice is important, passengers don't want multiple different tickets for every step of their journey; it's far too complex and does not deliver a good passenger experience.

For users, ticketing should be linked to live travel information and it has to be as easy as possible, end-to-end. To realize this, the complexity must be handled in the background.

This complexity typically comes in the form of clearing of funds, data exchanges at a technical level, as well as agreements between different local authorities, carefully managing any political issues and so on.

But complexity also comes in the form of providing ticketing inclusion for all types of use and population demographics.

NFC is simple enough to facilitate renting a bicycle or entering a metro gate. The contactless access method is well suited to all transport types.

The transaction speed of NFC is also important. In mass transit, it supports high throughput of passengers and reduces the risk of dangerous bottlenecks at gates and terminals. It also plays an important role in MaaS, as it will enhance the user experience if the process is quick, seamless and secure, rather than cumbersome and slow (as QR Codes, for example, can often be).

Contactless transaction speeds with dedicated transport cards, such as Calypso, are typically just 200 microseconds (0.2s), whereas open loop EMV®-based payments typically take 500ms (0.5s). This may not seem like a big variance, but this time difference adds up to significantly faster throughput in busy terminals and a better, simpler UX.

Our goal is to always keep complexities away from end users. The beauty of Calypso solutions, particularly when supported by Eclipse Keyple, is that they can also be easy for developers to integrate and manage.

keyple

Eclipse Keyple is a free, easy-to-use and flexible SDK, enabling the community to build to the Calypso ticketing standard with no vendor lock-in.

With Keyple, developers can create applications that seamlessly connect with Calypso cards. CNA provides developers with three documents that define the requirements to ensure optimum operational performance, interoperability, modularity and conformance.

Why enable choice and inclusion by using open standard technologies?

The future of mobility should and must result in the decline of the private car as a favoured mode of transport. It is inefficient, typically accommodating fewer passengers, and places huge demands on public space for travelling and parking.

This future needs networks to provide more attractive alternatives.

Calypso can help you with this. We understand the common challenges you face with investing in ideas, infrastructures and innovation.

The Calypso community brings together over 100 stakeholders, including operators, authorities, vendors, manufacturers, certification bodies and more to exchange ideas, experiences and requirements, advancing open systems that support consumer ticketing needs.

By using Calypso's true open source technologies, organisations can act free from proprietary constraints, source products from multiple manufacturers and learn best practices from peers around the world.

This is particularly important for those working with limited budgets and who have only ever operated at a hyper-local level, missing some of the easy-to-implement innovations being adopted by other networks.

What are open standards?

The International Telecommunication Union (ITU), defines open standards as: "standards made available to the general public and [which] are developed (or approved) and maintained via a collaborative and consensus driven process. Open standards facilitate interoperability and data exchange among different products or services and are intended for widespread adoption.

The challenge in the years ahead is maintaining innovation without excluding passengers. Undoubtedly, as smartphone adoption grows, and other smart devices become more capable and more accessible, developers need to ensure they have the right tools in place to support scalable growth quickly (in other words, responding to market needs without huge lead-times) and cost effectively (gaining greater control of their network and lowering the costs of evolutionary technologies).

Two recommended approaches to integrating MaaS and public transport services

Account-Based Ticketing (ABT)

Account-Based Ticketing is critical for modern mobility offerings.

Generally speaking, ABT is a ticketing system where all data related to the passenger's ticketing is stored in a remote account, with portable media containing only an identifier rather than the data itself.

However, CNA has developed technology that enables both options. Calypso Prime PKI (Public Key Infrastructure) enables a ticketing smartcard to conduct transactions on networks based on both "card-centric" and "server-centric" Account-Based Ticketing (ABT) infrastructures.

Calypso Prime PKI is the only solution offering interoperable ticketing for public transport networks and new mobility services (MaaS), enabling access for all passengers and reducing costs for operators.

Card-centric solutions see data stored in portable objects and managed by terminals.

Server-centric solutions see data stored and managed in a remote data centre.

Calypso® PRIME PKI

PRIME PKI FOR CARD-CENTRIC TICKETING	PRIME PKI FOR ABT TICKETING
Supporting traditional infrastructures with speed and security	*Supporting ticketing's role in sustainable MaaS deployments for all*
In card centric mode, the Prime PKI card's AES (Advanced Encryption Standard) or TDES (Triple Data Encryption) symmetric cryptography is used	In ABT mode for MaaS solutions, PKI cryptography can be used, as the traveller's settings and details data are stored centrally, and the card is used only for authentication
The card is authenticated	This removes the need for a SAM, simplifying ticketing infrastructures for the rollout of new transit services
The data is securely written to the card via secure exchanges between the card and the SAM implemented in the terminal	It allows networks to reduce costs by using standard hardware for the terminals

Two recommended approaches to integrating MaaS and public transport services

Eclipse Keyple

Keyple captures decades of technical transport ticketing experience to help make visions of advanced, joined-up ticketing ecosystems a reality for all.

