ARF, ARCAT, and Summary Results

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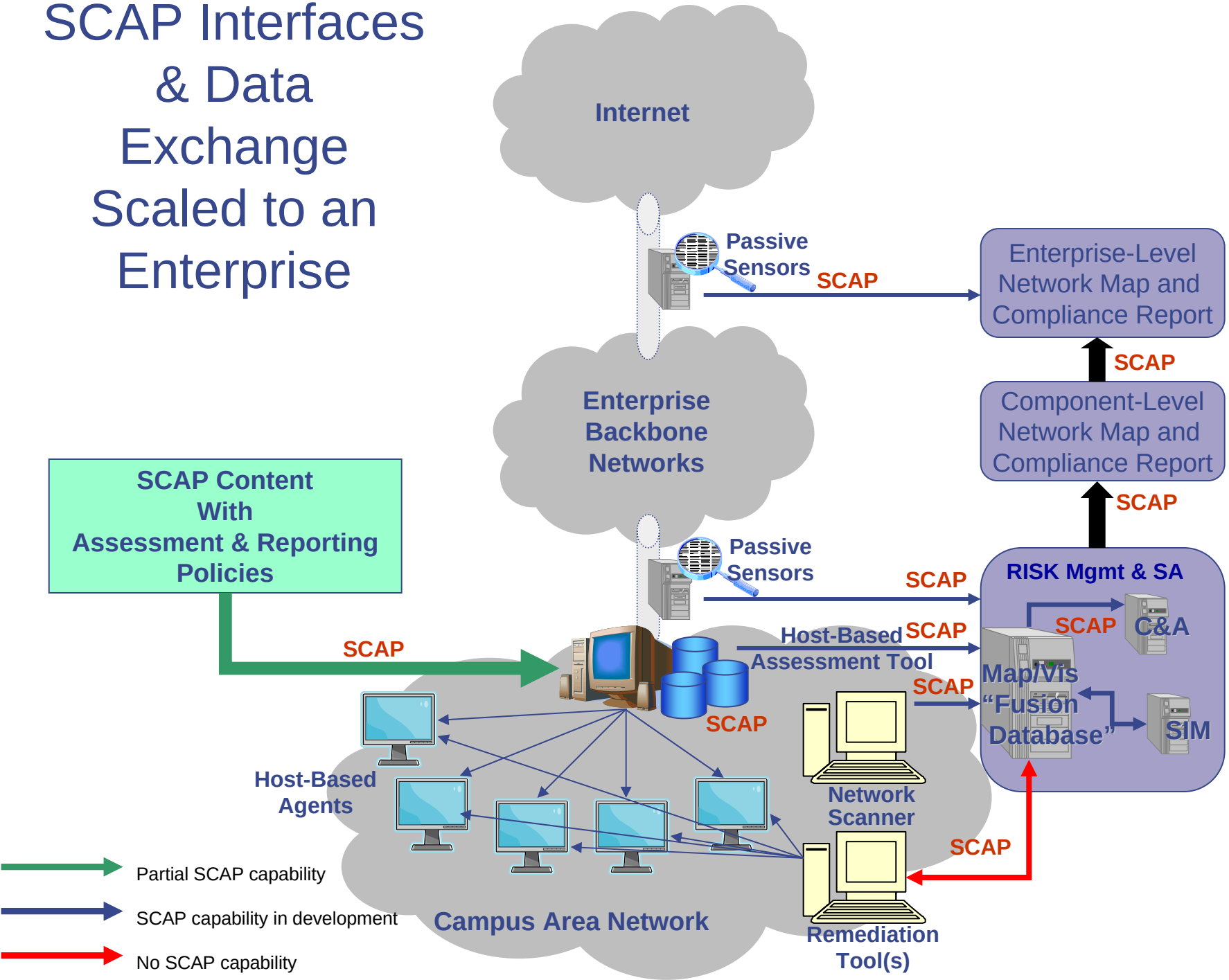
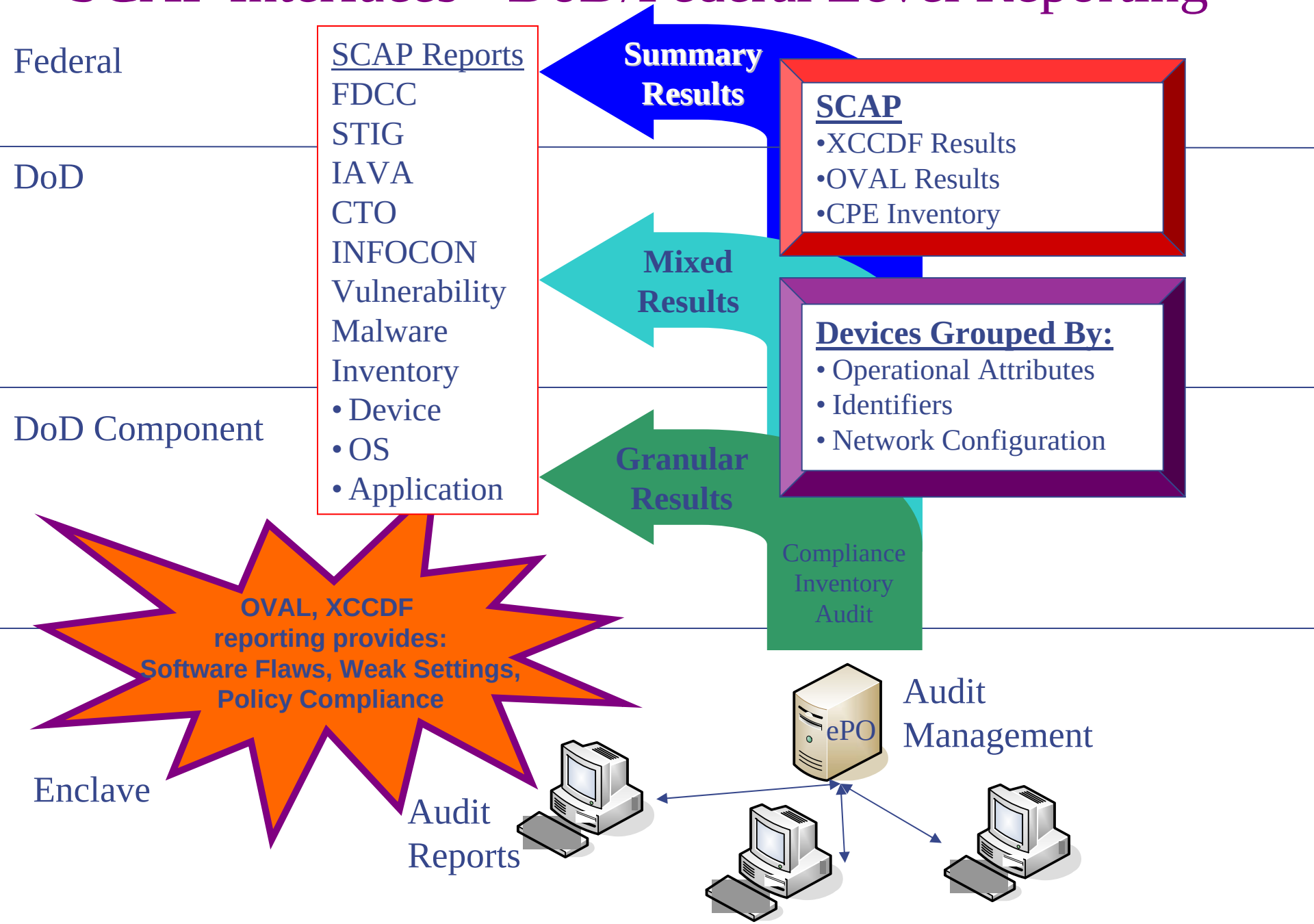
Enterprise-Level Assessment and Reporting

