

Security Issues on Identity Card in Malaysia

Yap Ai Kee, Yeoh Choo Nee, Leau Yu Beng, and Tan Soo Fun, *Member, IACSIT*

Abstract—A national identity card is an easy carry document, typically a plasticized card that citizen is required to carry as a means of confirming themselves. In Malaysia, MyKad is been introduced with using 12 digits characters system producing identification number as our personality number. MyKad is government-issued all-in-one smartcard which performs a wide range of functions such as data processing, storage and file management which's an ambitious project as Malaysia is a pioneer in deploying smart ID technology. However, implementation of MyKad have raised concerns about the privacy risks and criticized the lack of public consultation about the MyKad. Thus, security issues and the countermeasure of MyKad and MyID are the subject matter of this paper.

Index Terms—Identity card, information privacy, unauthorized use, security.

I. INTRODUCTION

A national identity card is an easy carry document, typically a plasticized card that citizen is required to carry as a means of confirming their self. General speaking, the most important of the card is actually its number. A national identification number is a number used by the government of many countries [1] as a means of identifying their citizens, permanent residents, taxation, government benefits, health care, or other governmentally-related functions. Ways of such system implemented are depended on countries respectively but most of the time, citizen is issued a number at birth or when they reach a legal age.

Before Malaysia attained independence from British colonial, identity card system had been implemented (1942).

As time passed by and technologies keeps on developing, in September 2001 Malaysian government officially launched a multipurpose smart identification card for its citizens and it's been named as "MyKad". In this MyKad it fits in a single card with multiple applications with several sets of personal information about the holder of the card. MyKad is been said to be the first government-backed smart card initiative and it has been indicated as a massive step on information technology both in Malaysia and worldwide [2].

Malaysian identity card is compulsory for Malaysians who are older than 12 years old. There are three forms of identification card issued throughout a Malaysian citizen's lifetime since after introduction of MyKad. The first identity card is issued to all newborn babies and is been named as MyKid. MyKad and MyKid are similar just that MyKid does

not have a photograph and fingerprint [3]. When a citizen reaches the age of 12 years old, the card must be upgraded to MyKad. The MyKad then must be replaced when a Malaysian citizen reaches 18 years old as it is a requirement that photograph must be the current. However, implementation of MyKad have raised up the unease about the privacy risks and criticized the lack of public consultation about the MyKad.

II. USAGE OF MYKAD

The main usage of MyKad is actually to identify or to prove oneself as a citizen of Malaysia. Imprisonment for a term of not more than 3 years or a maximum fine of RM 20000 is fined, if one fails to present the MyKad [3]. Without these documents, we nation will face problems in identifying ourselves but also particularly when dealing with government or any other private agencies. Matter regarding identification documents should be conducted appropriately and according to the laws of the country.

Originally MyKad is intended to contain 4 applications which are the national identity card, driving license, passport information, and health information. As these, 4 applications yet not sufficient in giving convenience to people, additional 4 applications is added. The 4 applications are included the electronic purse, ATM access, transit application ("Touch and GO" feature) and the Public Key Infrastructure (PKI) feature for online transactions [4].

The usage of MyKad reduces an amount of papers and environment friendly because MyKad replaces the existing paper-based laminated national identity card as well as the driving license. In the card, information such as race and religion, thumbprints, polling station code and date of registration as a voter, code for criminal record and restricted residence, driving summon and demerit points and health information.

Besides personal identification and driving license information, MyKad can be used as the travel passes to enter and leave the border countries such as Brunei [5], Singapore and Thailand by eliminating the need of passport. However, due to the personal information might be disclosed, development of using as travel document has been postponed.

The electronic purse application in MyKad makes easy payment for small purchases and can be used fo business related transactions and transactions with government agencies. The ATM access application allows storage of total 3 banks accounts in the MyKad and enables MyKad users to perform general banking actions such as cash withdrawals, balance inquiries and transfers of funds. Furthermore, MyKad uses the "Touch 'n' Go" feature to enable users to pay the bus and light rail transportation fare and parking fees

Manuscript received May 16, 2012; revised July 11, 2012.

