An Introduction to Biometrics

Julian Ashbourn

In the Beginning

- Did ancient civilisations use biometrics?
  - “Nechutes, son of Asos, aged forty, of middle size, sallow complexion, cheerful countenance, long face with straight nose and a scar upon the middle of his forehead…”

Afterwards

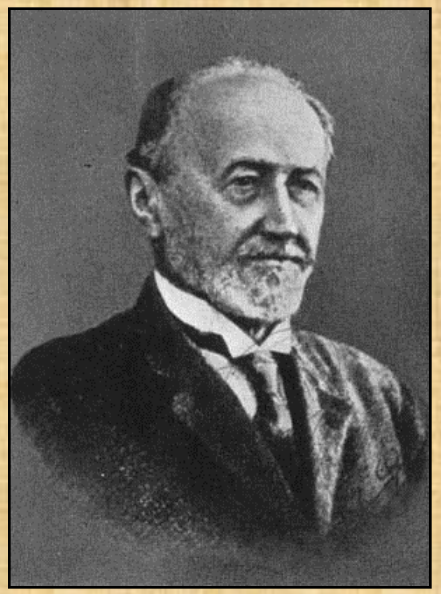
- Alphonse Bertillon 1853-1914
  - A fascination with anatomical measurement within the context of criminology
  - Bertillon developed a complex system of measurements and photography which came to be widely used ~ Anthropometry
  - A pioneer of the criminal mug-shot

Biometrics and Eugenics

- Karl Pearson, statistician and protégé of Galton formed a biometric laboratory at the University of London in 1907
- The journal ‘Biometrika’ becomes influential (particularly in the USA) as the concept of eugenics becomes political
- The Carnegie Institution create the Centre for Genetic Research and in 1910 the Eugenics Record Office founded at Cold Spring Harbor in the USA where ‘intelligence tests’ are initiated
- US psychologist Henry Goddard submits an influential study on the ‘Inheritance of Feeblemindedness’
- By 1931, 27 US states had enacted sterilisation laws
- By 1941, 36,000 individuals in America had been sterilised under these laws
- Germany and Switzerland pick up the thread of ‘eugenics’…..

And Evolves

- Juan Vucetich 1858-1925
  - Developed a system of fingerprint classification based upon Galton's ideas, for the Argentine police
  - First positive identification by fingerprints in a criminal case (Francisca Rojas)
  - System widely adopted by police forces in many countries
  - Galton-Henry system adopted by Scotland Yard