- The Concept
- Assessment Results Format (ARF)
- Assessment Summary Results (ASR)
- The Assessment Results Consumer and Analysis Tool (ARCAT)

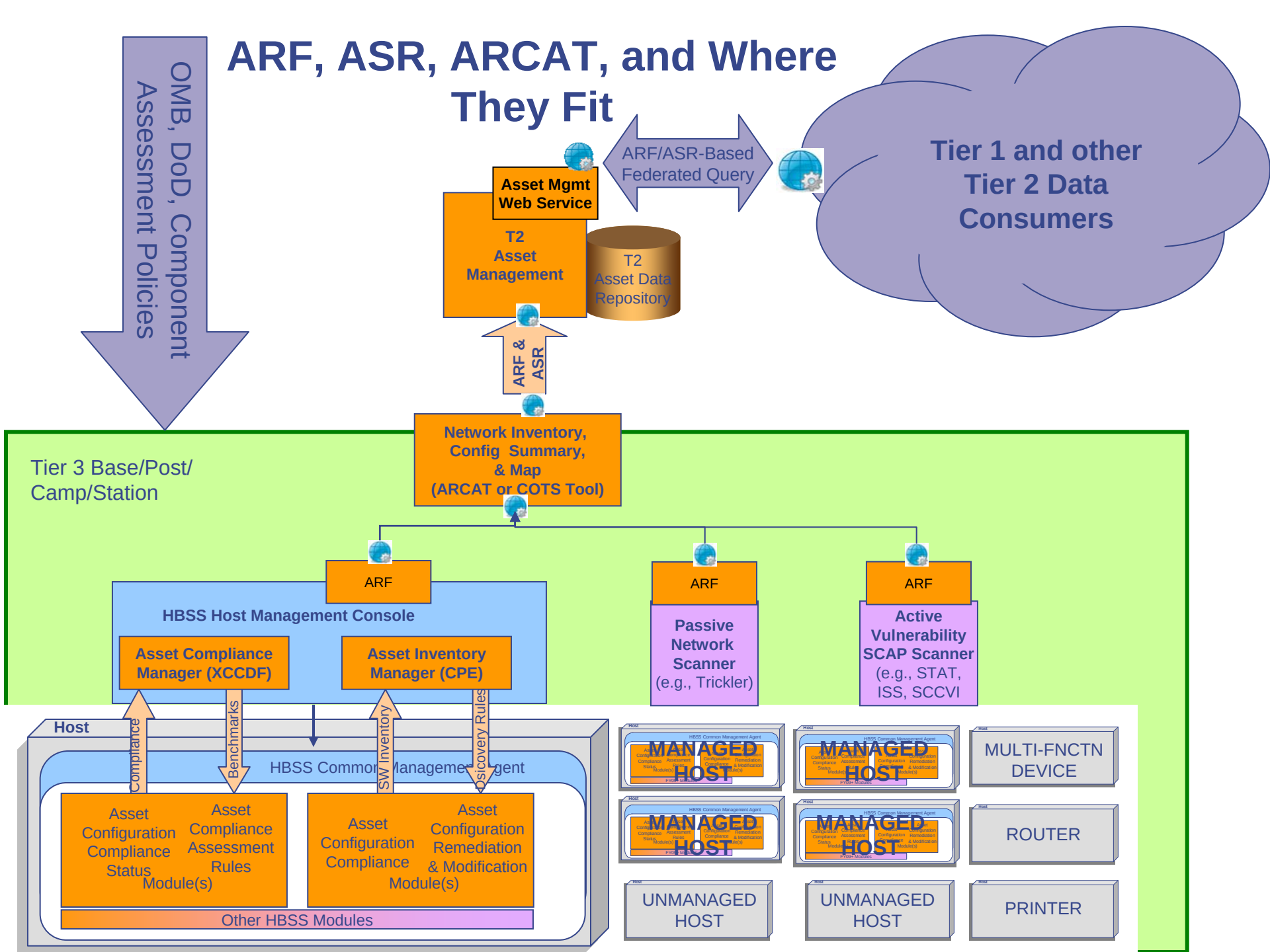
SCAP Interfaces & Data Exchange Scaled to an Enterprise



SCAP Interfaces - DoD/Federal Level Reporting



ARF, ASR, ARCAT, and Where They Fit



Assessment Results Format

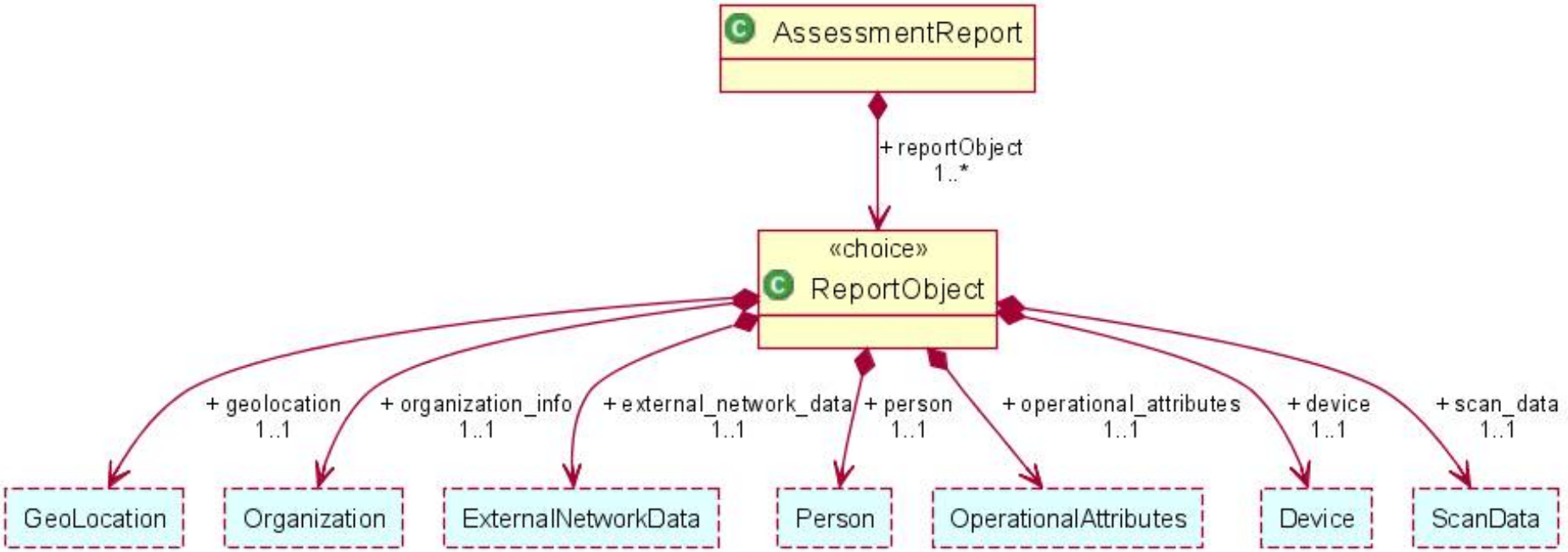
The detailed, per-device assessment results language

ARF Functionality

- Packages information any SCAP validated tool must already produce
  - OVAL Results
  - XCCDF Results
- Adds network info, CPE inventory, Ops-Attributes
  - CPE Inventory = findings reported against OS & applications
- Supports object re-use
  - References instead of building stand-alone objects
- Has built-in replication support
  - Action/Status tags
- Simplistic – Supports comprehension and Cross-Domain Solution (CDS)