Yap Ai Kee, Yeoh Choo Nee and Leau Yu Beng are with the School of Informatics Science in Universiti Malaysia Sabah, Labuan International Campus, 87000 Labuan F. T., Malaysia (e-mail: leaubyubeng@gmail.com).

Tan Soo Fun is with the School of Engineering and Information Technology in Universiti Malaysia Sabah, Jln UMS, Universiti Malaysia Sabah, 88400, Kota Kinabalu, Malaysia (e-mail: soofun4818@yahoo.com).

as well as at the toll booths and other outlets with a simple touch [6].

MyKad PKI application allows for two digital certificates to be inserted in the MyKad. Authenticity and integrity of the data is protected and inaccessible to anyone, apart from the relevant government agencies and the owner of the MyKad. Therefore, MyKad make possible users to perform online submission of tax returns, internet banking, and secure email [7] securely.

As the whole, MyKad is a single smart card that can be used for multiple purposes and which the government promises will drive Malaysians towards “an incredible transformation in their lives”. [2] However, due to all information lies in just one card, in one touch and all the information will be disclosed, therefore serious information privacy issues must be taken into account.

III. MYID INITIATIVE

On January 18, 2010, Deputy Prime Minister Tan Sri Muhyiddin Haji Mohd Yassin had launch MyID initiative for various Government departments or agencies. MyID initiative by mean government agencies at federal, state and local levels will do away with reference or account numbers to identify individuals, and use only MyKad 12-digit numbers for their transactions. The main purpose of introducing this MyID initiative is to lessen the burden of the public [8].

By having this MyID initiative is to avoid the need of citizen in carrying documents or memorize the reference number for services of various government departments or agencies that people deal with [9]. Apart from speed up the service delivery and reducing queues at government service counters, it could eliminate problems arising from lost and misplaced documents.

Although implementation of this MyID initiative seems to be likely to reduce the burden, time and cost of public and government, but the security level of it are often being questionable. All information and documents could be retrieved in just a second by just providing the 12 digit of number. How secure and secretive of the 12 digit of number is it can be to the public?

IV. HOW IS THE MYKAD NUMBER BE GENERATED?

From the day 1 of using national identification card number system till today, Malaysian identity card numbers can be distinguished into three major groups – 7 digits system, 8 character systems and the current 12 digit system.

In the year of 1948, Malaysian identification number was originally visualized as an incrementing number of seven digits, including the preceding 0s for lower than 100000. The system originally issues numbers based on the “first come first serve” basis on the time they registered for identification card. By the end of 1977, the increment exceeded the 7500000 mark, when it was discontinued.

Starting of 1978, modification of the identification number from 7 digits to 8 characters system was done and introduced for citizens born between 1965 and 1978. In the system of 8

characters, it consist of the same 7 digits number where it has been reset to 0000000 but in front of the 7 digits was added a letter of alphabet. The most common letter in used was “A” but, character of “K” and “H” does exist.

12 character system is been introduced in the year of 1991, which was a new identification number made for both old and new card holder. This 12 characters system follows the format of YYMMDD-BP-###G. The first 6 digit of YYMMDD is represented the holder’s date of birth, while the 2 middle digits BP code is based on the place of the MyKad holder that will be referred from the birth certificate upon application of the MyKad. The last 4 digits are generated randomly but the last digit generated based on the gender of holder – odd number for the males and the even number for the females.

V. IDENTITY CARD IN HONG KONG AND SWEDEN

Hong Kong identity card is an official identity document issued to persons who have the right of abode (ROA) in Hong Kong. All citizen of Hong Kong who is above 11 years old is required to register for a Hong Kong Permanent Identity card (HKID). In this HKID card, it consists of the name of the holder in English and Chinese, Chinese commercial code if any, the date of birth, HKID number and a white photograph. The number of HKID is following the format of X123456(A) where the X is represents any letter of the alphabet or the letter U followed by any letter of the alphabet. In the bracket of A is the check digit which has 11 possible values from 0 to 9 and A [12]. Therefore, there will be around 26 million possible card numbers using only one letter and while the numbers of those who have died are not reassigned, and yet there are still sufficient numbers available.

