# Trust, Tokenization and Tokens

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# The evolving definition of a "Tokenization"

- Tokens represent an Attribute Set (token types) -compressed or condensed - for example Perimeter host admission control solutions validate 60+ attributes about a device and then create a posture token (3 or 4 types - that reflects the Attribute sets)
- Tokens have some meta-data based on their characteristics (for example in the analogy above - green could mean healthy device, blue could mean device in quarantine, yellow could be unknown posture and red could mean defect in device)
- Tokens are Cryptic - meaning that if you are not briefed in advance - all the substance in the token will mean nothing to you (in our technology trend they are encrypted and compressed -secure exchange)
- Tokens represent Attributes with some level of Assurance -Attribute Assurance - since they are based on successful execution of some control function (validation of attributes and credentials)
- Tokens are generated at run time and have real time characteristics of a state of an Entity (entity can be subject or a resource or an action or condition) - real time representation of entities.

# The evolving SCOPE of a "Security Token"

- Hard Tokens and Soft Tokens (Initiating Vector, Calculated Vectors, in a Vault)
- Public Tokens vs. Private Tokens (between Enterprise within an Enterprise)
- Standardized Tokens vs. non-Standardized Tokens (SAML vs. proprietary tokens)
- Authentication Tokens vs. Access Tokens (RBAC token, XrML token, ACL token)
- Subject Tokens vs. Resource Tokens (Human and Non-human representation)
- Integrity Tokens vs. Trust Tokens (reputation, posture, TPM, SIM, etc)
- Computed Token Types (many – application specific VDS technology)
- Risk Tokens (for subjects and resources)
- Transaction Token Types (such as SWIFT Tokens & IdenTrust Tokens)
- Network Token Types (such as Posture tokens and Path tokens)
- Decision Tokens and Obligatory Tokens
- Data Tokenization (PCI-DSS, PII, etc., such as Protegrity)

- See http://www.network-identity.com (upcoming Book on "Identity & Trust for Controlled Cloud Computing" is all about Tokens and Trust (2014)

# Tokens → pre and post CONTROLS

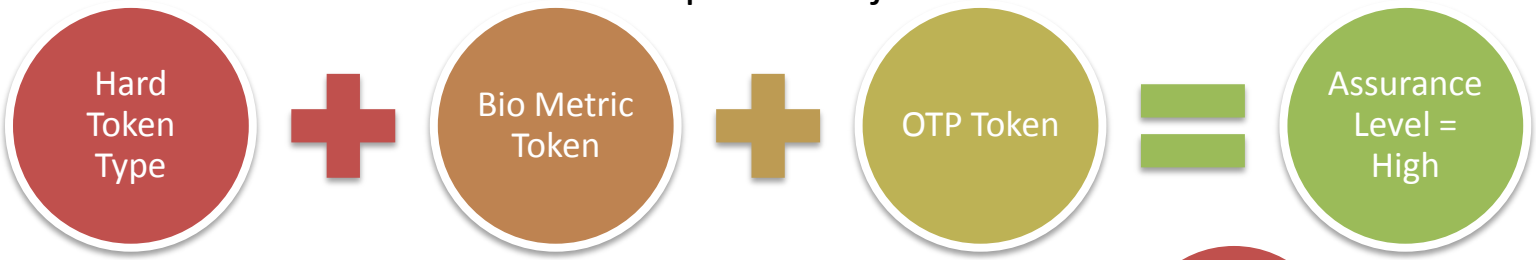
- Context driven Alignment (AuthN Context= Subject/entity and AC Context = Resource/Action)
- PCI-DSS, PII, iTAR and other Data Specific Control Alignments
- Streamlining Authentication = Type of AuthN = Token = Construct of Credentials
- Mimic Real World – Credential's (Assured Attribute Sets) equates to Access
- Streamline and Leverage Tokenization (Public STS, Private STS, Network STS, Risk & Data STS, etc)
- Integrate with Context Aware Security Systems (IAM with Net & Info Sec)
- Mitigation Strategies require Continuous Alignment of Integrated Controls
  - Preventive Controls
  - Concurrent Controls
  - Reactive Controls
  - Obligatory Controls
  - Mitigating Controls