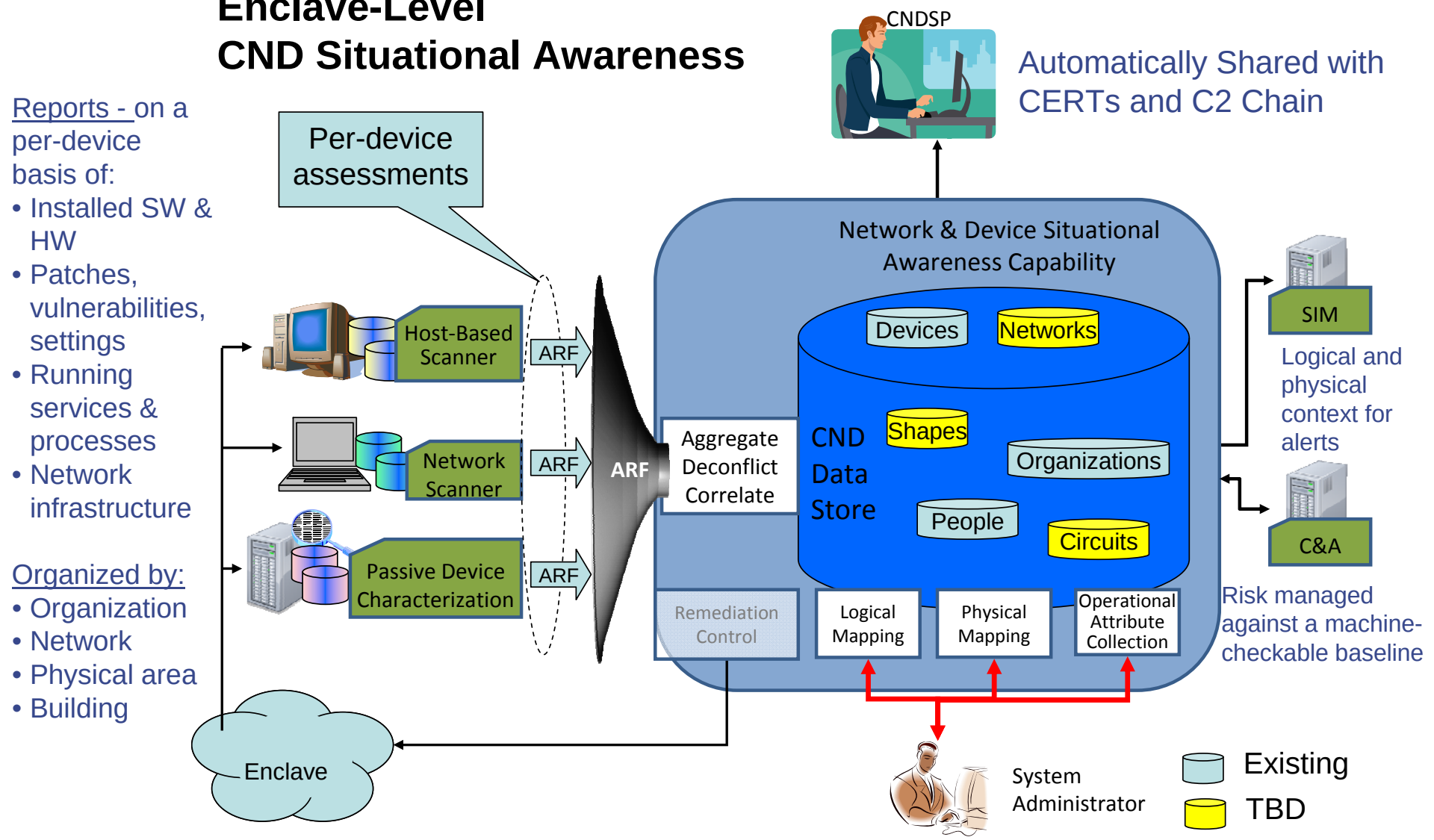
ARF Data Schema Top Level Concept

- A “report” consists of some number of “report objects”
  - Each type of object is assigned a unique ID and can be referenced
  - Intended to support paging – 0 to many report objects/page