The functions of smart card of HKID to its reader is to view the personal data stored in the card chip, view the content and change the PIN of a Hong Kong Post e-Cert and update condition of stay or limit of stay if the holder is a Hong Kong resident subject to a condition of stay [12]. To prevent forgery, the smart identity card of HKID has a number of complicated security features such as a triangle printed with optical variable ink inside the chip, which changes in color between reddish gold and green when viewed at different angles. Furthermore, multiple laser images of the holder’s photograph and identity card number in the lower left corner, which appear alternately when viewed at different angle. Lastly, Kineprint letters on the left of the multiple laser images is used where a red letter H and a black letter of K, which emerge alternately when viewed at different angles [12].

In Sweden, there is several identity documents used as identity documents but there are none compulsory. Documents such as passport, identity card and even driving license can be used as identity documents. Identity documents needed in Sweden only in situation of purchasing using debit and credit cards when not using a PIN, picking up a package in postal service representative, get medical care and medicine and opening bank account or other situation personal identity number only in used [11].

Personal identity number is the Swedish national identification number which is used by the authorities, health

care, schools and universities, banks and insurance companies. The personal identity number follows the format of YYMMDD-XXGC where it consists of 10 digits and a hyphen. The first 6 number of the identity number is the birthday date of the holder in the form of YYMMDD. Character of hyphen will be followed after the 6 numbers and the character of hyphen will be change to symbol of plus as the age of the holder over 100 years old. The next 3 digits are the serial number generated randomly with the odd 9th number assign to male and even 9th number goes to female. Finally, the last number is the checksum digit.

VI. SECURITY ISSUES IN MYKAD

The nature and amount of personal information stored on the MyKad and its expanding multipurpose use has raised several significant security issues. Notwithstanding, the issues that touch here are generally concerning of the information privacy implication of the MyKad.

A. Information Privacy of MyKad

The concept of privacy has been the subject of dispute and discussion by many scholars, jurists and judges over the years. Information privacy could be defined as “the interests of an individual in controlling the information held by others about that person” [2]. It has become an area of great international concern since the tremendous technological developments in the speed of collection, storage and transmission of personal information over computer networks and the internet. Thusly, with so much personal information stored on the MyKad, has had raise such similar concerns about information privacy.

Through the identification number given to each MyKad holder, which can be used to access and retrieve all types of information about the individual if the user of the CADs (card acceptance device) has access rights to such information, MyKad can be used to retrieve and consolidate information about an individual held in previously unconnected computer databases situated around the country [2]. Card holders can access their personal information with their MyKad at government kiosks and offices, after biometric authentication of their fingerprint. Access to personal information by others is hierarchical or compartmentalized. For example, only certain medical officers have access to sensitive health information. However, how MyKad is to be used, by whom and what purpose remains opaque for individual Malaysians as the government is not really provide with clear guidelines or consult with the public.

There's seem to be available for accessing to some personal information that held in the MyKad system, remotely via a network, to a wide range of third parties, including hotels, restaurants and ticket agents. This unique personal identifier is allowing multiple government agencies or other third parties who can use CADs to gain access to the consolidated information [2]. Yet, the Consumers Association of Penang has argued that the cards make individuals' personal and confidential information too vulnerable and has recommended that the proposed Personal Data Protection Act address these risks specifically. Also, the

Federation has challenged the security of the system, contending that the storage of personal information in a centralized database makes it vulnerable to tampering and sabotage. Apart from that, those proponents of the card may also have acknowledged inherent privacy risks. Of the smart card will probably add to the happening of theft because the attraction is there. There is a lot of personal information stored on the card, including buying patterns which would attract card cloning syndicates. [13].

B. Unauthorized Use of Personal Information

This happens when a person get use others' personal information for certain purpose use without gain or have the permission. There are two issues under this area of unauthorized using personal information being studied.

The MyKad project involves five major solutions providers, the MDC (Multimedia Development Corporation), the major government departments involved in the implementation of the MyKad, the enforcement authorities and other support agencies. Such a comprehensive project involves thousands of people within the public service as well as the private sector. This gives rise to a further privacy concern i.e. the misuse of personal information through corruption. Malaysia is no stranger to corruption. Despite the infancy of the MyKad project, there are already allegations that illegal immigrants in Malaysia's eastern state of Sabah possess valid MyKads. There have been instances of forgery and counterfeiting of existing identity cards and other high security devices, it's not due to a lack of security features, but due to the assistance of corrupt public officials holding positions of trust in government [2].

