

7th INTERNATIONAL CONFERENCE
"TOWARDS A HUMANE CITY"
Environmentally Friendly Mobility
Novi Sad 6th and 7th December 2019

Ralph Gambetta, PhD¹
E-mail: secretary@calypsonet-asso.org

Danijela Barić, PhD²
E-mail: danijela.baric@fpz.hr

¹ Calypso Networks Association
Rue Royale 76, B-1000 Brussels, Belgium

² University of Zagreb Faculty of Transport and Traffic Sciences
Vukelićeva 4, HR-10000 Zagreb, Croatia

OPEN SOURCE TICKETING ENHANCING MOBILITY AS A SERVICE SCHEMES

Key Words

Public transport;
Ticketing;
Open source;
MaaS

Abstract

Public transport users need innovative, multi-applicative, multi-functional, safe and secure ticketing systems, easy to use. Operators, on the other hand, need systems which offer all requirements from passengers but financial sustainable. To achieve balance and provide sustainable and useful public transport services, traditional public transport needs to be improved with new innovative mobility solutions. Ticketing is the key to the making mobility services work together. Data from services using public transport must be public for the benefit of citizens and city planners. Concept of Mobility as a Service (MaaS) as an integration of various forms of transport services into a single mobility service accessible on demand is a new way of thinking about public transport. This paper focuses particularly on open source as a main driver for enhancing Mobility as a Service schemes.

1. INTRODUCTION

Today, transport operators wish to deliver the best services and simplify people's daily lives. Future tools may help them in reaching that goal. NFC phones will certainly become more widely used and stand out as the inevitable multi applicative media. Meanwhile contactless USB keys may increase home usage services, such as the reloading of transport rights. Among the different ticketing systems available on the market, Calypso technology ranks as an attractive and

innovative solution, made for transport operators and driven by transport operators [1]. Calypso technology can accept new challenges. A generic applet is already available, fully compliant with the GlobalPlatform API specifications, and is today widely used by SIM providers and bank card manufacturers. The applet is downloadable onto a Secure Element based on the Java Card environment and implemented in an NFC mobile phone or a contactless USB key. This enables new facilities for customers and retailers. Rolling out an electronic ticketing project over time requires the ability to integrate new upgrade and technological capabilities on an ongoing basis.

Modern urban living is rapidly changing with new technological innovations, one of which is the possibility to integrate different electronic “on demand” services into one single medium. Therefore, different applications can be brought together into one single device for the citizens of tomorrow in Europe or elsewhere: the “Urban Pass”, will have the ability to integrate mobility and banking applications, local authority and public administration service access. Calypso security technology and memory storage are tailored to meet multi-functional requirements. A transport application and a dedicated city application may, for example, safely reside on the same Secure Element of a portable object; moreover, they may live alongside third party applications, opening the road to the ideal urban pass [1].

Beyond its original function of collecting revenues from transport, ticketing is now considered as the backbone of Mobility as a Service (MaaS). Ticketing must enable mobility services to be combined and offer passengers a seamless, end-to-end, easily accessible transport offer.

2. MOBILITY AS A SERVICE

Mobility as a Service (MaaS) represents a new way of thinking about transport. It has the potential to be the most significant innovation in transport since the advent of the automobile. MaaS is the integration of various forms of transport services into a single mobility service accessible on demand. To meet a customer’s request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride- sharing, car- sharing or bike-sharing, taxi or car rental/lease, or a combination thereof. For the user, MaaS can offer added value through use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. For its users, MaaS should be the best value proposition, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys as well as the entire system of mobility services [2].

The term Mobility as a Service (MaaS) was coined in Finland in 2014. Then defined as ‘a system, in which a comprehensive range of mobility services are provided to customers by mobility operators’, MaaS has more recently been described as an integrative concept that bundles different transport modalities into joint, seamless service offerings, in order to provide tailored mobility solutions that cater for users’ travel needs [3].

- MaaS trials enable great possibilities to get to know and try out new mobility services
- Public sector has a key role as an enabler of MaaS e.g. by supportive Legislation

The popularity of MaaS has spread to become a global phenomenon. For instance, outside Europe, scholars have also considered MaaS developments in North America Asia and Oceania [3].

3. OPEN SOURCE TICKETING

Data from services using public infrastructure such as roads must be public for the benefit of citizens and city planners. It is highly recommended that transport operators use available standards and open specifications (incl. security, data model, transmission, etc.) as much as possible to avoid costly implementations of proprietary and non-compatible systems, which make interoperability impossible. In this context, an open platform is composed of hardware and software components that adhere to common standards and are non-proprietary such that multiple vendors can supply these components interchangeably. In an open platform, components from multiple vendors using different technological approaches may be assembled and interoperability across products can be ensured. The objective of an open platform is to achieve vendor independence and allow easy transition to emerging technologies [8].

For the Mobility-as-a-Service dream to come true at a reasonable cost, the ecosystem must be based on standards, APIs and open technologies as much as possible. This opening has been a reality for several years in the field of passenger information services and has given rise to a wealth of attractive applications, thanks in particular to open data. To allow ticketing to follow that path of opening initiatives, Calypso Networks Association has provided the first fully open source ticketing API free of charge Eclipse – Keyple. Keyple offers a concrete and operational answer to two key issues: mastering ticketing systems and providing a simple and fast access to Calypso technology, especially as part of MaaS schemes. It will become easier to develop connected and interoperable services combining all forms of mobility: metro, train, tramways, buses, park & rides, bike-sharing, car-sharing, car-pooling, e-scooter-sharing, etc. Keyple aims at accelerating the integration and development of high-performance ticketing applications. It will enable mobility stakeholders, event organisers, sports, cultural and leisure infrastructure managers to easily and economically implement ticketing systems based on a common, open and modular platform, whilst keeping Calypso's fundamental characteristics of reliability, security and interoperability. Technically, it is a library of functions, available in Java and C++ that allows developing ticketing applications to communicate securely with Calypso media (NFC smartphones or cards). It provides developers with a generic interface that automatically manages Calypso transactions. It is available in several OS environments (Windows, Linux, Android etc.) and can interface with standard readers (PCSC) and proprietary environments linked to specific hardware. Keyple can be used in both card-centric ticketing architecture schemes and server-centric

schemes (account-based ticketing), where customer rights are stored on back-office servers. Using Keyple thus considerably reduces development time, avoiding both implementations specific to each environment and the need to master Calypso's complex secure session mechanisms.

