Bridge Certification Authority Interoperability Test Suite (BITS)

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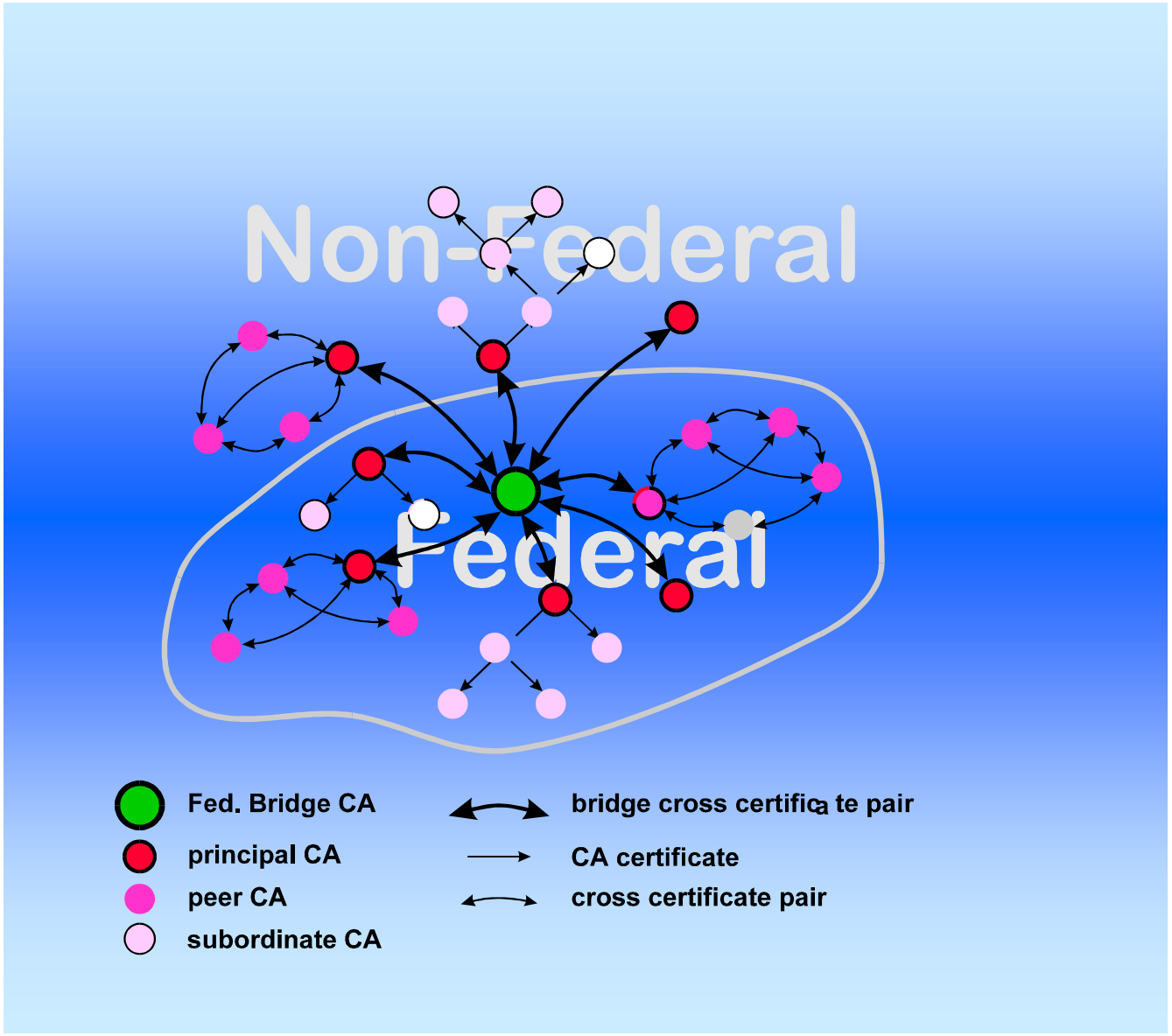
Getronics

Overview

- Requirements
- Objectives
- BITS Test Data and Documents
- Freeware BITS Test Data Generation Tool
- BITS Technical Support

BCA Connects PKIs

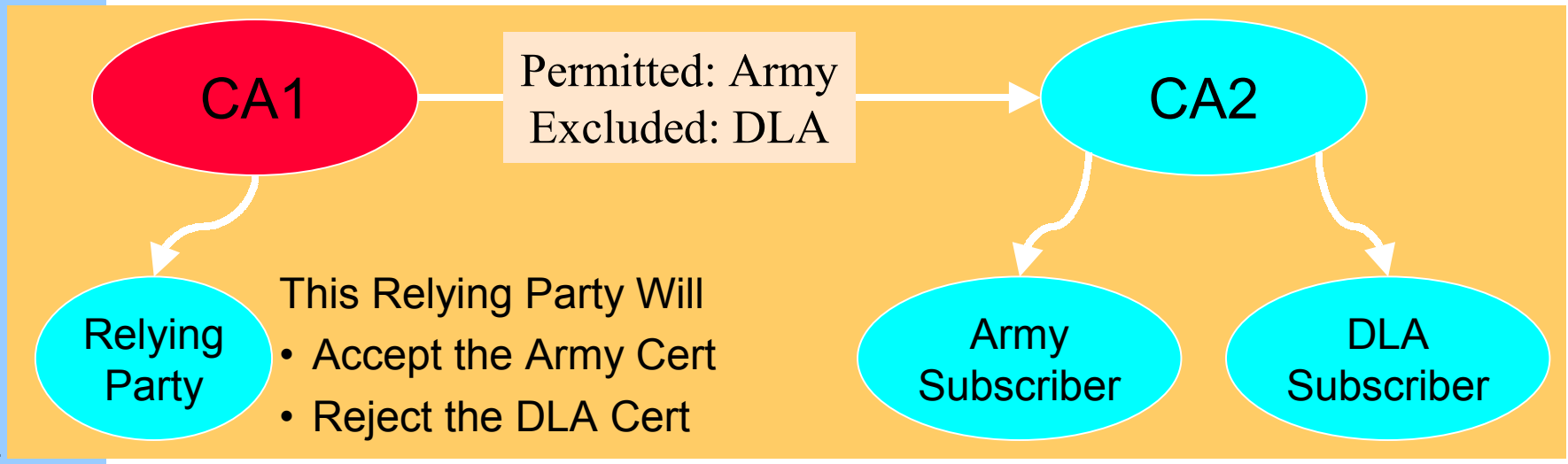


Managing BCA Interoperability

- BCA Establishes Trust Paths Between PKIs
- Organizations Need to Retain Security Control
  - Limit / Prevent Transitive Trust
  - Maintain Level of Assurance
- X.509 Provides Tools to Meet These Needs
  - Name Constraints
  - Certificate Policies
  - Certificate Policy Mapping