For the diverse types of personal information and multipurpose of the MyKad, it does create the great value to third parties for purposes ranging from marketing and direct selling to identity theft. A simple example is when a person is asked to produce his MyKad for identification purposes to gain access into a building. That person's MyKad is read by a 'Pembaca Kad Mini', which can be obtained and used by any person or organization. It will be a simple matter for the data so read to be recorded and stored in a data bank of that person or organization. It could subsequently be put to unauthorized usage, such as the sale of data (without consent) to a marketing company which mails out unsolicited promotional materials for commercial products. This would constitute a misuse of information, as the sole purpose of the person who produced his MyKad was simply for identification in order to gain access to a place. It is possible that in no time at all one's personal data could be transmitted and stored in hundreds or thousands of data banks, and used (without one's consent) for purposes which were not envisaged. It is not difficult to think of a myriad of other ways in which such personal data could be misused, some of which may be far from benign [14].

The fact that the security features of the MyKad would make it difficult for these parties to gain access to such information would in turn increase its value. This is likely to add to the temptation for public officials to engage in corrupt practices, including the unauthorized use or disclosure of the personal information in the MyKad. However, its high security features with a thumbprint image, photograph and surface information, trustfully can verify the cardholder's

identity with a card acceptance device (CAD) rather than the naked eye [15]. Even so, the integrity and efficacy of the MyKad project is still depends on the trustworthiness of all the people involved in its implementation. This is an assurance that the Malaysian Government cannot yet give to its citizens.

Another area of concern is that through incorrect, incompetence, error or lack of adequate training on the part of the public officials or other parties entrusted with the implementation of the MyKad project, the personal information of cardholders may be inadvertently released to third parties. A further concern is that the National Registration Department (NRD) may erroneously issue an individual's MyKad to an unintended recipient. Besides experiencing the inconvenience and difficulties of obtaining a new MyKad, the MyKad holder would face the risk of unauthorized use of his or her personal information as well as the risk of identity theft by unknown individuals. A related issue is that there is no culture of respect for information privacy within the government bureaucracy and enforcement agencies. Without such respect or coherent training on the necessity of safeguarding the privacy of citizens, inadvertent disclosures of personal information and careless handling of the MyKad are likely to occur [2].

There's also an issue with unreliable and corrupted with false information in MyKad such as the case of incorrect entry of religion which's proof by Seputeh MP Teresa Kok. Besides, some had claimed that they are perturbed that there have been so many cases in recent times revealing false recording of one's religious faith on the new national identity cards of Malaysians, the MyKad. False recording which's as opposed to erroneous entry simply because there are now too many cases of falsity to give the National Registration Department the benefit of the doubt [16]. Besides, it is also the case of same MyKad number which's led the case of contributions in another EPF account [17]. All these have raised the question whether people can trust sensitive and personal information with the NRD.

C. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have already been defined in the abstract. Abbreviations such as SI, ac, and dc do not have to be defined. Abbreviations that incorporate periods should not have spaces: write "C.N.R.S.," not "C. N. R. S." Do not use abbreviations in the title unless they are unavoidable (for example, "INTERNATIONAL JOURNAL OF ENGINEERING AND TECHNOLOGY" in the title of this article).

VII. POTENTIAL ATTACKS AND SUGGESTED COUNTERMEASURES

Due to the fact that a MyKad is to be issued to all Malaysians and stored with all the information, it is therefore vital that the security of the information be given the top priority. If any of the information is compromised, this may lead to the troubles and crime such as fraud, impersonations and thefts. Hence, there's in need to withstand all sorts of attacks and probes at its interface. In this section, some areas

of possible attacks are being highlighted as well as cautions and countermeasures are being stressed.

