

# **Title: NETWORKED VERIFICATION OF FORENSIC DNA ON DOCUMENTS**

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**Author:** Wendell M Smith, Enfield New Hampshire USA;  
Chris Outwater, Santa Barbara Ca. USA  
Mike Hayes, Halifax CA.  
Gil Jones, Clearwater Beach Fl. USA

**Abstract:** Cloud Networking of the Digital Information regarding a Document with a DNA forensic taggant - brings together the elements needed for a Smart Phone Reader to Authenticate and Locate an Original Document - even a single page of a document.

The Original Document is printed with a Unique Identifier Code (Serial number) with forensic Taggants. The Document's networked cloud based file will contain the UIC (and other data), That UIC will be "published" (as all tracking systems do today..). It may have any information that the author wishes, but will only respond to an inquiry from a Reader: "Yes/No/Suspect" regarding Authenticity; and, only if encryption support (Blockchain) reconfirms it's database as OK. It will add that inquiry detail event to the record. Location and Identity of the inquiry will be available to Author only. Cloud will report any surprise in Location or Source if not "appropriate" and consistent with the past.

**Keywords:** Document Security, Taggant, Forensic, DNA, Barcode, Network, Track and Trace, Anti- counterfeiting, Authentication, Transparency, Document Chain Management, Blockchain, UIC. . (see 5.0 Footnotes)

## **1. INTRODUCTION**

1.1 In the 15th Century the very invention of Printing meant a great deal about Security. Since only one printing press existed, if it was printed it was "real". In particular Engraved printing was , and still is more secure in that the artist's hand work is a Security feature. Since that time 100's of ideas for a new and better 'secret' have evolved and put into effective use. The anti counterfeiting efforts for luxury goods and now by law also for Medicine bottles (in US). However all anti-counterfeiting efforts are only effective when the store clerk can turn it down 'instantly'. DNA so widely know to be crime level Forensic stops the Counterfeiter before he decides what to fake.

In currencies we see 10 or more secrets (typically copied/overcome somehow in 6 weeks !). Not really faked in all secrets, since counterfeiters do not have to do anything except to see how to help a clerk or maybe an intermediary to accept that obvious or well known fake.

1.2 Our long use of the DNA Matrix tm on existing Art and Sports Memorabilia applications have brought us to a Document Model that "works".

Document Security has focused on better and better secrets . Dither the image, holograms, a better less visible/ invisible ink combination with a multi functioned reader, "Inks" that are really light lenses.

But now add the Unique Identifier "number" to the document with the DNA Taggants and the power of Track and Trace is in full play! Real time Authentication tracked to the Cloud.

1.3 What can we do to prove that the actual document is Authentic...even Negotiable .. as agreed by the Author?

Think of the impossible problem of authenticating Birth Certificates.

The government has reported that they have information on 45,000 (roughly) different formats of birth Certificates that have been used in the United States over the years. It is truly impossible to prove their authenticity to the authority in charge. There are many signs one can see or decipher, but not any single item much better than an embossed emblem of difficult to read images.

In the perfect world the DNA taggants and tracking codes would have been placed at birth.

So, for a new project be sure that the UIC arrives at Birth with DNA.

For the governments involved in birth certificates it would certainly help to study each living persons birth certificate to try to be as sure as possible. Then immediately apply a UIC and DNA and hope for the best.

1.4 For new printed Documents, note the author is the delivery operative for the 'birth'. A very easy time to add UIC's. DNA taggants, and solve the future issue forever (that's a bold statement..but the fact of many users of digital printers clever UIC generators, and track and trace system in the clouds.

Think about the insurance policies, wills, mortgages, letters to family giving things, prenuptials. Think of the Contracts and the Licenses and the Certificate Documents needed to cross a border.

1.5 National and International software companies are very serious and interested in this subject. Digital Systems companies have done a lot to make the Document that you create in

their software "SECURE". Microsoft's Docusign etc. as example : No actual handwritten signature, but promised by Microsoft to be "just as good". This is so important to a big company: that Judges and prosecutors all accept such documents as 'legal'. Partly because the alternative of all paper docs is an impossible task. Paper work on a big case might pile as high as the Empire State Building. This is a lot better than nothing, but leaves every other small business and individual signing wills etc. etc. out in the non digital non networked "cold".

1.6 These matters came together in our minds in 2001 when we recognized two things: First: DNA really works as a true long lasting crime stopper.\* ; and Second - Printing when turned digital, allowed anyone to mark anything with incomparable reliability of very high speed and low cost...DNA easily added to the ink and digital printer .\*\*

1.7 The DocuLock answer for us came as the application for our patent "Doculock" US 8040541 Smith \*\*\* starting an application about 2007 - Document Security . As you might see in the patent, the concept is directly and well written in this "space". It moved us out of a 'Thing' relationship to a Document relationship and now to a Networked Document concept bridging the "gap" of most or all Digitally delivered items. How to reconnect with at least one original authentically. All document and things at one time or another had a physical presence, or a piece of paper at one time in their life and now been separated from the digital data.