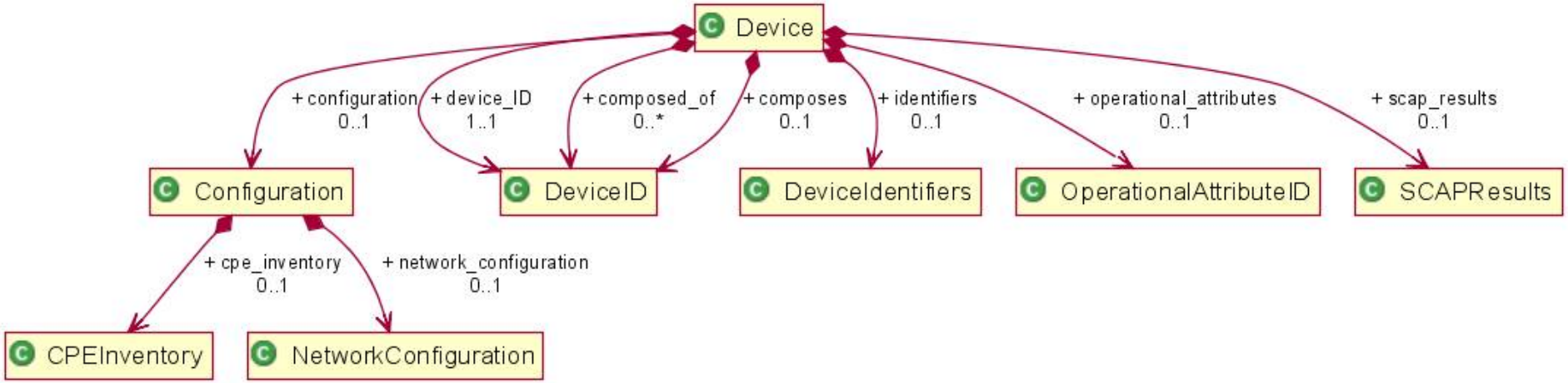
ARF Vision

Enclave-Level CND Situational Awareness

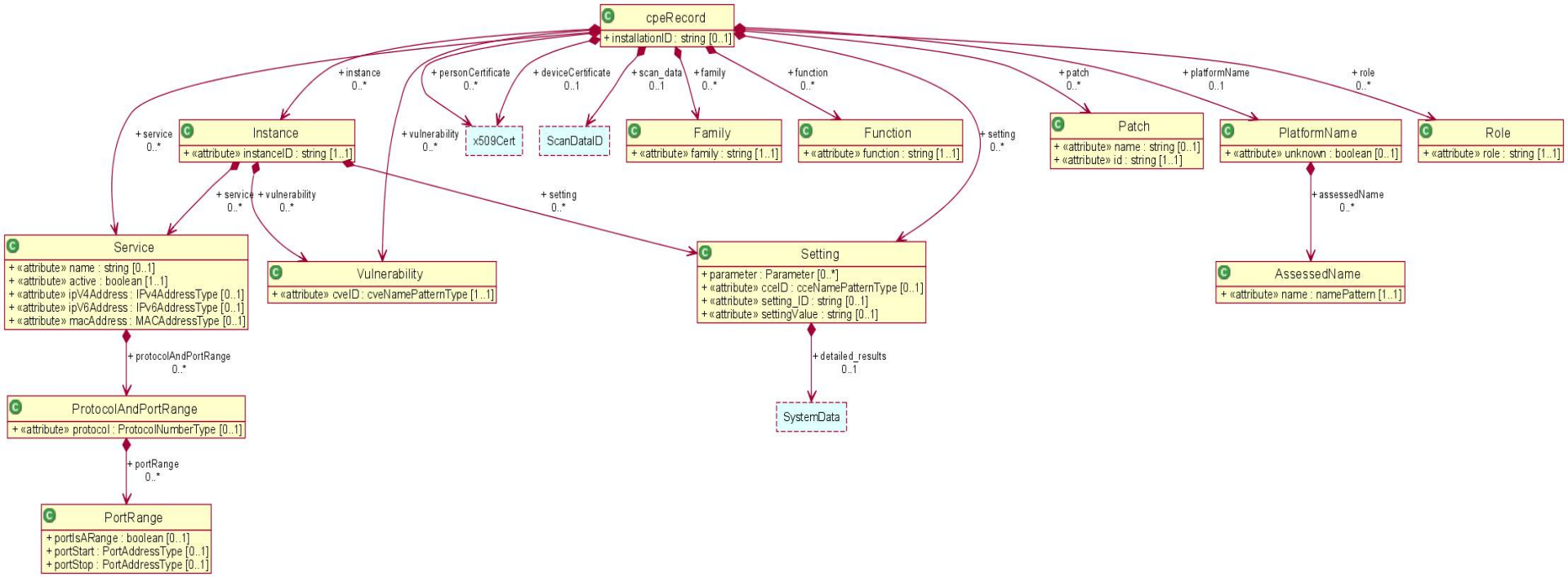


Device Record – The Key ARF Data Type

- The stuff from the DoD data modeling efforts
  - We're pretty sure we need
  - We're pretty sure we can get
  - No hardware inventory (disk drive, *µ*processor, memory, etc.)
    - *May re-look that before 1.0 release*



Per Software Product Data (aka cpe-record)



Summary Results

When you just want a single question answered

Summary Results Functionality

- Allows for Concise reports on single assessment checks
  - CPE platform definitions – For a CPE mask, how many devices have a matching CPE?
  - CVEs – Which devices have/don't have CVEs?
  - CCE parameters – How many/which devices have each parameter value?
  - OVAL Definitions - How many/which devices resolve to true or false for each OVAL def?
  - XCCDF Benchmarks
    - Average benchmark score, max score, min score, pass/fail
    - How many/which devices pass or fail each rule
  - Patches - How many/which devices have resolved to true or false for each patch?
- Provides results either as Counts and (optionally) Lists per finding
  - (true/false, pass/fail, not applicable, not checked, error)
  - Lists can include: IP, Domain Name, Record Identifier
- Plus population data and scan data

Sample – CPE Summary Report for cpe:/a:adobe:flash

```
<?xml version="1.0" encoding="UTF-8" ?>
- <summRes:ResultsPackage xmlns:cia-enum="http://scap.nist.gov/schema/cia_enums/0.1"
  xmlns:cndc="http://metadata.dod.mil/mdr/ns/netops/net_defense/cnd-core/0.41"
  xmlns:cpe="http://cpe.mitre.org/language/2.0" xmlns:p="http://scap.nist.gov/schema/cve/0.1"
  xmlns:scan_data="http://metadata.dod.mil/mdr/ns/netops/shared_data/scan_data/0.41"
  xmlns:summRes="http://metadata.dod.mil/mdr/ns/netops/net_defense/summary_res/0.41"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/netops/net_defense/summary_res/0.41 summary_res.xsd
  http://metadata.dod.mil/mdr/ns/netops/net_defense/cnd-core/0.41 cnd-core.xsd
  http://scap.nist.gov/schema/cia_enums/0.1 cia_enumerations.xsd http://cpe.mitre.org/language/2.0 cpe-language_2.0.xsd
  http://scap.nist.gov/schema/cve/0.1 cve_0.1.xsd http://metadata.dod.mil/mdr/ns/netops/shared_data/scan_data/0.41
  scan_data.xsd">
  - <summRes:PopulationCharacteristics populationSize="250">
      <summRes:resource>http://cpeDb.dod.mil</summRes:resource>
    </summRes:PopulationCharacteristics>
  - <summRes:cpe>
      <!--  First line "platform" defines the CPE mask that is the basis of the CPE results report   -->
      <summRes:platform>cpe:/a:adobe:flash</summRes:platform>
    - <!--
          Each CPE Result item record gives a count and may provide a list of products that match the
                  "platform" defined above.  Also count/list of devices that don't have any products
                  that match the platform mask.
      -->
    - <summRes:cpeResultItem cpeFinding="true" platformName="cpe:/a:adobe:flash:1.02">
        <summRes:result count="50" />
      </summRes:cpeResultItem>
    - <summRes:cpeResultItem cpeFinding="true" platformName="cpe:/a:adobe:flash:1.05">
        <summRes:result count="50" />
      </summRes:cpeResultItem>
    - <summRes:cpeResultItem cpeFinding="true" platformName="cpe:/a:adobe:flash:1.20">
        <summRes:result count="100" />
      </summRes:cpeResultItem>
    - <summRes:cpeResultItem cpeFinding="false" platformName="cpe:/a:adobe:flash">
        <summRes:result count="50" />
      </summRes:cpeResultItem>
    </summRes:cpe>
</summRes:ResultsPackage>
```

Sample – Arbitrary XCCDF Benchmark with 1 Rule, Listed by IP Address, Ungrouped

```
<?xml version="1.0" encoding="UTF-8" ?>
<summRes:ResultsPackage xmlns:cia-enum="http://scap.nist.gov/schema/cia_enums/0.1" xmlns:cndc="http://metadata.dod.mil/mdr/ns/netops/net_defense/cnd-core/0.41" xmlns:cpe="http://cpe.mitre.org/language/2.0" xmlns:cve="http://scap.nist.gov/schema/cve/0.1"
  xmlns:scan_data="http://metadata.dod.mil/mdr/ns/netops/shared_data/scan_data/0.41"
  xmlns:summRes="http://metadata.dod.mil/mdr/ns/netops/net_defense/summary_res/0.41" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://metadata.dod.mil/mdr/ns/netops/net_defense/summary_res/0.41 summary_res.xsd
  http://metadata.dod.mil/mdr/ns/netops/net_defense/cnd-core/0.41 cnd-core.xsd http://scap.nist.gov/schema/cia_enums/0.1 cia_enumerations.xsd
  http://cpe.mitre.org/language/2.0 cpe-language_2.0.xsd http://scap.nist.gov/schema/cve/0.1 cve_0.1.xsd
  http://metadata.dod.mil/mdr/ns/netops/shared_data/scan_data/0.41 scan_data.xsd">
- <summRes:PopulationCharacteristics populationSize="500000">
    <summRes:resource>DoDIAVMReportingdB</summRes:resource>
  </summRes:PopulationCharacteristics>
- <summRes:benchmark profile="Gold">
  - <summRes:benchMarkID>
      <cndc:resource>vms.dod.mil</cndc:resource>
      <cndc:record_identifier>winXPSTIGv2.53</cndc:record_identifier>
    </summRes:benchMarkID>
    <summRes:benchmarkStats aveScore="62.0" minScore="2.0" maxScore="93.0" minPassScore="62.3" scoreType="flat" />
    <!--  Compliance lists and counts at the overall benchmark level  -->
  - <summRes:benchmarkComplianceItem benchmarkResultStatus="pass">
    - <summRes:result count="375231">
        <summRes:deviceRecord record_identifier="asset1" ipv4Address="192.168.2.3" />
      </summRes:result>
    </summRes:benchmarkComplianceItem>
    <!--  Compliance lists and counts at the individual rule level  -->
  - <summRes:ruleResult ruleID="rule1">
      <summRes:ident>CCE-20075-7</summRes:ident>
    - <summRes:ruleComplianceItem ruleResult="pass">
      - <summRes:result count="3">
          <summRes:deviceRecord record_identifier="asset1" ipv4Address="192.168.3.5" />
          <summRes:deviceRecord record_identifier="asset2" ipv4Address="192.168.3.7" />
          <summRes:deviceRecord record_identifier="asset3" ipv4Address="192.168.3.11" />
        </summRes:result>
      </summRes:ruleComplianceItem>
    - <summRes:ruleComplianceItem ruleResult="fail">
      - <summRes:result count="3">
          <summRes:deviceRecord record_identifier="asset4" ipv4Address="192.168.3.12" />
          <summRes:deviceRecord record_identifier="asset5" ipv4Address="192.168.3.13" />
          <summRes:deviceRecord record_identifier="asset6" ipv4Address="192.168.3.14" />
        </summRes:result>
      </summRes:ruleComplianceItem>
    </summRes:ruleResult>
  </summRes:benchmark>
</summRes:ResultsPackage>
```

