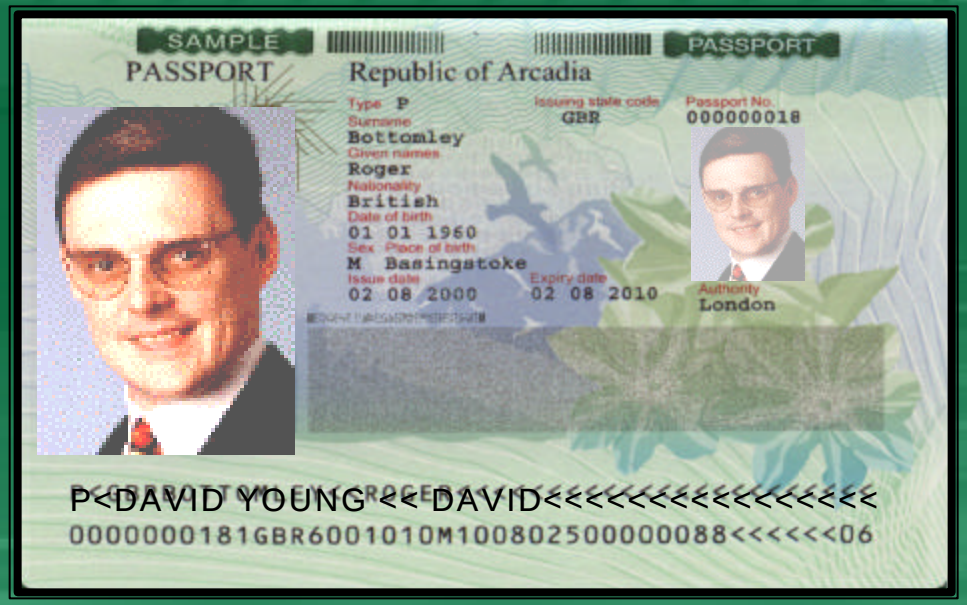
David Young
Director of Marketing & Technology

DeLaRue

Ultra-High Density Barcodes

DeLaRue



or… Full 1:1 Biometrics and Portrait without Chips or Networks

Credentials: De La Who? …

A world-wide trusted partner of governments and global companies.

…and more locally too:

- **100 years in the USA**
- **Almost 1,000 U.S. Employees**
- **Products and Services to 38 of top 50 Banks**
- **Bank of America's "Vendor of the Year"**

…and in directly relevant areas:

- **New York State Driver's License**
- **Portals™ paper to DMVs - vehicle titles for 35 states**
- **Mexico Passport Issuing System**
- **Chile Identity Card & Passport**
- **100 other Passport, ID Card & License projects.**

Today

- Secure Cards & Documents
- The need for On-Board Data Storage
- Technology Options
- Pros/Cons of different technologies
- An Introduction to Ultra High Density Barcodes
- Applications of UHDB

Characteristics of SECURE cards

- Typically Government-Issued to provide service or access rights
- Tens of Millions of holders, Issued for decades, Valid for years
- Balancing Security, Convenience and Cost
- Security in the Card, the Process and the System
- Durable and Resistant to Tampering, Replication, Emulation and Fraudulent issue.
- Overt, Covert, Forensic and Data-Carrying Features

Security Features

- **Overt :**

  To Deter.

Example:
Mouse &
Credit Card
Holograms

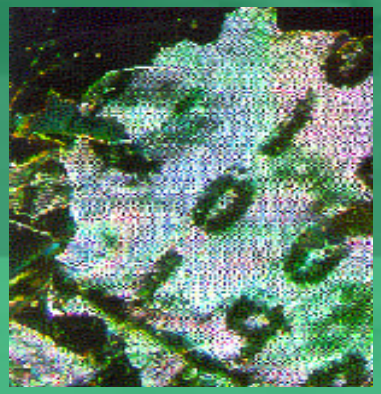
- **Covert :**

  To Detect.

Example:
Handheld Laser
Verifiers

- **Forensic :**

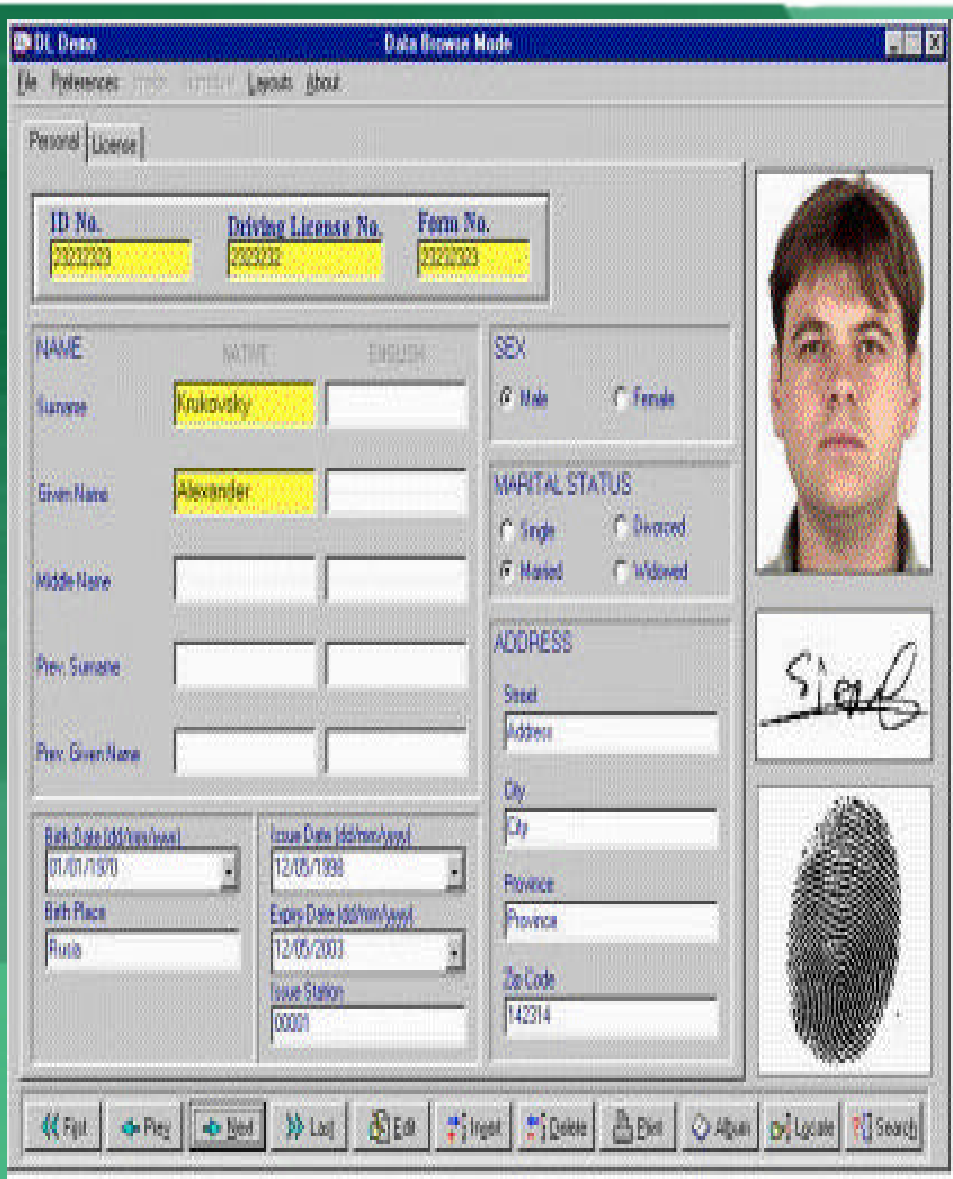
  To Detain.



