Open Security Controls Assessment Language (OSCAL) Workshop Logistics

David Waltermire

National Institute of Standards and Technology

Welcome

- This is the first of a series of OSCAL workshops
- Logistics
  - Nearest Exits
  - Thank you for silencing your cell phones
  - Breaks
  - Lunch @noon in Building 101

Goals for this Workshop

- Our goals for this workshop are:
  - To connect with the OSCAL community
  - To share information on the progress made to date
  - Educate users, content creators, and tool vendors about the current OSCAL models
  - Discuss next steps for OSCAL

Agenda

Time	Topic
8:00 am	**Registration and Networking**
9:00 am	**Welcome, Introduction to Workshop**
9:10 am	**What is OSCAL and Who Needs It** Michaela Iorga, OSCAL co-lead NIST
10:00 am	**OSCAL and FedRAMP** Ashley Mahan, Director, FedRAMP, GSA
10:30 am	**Break**
10:45 am	**Tools That Understand OSCAL** Andrew Weiss, GitHub and Wendell Piez, OSCAL team member, NIST
11:20 am	**OSCAL Roadmap** David Waltermire, SCAP Lead and OSCAL co-lead, NIST
Noon	**Lunch**
1:30 pm	**OSCAL Catalog and Profile Models** Brian Ruf, OSCAL team member, Noblis
2:45 pm	**Break**
3:00 pm	**OSCAL Component and System Security Plan Models** David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:15 pm	**Discussion: Tomorrow is Today – The Need for Automation** Moderator: David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:50 pm	**Closing Remarks**
5:00 pm	**Adjourn**

What is OSCAL and Who Needs It

Michaela Iorga

Senior Security Technical Lead and OSCAL co-lead

National Institute of Standards and Technology (NIST)

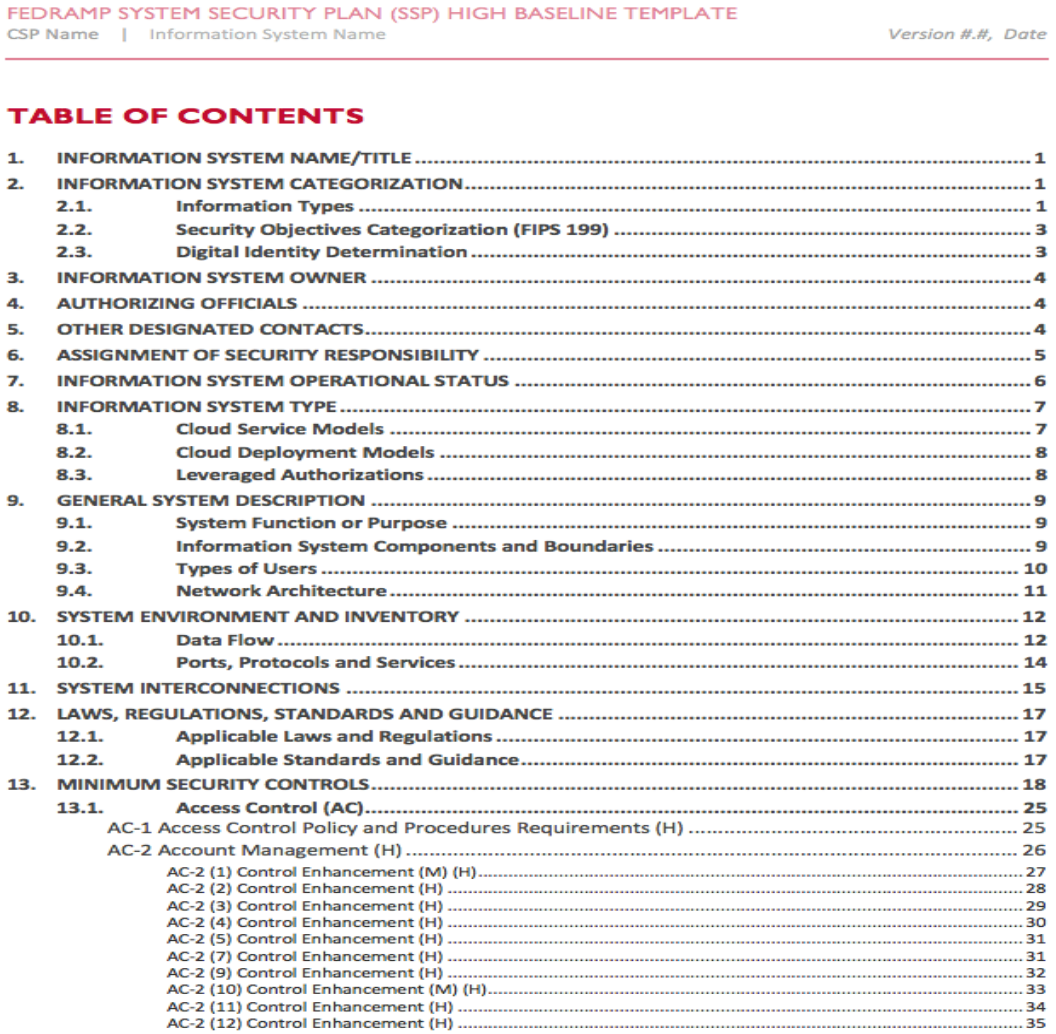
Presentation Agenda

- Why OSCAL is needed
- OSCAL in a nutshell
- Risk Management Framework and OSCAL
- OSCAL Guiding Principals
- Overview of OSCAL Layers and Models
- Project focus
- Show and tell

Why do we care … and why you should too!

Today's challenges:

- Information technology is complex
- Security vulnerabilities are everywhere
- Regulatory frameworks are burdensome
- Risk management is hard
- Documentation is out of date



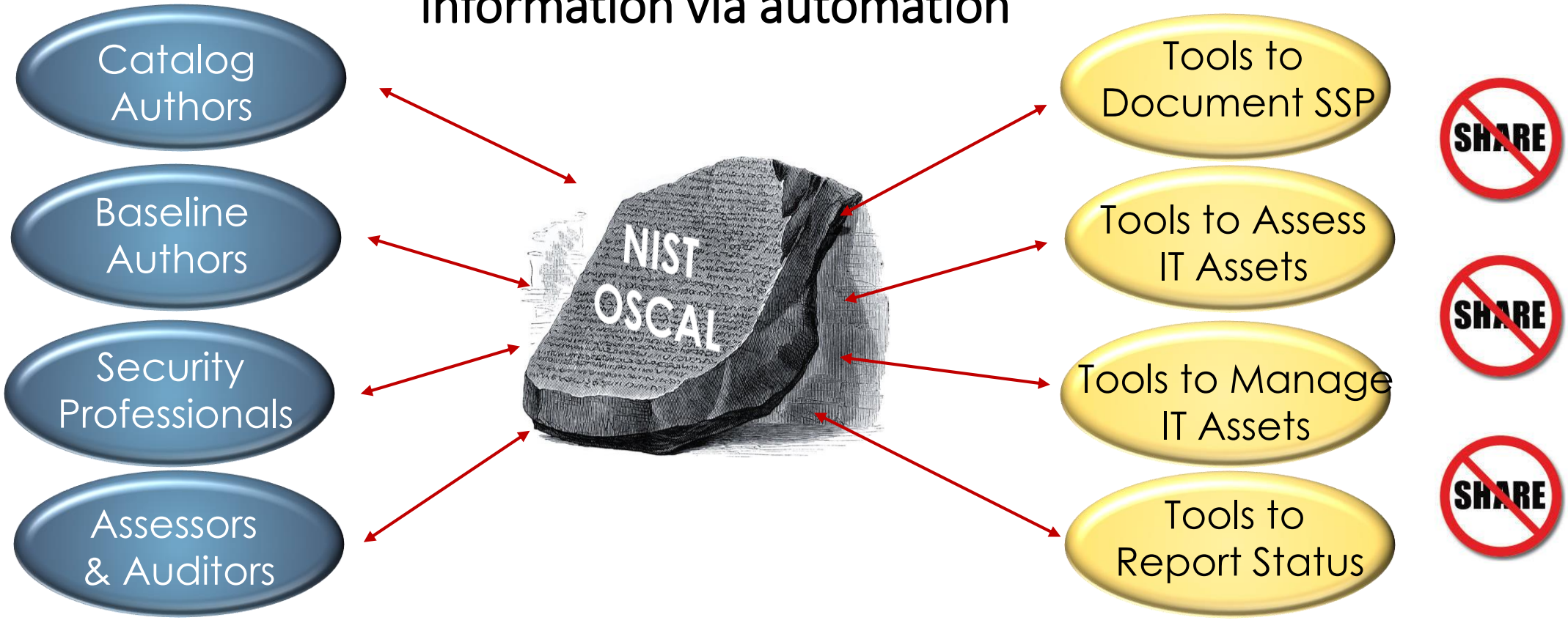
FEDRAMP SYSTEM SECURITY PLAN (SSP) HIGH BASELINE TEMPLATE

CSP Name | Information System Name *Version #.#, Date*

TABLE OF CONTENTS

What is OSCAL?

OSCAL is like a Rosetta Stone that enables tools and organizations to exchange information via automation



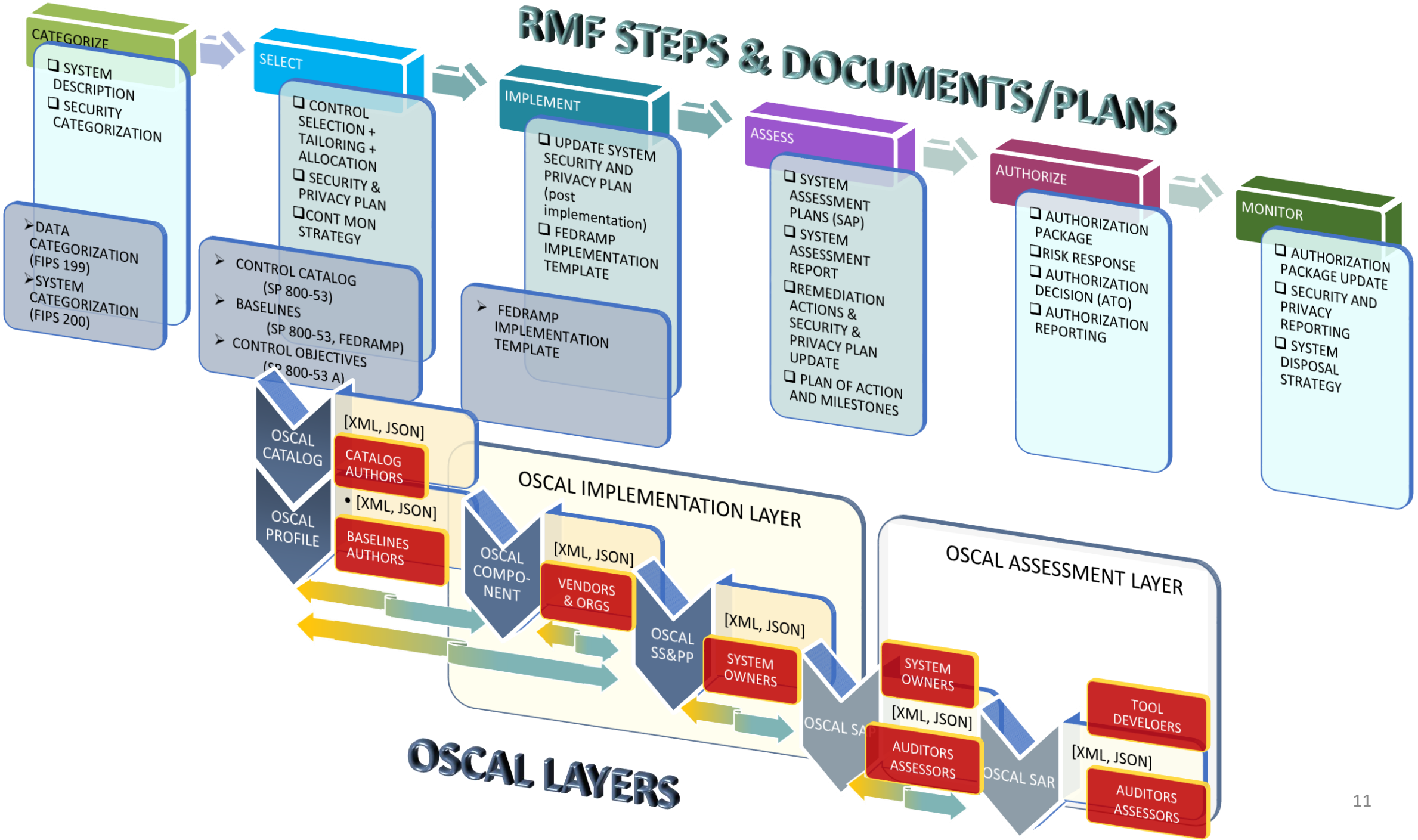
OSCAL sets the foundation for automation and interoperability

NIST's Goals for OSCAL

- **Provide** a common/single machine-readable *language*, expressed in XML and JSON, for:
  - multiple compliance and risk management frameworks (e.g. SP 800-53, ISO/IEC 27001&2, COBIT 5)
  - software and service providers to express implementation guidance against security controls
  - sharing how security controls are implemented (System Security Plans [SSPs])
  - sharing security assessment plans (System Assessment Plans [SAPs])
  - sharing security assessment results/reports (System Assessment Results [SARs])
- **Enable** automated traceability from selection of security controls through implementation and assessment

NIST's Targeted Outcome for OSCAL

- Widely available OSCAL-formatted content and OSCAL-enabled tools
  - A large decrease in assessment-related labor
  - The ability to assess a system's security much more often, ideally continuously
  - The ability to assess a system's compliance with several sets of requirements simultaneously
  - The consistent performance of assessments, regardless of system type


RMF STEPS & DOCUMENTS/PLANS
CATEGORIZE
SYSTEM DESCRIPTION
SECURITY CATEGORIZATION
DATA CATEGORIZATION (FIPS 199)
SYSTEM CATEGORIZATION (FIPS 200)
SELECT
CONTROL SELECTION + TAILORING + ALLOCATION
SECURITY & PRIVACY PLAN
CONT MON STRATEGY
CONTROL CATALOG (SP 800-53)
BASELINES (SP 800-53, FEDRAMP)
CONTROL OBJECTIVES (SP 800-53 A)
IMPLEMENT
UPDATE SYSTEM SECURITY AND PRIVACY PLAN (post implementation)
FEDRAMP IMPLEMENTATION TEMPLATE
FEDRAMP IMPLEMENTATION TEMPLATE
ASSESS
SYSTEM ASSESSMENT PLANS (SAP)
SYSTEM ASSESSMENT REPORT
REMEDIATION ACTIONS & SECURITY & PRIVACY PLAN UPDATE
PLAN OF ACTION AND MILESTONES
AUTHORIZE
AUTHORIZATION PACKAGE
RISK RESPONSE
AUTHORIZATION DECISION (ATO)
AUTHORIZATION REPORTING
MONITOR
AUTHORIZATION PACKAGE UPDATE
SECURITY AND PRIVACY REPORTING
SYSTEM DISPOSAL STRATEGY
OSCAL LAYERS
OSCAL IMPLEMENTATION LAYER
OSCAL ASSESSMENT LAYER
OSCAL CATALOG
[XML, JSON]
CATALOG AUTHORS
OSCAL PROFILE
[XML, JSON]
BASELINES AUTHORS
OSCAL COMPO-NENT
[XML, JSON]
VENDORS & ORGS
OSCAL SS&PP
[XML, JSON]
SYSTEM OWNERS
OSCAL SA
SYSTEM OWNERS
[XML, JSON]
AUDITORS ASSESSORS
OSCAL SAR
[XML, JSON]
TOOL DEVELOERS
AUDITORS ASSESSORS

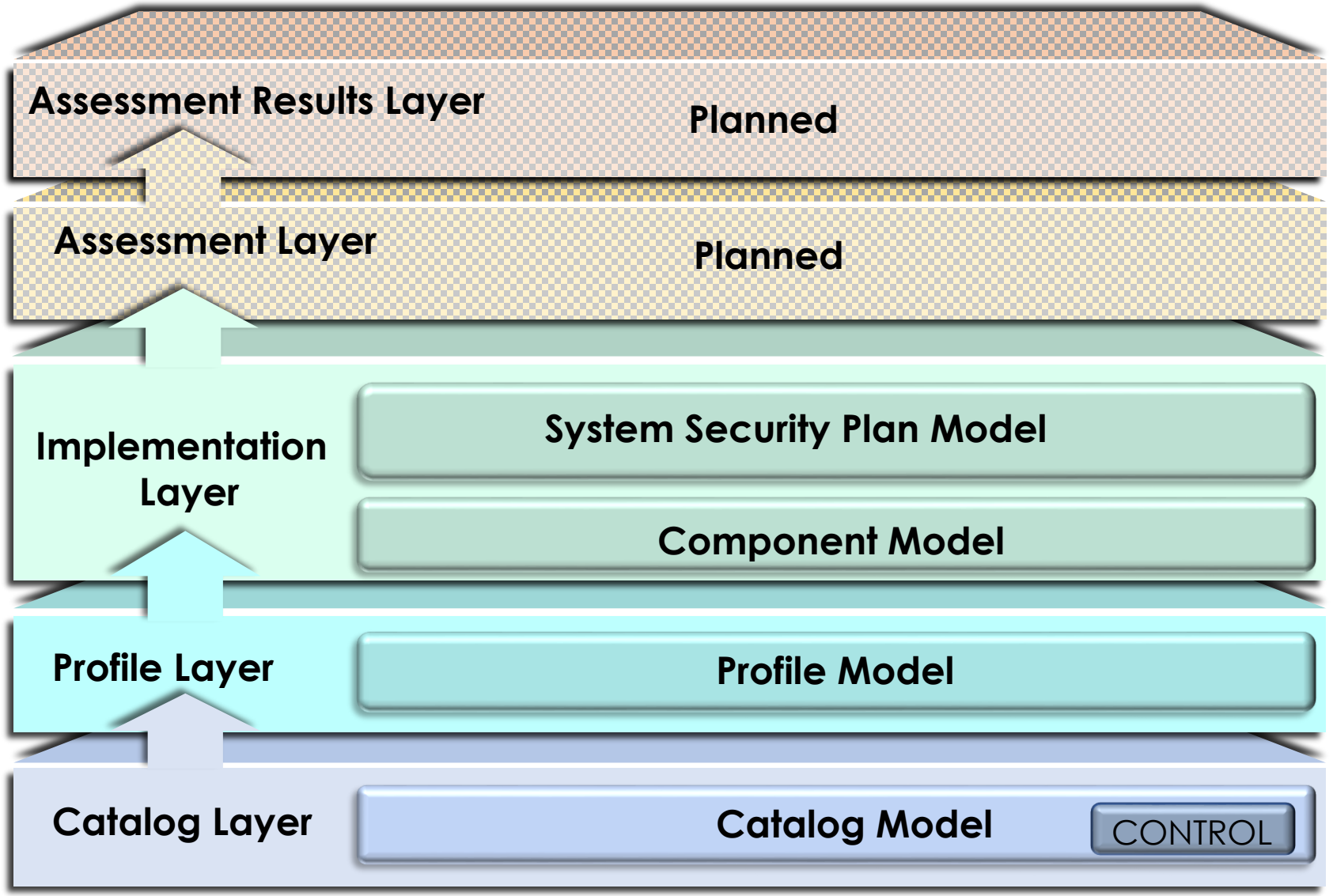
OSCAL Guiding Principles

- Produce a set of extensible formats through a community-focused effort that supports a broad range of control-based risk management processes.
- Support control-based risk assessment based on data collected using a continuous monitoring capabilities.
- Ensure security controls, implementation, and verification processes have full traceability and inherit at the baseline (software and service provider) and system interconnection levels

OSCAL Guiding Principles (cont)

- Standardize the expression of artifacts driving crowd-sourced development and improvement across profile and implementation layers
- Support multiple, interoperable, and lossless machine-readable formats including XML and JSON
- Provide a common means to identify and version shared resources
- Align OSCAL models with current, practical information, and support advanced structures that provide for greater automation and verification. **This principle provides a path for early adoption and ongoing evolution around how OSCAL will be used.**

OSCAL Layers and Models



Examples of control catalogs that where studied:

- ❑ NIST SP 800-53 + NIST 800-53 A
- ❑ ISO/IEC 27002&1
- ❑ COBIT 5

OSCAL Control

NIST SP 800-53 Rev4

AC-1 ACCESS CONTROL POLICY AND PROCEDURES

Control: The organization:

a. Develops, documents, and disseminates to [*Assignment: organization-defined personnel or roles*]:

   1. An access control policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

   2. Procedures to facilitate the implementation of the access control policy and associated access controls; and

b. Reviews and updates the current:

   1. Access control policy [*Assignment: organization-defined frequency*]; and

   2. Access control procedures [*Assignment: organization-defined frequency*].

Supplemental Guidance: This control addresses the establishment of policy and procedures for the effective implementation of selected security controls and control enhancements in the AC family. Policy and procedures reflect applicable federal laws, Executive Orders, directives, regulations, policies, standards, and guidance. Security program policies and procedures at the organization level may make the need for system-specific policies and procedures unnecessary. The policy can be included as part of the general information security policy for organizations or conversely, can be represented by multiple policies reflecting the complex nature of certain organizations. The procedures can be established for the security program in general and for particular information systems, if needed. The organizational risk management strategy is a key factor in establishing policy and procedures. Related control: PM-9.

Control Enhancements: None.

References: NIST Special Publications 800-12, 800-100.

Priority and Baseline Allocation:

P1	**LOW** AC-1	**MOD** AC-1	**HIGH** AC-1

ISO/IEC 27002

9.1.1 Access control policy

Control

An access control policy should be established, documented and reviewed based on business and information security requirements.

Implementation guidance

Asset owners should determine appropriate access control rules, access rights and restrictions for specific user roles towards their assets, with the amount of detail and the strictness of the controls reflecting the associated information security risks.

Access controls are both logical and physical (see Clause 11) and these should be considered together. Users and service providers should be given a clear statement of the business requirements to be met by access controls.

The policy should take account of the following:

a) security requirements of business applications;

b) policies for information dissemination and authorization, e.g. the need-to-know principle and information security levels and classification of information (see 8.2);

c) consistency between the access rights and information classification policies of systems and networks;

d) relevant legislation and any contractual obligations regarding limitation of access to data or services (see 18.1);

e) management of access rights in a distributed and networked environment which recognizes all types of connections available;

f) segregation of access control roles, e.g. access request, access authorization, access administration;

g) requirements for formal authorization of access requests (see 9.2.1 and 9.2.2);

h) requirements for periodic review of access rights (see 9.2.5);

i) removal of access rights (see 9.2.6);

j) archiving of records of all significant events concerning the use and management of user identities and secret authentication information;

k) roles with privileged access (see 9.2.3).

Other information

Care should be taken when specifying access control rules to consider:

a) establishing rules based on the premise "Everything is generally forbidden unless expressly permitted" rather than the weaker rule "Everything is generally permitted unless expressly forbidden";

b) changes in information labels (see 8.2.2) that are initiated automatically by information processing facilities and those initiated at the discretion of a user;

c) changes in user permissions that are initiated automatically by the information system and those initiated by an administrator;

d) rules which require specific approval before enactment and those which do not.

Access control rules should be supported by formal procedures (see 9.2, 9.3, 9.4) and defined responsibilities (see 6.1.1, 9.3).

