Trust Frameworks & Asymptotic Identity Proofing: A Systems Approach

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NIST NSTIC Program

- White House initiative proposed in April 2011
  - Focused on providing secure & correct cyber-identities in both public & private sectors to enable trusted online transactions
  - NIST tasked with funding initial NSTIC grants
    - Funded five grants in October 2012
    - D. Hartzband, PI for grant entitled *Identity Ecosystem for Patient Centered Coordination of Care*

Why Trusted Identities?

- Dept. of Commerce estimated $226B US ecommerce retail sales in 2012 comprising about 15B retail transactions
  - This does not count social media usage of 10s of billions of interactions
- Cyber-identity = the establishment & maintenance of one of more electronic identities for the purpose of engaging in ecommerce or other online interaction
  - essential for legal online interaction
  - Trusted identities are established through both agreements & technological support of an identity ecosystem

Why Trusted Identites 2

- Total loss from just from fraud in retail ecommerce, etc. was between $800M & $1.1B in 2011, more now…
- Users have little control over their identity information once it is released to a service provider
  - Could be sold or used for purposes other than the user expects
- Large amount of identity information sharing among service providers can lead to data compromise
- Strong cyber-identities one way of reducing these issues

Identity's Role in Online Privacy & Security

- Most online security today is based on both role & specific identity
  - Access to social media account: authentication to application directory (ID & password)
  - Access to a specific CDR requires authentication to a local directory (ID & password) & authorization through an IRB directory (ID, role, specific research processes)
  - Access to protected healthcare information: authentication (ID , password); authorization (patient consent); NIST LOA3 identity proofing
- Access to private information is increasing requiring some level of identity proofing

