

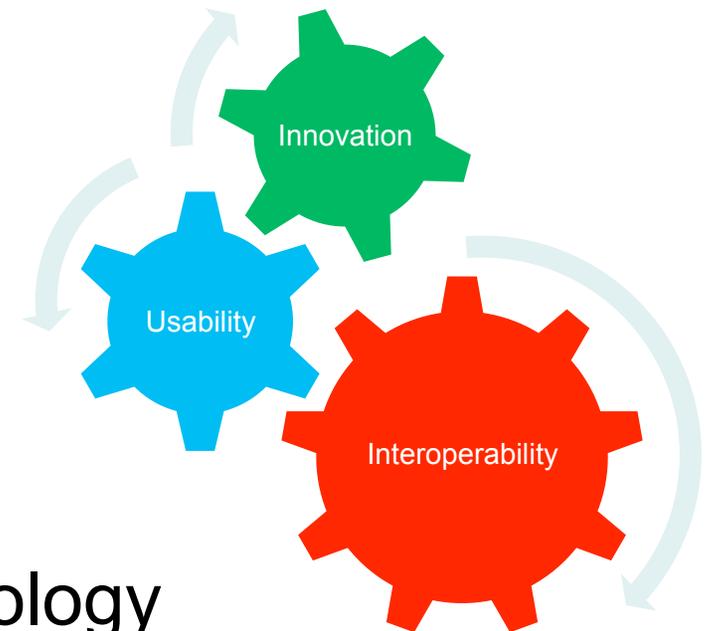
Biometric Performance ***A Systems Perspective***

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Overview – Performance Factors to Address

- Improve Interoperability
- Improve Usability
- Encourage Innovation



- Adopt Systems Technology

Improve Data Format Interoperability Biometric Images

- Goal: Allow Vendors to Converge on “Truth”
- Issues are Compression, Segmentation, Image Quality, Illumination, Subject “Correctness”.
- Automate “Biometric-ex” to drive Iterative Refinement
 - Hosted and Actively Managed Databases and Algorithms
 - Images from Multiple Vendor Sensors
 - Database consists of images
 - Matcher Interoperability Testing
 - Algorithm Under Test – Upload/Test/Delete
 - Private Report of Achieved Interoperability
- Restricted Access to Image Database for Training Purposes
- Extrapolated Performance to Reduce Database/System costs
- Regular Public Interoperability Testing to push the industry



Improve Data Format Interoperability Fingerprint Minutia Templates

- Goal: Allow Vendors to Converge on “Truth”
- Issues are Minutia Placement and Angle Accuracy, Image Quality, Zonal Quality, Ridge Counts, and Minutia Quality
- Leverage Fingerprint Infrastructure
- Refining Template Generators separately from Template Matchers, and assure linkage between images and associated templates.
- We should use restricted access to fingerprint images and anonymous associated templates. This would allow vendors to perform some detailed pairwise analysis of minutia. Vendors could then recognize deficiencies in their location procedures and address them

Consider Risk in Quality Algorithm Standardization

NFIQ is Wonderful

- It is predictive of matching performance
- It assures a **high level of consistency** from different systems, especially when a sample must be used in an unknown AFIS or in multiple AFIS systems from different vendors.



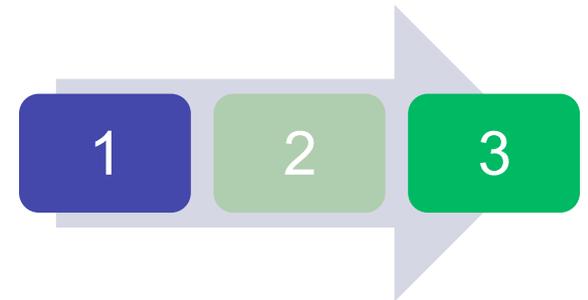
We need to *Utilize* the ability to perform vendor specific quality algorithms and also to perform multiple quality algorithms (including NFIQ.) when warranted. Our workflows must be better informed about intended use. Different use cases might need different weightings to decide about recapture.