Example:
Coded Polymer
Particles and
DNA Taggants

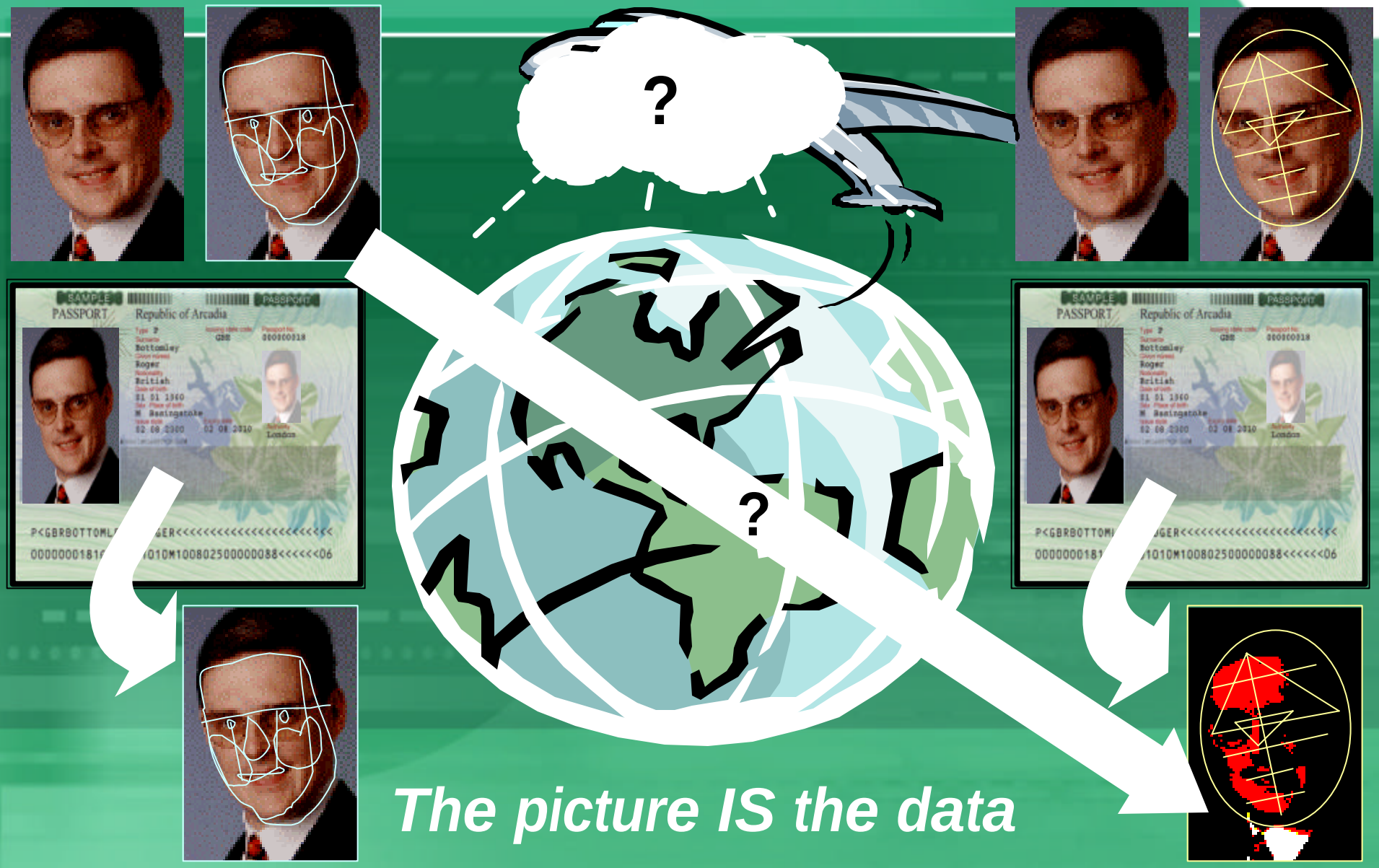
The need for *Data* on the Card

- 1st Line Verification
- 1:1 Biometric Enablement
- Rapid, Local Checks
- Off-Line Operation
- Barrier to Experimentation
- Keys to On-Line Systems
- Links to Enrollment Process