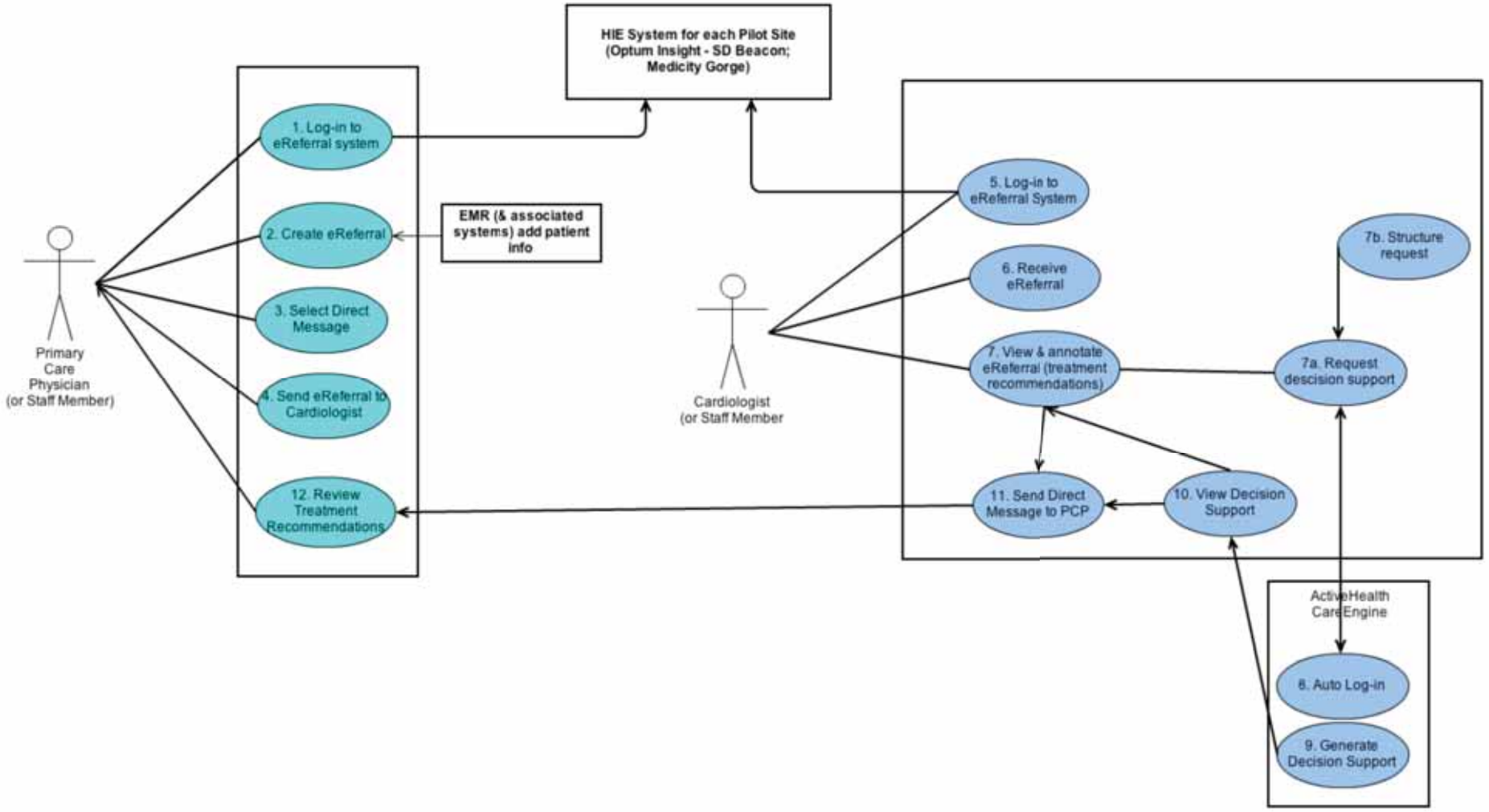
Identity Proofing

- Electronic location & verification of identity attributes for a specific user (screen ID)
  - Collection of identity attributes from:
    - local sources (directories, etc.)
    - Remote sources (public DBs, commercial 3rd parties, etc.)
  - Not all attributes have same weight
  - Multiple sources better than single source
  - NIST LOA 3
    - Requires multi-factor authentication & verification of identity attributes

NSTIC Healthcare Pilot

- Two HIEs
  - San Diego Regional Health Information Exchange
    - Part of the San Diego Beacon eHealth Community
    - Most hospitals in SD County & including Kaiser Permanente Southern CA (San Diego), San Diego VA, SD Council of Clinics, UCSD Medical Center, etc.
  - Gorge Health Community (The Dalles, OR)
    - Small, rural HIE the Columbia River Gorge community in OR & WA

Use Case



Trust Network Policy

https

Direct Protocol

Gorge Health Connect
- Medicity iNEXX

Identity Providers

Identity Syndicate

Data Services

ActiveHealth CareEngine®

Trust Network

SD Beacon
- Mirth Mail

LDAP

Mail Service

Phone Authentication

SQL

Trust Services

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Identity Issues

- Population of migrant farm workers get healthcare in both HIEs
  - Pick fruit in OR/WA in summer & get care at Gorge
  - Pick fruit/vegetables in winter in San Diego & Imperial Counties, get healthcare at SD Beacon
- Identity of migrant farm workers extremely hard to verify

Identity Issues 2

- Even identities of providers hard to verify
  - Name on license may be different
  - Name associated with NPI might be different
  - Might have several accounts with different names at various institutions
    - One doc at UCSDMC had 41 different accounts with 5 variations of name
- Patient names also very difficult
  - People's names changes, but records do not
  - Many ethnicities have names with different forms
  - Clerical errors account for a large proportion of ambiguity

Identity Issues - 3

- I have lived in CA twice for 6 & 4 years respectively
- The CA DMV & Kaiser Permanente had the following variations of my name, none of which were connected:
  - David Hartzband (Name I gave Kaiser)
  - David Jacob Hartzband (Name I gave the DMV as they required a middle name or NMN designation)
  - David J. Hartzband
  - David Jay Hartzband (?)
  - David Yakov Hartzband (?)
  - Davide Yakov Arturovitch Hartzband (birth certificate)
  - David Hartz Band (clerical error that became official)
    - For about a year, Kaiser could not access my medical records because I had several names associated with them & the State of CA thought I was David Hartz Band
- What identities are present in cyberspace representing YOU?

Identity Syndication[1]

