

ELECTRONIC TOLL COLLECTION (ETC) SYSTEMS DEVELOPMENT IN MALAYSIA

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ABSTRACT

The first ETC system was implemented along 22km expressways in 1995 and as of today, the whole stretch of 1,459 km expressways are equipped with a single ETC system allowing for full interoperable. A Service Provider providing electronic payment service operates the system, not just for toll payment but also for payment of parking, public transportation fares.

The journey towards achieving ‘single and interoperable ETC’ is started in 1994 and by July 2004, the system were implemented nationwide. During the earlier stage of ETC Development in Malaysia, various system and technology were introduced. The toll highway operators were actively involved in ETC development in Malaysia as they realized the needs to reduce cost of toll collection, capital investment savings, fraud elimination, faster journey time, increased fuel, less congestion and reduce pollution.

The first ETC Technology implemented is 2.45GHz microwave in 1994 and another highway operator introduced the same technology in 1997. The system was further enhanced in 2001 to meet the international standard of 5.8GHz. A contactless smartcard ETC was introduced in 1997 and the system was enhanced further with the introduction of two-piece On-Board-Unit for ETC in 1998. This system later adopted as the ‘single ETC’ system for Malaysia.

Moving forward, the Ministry of Work, Malaysian Highway Authority together with the ETC community is now exploring the Multi-Lane Free Flow ETC implementation with the objective to reduce congestion at toll plazas, reduce environmental issues and increase road safety. The system targeted to be implemented by 2008.

BACKGROUND

Electronic Toll Collection System (ETC) is one of the most successful implementation in the whole range of Intelligent Transportation Systems (ITS) applications. The benefits of ETC implementation is to eliminate congestions on existing and new toll highway and to minimize fraud, providing user convenience and at the same time enhancing operational efficiency for toll operators.

Unlike other ITS technology, ETC is not dependent on the implementation of new, advanced technical systems or an integrated infrastructure to be successful. However, the ETC will benefit greatly from the development advance technology such as smartcard and wireless telecommunication to enhance its functionality.

For Malaysia, various ITS applications such as Tolling System and Traffic Management System have been developed and implemented to enhance operational efficiency. Dedicated ETC lanes can process toll transaction faster than manual system, thus ETC lanes can improve the throughput of traffic flow.

ETC DEVELOPMENT IN MALAYSIA

The Introductory Period (1994 – 2001)

Economic and Environmental benefits associated with ETC such as the positive impacts associated with the cost of toll collection, capital investment savings, fraud elimination, faster journey time, increased fuel, less congestion and pollution were contributory push factors in ETC systems development.

During the above period, various ETC systems were introduced in Malaysia to achieve the above benefits. The first ETC system in Malaysia in 1994 was introduced by the North-South Expressway (NSE) based on 2.45 GHz microwave technology and marketed as *PLUSTag*, covering only the length of 22.0 km from whole 848 km-highway.

In 1995, upon completion of the Penang Bridge linking the Peninsular Malaysia with Penang Island in the northern area, contactless smartcard based ETC technology was introduced to replace discount vouchers to users.

In 1997, Shah Alam Highway (KESAS) introduced another ETC system based on 2.45 GHz and named as *KESASTag*. Cheras-Kajang Highway was the first to introduced 5.8 GHz microwave in Malaysia and brand their product as *SagaTag* in 2000. The system at KESAS was later upgraded to 5.8 GHz in 2001 to ensure compatibility and interoperability with ExpressTag introduced by LDP and SPRINT Highways.

In the same year, a consortium (Rangkaian Segar Sdn Bhd – RSSB); consists of highway concession, a financial institution and LRT operator introduced a ‘Common ETC’ based on pre-paid e-purse system. The system is known as the Touch ‘n Go Electronic Payment System (EPS) operated by Rangkaian Segar Sdn Bhd (RSSB) as the Service Provider. The Touch ‘n Go system based on the contactless Smartcard was first installed at East-West Link Highway and expanded to PLUS, Penang Bridge and Malaysia-Singapore Second Crossing (Linkedua) in 1998. Other highway concessions started adopting the Touch ‘n Go system from August 2000.