Travel Card/Passport Reciprocity = Lowest Common Denominator

DeLaRue



The picture IS the data

Implications on Data Storage Requirements

Photograph Storage Requirements

High Quality	12,000 – 20,000 Bytes
Fair Quality	5,000 – 12,000 Bytes
Poor Quality	500 – 5,000 Bytes

Signature Requirements

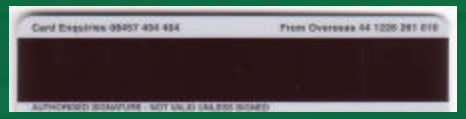
Good Quality	5,000 – 10,000 Bytes
Fair Quality	3,000 – 5,000 Bytes
Poor Quality	500 – 3,000 Bytes

Typical Data Storage Requirements

	Minimum	Most Likely
Biometrics Template	150	512 Bytes
Personal Data	300	800 Bytes
Photo	700	< 12,000 Bytes
Signature	700	c.3,000 Bytes
Security	400	400 Bytes
LDS overhead (EST)	200	400 Bytes
Total	>2,450	6k – 16k Bytes

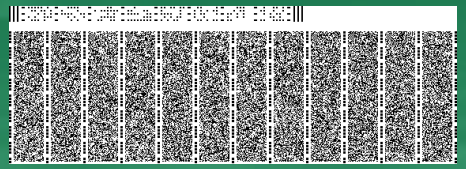
Card Data Storage Technologies

50 Bytes per Square Inch



70 Bytes per Square Inch

250 Bytes per Square Inch



» 8,000 Bytes per Square Inch

» 500,000 Bytes per Square Inch

≈10 – 100 Million Bytes per Square Inch
(State of art = 1Mb)

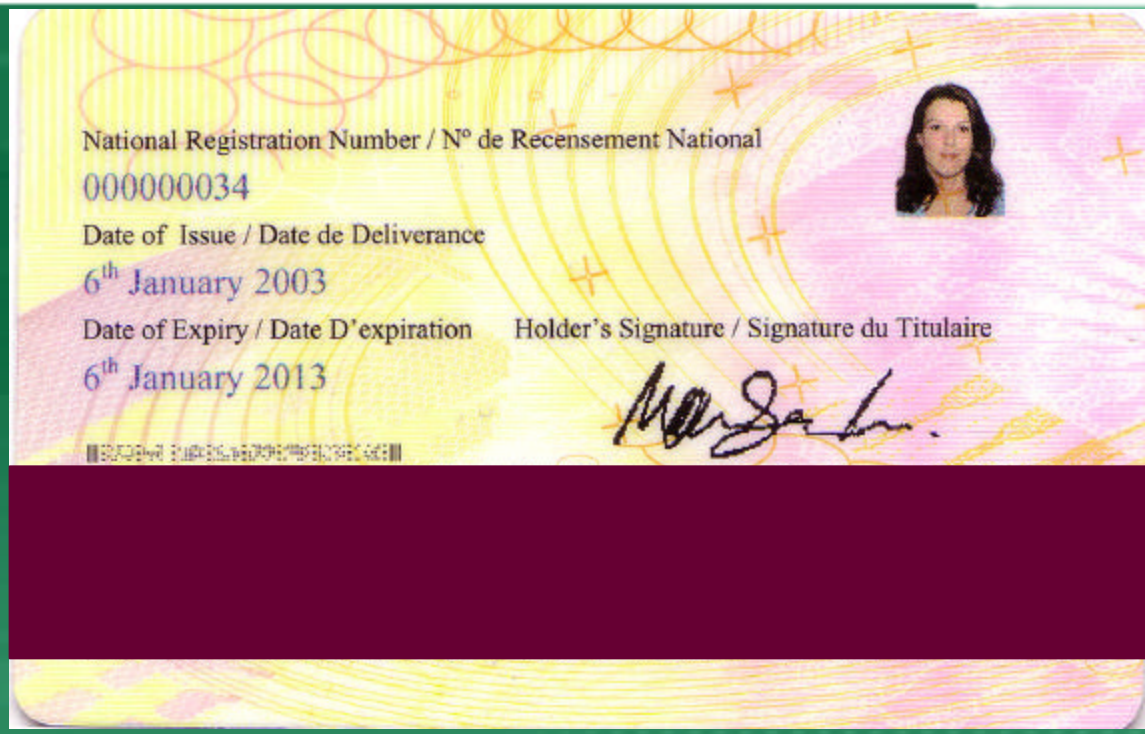
Take another look at printed storage…

Advantages and Disadvantages of Typical Storage Technologies

X ? $

Magnetic Stripe

- Well Proven Track Record
- Very Inexpensive
- Well Established Standards
- Low Security from Copies
- Infrastructure In Place
- Readers Cheap
- Memory Capacity <1k
- Questionable Long Term (>3 years) Durability



Capacity X

Durability X

Smart or Chip-Based Storage

- Unproven Track Record
- Expensive / Very Expensive (Processor)
- A Variety of Memory Types supported
- High Security Possible
- On card processing possible
- Long Term (>3 years) Durability an Issue
- Long Term Chip security a serious issue
- Infrastructure Requirement – Very High
- Full Read / Write capability
- Readers Cheap
- Memory Capacity 8K - 1,000K+

Durability ?

