Document Authentication System
Preventing and Detecting Fraud of Paper Documents

Executive Summary

Paper documents are widely used to support business transactions. These include grade and degree certificates for obtaining employment, bank and financial statements for applying for loans and identity and address proofs for several requirements. Some of the reasons for the continued use of paper documents for these transactions include:

- the affordability of paper - paper is low cost
- the familiarity of paper - people are used to it
- the simplicity of paper - one does not require special equipment to write or read paper

Fraud and Forgery is an issue that plagues paper documents. Document fraud is a major concern for governments and enterprises around the world. For example, a KPMG study[1] which polled senior managers across 1000 companies in India came up with the following findings:

- 39% of the respondents acknowledged that their enterprises had been subject to fraud in the last year.
- Forged documents was among the top 3 reasons for fraud encountered by these companies.
- 13% of the respondents identified forged documents as the major reason or fraud related losses in their business (in rupee terms).

Fraud prevention makes processes overly complex, increases the transaction costs, and makes due diligence of transactions cumbersome and time consuming. However incidents of forgery and fraud using paper documents has increased with the availability of cheaper printing and copying technologies.

So how can enterprises identify the authenticity of a given document given that manual verification of these documents is a tedious task, involving multiple levels of human interaction and is expensive and time consuming. Can we provide the same degree of security for paper documents that we can achieve in the electronic world?

We believe our technology innovation addresses these questions..

How do you Prevent Paper Fraud?

Traditionally, information on paper with a wet signature and a rubber stamp has been accepted as a reliable supporting document for all kinds of transactions. The strength of authentication using signatures is not very strong. Rubber stamps are also easy to replicate.

Determining the authenticity of the document is not just a technical challenge, but also a logistic one. In some countries there are as many as 20,000 authorities issuing birth certificates alone. Other agencies issue driver's licenses, degree certificates, etc. Tens of thousands of verifiers dealing with tens of thousands of issuing authorities is not a practical solution. Creating a dedicated online infrastructure for these agencies would be extremely expensive or in some cases even infeasible.

Existing authentication methods are complex, incur large transaction costs and are time consuming. Hence, the need for a system that can provide speedy, reliable and cost-effective verification of paper documents.

Our innovation addresses the problem by allowing enterprises to continue to use their existing methods of generating paper documents with the addition of machine readable data printed on them. The Document Authentication System (DAS) we have created can be used to verify documents either issued by a single enterprise or can be a centralized system that can verify documents issued by a set of enterprises.

Document Authentication System

Machine readability of data from paper can be enabled through symbologies such as 2D Barcodes. 2D Barcodes are capable of storing multilingual information and images subject to size limitations. All such content can be recovered reliably on scanning and decoding of the barcode.

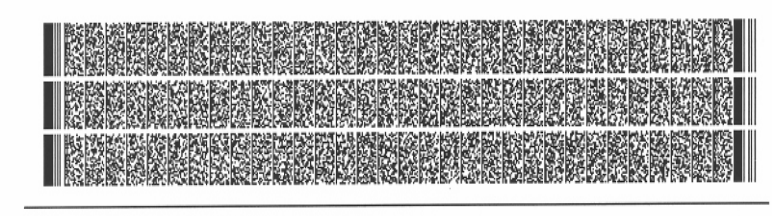


Figure 1: A 2D Barcode

Why 2D barcodes?

- Can hold significant amount of data, typically of the order of 500 bytes per square inch.
- Can be printed on paper by normal printers and scanned by normal scanners.

[1] KPMG (2006). India Fraud Survey Report

The integrity of the document is validated using the content decoded from the barcode. The DAS incorporates security features to ensure that the contents of the barcode are not tampered with. The client side software prints out a verification statement which contains the information decoded from the barcode along with a statement from the server indicating that the barcode's contents are authentic. Comparison of this information with the content on the original document can be used to detect forgery or manipulation very early in an attempted fraud. The verification statement, containing full information, can be processed by itself without even comparing it with the original human-readable text. It is also often desirable that a centralized system should protect the privacy of the end users whose documents are being verified. The DAS system handles privacy protection too.

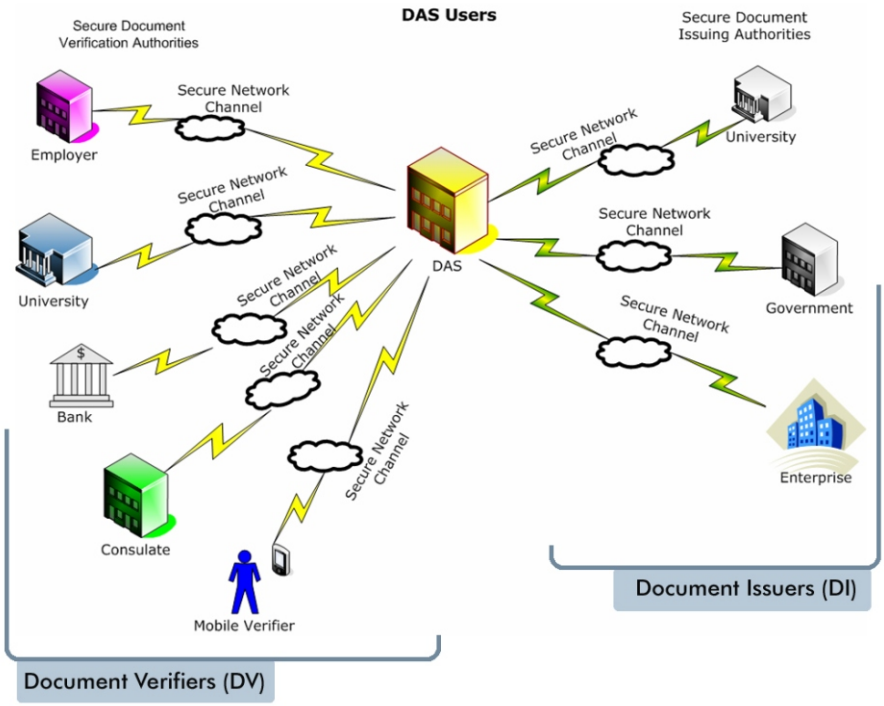
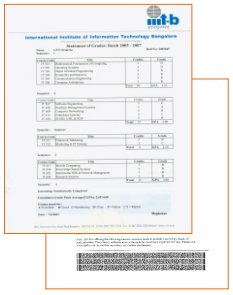


