

Appendix 1 – VERIFICATION AND VALIDATION (V&V) COMPOSITE MODEL

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A1.1 COMPOSITE MODEL OVERVIEW

The Composite Model defines the superset of V&V activities from which a V&V Plan would be tailored. Each activity in the Composite Model is described in a consistent format. This format includes:

- The activity description;
- Tailoring guidance associated with the activity;
- Notes related that add clarification to the purpose or implementation of the activity;
- Assumptions that underlie the implementation of the activity; and
- Descriptions of the tasks to be performed:
 - Descriptions of the information required to perform each task; and
 - Descriptions of the information produced by each task.

Instances where tailoring guidance, notes or assumptions are not defined for a specific activity are denoted by **(Blank)**.

A1.2 PHASE 1 – PLAN THE V&V EFFORT

Activity 1.1 – Develop the V&V Approach

Activity Description: This activity selects the specific activities and tasks that will be performed as part of the V&V approach. It also identifies the techniques and tools needed to accomplish the selected V&V tasks. Together, these elements define the V&V approach from which the rest of the V&V Plan is constructed.

Activity Tailoring Guidance: (Blank)

Activity Notes: The term “complexity” is used here, in the most general sense, as a measure of the difficulty of a task. These tasks do not include any iteration either within this activity or between the other V&V Planning activities.

Activity Assumptions: Guidance exists to aid the selection of V&V tasks and techniques and needs prioritization.

Task Descriptions:

1.1.1 Obtain the Acceptability Criteria Report and Accreditation Plan, if available.

Information Required:

- Accreditation Plan; Acceptability Criteria Report (Source: Preceding accreditation activity)

Information Produced:

- Accreditation Plan; Acceptability Criteria Report are forwarded to follow-on activities

1.1.2 Obtain the M&S requirements.

Information Required:

- M&S requirements (Source: User)

Information Produced:

- M&S requirements are forwarded to follow-on activities

1.1.3 Obtain a description of the M&S.

Information Required:

- M&S description (Source: Developer)

Information Produced:

- M&S description are forwarded to follow-on activities

1.1.4 Analyze the M&S requirements, accreditation information requirements and M&S description to develop the scope statement for the V&V effort.

Information Required:

- M&S requirements (Source: Task 1.1.2)
- M&S description (Source: Task 1.1.3)
- Accreditation information requirements (Source: preceding accreditation activity)

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Information Produced:

- V&V effort scope statement

- 1.1.5 Analyze the Acceptability Criteria Report or the M&S Requirements and M&S description to determine the acceptability criteria that define the required functionality.

Information Required:

- Acceptability Criteria Report or M&S requirements (Source: Task 1.1.1 or 1.1.2)
- M&S description (Source: Task 1.1.3)

Information Produced:

- Acceptability criteria defining needed functionality

- 1.1.6 Analyze the Acceptability Criteria Report or the M&S Requirements and M&S description to determine the acceptability criteria that define the required quality.

Information Required:

- Acceptability Criteria Report or M&S Requirements (Source: Task 1.1.1 or 1.1.2)
- M&S description (Source: Task 1.1.3)

Information Produced:

- Acceptability criteria defining needed quality

- 1.1.7 Analyze the Accreditation Plan, the acceptability criteria and any VV&A task selection guidance to determine the V&V activities and tasks that could be performed.

Information Required:

- Accreditation Plan (Source: Preceding accreditation activity)
- Acceptability criteria defining needed functionality (Source: Task 1.1.5)
- Acceptability criteria defining needed quality (Source: Task 1.1.6)
- VV&A task selection guidance (Source: Open literature)

Information Produced:

- Candidate V&V activities and tasks

- 1.1.8 Analyze the acceptability criteria, the Accreditation Plan and the needs prioritization guidance to assign the needs priorities to the acceptability criteria.

Information Required:

- Accreditation Plan (Source: Preceding accreditation activity)
- Acceptability criteria defining needed functionality (Source: Task 1.1.5)
- Acceptability criteria defining needed quality (Source: Task 1.1.6)
- Needs prioritization guidance (Source: Open literature)

Information Produced:

- Assigned acceptability criteria priorities

- 1.1.9 Analyze the candidate V&V activities and tasks, the level of technique rigor required, the acceptability criteria and any VV&A technique selection guidance to select the V&V techniques that could be applied.

Information Required

- Candidate V&V activities and tasks (Source: Task 1.1.7)
- Assigned acceptability criteria priorities (Source: Task 1.1.8)
- Acceptability criteria defining needed functionality (Source: Task 1.1.5)
- Acceptability criteria defining needed quality (Source: Task 1.1.6)
- VV&A technique selection guidance (Source: Open literature)

Information Produced:

- Candidate V&V techniques

- 1.1.10 Analyze the candidate V&V techniques to identify the tools needed to support the application of those techniques.

Information Required:

- Candidate V&V techniques (Source: Task 1.1.9)

Information Produced:

- Candidate tools needed to support V&V

- 1.1.11 Analyze the Accreditation Plan, the acceptability criteria and aspects of the V&V approach to estimate the complexity of each of the V&V tasks to be performed.

Information Required:

- Accreditation Plan (Source: Preceding accreditation activity)
- Acceptability criteria defining needed functionality (Source: Task 1.1.5)
- Acceptability criteria defining needed quality (Source: Task 1.1.6)
- Candidate V&V activities and tasks (Source: Task 1.1.7)
- Candidate V&V techniques (Source: Task 1.1.9)
- Candidate tools needed to support V&V (Source: Task 1.1.10)

Information Produced:

- Estimated complexity of each of the V&V tasks to be performed

- 1.1.12 Assemble the candidate V&V tasks, techniques, tools and estimated complexity into a description of the V&V approach.

Information Required:

- Candidate V&V activities and tasks (Source: Task 1.1.7)
- Candidate V&V techniques (Source: Task 1.1.9)
- Candidate tools needed to support V&V (Source: Task 1.1.10)
- Estimated complexity of each of the V&V tasks to be performed (Source: 1.1.11)

Information Produced

- Description of the V&V approach

Activity 1.2 – Identify the Required V&V Resources

Activity Description: This activity identifies the candidate personnel resources needed to perform the V&V activities. These candidates are selected from the skills required to perform the V&V tasks and the personnel that are available to the V&V effort.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- These tasks do not include any iteration either within this activity or between the other V&V Planning activities; and
- The term “labor estimate” refers to the number of hours required.

Activity Assumptions: The Sponsor can provide a list of the available candidate V&V personnel. If the Sponsor does not provide that information then the V&V practitioner may need to identify those personnel.

Task Descriptions:

1.2.1 Analyze the V&V approach to determine the skills required to perform each of the tasks.

Information Required:

- V&V approach (Source: Activity 1.1)

Information Produced:

- Skills required for each V&V task to be performed

1.2.2 Obtain a list of the available candidate V&V personnel using the skills required for each V&V task to be performed.

Information Required:

- List of the available candidate V&V personnel (Source: Sponsor)
- Skills required for each V&V task to be performed (Source: Task 1.2.1)

Information Produced:

- List of the available candidate V&V personnel are forwarded to follow-on activities

1.2.3 Analyze the V&V approach and the skills required for each V&V task to be performed to estimate the amount of labor required to perform each task for each skill.

Information Required:

- V&V approach (Source: Activity 1.1)
- Skills required for each V&V task to be performed (Source: Task 1.2.1)

Information Produced:

- Labor estimate for each task and skill

1.2.4 Analyze the V&V approach, the list of available candidate V&V personnel and the labor estimate for each task and skill to identify candidate personnel to perform each of the V&V tasks.

Information Required:

- V&V approach (Source: Activity 1.1)
- List of the available candidate V&V personnel (Source: Task 1.2.2)
- Labor estimate for each task and skill (Source: Task 1.2.3)

Information Produced:

- Candidate personnel to perform each of the V&V tasks

- 1.2.5 Analyze the labor estimate for each task and skill and the candidate personnel to perform each of the V&V tasks to map the labor required onto each candidate.

Information Required:

- Labor estimate for each task and skill (Source: Task 1.2.3)
- Candidate personnel to perform each of the V&V tasks (Source: Task 1.2.4)

Information Produced:

- Labor required from each candidate person

- 1.2.6 Assemble the skills required, available candidate personnel, labor estimates, candidate personnel task assignments and labor from each candidate into the required V&V resources.