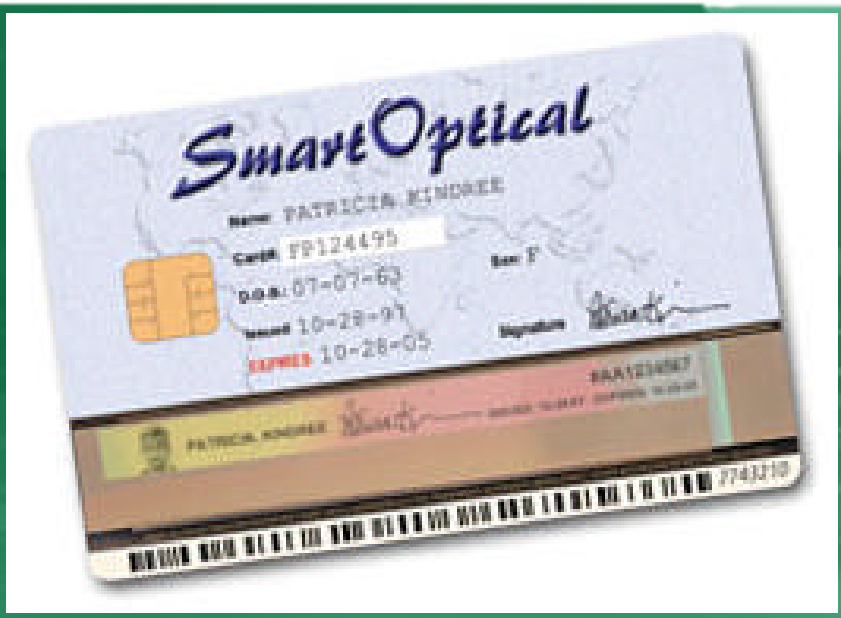
Warranty ?

Infrastructure X

Optical Memory Card

DeLaRue

- Largely Unproven Track Record
- Expensive
- High Security Possible
- Pouch to Carry Card (Durability ?)
- Infrastructure Requirement – Very High
- Write Many / Read Many
- Expensive Read / Write Devices
- Memory Capacity 1.1 MB (Formatted)
- Only Proven on Polycarbonate Base Material



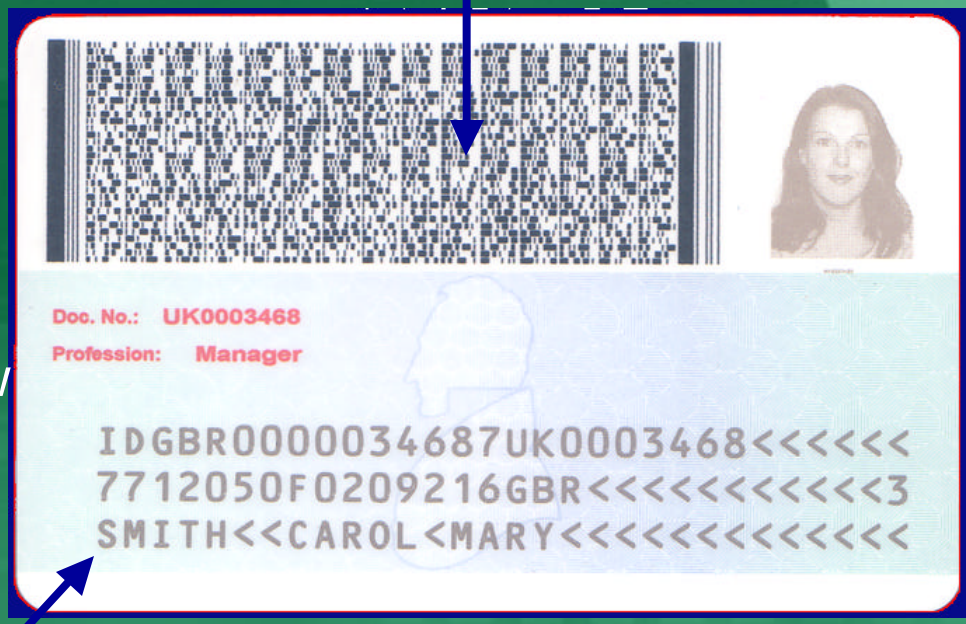
Proprietary ?
R/W Devices $
Infrastructure X

Normal Density PDF417 Barcodes

DeLaRue

- Proven Track Record
- Very Low Cost
- Some Security Possible
- Durability Good
- Infrastructure Requirement – Very Low
- Write Once Read Many
- Readers Expensive
- Memory Capacity 0K - 2K

PDF 417 **Minutiae from 2 Fingerprints**



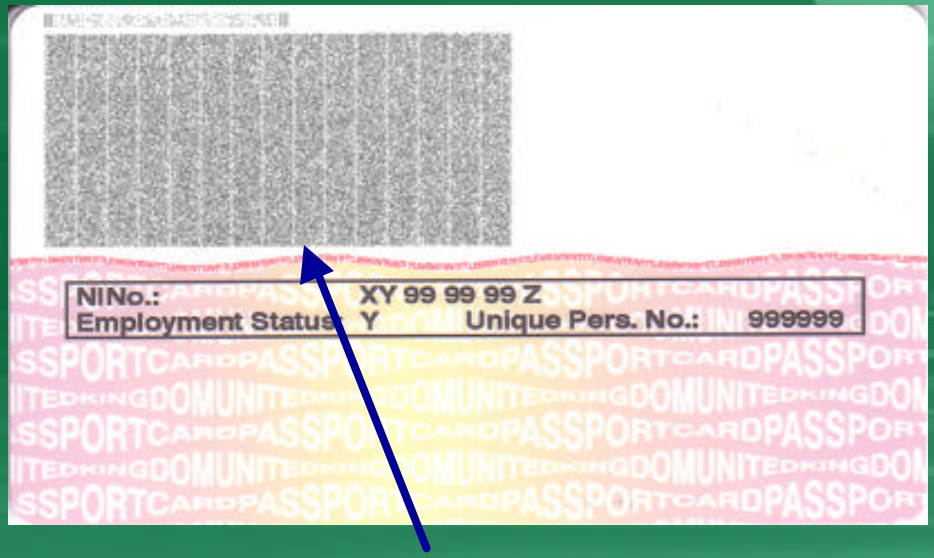
OCR B Codelines with 90 Bytes of Data

Capacity *X*

Readers *$*

Ultra High Density PDB™ Barcodes

Unproven Track Record
Low Cost
Fairly High Security Possible
Durability Good
Write Once / Read Many
Readers Very Cheap
Infrastructure - Very Low
Memory Capacity 2K – 32K