ARCAT

When you have a bunch of ARFs and want to look at and evaluate them

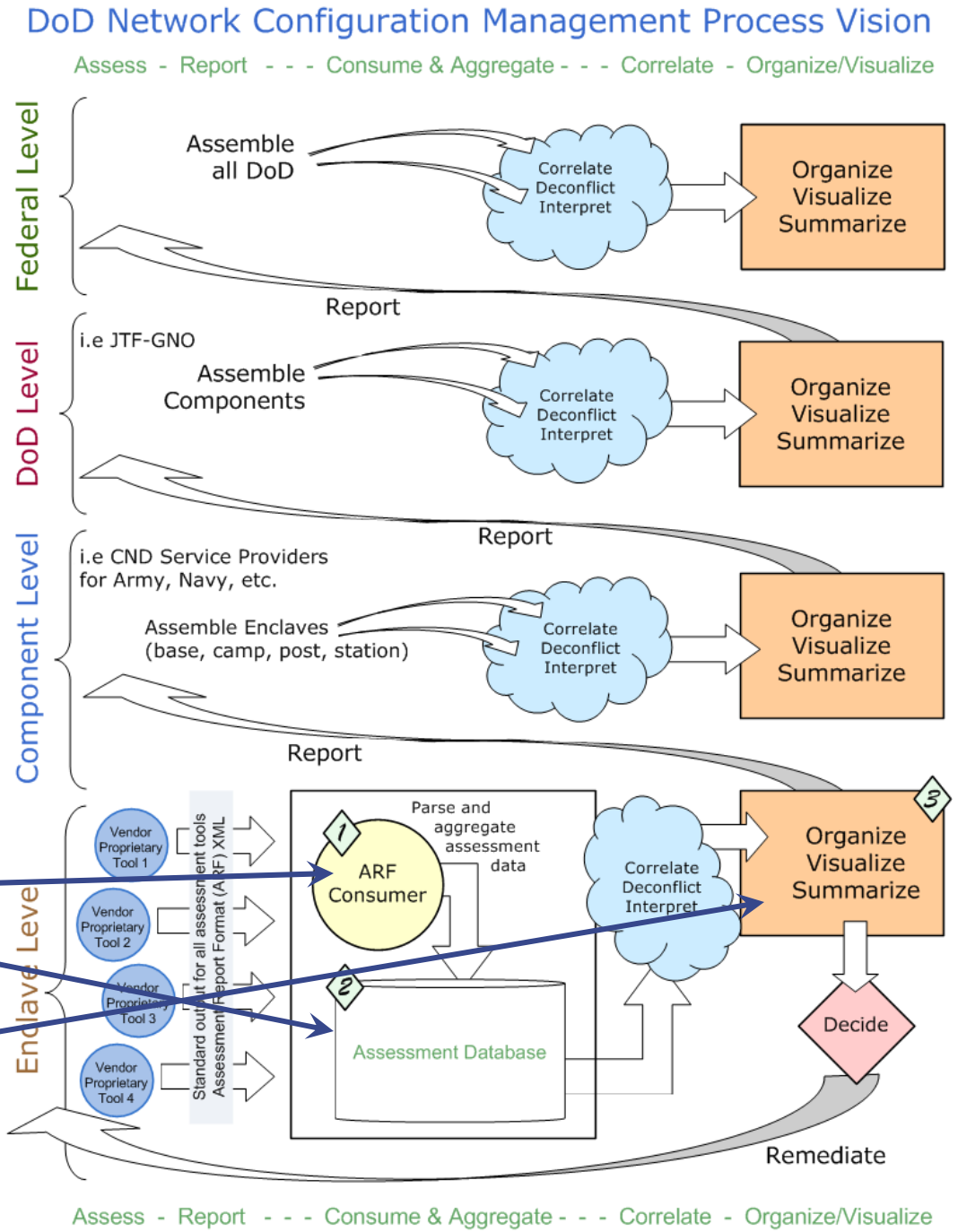
Assessment Results Consumer & Analysis Tool (ARCAT) Status

- ARCAT development began in June 09
  - Reference implementation of standard for device data reporting -- Assessment Results Format (ARF)
    - ARCAT is a generic ARF consumer (i.e. not a sensor, a sensor output data collection capability)
  - Used for reporting compliance with FDCC, STIG, IAVA, and CTO
  - Used for collecting inventories of devices and installed applications/OS
  - May serve as basis for multi-sensor network assessment data fusion capability
  - Source code to be made available within DoD and can be shared across US Government

Vision

ARCAT Spiral One

1) Consumer
2) Repository
3) GUI (to a very limited degree)



CND R&T Reference Implementation of the

Assessment Results Consumer & Analysis Tool

Manage Your Attributes

Home
Review
list
search
summary
results
Manage
attributes
locations
orgs
people

Name	Location	CNDSP	Owning Service	Owning Unit	Admin Unit and POC
Cool Group	Airport Square	Pentagon J6	Navy	Navy HQ J6	
AOR:	Reg:	DoD NW:	NW:	CCSD:	Circuit:
Class: CTS-BALK	MAC: 1	Confidentiality: Classified	FIPS 199 Confidentiality: H | Integrity: H | Availability: H		
Not POR Managed	System Affiliations:				
Roles:			Functions:		
Joe's Group	Chik fil A	USAF	USAF	USAF	POC: Wolfkiel, J
AOR: AFRICOM	Reg: West Africa	DoD NW: NIPRNET	NW: Internet	CCSD:	Circuit:
Class: U	MAC: 2	Confidentiality: Classified	FIPS 199 Confidentiality: L | Integrity: L | Availability: L		
Not POR Managed	System Affiliations:				
Roles: Testing			Functions: Lab Network		
Management	FANX3	Navy HQ J6	Navy	Montery NPS	Montery NPS
AOR: Pacific	Reg:	DoD NW: SIPRNET	NW:	CCSD: IJSNDF	Circuit:
Class: U	MAC: 3	Confidentiality: Sensitive	FIPS 199 Confidentiality: H | Integrity: L | Availability: M		
POR Managed	System Affiliations:	CNDSP Pacific			
Roles:			Functions:		
R and D	Five Guys	Montery NPS	Army	Army	
AOR:	Reg:	DoD NW:	NW:	CCSD:	Circuit:
Class: NS-S	MAC:	Confidentiality:	FIPS 199 Confidentiality: | Integrity: H | Availability:		
POR Managed	System Affiliations:				
Roles:			Functions:		
UNCLAS Email	FANX3	Navy	Pentagon J6	Navy	Navy
AOR: CONUS	Reg: Mid Atlantic	DoD NW: NIPRNET	NW: COMCAST	CCSD: AXNKL	Circuit: Fiber
Class: C	MAC: 2	Confidentiality: Public	FIPS 199 Confidentiality: L | Integrity: L | Availability: L		
Not POR Managed	System Affiliations:				
Roles: System Admin			Functions: Email Support		
					Total Operational Attributes: 5