Name Constraints

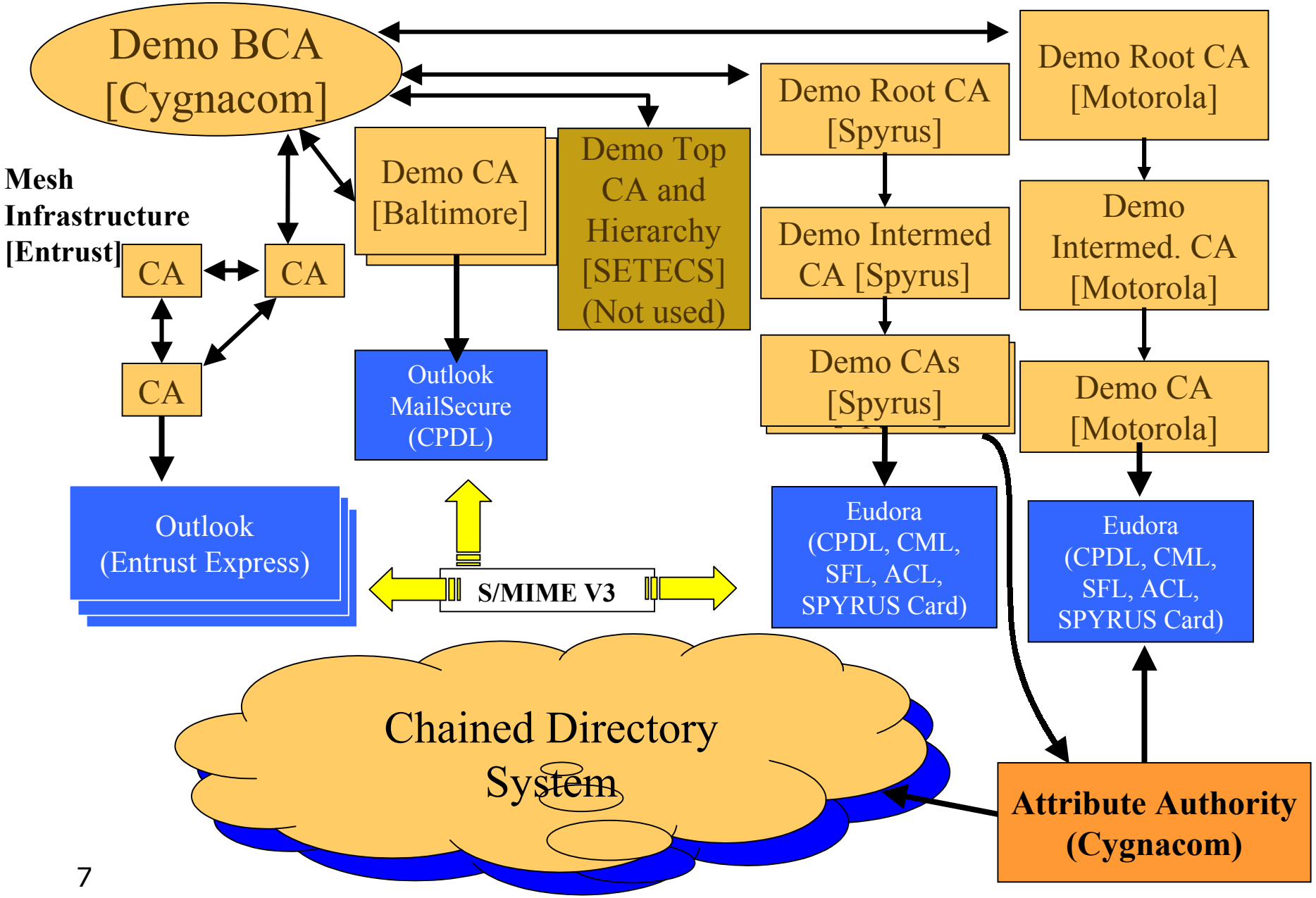
- Standard Extension to X.509 Certificates
- CA Certificates Can Include Name Constraints
  - Regulate Certificates Accepted Through Path
  - Can Specify Permitted or Excluded Names
- Names constraints checks performed by relying party certification path validation software



Certificate Policies

- Standard Extension to X.509 Certificates
- Each certificate asserts one or more certificate policies
- Certificate policies identify assurance level of certificate (ex: high, medium, low)
- Certificate policies identify acceptable uses of certificate (ex: DOD Class 4 for classified processing)
- Certificate policy mapping guides relying parties in determining acceptability of “foreign” certificates

BCA Demo Phase II Architecture



BCA Demo Phase II Standards

- ITU 2000 X.509 Recommendation
- RFC 2459 X.509 PKI Certificate & CRL Profile
- S/MIME v3 Secure Messaging (RFCs 2630, 2632, 2633)
- RFC 822 SMTP Messaging
- RFC 2045 MIME
- RFC 2253 LDAP v3 for Client - Directory Interface
- RSA/MD5 or DSA/SHA-1 for Signatures

BCA Demo Phase II Report

- Phase II BCA Interoperability Demonstration Final Report describes BCA concepts, PKI architecture, cross-certification relationships, test cases, and test results for demo
- Final Report appendix contains complete set of matrices illustrating results of interoperability testing conducted as part of demo effort
- Final Report available from these web sites:

  <http://www.anassoc.com/BCA.html>

  <http://bcatest.atl.getronicsgov.com/>

BCA Demo Objective

- A primary BCA Demo objective is to encourage vendors to provide commercial products that include capabilities required for BCA environment such as:
  - Building cert paths in cross-certified PKIs
  - Name Constraints
  - Certificate Policies
  - Certificate Policy Mapping

Commercialization Strategy

- DOD is providing freeware security libraries and test support at no cost to vendor to reduce investment required to enhance/test products to provide capabilities required for BCA environment
- Under DOD contract, Getronics is providing security services freeware, documentation & technical support at no cost to vendor
- Under DOD contract, Getronics is providing BITS test data, documentation, facilities & technical support at no cost to vendor
- Under DOD contract, Cygnacom is providing freeware Certification Path Development Library