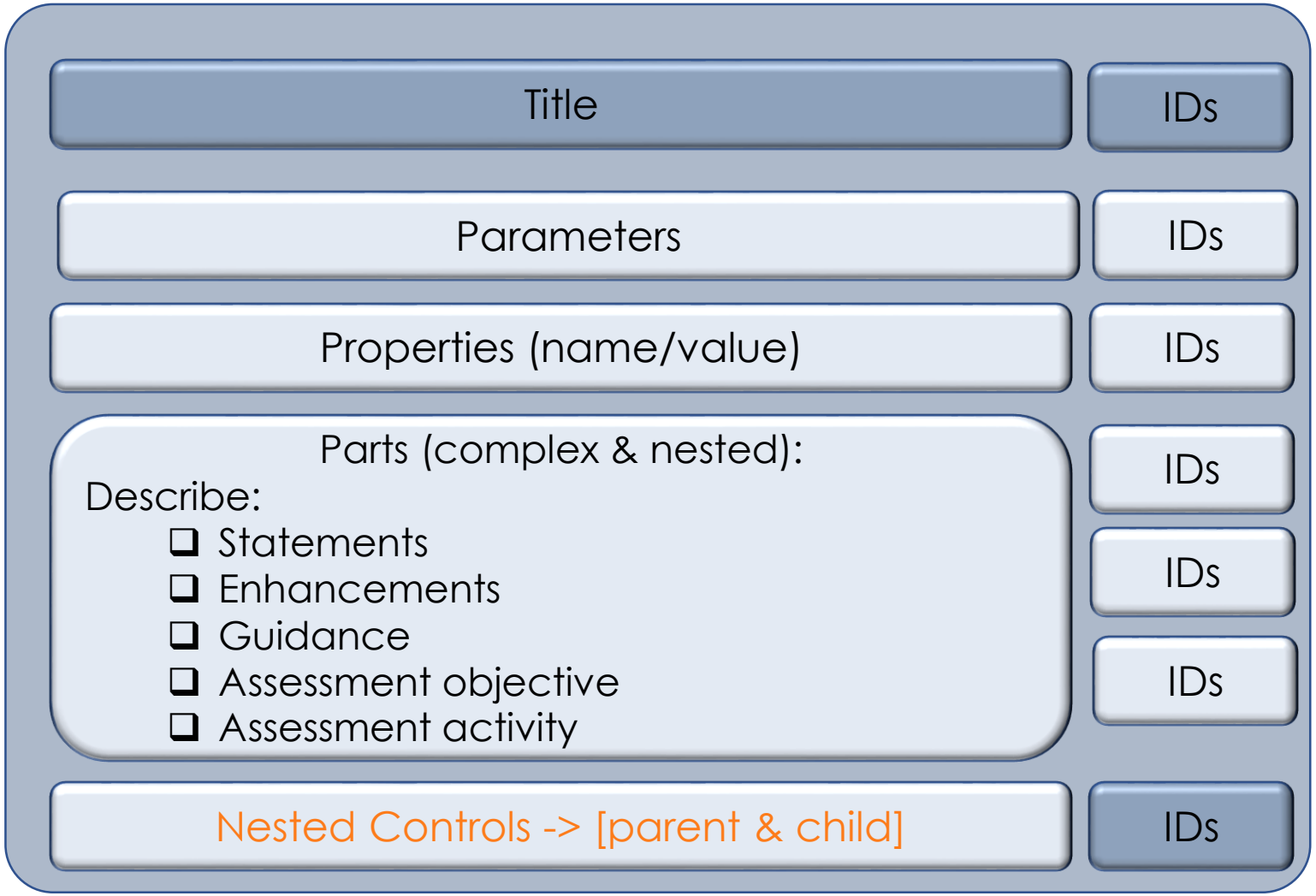
Role based access control is an approach used successfully by many organisations to link access rights with business roles.

Two of the frequent principles directing the access control policy are:

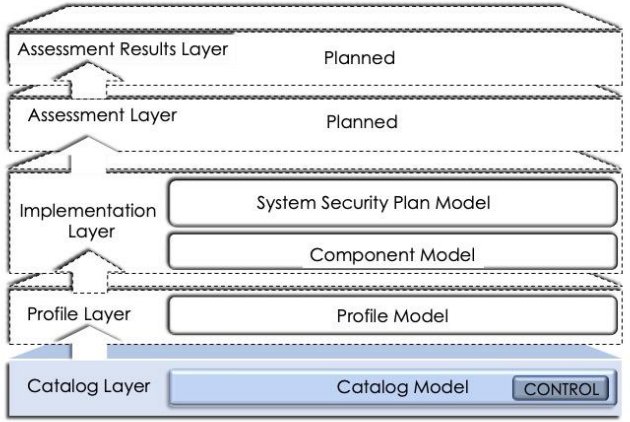
a) Need-to-know: you are only granted access to the information you need to perform your tasks (different tasks/roles mean different need-to-know and hence different access profile);

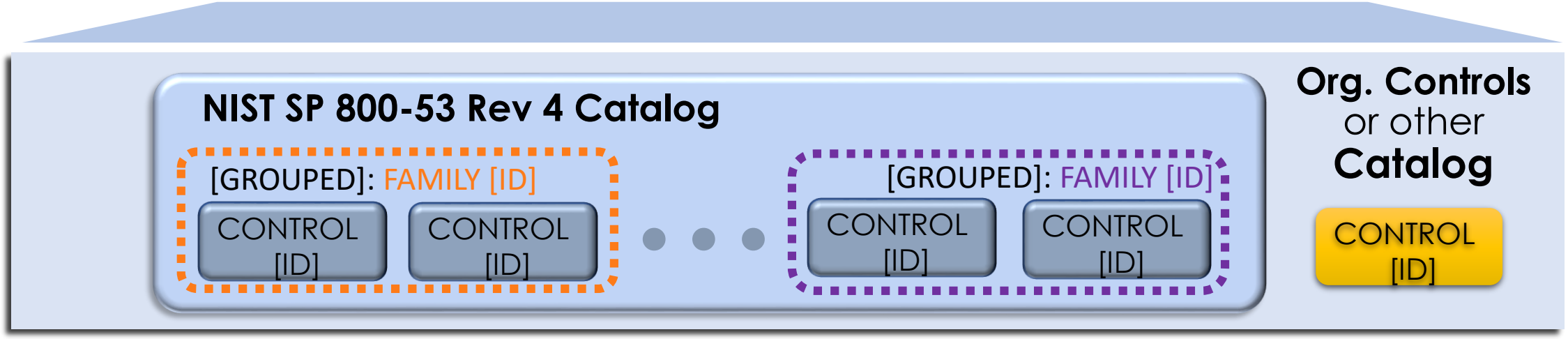
b) Need-to-use: you are only granted access to the information processing facilities (IT equipment, applications, procedures, rooms) you need to perform your task/job/role.

OSCAL Control

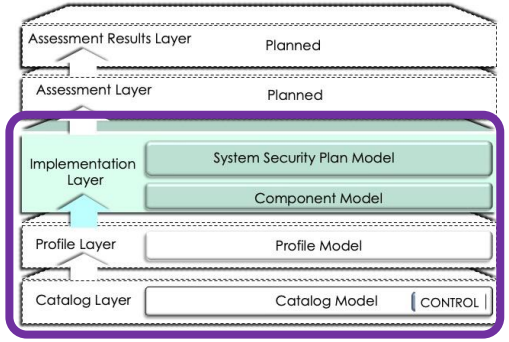


OSCAL Catalog Layer





OSCAL Profile Layer



FedRAMP Baselines [L, M, H]

NIST SP 800-53 Baselines [L,M,H]

CONTROL [ID]

CONTROL [ID]

CONTROL [ID]

[GROUPED]: FAMILY [ID]

CONTROL [ID]

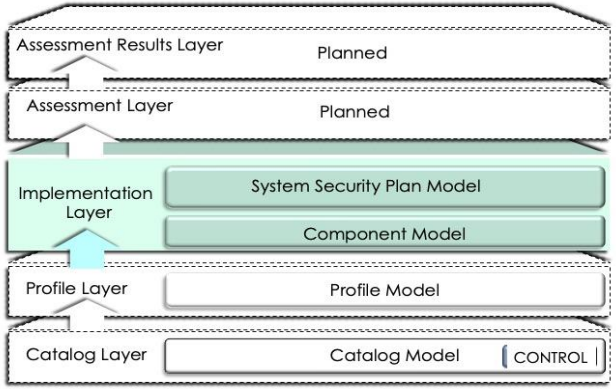
CONTROL [ID]

[GROUPED]: FAMILY [ID]

CONTROL [ID]

CONTROL [ID]

CONTROL [ID]



OSCAL Implementation Layer

- Component and SSP -

* From the top down

System Security Plan

Ch 1-12
[see NIST SP 800-18]

Ch 13
Controls' Implementation
- Baseline:
  - Family
    - Control 1 for Component A
    - Control 1 for Component B
    - Control 2 for Component B

OSCAL SSP

*From the bottom up

Component Definition
- *Provided by the owner or vendor of a component*

System Specification
(=aggregation of Components)

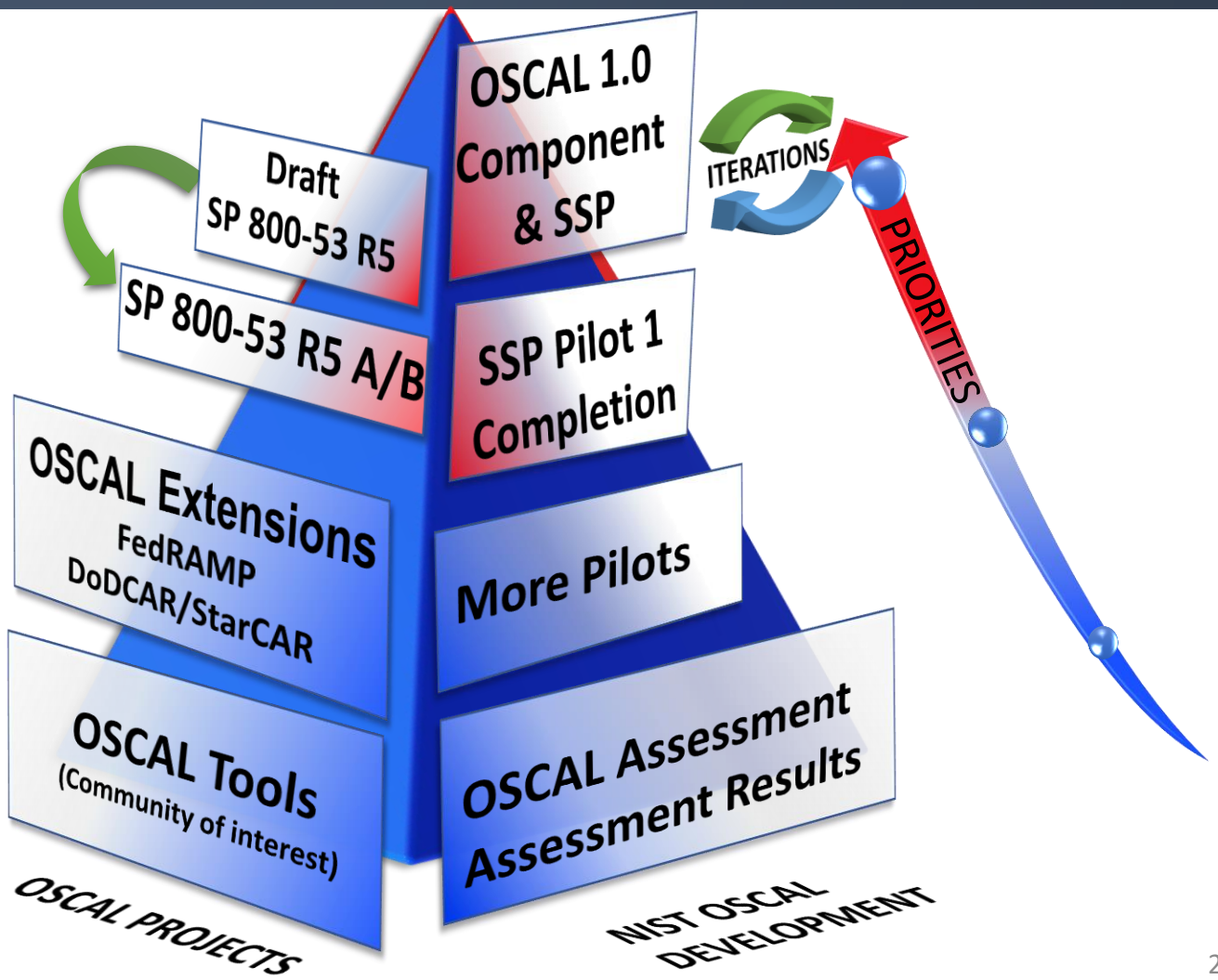
Component A
Specification
Control 1
Control 3

Component B Spec
Control 1
Control 2

PARTNERS:

- **Government:**
  - FedRAMP (GSA)
  - NSA
- **Industry:**
  - Noblis
  - GitHub
  - Docker
  - C2Labs
  - Amazon (AWS)
  - RedHat
- **Many following, including:**
  - Telos
  - InfoBeyond
  - Aponia
  - Mitre
  - CSA

CURRENT PROJECT FOCUS:



Show and Tell

➢NIST CATALOG & PROFILE(s):

- **OSCAL/content/nist.gov/SP800-53/rev4/**

https://github.com/usnistgov/OSCAL/tree/master/content/nist.gov/SP800-53/rev4

- **json**
- **xml**
- **yaml**

- NIST SP-800-53 rev4 HIGH-baseline profile
- NIST SP-800-53 rev4 MODERATE-baseline profile
- NIST SP-800-53 rev4 LOW-baseline profile
- NIST SP-800-53 rev4 control catalog

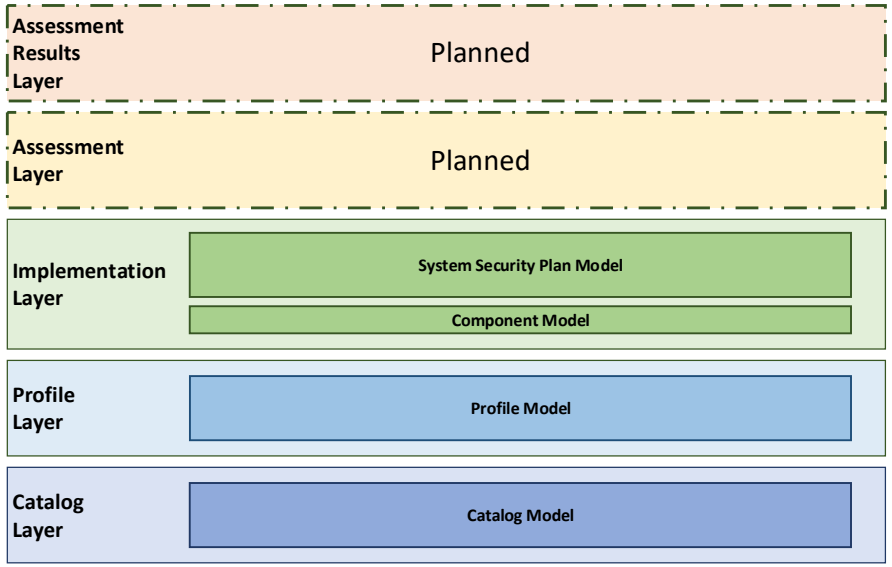
- **OSCAL/content/fedramp.gov/**

https://github.com/usnistgov/OSCAL/tree/master/content/fedramp.gov

- **json**
- **xml**
- **yaml**

- FedRAMP RESOLVED rev4 HIGH-baseline profile
- FedRAMP RESOLVED rev4 MODERATE-baseline profile
- FedRAMP RESOLVED LOW-baseline profile
- FedRAMP HIGH-baseline profile
- FedRAMP MODERATE-baseline profile
- FedRAMP LOW-baseline profile
- FedRAMP control catalog

Thank you



The **OSCAL project** is developed openly on GitHub.com.

Repository: https://github.com/usnistgov/OSCAL

Project Website: https://www.nist.gov/oscal

How to Contribute: https://pages.nist.gov/OSCAL/contribute/

We welcome contributions to this project.

Contact us via email at: oscal@nist.gov

Questions?

OSCAL and FedRAMP

Ashley Mahan

Director, Federal Risk and Authorization Management Program (FedRAMP) and Secure Cloud Portfolio

General Services Administration (GSA)

Break

On your own

Note: An escort is needed beyond building 215

Agenda

Time	Topic
8:00 am	**Registration and Networking**
9:00 am	**Welcome, Introduction to Workshop**
9:10 am	**What is OSCAL and Who Needs It** Michaela Iorga, OSCAL co-lead NIST
10:00 am	**OSCAL and FedRAMP** Ashley Mahan, Director, FedRAMP, GSA
10:30 am	**Break**
10:45 am	**Tools That Understand OSCAL** Andrew Weiss, GitHub and Wendell Piez, OSCAL team member, NIST
11:20 am	**OSCAL Roadmap** David Waltermire, SCAP Lead and OSCAL co-lead, NIST
Noon	**Lunch**
1:30 pm	**OSCAL Catalog and Profile Models** Brian Ruf, OSCAL team member, Noblis
2:45 pm	**Break**
3:00 pm	**OSCAL Component and System Security Plan Models** David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:15 pm	**Discussion: Tomorrow is Today – The Need for Automation** Moderator: David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:50 pm	**Closing Remarks**
5:00 pm	**Adjourn**

Tools That Understand OSCAL Today and Tomorrow

Andrew Weiss

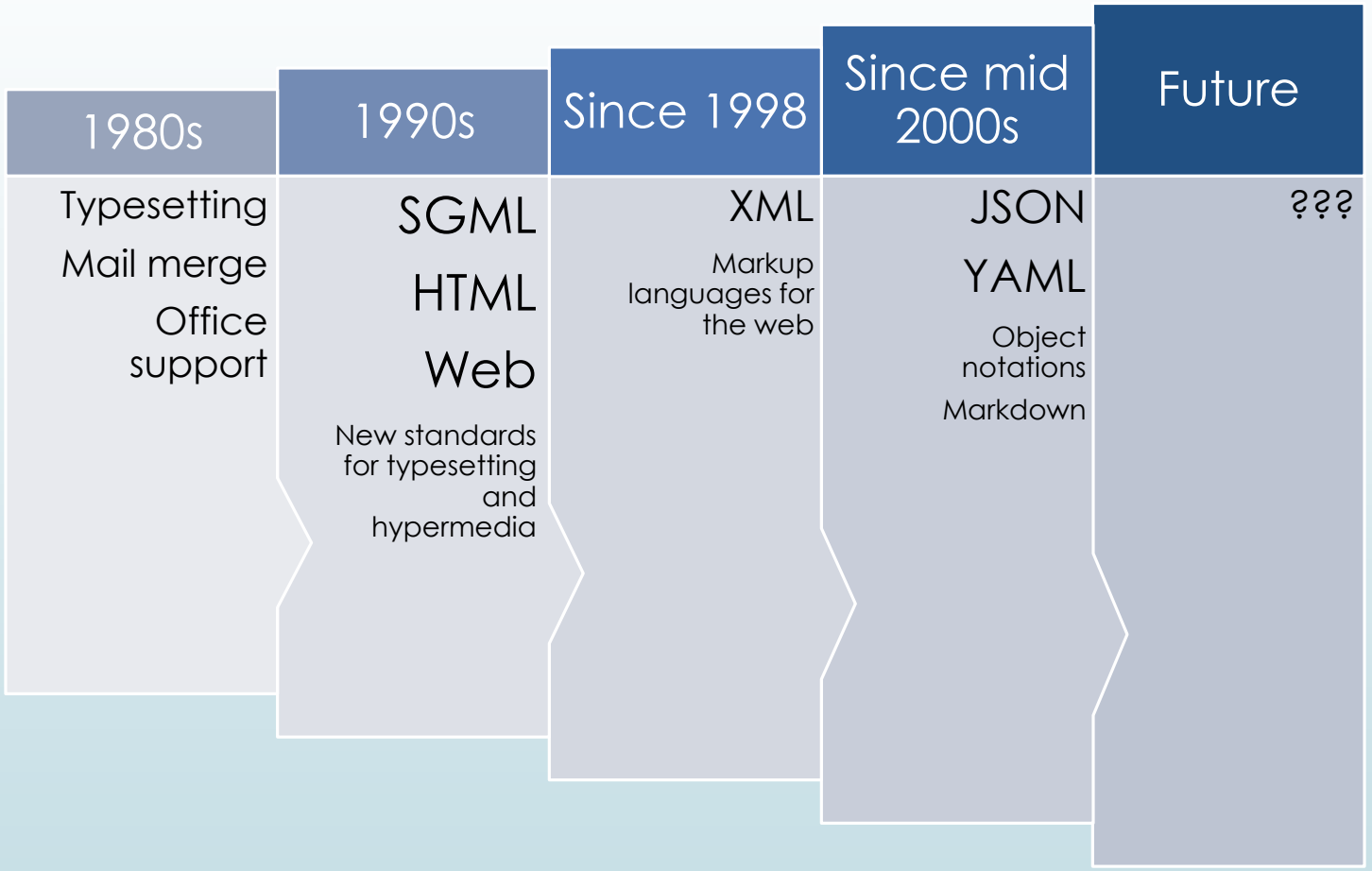
GitHub

Wendell Piez

OSCAL Team Member

National Institute of Standards and Technology (NIST)

Technologies emerge from practice



Standards are only half the story

The other half is how we get things done

- Many workflows are still document based
- PDF, MS Word / Excel / Office
- Legacy systems of all kinds
- There are functional gaps but they are unevenly felt
  - Tools, methods and processes are good enough for many things
  - Only not so good for some things
- Many reasons for this inertia

Three models of software development

Commercial / proprietary

- Capability is licensed as IP
- Viable and proven business model
- "Black box" – clean division of responsibilities between developer/provider and user/customer
- Division of responsibility helps indemnify parties

Open source

- Easier to acquire, adapt and run
- More transparent, hence (potentially) more secure(able)
- Easier maintenance? That depends
- Sustainable? How do we support it long-term?

