



IEEE Recommended Practice for Verification, Validation, and Accreditation of a Federation—An Overlay to the High Level Architecture Federation Development and Execution Process

IEEE Computer Society

Sponsored by the
Simulation Interoperability Standards Committee

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Abstract: This recommended practice defines the processes and procedures that should be followed to implement Verification, Validation, and Accreditation (VV&A) for federations being developed using the High Level Architecture (HLA) Federation Development and Execution Process (FEDEP). This recommended practice is not intended to replace existing VV&A policies, procedures and guidance, but rather is intended to focus on the unique aspects of VV&A of federations. It is a higher-level framework into which such practices can be integrated and tailored for specific uses. The VV&A Overlay provides implementation-level guidance to VV&A practitioners.

Keywords: federate, federation, Federation Development and Execution Process, FEDEP, High Level Architecture, HLA, Verification, Validation, and Accreditation, VV&A

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Introduction

This introduction is not part of IEEE Std 1516.4-2007, IEEE Recommended Practice for Verification, Validation, and Accreditation of a Federation—An Overlay to the High Level Architecture Federation Development and Execution Process.

The High Level Architecture (HLA) facilitates interoperability among simulations and promotes reuse of simulations and their components. The HLA is composed of three major components and has an accompanying Federation Development and Execution Process (FEDEP) model:

- *HLA Framework and Rules*: A set of rules that describe the general principles defining the HLA. (IEEE Std 1516TM-2000)
- *HLA Federate Interface Specification*: A description of the interface between simulations (federates) and the HLA runtime infrastructure. (IEEE Std 1516.1TM-2000)
- *HLA Object Model Template Specification*: A specification for documenting HLA object models. (IEEE Std 1516.2TM-2000)
- *HLA Federation Development and Execution Process*: A description of the process for constructing and executing HLA federations. (IEEE Std 1516.3TM-2003)

The HLA FEDEP (IEEE Std 1516.3-2003) is a recommended practice that describes a generalized process for building and executing HLA federations. It does not replace the existing management and development methodologies of HLA user organizations, but rather provides a high-level framework into which other systems engineering practices can be easily integrated. The FEDEP defines a methodology that can and should be tailored to meet the needs of user applications.

This recommended practice provides guidelines for verifying, validating, and accrediting a federation. Its purpose is to provide a more detailed view of the VV&A processes implied by the FEDEP.

This recommended practice defines the processes and procedures that should be followed to implement VV&A for federations being developed using the FEDEP. It is not intended to replace existing VV&A policies, procedures, and guidance, but rather is intended to focus on the unique aspects of VV&A of federations.

This recommended practice provides implementation-level guidance to VV&A practitioners by interpreting and customizing the more generalized FEDEP activity descriptions. It focuses upon the VV&A processes that apply to federations and not the VV&A processes associated with individual federates, but does incorporate the use of the information produced by those processes. Furthermore, the recommended practice does not describe the individual verification or validation techniques that could be employed to execute the VV&A processes for federations.

This recommended practice has been designed to apply across a wide range of functional applications. Currently, these processes represent the best practices available to the VV&A community. Just like the FEDEP, this recommended practice is not intended to be prescriptive for all FEDEP users. Rather, it is a tailorable process and is offered as guidance to all participants in FEDEP activities. Users and developers of other synthetic simulation environments that are not based on HLA can also benefit from the guidance provided in this recommended practice, as the VV&A activities can be tailored as necessary to support nearly any type of distributed simulation application.

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IEEE Recommended Practice for Verification, Validation, and Accreditation of a Federation—An Overlay to the High Level Architecture Federation Development and Execution Process

1. Overview

1.1 Scope

This recommended practice defines the processes and procedures that should be followed to implement Verification, Validation, and Accreditation¹ (VV&A) for federations being developed using the High Level Architecture (HLA) Federation Development and Execution Process (FEDEP). This recommended practice is not intended to replace existing VV&A policies, procedures, and guidance, but rather is intended to focus on the unique aspects of the VV&A of federations. It provides a higher-level framework into which such practices can be integrated and tailored for specific uses. The VV&A Overlay provides implementation-level guidance to VV&A practitioners; however, it does not describe the individual techniques that might be employed to execute the VV&A processes for federations.

This VV&A Overlay focuses upon the VV&A processes that apply to federations and not the VV&A processes associated with individual simulations (federates), but does consider using the information produced by those processes.