BITS Objectives

- BITS includes standard set of tests cases, procedures, data that can be used to determine a product's degree of interoperability with BCA Demo Phase II architecture including:
  - developing certification paths in cross-certified PKI environment;
  - validating certification paths;
  - implementing S/MIME in an interoperable way
- Includes certs & CRLs equivalent to those created by various products for BCA Demo Phase II
- Includes test cases and procedures that exercise features tested in BCA Demo Phase II (except for access control and border directory concept)

BITS Objectives (cont'd)

- Includes certification paths that product should be able to successfully validate
- Includes certification paths that product should reject or, in some cases, prompt user before proceeding
- Initial goal is to support testing of S/MIME applications, but BITS certification path test data can be used to test any PKI-enabled application
- BCA Interoperability Test Description documents test cases, procedures, data
- Includes subset of test cases documented in Phase II BCA Interoperability Demo Final Report

BITS Test Cases

- BITS includes test cases that exercise majority of RFC 2459 cert path validation reqts
- BITS does not include complete set of failure test cases for all RFC 2459 cert path validation reqts
- BITS includes test cases focused on:
  - name constraints (both permitted and excluded)
  - certificate policies
  - certificate policy mapping
  - certificate revocation using CRLs
  - cross certification
  - CRL distribution points
  - multiple signature algorithms (RSA, DSA) within a path

NIST Test Certification Paths

- NIST provides a standard test suite of X.509 certification paths at: <http://csrc.nist.gov/pki/testing/x509paths.html>
- NIST data includes extensive positive & negative test cases for testing these RFC 2459 reqts:
  - name chaining
  - signature verification
  - validity date checking
  - basic constraints extension
  - key usage extension

Combined NIST & BITS Testing

- Applications should first be tested using NIST test suite to verify basic certification path validation capabilities
- Applications that are unable to successfully complete NIST cert path tests will not be interoperable with BCA architecture
- Applications should then be tested using BITS
- Combination of both sets of test data can be used to perform a comprehensive evaluation of an application's degree of BCA interoperability

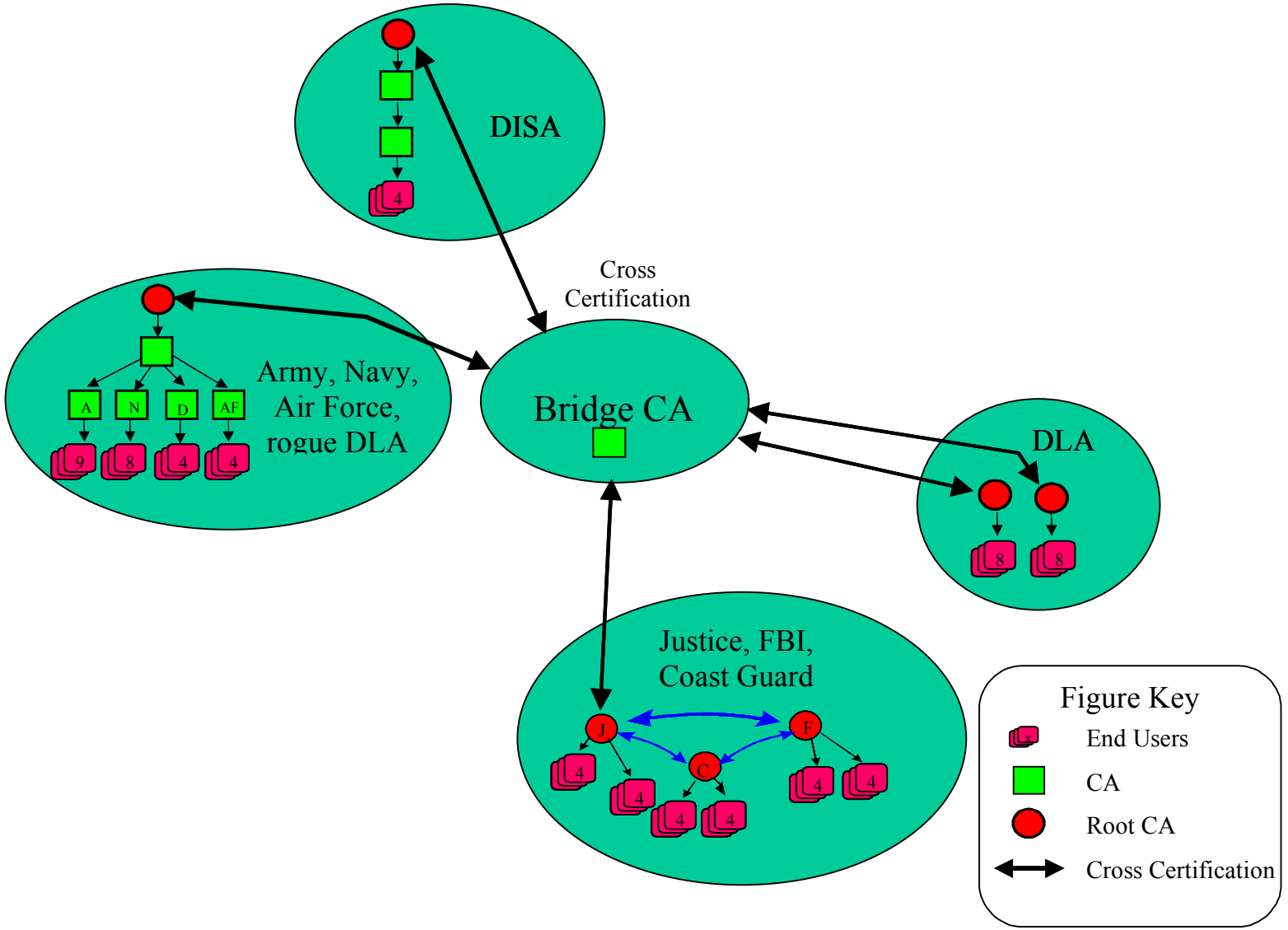
Certification Path Validation Test Scenarios

- Valid
- Revoked user cert
- Revoked CA cert
- Violates name constraints
- Unacceptable due to lack of acceptable chain of policy mappings
- Process cert path with policy mapping disabled (ex: fail due to unmapped cert policy)
- Process cert path with policy mapping enabled (ex: succeed due to mapped cert policy)