Home built / DIY

- Enables close fit of solutions to requirements
- Can leverage both the other models
- But: an organization responsible for X must now support dev/ops activity as well – sometimes a challenge

OSCAL Approach

- Our models are defined independently of their expression
- Like a mold for making cups from glass or ceramic
- This means we are agnostic regarding "best" technical implementation
  - Support multiple approaches
    - Today, XML and/or JSON (and YAML)
    - Java, XSLT/XQuery, Python, Ruby, Rust, you name it
    - Tomorrow, the best technologies available
  - Support conversion between alternative representations of the same information
    - System A prefers XML
    - System B prefers JSON
    - Commodity XML->JSON converter means it doesn't matter
  - Handle different aspects of the problem with different tools
- We can provide demos, testing and reference implementations

Needs for commodity tools

- Validate
  - Is my OSCAL actually OSCAL?
- Convert among alternative representations
- Viewing / publishing – "human readable"
  - In applications
  - In print / PDF
- Basic OSCAL functionality
  - E.g., represent a catalog as tailored by a profile
  - Editing, packaging …
- *We have prototypes*

Commercial opportunities

Tools and services

- Integration with capable systems
  - OSCAL import / export
- Analytics
  - OSCAL crunching
  - Gap analysis
- High performance or scale requirements
- Data acquisition
  - Convert Word/Excel data into OSCAL
- Integration with related/complementary technology stacks
  - SCAP (scanners and security tools)
  - NISO STS, DITA (product documentation)

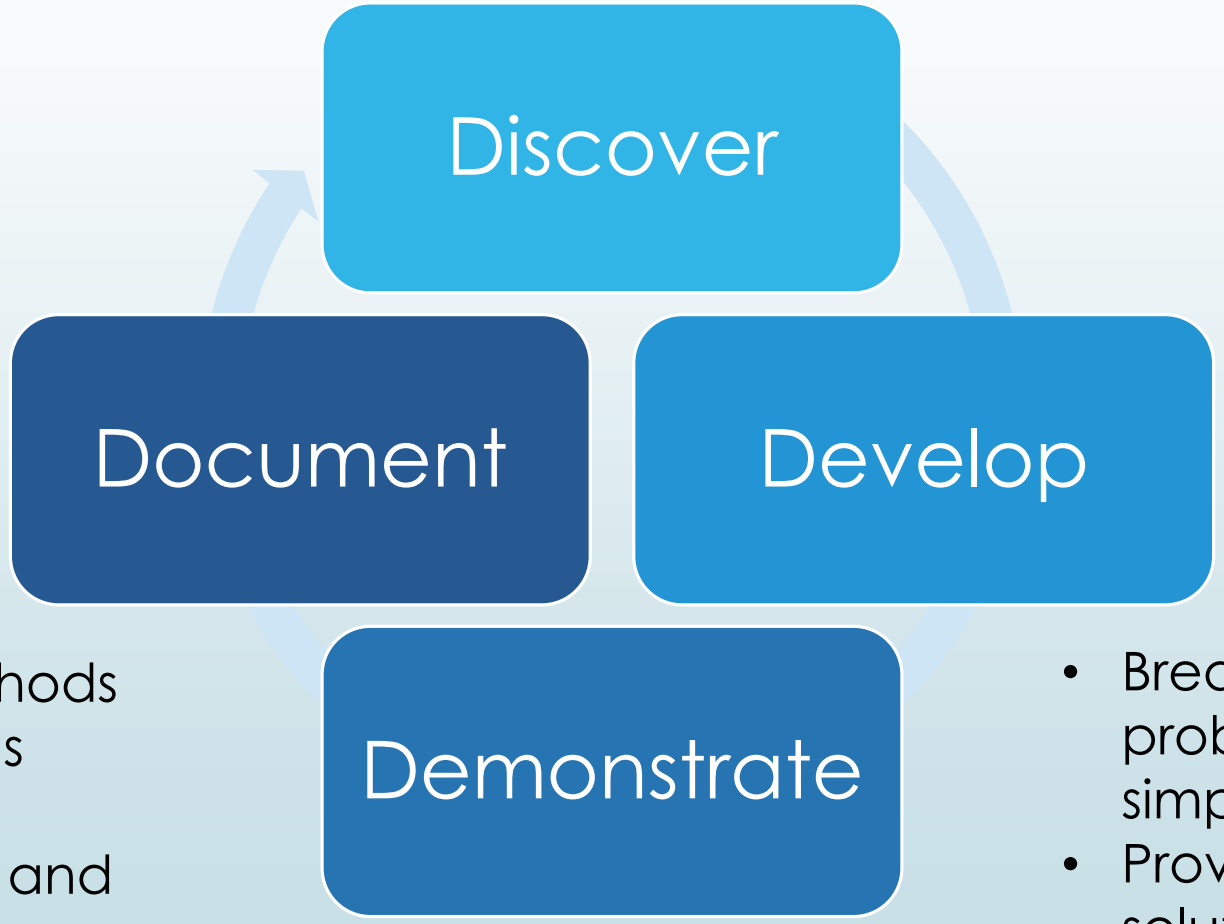
Multiple Implementations = A Good Thing

not many OSCALs but many ways to use OSCAL

- A robust standard implies different systems can do different things
  - And still exchange data
  - Across and within organizational boundaries
- To do different things we welcome a variety of tools

- We aim to encourage new applications by
  - Providing support for the basics
    - Jump start anyone
    - Provide a baseline to validate functionality
  - Offering early wins and ROI
  - Creating demand for more of the same
    - Advanced functionality
    - Customization
    - Specialized services
  - Helping ensure network effects

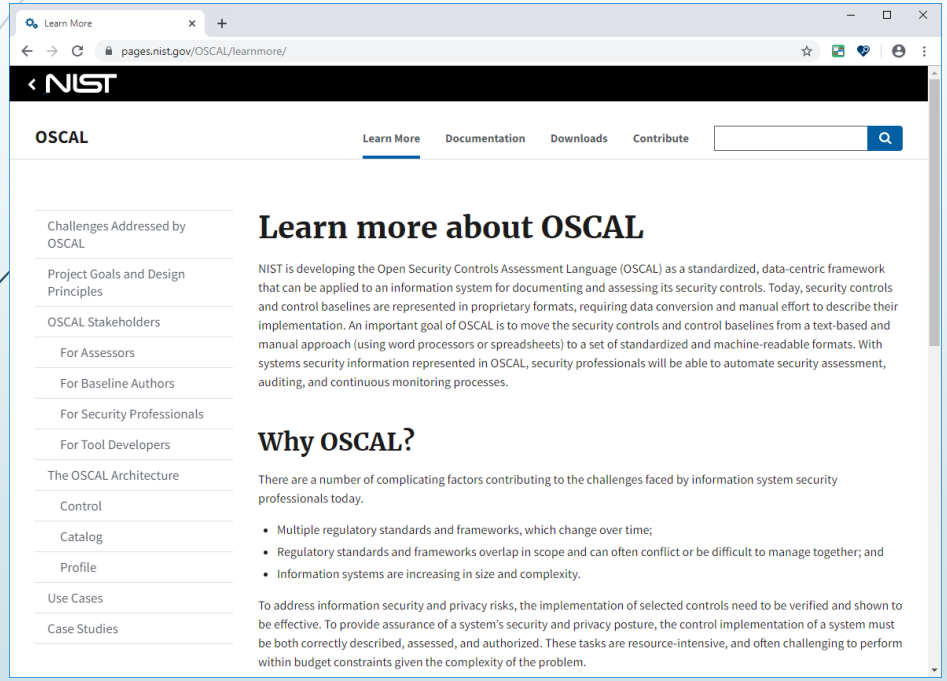
How to Catalyze a Market



- Share methods and means
- Develop consensus and common understanding

- Break complex problems into simpler pieces
- Provide actual solutions to do more for less

Resources for OSCAL Developers



How else can OSCAL help builders?

The **OSCAL project** is developed openly on GitHub.com

Repository: https://github.com/usnistgov/OSCAL

Project Website: https://www.nist.gov/oscal

How to Contribute: https://pages.nist.gov/OSCAL/contribute/

Chat with Us on Gitter: https://gitter.im/usnistgov-OSCAL/Lobby

We welcome contributions to this project.

Feedback? Questions?

Lunch with the Devs

NIST OSCAL team is hosting a bi-weekly, one-hour teleconference starting on Thursday, December 5th 2019 @ noon EST.

Goals:

- To increase communication with the OSCAL community.
- Keep the community up-to-date on what we are working on.
- Discuss issues that we need community feedback on or help with.
- Answer questions, and discuss new proposed features or identified defects.

More Info: https://pages.nist.gov/OSCAL/contribute/devlunch/

Hackathon

- We are hosting a hackathon on November 6th and 7th
- Bring an OSCAL-related project you would like to work on
  - You do not have to share code with other participants, although open source is welcome
  - Or pick one of our ideas
- The NIST OSCAL team will be in the room to help and answer any questions

Project Ideas:

- Build HTML or PDF converters for Catalog, Profile, or SSP content
- Build a report generator that uses OSCAL data
- Build OSCAL import / export capabilities into an existing tool
- Work on an open issue: https://git.io/Je2zO

Hackathon
Agenda

Time	Topic
Day 1 – November 6th	
8:30am	Registration
9:00am	Welcome and Logistics
9:20am	Form teams and start work
Noon	Lunch
1:00pm	Resume work
5:00pm	Adjourn for the day

Time	Topic
Day 2 – November 7th	
8:30am	Registration
9:00am	Resume Work
Noon	Lunch
1:00pm	Resume work
4:00pm	Team Presentations(optional)
5:00pm	Adjourn

OSCAL Roadmap

Future directions of the Open Security Controls Assessment Language

David Waltermire

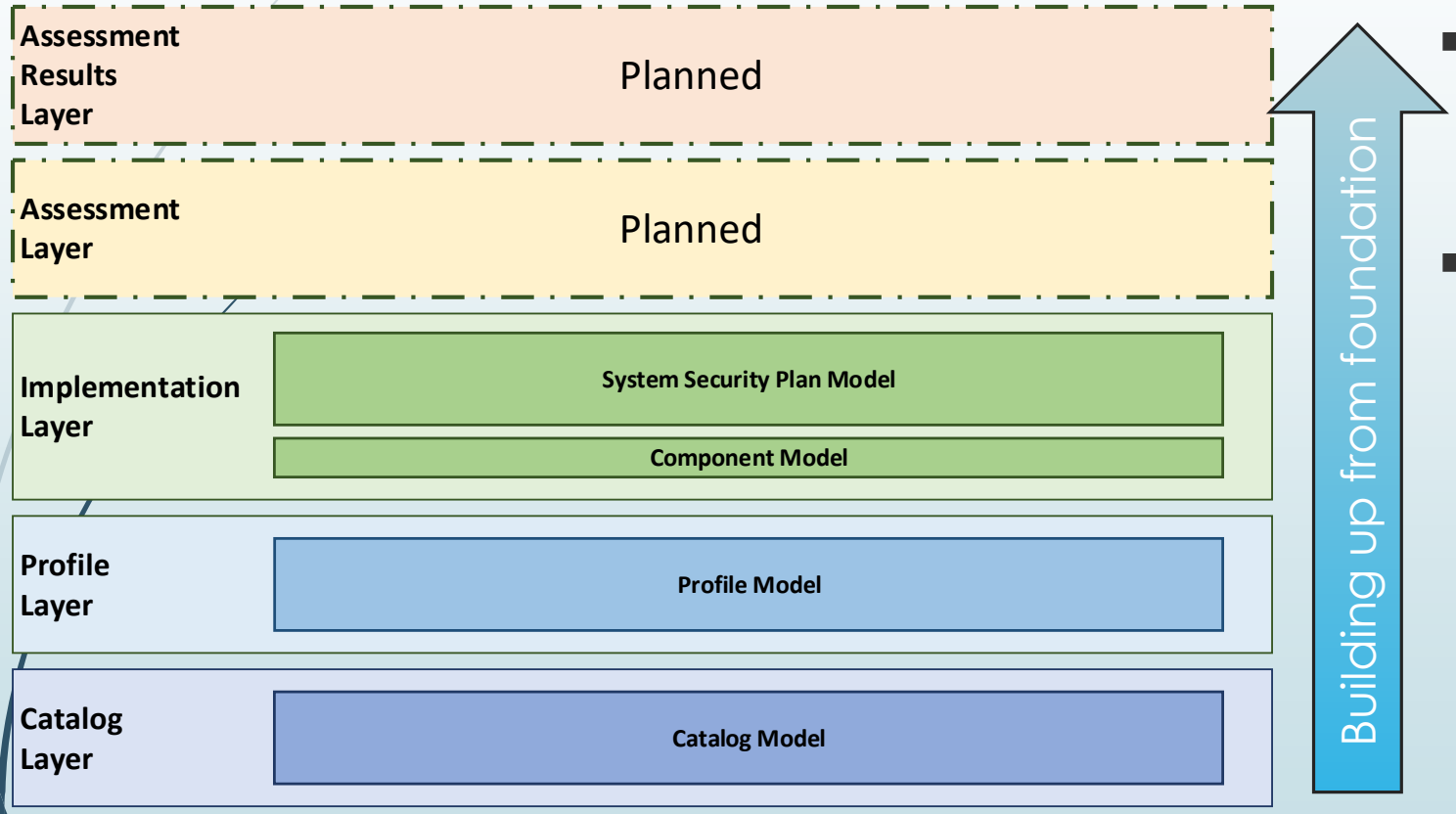
SCAP Lead and OSCAL Co-Lead

National Institute of Standards and Technology (NIST)

OSCAL Development

- OSCAL is being designed and developed over a series of development epics
  - Using an incremental, agile approach
  - Each epic consists of a series of sprints
  - focused on reaching a defined milestone.
- This approach allows the project team to provide increased value over time at an accelerated pace, by focusing on an 80% solution (Minimally Viable Product (MVP)) that can be implemented in 20% of the time.

OSCAL Layers & Models



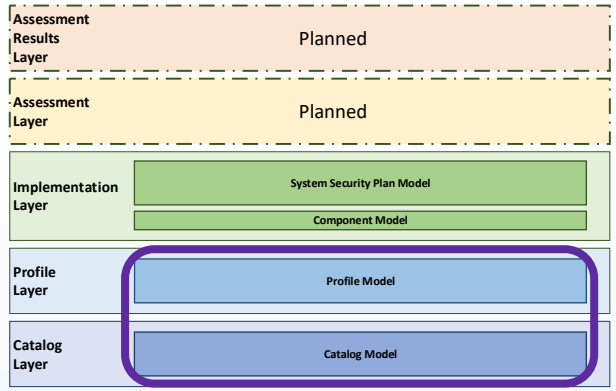
OSCAL is architected in layers

- The lowest layer is foundational
- Each higher layer builds on layer(s) below it
- OSCAL development is following this bottom up approach
  - Allows lower layers to be used, while higher layers are developed
  - Lower layers can be enhanced based on high-layer information needs
  - Ensures that data provided in lower layers can be used to meet the information needs in higher layers

OSCAL Version 1 Milestones

Milestone	Focus	Sprints	Status	Date
Milestone 1	Catalog and Profile Models	**1** to **21**	**Completed**	**6/15/2019**
Milestone 2	System Security Plan (SSP) Model	**6** to **23**	**Completed**	**10/1/2019**
Milestone 3	Component Definition Model	**6** to **~29**	**In Progress**	**March 2020**
Full Release	Development of a web-based specification	**24** to **~33**	**In Progress**	July 2020
Ongoing Maintenance	Minor and bugfix releases as needed	Additional Sprints	Planned	Ongoing

OSCAL 1.0.0 Milestone 1



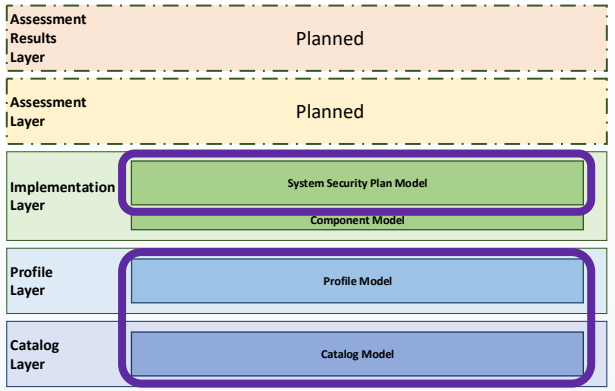
Focus: Development of Catalog and Profile Models

Status: Completed on 6/15/2019 **Sprints:** 1 through 21

Challenges Addressed:

- Developing a catalog model to represent different control catalog representations (e.g., SP 800-53, ISO/IEC 27002, and COBIT).
  - Statement-level identification supporting granular downstream implementation documentation.
  - Support for control parameters that can be tailored in baselines and implementations.
- Unified profile model that works for all control baselines.
  - Control and parameter customization.
  - Traceability of baselines back to control catalogs supporting granular implementation documentation.

OSCAL 1.0.0 Milestone 2



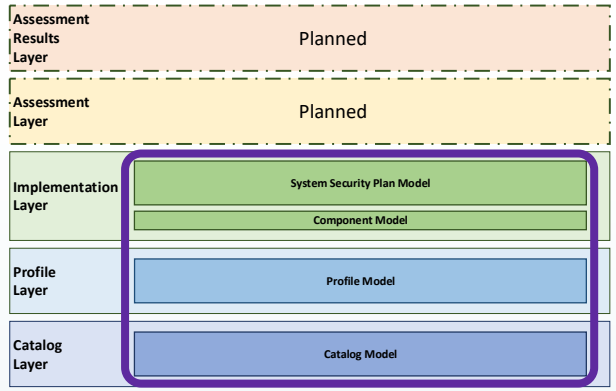
Focus: Development of the System Security Plan (SSP) Model

Status: Completed on 10/1/2019 **Sprints:** 6 through 23

Challenges Addressed:

- Alignment with SP 800-18 rev 1 and rev 2 (under development).
- Providing a rich model for documenting SSPs, with flexibility to support datacenter, cloud, and enterprise scenarios.
- Support for flat/system-level documentation of control implementations (current practice).
- Support for granular, component-based documentation of control implementations (evolving practice).

OSCAL 1.0.0 Milestone 3



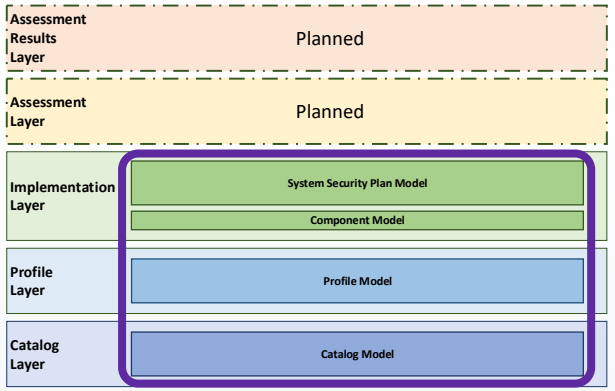
Focus: Development of the Component Definition Model

Status: Under development (March 2019) **Sprints:** 6 through ~29

Challenges to Address:

- Provide a component definition model that can describe controls implemented in asset types including: **hardware**, **software**, **services**, **policies**, **procedures**, **plans**, or anything else that *enables a system to satisfy a control.*
- Identify the controls satisfied by the asset.
  - For some asset types, this may include defining multiple options, which satisfy controls differently (e.g., software configurations).
  - Integrate control parameters, and align with configurable options.
- Align with SSP model to allow system implementers to import asset information into a SSP document.

OSCAL 1.0.0 Full Release



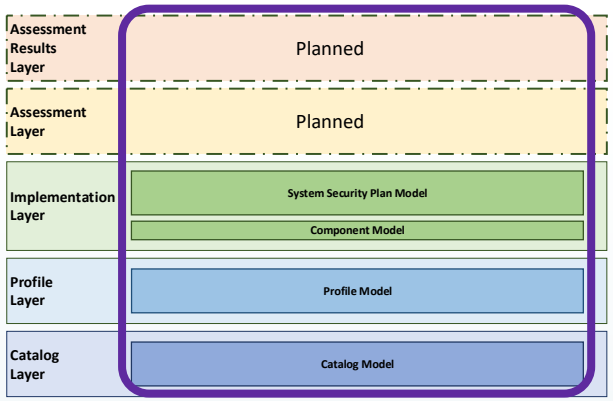
Focus: Finalization of OSCAL 1.0.0 and development of the OSCAL v1 Specification

Status: Under development (July 2019) **Sprints:** 24 through ~33

Challenges to Address:

- Create an initial web-based, formal specification for the OSCAL models.
- Fully document use of the OSCAL Catalog, Profile, Component, and SSP models.
  - Describe the semantics, allowed values, and recommended use of each data element.
  - Document processing rules for OSCAL content (e.g., Profile Resolution).
- Incorporate feedback from the OSCAL community based on early implementation and use.

Beyond OSCAL 1.0.0



- OSCAL v2 will focus on the Assessment and Assessment Results layers.
- Support for assessment plans, auditing, and assessment/audit results.
  - Allow for the definition of assessment workflows (e.g., business impact assessment, privacy assessment, etc.)
  - Attachment of assessment artifacts
- Focus on automated collection of human- and asset-related information.
  - Use of the Open Checklist Interactive Language (OCIL) for human-oriented data collection.
  - Integration with asset, configuration management, and orchestration frameworks (e.g., Puppet, Chef, Ansible, Kubernetes) and the Security Content Automation Protocol (SCAP) for assessment data collection.

- We will continue to maintain OSCAL 1.0.0 as we work on OSCAL v2
  - Allows implementation of OSCAL v1, while we work on OSCAL v2.
  - We can make backward-compatibility breaking changes in v2 without affecting v1 implementations.
  - New features added in v2 can be back ported as optional features of v1

Discussion Questions

- Is this roadmap clear?
- Do you find this incremental approach to be useful?
  - Does this help or hurt adoption of OSCAL?
  - At what Milestone will you consider implementation of OSCAL?
- What layers are most important to you? Why?

The **OSCAL project** is developed openly on GitHub.com.

Repository: https://github.com/usnistgov/OSCAL

Project Website: https://www.nist.gov/oscal

How to Contribute: https://pages.nist.gov/OSCAL/contribute/

We welcome contributions to this project.

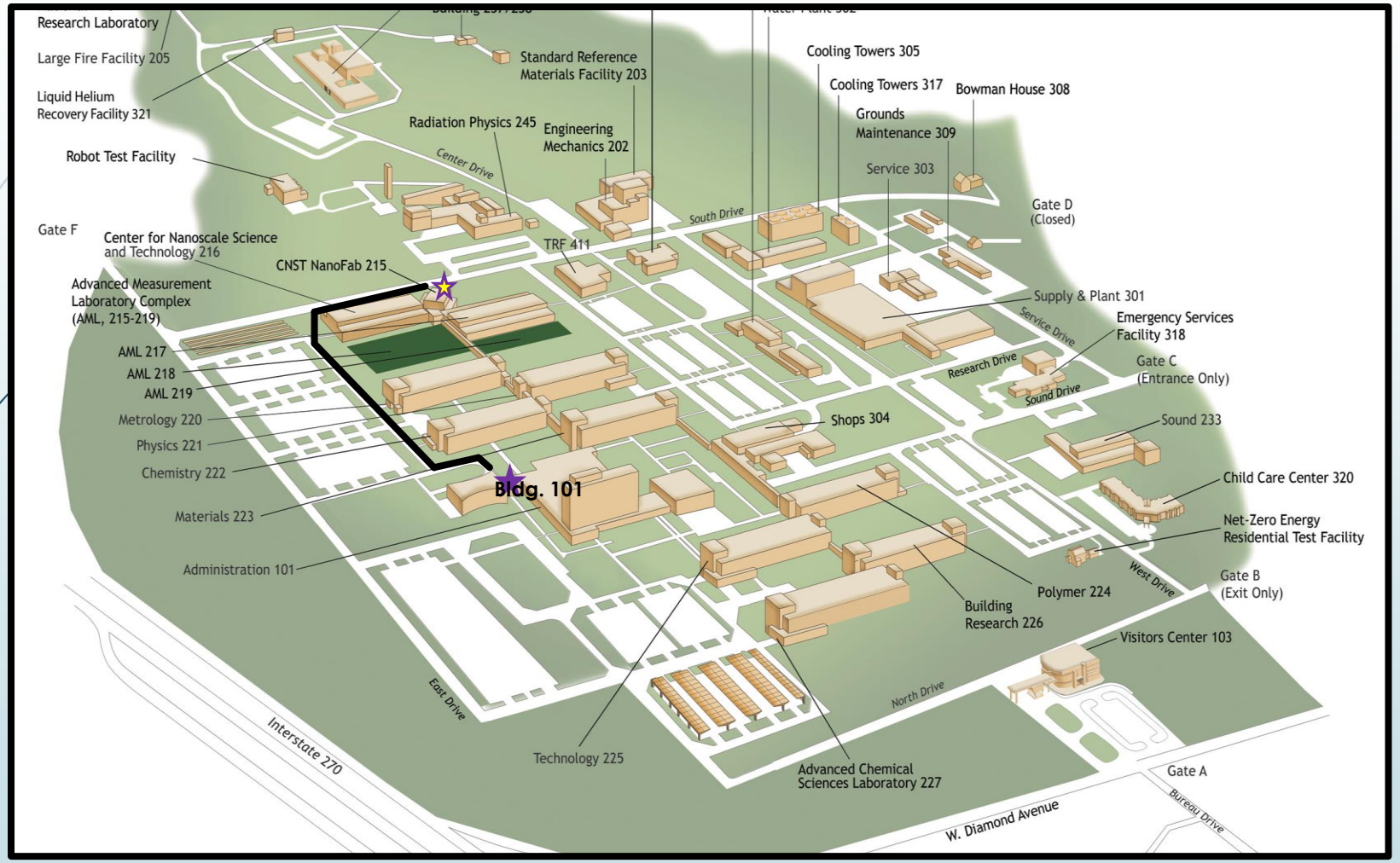
Questions?