Information Required:

- Skills required for each V&V task to be performed (Source: Task 1.2.1)
- List of the available candidate V&V personnel (Source: Task 1.2.2)
- Labor estimate for each task and skill (Source: Task 1.2.3)
- Candidate personnel to perform each of the V&V tasks (Source: Task 1.2.4)
- Labor required from each candidate person (Source: Task 1.2.5)

Information Produced:

- Required V&V resources

Activity 1.3 – Build the V&V Schedule

Activity Description: This activity produces a schedule for the V&V effort that aligns with the accreditation schedule and, ultimately, the project schedule.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- This set of tasks implicitly assumes that the schedule can determine the costs rather than vice versa.
- These tasks do not include any iteration either within this activity or between the other V&V Planning activities.
- The Sponsor can provide a schedule of the availability of the candidate V&V personnel. If the Sponsor cannot provide that information then the V&V practitioner may need to obtain it.

Activity Assumptions: The accreditation plan describes the programmatic scheduling constraints (in the accreditation activities).

Task Descriptions:

1.3.1 Obtain the availability schedule of the candidate V&V personnel using the required V&V resources.

Information Required:

- Candidate V&V personnel availability schedule (Source: Sponsor)
- Required V&V resources (Source: Activity 1.2)

Information Produced:

- Candidate V&V personnel availability schedule is forwarded to follow-on activities

1.3.2 Analyze the V&V approach to determine the task dependencies.

Information Required:

- V&V approach (Source: Activity 1.1)

Information Produced:

- V&V task dependencies

1.3.3 Analyze the V&V approach and the V&V task dependencies to determine the V&V task sequencing.

Information Required:

- V&V approach (Source: Activity 1.1)
- V&V task dependencies (Source: Task 1.3.2)

Information Produced:

- V&V task sequencing

1.3.4 Analyze the Accreditation Plan, the candidate V&V personnel availability schedule and the V&V task sequencing to determine the V&V schedule.

Information Required:

- Accreditation Plan (Source: Preceding accreditation activity)
- Candidate V&V personnel availability schedule (Source: Task 1.3.1)
- V&V task sequencing (Source: Task 1.3.3)

Information Produced:

- V&V effort schedule

Activity 1.4 – Estimate the V&V Costs

Activity Description: This activity produces estimates of the costs of performing V&V. These costs include components for labor, travel and costs other than labor and travel (e.g., to purchase tools or hardware).

Activity Tailoring Guidance: (Blank)

Activity Notes: These tasks do not include any iteration either within this activity or between the other V&V Planning activities.

Activity Assumptions: (Blank)

Task Descriptions:

- 1.4.1 Analyze the V&V approach and the required V&V resources to estimate the labor costs for each V&V task.

Information Required:

- V&V approach (Source: Activity 1.1)
- Required V&V resources (Source: Activity 1.2)

Information Produced:

- Estimated labor costs for each V&V task

- 1.4.2 Analyze the V&V approach and the required V&V resources to estimate the possible travel required to perform V&V and their costs.

Information Required:

- V&V approach (Source: Activity 1.1)
- Required V&V resources (Source: Activity 1.2)

Information Produced:

- Estimated V&V travel requirements and costs

- 1.4.3 Analyze the estimated labor costs for each V&V task and the estimated V&V travel requirements and costs to estimate the costs other than labor and travel required to perform V&V.

Information Required:

- Estimated labor costs for each V&V task (Source: Task 1.4.1)
- Estimated V&V travel requirements and costs (Source: Task 1.4.2)

Information Produced:

- Estimated V&V costs other than labor and travel

- 1.4.4 Analyze the V&V approach, the estimated labor costs for each V&V task, the estimated V&V travel requirements and costs and the estimated V&V costs other than labor and travel to estimate a total cost of the V&V effort.

Information Required:

- V&V approach (Source: Activity 1.1)
- Estimated labor costs for each V&V task (Source: Task 1.4.1)
- Estimated V&V travel requirements and costs (Source: Task 31.4.2)
- Estimated V&V costs other than labor and travel (Source: Task 1.4.3)

Information Produced:

- Estimated V&V effort cost

Activity 1.5 – Prepare the V&V Plan

Activity Description: This activity assembles the components produced by the previous activities into the V&V Plan, circulates that plan to interested parties, and responds to the comments from those parties with modifications to the plan.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- Iteration between the various parts of plan preparation can be coordinated within this activity; and
- Modifying the plan may require revisiting any of the preceding V&V Planning activities.

Activity Assumptions: (Blank)

Task Descriptions:

1.5.1 Construct the initial requirements traceability matrix.

Information Required

- M&S requirements (Source: Activity 1.1)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Initial requirements traceability matrix

1.5.2 Prepare citations of the information used for V&V Planning.

Information Required:

- Accreditation Plan (Source: Activity 1.1)
- Acceptability Criteria Report (Source: Activity 1.1)
- M&S requirements (Source: Activity 1.1)
- M&S description (Source: Activity 1.1)
- List of the available candidate V&V personnel (Source: Activity 1.2)
- Candidate V&V personnel availability schedule (Source: Activity 1.3)

Information Produced:

- Citations of information used for V&V Planning

1.5.3 Assemble the V&V approach, V&V resource needs, V&V schedule, V&V cost estimate and citations of the information used for V&V Planning into an integrated draft V&V Plan.

Information Required:

- V&V approach (Source: Activity 1.1)
- Required V&V resources (Source: Activity 1.2)
- V&V schedule (Source: Activity 1.3)
- Estimated V&V effort cost (Source: Activity 1.4)
- Initial requirements traceability matrix (Source: Task 1.5.1)
- Citations of information used for V&V Planning (Source: Task 1.5.2)

Information Produced:

- Draft V&V Plan

1.5.4 Analyze the draft V&V Plan for internal consistency and correct any inconsistencies.

Information Required:

- Draft V&V Plan (Source: Task 1.5.3)

Information Produced:

- Correct draft V&V Plan

- 1.5.5 Circulate the corrected draft V&V Plan for review and collect comments and recommendations for change.

Information Required:

- Corrected draft V&V Plan (Source: Task 1.5.4)

Information Produced:

- Comments and recommendations for change received on draft V&V Plan

- 1.5.6 Modify the corrected draft V&V Plan from the comments and recommendations for change received.

Information Required:

- Corrected draft V&V Plan (Source: Task 1.5.4)
- Comments and recommendations for change received on draft V&V Plan (Source: Task 1.5.5)

Information Produced:

- Modified V&V Plan

- 1.5.7 Analyze the modified V&V Plan for internal consistency, correct any inconsistencies and prepare the final V&V Plan.

Information Required:

- Modified V&V Plan (Source: Task 1.5.6)

Information Produced:

- Final V&V Plan

- 1.5.8 Prepare the V&V Plan versioning history with the final V&V Plan.

Information Required:

- Final V&V Plan (Source: Task 1.5.7)

Information Produced:

- V&V Plan versioning history

Activity 1.6 – Execute and Evolve the V&V Plan

Activity Description: This activity executes the V&V Plan, monitors the results of the execution process and evolves the V&V Plan in response to those results.

Activity Tailoring Guidance: (Blank)

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Activity Notes: Developing the V&V Plan may require several iterations and necessitate revisiting the preceding planning activities. Determining what parts of the plan need to be evolved will be done within this activity.

Activity Assumptions: A V&V Plan versioning history is kept, possibly as part of a program-level configuration management process.

Task Descriptions:

1.6.1 Execute the V&V Plan.

Information Required:

- V&V Plan (Source: Activity 1.5)

Information Produced:

- Updated V&V Plan

1.6.2 Monitor the V&V Plan execution and collect data on the results of that execution.

Information Required:

- V&V Plan (Source: Activity 1.5)

Information Produced:

- V&V Plan execution results

1.6.3 Analyze the V&V Plan and the results from its execution to determine the deviation from the expected results.

Information Required:

- V&V Plan execution results (Source: Task 1.6.2)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Deviations from the expected V&V Plan results

1.6.4 Analyze the revised Accreditation Plan to determine the modifications needed to accommodate those revisions in the V&V Plan.

Information Required:

- Revised Accreditation Plan (Source: Preceding accreditation activity)

Information Produced:

- Modifications to the existing V&V Plan from Accreditation Plan revisions

1.6.5 Obtain changes to the M&S requirements.

Information Required:

- M&S requirements changes (Source: User)

Information Produced:

- M&S requirements changes forwarded to follow-on activities

- 1.6.6 Analyze changes to the M&S requirements to determine modifications needed to the requirements traceability matrix.

Information Required:

- M&S requirements (Source: Task 1.6.5)

Information Produced:

- Requirements traceability matrix modifications

- 1.6.7 Analyze the revisions to the Accreditation Plan and deviations from the expected V&V Plan results to determine the modifications needed to accommodate the observed deviations from the existing V&V Plan.