Users, developers, and VV&A personnel working with simulations and simulation compositions not based upon the HLA and the FEDEP can also benefit from the guidance in this document since the activities that this overlay describes can be tailored to support any type of distributed simulation application.

1.2 Purpose

The VV&A Overlay has been designed to apply across a wide range of functional applications. The purpose of this overlay is to provide a more detailed view of the VV&A processes implied by the FEDEP. Currently, these processes represent the best practices available to the VV&A community. The VV&A Overlay is a tailorable process and is offered as guidance to all participants in FEDEP activities.

¹ Note that outside of the United States there may not be a formal accreditation process and the terms “acceptance” or “accepted for use” may be used; in this document the term acceptance is the decision to use a model, simulation, or federation of models and simulations for a specific purpose and the term accreditation is the official certification that a model, simulation, or federation of models and simulations is acceptable for use for a specific purpose. For the purposes of this document the terms are equivalent.

This overlay identifies and describes the recommended VV&A processes that should be followed to assure the acceptability and utility of federations for particular intended uses. The overlay also identifies and describes the information feeding and resulting from those processes as well as the relationships between the FEDEP and the VV&A processes and their respective information products. In addition, this overlay defines those terms uniquely needed to characterize the FEDEP VV&A Overlay. This overlay takes special care to use and build upon existing standards, standard terms and their definitions whenever possible.

1.3 Conventions

This subclause describes the conventions adopted for presenting the overlay material. The overlay employs three types of conventions: capitalization, special words, and graphic symbols. These conventions are used throughout the overlay as much as possible.

The overlay uses capitalization to identify the key participants in the VV&A processes. The overlay distinguishes between the Federation Development Team and the VV&A Team, and capitalizes the references to these teams. The VV&A Team may participate as part of the Federation Development Team; however, the VV&A Team may or may not be organizationally independent of it.

The titles of the primary information produced or needed by these teams are also capitalized (e.g., Federation Objectives, Federation Acceptability Criteria, and Federation Referent). This information includes that produced by both the Federation Development Team (e.g., Federation Objectives and Federation Conceptual Model) and the VV&A Team (e.g., Federation Acceptability Criteria and Federation Referent). Any modifiers describing those information items are not capitalized (e.g., initial Federation V&V Plan, revised Federation V&V Plan, and validated Federation Conceptual Model) as part of the title. These capitalization conventions emphasize the content of the information produced.

The overlay uses a few words in very specific ways. It divides the VV&A processes applied to federations into phases, activities, and tasks. Phases correspond to the seven top-level FEDEP steps. Each phase contains several activities and each activity includes a set of tasks that the VV&A Team executes to accomplish the activity.

The overlay also distinguishes between the following three types of VV&A Team participation in the FEDEP:

- Supporting
- Contributing to
- Responsible for performing

The overlay consistently begins both activity titles and task descriptions with the verbs corresponding to these types and uses this convention throughout the document. This distinction occurs because of the many different players in the FEDEP and the variety of ways in which various responsibilities may be assigned to these players.

All activity titles and task descriptions that begin with the verb “support” represent those activities or tasks that the FEDEP explicitly identifies and that the VV&A Team can support in some way. Activities with “support” titles are generally led or performed by a member of the Federation Development Team but involve the VV&A Team. A “support” activity may contain tasks that the FEDEP does not explicitly identify. The VV&A Team performs these tasks and assumes the responsibility for satisfactorily completing them.

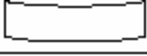
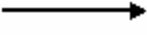
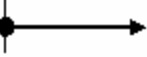
The activity titles and task descriptions that begin “contribute to” represent verification activities and tasks and need to be accomplished to ensure the success of the VV&A effort. As a result, the VV&A Team may need to be involved in performing these activities and tasks but will generally not take primary

responsibility for their completion. However, this does not imply that the VV&A Team does not perform verification activities. On the contrary, the VV&A Team may need to perform verification where they need the information to supplement that received from the verification that other members of the Federation Development Team have performed. In some cases, the VV&A Team may need to assume responsibility for performing the “contribute to” activities and tasks when that responsibility has been assigned to no other member of the Federation Development Team. This may be needed so that the VV&A Team can perform the duties for which they have explicit responsibility.