Lunch

On your own, Cafeteria in Building 101

Will resume the workshop at **1:30pm**

Lunch – On your own or NIST cafeteria



To reach the NIST cafeteria, you will need to walk outside to building 101.

Agenda

Time	Topic
8:00 am	**Registration and Networking**
9:00 am	**Welcome, Introduction to Workshop**
9:10 am	**What is OSCAL and Who Needs It** Michaela Iorga, OSCAL co-lead NIST
10:00 am	**OSCAL and FedRAMP** Ashley Mahan, Director, FedRAMP, GSA
10:30 am	**Break**
10:45 am	**Tools That Understand OSCAL** Andrew Weiss, GitHub and Wendell Piez, OSCAL team member, NIST
11:20 am	**OSCAL Roadmap** David Waltermire, SCAP Lead and OSCAL co-lead, NIST
Noon	**Lunch**
1:30 pm	**OSCAL Catalog and Profile Models** Brian Ruf, OSCAL team member, Noblis
2:45 pm	**Break**
3:00 pm	**OSCAL Component and System Security Plan Models** David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:15 pm	**Discussion: Tomorrow is Today – The Need for Automation** Moderator: David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:50 pm	**Closing Remarks**
5:00 pm	**Adjourn**

OSCAL Catalog and Profile Models

Brian Ruf

OSCAL Team Member

Noblis

Presentation Agenda

OSCAL Overview

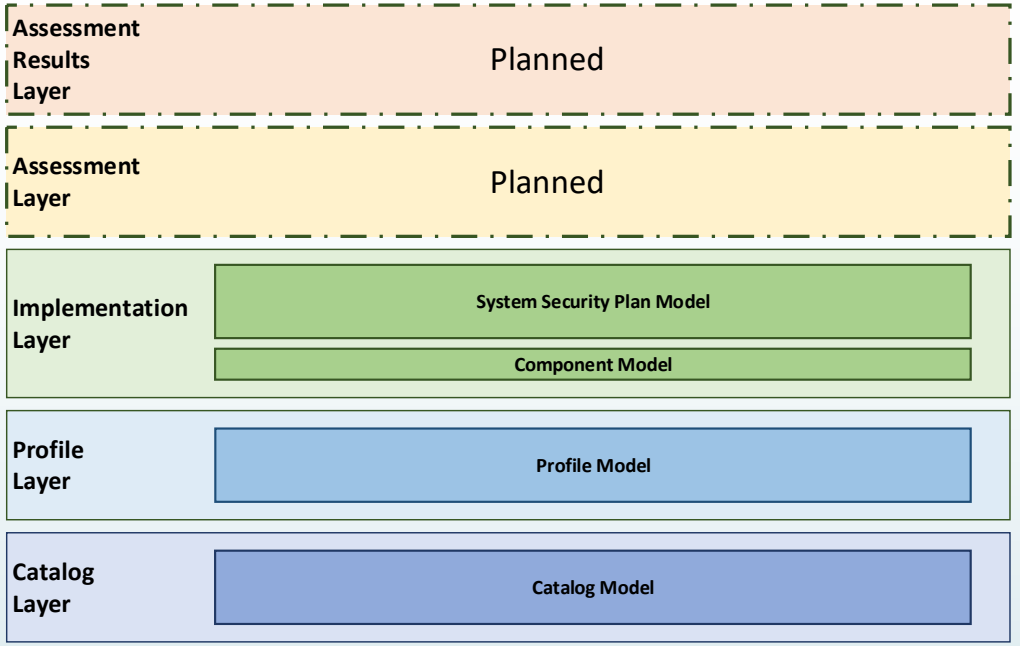
- Layers and Models
- Keeping In Sync
- Anatomy of an OSCAL File

CATALOG MODEL

- Goals
- Scope
- Authors & Consumers

PROFILE MODEL

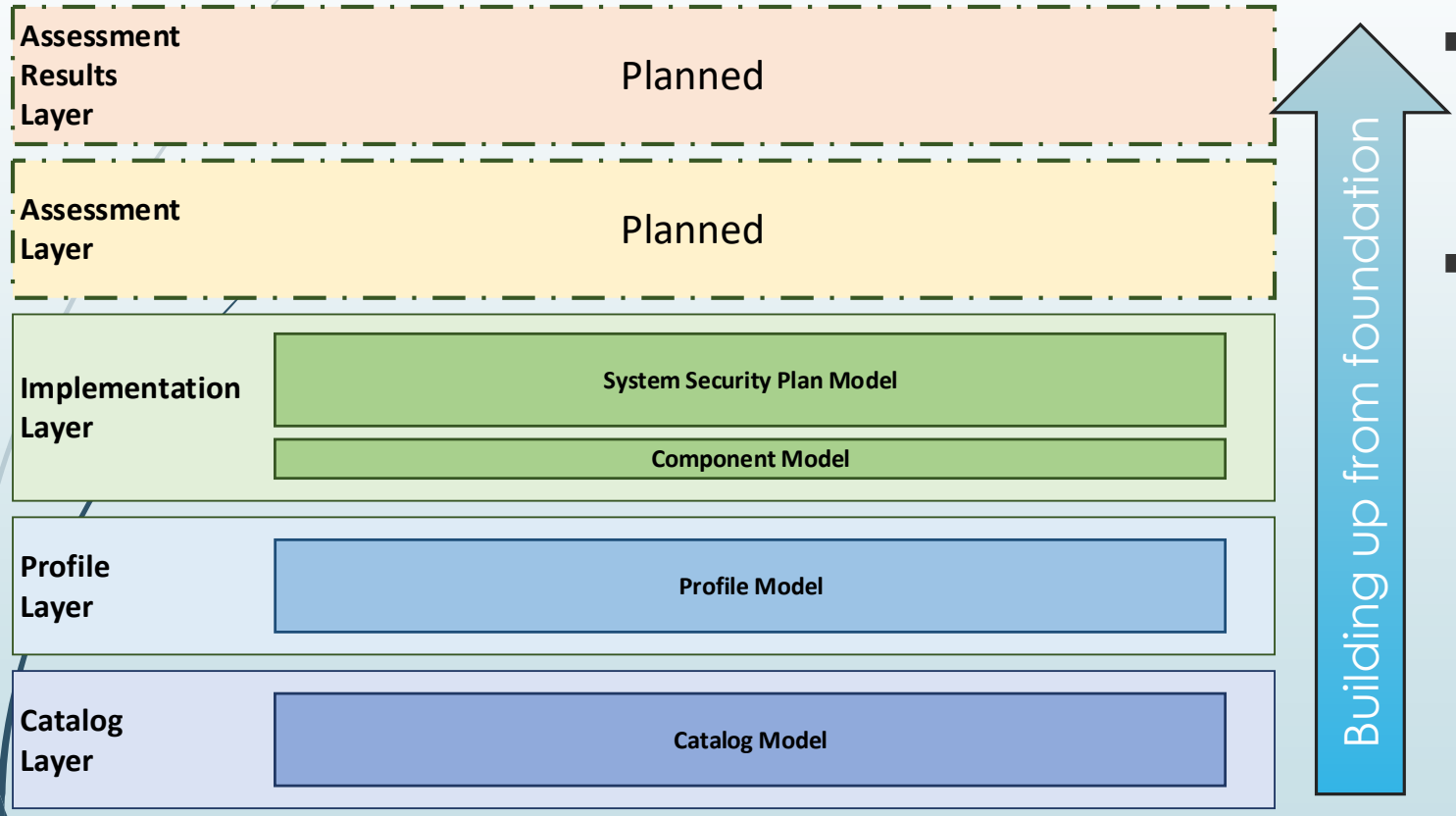
- Goals
- Scope
- Authors & Consumers



WORKING WITH CATALOGS AND PROFILES

- Case Studies / Examples
- Resources
- How You Can Help
- Questions?

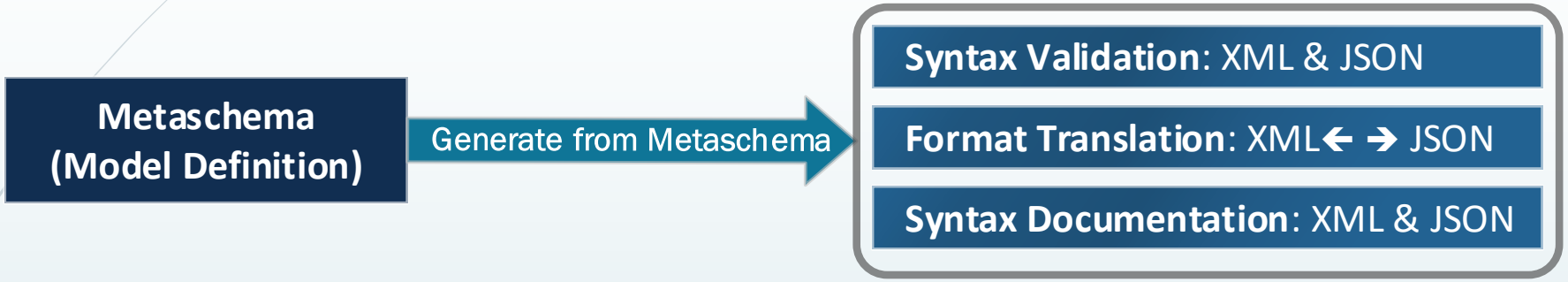
OSCAL Layers & Models



OSCAL is architected in layers

- The lowest layer is foundational
- Each higher layer builds on layer(s) below it
- We will discuss this from the bottom up:
  - Catalog
  - Profile
  - Implementation: Component and System Security Plan
  - Looking Forward: Assessment and Assessment Results

OSCAL Syntax Stays In Sync



For Each Model:

- Syntax is defined in one place for all supported formats (Metaschema)
  - Today: XML and JSON
  - Future: YAML
- For each supported format, the CI/CD pipeline generates:
  - Validation Schema (XML, JSON)
  - Converters (XML -> JSON, JSON -> XML)
  - Documentation (XML, JSON)
- **This ensures all formats align and interoperate as expected**

OSCAL Syntax Validation

XML Syntax Validation
`oscal_[model]_schema.xsd`

- OSCAL XML Schema Files:
  - https://github.com/usnistgov/OSCAL/tree/master/**xml**/schema
- XML Schema Definition Language (XSD) 1.1
  - Standard: https://www.w3.org/TR/xmlschema11-1/

JSON Syntax Validation
`oscal_[model]_schema.json`

- OSCAL JSON Schema Files:
  - https://github.com/usnistgov/OSCAL/tree/master/**json**/schema
- JSON Schema, draft 07
  - Standard: https://json-schema.org/

OSCAL Format Translation

Format Translation: XML ➔ JSON
`oscal_[model]_xml-to-json-converter.xsl`

- XML to **JSON**: https://github.com/usnistgov/OSCAL/tree/master/**json**/convert

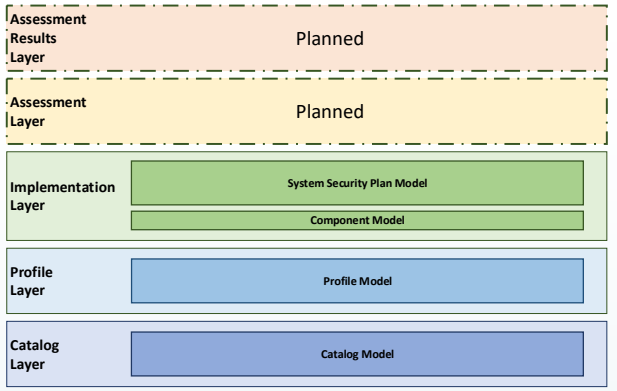
Format Translation: JSON ➔ XML
`oscal_[model]_json-to-xml-converter.xsl`

- JSON to **XML**: https://github.com/usnistgov/OSCAL/tree/master/**xml**/convert

Translation (in either direction) requires support for:

- Extensible Stylesheet Language Transformation (XSLT) 3.0
  - Standard: https://www.w3.org/TR/2017/REC-xslt-30-20170608/
- XML Path Language (XPath) 3.1
  - Standard: https://www.w3.org/TR/xpath-31/

Anatomy of an OSCAL File



Every OSCAL File

Root Element:
[`catalog` | `profile` | `component` | `system-security-plan`]
Universally Unique Identifier (UUID)

Metadata (Required)
At the start of every OSCAL file, regardless of model.
Syntax is the same in every model.

Body
Syntax differs by model.

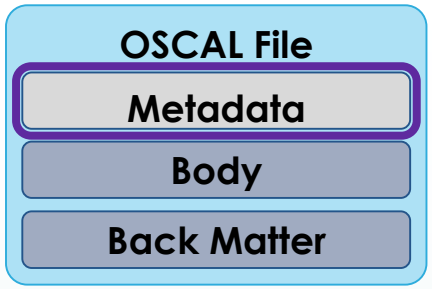
Back Matter (Optional)
At the end of every OSCAL file, regardless of model/layer.
Syntax is the same in every model.

Every OSCAL File has:

- A root element at the top
  - Automation tools should use this to determine which model is in use
- The root element contains a universally unique identifier (UUID)
  - Identifies the revision of the document
  - This should be updated every time the content or structure changes
- A **metadata** section immediately following the root element & UUID
- A model-specific **body** in the middle
- A **back matter** section at the end

Metadata

XML Example



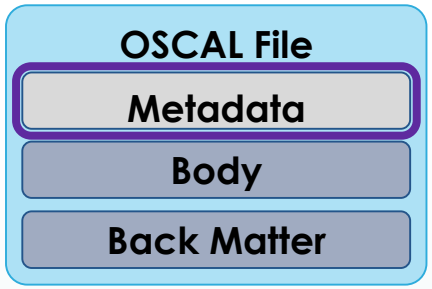
- **Document Properties**
  - Title, Version, Publication Date
  - Last Modified Date, Document ID
  - Keywords
- **Actors and Roles**
  - Party/Org, Party/Person
  - Roles and Role Assignments
- **OSCAL Administrivia**
  - OSCAL (Syntax) Version
  - Alternate and Canonical Information

Red underline denotes a mandatory field

```
<catalog xmlns="http://csrc.nist.gov/ns/oscal/1.0"
                  id="uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2">
   <metadata>
      <title>Document Title</title>
      <last-modified>2019-11-05T14:00:00.000-04:00</last-modified>
      <version>1.0</version>
      <oscal-version>1.0.0-milestone1</oscal-version>

      <role id="creator">
         <title>Document creator</title>
      </role>

      <party id="afla">
         <org>
            <org-name>A Four Letter Agency (AFLA)</org-name>
         </org>
      </party>

      <responsible-party role-id="creator">
         <party-id>afla</party-id>
      </responsible-party>
   </metadata>
   <!-- [cut] -->
</catalog>
```

Metadata

JSON and YAML Examples

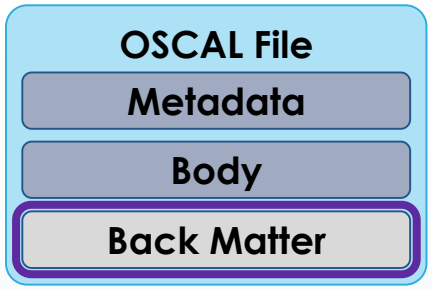



```json
{
  "catalog": {
    "id": "uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2",
    "metadata": {
      "title": "Document Title",
      "last-modified": "2019-11-05T14:00:00.000-04:00",
      "version": "1.0",
      "oscal-version": "1.0.0-milestone2",
      "roles": [
        {
          "id": "creator",
          "title": "Document creator"
        }
      ],
      "parties": {
        "id": "afla",
        "org": {
          "org-name": "A Four Letter Agency (AFLA)"
        }
      },
      "responsible-parties": {
        "creator": {
          "party-ids": "afla"
        }
      }
    }
  }
}
```

```yaml
catalog:
  id: "uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2"
  metadata:
    title:           "Document Title"
    last-modified:   "2019-11-05T14:00:00.000-04:00"
    version:         "1.0"
    oscal-version:   "1.0.0-milestone2"
    roles:
      - id:    "creator"
        title: "Document creator"
    parties:
      id:  "afla"
      org:
        org-name: "A Four Letter Agency (AFLA)"
    responsible-parties:
      creator:
        party-ids: "afla"
```

Back Matter

XML Example

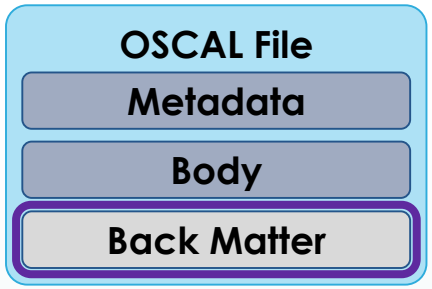


- **Back Matter is not required**
- **If present, Back Matter must appear last in the document**
- **Bibliographic References**
  - Citations
- **Resources**
  - Links to external resources
    - A single resource can have several links
  - **and/or** embedded Base64 attachments
  - Referenced within an OSCAL document using a URI fragment "**#id**"

```
<catalog xmlns="http://csrc.nist.gov/ns/oscal/1.0"
    id="uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2">
    <!-- [cut] -->
    <back-matter>
        <citation id="ref079">
            <target>https://doi.org/10.6028/NIST.SP.800-53r4</target>
            <title>NIST Special Publication 800-53 Revision 4</title>
            <doc-id type="doi">10.6028/NIST.SP.800-53r4</doc-id>
        </citation>
        <resource id="resource-policy-at">
            <rlink media-type="application/pdf"
              href="http://intranet.afla.gov/AT-Policy.pdf"/>
        </resource>
        <resource id="diagram">
            <desc>Main Diagram</desc>
            <rlink media-type="image/png"
                href="http://intranet.afla.gov/main-diagram.png"/>
            <base64 filename='main_diagram.png'>
               wolQTkIRFI--cut--ABJRU5Ewq5CYMKC
            </base64>
        </resource>
    </back-matter>
</catalog>
```

Back Matter

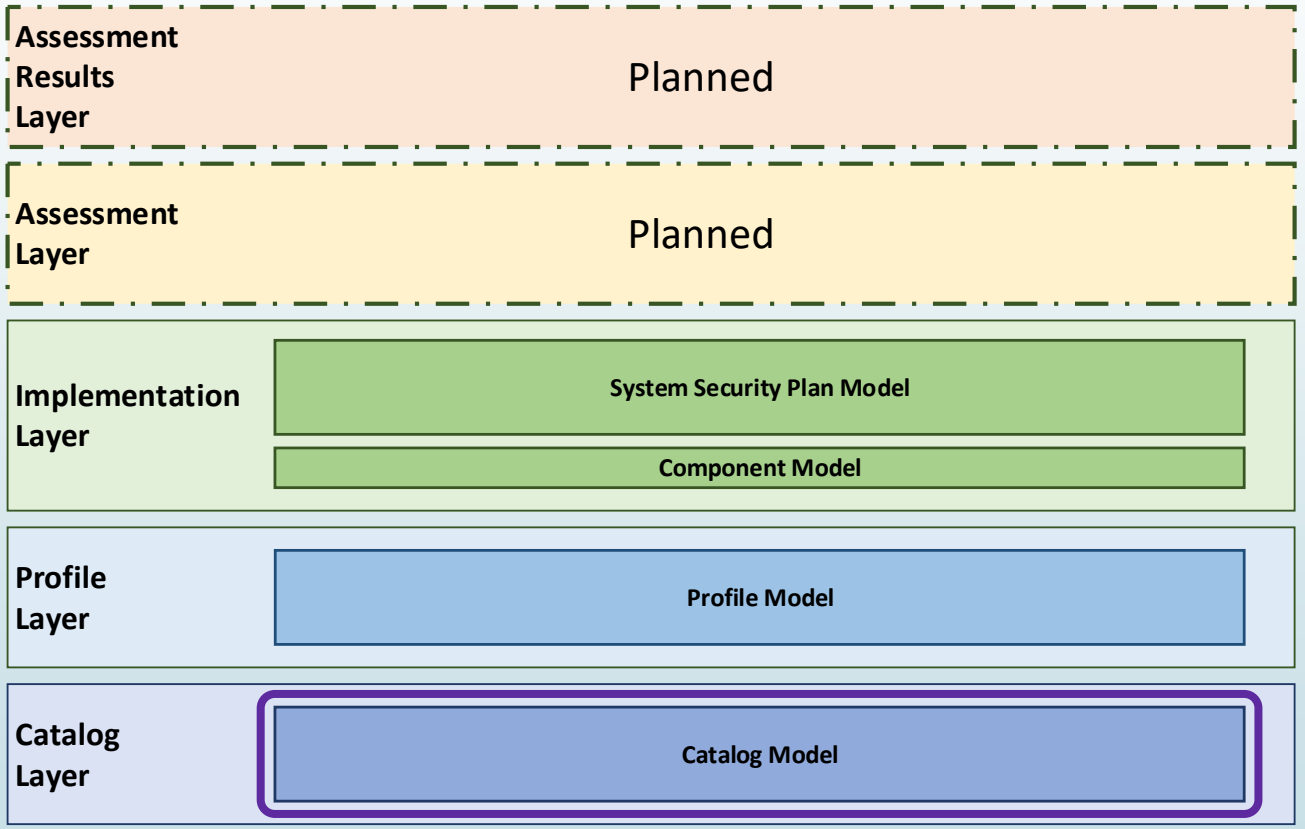
JSON and YAML Examples



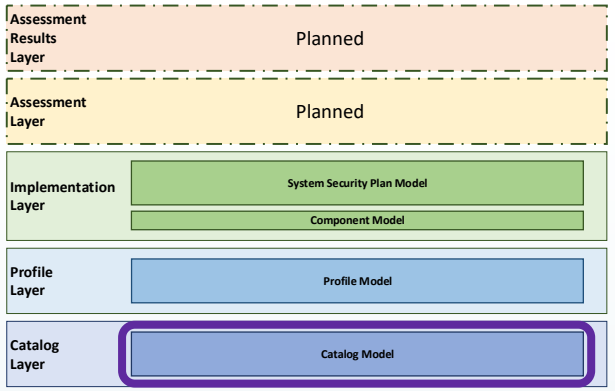

```json
{
    "catalog": {
        "id": "uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2",
        "back-matter": {
            "citations": [
                {
                    "id": "ref079",
                    "targets": "https://doi.org/10.6028/NIST.SP.800-53r4",
                    "title": "NIST Special Publication 800-53 Revision 4",
                    "document-ids": {
                        "type": "doi",
                        "identifier": "10.6028/NIST.SP.800-53r4"
                } }
            ],
            "resources": [
                {
                    "id": "resource-policy-at",
                    "rlinks": {
                        "href": "http://intranet.afla.gov/AT-Policy.pdf",
                        "media-type": "application/pdf"
                } },
                {
                    "id": "diagram",
                    "desc": "Main Diagram",
                    "rlinks": {
                        "href": "http://intranet.afla.gov/main-diagram.png",
                        "media-type": "image/png"
                    },
                    "base64": {
                        "filename": "main_diagram.png",
                        "value": "wolQTkIRFI--cut--ABJRU5Ewq5CYMKC"
                } }
            ]
} } }
```

```yaml
---
catalog:
  id: "uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2"
  back-matter:
    citations:
    - id:       "ref079"
      targets: "https://doi.org/10.6028/NIST.SP.800-53r4"
      title:   "NIST Special Publication 800-53 Revision 4"
      document-ids:
        type:       "doi"
        identifier: "10.6028/NIST.SP.800-53r4"
    resources:
    - id: "resource-policy-at"
      rlinks:
        href:       "http://intranet.afla.gov/AT-Policy.pdf"
        media-type: "application/pdf"
    - id:   "diagram"
      desc: "Main Diagram"
      rlinks:
        href:       "http://intranet.afla.gov/main-diagram.png"
        media-type: "image/png"
      base64:
        filename: "main_diagram.png"
        value:    "wolQTkIRFI--cut--ABJRU5Ewq5CYMKC"
```