It came in part because of the Transaction Business document market was using Barcodes to be sure that the document went to the right party and that they had the right number of pages. We were called in to print invisible codes. The printer company had been told that the bar codes were 'onerous'. The project never completed because they found that the codes were not considered distracting or ugly and that people (customers customers ) were occasionally using them too.

(\* From our many projects just marking or signing art work or pill bottles ..with DNA material)

(\*\* Variable data , number each item, print labels at 20 miles an hour .. 100 % inspection..... DNA Easily after our work to test and prove - all and any ink any printer.added to Inks and Printers)\*\*\*

\*\*\* see DOCULOCK US Patent number 8040541

Statement of author regarding patent number US 8040541 Smith .  
Doculock - "Secure Document Printing" in which the invention is described in detail including, but not limited to, disclosure that that security data specific to each page of said digital file, that the mark printed on each page of the printed file comprises covert data, and reproduction of the printed file as an authenticable printed file is prevented by means of the mark containing data unique to each page of the printed file."

Patent is based on several developments of DNA Technologies company starting in 1993.

The forensic taggant - DNA - had been used first by the founder Charles Butland in 1993 when he developed the concept of DNA molecular taggents for inks pens and printers. Most applications have been for "things" although the company has had paper such as Label stock applications for years; and has had considerable application to art goods like canvas paintings and such.

The techniques developed over the years have made such applications help users take advantage of rapid inexpensive printing technologies to be numerically (Unique Identifier Codes) marked (tagged) Traced in the responsible parties digital files and authenticated by every proper agent of delivery AND by the proper end user with a "standard" (or special) barcode reader. All with the DNA forensic taggant adding credibility Authenticity and also tracked.- The 'public' nature of the Unique Identifier (or at least the essential part of same) for transfers to legitimate persons means that Security comes from Transparent knowledge of the code along with an Authenticatable DNA protection.

(\*\*\*\* Smart Dye tm Jones Patent 6402986 Luminescence Lifetime ).

The original SmartDye tm developed by Dr Jones at Boston University 1999. And the subject of a company venture - PhotoSecure - now a part of DNA Technologies

## 2. TECHNOLOGY

2.1 DNA true Deoxyribonucleic Acid so well known as the long lasting identifier of people and in use now for objects for 20 years as the first product of DNA Technologies in 1993. Charles Butland sensed the importance of DNA (over fingerprints) and patented the idea. Now in Digital inks and Documents. Provides a simple but "perfect" forensic taggant. One that has never been counterfeited and has proven to reduce fake items in the market for 25 years, The forensic element of DNA provides Anti counterfeiting and Authentication with the longest lived element and known to all to be crime lab forensic material. It provides the most convincing element to the system as it is permanently on the page at "birth" and stays forever. DNA is invisible and never "lit up" by special lights or devices. Up to 5 forensic level 2 (Overt ) Smart Dye tm dyes (that can be revealed with modest cost field devices.) are used; but just the one level 3 Crime lab Forensic DNA taggant is in the mix (sometimes we will have more than one DNA strand for further confusion; but also for our comfort that we too can validate that single printed UIC). The lower level forensic elements are added for field inspection with low cost inspection devices before DNA analysis.

2.2 The hundreds of years of printing technology, now digital driven, provide the platform of extremely "perfect" results. High speed low cost images come through the Digital print method with actual 100% inspection of images as printed. (color control spectral control - in every dot).

The original paper will have an invisible (and visible if wanted) UIC that is very random and never to be repeated 'number'. Printed at the birth of the paper's Document process. Then in printing the final Document that UIC will be given its 'name' and location by scanning that 'birthmark' and Authenticating the 'birth' of the final Document. .

The ink cartridge with special taggants must be in place and controlled by the printer that it has the proper UIC for itself as correct with DNA and other factors. The digital networked system makes this happen seamlessly with 100% inspection.

2.4 Individual UIC codes when printed on blank paper will, later, when document is finished, be Authenticated as to date and any details desired. That starts the chain of custody that will be checked by anybody with the UIC 'public number' , and Authenticated again any time. If in doubt about a copy, or possibly the document aged, or was mishandled, or the hand held device did not find the lower level Forensic element, or the attempt raised doubt, the "cloud" network system will put the document on 'suspect' alert. Note the DNA will stand throughout many years of mishandling, even hundreds of years. If it has been destroyed the document would have been altered enough to make it imperfect too.