For new players in the mobility sector, or seasoned players who are looking to develop modern, integrated solutions with MaaS, Keyple helps by providing quick and inexpensive access to the development tools that have integration and future proofing within their design, whether it is a smartcard or m-ticketing solution.

It provides access to a dynamic community of experts, who are actively involved in shaping Keyple to ensure it is directly influenced by the growing trends in transport ticketing.

It offers a concrete answer to two key issues: mastering ticketing systems and providing access to Calypso for new entrants to the mobility community.

Keyple ensures that there is interoperability from the start, laying the foundation for the future of a joined-up public transport and MaaS ticketing ecosystem.

Using Keyple ensures a competitive approach to the terminal's software upgrades throughout the system's lifespan. This is one of the conditions for mastering the system, as outlined in CNA's Golden Rules of an open and interoperable ticketing system adapted to MaaS.

Case study: Mexico City's journey to MaaS for All

Mexico City is a shining example of the role ticketing plays in making mobility fully inclusive.

Urban inequalities, coupled with the gradual expansion of transport networks, made it critical to integrate unstructured transport into the public transport authority's offering.

Without this, the city could not truly claim to provide a quality service to inhabitants throughout the metropolitan area.

This investment in infrastructure paved the groundwork for a MaaS approach that provides everyone with access to the whole range of public and private transport services, regardless of their social status or the digital equipment they own.

MEXICO CITY MOBILITY FACTS:

- **8,000km² metropolitan area**
- **22 million people**

5M DAILY JOURNEYS, ACROSS:

- **687 Ecobici bicycle stations offering 9,300+ bicycles**
- **12 Metro lines**
- **10 trolleybus lines**
- **7 Metrobús lines**
- **2 Cablebús lines**
- **1 light railway**
- **Multiple microbuses and colectivos**
- **Multiple scooter hire options**
- **Car share services**

Case study: Mexico City's journey to MaaS for All

Mexico City relies on one of the world's largest and busiest public transport networks to carry millions of workers, students, and tourists and power its economy. SEMOVI, the public transport authority, relies on five different operators to run the network.

The Tarjeta Única de Movilidad Integrada is a unique integrated smartcard, providing passengers with access to the network.

Calypso Prime is the software foundation for the card and enables Mexico City to offer a contactless ticketing solution with built-in security. These reusable and reloadable cards make ticketing more sustainable and lower overall costs, eliminating the risk of vendor lock-in.

City planners are also using movement data collected from the Tarjeta Única de Movilidad Integrada ticketing infrastructure to make informed decisions on future network upgrades, based on passenger behaviours.

The Calypso Prime card, based on open standards created by the transport community, for the transport community, is designed for interoperability and can also be hosted on smartphones.

It enables ticketing across a wide range of platforms and environments, including multi-application and mobile; supports account-based ticketing (ABT); provides cross network and cross-border interoperability; and stores several contracts / different ticketing options.

Discover additional implementation stories by reading Calypso Live.

Download now to read about Montreal, Casablanca, Venice and more!

Álvaro Madrigal Montes de Oca
General Director of the Coordination of Public Organizations and Strategic Projects, Mexico City:

"Mexico City is a proud example of how urban transit can implement upgrades that guarantee long-term sustainability. The city has generated newfound levels of trust in contactless ticketing and optimism about its ability to integrate this with new and innovative public services.

As the city's network expands, there is huge potential for Mexico City to help inspire best practices for other networks to replicate around the world."

Final thoughts: Who is responsible for enabling mobility inclusion?

An integrated MaaS and public transport offer can enable door-to-door travel in a way that offers real competition to private vehicles – but it must be accessible and available to all.

Regulation and organisation are required to bring coherence to an effective MaaS offer, otherwise it cannot succeed. This requirement falls firmly on local authorities to put structures in place that facilitate data governance and enhanced urban planning, including redefining the use of space to encourage mobility services above private vehicles.

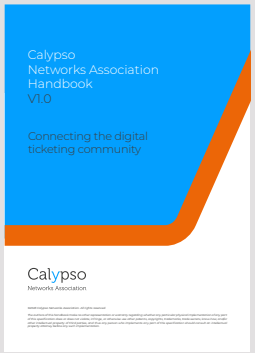
PTOs and PTAs therefore need to collaborate closely with mobility partners, but this will only succeed if every passenger is considered and able to simply and seamlessly enjoy a consistent ticketing experience across multimodal options.

The future, however, is looking positive. A report from the McKinsey Center for Future Mobility found in 2022 that 30% of survey respondents plan to increase their use of mobility services (such as e-bikes and e-scooters over the next decade), with 46% open to replacing their private vehicles with other modes of transport.

An open framework such as Calypso Standards offers an accessible, adaptable, sustainable infrastructure that will help such MaaS solutions reach the masses. Using technology that is familiar, user-friendly, widely adopted and proven, is imperative to making sure that the system is accessible for all.