Catalog Model



Catalog Model
Purpose and Goals



Purpose

- Model control definitions from any cybersecurity framework
- Model control assessment objectives and activities

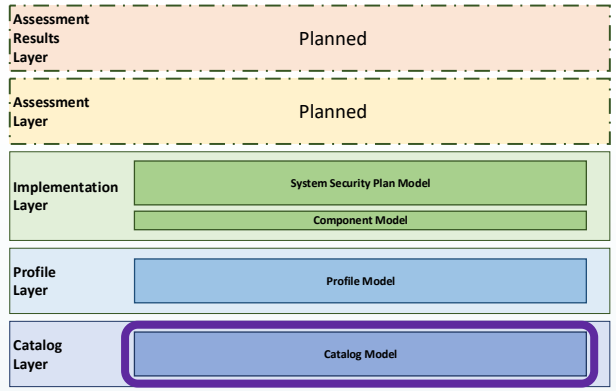
Goals

- Provide a structure for expressing control detail at level of granularity that ensures machine-readable processing in every phase of the cybersecurity lifecycle
- Provide a foundation for referencing modeled control information across all other OSCAL models

Examples of control catalogs that can be expressed in OSCAL:

- NIST SP 800-53 & 53A
- ISO/IEC 27002
- COBIT 5

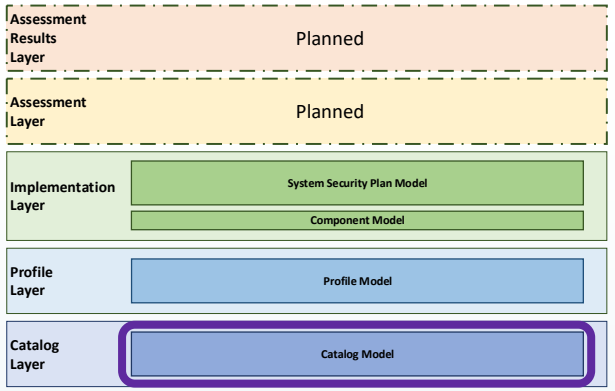
Catalog Model
Features



- Standardizes the semantics of control information
  - by normalizing the representation of control definitions
  - regardless of their originating governance frameworks
- Provides appropriate granularity to support automation across the cybersecurity lifecycle:
  - Provides identifiers down to the sub-statement level
  - Provides for in-line parameters
  - Represents control enhancements or child controls
  - Combines control definitions with assessment objectives and methods
  - Provides for grouping of controls into families
  - Allows for arbitrary relationships between controls

Catalog Model

Authors and Consumers



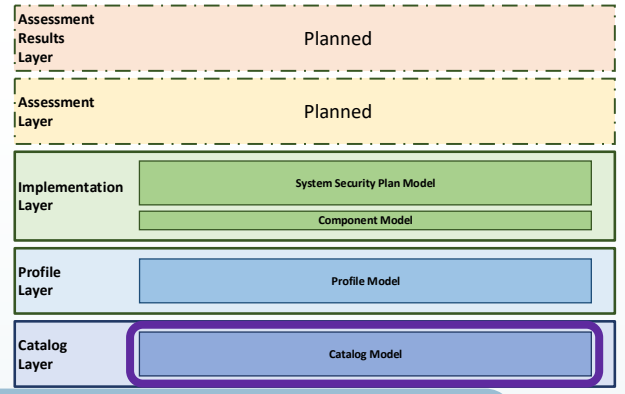
Authors

- Authors of cybersecurity governance frameworks, standards, practices, or guidelines.
- Organizations wishing to define organization-specific requirements, such as commercial organizations or government agencies.

Consumers

- Anyone who must align with a framework such as NIST, ISO, or COBIT
- Anyone who must align with organization-defined controls.
- Authors or consumers of any higher layer in the OSCAL stack, such as:
  - baseline authors
  - component authors
  - SSP authors
  - assessors
  - authorizing officials

Anatomy of a Catalog



Groups

- Allow for grouping of controls
- Optional ID and class assignments
- For 800-53, used to express families

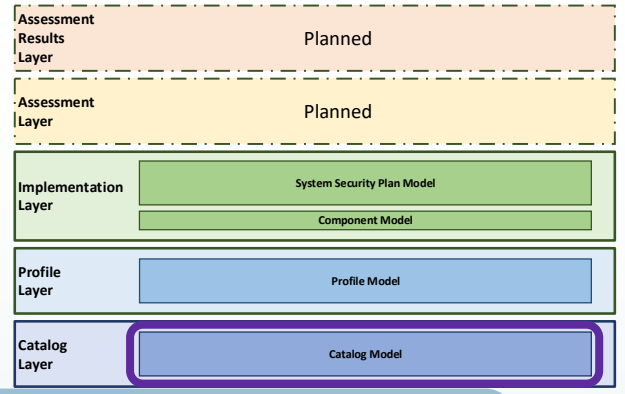
Controls

- Can be directly under the root or grouped
- Must contain an ID
- Optional class
- Controls may be nested (control within a control)

For 800-53, control enhancements are nested within the parent control

```
<catalog xmlns="http://csrc.nist.gov/ns/oscal/1.0"
    id="uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2">
  <metadata />

  <group class="family" id="ac">
    <title>Access Control</title>
    <control class="SP800-53" id="ac-1">
      <!-- [control details omitted] -->
    </control>

    <control class="SP800-53" id="ac-2">
      <!-- [control details omitted] -->

      <control class="SP800-53-enhancement" id="ac-2.1">
        <!-- [enhancement details omitted] -->
      </control>
    </control>
  </group>

  <control class="SP800-53" id="xx-1">
  <!-- [enhancement details omitted] -->
  </control>
</catalog>
```

Anatomy of a Catalog
Controls

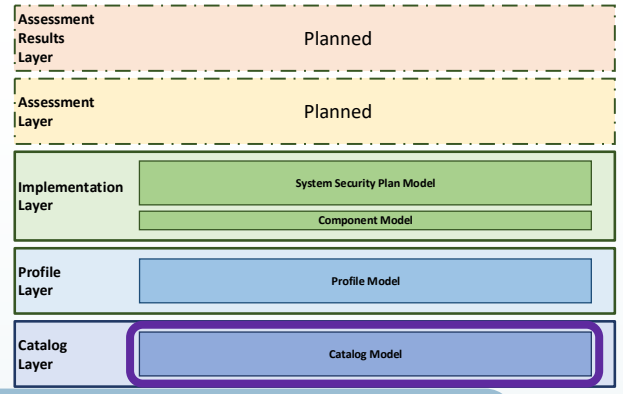


Controls Consist Of:

- Title (required)
- Parameters (optional)
- Properties (optional)
  - Simple name/value data intended for a single piece of information
- Parts (optional)
  - Parts contain more complex, nested information
  - Used to describe **Statements**, **Guidance**, **Assessment Objectives**, and **Assessment Activity** details
- Nested Controls (optional)

```
<catalog xmlns="http://csrc.nist.gov/ns/oscal/1.0"
    id="uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2">
  <metadata />
  <control class="SP800-53" id="ac-2">
    <!-- [control details omitted] -->
    <control class="SP800-53-enhancement" id="ac-2.1">
      <!-- [control details omitted] -->
    </control>
    <control class="SP800-53-enhancement" id="ac-2.2">
      <title>Removal of Temporary/Emergency Accounts</title>
      <param id="ac-2.2_prm_1"><!-- cut --></param>
      <param id="ac-2.2_prm_2"><!-- cut --></param>
      <prop name="label">AC-2(2)</prop>
      <prop name="sort-id">ac-02.02</prop>
      <part id="ac-2.2_smt" name="statement"><!-- cut --></part>
      <part id="ac-2.2_gdn" name="guidance"><!-- cut --></part>
      <part id="ac-2.2_obj" name="objective"><!-- cut --></part>
      <part name="assessment"><!-- cut --></part>
      <part name="assessment"><!-- cut --></part>
      <part name="assessment"><!-- cut --></part>
    </control>
  </control>
</catalog>
```

Anatomy of a Catalog
Statements



Statements:

- Broken down into individual pieces
- Each piece can be referenced individually because it has its own ID
- Parameters are referenced by insert statements, with a parameter ID

```
<control class="SP800-53" id="ac-1">
  <title>Access Control Policy and Procedures</title>
  <param id="ac-1_prm_1"> ... </param>
  <param id="ac-1_prm_2"> ... </param>
  <param id="ac-1_prm_3"> ... </param>

  <part id="ac-1_smt" name="statement">
    <p>The organization:</p>

    <part id="ac-1_smt.a" name="item">
      <prop name="label">a.</prop>
      <p>Develops, documents, and disseminates to
        <insert param-id="ac-1_prm_1" />:</p>

      <part id="ac-1_smt.a.1" name="item">
        <prop name="label">1.</prop>
        <p>Procedures to facilitate ... and</p>

        <part id="ac-1_smt.a" name="item">
          <p>An access control policy that ... and</p>
        </part>
      </part>
    </part>
  </part>
</control>
```

AC-1 ACCESS CONTROL POLICY AND PROCEDURES

Control: The organization:

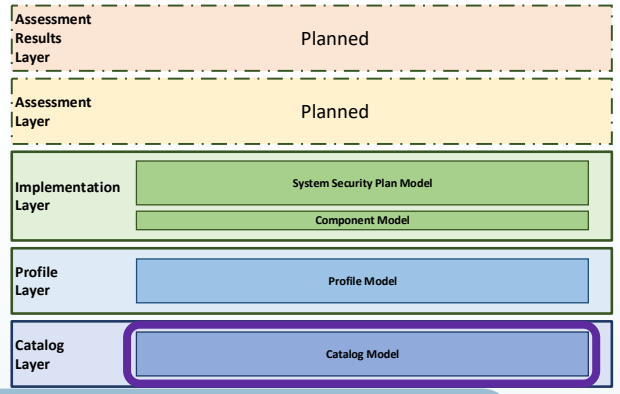
a. Develops, documents, and disseminates to [*Assignment: organization-defined personnel or roles*]:

1. An access control policy that addresses purpose, scope, roles, responsibilities, management commitment, coordination among organizational entities, and compliance; and

2. Procedures to facilitate the implementation of the access control policy and associated access controls; and

Anatomy of a Catalog

Parameters



- Any control statement can reference any parameter
- Two parameter types:
  - Assignment
  - Select
- Parameters may be nested
  - In 800-53, Rev 4 there are a few cases of an Assignment parameter within a Select parameter
- Can have constraints expressed

```
<control class="SP800-53" id="ac-1">
  <title>Access Control Policy and Procedures</title>

  <param id="ac-1_prm_1">
    <label>organization-defined personnel or roles</label>
  </param>

  <param id="ac-1_prm_2">
    <label>organization-defined frequency</label>
    <constraint>at least annually</constraint>
  </param>

  <param id="ac-1_prm_3"> ... </param>

  <part id="ac-1_smt" name="statement">
    <p>The organization:</p>
    <part id="ac-1_smt.a" name="item">
      <prop name="label">a.</prop>
      <p>Develops, documents, and disseminates
        to <insert param-id="ac-1_prm_1" />:</p>
    </part>
  </part>
</control>
```

AC-1 ACCESS CONTROL POLICY AND PROCEDURES

Control: The organization:

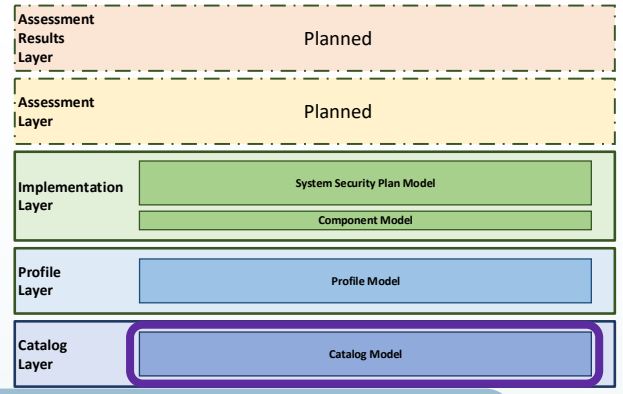
a. Develops, documents, and disseminates to [*Assignment: organization-defined personnel or roles*]:

Anatomy of a Catalog

Other Notes

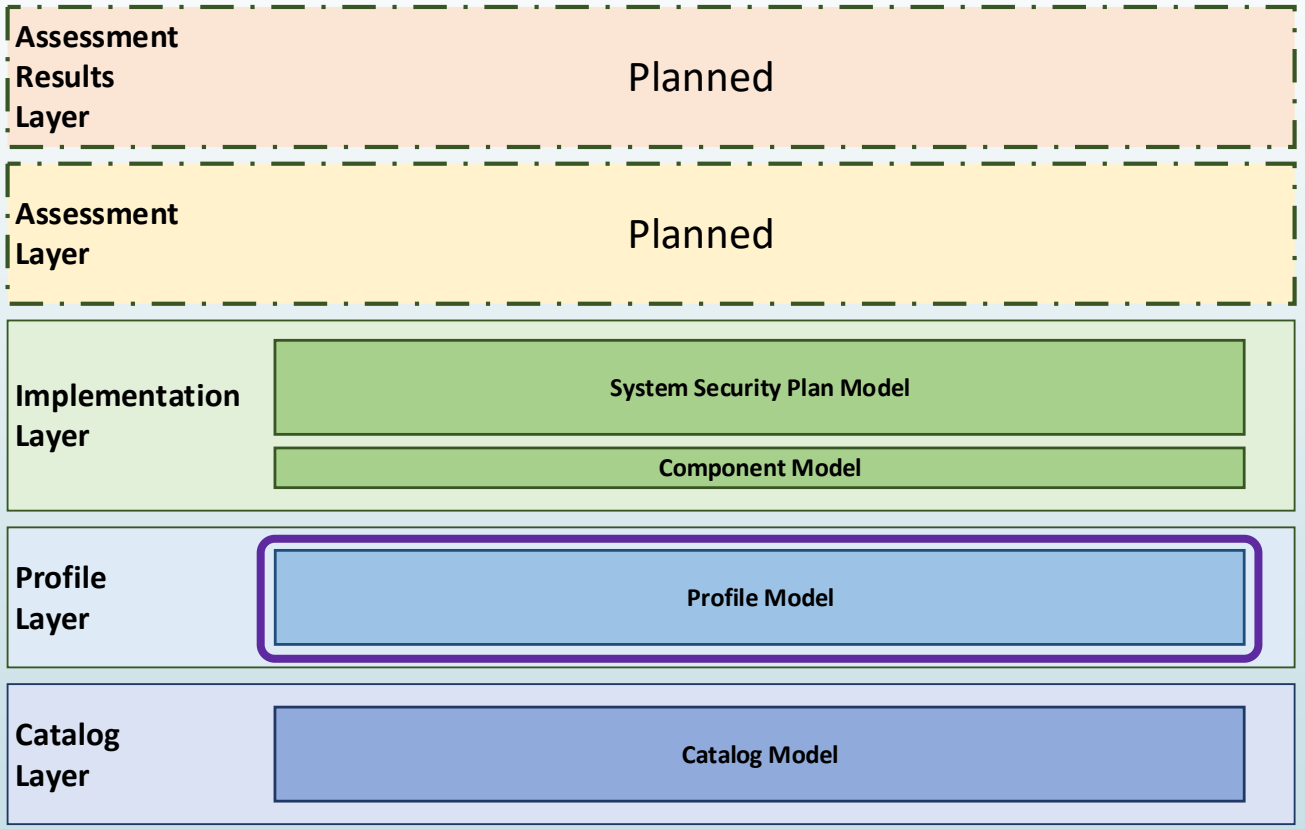
Guidance, **Objectives**, and **Assessment Activities** are expressed similar to statements.

For 800-53A, Rev 4, there are separate assessment parts for **Test**, **Examine**, and **Interview**.



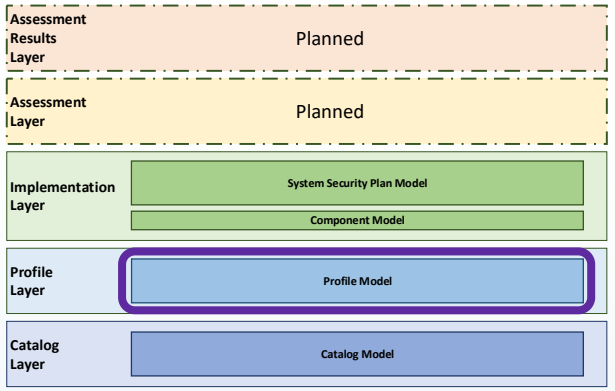

```
<control class="SP800-53-enhancement" id="ac-2.2">
  <title>Removal of Temporary/Emergency Accounts</title>

  <param id="ac-2.2_prm_1"> ... </param>
  <param id="ac-2.2_prm_2"> ... </param>

  <prop name="label">AC-2(2)</prop>
  <prop name="sort-id">ac-02.02</prop>

  <part id="ac-2.2_smt" name="statement"> ... </part>
  <part id="ac-2.2_gdn" name="guidance"> ... </part>
  <part id="ac-2.2_obj" name="objective"> ... </part>

  <part name="assessment"> ... </part>
  <part name="assessment"> ... </part>
  <part name="assessment">
    <prop name="method">TEST</prop>

    <part name="objects">
      <p>Automated mechanisms implementing information system auditing</p>
    </part>
  </part>
</control>
```

Profile Model



Profile Model

Purpose and Goals



Purpose

- Model control baselines/overlays – which are a customized subset of controls selected from one or more catalogs for a given purpose or security posture

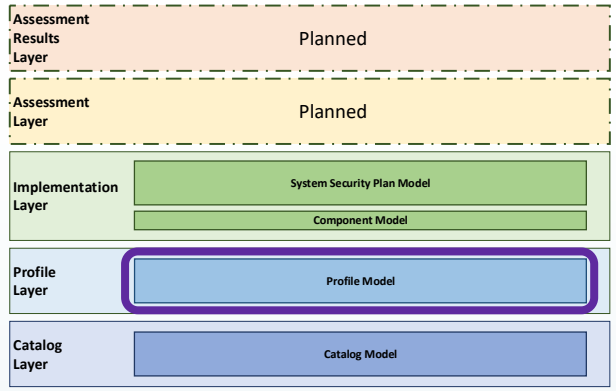
Goals

- Identify the controls to include from each relevant catalog
  - Possibly also from other profiles (baselines)
- Modify control parameters, statements, or assessment objectives/activities as needed
- Ensure transparency of control selection and customization, such that all changes can be traced back to its origination

Examples of control baselines that can be expressed in OSCAL:

- NIST High, Moderate, and Low Baselines
- FedRAMP High, Moderate, Low and Tailored Baselines
- Agency-specific Baselines
- Combined ISO/IEC-27002/NIST Moderate Baseline

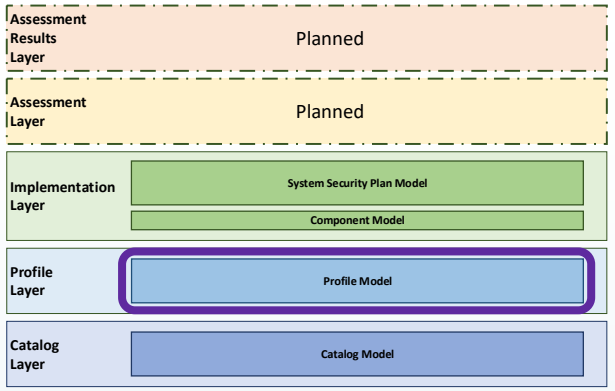
Profile Model
Features



- Selection of controls
- Customization of controls, including:
  - Parameters
  - Statements
  - Assessment Objectives and Activities
- Traceability of controls through all tailoring, back to originating catalog

Profile Model

Authors and Consumers



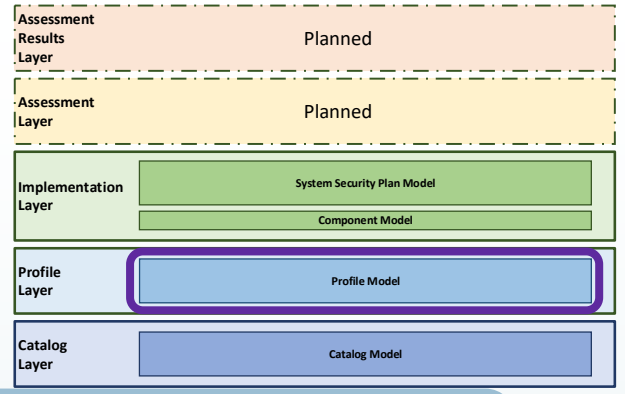
Authors

- Control baseline/overlay authors, such as NIST or FedRAMP
- Organizations wishing to define organization-specific baselines/overlays such as commercial organizations or government agencies

Consumers

- System owners who must align with a control baseline/overlay
- Authors of downstream profiles that reference existing profiles
- Authors or consumers of any higher layer in the OSCAL stack, such as:
  - component authors
  - SSP authors
  - assessors
  - authorizing officials

Anatomy of a Profile



Import

- Identifies a source a catalog or profile
- Identifies the controls to import from that catalog or profile
- One import per catalog or profile

Merge

- Directives as to how a profile should "resolve" (merge) and organize the information it imports

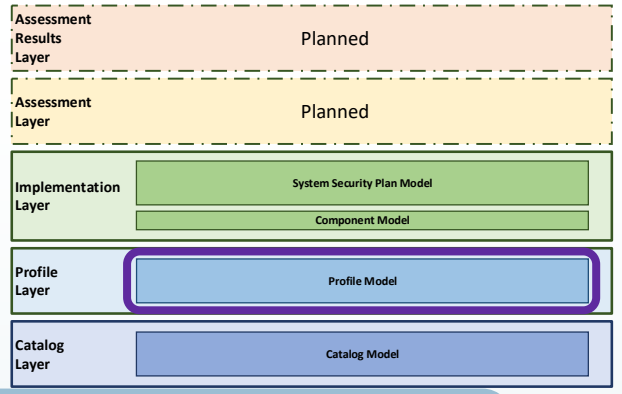
Modify

- Directives that add, change, or remove portions of an imported control

```
<profile xmlns="http://csrc.nist.gov/ns/oscal/1.0"
    id="uuid-47fdefdb-dc1a-4040-9f27-b517a16b06d2">
  <metadata /><!-- contents omitted -->

  <import href="NIST_SP-800-53_rev4_catalog.xml“>
    <include>
      <call control-id="ac-2" />
      <call control-id="ac-2.1" />
    </include>
  </import>

  <merge /><!-- contents omitted -->

  <modify /><!-- contents omitted -->
</profile>
```

Anatomy of a Profile

Modify

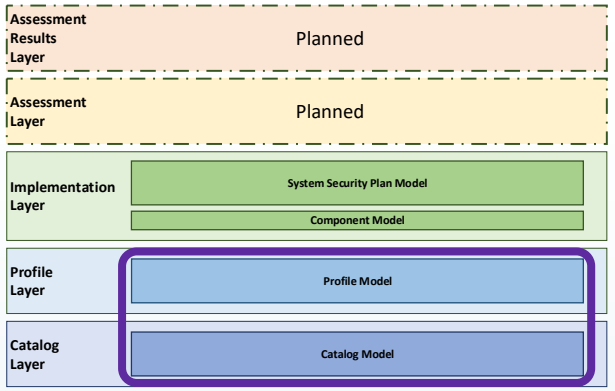


Modify (`modify`)

- **Parameters (`set`)**
  - Add a label, constraint, or value
- **Remove Portions of a Control (`remove`)**
  - Identify what to remove using:
    - ID (`ref-id`)
    - name (`name-ref`)
    - class (`class-ref`)
    - element (`item-name`)
- **Add content to a control (`add`)**
  - Add statements, guidance, objectives, or assessment activities

```
<!-- cut -->
<modify>
  <set param-id="ac-1_prm_3">
    <constraint>at least annually</constraint>
  </set>

  <alter control-id="au-2">
    <remove id-ref="au-2_smt.d" />

    <add position="ending">
      <part id="au-2_add" name="item" ns="my-org">
        <title>Additional Requirement</title>
        <part id="au-2_smt.a.add" name="item">
          <prop name="label">Additional a.</prop>
          <p>My replacement for statement.</p>
        </part>
      </part>
    </add>
  </alter>
</modify>
<!-- cut -->
```

Working With Catalogs and Profiles



OSCAL CATALOG
NIST 800-53 r4
NIST 800-53A r4

SP 800-53 Control Definition:
- Requirement Statements
- Associated Guidance
- Parameter Definition
- Assessment Objectives
- Assessment Activities

SP 800-53 Control Definition

SP 800-53 Control Definition

OSCAL PROFILE
NIST 800-53 r4 – High

SP 800-53 Control Selection

SP 800-53 Control Selection

OSCAL PROFILE
FedRAMP – High

SP 800-53 Control Selection

FedRAMP Control Modifications:
- Additional Requirement Statements
- Parameter Constraints
- Additional Guidance

SP 800-53 Control Selection

FedRAMP Control Modifications

SP 800-53 Control Selection

OSCAL CATALOG
FedRAMP

FedRAMP Control Definition

FedRAMP Control Definition

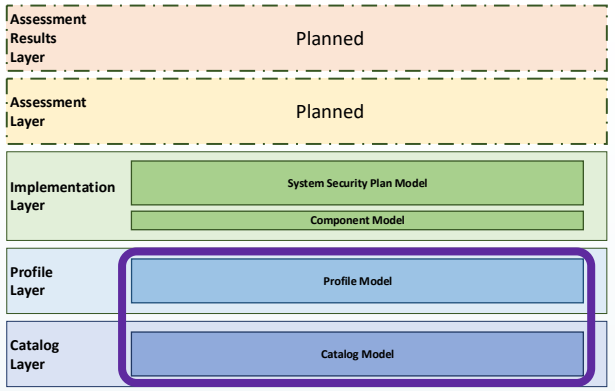
FedRAMP Control Definition

FedRAMP Control Selection

FedRAMP Control Selection

FedRAMP Control Selection

Profile Resolution



Merges all of the content to a single catalog file, as defined by the downstream-profile.