The system was further enhanced to non-stop ETC with the introduction of Infrared DSRC ETC technology in 1998. The tag is a two-piece on-board unit where Infrared Technology is used for DSRC communication and Touch ‘n Go card for payment of the transportation charges.

The chronological events during the introductory stage are as follows:

No	Year	ETC System Introduced	Operator	Highway	Technology
1.	1994	The first ETC system was introduced in Malaysia (PLUSTag)	PLUS	North-Klang Valley Expressway (NKVE)	2.45GHz Microwave
2.	1995	The first pre-paid contactless smartcard was introduced for ETC (BridgeKAD)	Penang Bridge	Penang Bridge	Contactless Smartcard Technology
3.	1997	Touch ‘n Go EPS introduced for ETC application (Touch ‘n Go)	RSSB	Metramac	Contactless Smartcard Technology
4.	1998	RSSB introduced Infrared On-Board-Unit ETC system (SmartTAG)	RSSB	Penang Bridge, NSE and some city Expressways	Infrared Technology (Two-piece Tag)
5.	2000	The first 5.8 GHz Microwave ETC was introduced in Malaysia (SagaTAG)	Grand Saga	Cheras-Kajang Highway	5.8GHz Microwave Technology
6.	2001	The inter-operable Microwave ETC between KESAS, SPRINT and LDP Highways (ExpressTAG)	Gamuda	KESAS, LDP and SPRINT Expressways	5.8GHz Microwave Technology

7.	2004 onwards	Single ETC system (<i>Touch 'n Go and SmartTAG</i>)	RSSB	All Toll Highways in Malaysia	Infrared Technology (Two-piece Tag)
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During the above introductory period, four (4) local Toll System Integrators emerged to provide ETC solutions for 18 toll highway operators in Malaysia. Also, Malaysian Banks started playing bigger roles by providing facilities for ETC pre-paid reloading through Automated Teller Machine (ATM) and convenience of credit card auto-reload.

The Single ETC: Consolidation and Standardization Period (2003 – 2005)

By the end of the introductory period (2001), Malaysia has two different ETC technology i.e. Infrared and Microwave. Due to this, public need to have three (3) ETC devices (SmartTAG, ExpressTag and SagaTag) to enable them to use the non-stop ETC for payment of toll charges within Kuala Lumpur city.

In a survey conducted by MHA in 2001, there was a unanimous decision amongst the toll highway concession companies on the requirement for a national standard for ETC Systems to streamline deployment and to ensure interoperability.

The requirements for the successful deployment of ETC systems in Malaysia can be listed as follows:

- Interoperability on all toll highways. The ETC system must allow users a smooth passage through all the toll highways regardless of the toll operators.
- Ability to operate both the open and closed toll systems.
- Proven security, reliability and accuracy of the ETC systems. This has to be in place before the toll concessionaires hand over the toll collection responsibility to the clearinghouse.
- The systems must support all vehicle types, even though presently it is mostly supporting only Class 1 vehicles only.
- Systems user and public acceptance of the systems, in that the systems must be affordable to allow maximum penetration of the market
- Multi vendor or suppliers of the ETC devices

Based on the above requirements, the Government endorsed the Touch 'n Go and SmartTAG ETC systems as the most suitable solution at that time for single electronic toll collection system for all toll highway in Malaysia.

With the adoption of a single ETC system, Malaysia has achieved nation-wide interoperability of ETC system for the existing 18 toll concessions companies in operation. Malaysia in many ways is ahead of many countries on the implementation of ETC. Motorists have greatly benefited from the single interoperable system irrespective of which highway networks they use. Highway companies on the other hand, have gained from the reduced duplication of tasks and resources, toll collection efficiencies have improved and operational cost savings have been realized. The ETC penetration has been growing steadily and as at June 2006, the average ETC penetration rate nationwide is 37% and 50% for Klang Valley toll highways.