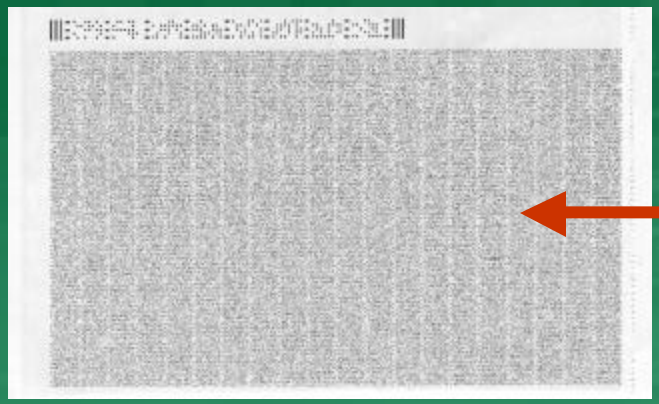
6,000 Bytes of Data

Flexible Printers and Substrates

PDF 417

400 Bytes Inkjet

2 X 6,000 Bytes Laser



17,000 Bytes Laser

Toner

4 X 1,500 Bytes Laser

12,000 Bytes Inkjet

Standard Optical Scanners

Smaller, Portable, Heavy-Duty, Faster high resolution scanners are under development

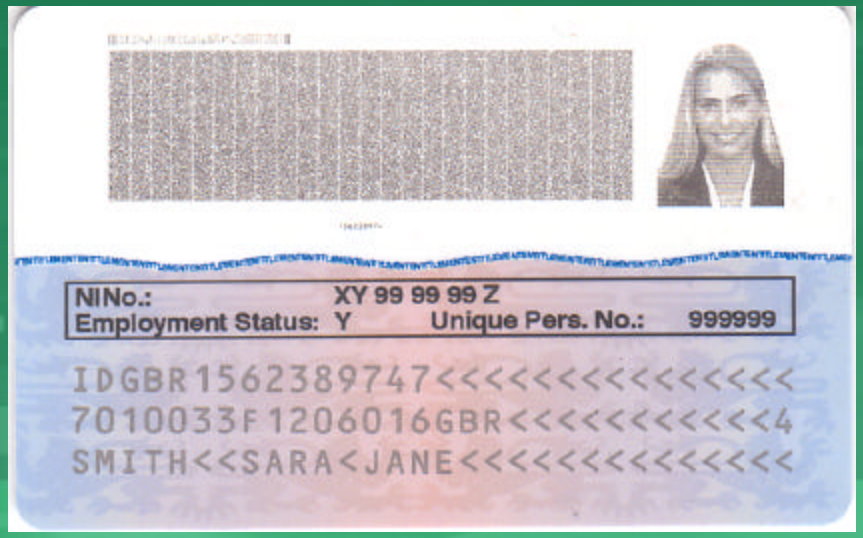
Cheap $100 Dollar scanners can read PDB™

Variable Size & Write/Read Resolution

DeLaRue

Micro Code with 127 Bytes

Travel Card with 8,000 Bytes

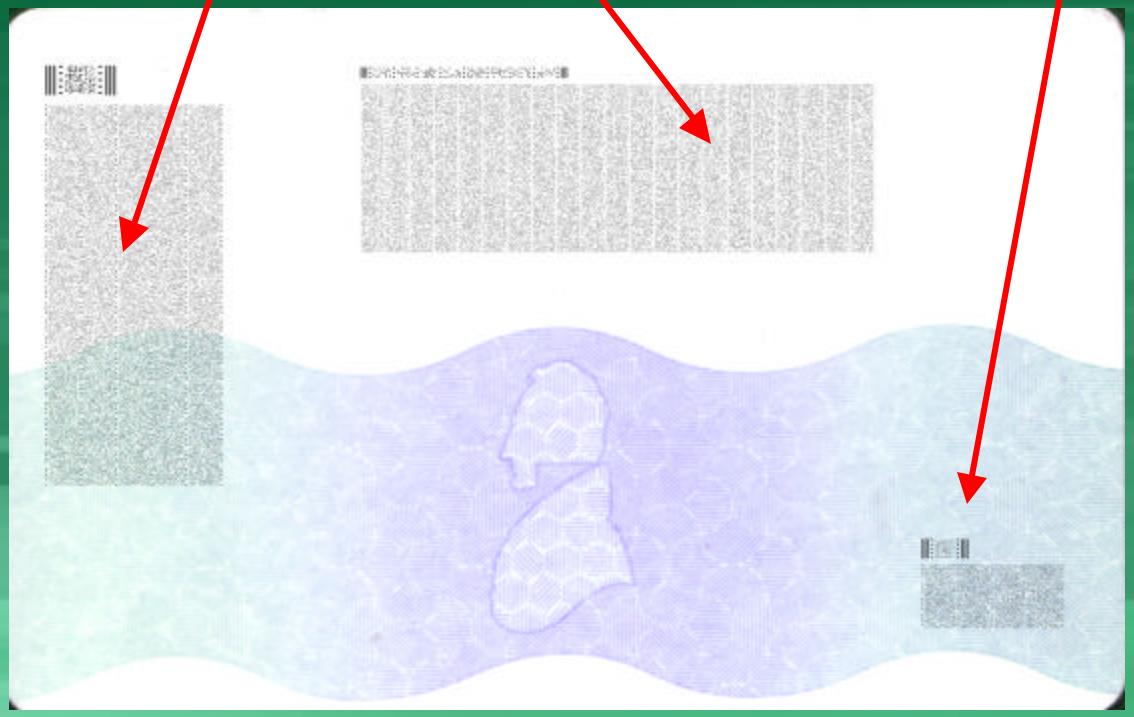


40,000 Bytes with Picture of ID Card in it

Variable Shape and Aspect Ratio

These two codes have the same data in them but have been produced at totally different sizes, without problem.