Those activity titles and task descriptions that begin with some other verb (e.g., plan, validate, perform, and prepare) represent the activities and tasks for which the VV&A Team has primary responsibility and will perform. These activities and tasks are essential to creating a valid federation. Consistent with these conventions, these VV&A-specific tasks do not begin with either the “support” or “contribute to” verbs.

Each phase described in this overlay has an activity diagram associated with it that shows the primary relationships between the VV&A activities in the phase and the activities in the corresponding FEDEP step. These diagrams use particular symbols to identify the types of VV&A activities and their interactions. Table 1 describes the meanings of these symbols.

Table 1—Symbol conventions used in the activity diagrams

Symbol	Meaning
	A FEDEP activity
	An activity that directly supports a corresponding FEDEP activity
	An activity to which the VV&A Team contributes and may perform if needed
	An activity that the VV&A Team uniquely performs, leads, and takes responsibility for its satisfactory completion
	Data sets needed to support a FEDEP execution
	A primary information flow from one activity to another or from one VV&A phase to another
	A connection between two information flows

These activity diagrams label each VV&A activity with a number designation (X.Y) to show the traceability between the phase (X) with which the activity is associated and the activity (Y). The activity numbers in these diagrams are only identifiers and do not imply any ordering of activity execution.

These activity diagrams present only abstractions of the details provided in the activity discussions. These diagrams are intended only as illustrations to clarify the key elements of the phases they describe. The activity diagrams show only the primary information exchanged and do not include all of the information involved in the activity interactions. The information illustrated in these diagrams either identifies what is important to the VV&A effort or emphasizes the value added by the VV&A activities. The activity discussions provide more extensive lists of the information inputs and outputs. The abstraction inherent to these diagrams is not intended to imply that these activities do not draw upon information prepared in the preceding phases. The conventions for these diagrams are informal, do not adhere to the specifications of formal diagramming conventions, and are provided only for illustrative purposes.

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

The three standards that compose the HLA, together with the FEDEP, provide the technical foundation for designing and developing all HLA federations. These standards are described in the following documents:

IEEE Std 1516TM-2000, IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Framework and Rules.^{2, 3}

IEEE Std 1516.1TM-2000, IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Federate Interface Specification.

IEEE Std 1516.2TM-2000, IEEE Standard for Modeling and Simulation (M&S) High Level Architecture (HLA)—Object Model Template (OMT) Specification.

IEEE Std 1516.3TM-2003 IEEE Recommended Practice For High Level Architecture (HLA) Federation Development and Execution Process (FEDEP).

3. Definitions, acronyms, and abbreviations

For the purposes of this recommended practice, the following terms and definitions apply. *The Authoritative Dictionary of IEEE Standards* [B4]⁴ should be referenced for terms not defined in this clause.

3.1 Definitions

3.1.1 acceptance: The decision to use the results produced by a model, simulation, or federation of models and simulations for an intended use.

3.1.2 credibility: The belief that a model, simulation, or federation of models and simulations can serve an intended use.

3.1.3 error characteristics: Those characteristics that describe the nature of the errors in the output from a model, simulation, or a federation of models and simulations. For each output variable that can assume metric values, the minimum and maximum error bounds are measured from the values established by the referent under the same conditions together with the probability that all errors of the output values for that variable will fall within those error bounds.

3.1.4 federate: An application that may be or is currently coupled with other software applications under a Federation Object Model Document Data/Federation Execution Data (FDD/FED) and a runtime infrastructure (RTI). This may include federation managers, data collectors, real world (“live”) systems (e.g., C4I systems, instrumented ranges, sensors), simulations, passive viewers, and other utilities. (See IEEE Std 1516.3-2003.)

3.1.5 federation: A named set of federate applications and a common Federation Object Model (FOM) that are used as a whole to achieve some specific objective. (See IEEE Std 1516.3-2003.)

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⁴ The numbers in brackets correspond to those of the bibliography in Annex A.

3.1.6 federation conceptual model: An abstraction of the real world that serves as a frame of reference for federation development by documenting simulation-neutral views of important entities and their key actions and interactions. (See IEEE Std 1516.3-2003.)

3.1.7 federation object model (FOM): A specification defining the information exchanged at runtime to achieve a given set of federation objectives. (See IEEE Std 1516.3-2003.)

3.1.8 federation objectives: The statement of the problem that is to be addressed by the establishment and execution of a federation. (See DoD 5000.59-M [B3].)