Ticketing systems in the MaaS age must support different types of fare media and should not exclude people based on their accessibility to technology or bank accounts. Building a platform that can integrate current and new payment methods is crucial. Otherwise MaaS will only ever remain a marginal offer used by few users. Public transport has a central unifying role to play and provides the necessary critical mass.

Contact CNA to discuss how your network can get ready for the future of mobility, today.



Want to learn more about CNA's work?

Download the **CNA Handbook** now for our most comprehensive guide yet to Calypso technologies, implementations, governance, engagement, support, and economic impact.

Calypso

Networks Association

Calypso Networks Association (CNA) is a not-for-profit organisation which brings members of the transport, mobility and services community together to exchange ideas, experiences and requirements to advance open systems that support seamless, consumer ticketing needs.

The CNA community combines transport and mobility authorities, operators, and service providers, as well as technology manufacturers and transport consultants. It is a diverse and welcoming community which spans public and private sector organisations.

www.calypsonet.org

Get in touch with our dedicated team today
https://calypsonet.org/contact-us/

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Learn more about CNA's work
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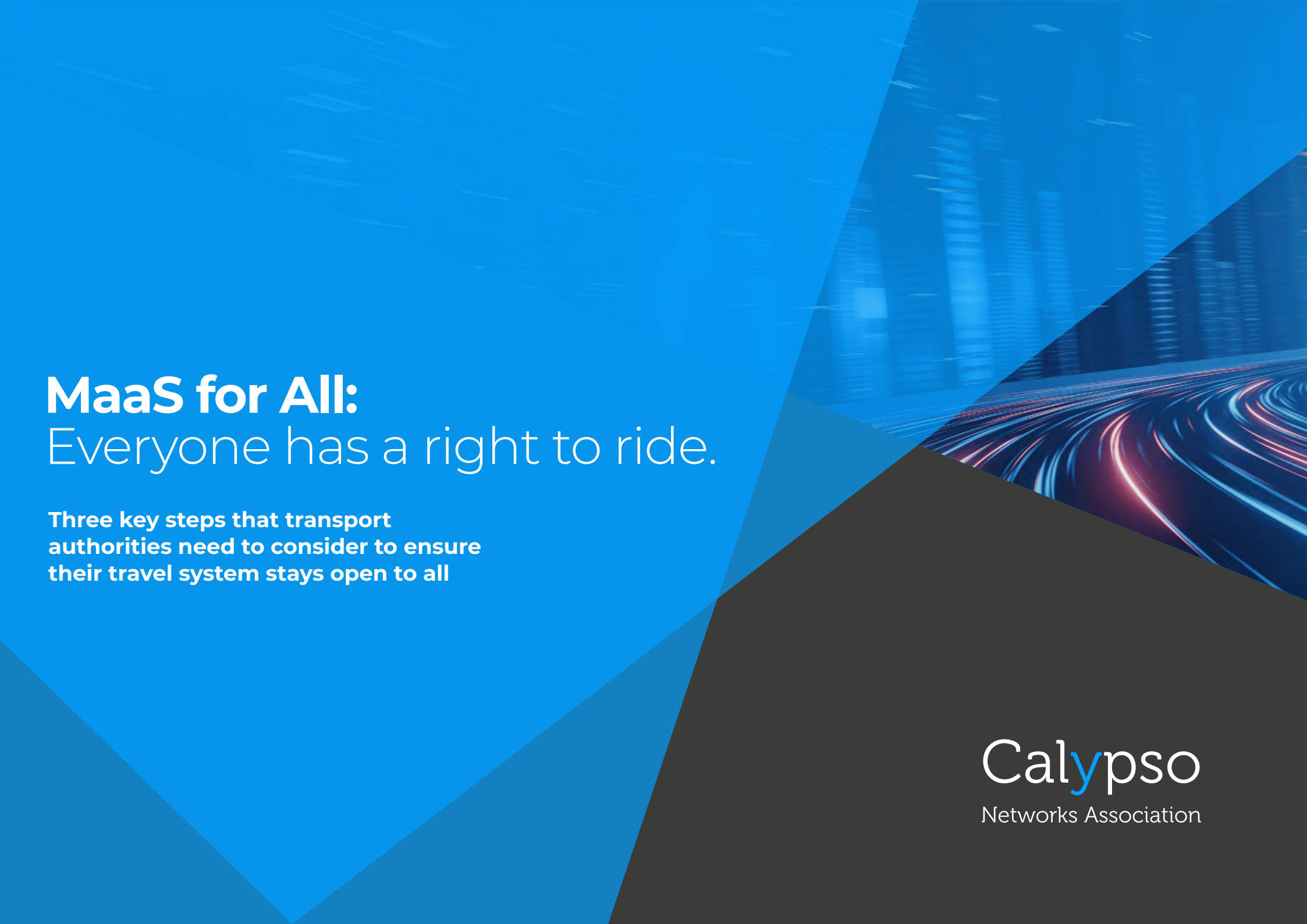

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