The Future: Multi Lane Free Flow ETC

The next step for Malaysia is to evaluate prospects of Multi-Lane Free Flow (MLFF) implementation where it promises reduction in congestion at toll plazas, environmental friendly and increase road safety.

In May 2005, MLFF working committees comprise of officials from MOW, MHA, toll concessionaire and RSSB was established toward this objective. It is noted that for successful implementation of MLFF in Malaysia, a variety of structural issues and operating challenges need to be reviewed and considered, establish proper operating and enforcement structures, efficient and adequate supporting systems with proper contractual and legal framework.

The Prospects Of MLFF Implementation In Malaysia

Multi-Lane free flow (MLFF) system is an electronic tolling system used in many expressway networks worldwide. Currently, full electronic toll payment system is being extensively implemented in countries such as Australia, USA, Chile and Canada.

Its establishment has proven to stimulate substantial multiplier effects and advantages to all facets of the society, nation's economy and the governments. Some of the primary advantages include improved traffic throughputs, which reduce travel times for road users, enhance savings to business community through fuel savings, vehicle's wear and tear and travel time certainty.

Ultimately, its implementation generates significant long term economic activities, growth and employment.

MLFF Implementation Issues and Challenges

In Malaysia, the key challenges of MLFF implementation is migrating from the current ETC to a full-scale multi-lane free flow. The key issues to be faced will be mostly related to legislative and contractual, public education and acceptance, and MLFF operations, technical and maintenance management.

The issues and challenges highlighted would need to be addressed by all relevant parties to ensure smooth and successful implementation of multi lane free flow in Malaysia:

1. Enforcement Issue

The existing legal frameworks are not suitable for MLFF implementation as it is not efficient in handling toll violators. Thus, the most critical task for MLFF is to first establish a comprehensive legislative framework and infrastructure for enforcement of violations.

The Service Provider and toll operator will also be facing challenges in integrating vital information of various agencies to facilitate enforcement management and prosecution of toll violators.

2. Funding for MLFF Infrastructure

Migration from existing ETC system to MLFF requires new investment for infrastructures. As in any investments, detailed justifications on the cost and the MLFF benefits to the investors.

3. Public Acceptance

The nationwide ETC penetration is now at 35% of total toll collection and various efforts are being made to increase the penetration rate. There is a need for concerted efforts from all parties to boost for higher ETC penetration rate to ensure success of MLFF implementation.

The challenge here is to provide reliable ETC devices at affordable price and ensure availability and excellent customer service and support to consumer.

We anticipated the following implementation schedule for MLFF:

No.	Implementation Stage	Period	Expected Date
1.	Feasibility Study and establish implementation approach	6 months	March 2007
2.	Development and Pilot Implementation	12 months starting from March 2007	March 2008
3.	Nationwide Rollout	2 – 3 years	Year 2010 onwards

CONCLUSION

The ETC development in Malaysia started in 1994 and by July 2004, the system were implemented nationwide. During the earlier stage of ETC development in Malaysia, various system and technology were introduced. The toll highway operators were actively involved in ETC development in Malaysia as they realized the needs to reduce cost of toll collection, capital investment savings, fraud elimination, faster journey time, increased fuel, less congestion and reduce pollution.

With the adoption of a single ETC system, Malaysia has achieved nation-wide interoperability of ETC system for the existing 18 toll concessions companies. Malaysia in many ways is ahead of many countries on the implementation of ETC. Motorists have greatly benefited from the single interoperable system irrespective of which highway networks they use. Highway companies on the other hand, have gained from the reduced duplication of tasks and resources, toll collection efficiencies have improved and operational cost savings have been realized.

Moving forward, based on the international success stories of the MLFF system implementation, we are optimistic that its implementation in Malaysia would augur well with expressway users, business community and the Malaysian society at large. Its establishment would not only improve traveling efficiency, but also boast substantial potentials to spur the Malaysian economy. It is definitely a win-win alternative for the government and expressway concessionaires.

We believe that multi-lane free flow would be reality in Malaysia in the near future. All issues and challenges highlighted are useful points of consideration to ensure the implementation a great success.