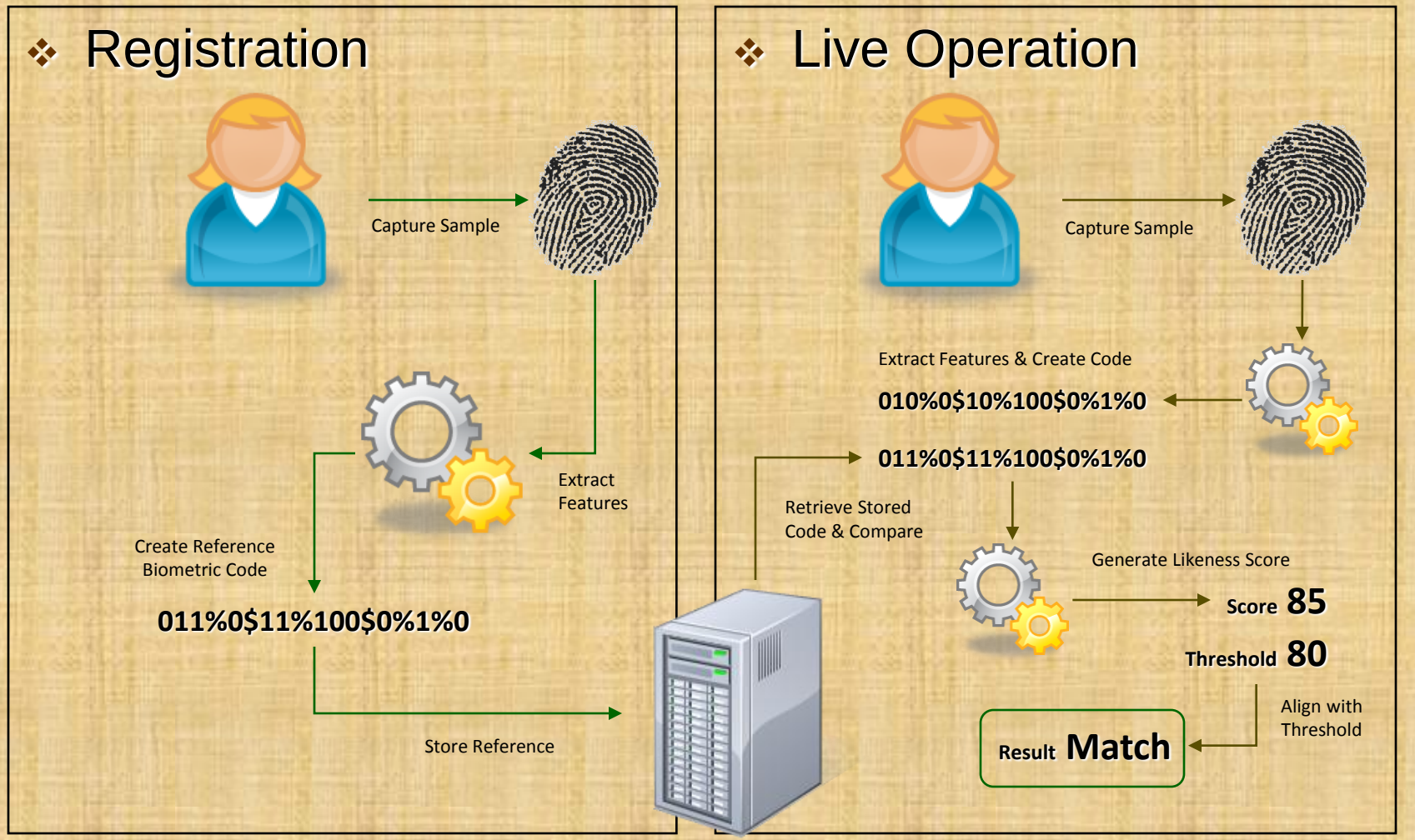
Interim Conclusion

- The idea of using a biometric for identity verification purposes is hardly new
- What has changed is the prospect of automation within the information age