Provides ability to associate devices with operational/environmental information
– e.g. Where is it, who owns it, who defends it, what network is it on, how important is it, etc.. (see example – above)

CND R&T Reference Implementation of the

Assessment Results Consumer & Analysis Tool

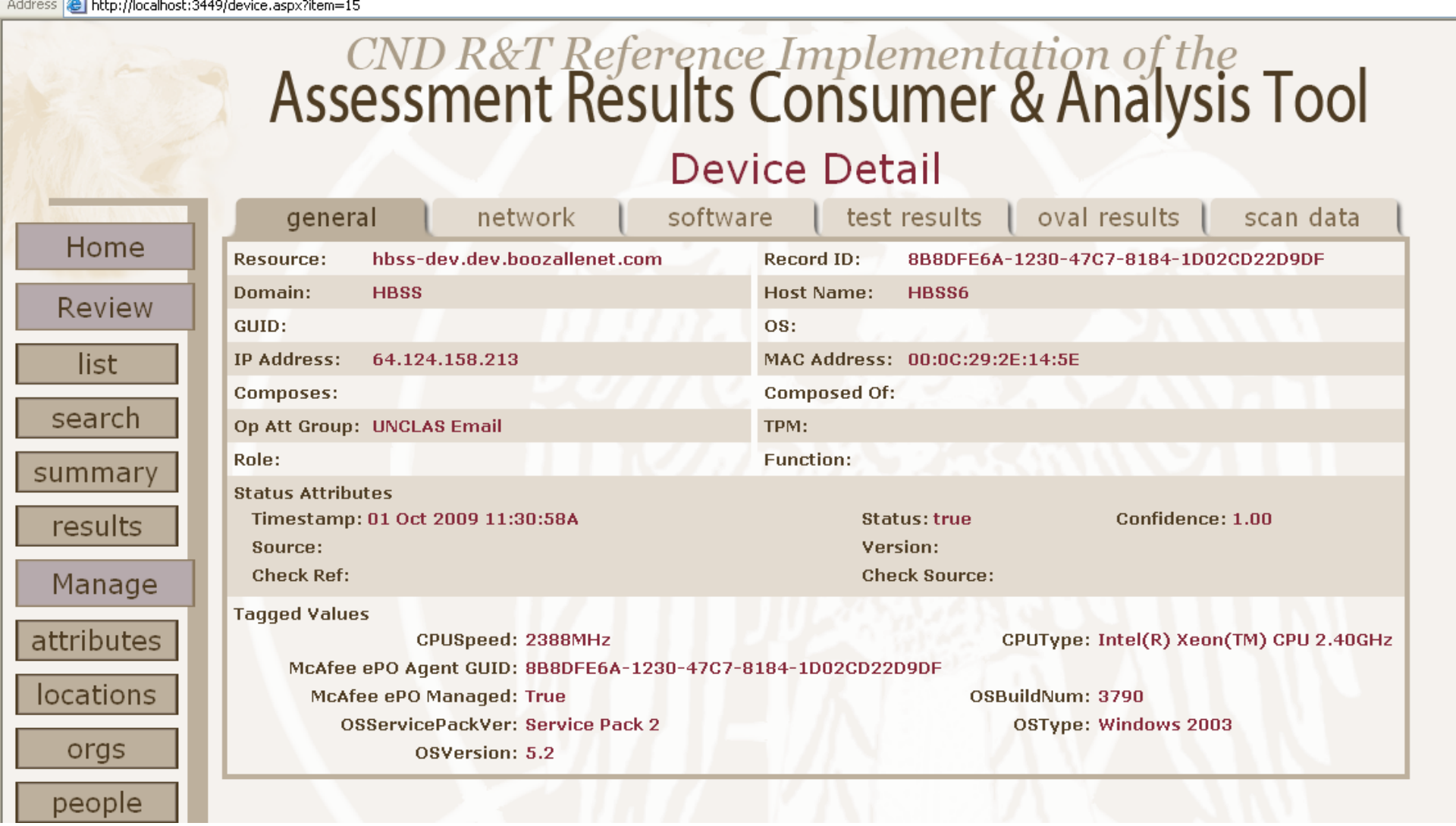
Device List

Home
Review
list
search
summary
results
Manage
attributes
locations
orgs
people

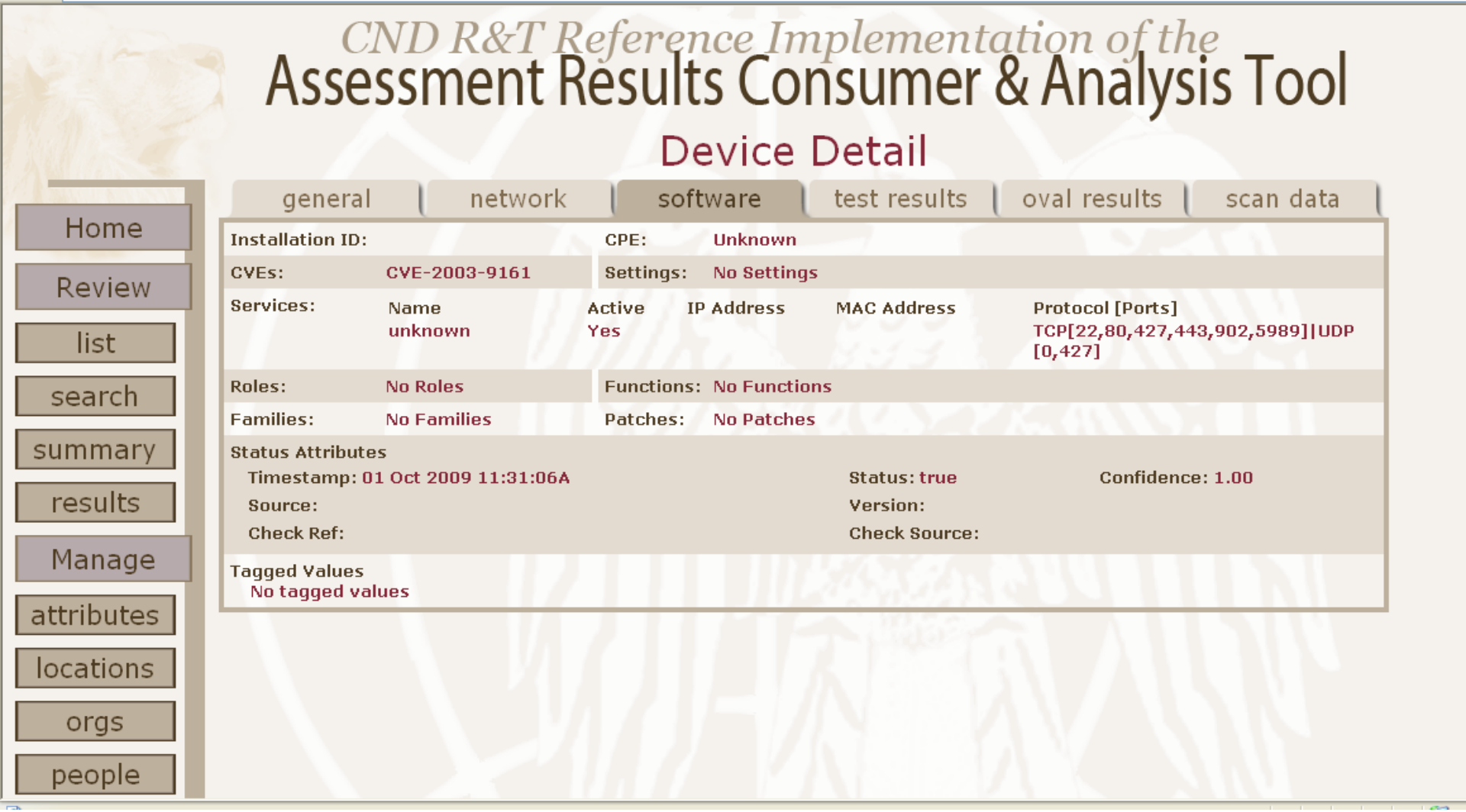
Group All Role All Function All Status All 1 2 3 4 5 6 7