3.1.9 federation requirements: A statement that identifies a federation characteristic, constraint, process, or product that is unambiguous and testable and that is necessary for a federation to be acceptable for its intended use.

3.1.10 federation scenario: A set of initial conditions and time line of significant events used within a federation execution to achieve federation objectives.

3.1.11 referent: A codified body of knowledge about a thing being simulated. (See Verification, Validation, and Accreditation (VV&A) Recommended Practices Guide, Build 2.5 [B2].)

3.1.12 representational requirements: That subset of the modeling and simulation requirements that specifically describes the required states or behavior of the things that the simulation represents, including the modeled entities, their properties, and their dependencies. (See Verification, Validation, and Accreditation (VV&A) Recommended Practices Guide, Build 2.5 [B2].)

3.1.13 results sampling strategy: The approach for collecting the output from a model, simulation, or federation of models and simulations.

3.1.14 validity: The property of a model, simulation, or federation of models and simulations representations being complete and correct enough for the intended use.

3.2 Special terms

These terms are already defined in *The Authoritative Dictionary of IEEE Standards Terms* [B4], but have been defined differently or the definitions have been slightly modified to promote better understanding for the purposes of this recommended practice.

3.2.1 acceptability criteria: The criteria that the model, simulation, or federation of models and simulations needs to meet to be acceptable for its intended use.

3.2.2 accreditation: The official certification that a model, simulation, or federation of models and simulations is acceptable for use for a specific purpose. (See DoDI 5000.61 [B1].)

3.2.3 activity: A set of tasks that consumes time and resources and whose performance is necessary for the execution of the federation development and execution process.

3.2.4 fidelity: The description of a model, simulation, or federation of models and simulations and its associated data representational capabilities (e.g., resolution, error, precision, and sensitivity).

3.2.5 interoperability: The ability of a federate to provide services to and/or accept services from other federates and to use the services so exchanged to enable the federates to operate effectively together.

3.2.6 risk: A measure of the probability and severity of undesired effects often taken as the simple product of probability and consequence.

3.2.7 uncertainty: A quantity or quantities that indicate the degree of doubt associated with the value of a simulated or referent property; for enumerated values, the probability that the actual enumerated value corresponds with the simulated or referent value under the same conditions; for metric values, the error characteristics associated with the simulated or referent value.

3.2.8 validation: The process of evaluating a model, simulation, or federation of models and simulations throughout the development and execution process to determine how well it satisfies the acceptability criteria within the context of the referent.

3.2.9 verification: The process of evaluating a model, simulation, or federation of models and simulations and its intermediate products to determine whether the products from a given development phase satisfy the conditions imposed at the start of that phase and, ultimately, determining that an implementation of a model, simulation, or federation of models and simulations correctly and completely represents the developer's conceptual description and specifications.

3.3 Acronyms and abbreviations

FEDEP	Federation Development and Execution Process
FOM	Federation Object Model
HLA	High Level Architecture
IEEE	Institute of Electrical and Electronics Engineers
M&S	modeling and simulation
SOM	Simulation Object Model (of a federate)
V&V	verification and validation; verify and validate
VV&A	verification, validation, and accreditation

4. Federation VV&A roles and responsibilities

This clause introduces the various roles and responsibilities that are required to perform each activity identified in the VV&A Overlay. The person or persons who perform in the roles needed to accomplish the activities in this overlay comprise the VV&A Team. The clause also describes the rationale used to identify and classify these roles and responsibilities.

The roles and responsibilities defined are not intended to map directly to specific people or organizations. There are cases where one individual or organization may have several of the roles. The delegation of these responsibilities depends upon the available resources. The resources required to support each of these roles depends on the User/Sponsor requirements and the complexity of the federates and federations. If these resources are not available, then some prioritization and tailoring of the tasks and their assignment to the roles will be necessary.

Table 2 identifies the roles and responsibilities relevant to VV&A for each activity in this overlay. They are intended only as general guidelines. Interpreting Table 2 requires understanding the actions attributed to the roles and the heuristics used to assign the actions to the roles.

The following actions are used in Table 2 and in the heuristics used to construct the table. They can apply to either an organization or an individual.

- **Lead (L)** Responsible for the activity including assignment of actions to others and scheduling.
- **Perform (P)** Responsible for performing an activity or task under the direction of the leader of the activity.
- **Assist (AST)** Help a performer or a leader complete an activity or task.

