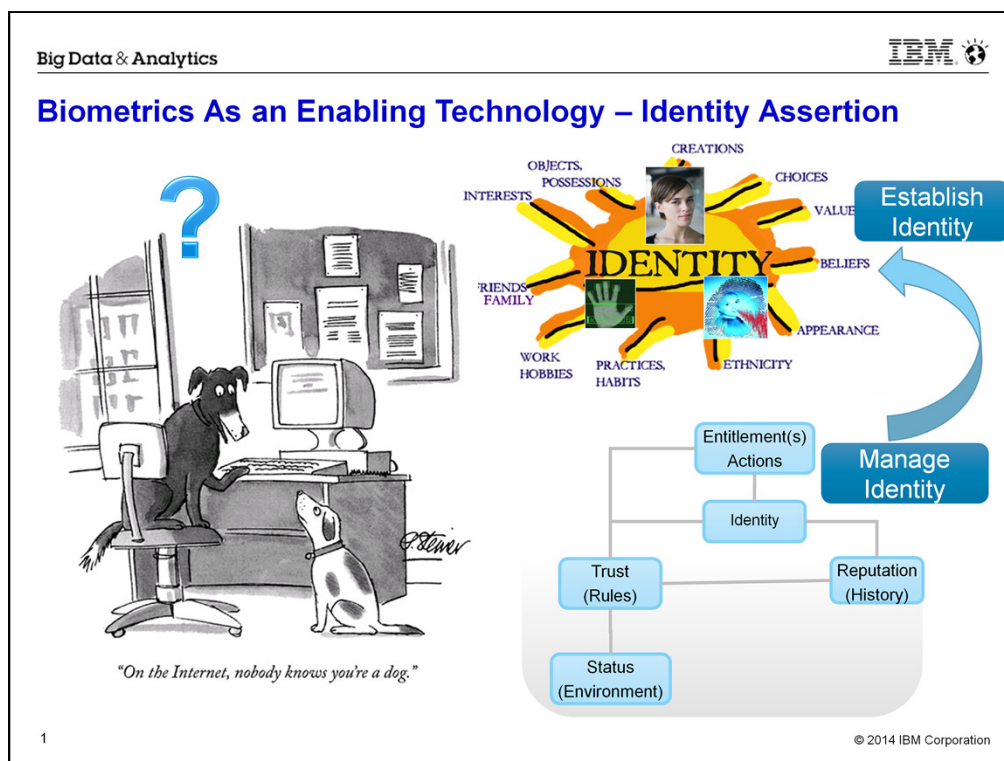




Research is for people with passion. Researchers work on

1. Interesting topics
2. Topics with impact
3. Following the money
4. Visionary, but see the bigger money in the future

Mostly, my topics fall into 3 or 4 – anything with a \$ sign.

Appraise

- Vendors
- Researchers
- Government

In particular, NIST has facilitated many success stories with the community.

Establish Identity – Photo, Social media behavior, Biometrics, travel history, social connections ...

Biometrics is an enabler of identity

- think about the following questions
- ‘is your fingerprint your identity?’ of course not
- ‘is your voice your identity?’ obviously not,
- ‘is your behavior at the keyboard our identity?’
- “is your habit of using computer applications your identity?”

about it
Identity

- be issued to ‘subject’ by Issuing ‘Identity Provider’
- be provided Entitlements by authorities and service providers

Biometrics

- technology enabler
- it provides accurate identity

Identity – what it is

Entitlement – your given privileges what you can do – rights to board, rights to run certain applications, right to access certain data

Reputations (History) – You crossed border many times, make reservations several times

run a application many times

Trust – I trust you to run an application because I know your identity and you have the right reputations

Status /Environment – Context

And also, Did you notice that the

“Biometrics Consortium Conference” changed to “Global Identity Summit”?