This code again has a different size, aspect ratio and resolution

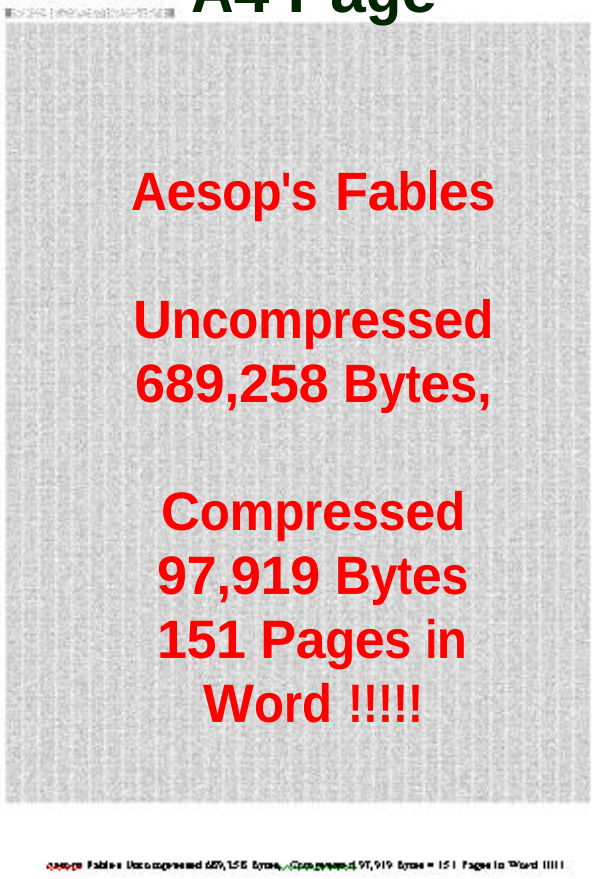


All can be scanned & decoded in a singe pass

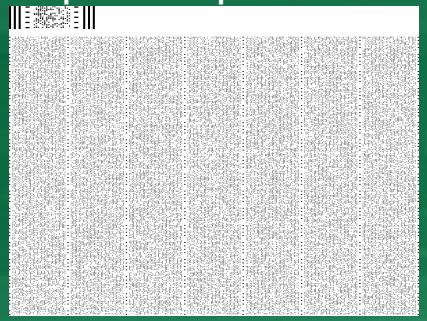
Effective Data Compression

DeLaRue

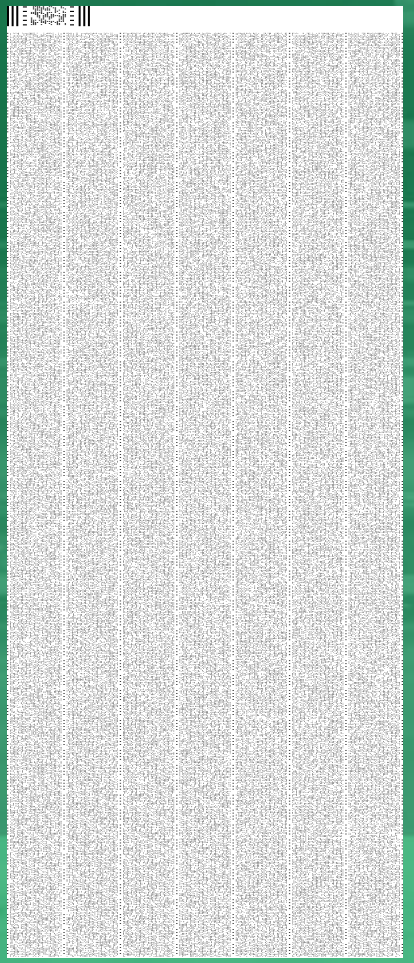
A4 Page



Compression Option Enabled



Compression Option Disabled



PDB™ SDK has Inbuilt Data Compression and User-Defined Redundancy

Used in combination with other codes

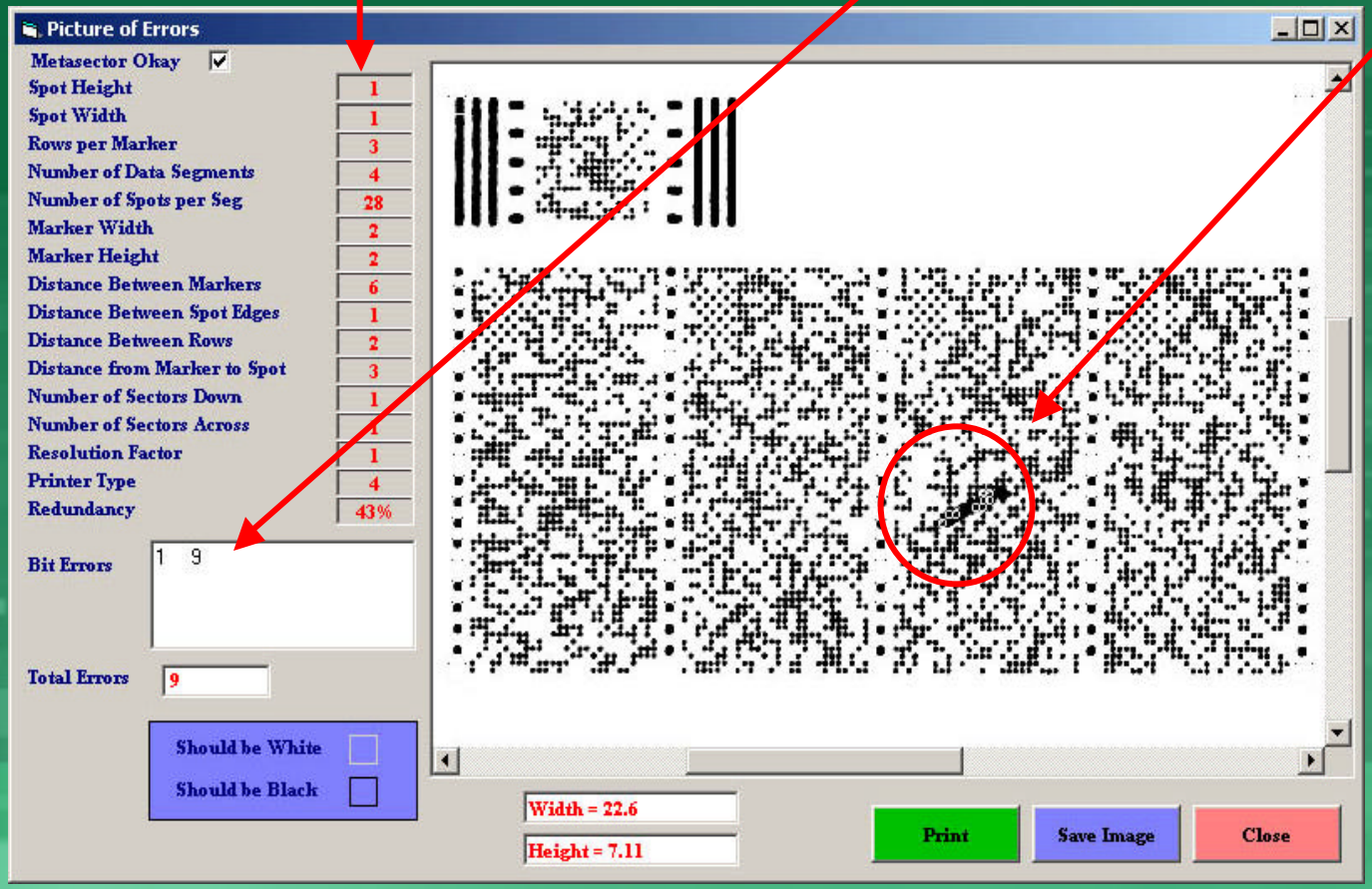
Because high resolution scanners are used to read PDB™ 16 other barcodes can be read at the same time by incorporating their respective decode algorithms

PDB™ – Quality Assurance