2.4 Confirmation of the DNA is made by a test called PCR (Polymerase Chain Reaction) in a laboratory environment. (possibly in the Author's location but much more likely by DNA Technologies or, a contract Lab, or a Government lab). The confirmation requires a sample of the DNA segment as used by the Author's Organization (coming from DNA Technologies). The Technician has to remove some ink and denature the DNA and then start an approx 2 hour confirmation match. (not a decoding of the DNA strand itself).

2.5 The more times the proper parties report in, the better. The Document Location and Authenticity will be in the hands of each "proper" person INCLUDING the intended PERSON/ USER who can be assured of Authenticity - the more times it is 'read' the better. Here is where:

### TRANSPARENCY ASSURES SECURITY

#### 2.6 Sample of one Authentication event

##### AUTHENTICATION EVENT

| Date                                | Time              | Location                   | DNA   |
|-------------------------------------|-------------------|----------------------------|---|
| 4/7/19                              | 07:31 EST USA     | {Secret }                  | {DNA T demo strand}   |
| Someone has <u>scanned</u>          | a DNA UIC on your | <u>Original first test</u> | <u>Document</u>   |
| Location and time noted in UIC File | noted in UIC file | Noted in UIC file          | DNA Matrix tm  |

### 3.0 References

See \* below

1. Doculock Patent Secure Documents US 8040541 Smith
2. Invisible Bar code US 603 0657 Outwater
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4. Compositions and Methods for Luminescence Lifetime Comparison US 6402986 Jones
5. DNA Technical Papers and White papers \*
  - DNA AS A SECURITY MARKER Chris Outwater Los Angeles Calif. and Rick Tullis DNA Sciences Carlsbad Calif.: 12 pages of the details of DNA and DNA marking . Copyright DNA Technologies 1998.
  - INTERESTED IN SECURITY OF PRINTED DOCUMENTS ? The actual first ever DNA protected Document Wendell Smith Nov. 12 , 2010
  - THE NEW WORLD STANDARD IN ANTI-COUNTERFEITING TECHNOLOGY  
SELECTED BY OLYMPICS 2000 copywrite DNA Technologies Mike Hayes 2001
  - Celebrating 20 Years of Unparalleled Protection Mike Hayes 2003
  - EXTREME SECURITY IN A SIMPLE BUSINESS CARD. Wendell Smith 2011
  - Forensic Mine to Market Solution Angelo Palmeri Gemprint
  - Company Brochure THE NEW WORLD STANDARD IN ANTI-COUNTERFEITING TECHNOLOGY SELECTED BY OLYMPICS 2000
  - ARTGUARD Protecting Artists works. With DNA
  - KINKADE Paintings signed with the artists DNA pens. 1999
  - ACUSHNET - TITLEIST GOLF BALLS -Protected from Diversion with Smartdye tm Barcodes.

See Website [WWW.DNATechnologies.com](http://WWW.DNATechnologies.com)

Several **Secure Industry** News briefs available

\* A significant portfolio of patents and Trade secrets available .

\* Contact Wendell Smith Or Mike Hayes

Wendell Smith [wms@PolestarLtd.com](mailto:wms@PolestarLtd.com) [wms@DNATechnologies.com](mailto:wms@DNATechnologies.com)

Mike Hayes [mhayes@DNATechnologies.com](mailto:mhayes@DNATechnologies.com)

Slides for this presentation available from M Hayes.

### 4.0 Acknowledgments

Ideas and quotes herein are the words of the authors gleaned over many years from many customers , printers and our competitors. We are pleased that considerable competition has

finally shown up in this market any good technology or good business will have at least 5 good companies . we are pleased to be in such company and to have started the concepts and brought them to the fast moving Printing Industry and to Documents.

## 5.0 Footnotes

**Forensic:** - relating to or denoting the application of scientific methods and techniques to the investigation of crime.

**Printing Press:** Gutenberg 1468

**Unique Identifier Code;** With reference to a given set of objects, a unique identifier (UID) is any code allocated by choice which are forced to be unique by keeping a central registry.

**Example GS1** - an industry standard for new Pharma pedigree laws. Many other common QR code applications International Barcode code definitions.

**Transparency** .(business): .. a “lack of hidden agendas or conditions, accompanied by the availability of full information required for collaboration, cooperation, and collective decision making.”

**Barcodes:** Barcodes are symbols that can be scanned electronically using laser or camera-based systems. They are used to encode information such as product numbers.

**Taggant:** elements for tagging of marks or objects to separate 'Originals' from 'Copies'. Overt change color; Covert , not readily observable; Forensic , crime lab needed.

**Track and Trace;** Read store and update information by item for its full lifetime. Networked digital system.

**Network :** The internet and digital connections through the high speed ethernet - the upcoming Internet of Things.

**Blockchain:** the technology behind virtual money. Now being used as the best of breed for secure data storage.

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