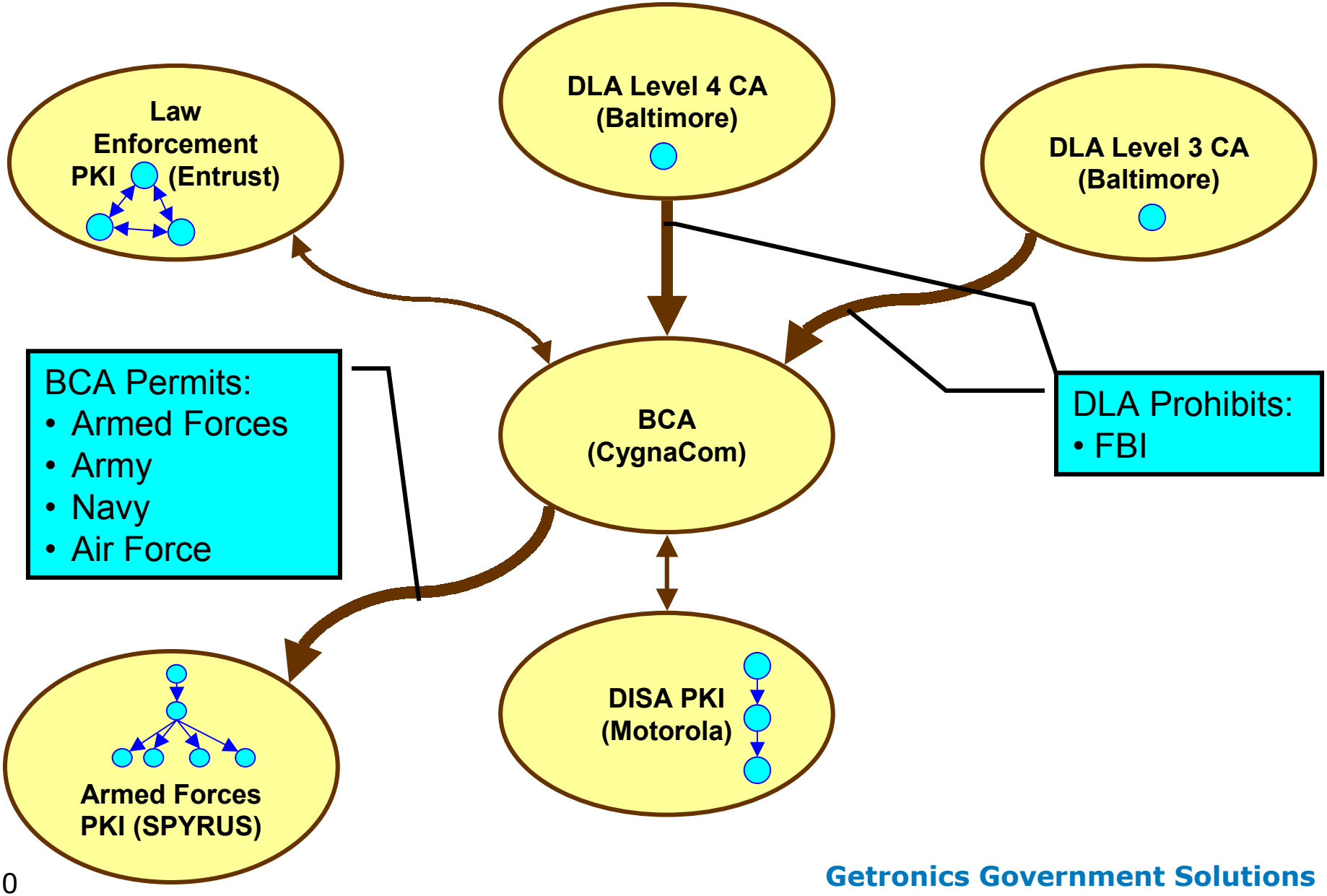
Certification Path Validation Test Inputs

- Each cert path validation test case specifies these inputs to cert path processing software:
  - Trusted certificate to use (a.k.a. trust anchor)
  - Initial-policy-set (one or more Object Identifiers, each representing a certificate policy)
  - Initial-explicit-policy indicator value
  - Initial-policy-mapping-inhibit indicator value
  - Initial-inhibit-policy indicator value

