Centralized Production of Documents in Government Applications

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Abstract

A Trend Towards Digital and Centralized Production

During recent times, production and personalization of identity cards and travel documents have undergone significant changes.

From the manual personalization: gluing of a portrait picture, typing or handwriting of the personal data, we witnessed the introduction of "digital/analogue" personalization – using e.g. photographic techniques for the production.

Over the last 10 years, all-digital personalization has definitely established itself as the standard solution. Another evolution has been taking place in parallel: a tendency to move from decentralized issuance to centralized production and issuance.

Most countries now also keep, or seek to keep in the near future, a computerized record of who has been applying for documents and where. The fact alone that such databases are in essence centralized systems, is an enabling factor for the use of a centralized production set-up.

This article will study the specifics in the creation of identity documents at large scale. The concept, presented here, is a technically advanced workflow, using the unique properties of several technology partners, each adding their own know-how. This technology group has formed the so-called "Estafette" consortium (Dutch and French for "relay race).

The partners, operating on a 'preferred partner' base, are: Schleicher&Schuell for the preprinting stage; BARCO for the personalization of the documents; Hologram Industries for the Security Holographic Foil, and Codor Dorned for an automated laminator solution.

They aim to provide the market with top-end solutions, wherein the use of advanced technology is the key factor.

Security Documents – Special Requirements

Security travel documents must contain all the features of a traditionally printed security document, no matter how advanced current digital technology has become.

Consider a security document as being built up of different "layers" of security features.

The lowest layer is the substrate (which in itself can be made of several sub-layers, i.e. different levels of security can be build into the substrate)

Above that there is a layer where static (or traditional e.g. offset) printing is applied. This to obtain different levels of print quality for different levels of security.

In travel documents, the personalization layer comes on top of that, and to finish such a document, a lamination layer, consisting of possibly several sheets of protective material, is laminated on to the document in an irreversible way.

The best way to create a document that is considered safe is to produce a well-balanced mix of secure layers, which form together a consistent and adequately protected document.

A Case for Centralized Solutions

The obvious security advantages of a central production approach speak for themselves. The fact that high security documents have been produced decentralized for so many years now, is, all things considered, astonishing. Passports and similar travel documents are on the same security level as banknotes, yet nobody would dream of numbering or even printing these notes locally, in the town hall. Still, this is exactly what has been done so many times for convenience.

An old objection, that centralized systems are slow and cumbersome, does not necessarily hold anymore. In a modern information-driven society, it is technically perfectly possible to provide fast turnaround times, whilst keeping at the same time a high level of intrinsic security.

The following chapters describe in more detail the different phases involved when producing security documents at high speed, and in high volumes.

Phase 1: Pre-Printing Stage

The current state of digital printing technology does not allow security documents to be printed in a completely digital manner. Indeed, there are no digital printers currently capable of producing ultra-fine line work; microprint and documents that possess the tactile feel of the traditional security printed document. Most digital printers operate only in the four typical offset colors (CMYK), although a few can offer additional or even spot colors.

Although there will be a time when digital printing seriously challenges classical printing technologies as a replacement, this will most probably not be happening in

the next ten years, and certainly not in the highly specialized area of security document production.

To offer complete solutions for the production of high security identity documents, a flexible, traditional security printing partner is essential to provide high quality traditionally printed base material.

German security printer Schleicher&Schuell (with roots going back to the 16th century) is equipped to combines traditional printing methods, with today's industry standards regarding flexibility, innovation and customer orientation.

Products like savings books, checks and stock certificates, tickets in numerous variations, vouchers and official documents such as ID-Cards and passports can all be produced. This variety in products offered is important, as it allows this partner to respond to a multitude of customer requirements.

Schleicher & Schuell has the ability to work with security printing techniques such as guilloches, intaglio printing, hologram application, two-stage-embossing, rainbow printing, bar-coding, micro line lettering etc. They also provide the necessary support services such as security logistics, development and adaptation to fulfill customers demands and wishes.

Phase 2: Digital Personalization

High volume, high-speed production of security documents does pose new requirements to the solution.

Digital personalization of security documents in itself is nothing new. It has been in use for a number of years now. Most of it on a smaller scale, although some companies do have experience with larger volume production.

However, much remains to be done in the area of true mass production of documents. The sheer productivity of such systems is an issue; print quality is at least as relevant. Lastly, managing the variable data within the process is a task where few systems are currently up to.