Different Perspective – Emerging Trends



- **Data Explosion** – more sensors, proliferation of data collection
- **Cloud Technology** – more mature
- **Computer Resources** – a commodity
 - Big Appliances – commodity platforms and services
 - Network, platform, application services become commodity – same for biometrics
- **Analytics Tools** – readily available
- **Open Source** – simply proliferated
- **Standard Adoption** – NIST-ITL, INCITS and many others
- **Low Government Funding** – mega programs (NGI, US-VISIT, UID) don't come often, S&T fund reducing



Cheap and open source SW and HW

More sensors available

Machine learning approaches now very mature

CPUs and connectivity everywhere should allow more automation

Low government funding for core technologies

Society favors convenience over privacy if they have control over their data

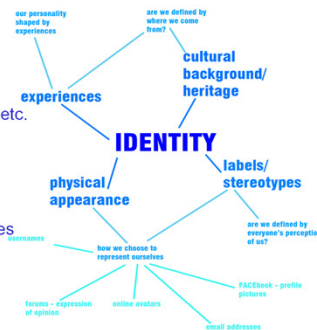
Mega amounts of data and now mega amounts of CPU available

Of course, everything is in the cloud. (So the shift to client side computing has reversed again due to available connectivity and low power clients (tablets/phones))

Non-traditional biometrics (DNA, voice, vein, sclera, skin, etc.)

A Need – Establish Identity Service in the Cloud

- **Focus on Identity Assertion**
 - Biometrics as an enabling technology
 - Avoid a race for accuracy
 - Business owners have limited resources for better sensors, more data and etc.
 - Business owners still want the same performance with a smaller budget
- **Driven by Economics and Technology Trends**
 - Proliferation of data collection and mobility
 - Success or advancement of Big Data infrastructure and platform technologies
 - Advancement of IT industry and commoditization
 - Leverage all data sources available and within the "vicinity"



- **Areas of Challenges**
 - Security, privacy, and protection for cloud based identity information
 - Secure biometrics data
 - Techniques to address privacy
 - Contextual information fusion through context accumulation
 - Research spatial & temporal impact
 - Bringing identity resolution technologies into the mix
 - Other information including biographic

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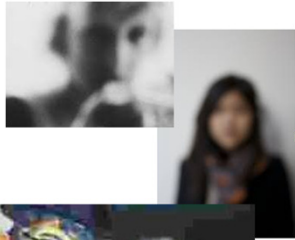
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A Challenge – Working with Low Quality Data



“A fact of life”

- Low Resolution Data
- Out of Focus Image
- Unconstrained Capture
- Insufficient Color/Grayscale Information
- Limited Data Samples
- Many more

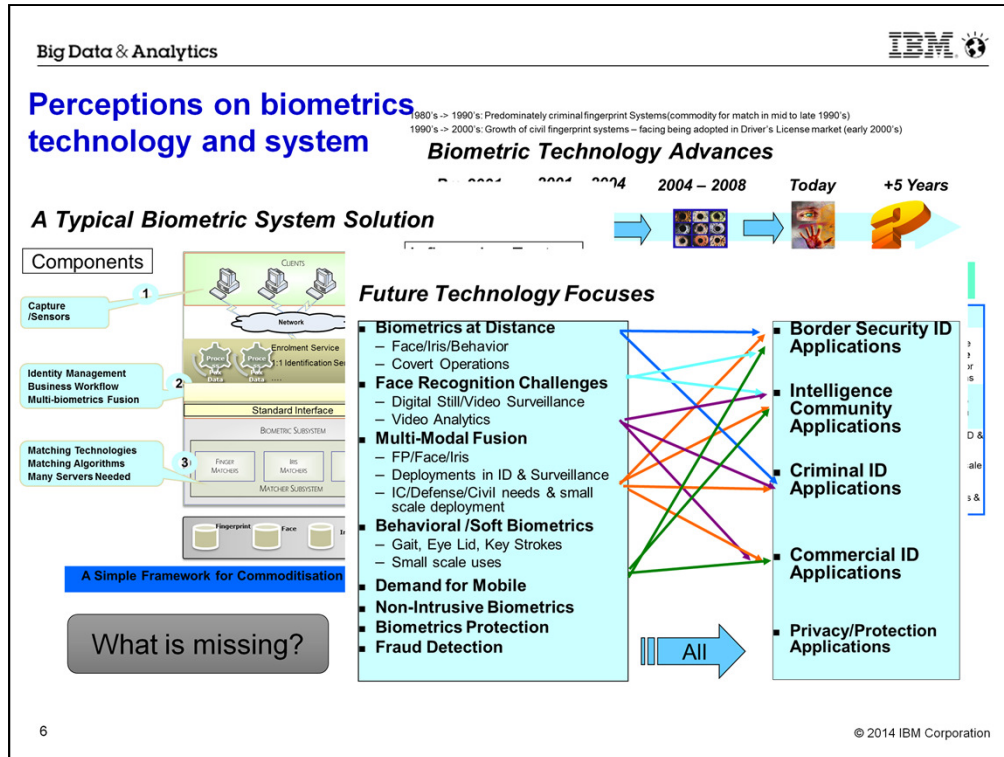


- Unconstrained capture – refers to not limited by distance and etc...
- Limited data samples for enrollment



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We all face choices based on curiosity, impact, funding and many other short term and long term goals



We need to visit how we usually look at the biometrics technologies, industry and technology providers?