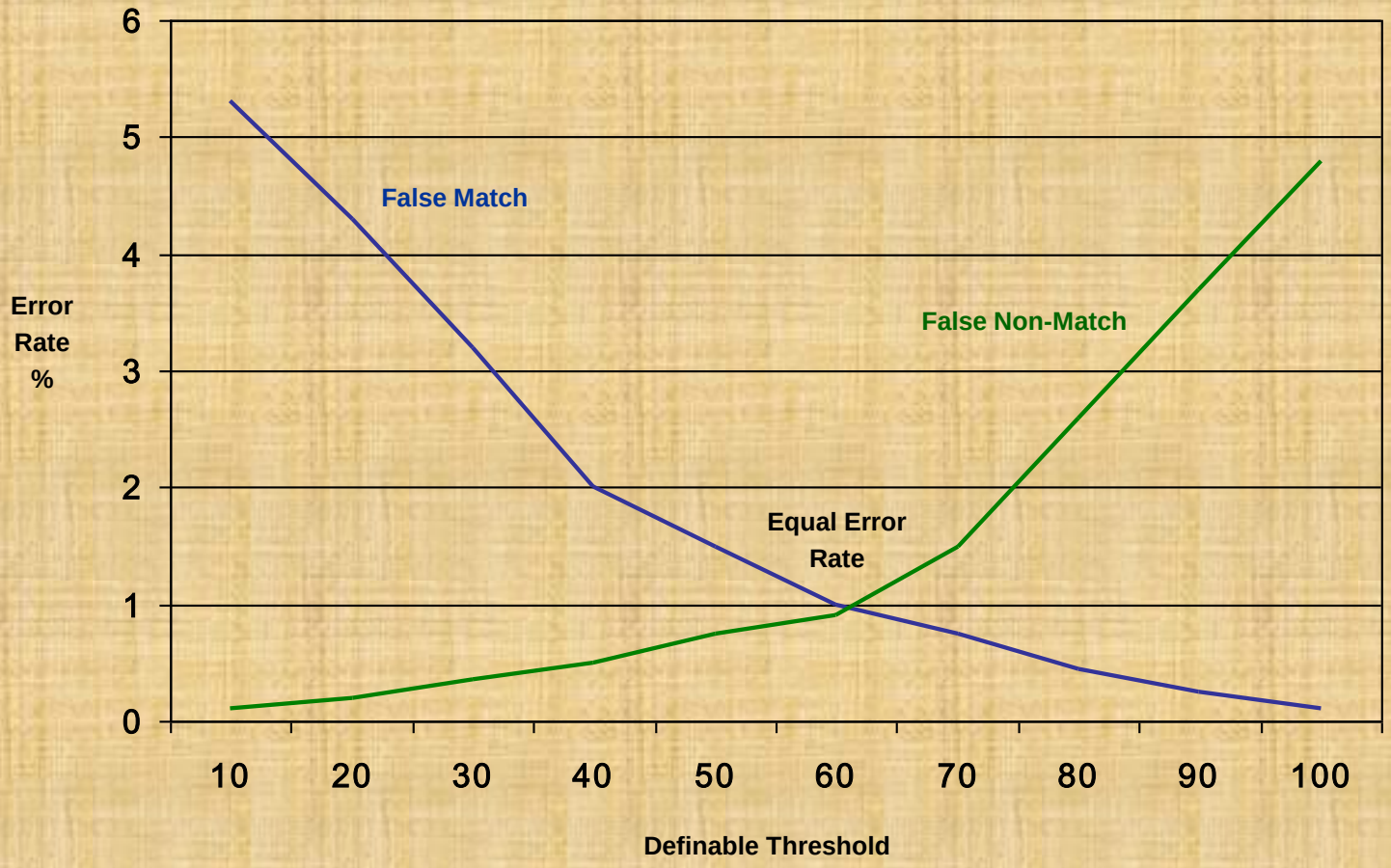
Modern Principles of Operation

- How does it all work?
  - Determine features to be matched
  - Extract features and create biometric reference
  - Extract features from live sample and match against reference creating a ‘statement of likeness’
  - Determine a match or non-match according to the alignment of the statement of likeness against a pre-defined threshold
  - Thresholds may be adjustable in order to manipulate realised performance