As known, MyKad would be exposed to physical attacks. Not alike with other secure computers, smart cards are physically in the hands of the attackers. The attackers may observe power consumption and electromagnetic emissions as a function of time and expose the chip and implant microelectrodes on data paths. The attacks included temporary perturbations which is glitches on power supply or external clock and flashes it with high-energy radiations as well as permanent modifications that destroy connections and transistors and grow back fuses. With this attack, attacker may read directly secret information and more often cause the program to malfunction and reveal a secret or grant permission. Hardware countermeasures against these attacks exist, i.e. protection layers, obfuscation of the chip layout, encryption of the memory bus, hardware memory access control as well as software which can also be hardened to some extent against the hardware attacks [19]. The conventional as well as the latest physical attacks such as power analysis, fault analysis, timing analysis and newer variants like the differential power analysis, differential fault analysis and the optical fault induction attack [18].

Countermeasure by employing or developing technologies such as technology barrier, clock fluctuation, robust design, memory control for multi-applications and security mechanisms and firmware functions [20] might be very useful in protection away from attacks.

Study of the design of a very high-security padlock, with the state-of-the-art technology neither strongest nor sharpest of tools could cut through. When it comes to being manufactured, if the specifications are not followed correctly, no matter how good the design was, the final product would have defects and thus be weaker than desired [18]. The security mechanisms are applied as so as well. Techniques such as the RSA or the AES are strong designs, but if any mistakes are made in the process of implementing them in hardware or software, then the final product would not be as strong as conceived by the designer [18]. Therefore, there's must-be checked properly and as a wholly while the implementations of security mechanisms in MyKad for the prevention of bugs or flaws.

Since MyKad would be required to communicate with smart card readers, PCs, servers, websites, government officers and the like, each instance of the communication need to follow a certain protocol [18]. For example, what protocol should be used to authenticate MyKad against a website? These authentication protocols and other security related protocols are creating the protocol weakness and at times the target of attacks. The most common of such attacks are replay attacks, impersonation attacks, interleaving attacks, reflection attacks, deflection attacks and multiplicity attacks [18]. Again, comprehensive analysis the protocols used in MyKad should go through comprehensive analysis to show resistance against these attacks. MyKad's operation is encouraged to be unifying so that all vital and security-related operations could be performed on MyKad itself for avoidance in bringing-up of more vulnerabilities which will increases the security attack. Apart from that, there should be urging of suitable means for manage and

optimize the memory storage of MyKad as well as developing of security technologies and so with requisite laws or safeguards.

In addition, vulnerability in Malaysian identification number out in the open. As we can easily guess what is last 4 digits as long we know a little bit more about the holders such as the birthday date, state of birth and gender. The possibility to guess the last 4 digits is reduced till 10 00 numbers. In current numbering usage, for Malaysian, numbering is starting from digit 5 which minimize down the possibility to 1000. Besides that, the last digit of the identification number is where the gender comes in – odd to males and even to females. This obviously shows that the possibility is being reduced from 10 000 to 500 of possibility numbers. With the current technology bear in mind, to reveal the 500 numbers is easy as ABC by theft or criminal. It is so unsecure with our current identification numbering system, and yet government is introducing new MyID initiative to public. In MyID system, only identity number is in used in all kind of transactions dealing with government sectors [9]. Therefore, deep considering of continuing using this 12 digits system is indeed needed.

We would like to suggest by improving the numbering system, it is better to combine the 7/8 digits numbering system with the current 12 digits system. By mean, instead of having 4 digits running randomly makes it 7 or 8 digits. This surely will reduce the vulnerability of the number and increase the security of it. By increasing the number to 8 digits, the vulnerability is reduced in a million times. From 10 000 possibilities increased to 100 000 000 000 possibilities of numbers in guessing. With this numbering system, the possibility of repeating the same number is reducing too. In term of memorizing the 8 numbers is increased too comparing to 4 numbers. Therefore, it is more secure to use this system as compare to this current 12 digits numbering system. In addition, a checksum digit can be added in bracket after the 8 digits in order to reduce human error in data entry like what had been implemented in Hong Kong and Sweedish's identity card. Indirectly, it does lowering the risk of privacy revealing to the public as the number is hard to be remembered due to the length.