Keyple project is hosted by the Eclipse Foundation, which guarantees strict compliance with open source rules. It is therefore accessible to everyone free of charge with the only condition that any modification of the source code must be made available to the community. This allows a documented access to the source code, and therefore everyone can optimise its use in specific contexts. Developers can interact with the Keyple user community and contribute to product improvements. Keyple offers the highest guarantee of technical and financial efficiency, full control of its ticketing system and a real independence from equipment suppliers. As public transport operators, RATP and SNCF are committed to ensuring that future MaaS platforms are as open and inclusive as possible, so as not to be locked into a few large private players [9].

4. DISCUSSION

Seamless travel, e-Mobility, ease of access to the city, passenger information, guidance, smart and flexible ticketing are key points to ensure a real attractiveness of public transport. More and more these new digital services are both integrating transport in the city thanks to the deployment of urban multi-application solutions (banking, parking, leisure, event management, etc.) and linking cities between them thanks to interoperable schemes.

Successful adoption of technology is one of the key elements to sustainable economic development and growth. In addition, intelligent solutions are a driving force to modernise society. With urban transport at the core of future mobility patterns we see the need of intelligent solutions that will allow users to benefit from integrated services. Only by becoming part of lifestyle services public transport will create the necessary positive image and allow increased ridership on the long term. Customers want to be informed about the services they use and everything that relates to them. Matching these expectations means that numerous services need to be integrated with smart ticketing such as real-time information, guidance, events information etc. Internet 2.0 has started to educate users to perceive their environment this way and urban transport needs to adapt to this new societal paradigm.

For more than two decades now Calypso technology has contributed to many significant developments in the frame of smart ticketing. To manage successfully the upcoming mobility challenges the ability to offer a standardized and interoperable transport application, matching the needs of transport operators irrespective of what customer medium they run on, is essential. To better enhance developments the technical specification has been opened. By matching the philosophy of open source to ticketing a new dimension within the world of developers has been reached. Only by having open APIs and ticketing specifications it will be possible to act as a connector for mobility services. The

availability and accessibility of technology through “Open Sources” means a significant broadening of the perimeter of the potential technology deployment and it widens in parallel the current eco system to meet the future challenges of mobility by guaranteeing a high level of security of transactions.

To be prepared to the new challenges of ticketing, the Calypso community has initiated one year ago this path towards Open Source. This means that over the coming years a switch to a model oriented on the parameters of an Open Source approaches will be made. Consequently, a significant broadening of the perimeter of technology will open to new business models. With higher service orientation, the competitiveness of Calypso will increase the value for its users and generate new streams of revenue. The Open Source SDK that will be provided by CAN, the association managing the Calypso technology) through the Open Source Platform ECCLIPSE will allow local suppliers to implement Calypso ticketing systems without having to be linked to big traditional ticketing integrators. This strategy will allow the creation of local added value and work force by integrating every player of the ticketing eco system without any discrimination.

5. CONCLUSION

As the ticketing system typically lasts for up to 20 years, its implementation represents an important investment. Therefore, ticketing system must enable evolutions and upgrades throughout its life. Whilst ticketing was initially a mere fare collection tool, it is now considered as an essential enabler of MaaS which has given back to ticketing a major role as the gateway to mobility for all, after having often been wrongly perceived as just a means of paying for transport. Sustainable door-to-door mobility need innovative mobility solutions complement with traditional public transport and useful transport services. This has driven the need to connect pt services together to provide a coherent mobility offer, which is the principle that guides the concept of Mobility as a Service. In conclusion, ticketing is the key to the making mobility services work together, as it should facilitate the transition from one form of mobility to another seamlessly and contribute to the attractiveness of services through an adapted fare offer.

REFERENCES

- [1] <https://www.calypsonet-asso.org/content/definition>
- [2] <https://maas-alliance.eu/homepage/what-is-maas/>
- [3] G. Smith, J. Sochorad, S. Sarasinid, “Mobility as a service: Comparing developments in Sweden and Finland” *Research in Transportation Business & Management*, vol. 27, pp. 36-45, June 2018.
- [4] <https://maas-alliance.eu/homepage/what-is-maas/>
- [5] https://maas-alliance.eu/wp-content/uploads/sites/7/2018/03/ERT_MaaS_leaflet_FINAL.pdf

- [6] D. A. Hensher, "Future bus transport contracts under a mobility as a service (MaaS) regime in the digital age: Are they likely to change?" *Transp. Res. Part A Policy and Practice*, vol. 98, pp. 86-96, April 2017.
- [7] R. Utriainen, M. Pöllänen, "Review on mobility as a service in scientific publications" *Research in Transportation Business & Management*, vol. 27, pp. 15-23, June 2018.
- [8] EMTA, "Study on electronic ticketing in public transport", Final Report, 2008.
- [9] J. Eppe, P. Vappereau, "*The field of ticketing: from open standard to open source*", Intelligent Transport, 2019.