Op Att Group	Host Name	IP Address	MAC Address	Role	Function	Status
R and D	mirage.acme.corp.net	10.1.3.126	A0:EE:05:1D:43:42			true
R and D	mbddev.acme.corp.net	10.1.3.129	01:44:6B:36:B3:8C			true
R and D	ksrealtimedev.acme.corp.net	10.1.3.137	11:33:2A:17:47:23			true
R and D	precision.acme.corp.net	10.1.3.139	11:2D:34:58:69:00			true
R and D	weblogic10	10.1.3.150	00:1D:3A:55:75:96			true
R and D	temporaryspare.acme.corp.net	10.1.3.151	10:10:A0:1A:C8:ED			true
R and D	viggen.acme.corp.net	10.1.3.154	11:23:2A:6D:23:BC			true
R and D	gunner.acme.corp.net	10.1.3.155	01:1C:29:16:1D:3A			true
R and D	tomahawk.acme.corp.net	10.1.3.156				true
R and D	acme-desktop-4	10.1.3.158	37:2D:09:EA:7A:0A			true
R and D	martinsville.acme.corp.net	10.1.3.198	00:26:CD:A7:E7:D7			true
R and D		10.1.3.247	00:1B:C9:2A:25:3F			true
R and D	docmanager.acme.corp.net	10.1.3.248	00:1D:56:28:BD:E2			true
R and D	redmine.acme.corp.net	10.1.3.250	00:0D:2A:3C:A7:08			true
R and D	svn.acme.corp.net	10.1.3.252	00:1D:3A:79:AA:CD			true
R and D	corporate-nas.acme.corp.net	10.1.3.254	01:1E:B3:10:6D:86			true
R and D	jones-pc.acme.corp.net	10.1.4.100				true
R and D	ARCAT01	10.1.4.50 0:0:0:0:0:0:0:0 0:0:0:0:0:0:0:0	00:00:00:00:00:00 00:00:00:00:00:00 00:00:00:00:00:00	role0	function0	true
UNCLAS Email	WHITELIST-DB	64.124.158.104	00:1A:4B:34:DD:C2			true

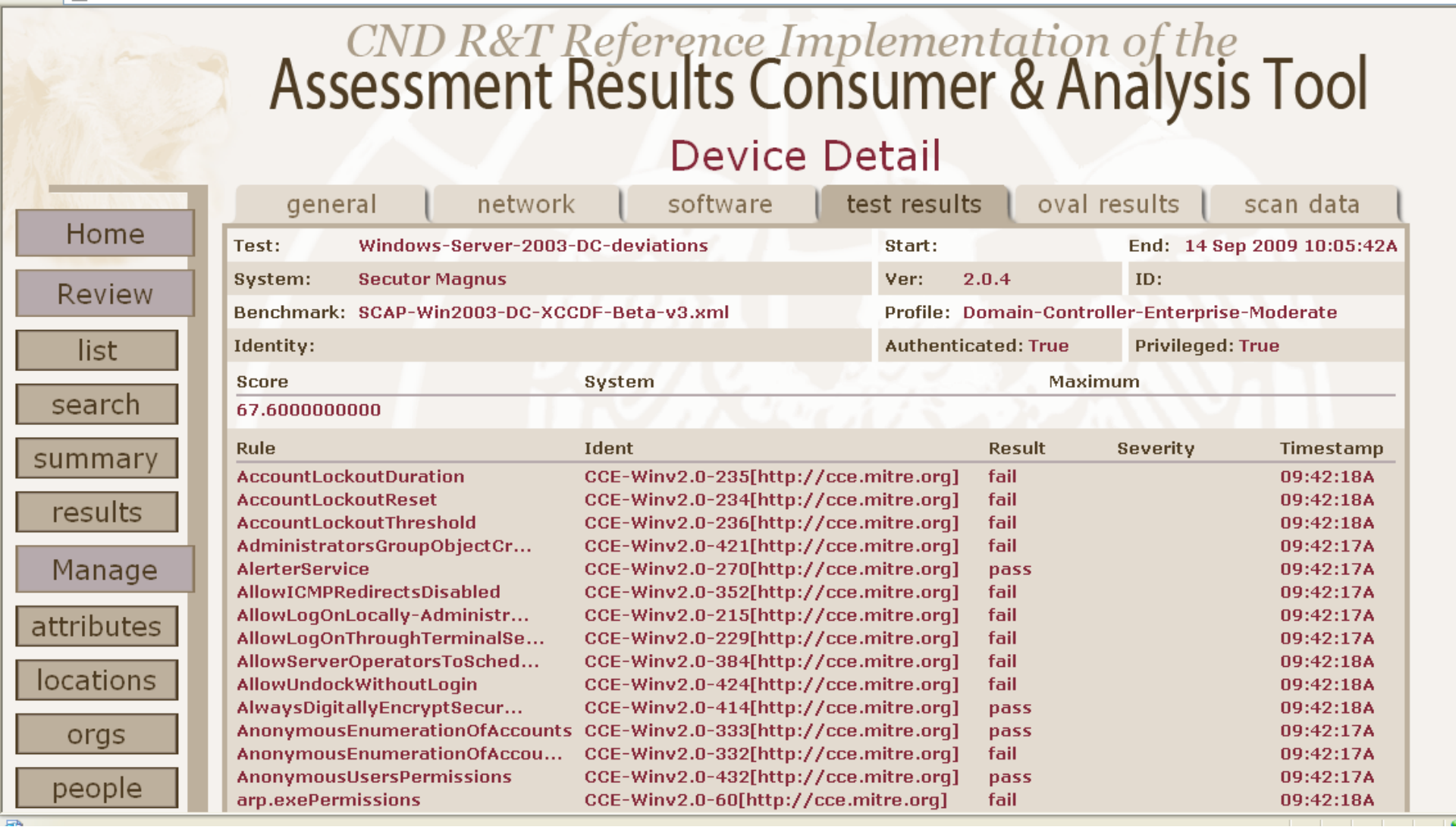
Shows device information collected from all sensors and any environmental information associated – supports “clickable” drill down for any device



