

# Identity Theft: Much Too Easy?

## A Study of Online Systems in Norway

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**Abstract.** Governments and commercial companies connect more and more computer systems to the Internet, giving people easier access to services. Many of these online services handle personal information. Leakage of such information can facilitate large-scale identity theft. This paper determines how personal information leaks from online systems of national importance, discusses proof of concept software to demonstrate the seriousness of the problem, and suggests how to improve the situation.

## 1 Introduction

Many companies and modern governments offer services through the Internet. Such online services often manage personal information. The services discussed in this paper are available on the Web, and users access them through their Web browser.

Adequate security and privacy are vital for online systems containing personal data. *Information privacy* refers to the individual's interest in controlling the flow of personal information [1, p. 63]. It can be difficult for a citizen to keep track of what information is available where, and to whom on the Internet. For example, a citizen might have an account in a governmental service without even knowing it.

A major problem is the information beyond the individual's control, which the individual cannot secure [2]. Large amounts of data leak from various systems, and governments seem to be struggling the most to keep the data safe [3], [4, p. 28]. During 2006, there were several news stories in Norway where various governmental institutions disclosed personal information on the Internet by accident. However, the amount of leaked information was insignificant compared to the scenarios described later in this paper.

Norwegian Birth Numbers (NBNs, no: fødselsnummer) are in widespread use in national computer systems in Norway. The NBNs are National Identification Numbers (NINs) comparable to the American Social Security numbers. Many countries have NINs, see [5] for pointers to governmental websites with information about NINs. NBNs have been used as tokens of authentication by

governmental institutions and companies in the private sector since long before the age of online services. This solution has worked well, still, identity theft has been possible with knowledge of a person's NBN and name for a long time. Because NBNs are still widely used as authenticators, they are of great value to an identity thief. The Norwegian Data Inspectorate has expressed concern over the use of NBNs as usernames in e.g. online banking systems. The problematic use of NBNs by a Norwegian pension fund was described in [6].

Identity theft occurs when someone uses another individual's personal information to pose as that individual [1, p. 99]. Useful information is e.g. credit card numbers and expiration dates, usernames/passwords, date of birth, NINs, name, and address of a victim. Successful impersonation of a victim lets the identity thief commit fraud.

This paper outlines the national identity system in Norway, and proof of concept software automating the collection of personal information from this system. Major privacy violations are highlighted and measures to reduce the problem are suggested. The paper focuses on the situation in Norway because of legal concerns. The authors are familiar with Norwegian laws and regulations, and our project was approved by Norwegian authorities. Still, our findings should be relevant to other countries using equivalent identifiers for their citizens. We leave it to the reader to apply our insights to domestic information systems.

The rest of this paper is organized as follows. Sect. 2 discusses personal identifiers, Sect. 3 determines why systems reveal personal information, and Sect. 4 describes software collecting such information. Sect. 5 makes suggestions on how to improve the current situation, and Sect. 6 concludes the paper.

## 2 The Norwegian Birth Number

An *identifier*, such as a name, NIN, or a customer number, points to an identity. The *identity* of an individual is the set of information associated with that individual in a particular computer system [1, p. 20]. Identifiers should be chosen with great care when designing a system. Certain identifiers can make the task easier for those who want to collect information about individuals.

All Norwegian citizens are assigned an NBN, containing the date of birth and reflecting the gender of an individual [7]. NBNs are assigned chronologically for a particular day, yielding a sub-range of used NBNs within the range of all valid NBNs for that day. NBNs are not secret by Norwegian law, but access to them is restricted.

The Norwegian National Identity Register (NNIR) (no: Folkeregisteret) contains the NBN, full name, full address, place of birth, and family relations for all Norwegian citizens. Approximately 7 million identities are kept in the registry, where 4.5 million people are residents in Norway and the rest are emigrants. The NNIR is often used to determine full name and address of an individual. Certain requirements defined by Norwegian law must be fulfilled to be allowed to interact with the NNIR. The Office of the National Registrar (no: Sentralkontoret for folkeregistrering) grants applicants access to the registry. Many governmental

and commercial entities use information from the registry. In a 2005 press release, Skatteetaten stated that about 1 500 entities had access to the registry, and 30 million queries were executed.

### 3 Why Systems Leak

Many authentication schemes used by websites leak valid identifiers. This leakage has been considered bad design for decades [8]. Fig. 1 illustrates a popular solution in Norwegian systems where a user first enters his NBN, the system verifies that the NBN is used, and then asks for authentication information such as a password or Personal Identification Number (PIN). A software program can post candidate NBNs to such a website and log which NBNs are used. Online services in this category include e.g. governmental websites, online banks, and student portals at several universities.

Several mobile operators leak names and addresses corresponding to NBNs during their signup process, effectively publishing data from the NNIR on the Internet. Users select a subscription type and enter their NBN to sign up. The mobile operator will then conveniently present the full name and address associated with the NBN on the webpage for user confirmation. Since an NBN and a name suffice as authenticators in many online and offline systems, an identity thief can use these web services as a starting point before targeting other systems.