Other diagnostic information here

Total Number of errors in each Sector(1) is shown here

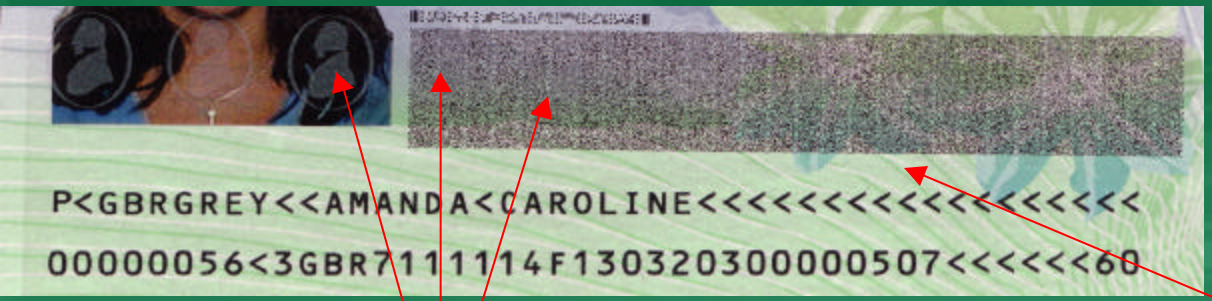
Actual Individual Errors are shown here



Anti-copy & Anti-Tamper Security: Under-Printing and Laminates

DeLaRue

Sophisticated diagnostic tools make it possible to combine the code, in secure ways, with other features

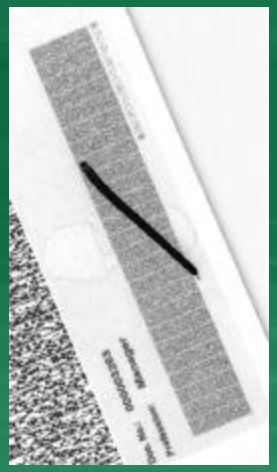


Security Printing runs under the code that contains over 6,000 bytes of data

This Pearlescent feature is present over the barcode as well as the photo.

PDB™ – Angles & Orientation

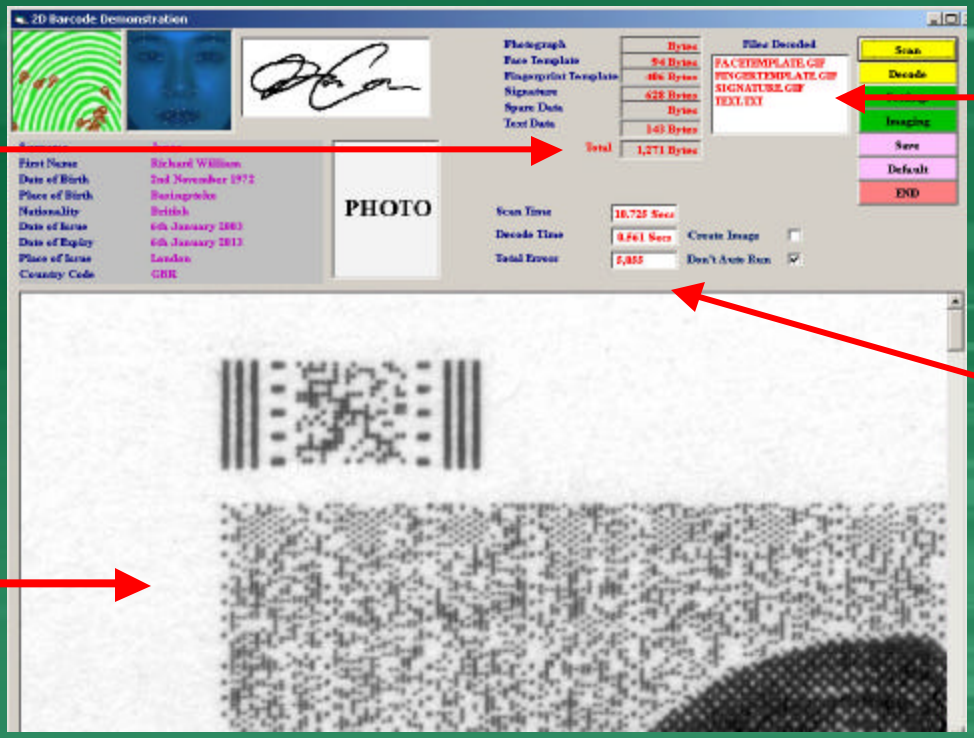
PDB™ can be read at different orientations