In Simple Terms



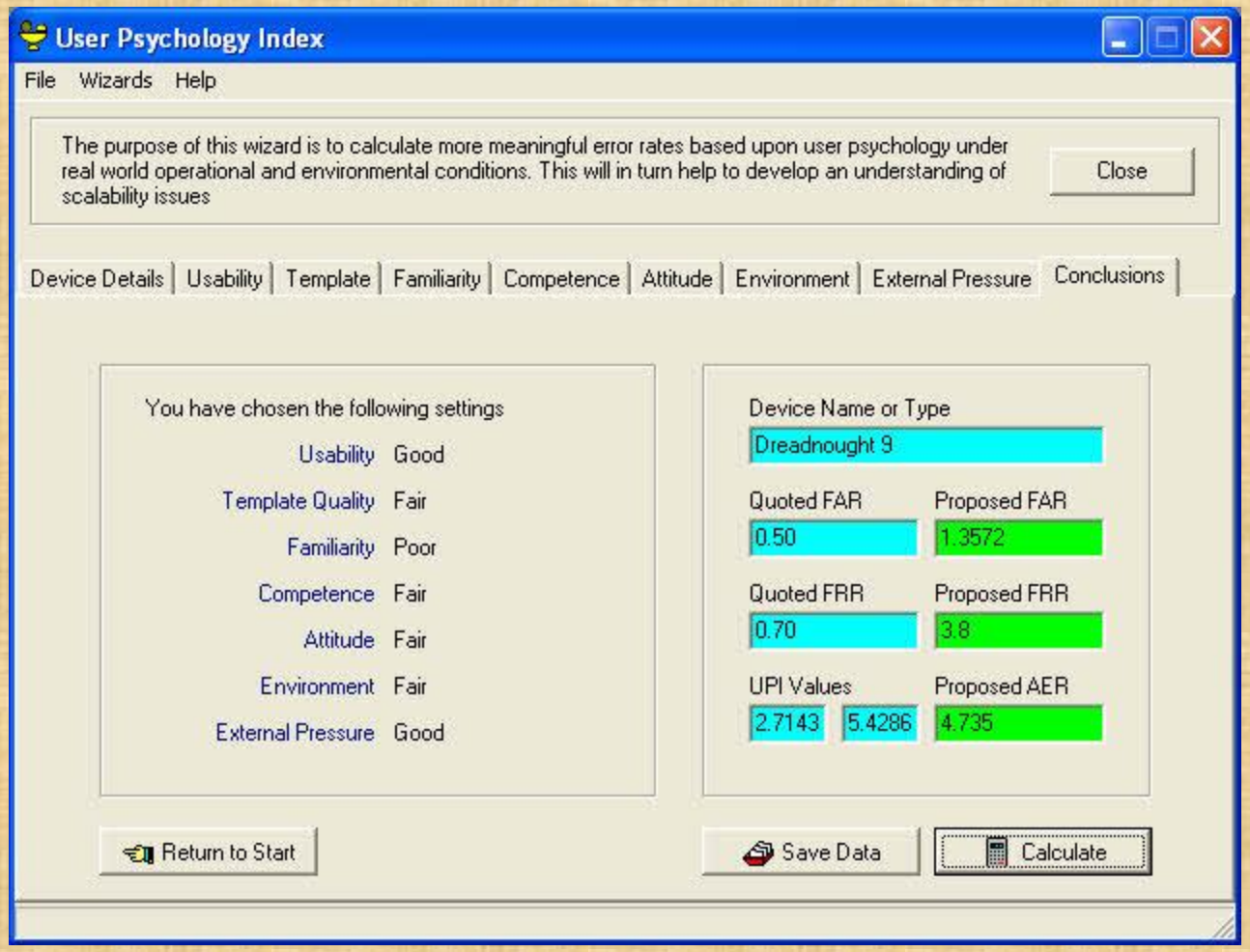
Probability of Errors



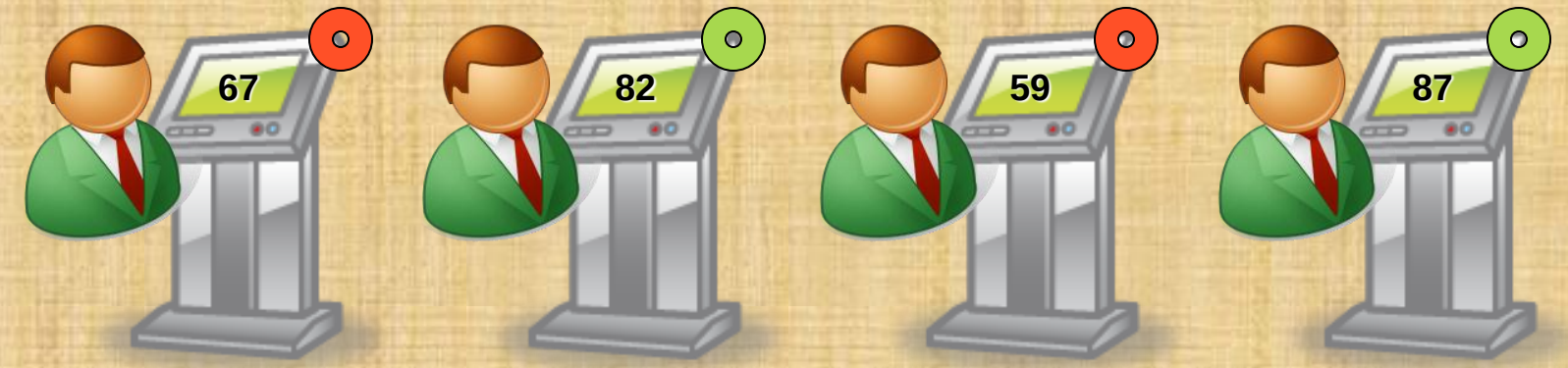
Environmental Factors

- Operational environment
  - Temperature, humidity, available light, noise levels, cleanliness, signage
- Technical environment
  - Network availability, noise, power stability, component performance
- User psychology
  - Habituated or non-habituated user, sympathetic or not to concept, disabilities, confidence, general understanding of technology