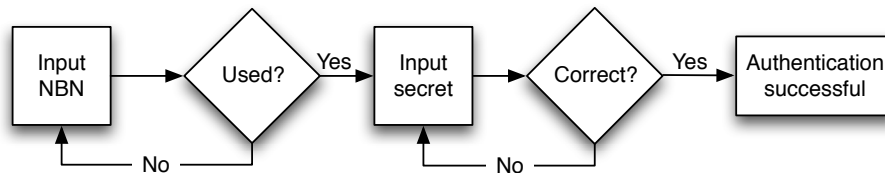


Fig. 1. Privacy violating authentication scheme

### 4 The Software

To establish how easy it is to automate harvesting of personal data, the first author developed a small graphical program in the Java programming language, called *NBNtool*. Two notable features are discussed here.

NBNtool was able to establish many of the customers in one of the largest banks in Norway, taking advantage of the bank's authentication scheme resembling Fig. 1. Furthermore, NBNtool used a particular mobile operator's signup procedure to extract full name and address for Norwegian citizens aged  $\geq 18$ , by simply posting NBNs to the website. Hence, large parts of the NNIR could be mirrored through the mobile operator's website.

NBNtool communicated with the websites through The onion routing (Tor) network to avoid detection [9]. The bank is known to utilize intrusion detection technology, but NBNtool still ran uninterrupted on several occasions.

## 5 Improving the Situation

In the short-term, technical measures such as a Completely Automated Public Turing Test to Tell Computers and Humans Apart (CAPTCHA) would make it harder to automate the collection of personal data [10]. At least one Norwegian mobile operator has recently incorporated a CAPTCHA in its signup procedure. Traffic analysis can also be used to detect patterns indicating large-scale download of personal information. Most importantly, authentication schemes should be changed so they do not leak the validity of identifiers.

An important policy change that would improve the current situation is to enforce regulations on services with privacy implications so that users have to opt-in to access the service online. Today, individuals have to locate privacy violating services and try to invalidate their identities in these services.

In the long run, the NBN system must be changed. According to [11], an identity system should undergo a thorough analysis involving all stakeholders. Both the creators of the system and the users must be involved in the analysis. Scientists with expertise on privacy, and without commercial interests in the system, should also partake to ensure that citizens' privacy is well protected.

Authorities responsible for privacy in Norway need to find better ways to work in the future, enabling them to deal with privacy violators in a more efficient and swift manner. The findings described in this paper clearly show that the control of personal information is unsatisfactory. The authorities' shortcomings in this area have many explanations, including judicial limitations, lack of funding, shortage of staff, and unclear placement of liability.

## 6 Conclusions

Data harvesting is possible in Norwegian online systems. Large amounts of NBNs and corresponding personal information can be determined. Many websites use NBNs to identify, or even authenticate their users, facilitating creation of personal profiles. We conclude that large-scale identity theft is indeed possible in Norway. The risk of this happening is unclear, but it is definitely present as small-scale online identity theft is already a problem.

NBNs should not be used as authenticators anymore. They are in practice published on the Internet and can easily be collected. In addition, there are probably thousands of people with authorization to access the NNIR. NBNs must therefore be considered public information in the future. Privacy violating authentication schemes must be improved accordingly.

This paper highlights severe privacy issues, but the whole picture cannot be analyzed in a single short paper. A thorough analysis of the current NBN-based identity system in Norway is called for, and will lay the groundwork for the development of a new and improved identity system.

## 6.1 Final Remarks

Special thanks are due to the Norwegian Data Inspectorate for allowing us to demonstrate NBNtool at a meeting in January of 2007. The first author is very grateful to Senior Engineer Atle Årnes for several useful discussions on privacy issues. We also thank the FC'08 reviewers for thorough reviews and valuable feedback on this paper.

More information about our work can be found in a technical report [12].

## References

1. Kent, S.T., Millett, L.I. (eds.): Who Goes There? Authentication Through the Lens of Privacy. National Academies Press, Washington (2003)
2. Schneier, B.: Risks of third-party data. *Communications of the ACM* 48(5), 136 (2005)
3. Privacy Rights Clearinghouse: A chronology of data breaches (Last checked February 20, 2008), <http://www.privacyrights.org/ar/ChronDataBreaches.htm>
4. Symantec Inc.: Symantec internet security threat report xi (Last checked February 20, 2008), <http://www.symantec.com/threatreport/>
5. Wikipedia: National identification number (Last checked February 20, 2008), [http://en.wikipedia.org/wiki/National\\_identification\\_number](http://en.wikipedia.org/wiki/National_identification_number)
6. Moen, V., Klingsheim, A.N., Simonsen, K.I.F., Hole, K.J.: Vulnerabilities in e-governments. *International Journal of Electronic Security and Digital Forensics* 1(1), 89–100 (2007)
7. Selmer, E.S.: Personnummerering i norge: Litt anvendt tallteori og psykologi. *Nordisk Matematisk Tidsskrift* 12, 36–44 (1964); (in Norwegian)
8. Morris, R., Thompson, K.: Password security: a case history. *Communications of the ACM* 22(11), 594–597 (1979)
9. Tor: Anonymity online (Last checked February 20, 2008), <http://tor.eff.org>
10. von Ahn, L., Blum, M., Langford, J.: Telling humans and computers apart automatically. *Communications of the ACM* 47(2), 56–60 (2004)
11. Kent, S.T., Millett, L.I. (eds.): IDs—Not That Easy: Questions About Nationwide Identity Systems. National Academies Press, Washington (2002)
12. Klingsheim, A.N., Hole, K.J.: Personal information leakage: A study of online systems in norway. Technical Report 370, Department of Informatics, University of Bergen (2008)