OSCAL CATALOG
NIST 800-53 r4
NIST 800-53A r4

SP 800-53 Control Definition:
- Requirement Statements
- Associated Guidance
- Parameter Definition
- Assessment Objectives
- Assessment Activities

SP 800-53 Control Definition

SP 800-53 Control Definition

OSCAL CATALOG
FedRAMP

FedRAMP Control Definition

FedRAMP Control Definition

FedRAMP Control Definition

OSCAL PROFILE
NIST 800-53 r4 – High

SP 800-53 Control Definition

SP 800-53 Control Definition

OSCAL PROFILE
FedRAMP – High

SP 800-53 Control Selection

FedRAMP Control Modifications:
- Additional Requirement Statements
- Parameter Constraints
- Additional Guidance

SP 800-53 Control Selection

FedRAMP Control Modifications

SP 800-53 Control Selection

FedRAMP Control Selection

FedRAMP Control Selection

FedRAMP Control Selection

PROFILE RESOLUTION COLLAPSES ALL TO A SINGLE FILE

OSCAL RESOLVED PROFILE
FedRAMP High "Resolved Profile" Catalog

SP 800-53 Control Definition with FedRAMP Modifications:
- Additional Requirement Statements
- Parameter Constraints
- Additional Guidance

SP 800-53 Control Definition with FedRAMP Modifications

SP 800-53 Control Definition

FedRAMP Control Definition

FedRAMP Control Definition

FedRAMP Control Definition

How You Can Help

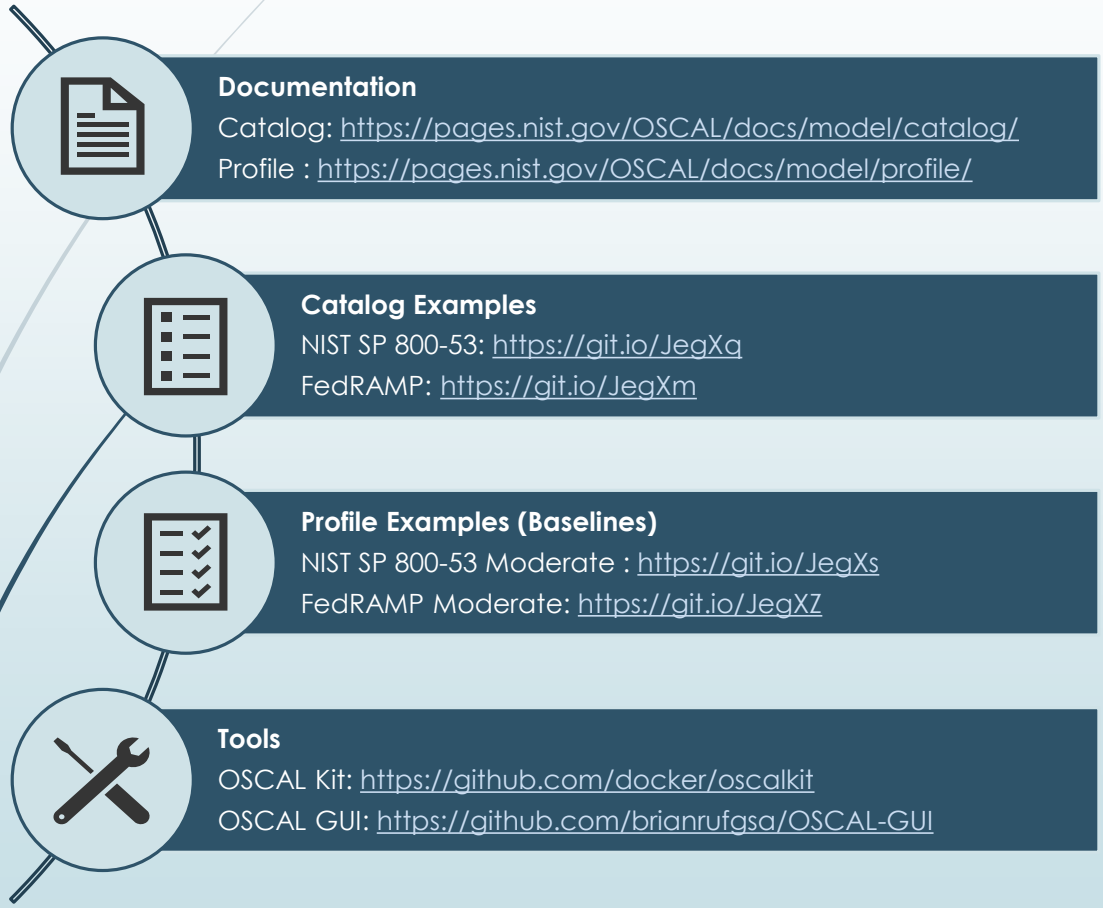
We need your help!

- **Provide Feedback on the Models**
- Produce Catalogs:
  - ISO-27002, COBIT 5
  - Organizational Catalogs
- Produce Profiles
  - Organizational baselines/overlays
- Produce Tools That Import, Export, and/or Manipulate OSCAL Catalogs and Profiles

Ways to Submit Feedback

- Add a comment to an appropriate issue: https://github.com/usnistgov/OSCAL/issues
- Create a new issue – if no appropriate issue exists
- Send us email: oscal@nist.gov
- Contribution Guidance: https://pages.nist.gov/OSCAL/contribute/

Resources



Documentation
Catalog: https://pages.nist.gov/OSCAL/docs/model/catalog/
Profile : https://pages.nist.gov/OSCAL/docs/model/profile/

Catalog Examples
NIST SP 800-53: https://git.io/JegXq
FedRAMP: https://git.io/JegXm

Profile Examples (Baselines)
NIST SP 800-53 Moderate : https://git.io/JegXs
FedRAMP Moderate: https://git.io/JegXZ

Tools
OSCAL Kit: https://github.com/docker/oscalkit
OSCAL GUI: https://github.com/brianrufgsa/OSCAL-GUI

The **OSCAL project** is developed openly on GitHub.com.

Repository: https://github.com/usnistgov/OSCAL

Project Website: https://www.nist.gov/oscal

How to Contribute: https://pages.nist.gov/OSCAL/contribute/

We welcome contributions to this project.

Questions?

Break

On your own

Note: An escort is needed beyond building 215

Agenda

Time	Topic
8:00 am	**Registration and Networking**
9:00 am	**Welcome, Introduction to Workshop**
9:10 am	**What is OSCAL and Who Needs It** Michaela Iorga, OSCAL co-lead NIST
10:00 am	**OSCAL and FedRAMP** Ashley Mahan, Director, FedRAMP, GSA
10:30 am	**Break**
10:45 am	**Tools That Understand OSCAL** Andrew Weiss, GitHub and Wendell Piez, OSCAL team member, NIST
11:20 am	**OSCAL Roadmap** David Waltermire, SCAP Lead and OSCAL co-lead, NIST
Noon	**Lunch**
1:30 pm	**OSCAL Catalog and Profile Models** Brian Ruf, OSCAL team member, Noblis
2:45 pm	**Break**
3:00 pm	**OSCAL Component and System Security Plan Models** David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:15 pm	**Discussion: Tomorrow is Today – The Need for Automation** Moderator: David Waltermire, SCAP lead and OSCAL co-lead, NIST
4:50 pm	**Closing Remarks**
5:00 pm	**Adjourn**

OSCAL Component and System Security Plan Models

David Waltermire

SCAP Lead and OSCAL Co-Lead

National Institute of Standards and Technology (NIST)

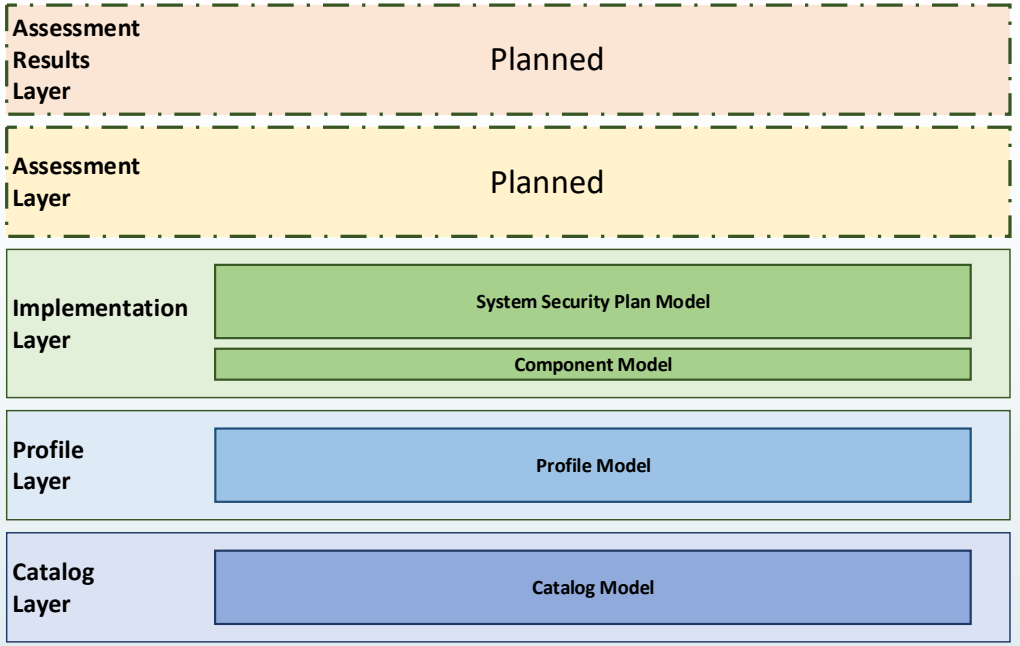
Presentation Agenda

Component Model

- Goals
- Scope
- Authors & Consumers

System Security Plan (SSP) Model

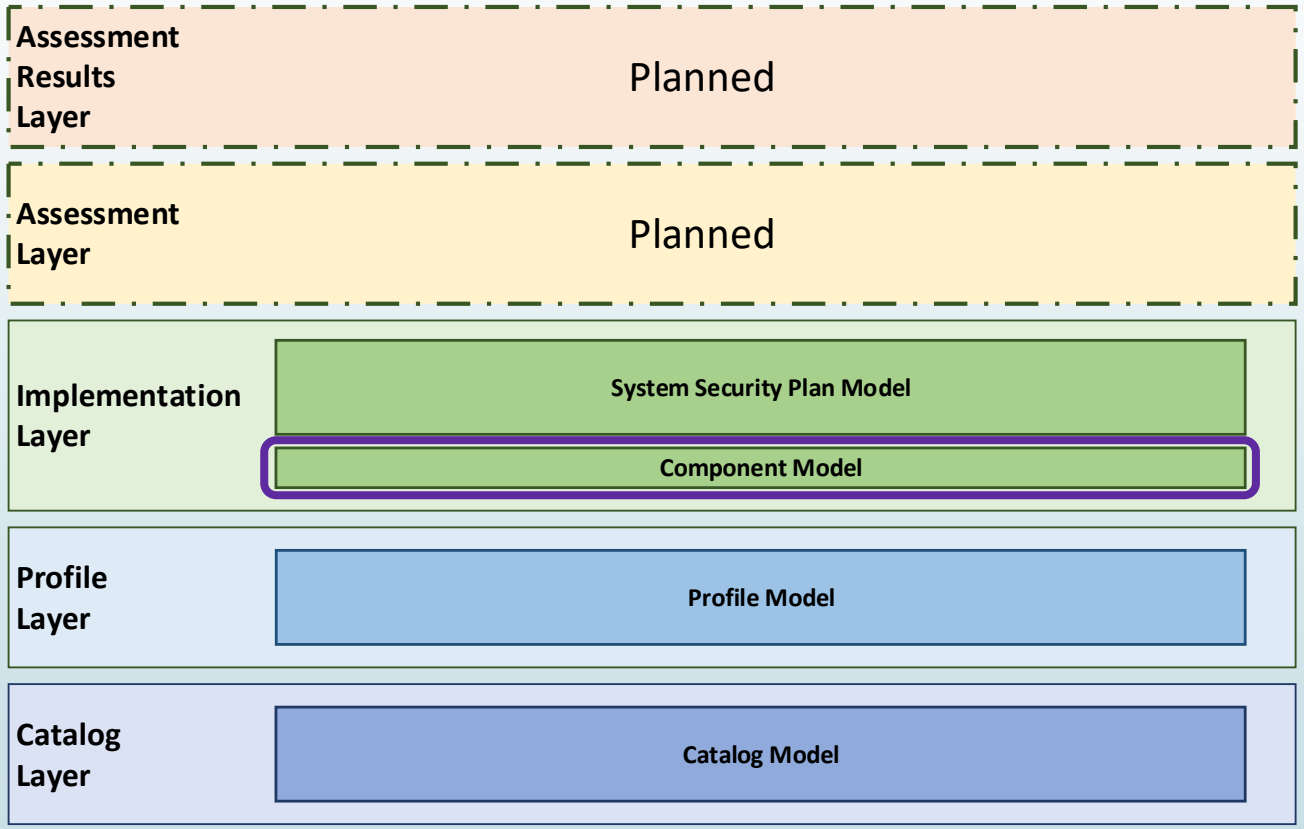
- Goals
- Scope
- Authors & Consumers



Working with Components and SSPs

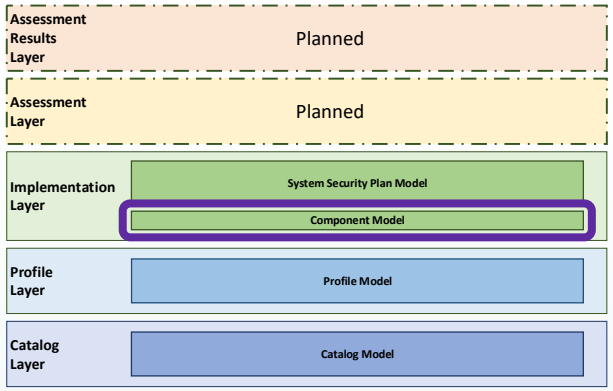
- Case Studies / Examples
- Resources
- How You Can Help
- Questions?

Component Model



Component Model

Purpose and Goals



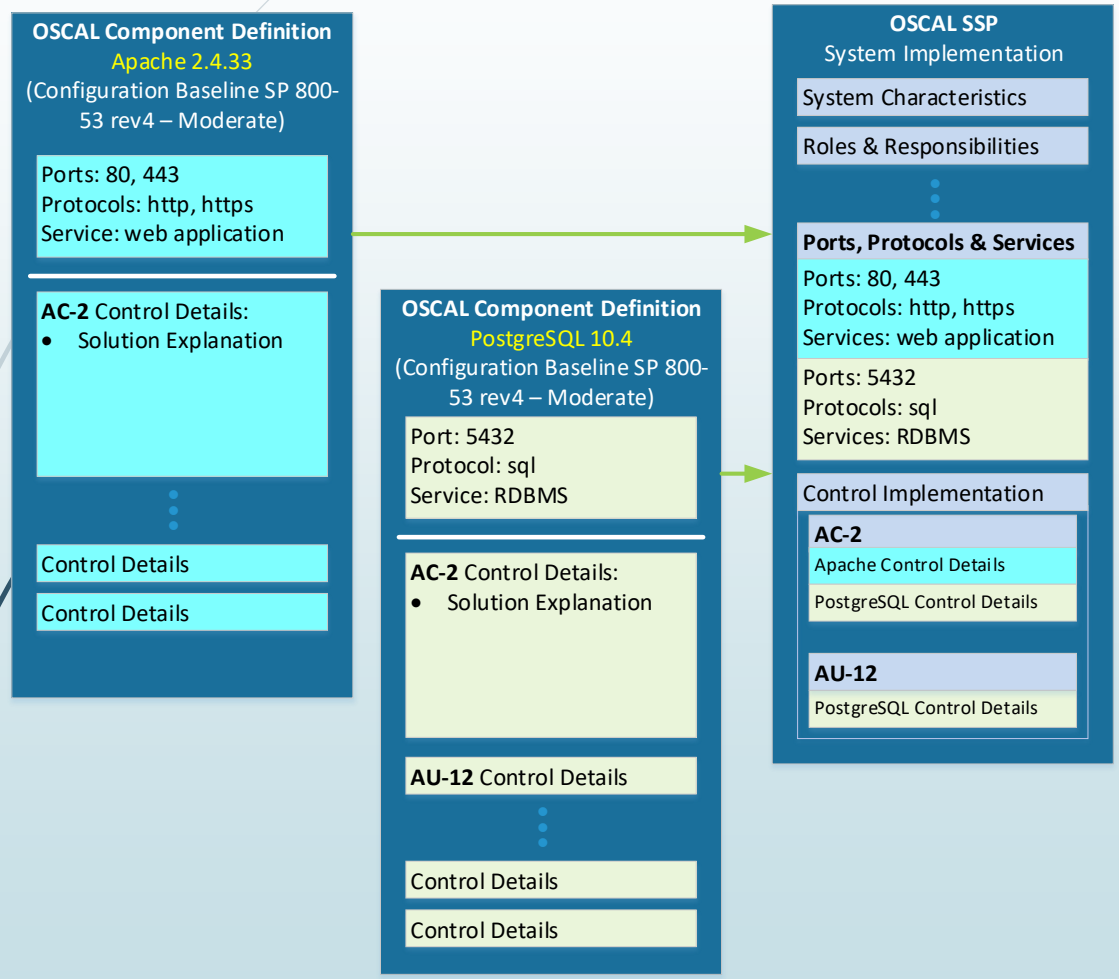
Purpose

- Allow maintainers of assets to describe and share how the asset can be implemented to satisfy specific controls.
  - Asset types include hardware, software, services, policies, procedures, plans, or anything else that enables a system to satisfy a control.
  - For some asset types, this may include defining multiple options, which satisfy controls differently.

Goals

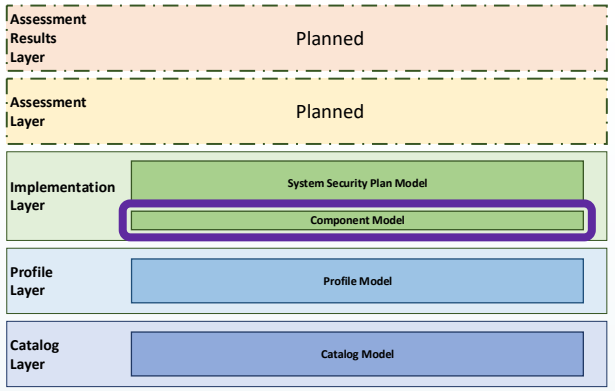
- Provide machine-readable detail about assets.
- Identify the controls satisfied by the asset, and provide a description that details how each control is satisfied for a given implementation.
- Enable system implementers to import asset information into a system implementation document, saving effort and reducing error.