Figure 2: A DAS system can serve multiple Document Issuers (DI) and Document Verifiers (DV)

How DAS can be used to Authenticate Documents? An example of Issue and Verification of Educational Transcripts

Lets take the example of transcripts that are issued by educational institutions that need to be verified by potential employers. This is based on a pilot we have running with the International Institute of Information Technology (http://www.iiitb.ac.in) where they have issued the grade transcripts for their students using our technology as a pilot.

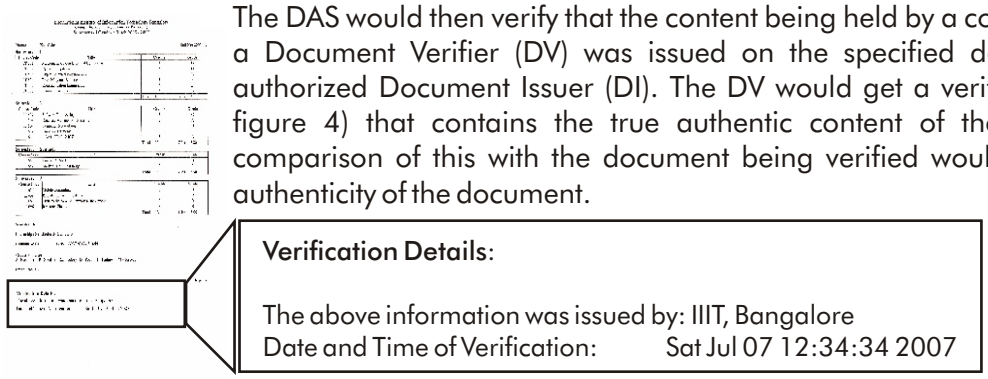
The text of a transcript like the one given in Figure 3 can be presented as a 2D barcode and printed at the bottom or behind the page in a few square inches. This is done when it is issued by the authority, in this case an educational institute, whom we term as a Document Issuer (DI).



The centralized DAS systems created by HP Labs, India would accept information from many Document Issuers (DIs) and serve users on a network, which could be the Internet (see Figure 2).

A barcoded document can be verified when presented as an authoritative document, for example, while applying for a job to an employer. The entity requesting the verification is a Document Verifier (DV) which in this case is a company. The barcode can be machine read using commonly available scanning devices and transmitted over a secure network.

Figure 3: Educational Transcript of IIITB with 2D barcode printed at the back



The DAS would then verify that the content being held by a computer in the office of a Document Verifier (DV) was issued on the specified date and place by an authorized Document Issuer (DI). The DV would get a verification statement(See figure 4) that contains the true authentic content of the document. Manual comparison of this with the document being verified would help determine the authenticity of the document.

Figure 4: The verification statement for the IITB transcript.

The same method can be used to remotely issue documents and alleviate the need for a physical signature. This could be applicable in the context of government documents issued by kiosks.

Other Features of a DAS

Some of the other features of a DAS include:

a) The DAS itself will not hold content which can be misused by an agency/staff running it.
b) It does not compromise the privacy of the individuals concerned.
c) It incorporates error correction techniques, while enabling data to be extracted from even damaged barcodes.
d) It can deal suitably with documents issued prior to the creation of a DAS.

Advantages of a DAS

The advantages of a DAS include:

a) It is not expensive or complex to implement.
b) It automates verification, thus reducing time and cost for transactions.
c) It uses standard printing and scanning equipment without the need for any specialized devices.

While enabling networked security for paper documents, DAS does not take away the positive aspects of the paper medium: low cost and user-friendliness. Adding a 2D barcode to the bottom or behind a printed document does not significantly increase the cost of generating such a paper document. The issuing institution will need to spend less time and resources in handling queries on the authenticity of a document it has issued, while the end users can be absolutely sure of the authenticity of the document in question.

About HP Labs India

HP Labs India has been established with the principal focus of creating new technologies for addressing the IT needs of the next billion users of IT. A large majority of these new customers arise from rapidly growing markets such as India, China, and other Asian countries. Effectiveness of IT has been limited in these markets due to issues related to IT complexity, affordability and infrastructure. At HP Labs India, we derive our inspiration by being deeply immersed in the local customer environment and understanding major global technology trends. HP Labs India works at the intersection of deep technical research, direct impact on HP's business and solving hard and significant customer challenges.

Research Areas

Our current research programs are motivated by opportunities in Paper and IT convergence with strong emphasis on document imaging and its applications; mobile personal computing with thrust on pen/gesture based interfaces and novel personal computing architectures; and mass communication technologies with particular emphasis on sponsorship based services using emerging Web 2.0 technologies.

For More Information

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