Real Performance

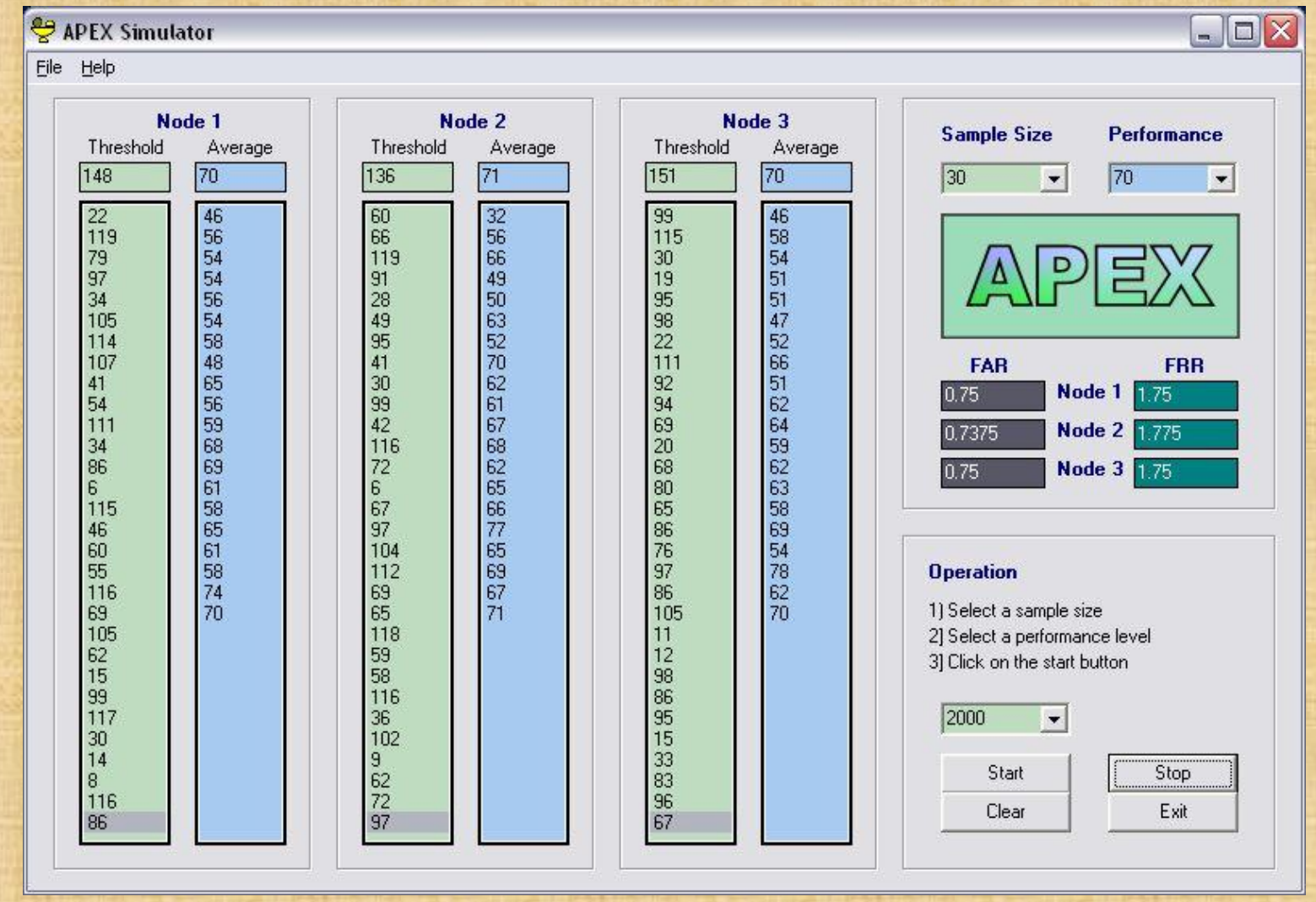


Equivalence of Performance



- Who installed the system?
- Who set the threshold?
- Against what criteria?
- Who is maintaining the system?
- How often is it checked?