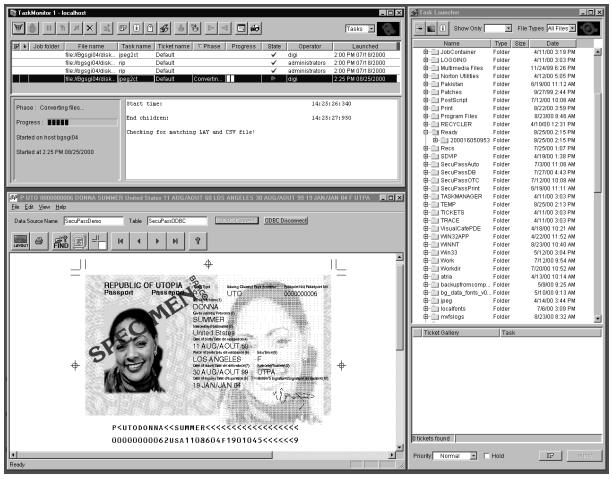
Such 'database publishing' systems need interfacing with a (central) database. The SDVIP (Security Document Variable Information Printing) workflow is optimized for high throughput and automated production.

Data Set Handling

A data set as large as millions of citizens' personal records must be handled efficiently and securely. A connection to the existing database therefore has to be made.

This can be done in several ways, either through so-called "flat files", where all the database fields are in straight files. These comma-separated-value files are the simplest way of getting database extracts. More sophisticated interfaces, such as through the ODBC standard are provided as well.

Then follows the treatment of the data. To optimize throughput, data is divided in batches of a particular length. Such parameters need to be configurable, to allow streamlining for each individual project.



Interface of the SDVIP personalization workflow

Adding 'SECUMARKS'

Extra security features can at this stage be added into the variable elements. These so called "SECUMARKS" are increasing the intrinsic value of such ID documents. They add protection to the essence of the document: the variable data content.

Examples of such SECUMARKS are background portrait pictures in hard-to-copy screenings, Scrambled-Indicia™ hidden messages, digital watermarking solutions (e.g. from Digimarc™ or Signum Technologies™) etc. The use and usefulness of these features needs to be studied together with the client, so that an optimal level of document security is achieved that is 'fit for purpose'.

Example of a visible SECUMARK: the photograph of the holder is repeated on the right, using a special raster. This to avoid fraudulent replacement of the original picture

Workflow

High volume, high-speed production is mainly a matter of continuous operation. Yet, the operator controls need to be informative and allow interaction

with the system, for maintenance and service interrupts. The system also needs to allow for rush jobs.

Imaging Technology

On the print engine side, the sheer data flow sent to a digital press is impressive: typical such press requires that an average of 100 MB/second is fed continuously into it. This impressive number is only going to increase in future, as ever more information in ever-higher resolution will be printed on the document.

From that criterion, a buffering device for the SDVIP workflow has been developed, the so-called PRINTSTREAMER. Simply put, this buffering device has massive storage capacity and is capable of collecting variable data fields (portrait picture, personal data etc) of tens of thousands of individuals, and keeps them in print-ready format.

The key to this so-called 'press-server' concept is clever data management, hardware image decompression techniques and high-speed communication protocols.

Rather than looking at printed matter as mere pages, an object-oriented model is used for the machine. Every element on the document (photo, text, barcode), is considered to be an 'object' and stored as such. This significantly reduces the amount of storage needed as it also allows the re-use of objects.

As Ripped objects are stored in compressed format on the PRINTSTREAMER, specially developed hardware circuits ('expansion' boards) decompress the data, apply dot gain compensation and do image screening at nominal printing speed. Data is passed on to the press through a high-speed serial cable, operating at one gigabyte per second. The whole concept, although specifically developed to solve one particular problem: eliminating the restrictions for variable data printing - is by no means a closed product.

Both the hardware and software of the devices are open to the industry standards. In software terms, the PRINTSTREAMER carries a documented API for connecting other Rips to the machine. In hardware terms, this means that connecting the machine goes via industry standards. This ensures that interfacing to a new type of digital press, is as straightforward as it can be.

Output Devices – Digital Presses

With the currently available technology in digital color presses, it is quite possible to produce quality documents.

However, Barco decided to take development of digital presses into a new era and introduced recently a prototype of an all-new digital press, based on inkjet technology.

This new development, called **the.factory** (pronounced: "the-dot-factory"), adheres to the principle of providing security documents on security substrates. It drastically expands the options available to digital print engines such as improved light fastness and durability through UV curing inks, the possibility to implement special security inks and include a wide range of non-paper based substrates.

the.factory *industrial drop-on-demand inkjet press. Uses up to 6 UV-curing inks and has a maximum web speed op 21m/min.*

Security Laminates

One may consider a security document as consisting of several layers. It starts with the base layer, the substrate, moves on to static print, then the personalization layer and so on. One of these layers is very often a laminate, or security foil.

A solution for modern ID documents is to use customized holographic security laminates as a protection against forgeries, simulation and manipulation.

Consortium partner Hologram Industries has developed a range of high security laminates for different ID documents. A combination of demetallization and high refractive index coatings are the basis for lamination foil for ID documents. This includes a high precision customized demetallization technique and customized holographic images.