Information Required:

- Deviations from the expected V&V Plan results (Source: Task 1.6.3)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Modifications to the existing V&V Plan from deviations from that plan

- 1.6.8 Analyze the revisions to the Accreditation Plan and deviations from the expected V&V Plan results to determine the modifications needed to accommodate the observed deviations from the existing V&V Plan.

Information Required:

- Modifications to the existing V&V Plan from Accreditation Plan revisions (Source: Task 1.6.4)
- Modifications to the existing V&V Plan from deviations from that plan (Source: Task 1.6.7)
- Requirements traceability matrix modifications (Source: Task 1.6.6)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Draft revised V&V Plan

- 1.6.9 Circulate the draft revised V&V Plan for review and collect comments and recommendations for change.

Information Required:

- Draft revised V&V Plan (Source: Task 1.6.8)

Information Produced:

- Comments and recommendations for change received on draft revised V&V Plan

- 1.6.10 Modify the draft revised V&V Plan from the comments and recommendations for change received.

Information Required:

- Draft revised V&V Plan (Source: Task 1.6.8)

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- Comments and recommendations for change received on draft revised V&V Plan (Source: Task 1.6.9)

Information Produced:

- Modified V&V Plan

- 1.6.11 Analyze the modified V&V Plan for internal consistency, correct any inconsistencies and prepare the final V&V Plan.

Information Required:

- Modified V&V Plan (Source: Task 1.6.10)

Information Produced:

- Final revised V&V Plan

- 1.6.12 Update the V&V Plan versioning history associated with the V&V Plan.

Information Required:

- V&V Plan versioning history (Source: Activity 1.5)

Information Produced:

- V&V Plan versioning updates

- 1.6.13 Analyze the V&V Plan execution results, deviations from the expected plan results and modifications to the plan to develop the lessons learned from exercising the V&V process.

Information Required:

- V&V Plan execution results (Source: Task 1.6.2)
- Deviations from the expected V&V Plan results (Source: Task 1.6.3)
- Existing V&V Plan modifications from Accreditation Plan revisions (Source: Task 1.6.4)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Collected lessons learned from exercising the V&V process

A1.3 PHASE 2 – APPLY RELEVANT HISTORICAL INFORMATION

Activity 2.1 – Collect and Analyze Developer Accounts of M&S Capabilities and Limitations

Activity Description: The M&S Developer possesses unique insight into its capabilities and limitations, and this insight can contribute greatly to the knowledge of the M&S's capabilities. In this activity, the V&V practitioner locates, obtains, and analyzes developer accounts of a M&S's capabilities and limitations. These Developer's accounts can come from any documentation produced by the Developer's activities and interviews concerning the development, testing, and maintenance of the M&S.

Activity Tailoring Guidance:

- This activity may not be performed if the Developer has produced no documentation from which knowledge of the M&S's capabilities can be abstracted.
- This activity should not be performed if the Developer cannot produce any documentation of the M&S's configuration management history.

Activity Notes:

- This activity may still apply to new M&S situations for which no history exists, since Developers often produce useful documentation during the development process (e.g., user's manuals, training materials).
- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: This activity assumes that the M&S configuration management history has not been obtained through prior activities. (See the guidance note above)

Task Descriptions:

2.1.1 Obtain the M&S configuration management history from the Developer.

Information Required:

- M&S configuration management history (Source: Developer)

Information Produced:

- M&S configuration management history

2.1.2 Obtain any available documentation produced by the Developer's activities.

Information Required:

- Developer's documentation about the M&S (Source: Developer)

Information Produced:

- Developer's documentation about the M&S

2.1.3 Analyze the Developer's documentation with the M&S configuration management history to identify that documentation that is relevant to the current M&S configuration.

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Information Required.

- Developer's documentation about the M&S (Source: Task 2.1.2)
- M&S configuration management history (Source: Task 2.1.1)

Information Produced:

- Relevant Developer's documentation

- 2.1.4 Analyze the relevant Developer's documentation with the acceptability criteria to identify that documentation that applies to the intended use.

Information Required:

- Developer's documentation relevant to the current M&S configuration (Source: Task 2.1.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable Developer's documentation

- 2.1.5 Analyze the Relevant and applicable Developer's documentation to determine the capabilities and limitations of the current M&S configuration.

Information Required:

- Relevant and applicable Developer's documentation (Source: Task 2.1.4)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the M&S capabilities and limitations from the Developer's documentation

- 2.1.6 Analyze the M&S capabilities and limitations, the Relevant and applicable Developer's documentation and the acceptability criteria to identify any gaps and inconsistencies that exist in the evidence from the Developer's documentation.

Information Required:

- Description of the M&S capabilities and limitations from the Developer's documentation (Source: Task 2.1.5)
- Relevant and applicable Developer's documentation (Source: Task 2.1.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the gaps and inconsistencies in the evidence from the Developer's documentation

- 2.1.7 Interview the Developer, where needed and practical, to fill any gaps, resolve any inconsistencies, describe any gaps or inconsistencies that cannot be resolved and document the results from these interviews.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s documentation (Source: Task 2.1.5)
- Description of the gaps and inconsistencies in the evidence from the Developer’s documentation (Source: Task 2.1.6)
- Information from interviews with the Developer (Source: Developer)

Information Produced:

- Description of the M&S capabilities and limitations from the Developer’s accounts
- Description of the unresolved gaps and inconsistencies in Developer’s accounts

2.1.8 Prepare citations of the Relevant and applicable Developer’s accounts and resolve any citation problems.

Information Required:

- M&S configuration management history (Source: Task 2.1.1)
- Relevant and applicable Developer’s documentation (Source: Task 2.1.4)
- Information from interviews with the Developer (Source: Developer)

Information Produced:

- Citations of information from Developer’s accounts

Activity 2.2 – Collect and Analyze the V&V and Testing Histories

Activity Description: Any available documentation of prior V&V or testing activities can contribute tremendously to an ongoing V&V effort. In this activity, the V&V practitioner locates, obtains and analyzes any available prior V&V and testing reports. Often testing activities perform many of the same functions that V&V does and can be leveraged directly.

Activity Tailoring Guidance:

- This activity should not be performed if no documentation of prior V&V or testing activities exists.
- This activity should not be performed if the Developer cannot produce any documentation of the M&S’s configuration management history.
- If the M&S configuration management history has been obtained in a prior activity then that task does not need to be performed in this activity.

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: This activity assumes that the M&S configuration management history has not been obtained through prior activities. (See the guidance note above)

Task Descriptions:

2.2.1 Obtain the M&S configuration management history.

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Information Required:

- M&S configuration management history (Source: Developer)

Information Produced:

- M&S configuration management history

2.2.2 Obtain documentation produced by any prior VV&A efforts.

Information Required:

- Documentation from prior VV&A efforts (Source: VV&A Teams)

Information Produced:

- Documentation from prior VV&A efforts

2.2.3 Obtain documentation produced by any prior testing efforts.

Information Required:

- Documentation from prior testing efforts (Source: Testing Teams)

Information Produced:

- Documentation from prior testing efforts

2.2.4 Analyze the documentation from prior VV&A efforts and the M&S configuration management history to identify that documentation that is relevant to the current M&S configuration.

Information Required:

- Documentation from prior VV&A efforts (Source: Task 2.2.2)
- M&S configuration management history (Source: Task 2.2.1)

Information Produced:

- Relevant documentation from prior VV&A efforts

2.2.5 Analyze the documentation from prior testing efforts and the M&S configuration management history to identify that documentation that is relevant to the current M&S configuration.

Information Required

- Documentation from prior testing efforts (Source: Task 2.2.3)
- M&S configuration management history (Source: Task 2.2.1)

Information Produced:

- Relevant documentation from prior testing efforts

2.2.6 Analyze the relevant documentation from prior VV&A efforts and the acceptability criteria to identify that documentation that applies to the intended use.

Information Required:

- Relevant documentation from prior VV&A efforts (Source: Task 2.2.4)

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable documentation from prior VV&A efforts

- 2.2.7 Analyze the relevant documentation from prior testing efforts and the acceptability criteria to identify that documentation that applies to the intended use.

Information Required:

- Relevant documentation from prior testing efforts (Source: Task 2.2.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable documentation from prior testing efforts

- 2.2.8 Analyze the Relevant and applicable documentation from prior VV&A efforts to determine the capabilities and limitations of the current M&S configuration.

Information Required:

- Relevant and applicable documentation from prior VV&A efforts (Source: Task 2.2.6)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the M&S capabilities and limitations from the relevant and applicable documentation of prior VV&A efforts

- 2.2.9 Analyze the Relevant and applicable documentation from prior testing efforts to determine the capabilities and limitations of the current M&S configuration.