VIII. CONCLUSION

MyKad is government-issued all-in-one smartcard which performs a wide range of functions such as data processing, storage and file management which's an ambitious project as Malaysia is a pioneer in deploying smart ID technology. However, the response from the citizens is not that ideal for believing that citizens are not really in exposing to that particular development or getting any acknowledge from government as well.

Notwithstanding, MyKad is in fact offers the advantages and convenience, e.g. in doing away with the need to have multiple documents such as an identity card, a driver's license

and a passport for which's been embedded into one card. But simultaneously, it may accompany by negative impact on privacy and civil rights as well as security concerns. As a whole, adequate security analysis and a comprehensive support included possessing all the requisite resources and citizens' responses are in need for the successful implementation of MyKad.

REFERENCES

- [1] R. Forno and B. Schneier. (2007) Identity Cards. [Online]. Available: <http://www2.ministries-online.org/biometrics/natid2.html>
- [2] M. Thomas, *Is Malaysia's MyKad the 'One Card to Rule Them All*, Melbourne University Law, 2004.
- [3] J. Pendaftaran and N. Malaysia. (June 2009). MyKid Identity Card of Malaysia for Children below 12 Years Old. *Malaysian's Identification Documentation*. [Online] Available: <http://www.malaysiacentral.com/information-directory/governmentrules-and-politics/identification-documents/mykid-identity-card-of-malaysia-for-children-below-12-years-old/>
- [4] E. Oh. (June 2009). Be Smart About MyKad. *The Star*. [Online]. Available: <http://biz.thestar.com.my/news/story.asp?file=/2009/12/12/business/5289211&sec=business>
- [5] S. Then. (June 2007). Malaysia and Brunei to Allow Frequent Travelers to Use ICs. *The Star*. [Online]. Available: <http://thestar.com.my/news/story.asp?file=/2007/8/15/nation/18593142&sec=nation>
- [6] Malaysia Central. (May 2007). MyKad the Government Multipurpose Card Applications. [Online]. Available: http://www.malaysiacentral.com/article_people_of_malaysia/MyKad_the_government_multipurpose_card_applications.php
- [7] M. Thomas. "Is Malaysia's MyKad the 'One Card to Rule Them All'? The Urgent Need to Develop a Proper Legal Framework for the Protection of Personal Information in Malaysia," *Melbourne University Law Review*, 2004.
- [8] Z. Ahmad. (January 2010). MyID – One Number Does It All. *The Star*. [Online]. Available: <http://thestar.com.my/news/story.asp?file=/2010/2/26/nation/5719003&sec=nation>
- [9] S. Dharmender, (January 2010). New MyID System for Retrieving Documents. *The Star*. [Online]. Available: <http://thestar.com.my/news/story.asp?file=/2010/1/19/nation/5500150&sec=nation>
- [10] S. Roger. "Information Resource on Identity Cards", 2004.
- [11] *Identity Cards*, vol. I, 4th Report of Session 2003-2004.
- [12] Hong Kong Immigration. (January 2003). The Smart Identity Card. [Online]. Available: <http://www.gov.hk/en/residents/immigration/iccard/hkic/smartid.htm>
- [13] *Privacy and Human Right Malaysia*, 2003. [Online]. Available: <http://www.privacyinternational.org/survey/phr2003/countries/malaysia.htm>
- [14] *MyKad and Privacy Right*, the Malaysian Bar, April 2, 2004.
- [15] *Malaysia Smart Card Delivering Citizen Services Faster*, Unisys: The Government of Malaysia.
- [16] MyKad: Sheer incompetence or sabotage. (June 2005). [Online]. Available: <http://www.aliran.com/oldsite/ms/2005/1102.html>
- [17] NRD Probe on Sharing Same MyKad Number Case. (August 2010). [Online]. Available: <http://www.dailyexpress.com.my/news.cfm?NewsID=74078>
- [18] R. Phan and L. Mohammed, "On the Security & Design of MyKad".
- [19] L. Xavier, *Smart Card Security from a Programming Language and Static Analysis Perspective*.
- [20] Smart Card Technology and Security. [Online]. Available: <http://people.cs.uchicago.edu/~dinoj/smartcard/security.html>