Such type of lamination foil represents a very high security level in optical security.

For different types of substrates (security paper, Polycarbonate, PVC, TESLIN etc.) specific laminate structures and production processes exist to guarantee secure bonding to the selected substrate. Attempts to remove the laminate under a variety of conditions or to alter the information contained on the card will result in physical destruction of the optical system that should be apparent visually.

In the context of this project, Hologram Industries have developed a special OPTOSEAL Polyester Polyethylene foil that gives a perfect bonding to pre-printed and personalized TESLIN inlets.

The multi-layer film contains customized holographic images that under normal ambient lighting conditions will undergo color shifts as the viewing angle is changed.

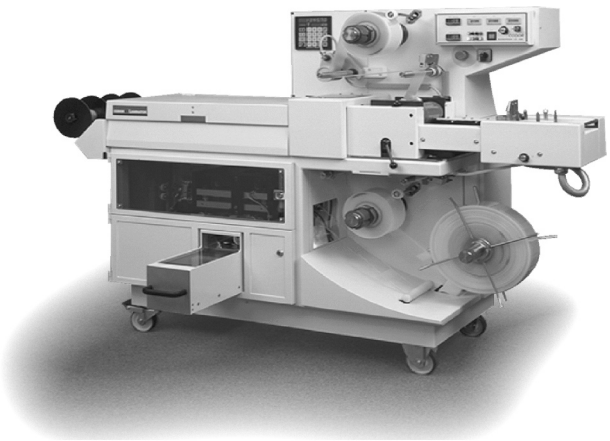
Lamination

To apply a security laminate, especially transfer laminates at high speed, Codor Dorned (Netherlands) had to develop a new laminator.

Codor Dorned is a dutch key supplier for standard ID document laminating solutions, with multiple references in ID cards, student cards, passports and similar projects. As an engineering bureau, they also specialize in engineering for specific problems.

The CODOR® AutoLaminator is an automatic laminating and punching machine for high-speed production of all kind of ID-cards. The machine has been designed to provide uniquely accurate precision punching of the laminated cards at high speeds. Tolerances less than 0,1 mm are achieved during this operation. If required the laminated documents can be embossed in register during the same production process.

To cope with the productivity of the digital press, the AutoLaminator has a speed of 4000 ID cards per hour.



Codor-Dorned AutoLaminator.
Lamination speed of 4000 cards per hour

Conclusion

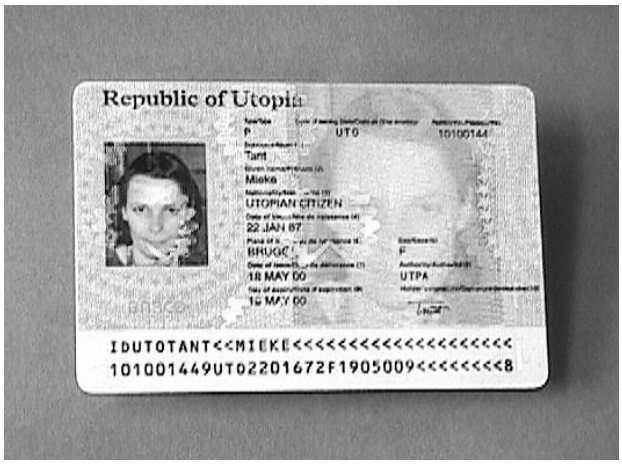
This article showcases a solution for the production at high speed of large quantities of personalized security documents.

The challenges in this approach have been numerous. Every stage in the production process had to be coordinated as each partner in the consortium worked to merge advanced and innovative techniques into a coherent workflow.

In this type of business, the customer is more often than not a government body. Their primary need is to obtain a working solution that is acceptable at a social and political level. The end goal is the finished document. It is thus important to bring a complete solution to this 'audience'.

Although probably not the only solution on the market, the Estafette consortium is convinced that the joint effort of four 'technology driven' companies has led to a unique yet effective workflow.

Will centralized production take over from decentralized solutions? Only time will tell, but all market and technology indicators seem to point in this way.



Photograph of a finished card. Traditionally printed background; personalization by digital press, customized holographic security laminate applied by autolaminator.

Biography

Jan Van Laethem (1966) holds an engineering degree in electronics. He is with Barco since 1989, where he started in software application development for CAD systems for the packaging design market. A few years later, Jan became involved in the development of a specific CAD system for the ceramics design market. Since 1993, he joined the Security Systems group, and was responsible for the design and implementation of the Fortuna design system. Currently, Jan is division manager of the Security Systems group that is part of the Industrial Printing division at Barco. In this position, he is responsible for product definition, development and marketing of the Fortuna, SecuSeal and INSIDER products.