



NORTHERN IRELAND  
PRISON SERVICE



# Biometrics

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The views expressed are those of the individual and do not necessarily represent the views of the NI Prison Service

# Defining Biometrics

Biometrics is the technology used to identify people based on their biological characteristics. There are two main types of authentication :

**Physiological** - e.g. Hand, Face, Fingerprint, Iris

**Behavioural** - e.g. Signature, Voice



Ear



Iris



Odour



Fingerprint



Heart Murmur



Tongue



Hand



Vein



DNA



Face



Signature



Voice

# Types of Technologies

- Hand Geometry
- Fingerprint Recognition
- Vein Recognition
- Facial Recognition
- Iris Scan



# Two factor Authentication

To improve the security of biometric systems they are often paired with a secondary authentication method which is incorporated alongside the primary identification method.

- Token / Card



- PIN Number



- Card
- Card & PIN
- Card & scrambled PIN

# Types of Authentication

## Verification

**Are you who you say you are?**

Compares the claimed identity against an authenticated enrolled identity

Comparison

**All** devices can do this

## Identification

**Who is the individual ?**

Database of enrolled individuals

Searches whole database and establishes identity of a person from a set of enrolled people

**Not all** devices can do this

# Biometric Verification

## Process of Enrolment

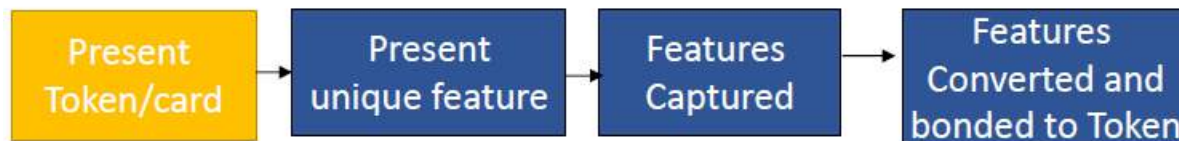
*Process of adding your biometric template to the biometric device*



No Match!

## Process of Verification

*Are you who you say you are?*



=



Match!

# Enrolment

- Users identity bound with the biometric template
- Data collection and feature extraction
- Biometric template is stored in a database or an appropriate token (e.g. smart card)

The screenshot displays a biometric enrolment software interface. The main window is titled 'Record 1 of 5' and 'Browse Mode'. It contains several sections for data entry:

- Personal Details:** Surname (SURNAME), Forename (FORENAME), Address, Postcode, Date of Birth, Gender (Male), Email.
- Employment Details:** Company (CEM - CEM), Department, Job Title, Payroll Number.
- Card Details:** Card Format (cf144), Access Level (Level1), Timezone (ALL THE TIME), Start Date (10/25/2016), Expiry Date (10/24/2017), Card Status (Current).
- System Information:** Serial (1), Site (Home site), Partition (XXXX), BIO Captured (Yes), Added By (cem), Creation Date (10/25/2016), Park Exemption (Not Exempt), Exempt Until.
- Usage:** Referred (Limited Usage), Permit (Extra Access), Traced (Parked).

A 'Capture Biometrics' dialog box is open in the center, showing two captured fingerprints: 'First Finger' and 'Second Finger'. Below the fingerprints are 'Accept' and 'Cancel' buttons. The main window also includes a 'TestPage' button and a 'Capture Date' field. A small portrait photo of a man is visible in the bottom right corner of the main window.