- **Review (R)** Called upon to review the work of others and to make suggestions for improvement where appropriate.
- **Monitor (M)** Will watch the activities being performed or receive the products so that they can be aware of the VV&A status.
- **Approve (AP)** Responsible for approving the products from the VV&A activities.

The following heuristics were used to develop Table 2:

- Federation-related (non VV&A) activities are led or performed by the Federation Manager or Federation Developer.
- Verification activities may be led or performed by the Federation Developer and assisted by the V&V Agent; or led and performed by the V&V Agent, if needed.
- Validation activities are led or performed by the V&V Agent.
- Accreditation activities are led or performed by the Accreditation Agent.
- For “support” activities, the V&V Agent or the Accreditation Agent generally monitor or assist.
- For “contribute to” activities, the V&V Agent or the Accreditation Agent may either assist or perform.

Table 2— Roles and responsibilities

VV&A Overlay Phases and Activities L = Lead, P = Perform, AST = Assist, R = Review, M = Monitor, AP = Approve		User/ Sponsor	Federation Manager	Federation Developer	V&V Agent	Accreditation Agent	Subject Matter Expert
Phase 1—Verify federation objectives							
Activity 1.1	Support identifying User/Sponsor Needs	AST, AP	L, P	AST	M	AST	AST
Activity 1.2	Plan accreditation activities	R, AP	AST		AST	L, P	AST
Activity 1.3	Support developing federation objectives	AST, AP	L, P	AST	M	AST	AST
Activity 1.4	Contribute to verifying federation objectives	AP	L	P	AST	AST	AST
Activity 1.5	Assemble federation referent	AST, AP	M	AST, P	AST	L, P	AST
Activity 1.6	Define federation acceptability criteria	AST, AP	M	AST	AST	L, P	AST
Activity 1.7	Plan V&V activities	R	AST, AP	R	L, P	AST	AST
Phase 2—V&V federation conceptual model							
Activity 2.1	Support developing federation scenarios	AP	L	P	AST	M	P, AST
Activity 2.2	Contribute to verifying federation scenarios		M	L, P	AST	M	P, AST
Activity 2.3	Support developing federation conceptual model	AP	L	P	AST	M	P, AST
Activity 2.4	Contribute to verifying federation conceptual model		M	L, P	AST	M	P, AST
Activity 2.5	Validate federation conceptual model	AP	M	AST	L, P	M	P, AST
Activity 2.6	Support developing federation requirements	AST, AP	L, P	AST	AST	M	AST
Activity 2.7	Contribute to verifying federation requirements	AP	L	P	AST	M	AST
Phase 3—Verify federation design							
Activity 3.1	Support selecting federates	AP	L	P	AST	M	AST
Activity 3.2	Support preparing federation design	AP	L	P	AST	M	AST
Activity 3.3	Contribute to verifying federation design		M	L, P	AST	M	AST
Activity 3.4	Support preparing federation development and execution plan	AP	L	P	AST	AST	AST

Table 2—Roles and responsibilities (*continued*)

VV&A Overlay Phases and Activities L = Lead, P = Perform, AST = Assist, R = Review, M = Monitor, AP = Approve		User/ Sponsor	Federation Manager	Federation Developer	V&V Agent	Accreditation Agent	Subject Matter Expert
Phase 4—Verify federation development products							
Activity 4.1	Support developing FOM		L, AP	P	AST	M	AST
Activity 4.2	Contribute to verifying FOM		AST	L, P	AST	M	AST
Activity 4.3	Support establishing federation agreements	AP	L, P	AST	AST	M	AST
Activity 4.4	Contribute to verifying federation agreements		L	P	AST	M	AST
Activity 4.5	Support implementing federate designs		L	P	AST	M	AST
Activity 4.6	Support implementing federation infrastructure	AST	L	P	AST	M	
Activity 4.7	Contribute to verifying federation infrastructure		M	L, P	AST	M	
Activity 4.8	Verify and validate federation data sets	AP	M	P	L, P	M	P, AST
Phase 5—Validate and accept federation							
Activity 5.1	Support planning federation execution	AST	L, P	AST	AST	M	AST
Activity 5.2	Support integrating federation		L	P	AST	M	AST
Activity 5.3	Contribute to verifying integrated federation		M	L, P	AST	M	AST
Activity 5.4	Support testing federation	M	L	P	AST	M	AST
Activity 5.5	Validate integrated federation results		M	AST	L, P	M	P, AST
Activity 5.6	Perform acceptance assessment	AP	M	AST	AST	L, P	P, AST
Phase 6—Verify and validate federation output							
Activity 6.1	Support executing federation	P, M	L	P, AST	AST	M	P, AST
Activity 6.2	Contribute to verifying raw execution and derived output	P, M	L	P, AST	AST	M	P, AST
Activity 6.3	Validate federation output	AP	AST	AST	L, P	AST	P, AST
Phase 7—Consolidate federation VV&A products							
Activity 7.1	Support analyzing data	L, P	AST	AST	AST	M	P, AST
Activity 7.2	Prepare federation VV&A products for reuse	AP	M	AST	P	L, P	