Maintaining Equivalence



Interim Conclusion

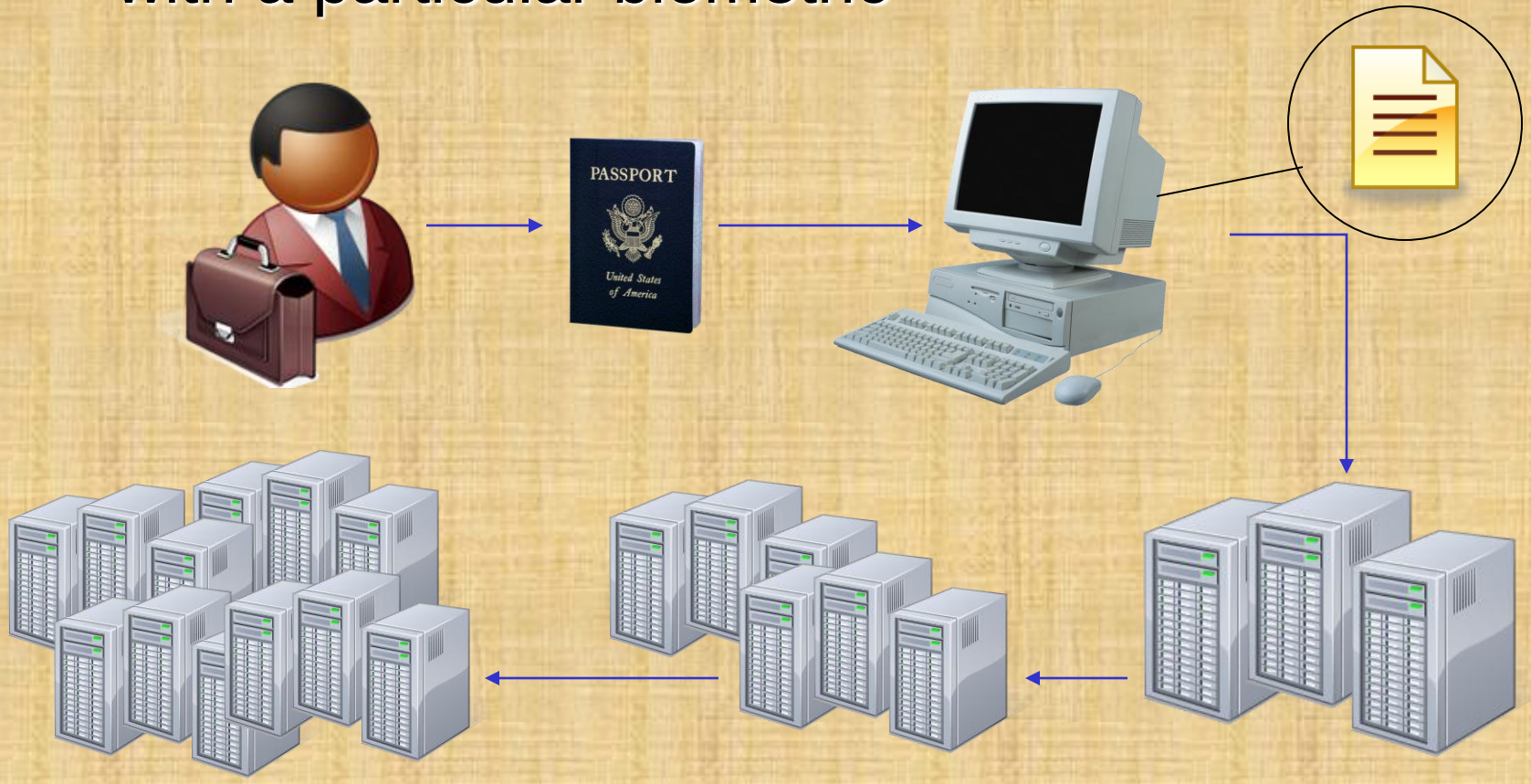
- Biometric matching is not an exact science
- System implementation may be complex
- Understanding performance is important
- True systems integration is potentially complex

Working with Biometrics

- Some fundamentals
  - Under what situations might it be pertinent to undertake a biometric identity verification check?
  - Who does the biometric belong to?
  - Who should decide how it is used?
  - Who has access to data aligned with a biometric?
  - Can a biometric match be repudiated?
  - Should a biometric be used covertly?
  - What assumptions are made around the results of a biometric identity verification transaction?