# Northern Ireland Prisons

2012 Biometric Verification System

## **P R I S M** Prisoner **R**ecords **I**nformation **S**ystem**M**

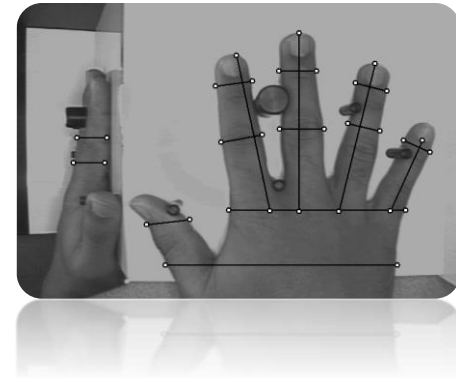
- All prisoners enrol onto the system at the point they first enter the prison (Reception)  
All digits are scanned (4 fingers and a thumb on both hands)
- Once enrolled prisoners only use a single finger to verify their identity
- Prisoners - Used to verify prisoners at Pharmacy (also supervised swallows) or to attend their Visit
- Prison Visits – Enrolled using a single finger and Speeds access to Visits by avoiding traditional Forms and Identity Document checks.





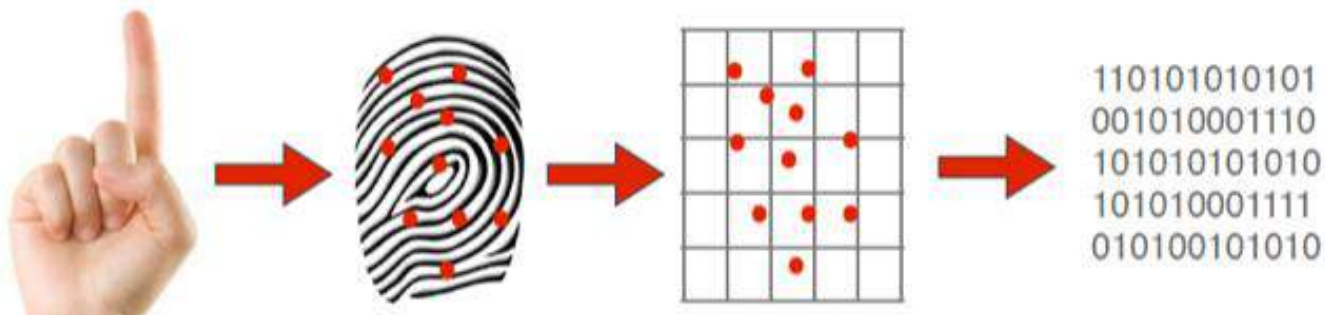
# Hand Geometry

- Fast and intuitive Enrolment and verification time
- Involves the measurement and shape of an individuals hand
- Accepted by end Users as there are no fingerprints or palm prints taken and user does not leave any biometric trace of their biometric data



# Fingerprint Recognition

- Actual fingerprint is not stored
- Uses the ridge edges and bifurcations on a persons finger to plot points known as Minutiae
- Uses 1:1 fingerprint match



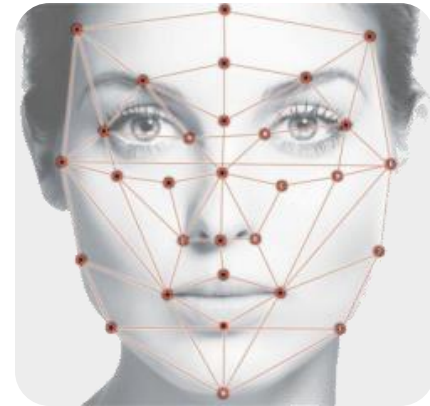
# Vein Recognition

- Difficult to forge as the biometric is under the skin
- Accurate as vein has a high tolerance to skin changes
- Can be used as either a 1:1 or a 1:N match
- Palm Vein reader now been released



# Facial Recognition

- Real-time 3-D imaging using invisible light
- Early 2-D devices were easy to fool, pose and expression needs to be consistent but the technology continues to develop
- Height of reader can be an issue
- Really only suitable for indoor use as direct sunlight can reduce effectiveness



# Iris Recognition

- Iris is the most visible, coloured part of the eye, the patterns of striation and colour variation are unique to the individual
- Very accurate biometric using high resolution face capture cameras
- Height of reader can be an issue
- Really only suitable for indoor use as direct sunlight can reduce effectiveness