5. Overlay assumptions and tailoring

5.1 Assumptions

The following assumptions were made during development of the VV&A Overlay to scope the responsibilities of the VV&A Team. They have been arranged loosely in logical, not priority, order.

- The Federation Development Team will follow the FEDEP in their development and execution of their federation.
- Coordination and cooperation occurs between the VV&A Team and the Federation Development Team as an essential part of VV&A implementation.
- The Federation Development Team leads and performs federation verification activities.
- The VV&A Team leads and performs federation validation activities.
- The VV&A Team will consider federate V&V information and use histories in the federation VV&A processes.
- The VV&A Team is not responsible for validating or verifying the individual federates, although they do rely upon the products of these activities and may request or perform verification and validation to gain the information they need for federation VV&A.
- The VV&A Team will have timely access to the information they require.
- The User/Sponsor will agree that a finite set of observable or measurable acceptability criteria will be used to judge federation acceptability for an intended use.
- The VV&A processes may be executed iteratively throughout the federation development and execution process.
- All federations will be subject to an acceptance process that may or may not include accreditation.
- If needed, accreditation of the federation can occur anywhere from Activity 5.5 through Activity 7.1.
- The federation VV&A processes described in this overlay will be tailored to meet the needs of the individual applications.

5.2 Tailoring

The VV&A activities described in this document, while being generally applicable to most HLA federations, are intended to be tailored to meet the needs of each individual application. Every federation application is unique. The extent to which these VV&A processes can be performed for a given federation application will depend on a number of factors, including the quality of the requirements information and the resources allocated to the VV&A Team. The recommended practices provided in this document should be used as a starting point for developing the specific approach to federation VV&A needed to support the intended use.

The following are some perspectives on tailoring the VV&A processes to best fit the circumstances of each individual application:

- Tailoring is driven by risk and resource constraints (e.g., available information, budget, skills, and time).

- Quantifying risk and the tolerance for those risks are factors that drive tailoring decisions.
- The correctness and completeness of the federation VV&A products can reduce the risk incurred by using the federation results (i.e., use risk).
- The absence of certain information input to the VV&A processes will limit the quality of the content of the VV&A products.
- Tailoring decisions have an impact upon use risk and the resources required, and this impact should be understood and documented.
- The VV&A processes should influence test plans and leverage testing and data collection tasks and describe this in the Federation Accreditation Plan and V&V Plan.
- Tailoring should adhere to policies, standards, or guidelines that may be relevant to the intended use.
- Tailoring may be done at any time in the federation VV&A processes.

6. VV&A Overlay model: top-level view

As in the FEDEP, one of the design goals identified during the development of this VV&A Overlay was to define a highly flexible process. This facilitates tailoring the VV&A activities defined in this overlay as the user needs and resource constraints demand. The actual application of VV&A techniques to support the development of a federation could vary significantly within or across different intended uses. However, the VV&A phases that correspond to the FEDEP steps establish a foundation for applying VV&A within the FEDEP. Figure 1 illustrates each of the FEDEP steps together with the corresponding VV&A Overlay phases.