Information Alignment

- How accurate is the information associated with a particular biometric



Supporting Biometrics

- Reduced help desk calls?
- Managing templates and directories
- Enrolment procedures
  - Establishing an identity
  - Template quality
  - User instruction
- Exception handling
  - Repudiation
  - Biometric forensics

Biometrics in the Cloud

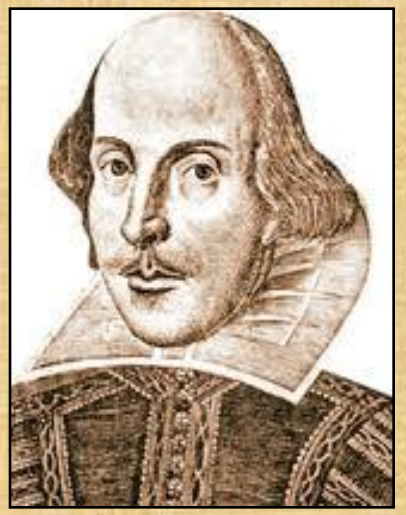
- Federated identities
  - Implications for the registration process
  - Who owns them? who services them?
  - Who maintains the directory of biometrics?
- Alignment with profiles, privileges, location, device and other factors (context based)
- Virtualised environments and identity management
- A Pandora's Box of biometrics

A Brave New World

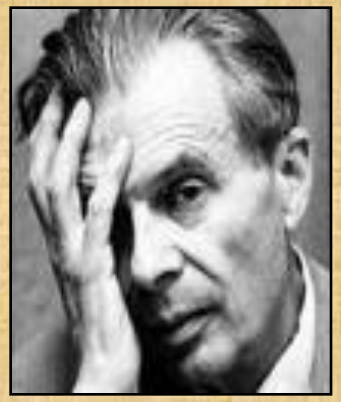
- William Shakespeare

  O wonder! How many goodly creatures are there here! How beauteous mankind is!

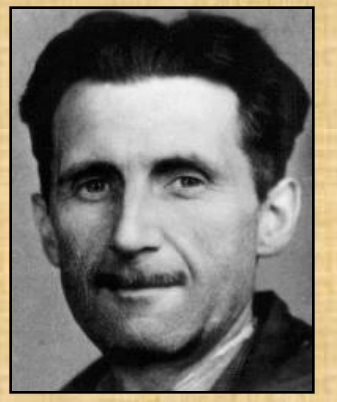
  O brave new world!



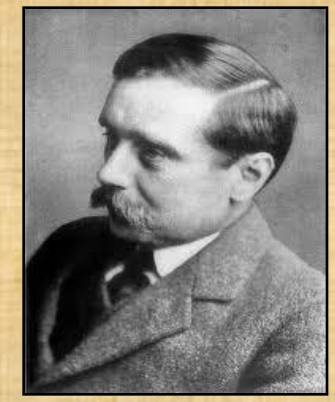
- Or….



Aldus Huxley



George Orwell

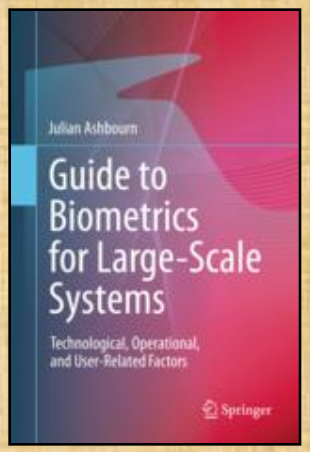


H.G. Wells

Final Conclusion

- The time has come to take a fresh look at what we might achieve with this technology
  - A re-statement of relevance
  - Best practices around systems integration
  - Clarity around privacy, ownership and data protection (on an international scale)
  - Clarity of purpose with respect to large scale public sector applications (and communication)
- A Biometric Constitution?
- See http://biometrics.zzl.org

Thank You



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