# Layer 1 -7 + 2 more (Identity & Policy)

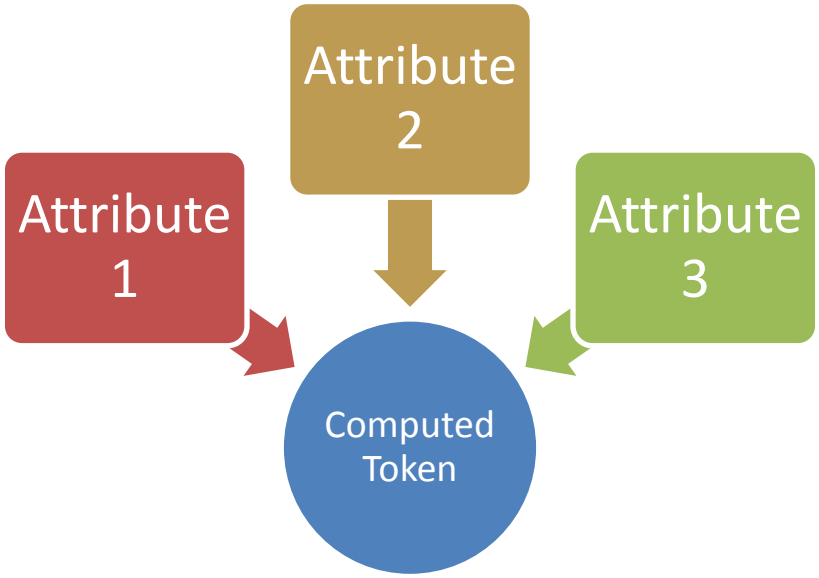
| Layers | Example Tokens | Token Combination leads to specific Levels | Control Functions augmenting –RBAC, ABAC, T-BAC |
|---|---|---|---|
| USER | OTP Token, Bio-metric tokens, etc. | Subject IA/AA Levels | User & resource level Access Control |
| Application Layer | Kerberos Token, RDF token, etc. | Resource Trust Level | App Protocol Control |
| Presentation Layer | Data Tokens, USB Tokens, DOM token, etc. | Risk Levels and Integrity Levels | Coding & Conversion Controls |
| Session Layer | SSO Token, CDSSO token, Network Token | Integrity Level, Trust Level | Session Control |
| Transport Layer | IP/Host Identity Protocol /HIP token | Integrity Level, Trust Level | Flow, Port and Header Control |
| Network Layer | Packet Token, Posture Token, TNC token, Path Token, Periphery Token etc. | Integrity Level (subject and resource) | IP Address and Routing Control |
| Data Link Layer | MAC Address Token, PSS toke, TPM token, etc. | Trust Level Subject IA/AA Level | (physical) media access control |

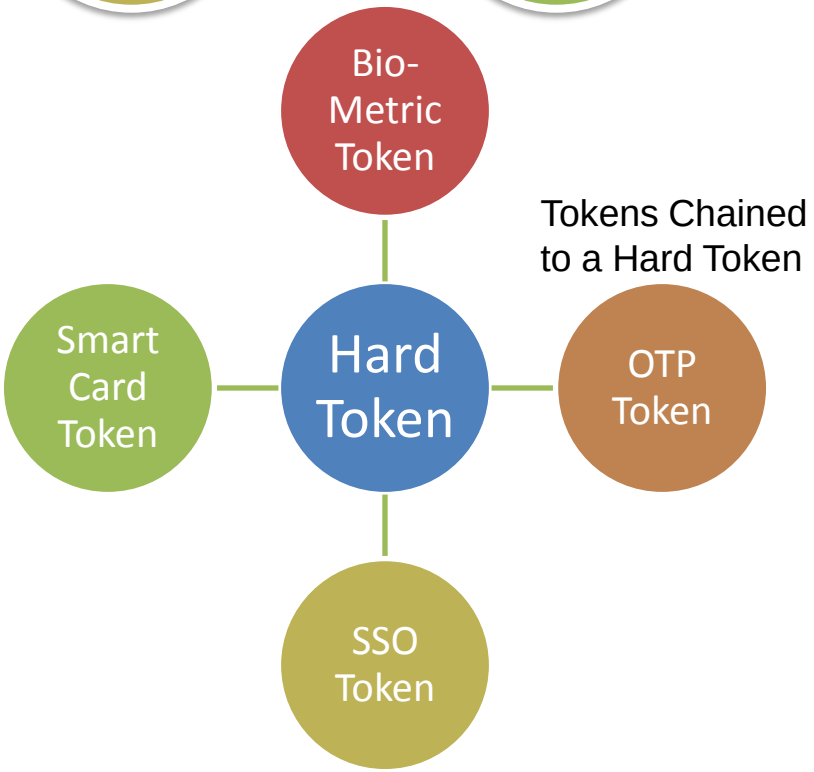
# Assimilating Token Types for Alignment