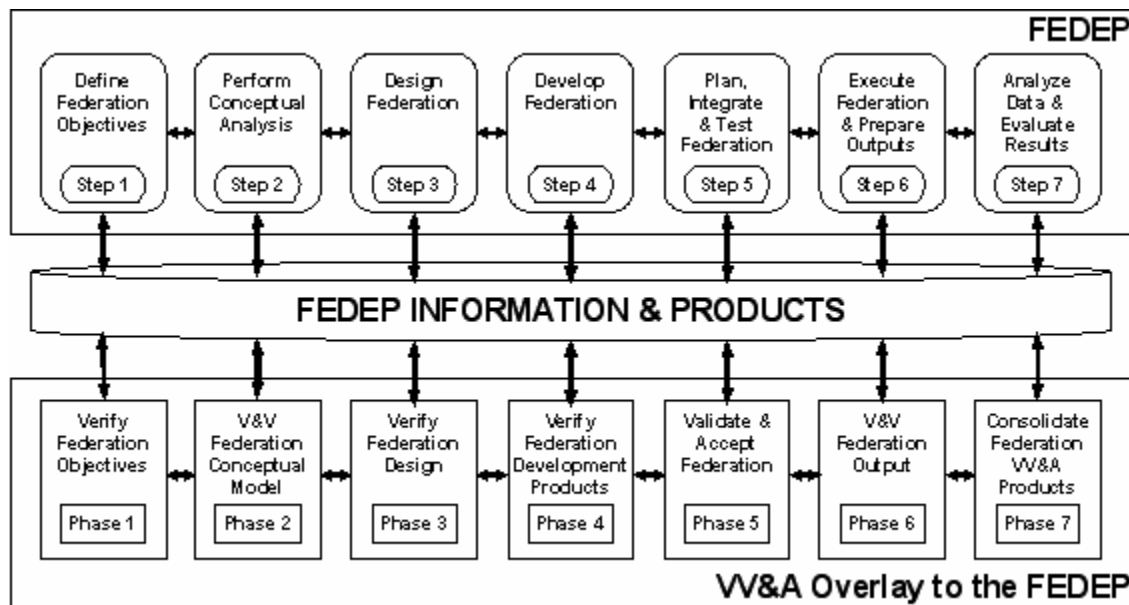


Figure 1—Top-level view of the VV&A Overlay to the FEDEP

The purpose for each of the overlay phases is summarized as follows:

- *Phase 1: Verify Federation Objectives*—The VV&A Team works as part of the Federation Development Team to define a set of Federation Objectives and verify the completeness, consistency, and correctness of those objectives with the User/Sponsor. The VV&A Team also

assembles the Federation Referent, defines the Federation Acceptability Criteria, and formulates the initial Federation Accreditation Plan and V&V Plan at this time.

- *Phase 2: V&V Federation Conceptual Model*—The VV&A Team supports the Federation Development Team in developing the Federation Scenarios, Federation Conceptual Model, and Federation Requirements. They also contribute to verifying these products and are responsible for validating the Federation Conceptual Model.
- *Phase 3: Verify Federation Design*—The VV&A Team supports selecting the federates and preparing the Federation Design. They also contribute to verifying the Federation Design and provide an updated Federation Accreditation Plan and V&V Plan for inclusion into the Federation Development and Execution Plan.
- *Phase 4: Verify Federation Development Products*—The VV&A Team supports developing the FOM, establishing the Federation Agreements, and implementing the Federation Infrastructure. They also contribute to verifying the FOM, Federation Agreements, and Federation Infrastructure. They provide any support needed to verify and validate the federate implementations and collect the information from these V&V processes. Finally, they verify and validate the data sets needed for federation execution.
- *Phase 5: Validate and Accept Federation*—The VV&A Team supports the Federation Development Team in planning the federation execution, integrating the federation, and testing the federation. They also contribute to verifying the integrated federation. They have primary responsibility for validating the results produced by the integrated federation and developing the federation acceptance/accreditation recommendations from the collected V&V evidence.
- *Phase 6: V&V Federation Output*—The VV&A Team supports executing the federation when needed and contributes to verifying the raw execution and derived output produced from these executions. They then validate the federation output when needed.
- *Phase 7: Consolidate Federation VV&A Products*—The VV&A Team supports analyzing the federation output when needed and collects and assembles the products from the preceding VV&A activities into a consolidated package to support future reuse.

The seven phases in this overlay parallel the seven steps in the FEDEP. As in the FEDEP, this overlay decomposes each of the VV&A phases into a set of interrelated lower-level activities and supporting information resources.

7. VV&A Overlay model: detailed view

The VV&A Overlay describes a high-level framework for the verifying, validating, and accepting HLA federations. The intent of the VV&A Overlay is to specify a recommended practice that details the VV&A phases that correspond to, support, and augment the FEDEP steps. Federation stakeholders can leverage this overlay to achieve the specific needs associated with their intended use.