NFIQ is EVIL

- we **should not overly rely on a lowest common denominator approach** to finger quality.
- a static algorithm very well could lead to inappropriate recapture and fusion decisions – especially as matching technology improves. We need to **keep NFIQ dynamic** also.

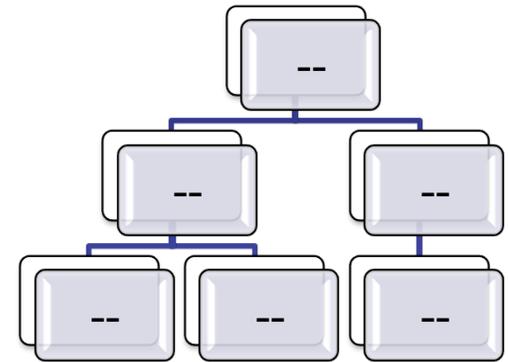
Improve Biometric Systems: Consistent Workflow Provisioning

- Our Capture Workflow at Enrollment and at Matching should be improved. Let us address a consistent specification of how and what we want to capture, and improve our Workflows...
 - Data driven (xml based on a standard)
 - They should declare intended use
 - They should be quality driven
 - What Algorithms
 - Retry Specifications
 - They should be sensitive to differences in fingerprint utility.
 - They should be robust. If a wrong hand is detected, it can be used. If a finger fails sequence check, it might still be able to be used
 - They should support queuing for pipelined enrollment processes
 - They should support contingency when interlinked with matching algorithms



Improve Biometric Systems: Address our Software Architecture

- We need to target our core technology at software developers – beyond BioAPI. We should probably aggressively target **web services** as the means by which software developers acquire, process, assess, and match biometric samples. This is easily supported by all major software development platforms (e.g. c# and java).
- This should also allow us to provide more unified capabilities with respect to distributed and virtual computing resources, as well as providing a more consistent approach to issues of privacy and security.



Improve Biometric Usability Mobility

- Many field use cases
 - Law Enforcement Citation
 - Watchlist
 - Document Verification,
 - Temporary Population Management (Emergency Response), Temporary Credentialing
 - In Field Enrollment
- Many system Issues we need to address
 - Smaller Display – Consistent, Recognized Icons
 - Limited Processing Power – Speed/Accuracy Tradeoffs
 - Limited Capture Capabilities - Tradeoffs
 - Limited Connectivity – Image Compression and Templates
 - Less Open Software Platform



Improve Biometric Performance Utilize Similarity Information

- We often focus on the painful parts of the genuine and imposter distributions. We don't think enough about leveraging the other parts.
- We could/should
 - Not make the decision as often, and provide guidance
 - Guide the access of privileges
 - Encourage the use of other information (non-biometric fusion)
 - Make more informed decisions regarding speed/accuracy tradeoffs in other biometric calculations.



Improve Biometric Performance

Consider Processing Time

- Accuracy is probably not our industry's biggest problem. With fusion of multimodal biometrics, our accuracy will not prevent us from being utilized in many applications.
- We must focus more on speed...
 - Quality Assessment
 - Compression
 - Template Generation
 - Template Matching



Encourage Innovation within a Standards Based Industry

- We need to balance the needs of interoperability with mechanisms for improved performance with innovations
- Support Proprietary Image Format Extensions – e.g.
 - Diversity Information (Perspective, Illumination)
 - “State” Information
 - Illumination/Imaging Information
 - Finger (Pressure Information, Electrical Response)
 - Iris (Curvature Information, Perspective Information, Rotation Estimate)
 - Face (Perspective Information)
- Encourage Proprietary Template Format Extensions
- Increase the Demand for Base Interoperability
- Room for Innovation with Standard as BASIS for value add.



Summary and Questions

Thanks