Information Required:

- Relevant and applicable documentation from prior testing efforts (Source: Task 2.2.7)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the M&S capabilities and limitations from the relevant and applicable documentation of prior testing efforts.

- 2.2.10 Analyze the M&S capabilities and limitations from the relevant and applicable documentation of prior VV&A efforts and the acceptability criteria to identify any gaps and inconsistencies that may exist in the evidence from that documentation.

Information Required:

- Description of the M&S capabilities and limitations from the relevant and applicable documentation of prior VV&A efforts (Source: Task 2.2.8)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)

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- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.5)

Information Produced

- Description of the gaps and inconsistencies in the evidence from the documentation of prior VV&A efforts

- 2.2.11 Analyze the M&S capabilities and limitations from the relevant and applicable documentation of prior testing efforts and the acceptability criteria to identify any gaps and inconsistencies that may exist in the evidence from that documentation.

Information Required:

- Description of the M&S capabilities and limitations from the relevant and applicable documentation of prior testing efforts (Source: Task 2.2.9)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the gaps and inconsistencies in the evidence from the documentation of prior testing efforts

- 2.2.12 Interview the VV&A teams, where needed and practical, to fill any gaps, resolve any inconsistencies, describe any gaps or inconsistencies that cannot be resolved and document the results from these interviews.

Information Required:

- Description of the gaps and inconsistencies in the evidence from the documentation of prior VV&A efforts (Source: Task 2.2.10)
- Information from interviews with the VV&A teams (Source: VV&A Teams)

Information Produced:

- Description of the M&S capabilities and limitations from the VV&A histories
- Description of the unresolved gaps and inconsistencies in the evidence from the VV&A histories

- 2.2.13 Interview the testing teams, where needed and practical, to fill any gaps, resolve any inconsistencies, describe any gaps or inconsistencies that cannot be resolved and document the results from these interviews.

Information Required:

- Description of the gaps and inconsistencies in the evidence from the documentation of prior testing efforts (Source: Task 2.2.11)
- Information from interviews with the testing teams (Source: Testing Teams)

Information Produced:

- Description of the M&S capabilities and limitations from the testing histories
- Description of the unresolved gaps and inconsistencies in the evidence from the testing histories

2.2.14 Assemble the information on the M&S capabilities and limitations from prior VV&A and testing efforts into a consistent description.

Information Required:

- Description of the M&S capabilities and limitations from the VV&A histories (Source: Task 2.2.12)
- Description of the M&S capabilities and limitations from the testing histories (Source: Task 2.2.13)

Information Produced:

- Integrated description of the M&S capabilities and limitations from prior VV&A and testing

2.2.15 Assemble the information on the unresolved gaps and inconsistencies from prior VV&A and testing efforts into a consistent description.

Information Required:

- Description of the unresolved gaps and inconsistencies in the evidence from the VV&A histories (Source: Task 2.2.12)
- Description of the unresolved gaps and inconsistencies in the evidence from the testing histories (Source: Task 2.2.13)

Information Produced:

- Integrated description of the unresolved gaps and limitations the VV&A and testing histories

2.2.16 Prepare citations of the relevant and applicable VV&A and testing histories and resolve any citation problems.

Information Required:

- M&S configuration management history (Source: Task 2.2.1)
- Relevant and applicable documentation from prior VV&A activities (Source: Task 2.2.4)
- Relevant and applicable documentation from prior testing activities (Source: Task 2.2.5)
- Information from interviews with the VV&A teams (Source: VV&A Teams)
- Information from interviews with the testing teams (Source: Testing Teams)

Information Produced:

- Citations of information from the VV&A and testing histories

Activity 2.3 – Collect and Analyze the Prior Use History

Activity Description: Like the information produced by prior V&V and testing activities, documentation of prior uses of a M&S can provide information about the M&S's validity. In this activity, the V&V practitioner locates, obtains and analyzes any documentation of prior use history. The products of prior M&S use can be reports or technical papers that document the results from studies, training exercises, experiments, and design activities.

Activity Tailoring Guidance:

- This activity should not be performed if no documentation of prior use exists.

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- This activity should not be performed if the Developer cannot produce any documentation of the M&S's configuration management history.
- If the M&S configuration management history has been obtained in a prior activity then that task does not need to be performed in this activity.

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: This activity assumes that the M&S configuration management history has not been obtained through prior activities. (See the guidance note above)

Task Descriptions:

2.3.1 Obtain the M&S configuration management history.

Information Required:

- M&S configuration management history (Source: Developer)

Information Produced:

- M&S configuration management history

2.3.2 Obtain any documentation produced by prior uses of the M&S.

Information Required:

- Documentation from prior uses of the M&S (Source: Users)

Information Produced:

- Documentation from prior uses of the M&S

2.3.3 Analyze the documentation from prior uses and the M&S configuration management history to identify the documentation that is relevant to the current M&S configuration.

Information Required:

- Documentation from prior uses of the M&S (Source: Task 2.3.2)
- M&S configuration management history (Source: Task 2.3.1)

Information Produced:

- Relevant documentation from prior M&S uses

2.3.4 Analyze the relevant documentation from prior uses and the acceptability criteria to identify the documentation that applies to the intended use.

Information Required:

- Relevant documentation from prior M&S uses (Source: Task 2.3.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable documentation from prior uses

- 2.3.5 Analyze the relevant and applicable documentation from prior uses to determine the capabilities and limitations of the current M&S configuration.

Information Required:

- Relevant and applicable documentation from prior uses (Source: Task 2.3.4)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the M&S capabilities and limitations from the relevant and applicable documentation from prior uses

- 2.3.6 Analyze the M&S capabilities and limitations from the relevant and applicable documentation from prior uses and the acceptability criteria to identify any gaps and inconsistencies that may exist in the evidence from that documentation.

Information Required:

- Description of the M&S capabilities and limitations from the Relevant and applicable documentation from prior uses (Source: Task 2.3.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Description of the gaps and inconsistencies in the evidence from the documentation of prior uses

- 2.3.7 Interview the users, where needed and practical, to fill any gaps, resolve any inconsistencies, describe any gaps or inconsistencies that cannot be resolved and document the results of these interviews.

Information Required:

- Description of the gaps and inconsistencies in the evidence from the documentation of prior uses (Source: Task 2.3.6)
- Information from interviews with the users (Source: Users)

Information Produced:

- Description of the M&S capabilities and limitations from the use history
- Description of the unresolved gaps and inconsistencies in the evidence from the use history

- 2.3.8 Prepare citations of the relevant and applicable use history and resolve any citation problems.

Information Required:

- M&S configuration management history (Source: Developer)
- Relevant and applicable documentation from prior uses (Source: Task 2.3.4)
- Information from interviews with the users (Source: Users)

Information Produced:

- Citations of information from the use history

Activity 2.4 – Integrate and Employ the Historical Evidence

Activity Description: In this activity, the V&V practitioner integrates any relevant historical evidence into a coherent view of an M&S’s capabilities and limitations.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

2.4.1 Analyze the historical evidence produced by the prior activities to generate an integrated description of the M&S capabilities and limitations.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s accounts (Source: Activity 2.1)
- Description of the M&S capabilities and limitations from the VV&A and testing histories (Source: Activity 2.2)
- Description of the M&S capabilities and limitations from the use history (Source: Activity 2.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities and limitations from the historical evidence

2.4.2 Analyze the gaps and inconsistencies identified by the prior activities using the integrated description of the M&S capabilities and limitations from the historical evidence to reconcile them and produce a description of the unresolved gaps and inconsistencies in the historical evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)
- Description of the unresolved gaps and inconsistencies in the evidence from the Developer’s accounts (Source: Activity 2.1)
- Description of the unresolved gaps and inconsistencies in the evidence from the VV&A and testing histories (Source: Activity 2.2)
- Description of the unresolved gaps and inconsistencies in the evidence from the use history (Source: Activity 2.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the unresolved gaps and inconsistencies in the historical evidence

2.4.3 Analyze the integrated description of M&S capabilities and limitations, description of the unresolved gaps and inconsistencies in the integrated historical evidence, and acceptability criteria to estimate the coverage of the integrated historical evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)
- Description of the unresolved gaps and inconsistencies in the historical evidence (Source: Task 2.4.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the historical evidence

- 2.4.4 Analyze the integrated description of M&S capabilities and limitations, description of the unresolved gaps and inconsistencies in the integrated historical evidence, and estimated coverage in the historical evidence to estimate the uncertainties in the integrated historical evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)
- Estimated coverage of the historical evidence (Source: Task 2.4.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the historical evidence

- 2.4.5 Analyze the acceptability criteria, the integrated description of M&S capabilities and limitations from the historical evidence and the estimated uncertainties in the historical evidence to identify the factors that may constrain use.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)
- Estimated uncertainties in the historical evidence (Source: Task 2.4.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the historical evidence

- 2.4.6 Analyze the integrated description of the M&S capabilities and limitations from the historical evidence, the unresolved gaps and inconsistencies in the historical evidence, the estimated coverage of uncertainties in the historical evidence and the acceptability criteria to identify candidate output sampling areas.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)

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- Description of the unresolved gaps and inconsistencies in the historical evidence (Source: Task 2.4.2)
- Estimated coverage of the historical evidence (Source: Task 2.4.3)
- Estimated uncertainties in the historical evidence (Source: Task 2.4.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Candidate output sampling areas suggested by the historical evidence

2.4.7 Update the requirements traceability matrix with the historical evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Task 2.4.1)
- Description of the unresolved gaps and inconsistencies in the historical evidence (Source: Task 2.4.2)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

2.4.8 Prepare, from the individual citation lists, an integrated list of citations of relevant and applicable information and resolve any citation problems.