Token Combinations Impacts Subject Assurance Levels




Computed Tokens from Attributes

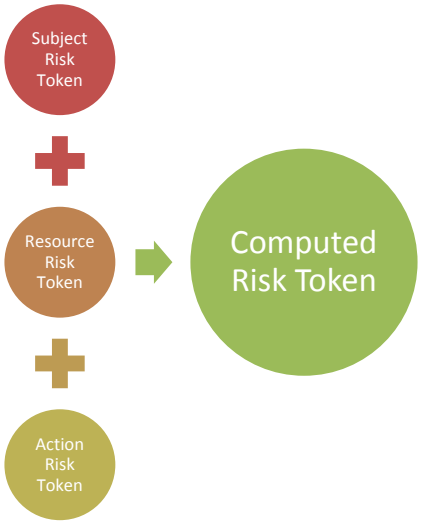


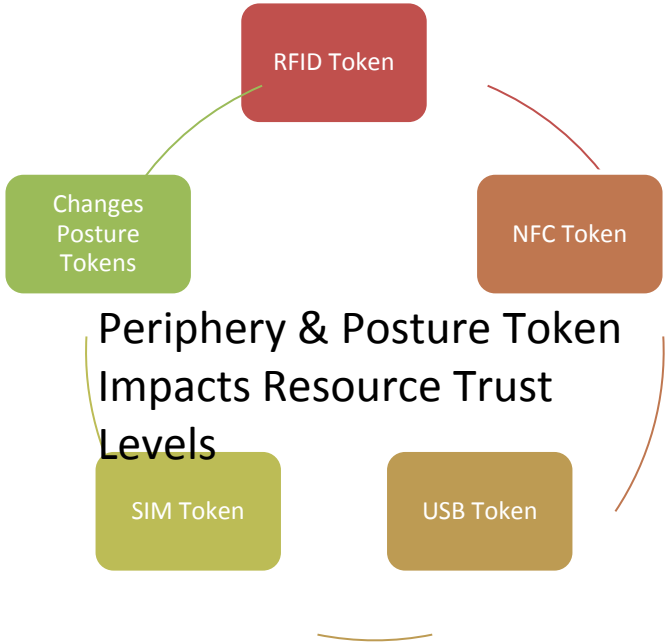



# Assimilating Token Types for Alignment

Token Combinations Impacts Resource Trust Levels


Computed Composite Risk Token



# Background Papers on Tokens

1) http://www.utdallas.edu/~hamlen/khaled-cloudcom10.pdf

This paper validates the fact that just like subject are represented as TOKEN's in today world – the challenges associated with representing distributed resources as Token's are attempted to be addressed by the Academic and Security Standards world – RDF/Semantics

2)http://ipdps.cc.gatech.edu/1997/wocs/hapinkst.pdf

This paper describes the Token based approach for a TDMA network – tokenizing the packets at the Data Link Layer –in conjunction with potential hard tokens – this is being expanded to all MPLS networks – multi-protocol label switching networks and 4G like high bandwidth network –where we can afford to add another token insertion between data packets and the header packets to validate INTEGRITY of PATHS Connections and more

3) http://csrc.nist.gov/news_events/privilege-management-workshop/PvM-Model-Survey-Aug26-2009.pdf

The above NIST paper – discusses RBAC 1st and then ABAC – it also sees a future in Policy BAC(PBAC) and the RiskAdaptiveAC (RadAC) The next stage beyond 2012 is to evolve Token BAC (that leverages the NG Tokenization Technologies to abstract RBAC, ABAC and RiskBAC)

4)http://www.cisco.com/en/US/docs/net_mgmt/cisco_secure_access_control_server_for_windows/4.2/user/guide/PstrVal.html#wp24141 A cisco paper on cisco security product lines that have started tokenization's (posture token for example acts as an input to the INTEGRITY Token and Integrity Level that we compute in T-BAC –token buckets are utilized by Cisco ASA to compute integrity tokens)

5)http://securosis.com/reports/Securosis_Understanding_DBEncryption.V_.1_.pdf SecureOSIS paper on Data Tokenization and Encryption

6) http://accelconf.web.cern.ch/accelconf/ica07/PAPERS/TPPA04.PDF A paper describing how RBAC profile can be expressed in XML as x-rbac and how the XML profile can be tokenized with a MAP

7)http://publib.boulder.ibm.com/infocenter/wsdoc400/v6r0/index.jsp?topic=/com.ibm.websphere.iseries.doc/info/ae/ae/cwbs_xmltoken.html A paper describing how Rights Management in a DRM or IRM system can be expressed in XML using XrML and any XML profile again can be tokenized XrML token

8) http://download.oracle.com/docs/cd/E19253-01/816-4557/aparecord-3/index.html A paper describing the expression of ACL (access control lists) as ACL token

9) http://www.ece.cmu.edu/~peha/network_PTB.pdf

http://repository.cmu.edu/cgi/viewcontent.cgi?article=1046&context=epp&sei-redir=1#search=%22priority%20token%22

Papers describing Permission Token (including white list black list) & Priority Token