Figure 2 provides a detailed view of the VV&A Overlay and its interactions with the FEDEP at equivalent levels of abstraction. This view illustrates the flow of VV&A activities, information, and products across the seven process phases identified in Figure 1. Figure 2 depicts the FEDEP steps, the VV&A phases, and the VV&A information shared between these steps and phases.

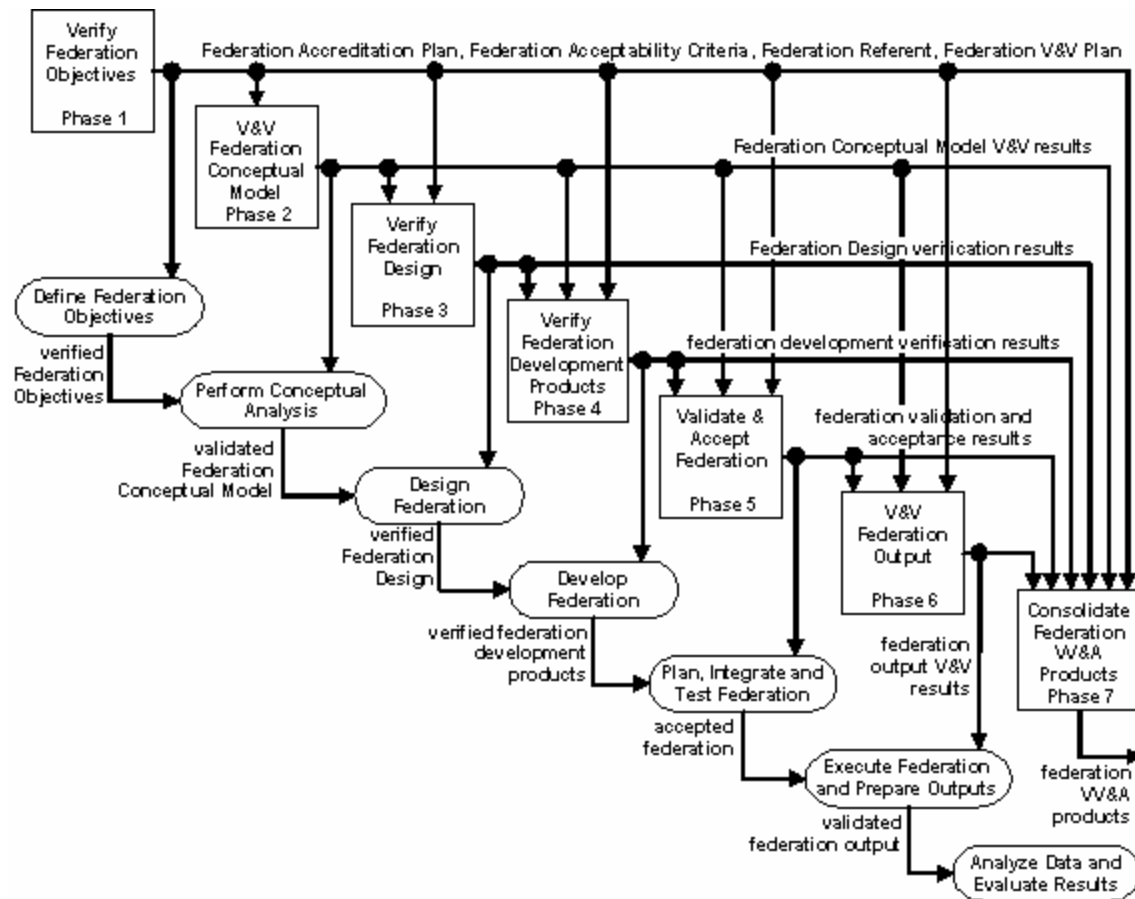


Figure 2—Detailed view of the VV&A Overlay to the FEDEP

Subclauses 7.1 through 7.7 describe the lower-level activities associated with each of the seven major VV&A phases associated with the FEDEP's seven steps. Figure 3 identifies the individual activities that compose each of these VV&A phases. Each activity description includes the information required, the component tasks, and the information produced for that activity. As in the FEDEP, this overlay assumes that once a product has been created, it will be available for all subsequent activities; even though the product may not be identified as an input in the activity description.