Information Required:

- Citations of information from Developer's accounts (Source: Activity 2.1)
- Citations of information from the VV&A and testing histories (Source: Activity 2.2)
- Citations of information from the use history (Source: Activity 2.3)

Information Produced:

- Integrated citations supporting the compilation and analysis of the historical evidence

A1.4 PHASE 3 – VERIFY AND VALIDATE THE M&S CONCEPTUAL MODEL

Activity 3.1 – Verify the Conceptual Model

Activity Description: This verifies the M&S conceptual model.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- Analysis to discover computational anomalies is constrained to the conceptual model (specifically, the mathematical model) because that seems to be the only artifact that lends itself to analysis.
- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: An M&S conceptual model exists and is available to the V&V effort.

Task Descriptions:

3.1.1 Obtain the M&S conceptual model.

Information Required:

- M&S conceptual model (Source: Developer)

Information Produced:

- M&S conceptual model

3.1.2 Analyze the M&S conceptual model for the possible existence of computational anomalies.

Information Required:

- M&S conceptual model (Source: Task 3.1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Computational anomalies discovered in the M&S conceptual model

3.1.3 Analyze the M&S conceptual model to determine its internal consistency.

Information Required:

- M&S conceptual model (Source: Task 3.1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered within the M&S conceptual model

3.1.4 Analyze the M&S requirements and the M&S conceptual model to determine the consistency between them.

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Information Required:

- M&S requirements (Source: Activity 1.1)
- M&S conceptual model (Source: Task 3.1.1)

Information Produced:

- Inconsistencies discovered between the M&S requirements and the M&S conceptual model.

3.1.5 Analyze the M&S conceptual model to verify the input functionality that it represents.

Information Required:

- M&S conceptual model (Source: Task 3.1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the input design represented in the M&S conceptual model

3.1.6 Analyze the M&S conceptual model to verify the output functionality that it represents.

Information Required:

- M&S conceptual model (Source: Task 3.1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the output design represented in the M&S conceptual model

3.1.7 Analyze the computational anomalies and the inconsistencies discovered during the M&S conceptual model verification to develop an integrated description of the inconsistencies discovered in the M&S conceptual model.

Information Required:

- Computational anomalies discovered in the M&S conceptual model (Source: Task 3.1.2)
- Inconsistencies discovered within the M&S conceptual model (Source: Task 3.1.3)
- Inconsistencies discovered between the M&S requirements and the M&S conceptual model (Source: Task 3.1.4)
- Inconsistencies discovered in the input design represented in the M&S conceptual model (Source: Task 3.1.5)
- Inconsistencies discovered in the output design represented in the M&S conceptual model (Source: Task 3.1.6)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the inconsistencies discovered in the M&S conceptual model
- Verified M&S conceptual model

Activity 3.2 – Validate the Conceptual Model

Activity Description: This activity validates the M&S conceptual model.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: This activity assumes that the M&S conceptual model has been obtained and verified as part of previous activities.

Task Descriptions:

3.2.1 Analyze the verified M&S conceptual model and the acceptability criteria defining needed functionality to determine the functionality needs that are met; identify those criteria that are not met; and identify those criteria for which insufficient information is available.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Verified M&S conceptual model (Source: Activity 3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria defining needed functionality that the M&S conceptual model meets
- Acceptability criteria defining needed functionality that the M&S conceptual model does not meet
- Acceptability criteria defining needed functionality for which insufficient information is available from the M&S conceptual model

3.2.2 Analyze the verified M&S conceptual model, the acceptability criteria defining needed quality and the validation referent to determine the quality needs that are met, identify those criteria that are not met and identify those criteria for which insufficient information is available.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Verified M&S conceptual model (Source: Activity 3.1)
- Validation Referent (Source: Preceding accreditation activity)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria defining needed quality that the M&S conceptual model meets
- Acceptability criteria defining needed quality that the M&S conceptual model does not meet
- Acceptability criteria defining needed quality for which insufficient information is available from the M&S conceptual model

3.2.3 Analyze the acceptability criteria that the verified M&S conceptual model meets and the verified M&S conceptual model to determine the M&S capabilities that the valid M&S conceptual model supports.

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Information Required:

- Acceptability criteria defining needed functionality that the M&S conceptual model meets (Source: Task 3.2.1)
- Acceptability criteria defining needed quality that the M&S conceptual model meets (Source: Task 3.2.2)
- Verified M&S conceptual model (Source: Activity 3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S capabilities that the valid M&S conceptual model can support

3.2.4 Analyze the acceptability criteria that the verified M&S conceptual model does not meet and the verified M&S conceptual model to determine the M&S limitations implied by the valid M&S conceptual model.

Information Required:

- Acceptability criteria defining needed functionality that the M&S conceptual model does not meet (Source: Task 3.2.1)
- Acceptability criteria defining needed quality that the M&S conceptual model does not meet (Source: Task 3.2.2)
- Verified M&S conceptual model (Source: Activity 3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S limitations implied by the M&S conceptual model validation
- Verified and validated M&S conceptual model

3.2.5 Analyze the acceptability criteria for which insufficient information is available and the verified M&S conceptual model to determine the information gaps implied by that model.

Information Required:

- Acceptability criteria defining needed functionality for which insufficient information is available from the M&S conceptual model (Source: Task 3.2.1)
- Acceptability criteria defining needed quality for which insufficient information is available from the M&S conceptual model (Source: Task 3.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Information gaps in the conceptual model validation evidence

Activity 3.3 – Verify and Validate the Use Scenarios

Activity Description: This activity verifies and validates the use scenarios.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: An M&S conceptual model exists that has been verified and validated.

Task Descriptions:

3.3.1 Obtain the scenarios for the intended use.

Information Required:

- User Scenarios (Source: User)

Information Produced:

- Collected scenarios

3.3.2 Analyze the individual collected scenarios to determine their internal consistency.

Information Required:

- Collected scenarios (Source: Task 3.3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies within the individual collected scenarios

3.3.3 Analyze the collected scenarios to determine the consistency between them.

Information Required:

- Collected scenarios (Source: Task 3.3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the collected scenarios

3.3.4 Analyze the collected scenarios to determine their consistency with the intended use.

Information Required:

- Statement of intended use (Source: Preceding accreditation activity)
- Collected scenarios (Source: Task 3.3.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the collected scenarios and the intended use

3.3.5 Analyze the inconsistencies discovered during the scenario verification to develop an integrated description of the scenario inconsistencies and the verified scenarios.

Information Required:

- Inconsistencies within the individual collected scenarios (Source: Task 3.3.2)
- Inconsistencies between the collected scenarios (Source: Task 3.3.3)
- Inconsistencies between the collected scenarios and the intended use (Source: Task 3.3.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the scenario inconsistencies
- Verified collected scenarios

- 3.3.6 Analyze the verified collected scenarios, scenario inconsistencies and the acceptability criteria defining needed functionality to determine the functionality needs that are met, identify those criteria that are not met and identify those criteria for which insufficient information is available.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Integrated description of the scenario inconsistencies (Source: Task 3.3.5)
- Verified collected scenarios (Source: Task 3.3.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria defining needed functionality that the scenarios meet
- Acceptability criteria defining needed functionality that the scenarios do not meet
- Acceptability criteria defining needed functionality for which insufficient information is available from the scenarios

- 3.3.7 Analyze the verified collected scenarios, scenario inconsistencies, the acceptability criteria defining needed quality and the validation referent to determine the quality needs that are met, identify those criteria that are not met and identify those criteria for which insufficient.