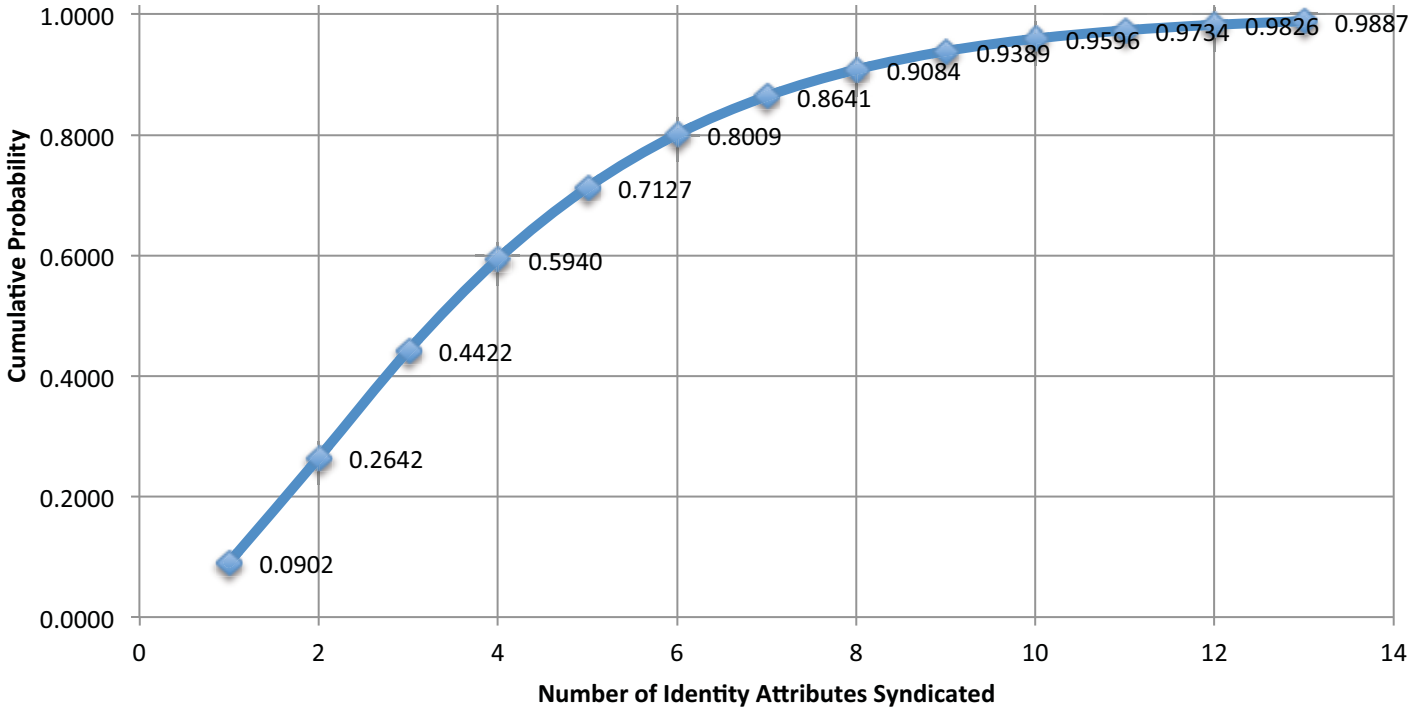
- Use of multiple sources for location & verification of identity attributes allows for verification with higher assurance
- Syndication uses a search algorithm & known attribute sources to locate identity attributes for a specific user on a per request basis
- Both public & private attribute sources used including commercial & professional sources (AMA, LexisNexis,…)
- Specialized server aggregates attributes & algorithm evaluates/verifies relevance
- Probability model used to assess level of assurance
- High probability identity used in resolution of policy for access of information

[1]Syndication work done in participation with Resilient Network Systems, the prime contractor on NIST 12D296

Probability Model

- Cumulative Gamma distribution
  - Projection of a Poisson model as a Bayesian function
  - $f(x;\alpha,\beta) = \Upsilon(\alpha,\beta x)/(\alpha-1)!$
    - α,β are the prior & posterior parameters of the Bayesian distribution
    - Expected mean value = variance
      - Sample size small, so variance small

Cumulative Probability Distribution - Bayesian Gamma: Identity Syndication



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Assurance Levels

Number of Identity Attributes	Probability (certainty) of Verification – low assurance attributes	Probability (certainty) of Verification – High assurance attributes
2	0.26	0.45
4	0.59	0.90
6	0.80	0.99
8	0.91	0.999
10	0.96	0.9999
13	0.99	

Systems Perspective…

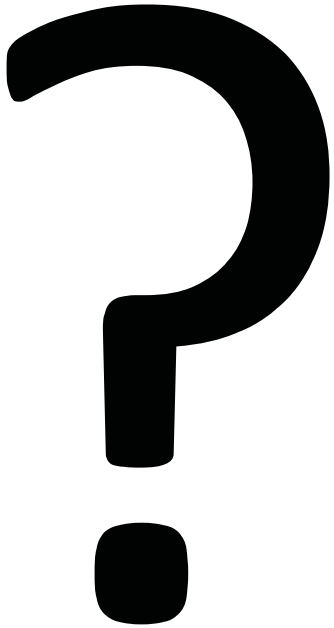
- Actual network architecture (VPN layered on TCP/IP) allows decentralization of policy definition & enforcement
- Enables fully distributed network-based services to be used natively
- No central points of attack or centralized data stores for synchronization or corruption issues
- Security & Privacy Policies described in general & then specialized per request allows for "mass customization" of function

Future of Identity

- NSTIC aimed at federated &/or aggregated (syndicated) single ID equivalent for eCommerce & public interaction (healthcare, public registrations (DMV,…) etc.) to improve efficiency/effectiveness of transactions, reduce fraud, etc.
  - May or may not be achievable in finite time – many vested interests with different agenda…
- Latest discussions in NSTIC forums:
  - FIPS rights – current regulations require network entities to inform consumers what data & data sources may be used to authenticate, authorize & identity proof them
    - Consumer can refuse to allow data to to be used (fine-grained) & entity can refuse to complete transaction
  - Fine-grained Privacy – consumer can specify what data (at the field level) can be used in eTransactions, network entity must make effort to accomodate
  - "Nym Rights" – allowing consumers full anonymity through pseudonyms & other mechanisms, but still maintaining their ability to be authenticated, etc. – not clear what this means yet

“Futurer” Aspects of Identity

- IMHO - Identity as defined currently is just a façade’
  - Even if we can identify the screen presence to a 4 or 5 9’s level of assurance, it still only tells us a name
  - Actual identity is a context that is built up by your ePresence & your life IRW
  - Syndication is a beginning for developing a sharing that context
  - Eventually it is the context & not the name that is important in your electronic interactions (as it is IRW now)



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