# Morpho Wave – Hand

- World's first biometric access solution capturing and matching four fingerprints with a single hand movement
- Supports 1:N fingerprint identification
- Robust against external light
- 100% touchless



# Summary of Technologies

- Hand Geometry



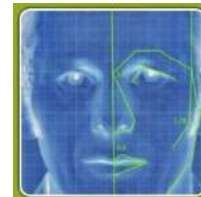
- Fingerprint Recognition



- Vein Recognition



- Facial Recognition



- Iris Scan



# Global Trend

Deloitte Global predicts that the active base of fingerprint reader-equipped devices will top

**1 billion**  
for the first time  
in early 2017

**90% of devices** will be: smartphones and tablets

Each active sensor will be used an average of

**30 times a day**

**over 10 trillion** times a year

**Catalyst** for the deployment of biometric sensors in other environments and across multiple industries including:



retail



financial institutions



government



schools



media companies



many more



# Questions





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# IP (Internet Protocol) Systems within Prison

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# What has Changed?

- Manufacturers of security equipment (CCTV, Alarms, Intercoms) are looking to embrace new technologies and increase the functionality of their devices
- IP (Internet Protocol) has the capability to allow devices to be accessed and operated from anywhere you can gain an internet connection ! (even your own home)
- Investment is no longer in the established 'analogue' systems – for the time being these continue to be supported and spares can still be sourced but this is likely to decrease as manufacturers develop new IP solutions
- Currently an evolving market !

Its about progress

Moving from this....

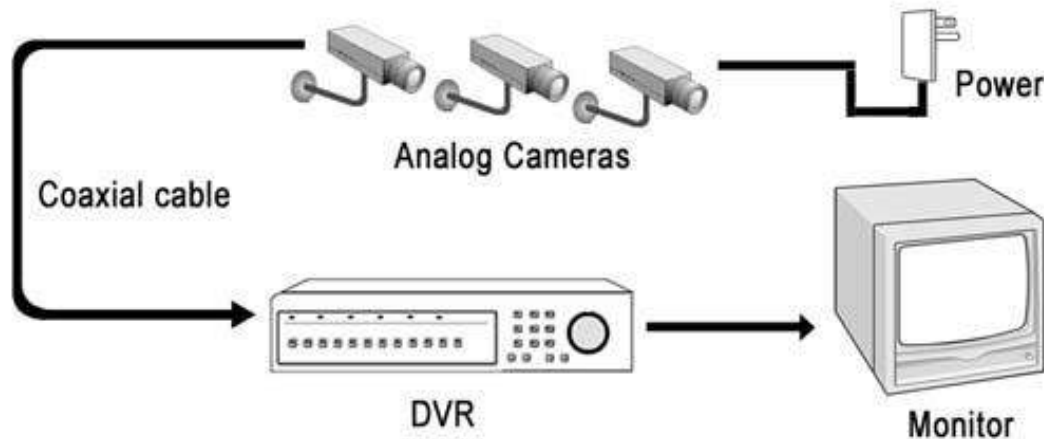


to this!



# The Analogue System

- Technology developed in the 1960's
- Steady, reliable but with large amounts of cables!
- Single Function Devices (a camera shows an image)
- CCTV image quality offers limited resolution and old screen ratio
- Closed circuits (secure) as every device needs to be cabled back to a central control point (can be 100's of metres)