We tends to label them “Matcher companies”, “scanner”, “middleware companies”...

Now, we all want to be solution providers so we can have higher profit margin 😊.

Focusing on technology feasibility, open architecture, agnostic features, vendor neutrality and etc.

Is this an Race of Accuracy?

Identity and its associated DATA are the focus – We need to remember the purpose of collecting biometrics data: it is the data for “identity assertion. “

The big data, analytics and Cloud in IT industry should make us to think
- Do we have big data?

- Can we leverage the committed analytics tools to make our specialized performance analysis team more effective and efficient?
- How can we leverage the strength of cloud to reduce cost?

Let us get into those topics

...

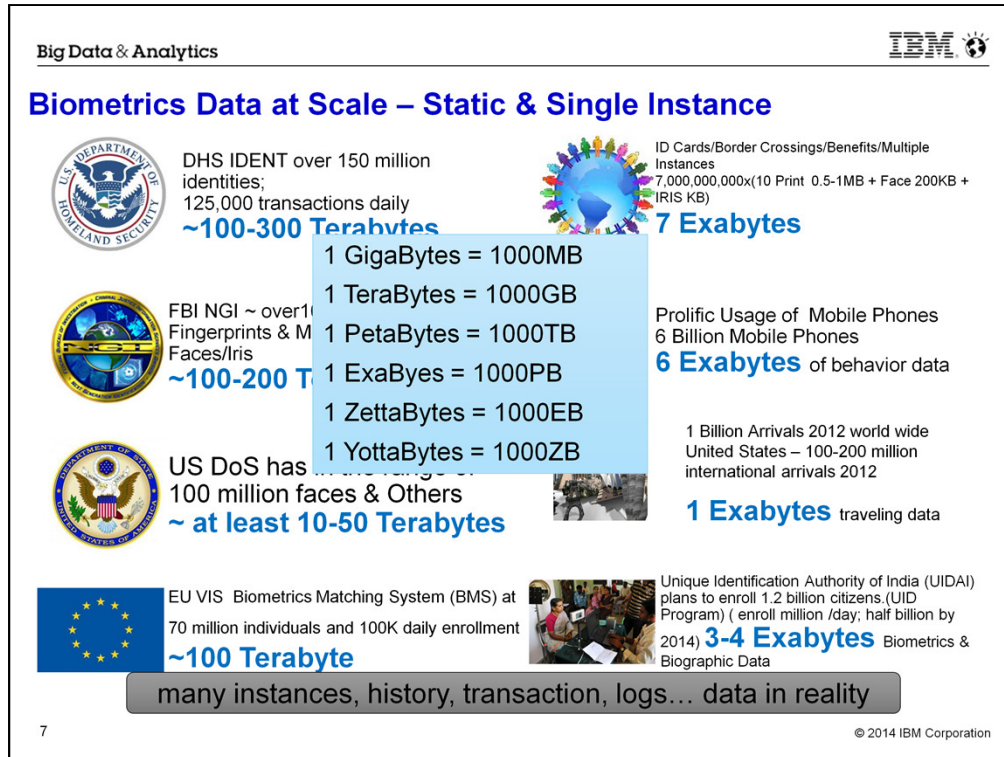


Image Size	template size
Face – 200KB	/template 1KB to 10 Bytes
IRIS – 10KB	/template 100-500 Bytes
Fingerprint – 1MB	/template 1KB for each finger

World wide population – 7 Billion

ID Cards/Border Crossings/Benefits/Multiple Instances

7,000,000,000x(10 Print 0.5-1MB + Face 200KB + IRIS KB) ~ 7TB biometric data

- [Prolific Usage of Mobile Phones](#)
 - [6 Billion Mobile Phones](#) -
- [World Wide Travel \(World Tourism Organization\)](#)
 - [Close to 1 Billion Arrivals 2012](#)
 - [United States – 100-200 million international arrivals 2012](#)