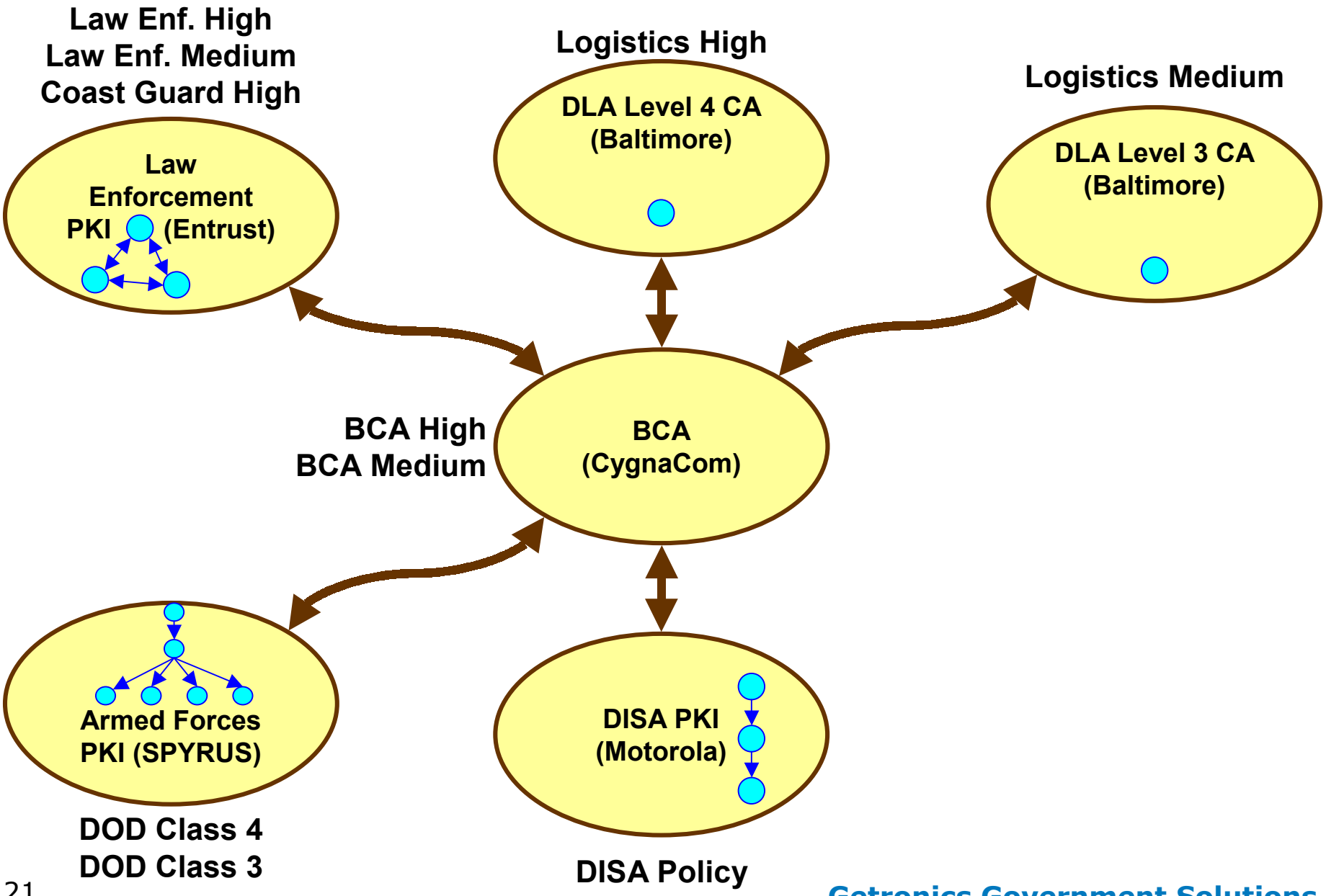
BITS PKI Architecture



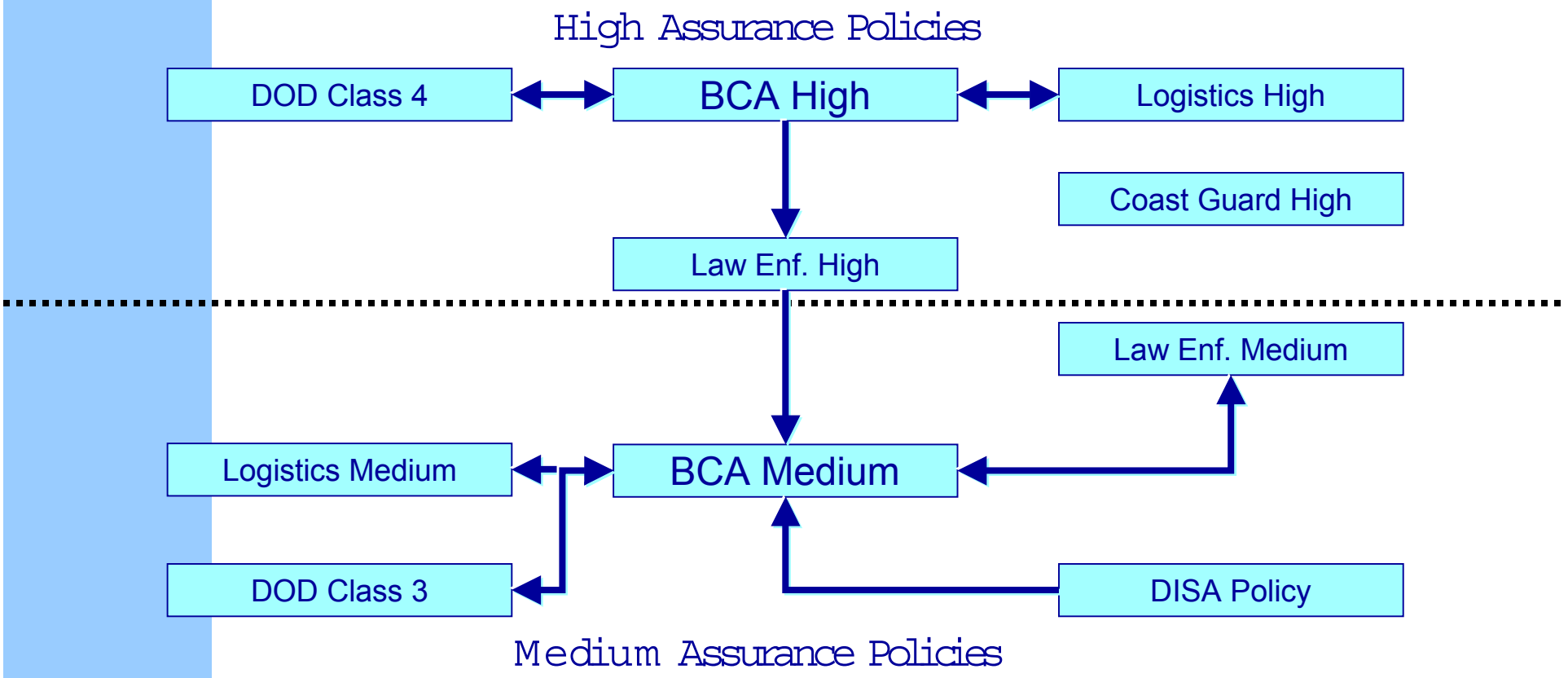
BITS Name Constraints



BITS Certificate Policies

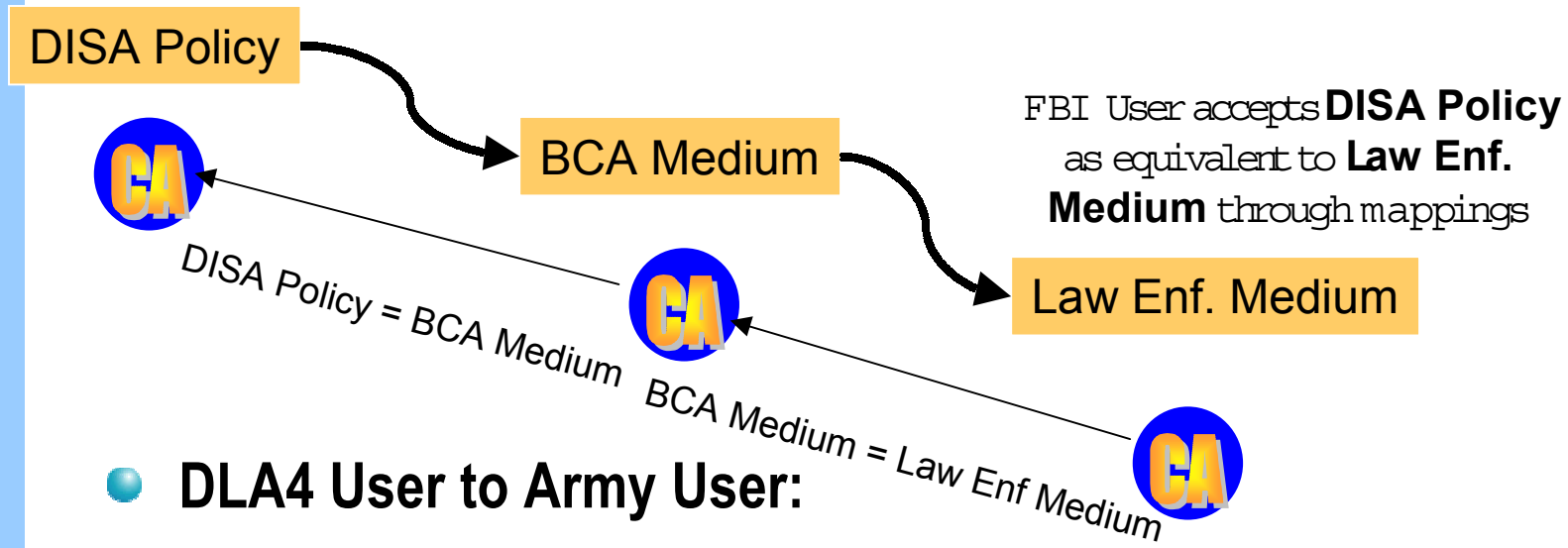


BITS Certificate Policy Mappings

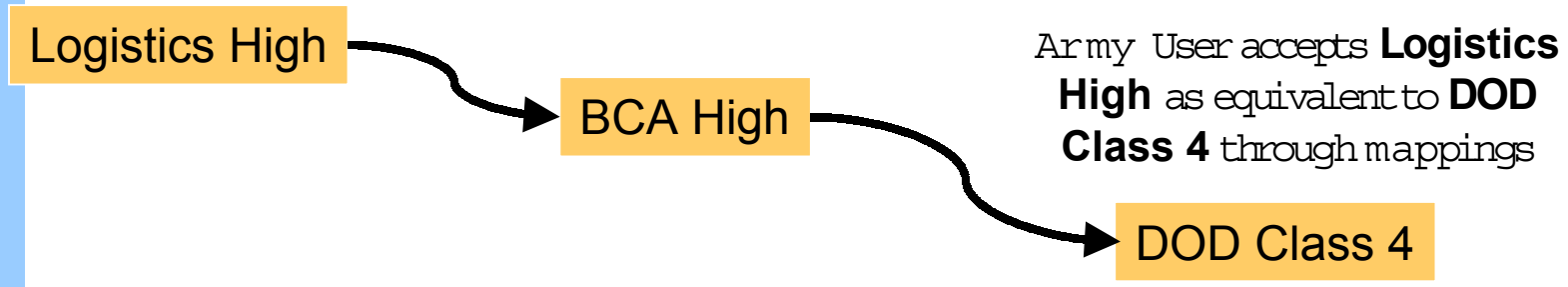


Example Policy Mapping Flows

- **All Mappings "Pass Through" BCA Policies**
- **DISA User to FBI User:**



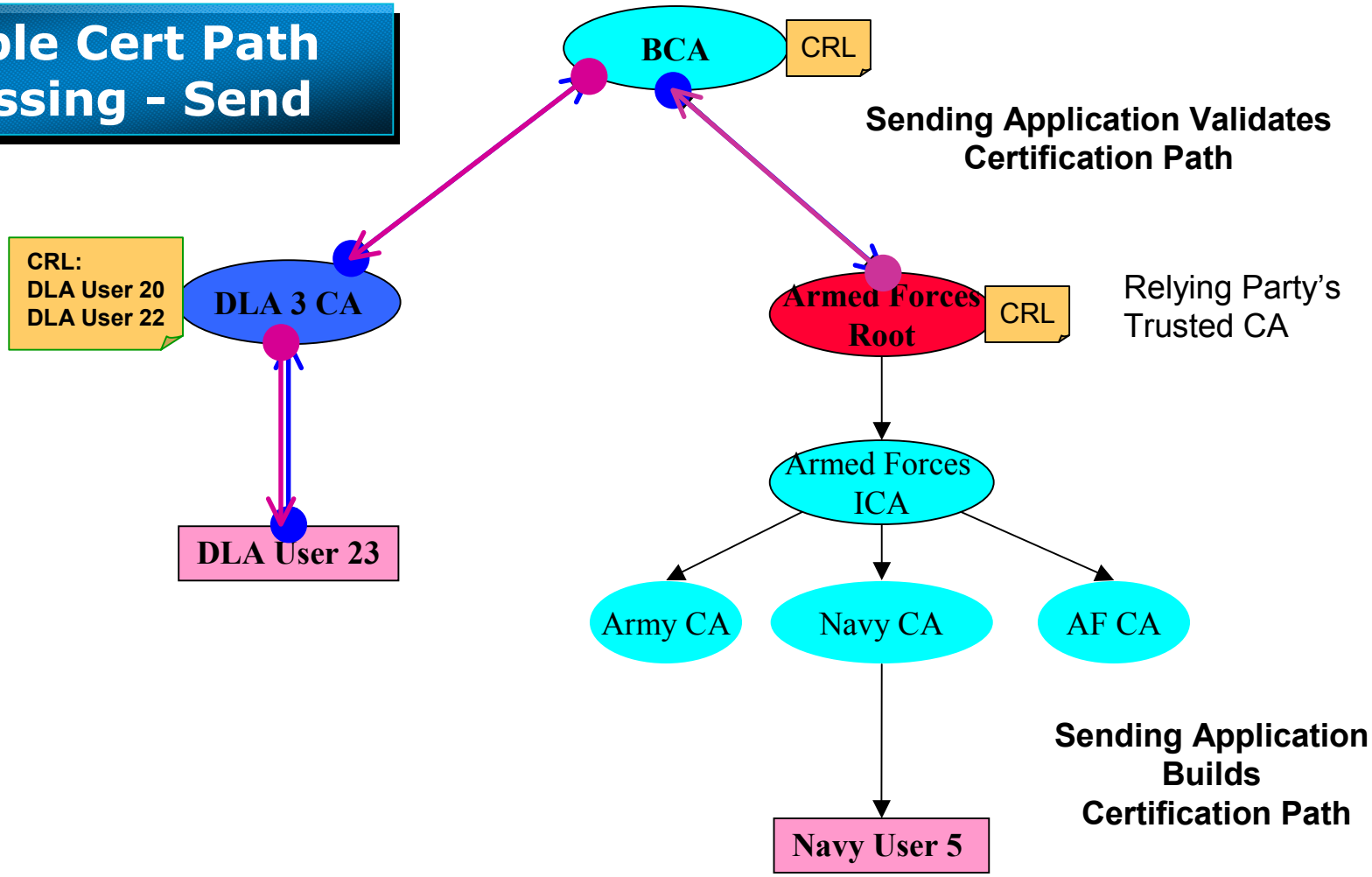
- **DLA4 User to Army User:**



BITS Secure Messaging Test Scenarios

- Simulate exchange of signed-only, encrypted-only, signed&encrypted messages between users in different PKIs
- Signed S/MIME messages are provided that require product to validate signer's cert path
- Test cases specify creation of encrypted S/MIME messages that require product to validate recipient's cert path
- Encrypted S/MIME messages are provided that can be decrypted using private key provided via PKCS #12 file