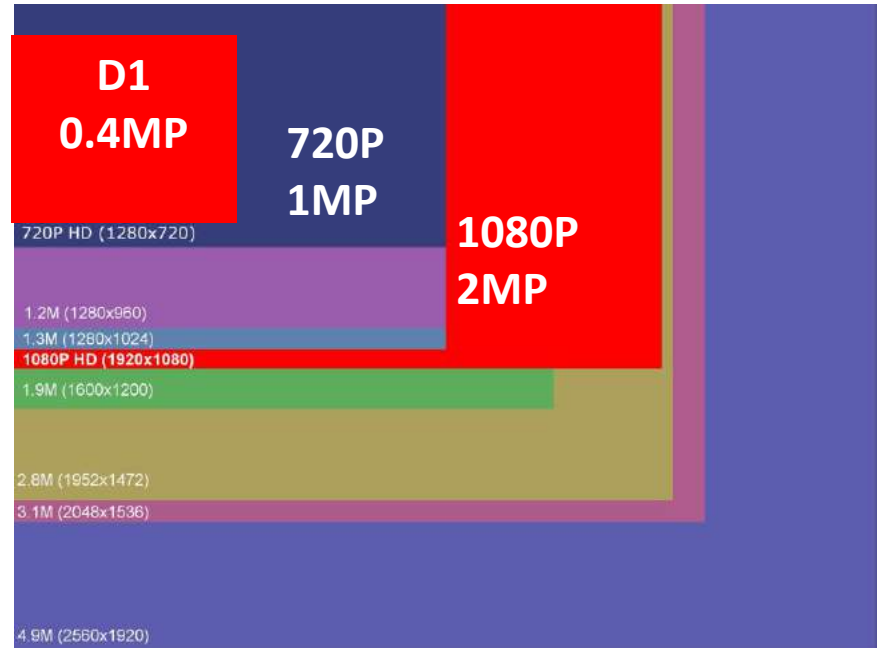


# What does IP Offer?

- Functionality
- Operability
- Improved Image quality
- Less Cabling – lower install costs
- No longer 'Closed' circuits - Need to take additional Precautions

# Image Quality

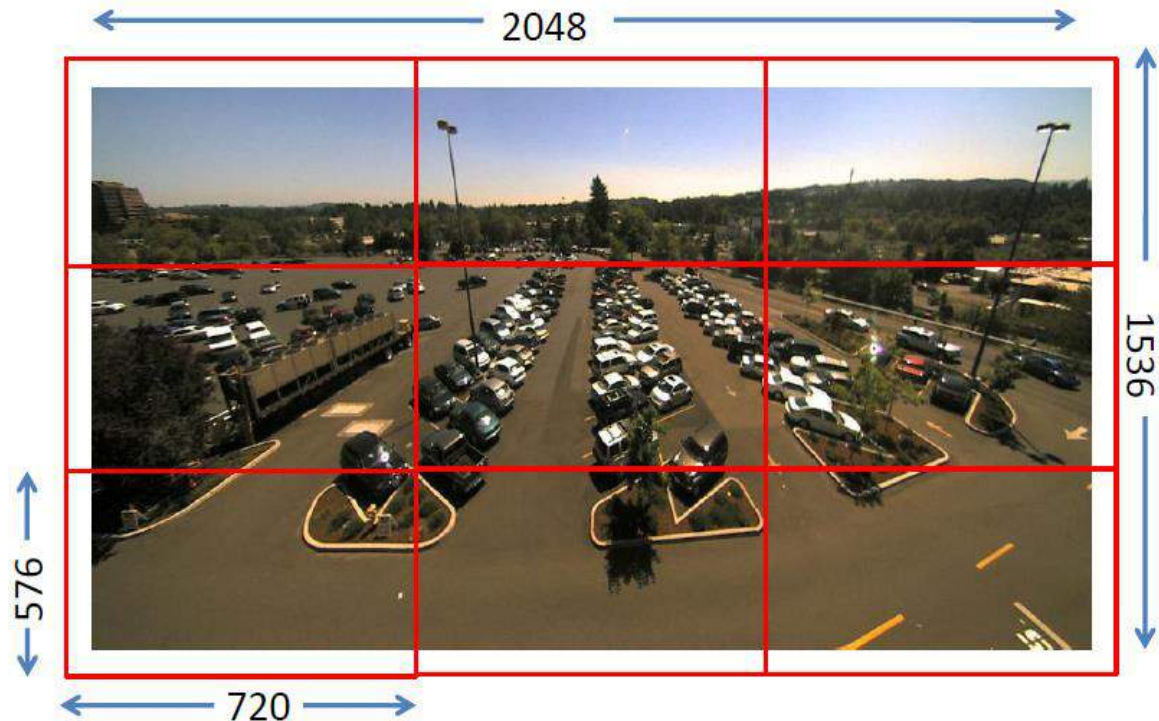
- Maximum recorded resolution from an analogue video signal is 0.4MP
- Improved Screen ratios (analogue is limited to 4:3 but IP can be adjusted to suit a range of ratios)
- Be Careful – the higher the resolution the higher the storage requirements – (e.g. 10 cameras on 30 day recording typically require 25,000 GB of storage)
- Low light conditions (lower pixel cameras perform better in low light)