A few large biometrics systems

DHS Automated Biometric Identification System (IDENT) reached over 150 million

It enrolls or verifies ~ 125,000 individuals daily

Internationally, Unique Identification Authority of India (UIDAI) plans to enroll 1.2 billion citizens.(UID Program) (enroll million /day; half billion by 2014)

FBI NGI ~ over 100 Million Fingerprints & More coming plus Faces/Iris

US DoS has close to 100 million faces

Other Big data examples



By 2016, annual Internet traffic will reach **1.3 Zettabytes**



Google processes **> 24 Petabytes** of data in a single day



Facebook processes **500+ Terabytes** of data daily



Twitter processes **12 Terabytes** of data daily



150 Exabytes global size of "Big Data" in Healthcare, growing between 1.2 and 2.4 EX / year



AT&T transfers about **30 Petabytes** of data through its network daily



Hadron Collider at CERN generates **40 Terabytes** of usable data / day



For every session, NY Stock Exchange captures **1 Terabyte** of trade information

We don't have the most challenging problem!

1GigaBytes = 1000MB

1TeraBytes = 1000GB

1PetaBytes = 1000TB

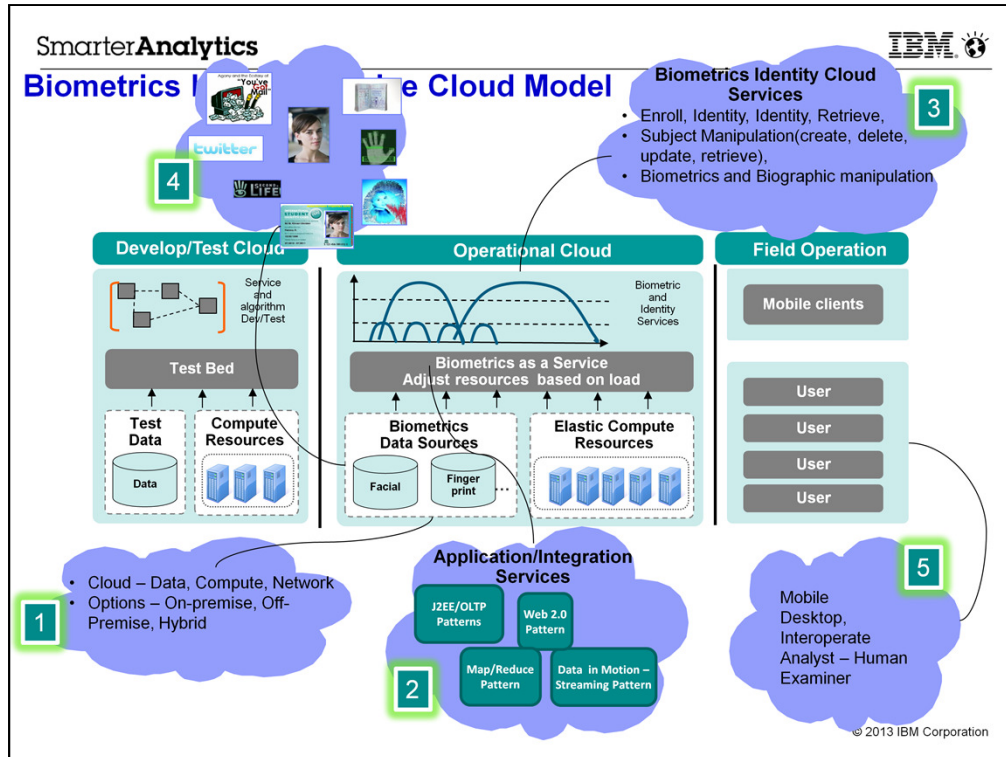
1ExaByes = 1000PB

1ZettaBytes = 1000EB

1YottaBytes = 1000ZB

Biometrics and Identity challenges are not unique

We need to be open-minded to learn experiences from other 'IT' projects.



How to develop a Biometrics Identity Service Cloud Model?

- Taking into account, the IT infrastructure, matching technologies, capture technologies, middleware, solutions providers?
- What does all mean to the users or owners?
- When SOA technology was available, we went through this exercise? As a result, we have a lot of standard compliant products/solutions and
-

Steps

1 – One Simple cloud model

Dev/Test, Operational Cloud

2 – Each bubble

1- Taking into account all sources for Identity assertion

2 – Cloud options – on-premise; off premise

3 – Matching software vendors based on different technologies

4 – Client/Mobile/Interoperability/Human in the loop

5 – Services - BIAS