Information Required:

- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Integrated description of the scenario inconsistencies (Source: Task 3.3.5)
- Verified collected scenarios (Source: Task 3.3.5)
- Validation Referent (Source: Preceding accreditation activity)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria defining needed quality that the scenarios meet
- Acceptability criteria defining needed quality that the scenarios do not meet
- Acceptability criteria defining needed quality for which insufficient information is available from the scenarios

- 3.3.8 Analyze the acceptability criteria that the verified collected scenarios meet and the M&S conceptual model to determine the M&S capabilities that valid scenarios can support.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Acceptability criteria defining needed functionality that the scenarios meet (Source: Task 3.3.6)
- Acceptability criteria defining needed quality that the scenarios meet (Source: Task 3.3.7)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S capabilities that the valid scenarios can support

- 3.3.9 Analyze the acceptability criteria that the verified collected scenarios do not meet and the M&S conceptual model to determine the M&S limitations implied by the scenarios.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Acceptability criteria defining needed functionality that the scenarios do not meet (Source: Task 3.3.6)
- Acceptability criteria defining needed quality that the scenarios do not meet (Source: Task 3.3.7)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S limitations implied by the scenario validation

- 3.3.10 Analyze the acceptability criteria for which insufficient information is available from the scenario validation and the M&S conceptual model to determine the information gaps implied by those sets.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Acceptability criteria defining needed functionality for which insufficient information is available from the scenarios (Source: Task 3.3.6)
- Acceptability criteria defining needed quality for which insufficient information is available from the scenarios (Source: Task 3.3.7)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Information gaps implied by the scenario validation

- 3.3.11 Assemble and communicate the results of the scenario verification and validation.

Information Required:

- Integrated description of the scenario inconsistencies (Source: Task 3.3.5)
- M&S capabilities that the valid scenarios can support (Source: Task 3.3.8)
- M&S limitations implied by the scenario validation (Source: Task 3.3.9)
- Information gaps implied by the scenario validation (Source: Task 3.3.10)

Information Produced:

- Integrated description of scenario verification and validation results
- Verified and validated collected scenarios

Activity 3.4 – Integrate and Employ the Conceptual Model V&V Evidence

Activity Description: This integrates the scenario and M&S conceptual model verification and validation results.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)**Task Descriptions:**

- 3.4.1 Analyze 1) the scenarios and M&S conceptual model, 2) the descriptions of the scenario and M&S conceptual model inconsistencies, and 3) the M&S capabilities that the M&S conceptual model and scenarios support to produce an integrated description of the M&S capabilities supported by both the M&S conceptual model and scenarios.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Verified and validated collected scenarios (Source: Activity 3.3)
- Integrated description of the M&S conceptual model inconsistencies (Source: Activity 3.1)
- Integrated description of the scenario inconsistencies (Source: Activity 3.3)
- M&S capabilities that the valid M&S conceptual model supports (Source: Activity 3.2)
- M&S capabilities that the valid scenarios supports (Source: Activity 3.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities that the scenarios and M&S conceptual model can support

- 3.4.2 Analyze the scenarios and M&S conceptual model, the integrated descriptions of the scenario and M&S conceptual model inconsistencies, the M&S limitations implied by the scenario and M&S conceptual model validation to produce an integrated description of the M&S limitations implied the scenarios and M&S conceptual model.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Verified and validated collected scenarios (Source: Activity 3.3)
- Integrated description of the M&S conceptual model inconsistencies (Source: Activity 3.1)
- Integrated description of the scenario inconsistencies (Source: Activity 3.3)
- M&S limitations implied by the M&S conceptual model validation (Source: Activity 3.2)
- M&S limitations implied by the scenario validation (Source: Activity 3.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S limitations implied by the scenario and M&S conceptual model V&V

- 3.4.3 Analyze the integrated description of the M&S capabilities that the conceptual model can support and the integrated description of the M&S limitations implied by the scenario and the conceptual model V&V to produce an integrated description of the M&S capabilities and limitations implied by the scenario and conceptual model V&V.

Information Required:

- Integrated description of the M&S capabilities that the scenarios and M&S conceptual model can support (Source: Task 3.4.1)

- Integrated description of the M&S limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V

- 3.4.4 Analyze the scenarios and M&S conceptual model, the acceptability criteria, the integrated descriptions of the scenario and M&S conceptual model inconsistencies, the information gaps implied by the scenario and M&S conceptual model validation to produce an integrated description of the information gaps and inconsistencies in the evidence from the scenarios and the M&S conceptual model.

Information Required:

- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Verified and validated scenarios (Source: Activity 3.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Integrated description of the M&S conceptual model inconsistencies (Source: Activity 3.1)
- Integrated description of the scenario inconsistencies (Source: Activity 3.3)
- Information gaps implied by the M&S conceptual model validation (Source: Activity 3.2)
- Information gaps implied by the scenario validation (Source: Activity 3.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V

- 3.4.5 Analyze the acceptability criteria, integrated description of the M&S capabilities that the scenarios and M&S conceptual model can support, the integrated description of the limitations implied by the scenarios and M&S conceptual model and the information gaps implied by the scenario and M&S conceptual model validation to estimate the coverage of the scenario and M&S conceptual model V&V evidence.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.3)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Task 3.4.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the scenario and M&S conceptual model V&V evidence

- 3.4.6 Analyze the integrated descriptions of the M&S capabilities, limitations and information gaps implied by the scenarios and M&S conceptual model V&V evidence and the estimated coverage of the scenario

and M&S conceptual model V&V evidence to estimate the uncertainties in the scenario and M&S conceptual model V&V evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.3)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Task 3.4.4)
- Estimated coverage of the scenario and M&S conceptual model V&V evidence (Source: Task 3.4.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the M&S conceptual model V&V evidence

- 3.4.7 Analyze the integrated description of the M&S limitations implied by the scenario and M&S conceptual model V&V, the integrated description of the information gaps implied by the scenario and M&S conceptual model V&V, and the acceptability criteria to identify the factors that may constrain use.

Information Required:

- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.3)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Task 3.4.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the scenario and M&S conceptual model V&V

- 3.4.8 Analyze the integrated description of the M&S limitations implied by the scenario and M&S conceptual model V&V, the integrated description of the information gaps implied by the scenario and M&S conceptual model V&V and the acceptability criteria to identify the candidate output sampling areas implied by the scenario and M&S conceptual model V&V.

Information Required:

- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.3)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Task 3.4.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Candidate output sampling areas implied by the scenario and M&S conceptual model V&V

3.4.9 Update the requirements traceability matrix with the evidence from the M&S conceptual model verification and validation.

Information Required:

- Integrated description of the M&S capabilities and limitations implied by the scenario and M&S conceptual model V&V (Source: Task 3.4.3)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Task 3.4.4)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the M&S conceptual model V&V evidence

3.4.10 Prepare citations of the M&S conceptual model and collected scenarios and resolve any citation problems.

Information Required:

- M&S conceptual model (Source: Activity 3.1)
- Collected scenarios (Source: Activity 3.3)

Information Produced:

- Integrated citations supporting the compilation and analysis of the M&S conceptual model and collected scenarios

A1.5 PHASE 4 – PERFORM SUPPLEMENTAL VERIFICATION

Activity 4.1 – Determine the Scope of Supplemental Verification Needed

Activity Description: This activity determines the scope of the verification that will be done by the V&V Team to supplement that done by the Developer.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions:

- The Developer has produced documentation of the verification activities that they have performed.
- The Developer has an up-to-date M&S configuration management history.

Task Descriptions:

4.1.1 Obtain the M&S configuration management history.

Information Required:

- M&S configuration management history (Source: Developer)

Information Produced:

- M&S configuration management history

4.1.2 Obtain the Developer's verification products.

Information Required:

- Developer's verification products (Source: Developer)

Information Produced:

- Developer's verification products

4.1.3 Analyze the Developer's verification products with the M&S configuration management history to identify those products that are relevant to the current M&S configuration.

Information Required:

- Developer's verification products (Source: Task 4.1.2)
- M&S configuration management history (Source: Task 4.1.1)

Information Produced:

- Relevant Developer's verification products

4.1.4 Analyze the relevant Developer's verification products, verified and validated M&S conceptual model and acceptability criteria to identify those products that apply to the intended use.

Information Required:

- Relevant Developer's verification products (Source: Task 4.1.3)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable Developer's verification products

- 4.1.5 Analyze the relevant and applicable Developer's verification products, verified and validated M&S conceptual model and acceptability criteria to determine the M&S capabilities and limitations implied by the Developer's verification products.