It can be read at different angles, even though damaged

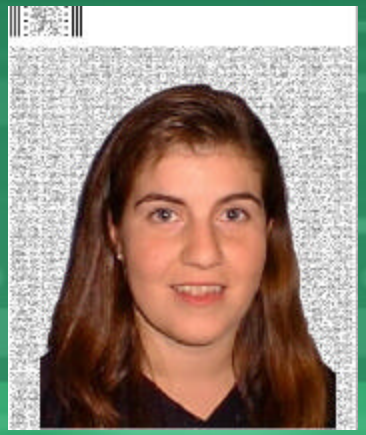
Ongoing Developments

Total amount of data decoded



Files decoded from Barcode

Errors detected in Barcode



Part of the original scanned image converted to grayscale for decoding.

Signature Panel with Biometric Data

A Simple ID Card that appears to have no data or security at all...

DeLaRue

This $1 PDB Card…

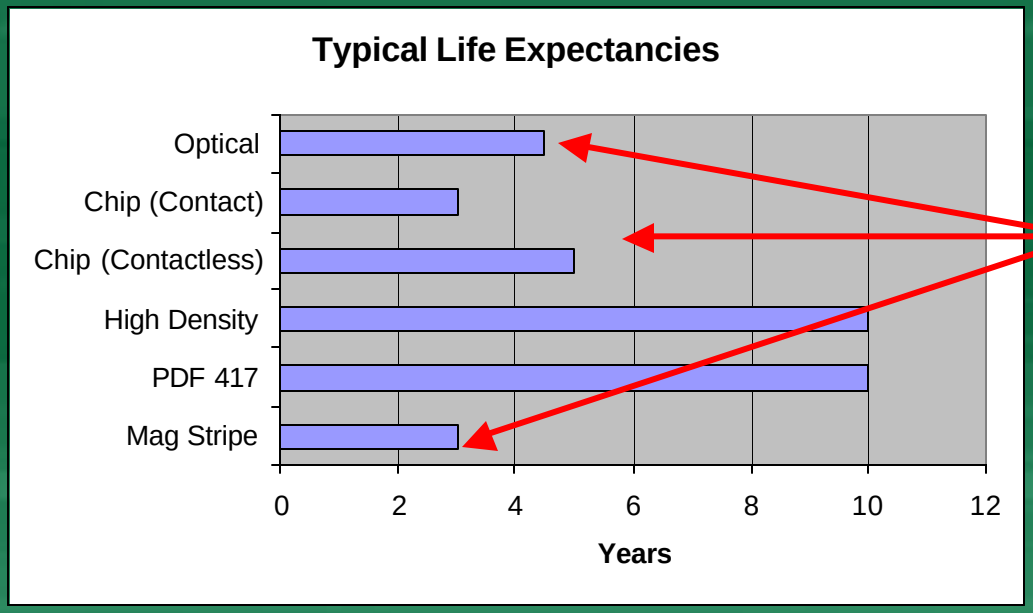
..contains 6k of encrypted data,
self-authenticating portrait & signatures,
digital PKI signatures and acres of real-estate
for your state/national branding and other security features.

In the Lab…Nano Density Codes…

Not quite IBM on an atom but…

Laser-Etched at 2,400 dpi
= 64k on 1/3 area of a
ISO Standard Credit Card

Application Areas:
UHDBC – A Backup to Other Technologies



Backing up critical chip data on PDB™ can provide extended life and security to other technology solutions

Critical Chip Data backed up in PDB™ 16 Barcode

ICAO – Compliant Visas/Passports with 'Patriot-Act' Biometric Storage

May 2003: ICAO Recommended 32k RFID chip and Facial Biometric

A UHDB can be used to provide cross-checks and backup.

May even survive the immigration officer's big chrome stamper!

Production Trial Examples

DeLaRue

Laser Printed Card with 6,000 Bytes

Inkjet Dye Sublimation Card 3,000 Bytes

Inkjet Produced Visa with PDB™ 16 with 6,000 Bytes

Laser Engraved Card with 6,000 Bytes

Cost Effectiveness Analysis

DeLaRue

	Weighting	Magnetic Strip	PDF 417	PDB™ 16	Contact Chip	Contactless Chip	Optical Memory
Cost	4	4	5	4	1	1	2
Capacity	3	0	1	3	5	5	4
Durability	3	1	3	4	1	3	2
Security	3	1	2	3	4	4	4
Infrastructure	4	3	3	2	1	1	1
Weighted Total		34	50	54	38	44	42

Printed Storage. It’s never too late…

De La Rue - Security Integrity & Trust

DeLaRue

Thank you for listening.

We hope you found it useful.

David Young,
Director of Marketing
De La Rue

Give me your card or details now for an Evaluation Pack

Or mail me on david.young@uk.delarue.com

Or visit www.delarue.com