A quick discussion on components



- A *component definition* provides for the sharing of knowledge about a component asset
- Allows an asset provider to share information about
  - how the asset *can be* implemented
  - the controls that are supported by the asset
- Implementors of a system can use this component information to "seed" their system implementation details

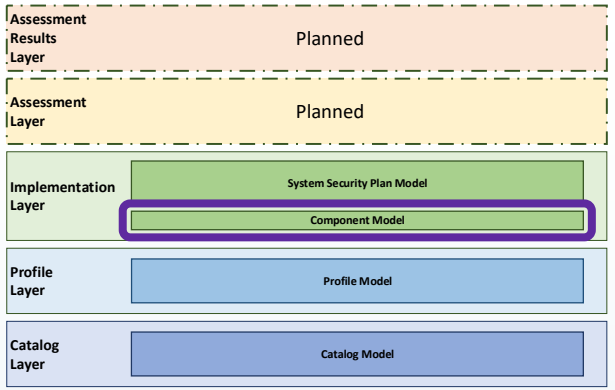
Component Model
Features



- Ability to capture details about an asset in machine-readable format such as its name, version, provider, and implementation characteristics
- Controls implemented by the asset
- The specific baselines (profiles) that may lead to particular control implementation
- Required configuration of asset in order to implement those controls relative to a particular baseline (profile)
- Examples:
  - Access Control Policy
  - Incident Response Plan
  - Account Authorization Process
  - Network Firewall
  - Database
  - Application Server

Component Model

Authors and Consumers



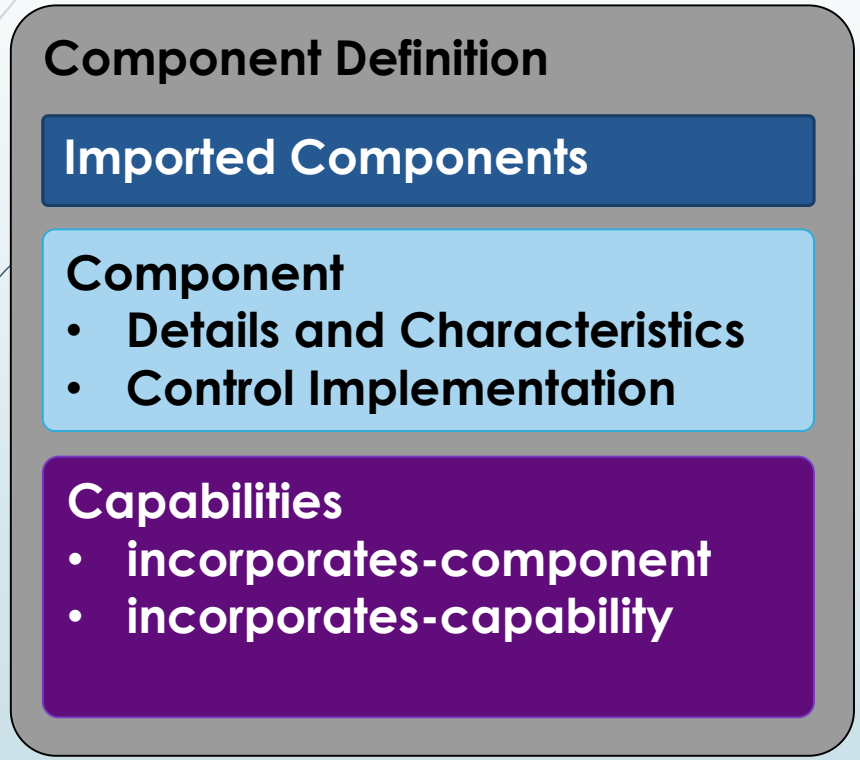
Authors

- Asset maintainers that wish to publish how the given asset implements a set of controls
  - For **hardware**, **software**, and **services** this may include open source, commercial, or custom implementations
  - For **policies**, **procedures**, **plans**, and other documentary artifacts this author may be the artifact maintainer

Consumers

- Organizations acquiring and implementing the asset
- Anyone who must document controls
- Anyone who must audit or assess control implementation compliance
- Anyone who must adjudicate or render an authorization decision for a system based on control compliance

Component Definition
Organization



A component definition can:

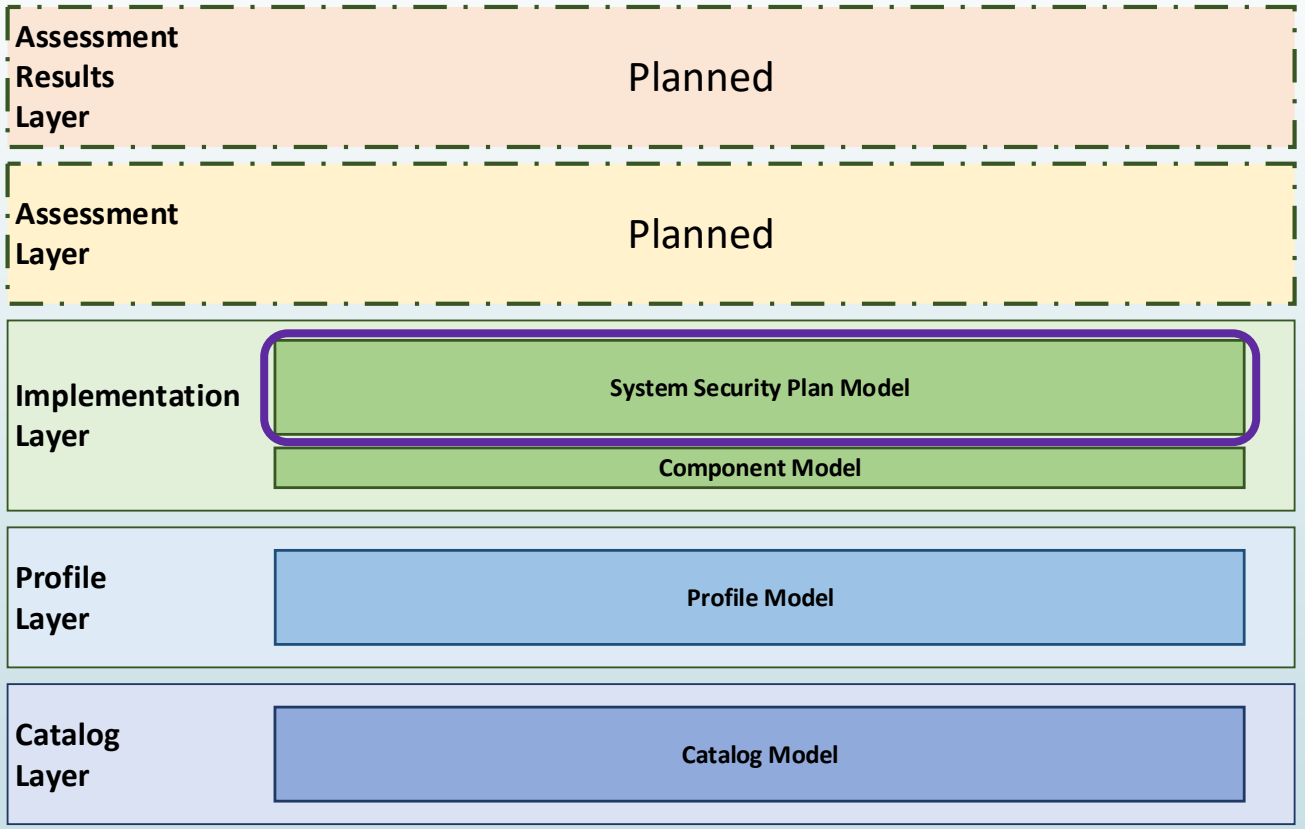
- Import components from other component definitions
- Define one or more components
- Capabilities group components
  - can incorporate other capabilities
  - define how multiple components can be used together as part of a solution

Component Definition
Component

A component can define:

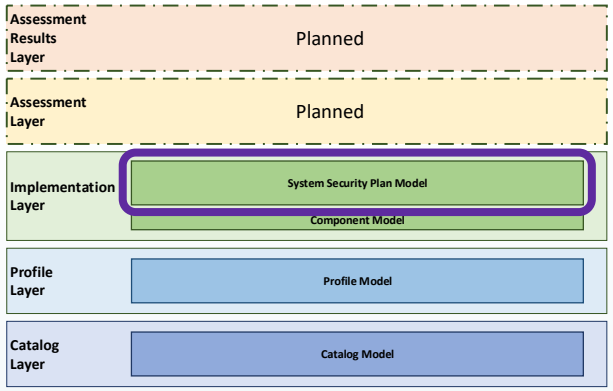
- **name:** The name of the component
- **type:** The component type: hardware, software, services, policies, procedures, plans, etc.
- **properties:** version(s), model, release date, identifiers, other characteristics
- **responsible-parties:** creator, maintainer, publisher, etc.
- **control-implementation:** How the asset can meet a set of control requirements
  - Can be defined at the control- or control statement-levels.
  - Can detail how specific baselines can be implemented
    - Use of parameters to define implementation options and constraints
- Component dependencies
  - component A *requires* component B
  - Component B *implements* component A
- Methods for implementing and assessing the component implementation

System Security Plan (SSP) Model



SSP Model

Purpose and Goals



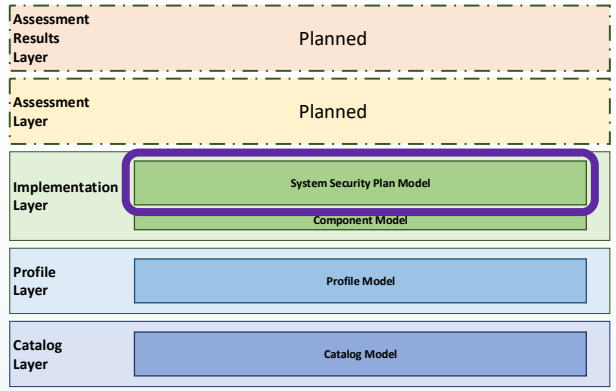
Purpose

- Document the present and planned states of control implementation within an information system

Goals

- Facilitate up-to-date documentation about the current state of the system
- Provide a level of granularity that allows each control implementation to be documented at the component level as well as at the system-wide level
- Support current SSP practices, and future automation based on improved SSP practices, with a migration path
- Enable automated analysis of current system implementation relative to the SSP content for a given system and connected systems
- Enable automated dashboards of cybersecurity status across a portfolio of systems

SSP Model
Features

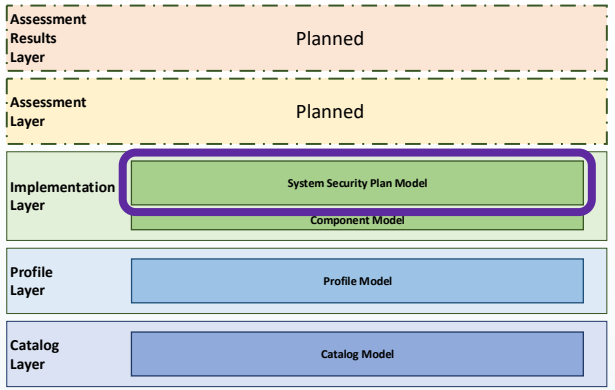


Provides appropriate granularity to support automation across the cybersecurity lifecycle:

- Rich description of the system's characteristics including: handled information types and criticality, system boundary, network architecture, and data-flow information
- Security categorization by overall impact and handled information
- Supports system planning as well as snapshot in time
- System's implementation can be detailed for users, components, services, interconnections, and system inventory
- Standardizes the semantics of control implementation information
  - by normalizing the representation of control implementation descriptions
  - regardless of their originating governance frameworks
  - Uses control identifiers down to the sub-statement level, allowing fine-grained implementation descriptions
  - Allows for parameter values to be defined on a per-control, per-component basis
- Defines the connectedness of SSPs, allowing data across multiple SSPs to be aggregated
  - Interconnected systems
  - Common control providers

SSP Model

Authors and Consumers



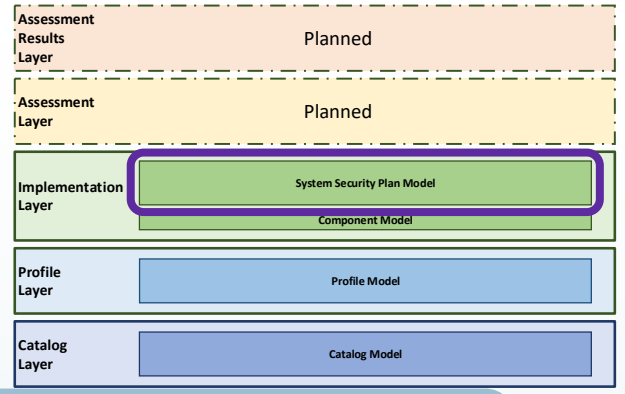
Authors

- Control baseline/overlay authors, such as NIST or FedRAMP
- Organizations wishing to define organization-specific baselines/overlays such as commercial organizations or government agencies

Consumers

- Authors or consumers of any higher layer in the OSCAL stack, such as:
  - assessors
  - authorizing officials
- Auditors who must assess control implementation alignment
- Adjudicators who must render an authorization recommendation or decision for a system
- Anyone who must document controls.
- Anyone who must audit or assess control implementation compliance.

Anatomy of an SSP

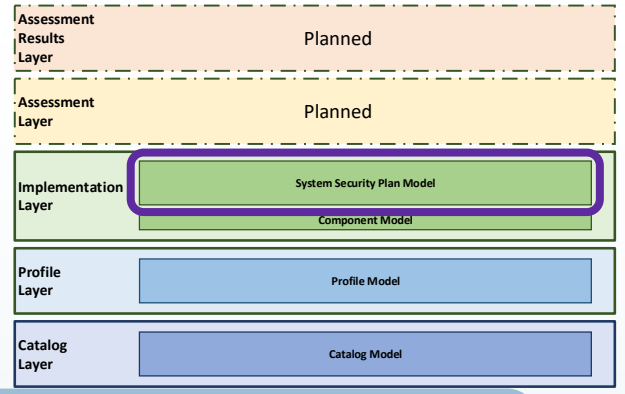


The major sections of an SSP are:

- metadata
- import-profile
- system-characteristics
- system-implementation
- control-implementation
- back-matter (optional)

```yaml
---
system-security-plan:
  id: "uuid-2e825608-980c-4c96-9435-54ce73bb09b6"
  metadata:
    # provides parties and roles used in the SSP
  import-profile:
    # identifies the system baseline, an OSCAL Profile
  system-characteristics:
    # System description, information types, impact levels,
    # system boundary, network architecture
  system-implementation:
    # Users, components, system inventory
  control-implementation:
    # Control implementation details
  back-matter:
    # provides resources that are referenced (e.g., diagrams,
    # policies, procedures, etc.)
```

Anatomy of an SSP
Metadata



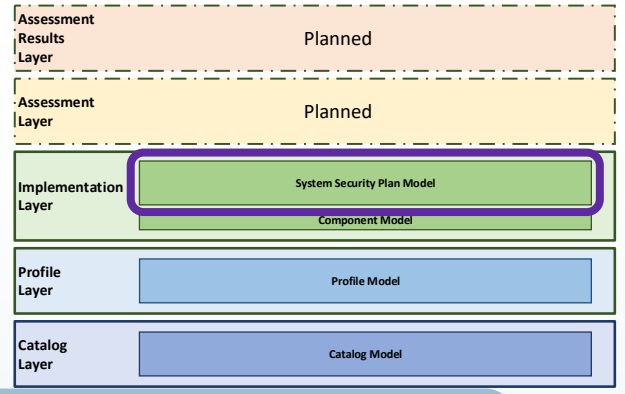
The `metadata` section in an SSP is used to define:

- `role` entries: All specialized roles used in the system
- `party` entries: All organizations and individuals related to the system are defined as parties

```yaml
---
metadata:
  title: "Enterprise Logging and Auditing System Security Plan"
  last-modified: '2019-09-23T18:14:50.591Z'
  version: '1.0'
  oscal-version: '1.0.0-milestone2'
  roles:
    id: 'legal-officer'
    title: "Legal Officer"
  parties:
  - id: 'enterprise-asset-owners'
  - id: 'enterprise-asset-administrators'
  - id: 'legal-department'
  - id: 'it-department'
  - id: 'logging-server-vendor'
    org:
      org-name: "Acme Corp"
```

Anatomy of an SSP

System Control Baseline

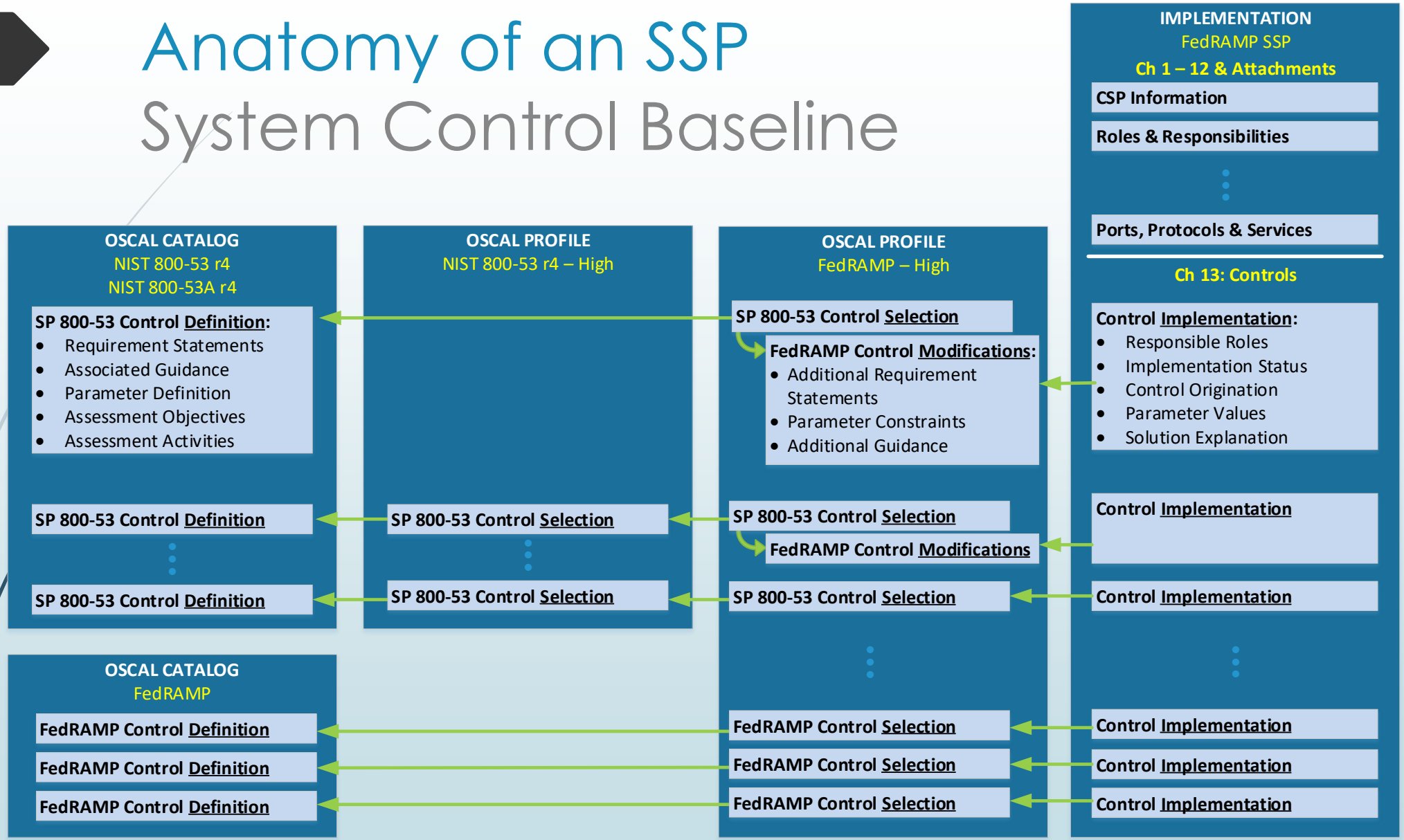


The `import-profile` section defined the system's control baseline

- References an OSCAL profile used as the system baseline

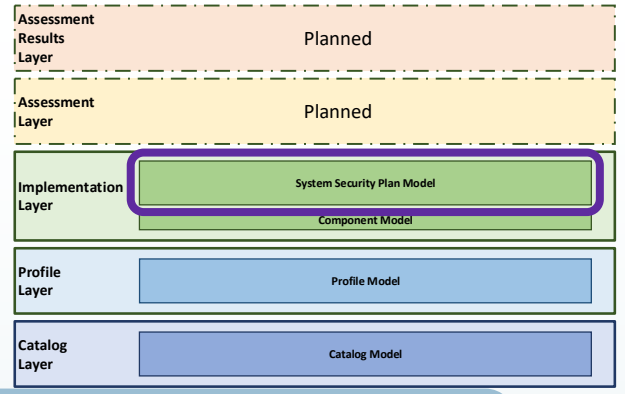
```yaml
---
# ... snip ...
import-profile:
  href: "NIST_SP-800-53_rev4_MODERATE-baseline_profile.json"
# ... snip ...
```

Anatomy of an SSP
System Control Baseline



Anatomy of an SSP

System Characteristics



The `system-characteristics` section in an SSP is used to define:

- Descriptive information: the system's **name**, **description**, and **identifiers**, **status**
- Use of **props**, **annotations**, and **links** provide for extensible metadata
- Overall **system sensitivity level**
- Enumeration of the **types** and **criticality** of **information** handled by the system
- System **security objectives**
- System's **authorization boundary** definition
- Other descriptive information (e.g., data flows, network architecture)

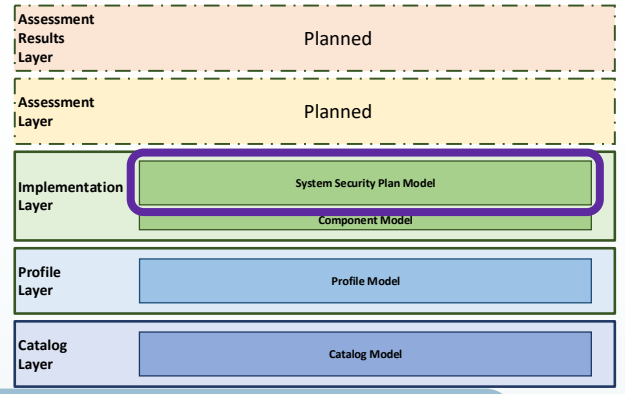
```yaml
---
# ... snip ...
system-characteristics:
  system-name: "Enterprise Logging and Auditing System"
  description: ''
  system-ids:
    id: 'd7456980-9277-4dcb-83cf-f8ff0442623b'
    identifier-type: 'https://ietf.org/rfc/rfc4122'
  status:
    state: 'other'
    remarks: "This is an example, and is not intended to be implemented
      as a system"
  annotations:
  - name: "deployment-model"
    value: 'private'
  - name: "service-models"
    value: 'iaas'
  security-sensitivity-level: "moderate"
  system-information:
    information-types:
      # ... snip ...
  security-impact-level:
    security-objective-confidentiality: 'fips-199-moderate'
    security-objective-integrity: 'fips-199-moderate'
    security-objective-availability: 'fips-199-low'
  authorization-boundary:
    description: "The description of the authorization boundary would go
      here.“
# ... snip ...
```

Anatomy of an SSP

System Characteristics: Information Types

The `information-types` section is used to define:

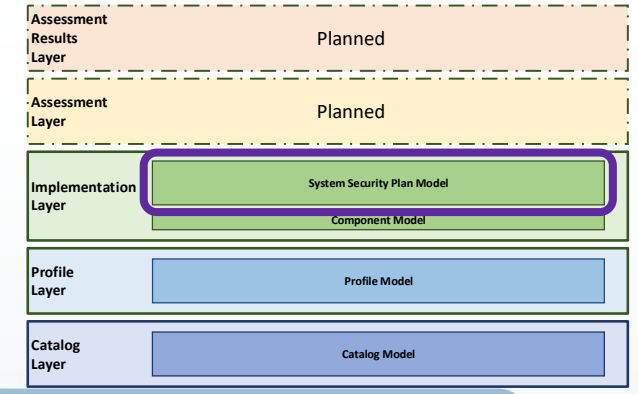
- The different types of information handled by the system
- For each information type:
  - Reference(s) to information type identification system(s)
  - a description of what the information is used for
  - associated impact levels




```yaml
---
# ... snip ...
system-characteristics:
  # ... snip ...
  system-information:
    information-types:
      name: "System and Network Monitoring"
      information-type-ids:
        https://doi.org/10.6028/NIST.SP.800-60v2r1:
          id: 'C.3.5.8'
      description: "This system maintains historical logging and
        auditing information for all client devices connected to
        this system."
      confidentiality-impact:
        base: 'fips-199-moderate'
      integrity-impact:
        base: 'fips-199-moderate'
      availability-impact:
        base: 'fips-199-low'
    # ... snip ...
```