Information Required:

- Relevant and applicable Developer's verification products (Source: Task 4.1.4)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S capabilities and limitations implied by the Developer's verification products

- 4.1.6 Analyze the relevant and applicable Developer's verification products, acceptability criteria and the M&S capabilities and limitations implied by the Developer's verification products to determine the gaps and inconsistencies in the evidence from the Developer's verification products.

Information Required:

- Relevant and applicable Developer's verification products (Source: Task 4.1.4)
- M&S capabilities and limitations implied by the Developer's verification products (Source: Task 4.1.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Gaps and inconsistencies in the evidence from the Developer's verification products

- 4.1.7 Analyze the M&S capabilities and limitations implied by the Developer's verification products, gaps and inconsistencies in the Developer's verification products and acceptability criteria to estimate the coverage of the Developer's verification products.

Information Required:

- M&S capabilities and limitations implied by the Developer's verification products (Source: Task 4.1.5)
- Gaps and inconsistencies in the evidence from the Developer's verification products (Source: Task 4.1.6)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the Developer's verification products

- 4.1.8 Analyze the gaps and inconsistencies in the Developer's verification products and estimated coverage of the Developer's verification products and the V&V Plan to determine the supplemental verification needs.

Information Required:

- Estimated coverage of the Developer's verification products (Source: Task 4.1.7)
- Gaps and inconsistencies in the evidence from the Developer's verification products (Source: Task 4.1.6)
- V&V Plan (Source: Activity 1.5)

Information Produced:

- Supplemental verification needs

Activity 4.2 – Verify the M&S Design Products

Activity Description: (Blank)

Activity Tailoring Guidance: This activity need not be performed if the supplemental verification needs do not include any needs for verifying the M&S design products (e.g., the developer has already performed adequate verification of the M&S design products).

Activity Notes:

- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.
- All design products can only be analyzed for inconsistencies and cannot be tested because they cannot be executed (i.e., only the M&S executable can be executed).

Activity Assumptions: (Blank)

Task Descriptions:

- 4.2.1 Analyze the supplemental verification needs to determine the needs for verifying the M&S design products.

Information Required:

- Supplemental verification needs (Source: Activity 4.1)

Information Produced:

- M&S design product verification needs

- 4.2.2 Obtain the M&S design products from the Developer.

Information Required:

- M&S design products (Source: Developer)

Information Produced:

- M&S design products

4.2.3 Analyze the M&S design products for the possible existence of computational anomalies.

Information Required:

- M&S design product verification needs (Source: Task 4.2.1)
- M&S design products (Source: Task 4.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Computational anomalies discovered in the M&S design products

4.2.4 Analyze the M&S design products to determine their internal consistency.

Information Required:

- M&S design product verification needs (Source: Task 4.2.1)
- M&S design products (Source: Task 4.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered within the M&S design products

4.2.5 Analyze the M&S design products to determine the consistency between them.

Information Required:

- M&S design product verification needs (Source: Task 4.2.1)
- M&S design products (Source: Task 4.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered between the M&S design products
- Verified M&S design product

4.2.6 Analyze the M&S design products to verify the input functionality.

Information Required:

- M&S design product verification needs (Source: Task 4.2.1)
- M&S design products (Source: Task 4.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the input design

4.2.7 Analyze the M&S design products to verify the output functionality.

Information Required:

- M&S design product verification needs (Source: Task 4.2.1)

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- M&S design products (Source: Task 4.2.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the output design

- 4.2.8 Analyze the inconsistencies discovered during the M&S design product verification to develop an integrated description of the M&S design product inconsistencies.

Information Required:

- Inconsistencies discovered within the M&S design products (Source: Task 4.2.4)
- Inconsistencies discovered between the M&S design products (Source: Task 4.2.5)
- Inconsistencies discovered in the input design (Source: Task 4.2.6)
- Inconsistencies discovered in the output design (Source: Task 4.2.7)

Information Produced:

- Integrated description of the inconsistencies discovered in the M&S design products
- Verified M&S design products

- 4.2.9 Update the requirements traceability matrix with the evidence from design verification.

Information Required:

- Integrated description of the inconsistencies discovered in the M&S design products (Source: Task 4.2.8)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the design verification evidence

Activity 4.3 – Verify the M&S Object Code

Activity Description: In this activity, the V&V Team verifies the M&S object code if needed.

Activity Tailoring Guidance: This activity need not be performed if the supplemental verification needs do not include any needs for verifying the M&S object code (e.g., the Developer has already performed sufficient verification of the M&S object code).

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: All object code products can only be analyzed for inconsistencies and cannot be tested because they cannot be executed (i.e., only the M&S executable can be executed).

Task Descriptions:

- 4.3.1 Analyze the supplemental verification needs to determine the needs for verifying the M&S object code.

Information Required:

- Supplemental verification needs (Source: Activity 4.1)

Information Produced:

- M&S object code verification needs

4.3.2 Obtain the M&S object code from the Developer.

Information Required:

- M&S object code (Source: Developer)

Information Produced:

- M&S object code

4.3.3 Analyze the M&S object code for the possible existence of computational anomalies.

Information Required:

- M&S object code verification needs (Source: Task 4.3.1)
- M&S object code (Source: Task 4.3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Computational anomalies discovered in the M&S object code

4.3.4 Analyze the M&S object code to determine its internal consistency.

Information Required:

- M&S object code verification needs (Source: Task 4.3.1)
- M&S object code (Source: Task 4.3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered within the M&S object code

4.3.5 Analyze the M&S object code to verify its input functionality.

Information Required:

- M&S object code verification needs (Source: Task 4.3.1)
- M&S object code (Source: Task 4.3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the object code input functionality

4.3.6 Analyze the M&S object code to verify its output functionality.

Information Required:

- M&S object code verification needs (Source: Task 4.3.1)

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- M&S object code (Source: Task 4.3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered in the object code output functionality

- 4.3.7 Analyze the verified M&S object code and the verified M&S design products to determine the consistency between them and to produce the verified symbolic code.

Information Required:

- M&S object code verification needs (Source: Task 4.3.1)
- M&S object code (Source: Task 4.3.2)
- Verified M&S design products (Source: Activity 4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered between the verified M&S design products and the M&S object code

- 4.3.8 Analyze the inconsistencies discovered during the M&S object code verification to develop an integrated description of the M&S object code inconsistencies.

Information Required:

- Inconsistencies discovered within the M&S object code (Source: Task 4.3.4)
- Inconsistencies discovered in the object code input functionality (Source: Task 4.3.5)
- Inconsistencies discovered in the object code output functionality (Source: Task 4.3.6)
- Inconsistencies discovered between the verified M&S design products and the M&S object code (Source: Task 4.3.7)

Information Produced:

- Integrated description of the inconsistencies discovered in the M&S object code
- Verified M&S object code

- 4.3.9 Update the requirements traceability matrix with the evidence from object code verification.

Information Required:

- Integrated description of the inconsistencies discovered in the M&S object code (Source: Task 4.3.8)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the M&S object code verification evidence

Activity 4.4 – Verify the M&S Executable

Activity Description: The V&V Team verifies the M&S executable in this activity. Depending upon the available tools and personnel skill, verification of the M&S executable can be done through analysis, testing or both.

Activity Tailoring Guidance:

- This activity need not be performed if the supplemental verification needs do not include any needs for verifying the M&S executable (i.e., the Developer has already performed sufficient verification of the M&S executable).
- This activity can only be performed if the M&S executable is available from the Developer.

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions:

- The only development product that can be reasonably tested is the M&S executable.
- Analysis of the M&S executable is only possible if done with a suitable tool.
- Verification testing is performed as an activity separate from M&S results validation testing.

Task Descriptions:

4.4.1 Analyze the supplemental verification needs to determine the needs for verifying the M&S executable.

Information Required:

- Supplemental verification needs (Source: Activity 4.1)

Information Produced:

- M&S executable verification needs

4.4.2 Obtain the M&S executable from the Developer.

Information Required:

- M&S executable (Source: Developer)

Information Produced:

- M&S executable

4.4.3 Analyze the M&S executable for computational anomalies.

Information Required:

- M&S executable verification needs (Source: Task 4.4.1)
- M&S executable (Source: Task 4.4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Computational anomalies in the M&S executable discovered through analysis

4.4.4 Analyze the M&S executable to determine its internal consistency.

Information Required:

- M&S executable verification needs (Source: Task 4.4.1)

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- M&S executable (Source: Task 4.4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies within the M&S executable discovered through analysis

- 4.4.5 Analyze the M&S executable and the verified M&S object code to determine the consistency between them.