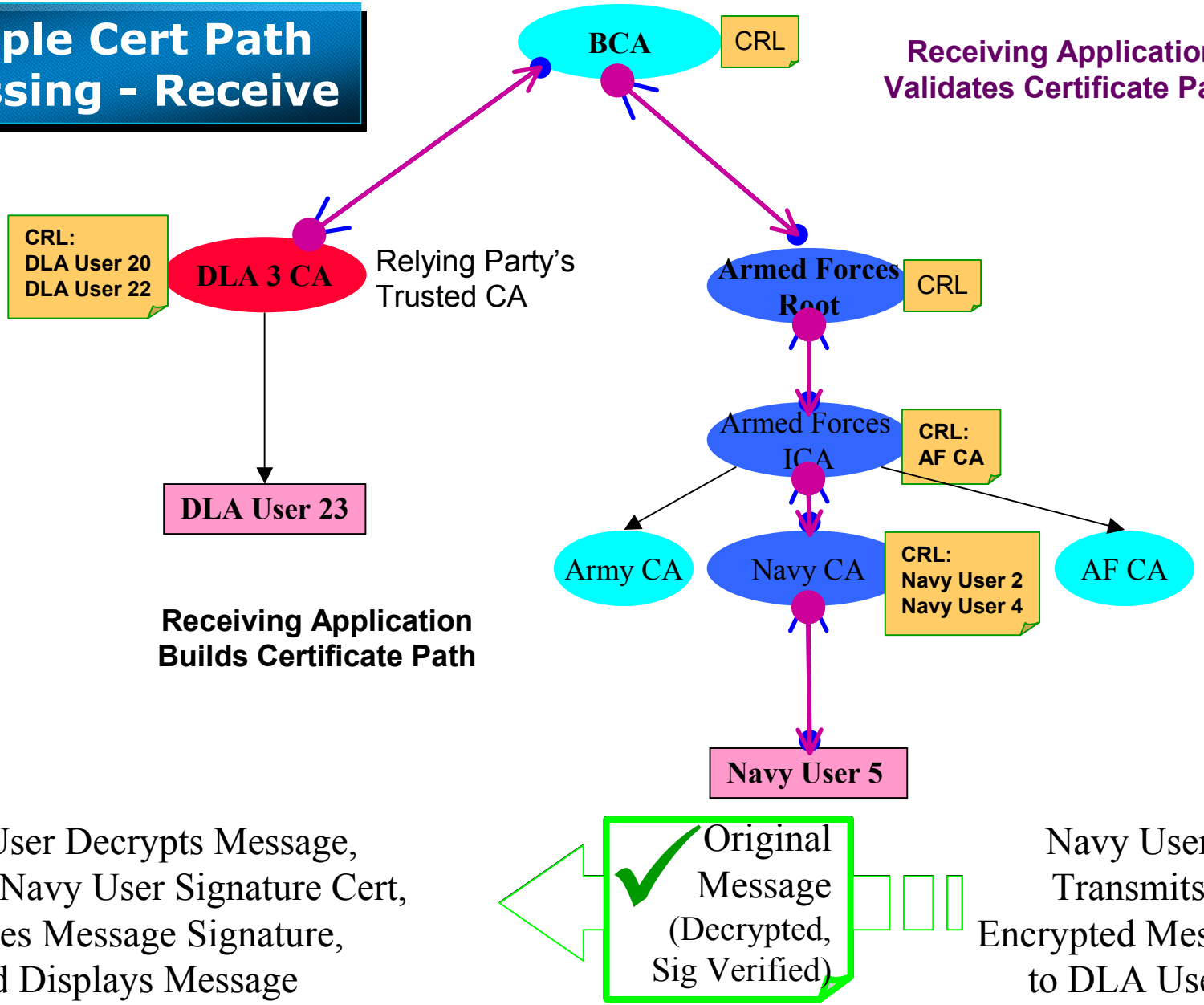
Example Cert Path Processing - Send



Recipient Encryption Certificate Validated, Message Encrypted

Navy User Signs Message, Retrieves and Validates DLA User Encryption Certificate

Example Cert Path Processing - Receive



1/22/02 BITS Status

- BCA Interoperability Test Description document completed and available from BITS web site
- BITS test data generation & testing tools complete
- BITS certs, crossCertificatePairs, CRLs generated
- Majority of verification testing using CML complete, but still resolving errors in test data
- Now generating & testing: S/MIME msgs, PKCS #12 files
- We will send e-mail to FPKI TWG mail list when fully tested data and freeware tools are available
- Getronics goal is to complete testing by 1/31/02

BITS LDAP Directory

- All BITS certs, crossCertificatePairs, CRLs are available in LDAP directory (data still under test)
- Single LDAP directory includes directory information tree equivalent to that hosted on 6 directory servers for BCA Demo Phase II
- Applications can use LDAP to access directory to test their ability to retrieve data required to build cert paths composed of certs from multiple PKIs
- LDAP directory is accessible from Internet using: <ldap://bcatest.atl.getronicsgov.com/>
- IP address of LDAP server is 199.79.206.5
- LDAP server runs default port of 389

BITS Web Site

- BITS "U.S. DoD BCA Technology Demonstration" web site is accessible from Internet using: <http://bcatest.atl.getronicsgov.com/>
- BITS web site provides:
  - Zip file containing all test data (certs, CRLs, S/MIME messages, PKCS #12 files); (available soon)
  - Instructions for accessing BITS LDAP directory;
  - BCA Interoperability Test Description document;
  - BCA Demo docs: Briefing, Report, Technical Interop Profile, Cert/CRL Profiles, Directory Profile
  - Links to other related web sites
  - BITS Freeware Test Utilities (available soon)
  - Links to other freeware

BITS Technical Support

- Under DOD contract, Getronics will assist vendors with executing BITS tests, answering technical questions, and providing troubleshooting hints
- Contact:

  John.Pawling@GetronicsGov.com

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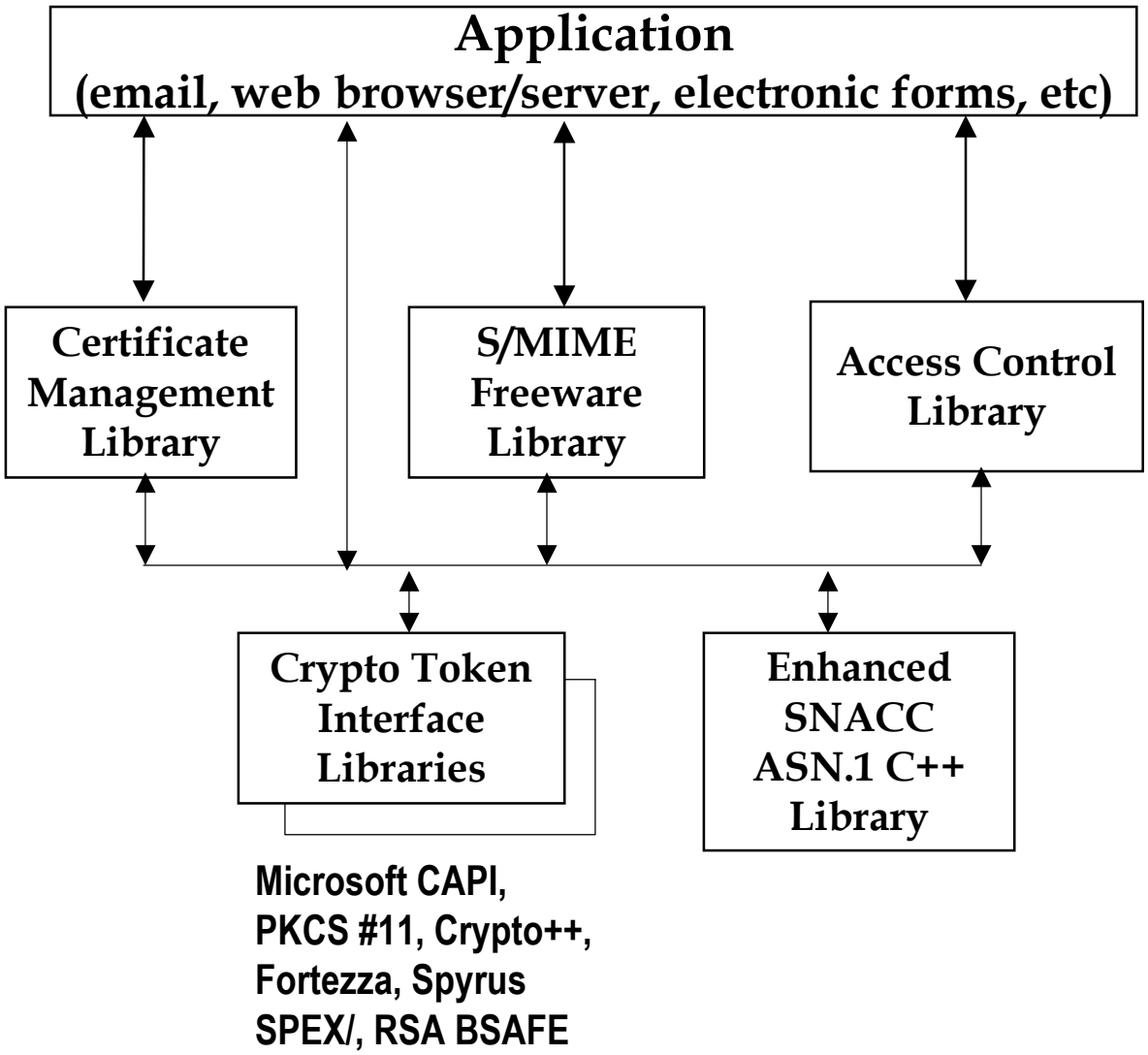
BITS Freeware Utilities

- BCA Interoperability Test Description documents test cases, procedures, data
- Getronics developed freeware test utility to parse Test Description document to automatically generate all test data and post to LDAP directory
- Getronics also developed freeware test utility to use Certificate Management Library to automate validation tests of generated data
- Under DOD contract, Getronics is providing source code for both utilities at no cost to vendors
- Data generation and testing can be easily reproduced or changed by Getronics or third party

Getronics Security Services Libraries

- Certificate Management Library (CML)
  - Builds and validates X.509 certification paths & CRLs
  - Provides local cert/CRL storage functions
  - Provides remote directory retrieval via LDAP
- S/MIME Freeware Library (SFL)
  - Implements IETF S/MIME v3 security protocol
  - Security label, signed receipts, mail list support
- Access Control Library (ACL)
  - Provides Rule Based Access Control using security labels & authorizations as per SDN.801
  - Implements Attribute and X.509 Certificates
  - Meets DMS, Bridge CA, Canadian MMHS Reqts
- Enhanced SNACC
  - Implements Abstract Syntax Notation.1 (ASN.1) Distinguished Encoding Rules (DER)

Getronics Security Services Architecture



Getronics Freeware Availability

- S/MIME Freeware Library <http://www.getronicsgov.com/hot/sfl_home.htm>
- Certificate Management Library <http://www.getronicsgov.com/hot/cml_home.htm>
- Access Control Library <http://www.getronicsgov.com/hot/acl_home.htm>
- Enhanced SNACC – ASN.1 Toolkit supports DER. <http://www.getronicsgov.com/hot/snacc_home.htm>
- For all Getronics freeware libraries, unencumbered source code is freely available to all. Getronics freeware can be used without paying any royalties or licensing fees. There is a public license associated with each freeware library.

BCA CML/SFL/ACL Success

- BCA Demo Phase II tested cross-certified Entrust, General Dynamics, Baltimore & SPYRUS PKIs
- CML/CPDL successfully used to build & validate certification paths between these PKIs
- CygnaCom Certification Path Development Library: <http://www.cygnacom.com/products/index.htm>
- CygnaCom integrated SFL/CML/ACL/CPDL into plug-in for Eudora Pro mail client
- Interop testing successful with Baltimore MailSecure & Entrust S/MIME toolkit
- CygnaCom used ACL in Attribute Authority
- CygnaCom used ACL & CML in trusted web server

NIST S/MIME v3 Test Facility

- NIST and Getronics are developing open source S/MIME v3 auto responder using SFL, CML, Enhanced SNACC, CTILs
- NIST plans to host auto responder on NIST web site <http://csrc.ncsl.nist.gov/pki/smime/>
- Vendors can use facility to determine if products comply with S/MIME v3 specs & NIST profile
- Auto responder processes S/MIME messages sent by tester & provides success/failure feedback
- Auto responder creates signed and/or encrypted S/MIME messages for processing by tester

Point of Contact

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