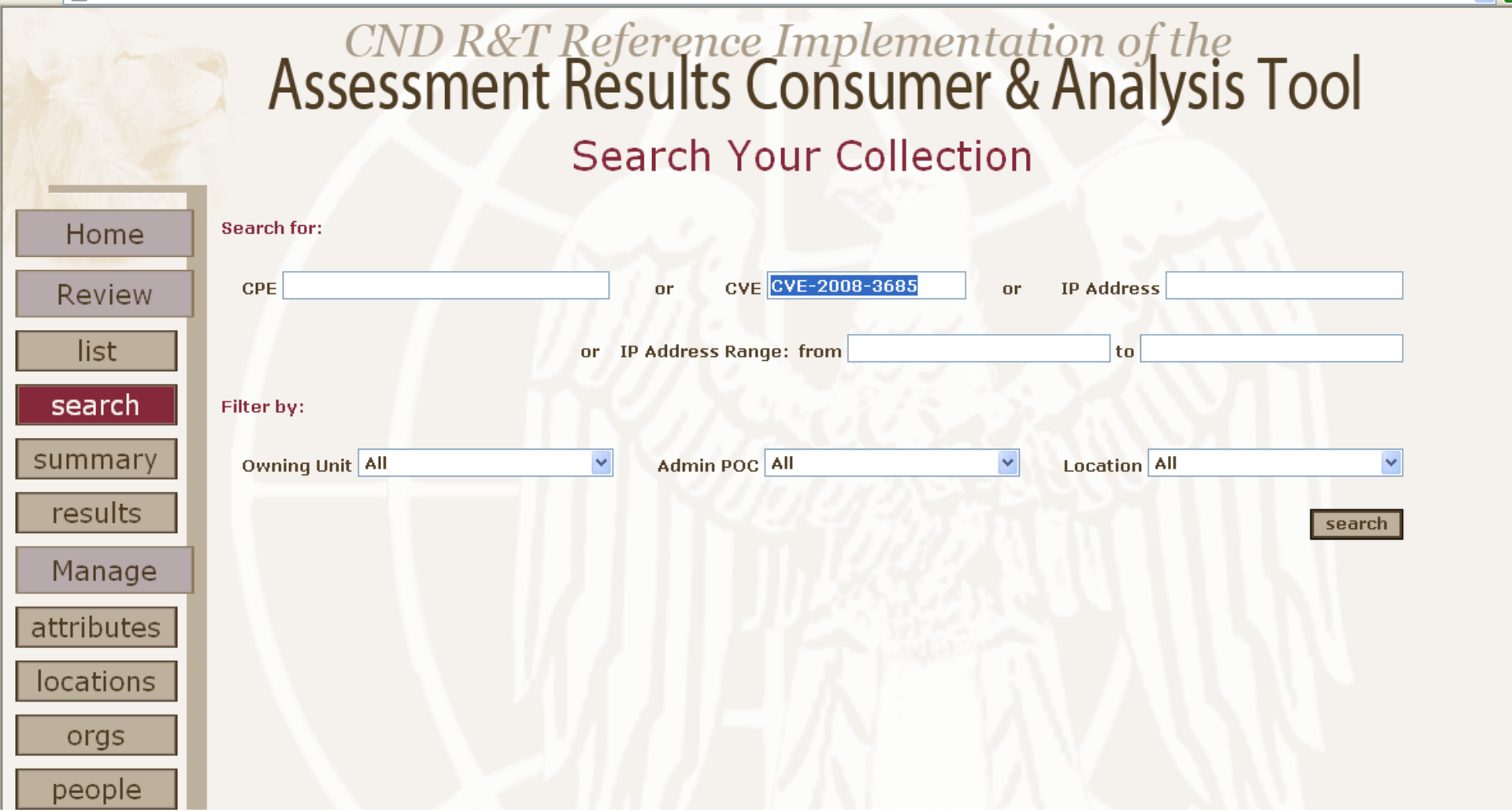
Shows device detail that can be packaged in standard ARF device inventory or compliance fields.



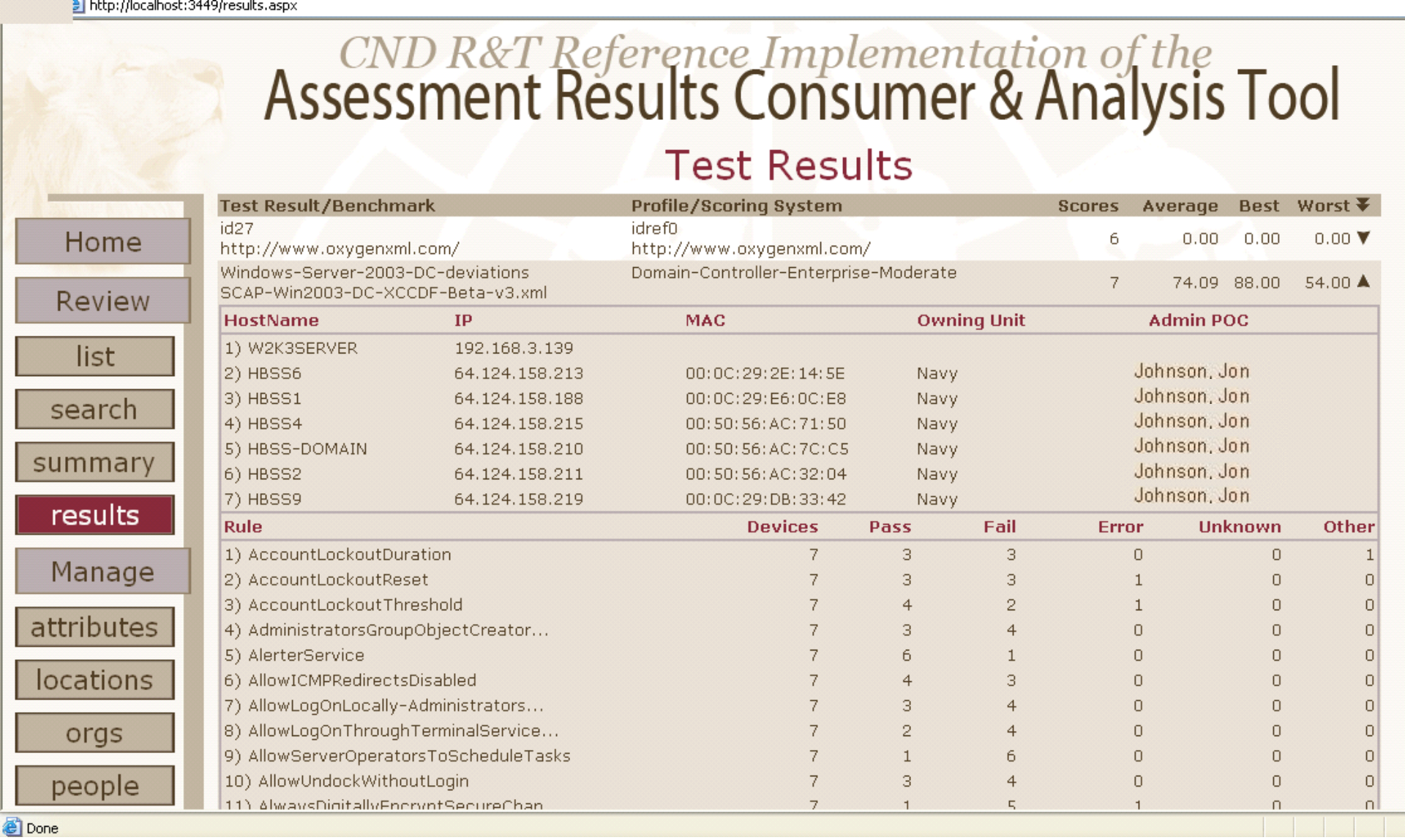
Combines installed software descriptions, plus any vulnerabilities, settings, patches, services, and open ports/protocols associated.



Shows compliance with any XCCDF checklist – e.g. FDCC, STIG, IAVM, CTO



Supports search for common data elements reported in ARF.



Provides summarized roll-up for decision maker-level situational awareness.

Why ARCAT?

- Serves as reference implementation to ensure ARF provided by tools is valid
- Acts as development platform to do proof-of-concept for vendor discussions
- Allows for testing of bandwidth, processing, and implementation of new reporting capabilities
- Serves as surrogate network sensor central collection point pending commercial availability

When?

- Spiral 1 of ARCAT is complete and can be accessed by DoD personnel on DKO at the CND Architecture Web Site
- Has been distributed internal to DoD as development platform/sample implementation
  - DISA VMS
  - Navy NRL
  - Others
- Can share with other organizations, but…
  - Not ready for deployment as finished product
  - Not locked down in “STIG’d” mode
  - No promises on scalability or stability
  - Will request memo documenting limited liability/terms of use

POC

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