# Image Resolution

**IP Cameras have a much higher Image resolution than analogue**

- IP Cameras provide the option to cover larger areas with fewer cameras than analogue
- A 2MP 1080P IP camera can cover the same detail as six analogue cameras (at equal levels of quality)



In this example if one Camera is used the useable digital zoom capability will be less due to the lower pixel density

# Cabling – IP System

Cat 5,6,7 (Copper)

100 m

+ 'switch'



Fibre

(used to link switches)

10,000 km



# Cabling - Analogue System

Coaxial

+ separate local power connection

1,000 m





# Key Ingredients of IP Operation

- **Switches**

IP Devices are linked to **Switches** (24 or 48 Devices per switch)



- **IP Address for each Device**

Every IP device must have its own unique IP Address

- **Power over Ethernet (PoE)**

A single cable can now link to the device and also provide power to operate it (reducing need for separate power cables)

- **Power Back-up Considerations / UPS**

# Summary of Key Differences

## Analogue v IP

Consideration	Analogue	IP
Functionality of Devices	Single Function	Multi-function Devices
Cabling	<b>2 Cables per device</b> (Power and connection)	<b>1 Cable per Device</b>
	<b>More cabling</b> (Each device must be separately cabled back to the recorder)	<b>Lower amounts of cabling</b> (Careful Network planning is required separately cabled to a recorder)
Quality of Camera Image	0.4 Mega Pixel	2 Mega Pixel
Signal	<b>Stable</b> (no worries about signal loss)	Bandwidth may reduce stability
Recording	<b>Digital Recording</b> (connected via coax cable from each device to the recorder)	<b>Network Recording</b> (Software based files stored on the Hard drive)
Cyber Security	Closed Network	Need to take careful precautions to ensure it cannot be 'hacked' from outside the network
Management	Advisable to monitor network (network inherently closed)	Critical to have network planning and establish network management

# Cyber Security



**3 out of every 4** organizations have suffered at least one successful *attack* in the past 12 months.

# Cyber Security



**Most IP-based surveillance Cameras use a web interface for setup and control of the camera**

**It is important to secure cameras as you would any network device**

# Prison's - Hybrid Option

(whilst IP technology market matures)

**Consider retaining your existing CCTV infrastructure and moving onto a digital footing**

- Digital HD CCTV cameras (not full IP) run over co-axial cables  
(operate with an analogue network and images can also be viewed on a future IP system – although not full IP)
- Digital Recorders + encoders (converts analogue to digital)

Offers a structured cost effective holding position without the need for full system replacement

Hybrid elements (HD Cameras + Digital Recorders) can be incorporated into future IP solutions

# Prison's – IP Solution

## Operating a Closed IP Network within a Prison

- Upgrade Head End software (IP compatible and backward compatible with analogue)
- Close down Access to the network(s) with no external/ unauthorised connections (ensure there are no bridges to outside networks)
- Switches – lock down the ports on the switches



# Key Ingredients of IP Operation

## **Management of the IP Network should reside inside the Prison Service**

- Control the Register of IP Addresses – each device needs a unique identifier code
- Control Colour Cable Conventions
- Management of Switches (configuration/ spares)
- Centralised Back-up
- Passwords
- Potential Vulnerabilities need to be managed out!

## **Network Planning is Critical**

Has the potential to be easily messed up by inept planning

# Questions