Anatomy of an SSP

System Implementation



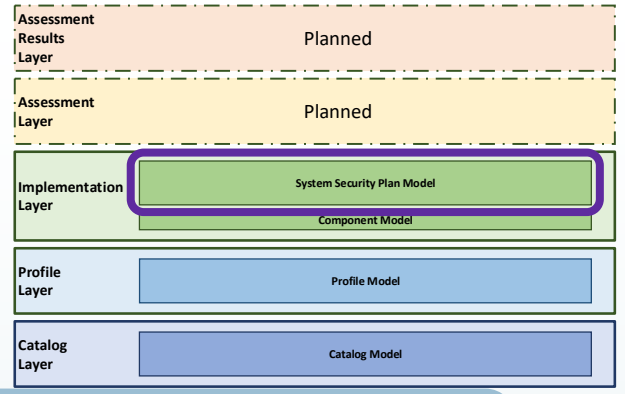
The `system-implementation` section in an SSP is used to define:

- The system's user groups
- The components used in the system
  - Use of components is an optional feature
- A system inventory consisting of each unique inventory item

```
---
# ... snip ...
system-implementation:
    remarks: "This is a partial implementation that addresses the logging server
      portion of the auditing system."
    # ... snip ...
    users:
      # ... snip ...
    components:
      component-logging-server:
        name: "Logging Server"
        description: "Provides a means for hosts to publish logged events to a
          central server."
        status:
          state: 'operational'
        component-type: 'software'
        responsible-roles:
          provider:
            party-ids: 'logging-server-vendor'
          asset-owner:
            party-ids: 'enterprise-asset-owners'
          asset-administrator:
            party-ids: 'enterprise-asset-administrators'
      component-logging-policy:
        name: "Enterprise Logging, Monitoring, and Alerting Policy"
        component-type: 'policy'
        description: |
          - Requires all components to send logs to the enterprise logging
            solution
          - Requires all components synchronize their time with the appropriate
            enterprise time service, and at what frequency.
          - Identifies the events that must be captured
          - Identifies who is responsible/accountable for performing these
            functions
        status:
          state: 'operational'
        properties:
          version: '1.2'
          last-modified-date: '20181015'
        responsible-roles:
          maintainer:
            party-ids: 'legal-department'
      system-integration-process:
        name: "System Integration Process"
        component-type: 'process'
        description: "Ensures proper integration into the enterprise as new
          systems are brought into production."
        status:
          state: 'operational'
        properties:
          last-modified-date: '20181015'
        responsible-roles:
          maintainer:
            party-ids: 'it-department'
        links:
          rel: 'implements-policy'
          href: "#component-logging-policy"
          text: "Ensures logs from components in new system are able to
            published to the logging server. Ensures log monitoring capabilities
            recognize new system as authorized."
      inventory-management-process:
        name: "Inventory Management Process"
        component-type: 'process'
        description: "Describes how new components are introduced into the
          system - ensures monitoring teams know about every asset that should
          be producing logs, thus should be monitored."
        status:
          state: 'operational'
        properties:
          last-modified-date: '20181015'
        responsible-roles:
          maintainer:
            party-ids: 'it-department'
        links:
          rel: 'implements-policy'
          href: "#component-logging-policy"
          text: "Ensures that all host are known and authorized. Ensures that
            these hosts publish log events to the logging server."
      configuration-management-guidance:
        name: "Configuration Management"
        component-type: 'guidance'
        description: "Describes how to configure a component to ensure its logs
          are transmitted to Splunk in the appropriate format. Also describes
          how to configure time synchronization."
        status:
          state: 'operational'
        properties:
          last-modified-date: '20181015'
        responsible-roles:
          maintainer:
            party-ids: 'it-department'
        links:
          rel: 'implements-policy'
          href: "#component-logging-policy"
          text: "Ensures that all host are configured to publish log events to
            the logging server."
    system-inventory:
      inventory-items:
        id: 'inventory-logging-server'
        description: "Logging server"
        asset-id: 'asset-id-logging-server'
        responsible-roles:
          asset-administrator:
            party-ids: 'enterprise-asset-administrators'
          asset-owner:
            party-ids: 'enterprise-asset-owners'
        implemented-components:
          component-identifier:
            use: 'runs-software'
          component-enforces-policy:
            use: 'enforces-policy'
```

Anatomy of an SSP

System Implementation: Users



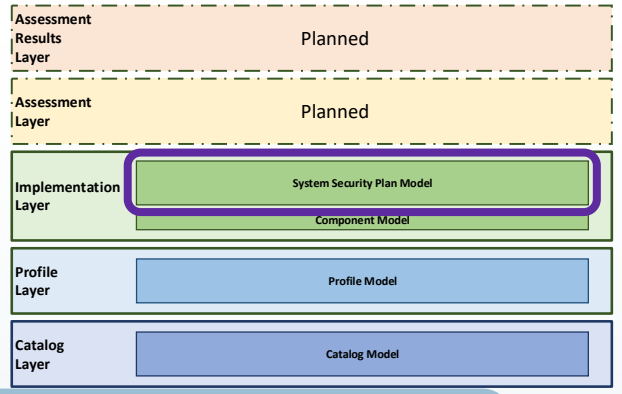
The `users` section is used to define:

- Each user group that interacts with the system
- For each user, you can provide:
  - **title**(required)
  - **short-name**
  - **description** (required)
  - Map to **roles** (defined in the metadata (required)
  - **Privileges used** (optional)

```yaml
---
# ... snip ...
system-implementation:
 users:
  # ... snip ...
  user-asset-administrator:
    title: "System Administrator"
    description: "The systems administrators responsible for the day-to-day
      operation of all assets."
    role-ids: 'asset-administrator'
    annotations:
      name: "type"
      value: 'internal'
  user-asset-owner:
    title: "Asset Owner"
    description: "The owners of specific assets in the system that are
      responsible for ensuring the security of these assets."
    role-ids: 'asset-owner'
    annotations:
      name: "type"
      value: 'internal'
  user-legal:
    title: "Legal Department"
    description: "The legal team is responsible for approving all policies
      and procedures used in the system."
    role-ids: 'legal-officer'
    annotations:
      name: "type"
      value: 'internal'
# ... snip ...
```

Anatomy of an SSP

System Implementation: Components



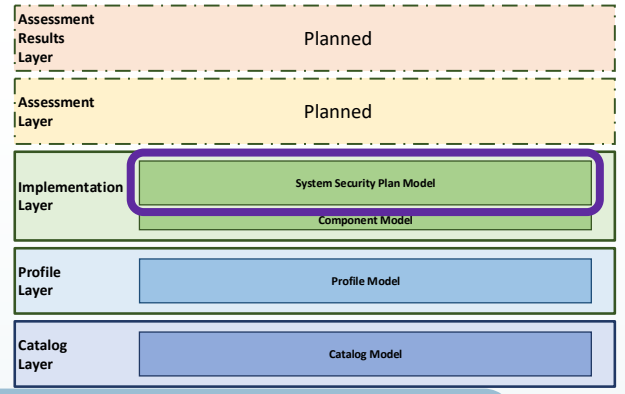
The `components` section is used to define:

- Each component used in the system
- For each component, you can provide:
  - **name**, **description**, **status**
  - Responsible roles
    - Who provides the component?
    - Who owns the implementation?
    - Who is responsible for administration of the asset?

```yaml
---
# ... snip ...
system-implementation:
  # ... snip ...
  components:
    component-logging-server:
      name: "Logging Server"
      description: "Provides a means for hosts to publish logged
        events to a central server."
      status:
        state: 'operational'
      component-type: 'software'
      responsible-roles:
        provider:
          party-ids: 'logging-server-vendor'
        asset-owner:
          party-ids: 'enterprise-asset-owners'
        asset-administrator:
          party-ids: 'enterprise-asset-administrators'
```

Anatomy of an SSP

System Implementation: Components




```yaml
---
# ... snip ...
system-implementation:
 # ... snip ...
  components:
    component-logging-policy:
      name: "Enterprise Logging, Monitoring, and Alerting
        Policy"
      component-type: 'policy'
      description: |
        - Requires all components to send logs to the
          enterprise logging solution
        - Requires all components synchronize their time
          with the appropriate enterprise time service,
          and at what frequency.
        - Identifies the events that must be captured
        - Identifies who is responsible/accountable for
          performing these functions
      status:
        state: 'operational'
      properties:
        version: '2.1'
        last-modified-date: '20181015'
      responsible-roles:
        maintainer:
          party-ids: 'legal-department'
```

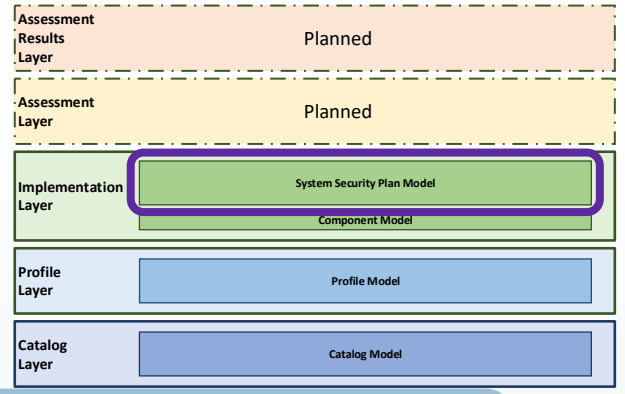
```yaml
---
# ... snip ...
system-implementation:
 # ... snip ...
  components:
    system-integration-process:
      name: "System Integration Process"
      component-type: 'process'
      description: "Ensures proper integration into the
        enterprise as new systems are brought into
        production."
      status:
        state: 'operational'
      properties:
        last-modified-date: '20181015'
      responsible-roles:
        maintainer:
          party-ids: 'it-department'
      links:
        rel: 'implements-policy'
        href: "#component-logging-policy"
        text: "Ensures logs from components in new
          system are able to be published to the logging
          server. Ensures log monitoring capabilities
          recognize new system as authorized."
```

Anatomy of an SSP

System Implementation: System Inventory

The `system-inventory` section is used to define:

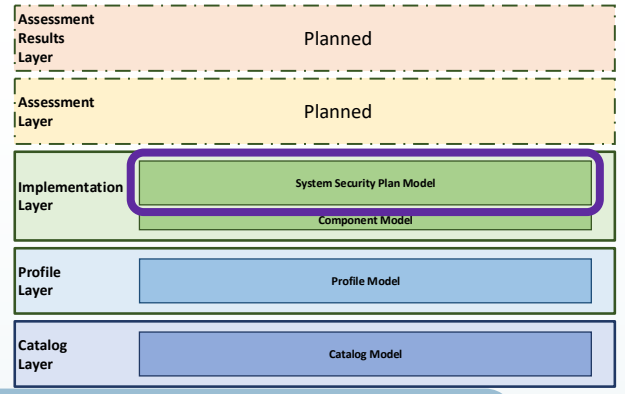
- Each `inventory-item` in the system
- For each inventory item you can provide:
  - **description**, **asset-id**
  - Map roles to parties
  - Define implemented components




```yaml
---
# ... snip ...
system-implementation:
  # ... snip ...
  system-inventory:
    inventory-items:
      id: 'inventory-logging-server'
      description: "The logging server."
      asset-id: 'asset-id-logging-server'
      responsible-parties:
        asset-administrator:
          party-ids: 'enterprise-asset-administrators'
        asset-owner:
          party-ids: 'enterprise-asset-owners'
      implemented-components:
        component-logging-server:
          use: 'runs-software'
        component-logging-policy:
          use: 'enforces-policy'
  # ... snip ...
```

Anatomy of an SSP

Control Implementation

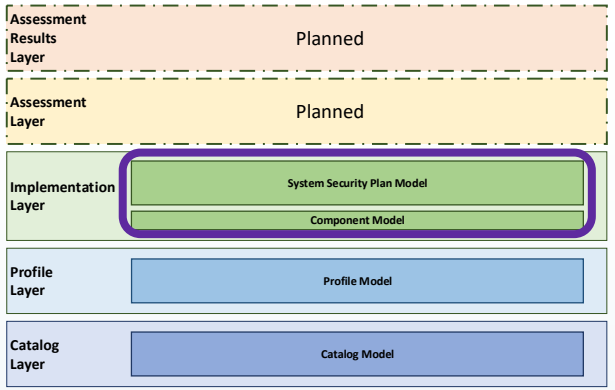


The `control-implementation` section is used to define:

- How a given control is implemented in the system?
- Can be documented at the statement-level
- Can be documented per-component
- Parameter values can be defined at the control-, statement-, and component-levels

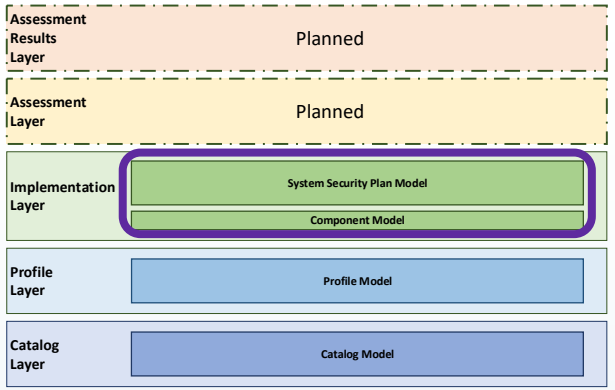
```yaml
---
# ... snip ...
control-implementation:
  description: "Controls are implemented by a number of
    components used in this system."
  implemented-requirements:
    control-id: 'au-1'
    statements:
      # ... snip ...
      au-1_smt.b.1:
        by-components:
          component-logging-policy:
            set-params:
              au-1_prm_2:
                value: "annually, and other times as necessary in response to
                  regulatory or organizational changes"
            description: "The legal department reviews this policy annually,
              and other times as necessary in response to regulatory or
              organizational changes. The legal department updates the policy
              as needed based on these reviews."
      au-1_smt.b.2:
        by-components:
          inventory-management-process:
            set-params:
              au-1_prm_3:
                value: "annually, and other times as necessary in response to
                  regulatory or organizational changes"
            description: "The IT department reviews this process annually, and
              other times as necessary in response to regulatory or
              organizational changes. The IT department updates the policy as
              needed based on these reviews."
```

Working With Components and SSPs



- Use of components in SSPs provide a path for assessing and managing distinct components
  - Implementation responsibilities can be clearly articulated
  - Automated collection can be used to gather configuration information for specific components
- Many SSPs today do not enumerate specific components used in the system
  - Use of components is an optional feature
  - OSCAL-based SSPs without components support current SSP practices
  - Definition of components in OSCAL-based SSPs provide for additional automation based on improved SSP practices, with a migration path
- Providers of assets who also provide an associated component definition help to support this transition!

Working With Components and SSPs



- The "connectedness" of SSPs provides for analysis of the larger connected system.
  - System interconnections provide details of how the remote system is implemented.
  - Leveraged authorizations provide details of locally connected systems on which the security of the current system depends.
  - This information can be used to identify control implementation gaps that pose organizational risk.
- While some SSP information may be sensitive, some portions might be sharable.
  - Some portions of an SSP can be redacted to support more sharing between partners.
  - We want to better understand how information can be partitioned in the OSCAL SSP to support this type of use.

Discussion topic: Any recommendations on how to approach this?

How You Can Help

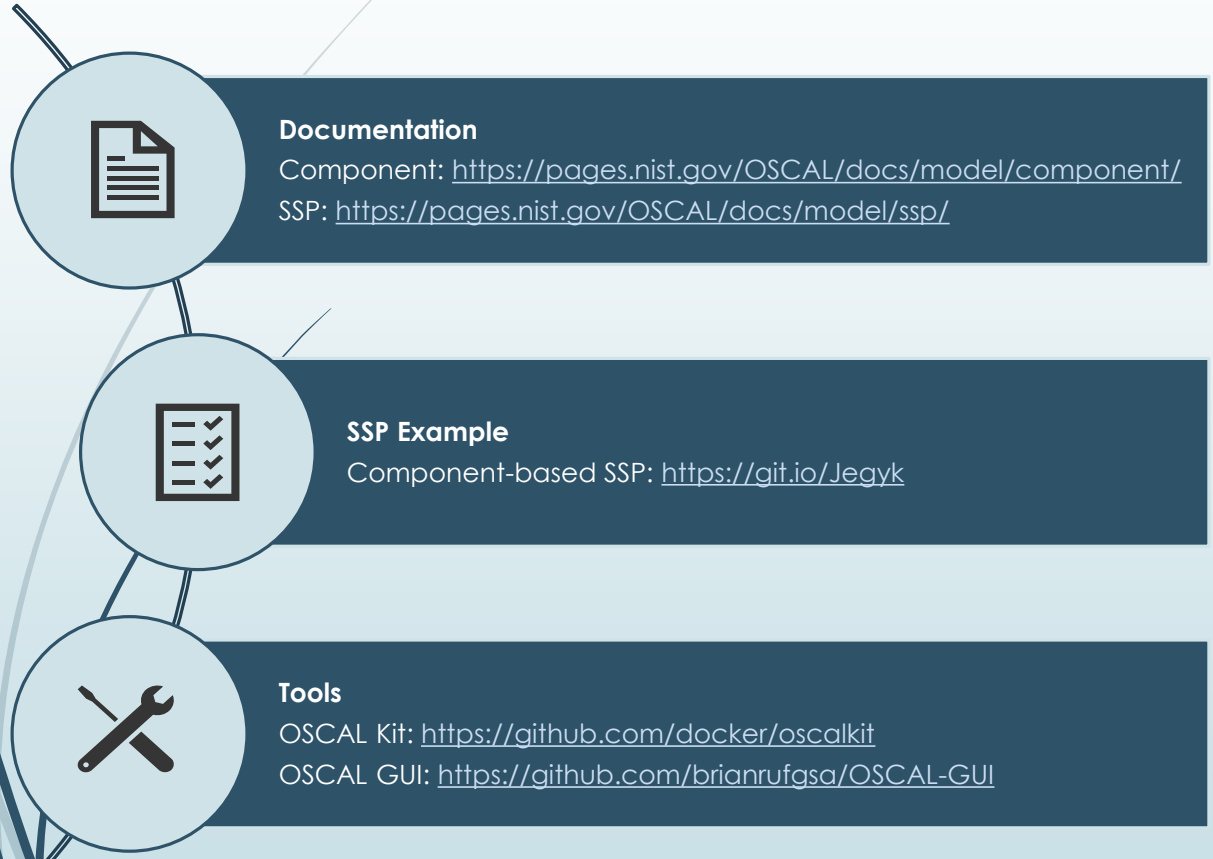
We need your help!

- **Provide Feedback on the Models**
- Produce Component Files:
  - Hardware and Software Producers, and Service Providers
  - Policy/Process/Plan Authors
- Produce System Security Plans
  - System Owners
  - Service Providers
- Produce Tools That Import, Export, and/or Manipulate OSCAL SSP Content

Ways to Submit Feedback

- Add a comment to an appropriate issue: https://github.com/usnistgov/OSCAL/issues
- Create a new issue – if no appropriate issue exists
- Send us email: oscal@nist.gov
- Contribution Guidance: https://pages.nist.gov/OSCAL/contribute/

Resources



Documentation
Component: https://pages.nist.gov/OSCAL/docs/model/component/
SSP: https://pages.nist.gov/OSCAL/docs/model/ssp/

SSP Example
Component-based SSP: https://git.io/Jegyk

Tools
OSCAL Kit: https://github.com/docker/oscalkit
OSCAL GUI: https://github.com/brianrufgsa/OSCAL-GUI

The **OSCAL project** is developed openly on GitHub.com

Repository: https://github.com/usnistgov/OSCAL

Project Website: https://www.nist.gov/oscal

How to Contribute: https://pages.nist.gov/OSCAL/contribute/

We welcome contributions to this project.

Questions?

Discussion: Tomorrow is Today
The Need for Automation

David Waltermire

SCAP Lead and OSCAL Co-Lead

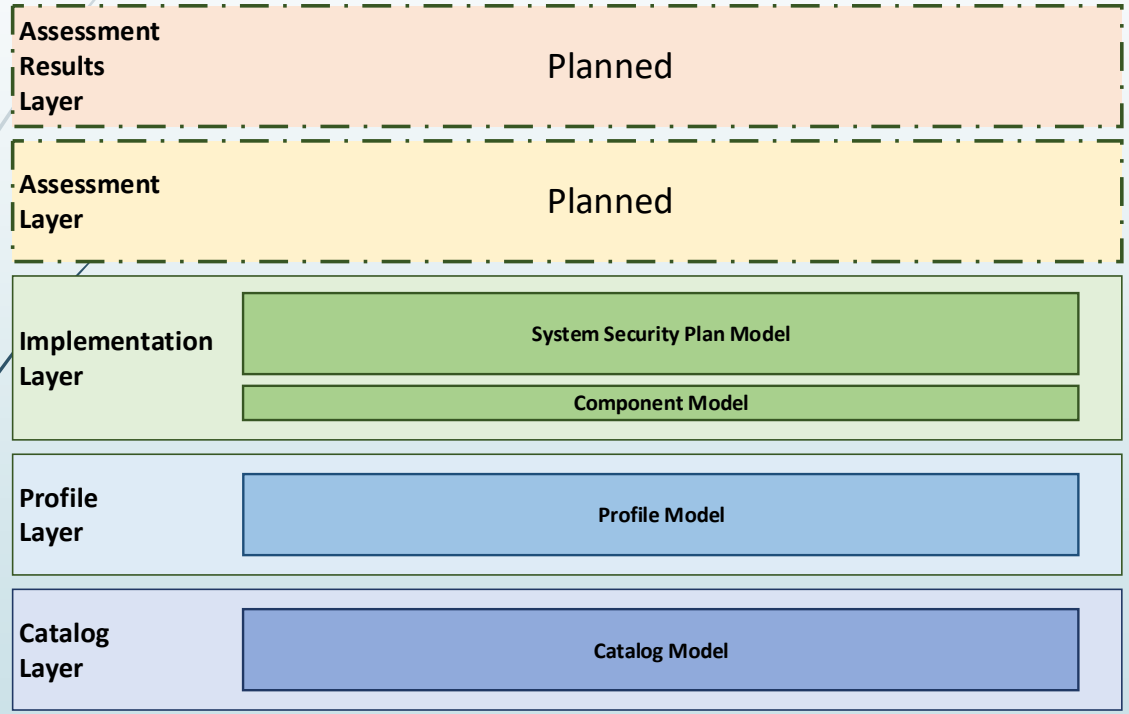
National Institute of Standards and Technology (NIST)

What we have discussed so far…

- Overview of OSCAL
- OSCAL and FedRAMP: A use case for OSCAL
- Issues to consider related to OSCAL tooling
- Deep dive into the Catalog, Profile, Component, and SSP models

Discussion

OSCAL Architecture



The OSCAL architecture segments the information needed to document control-based **system implementation** and to support control-based **assessment**.

- Does this architectural approach align with how you produce and use this information?
- Do you have any ideas on how we can organize the assessment/assessment results layers?

Discussion
OSCAL Adoption

OSCAL can be used to:

- Import and export control, baseline, and control implementation information between tools
- Support advanced analytics
  - find implementation gaps
  - Provide context to other domains (e.g., asset / information criticality used for patch / vulnerability management)
- But, current system implementation information is not in OSCAL format

- Do you find the OSCAL models useful as data exchange formats? Why so or not?
- What use cases beyond control assessment do you see OSCAL data supporting?
- How can we facilitate a transition from Word, PDF, and spreadsheets (current practice) into OSCAL-based formats?

Discussion
Other Topics?

Do you have any other points for discussion?

Any other Questions?

OSCAL Repository:
https://github.com/usnistgov/OSCAL

Project Website:
https://www.nist.gov/oscal

How to Contribute:
https://pages.nist.gov/OSCAL/contribute/

Closing Remarks

Thank you

We would like to host another workshop in early April 2020.

Are there any conflicts we should avoid?

OSCAL Repository:
https://github.com/usnistgov/OSCAL

Project Website:
https://www.nist.gov/oscal

How to Contribute:
https://pages.nist.gov/OSCAL/contribute/