Information Required:

- M&S executable verification needs (Source: Task 4.4.1)
- M&S executable (Source: Task 4.4.2)
- Verification M&S object code (Source: Activity 4.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the M&S executable and the verified M&S object code discovered through analysis

- 4.4.6 Analyze the M&S executable verification needs, the inconsistencies found in the M&S design products and the M&S object code, the inconsistencies found in the M&S executable through analysis and the V&V Plan to develop the M&S executable verification testing plan.

Information Required:

- M&S executable verification needs (Source: Task 4.4.1)
- Inconsistencies found in the M&S design products (Source: Activity 4.2)
- Inconsistencies found in the M&S object code (Source: Activity 4.3)
- Computational anomalies in the M&S executable discovered through analysis (Source: Task 4.4.3)
- Inconsistencies within the M&S executable discovered through analysis (Source: Task 4.4.4)
- Inconsistencies between the M&S executable and the verified M&S object code discovered through analysis (Source: Task 4.4.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S executable verification testing plan

- 4.4.7 Analyze the M&S executable verification testing plan and the verified M&S design products to identify verification test cases and procedures.

Information Required:

- M&S executable verification testing plan (Source: Task 4.4.6)
- Verified M&S design products (Source: Activity 4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S executable verification test cases and procedures

- 4.4.8 Test the M&S executable with the verification test cases and collect the results specified in the M&S executable verification testing plan.

Information Required:

- M&S executable verification testing plan (Source: Task 4.4.6)
- M&S executable verification test cases and procedures (Source: Task 4.4.7)
- M&S executable (Source: Task 4.4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S executable verification testing results

4.4.9 Characterize the conditions under which the M&S executable verification testing was performed.

Information Required:

- M&S executable verification testing plan (Source: Task 4.4.6)
- M&S executable verification test cases and procedures (Source: Task 4.4.7)
- M&S executable (Source: Task 4.4.2)
- M&S executable verification testing results (Source: Task 4.4.8)

Information Produced:

- M&S executable verification testing conditions

4.4.10 Analyze the M&S executable verification testing results for computational anomalies.

Information Required:

- M&S executable verification testing results (Source: Task 4.4.8)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Computational anomalies in the M&S executable discovered through testing

4.4.11 Analyze the M&S executable verification testing results to determine the inconsistencies found in the M&S executable through testing.

Information Required:

- M&S executable verification testing results (Source: Task 4.4.8)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies in the M&S executable discovered through testing

4.4.12 Analyze the M&S executable verification testing results to identify interoperability and compatibility problems.

Information Required:

- M&S executable verification testing results (Source: Task 4.4.8)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Interoperability and compatibility problems discovered through testing

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4.4.13 Analyze the computational anomalies discovered during the M&S executable verification to develop an integrated description of the M&S executable computational anomalies.

Information Required:

- Computational anomalies in the M&S executable discovered through analysis (Source: Task 4.4.3)
- Computational anomalies in the M&S executable discovered through testing (Source: Task 4.4.10)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the computational anomalies in the M&S executable

4.4.14 Analyze the inconsistencies and interoperability and compatibility problems discovered during the M&S executable verification to develop an integrated description of the M&S executable inconsistencies.

Information Required:

- Inconsistencies within the M&S executable discovered through analysis (Source: Task 4.4.4)
- Inconsistencies between the M&S executable and the verified M&S object code discovered through analysis (Source: Task 4.4.5)
- Inconsistencies in the M&S executable discovered through testing (Source: Task 4.4.11)
- Interoperability and compatibility problems discovered through testing (Source: Task 4.4.12)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the inconsistencies discovered in the M&S executable
- Verified M&S executable

4.4.15 Update the requirements traceability matrix with the evidence from M&S executable verification.

Information Required:

- Integrated description of the inconsistencies discovered in the M&S executable (Source: Task 4.4.14)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the M&S executable verification evidence

Activity 4.5 – Verify the Development Products for Standards Compliance

Activity Description: The V&V Team verifies the compliance of all of the development products against the standards that have been chosen to guide the development process.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: The User specifies any standards that have been chosen to guide the development process.

Task Descriptions:

4.5.1 Obtain the results of the Developer’s standards compliance verification efforts.

Information Required:

- Standards compliance verification results from the Developer (Source: Developer)

Information Produced

- Standards compliance verification results

4.5.2 Analyze the supplemental verification needs and the standards compliance verification results from the Developer to determine the needs for standards compliance verification.

Information Required:

- Supplemental verification needs (Source: Activity 4.1)
- Standards compliance verification results from the Developer (Source: Activity 4.1)

Information Produced:

- Standards compliance verification needs

4.5.3 Analyze the standards compliance verification needs and the M&S requirements to determine the applicable standards needs.

Information Required:

- Standards compliance verification needs (Source: Task 4.5.2)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Applicable standards needs

4.5.4 Obtain the standards defined by the applicable standards needs from the standards organizations.

Information Required:

- Applicable standards needs (Source: Task 4.5.3)
- Library of standards (Source: Standards organizations)

Information Produced:

- Applicable standards

4.5.5 Analyze the M&S design products against the applicable standards to determine their compliance.

Information Required:

- Standards compliance verification needs (Source: Task 4.5.2)
- Validated and verified M&S conceptual model (Source: Activity 3.2)
- Verified and validated collected scenarios (Source: Activity 3.3)
- Verified M&S design products (Source: Activity 4.2)
- Verified M&S Object Code (Source: Activity 4.3)

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- Verified M&S Executable (Source: Activity 4.4)
- Applicable standards (Source: Task 4.5.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Compliance of the M&S design products with the applicable standards

4.5.6 Analyze the M&S object code against the applicable standards to determine its compliance.

Information Required:

- Standards compliance verification needs (Source: Task 4.5.2)
- Verified M&S object code (Source: Activity 4.3)
- Applicable standards (Source: Task 4.5.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Compliance of the M&S object code with the applicable standards

4.5.7 Test the M&S executable against the applicable standards to determine its compliance.

Information Required:

- Standards compliance verification needs (Source: Task 4.5.2)
- Verified M&S executable (Source: Activity 4.4)
- Applicable standards (Source: Task 4.5.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Compliance of the M&S executable with the applicable standards

4.5.8 Analyze the compliance of the M&S design products, M&S object code, and M&S executable with the applicable standards to develop an integrated picture of M&S development product compliance with applicable standards.

Information Required:

- Compliance of the M&S design products with the applicable standards (Source: Task 4.5.5)
- Compliance of the M&S object code with the applicable standards (Source: Task 4.5.6)
- Compliance of the M&S executable with the applicable standards (Source: Task 4.5.7)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S development product compliance with applicable standards

4.5.9 Update the requirements traceability matrix with the evidence from verification against applicable standards.

Information Required:

- Integrated description of the M&S development product compliance with applicable standards (Source: Task 4.5.8)

- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the standards verification evidence

Activity 4.6 – Integrate the Supplemental Verification Evidence

Activity Description: This activity collects and integrates the evidence produced by the supplemental verification activities.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: The M&S configuration management history has been obtained in a previous activity.

Task Descriptions:

- 4.6.1 Analyze the Developer’s verification products and the M&S configuration management history to produce a description of the computational anomalies discovered by the Developer’s verification.

Information Required:

- Developer’s verification products (Source: Activity 4.1)
- M&S configuration management history (Source: Activity 4.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the computational anomalies discovered by the Developer’s verification

- 4.6.2 Analyze the computational anomalies discovered by the supplemental verification of the design, object and executable products and the Developer’s verification products to produce an integrated description of the computational anomalies discovered by the supplemental verification.

Information Required:

- Description of the computational anomalies discovered by the Developer’s verification (Source: Task 4.6.1)
- Computational anomalies discovered in the M&S design products (Source: Activity 4.2)
- Computational anomalies discovered in the M&S object code (Source: Activity 4.3)
- Integrated description of the computational anomalies discovered in the M&S executable (Source: Activity 4.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the computational anomalies discovered in the M&S development products

- 4.6.3 Analyze the Developer’s verification products and the M&S configuration management history to produce a description of the inconsistencies discovered by the Developer’s verification.

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Information Required:

- Developer's verification products (Source: Activity 4.1)
- M&S configuration management history (Source: Activity 4.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered by the Developer's verification

- 4.6.4 Analyze the inconsistencies found in the M&S design products, symbolic code and executable to produce an integrated description of the inconsistencies in the M&S development products.

Information Required:

- Inconsistencies discovered by the Developer's verification (Source: Task 4.6.3)
- Inconsistencies discovered within the M&S design products (Source: Activity 4.2)
- Inconsistencies discovered between the M&S design products (Source: Activity 4.2)
- Inconsistencies discovered within the M&S object code (Source: Activity 4.3)
- Inconsistencies discovered between the verified M&S design products and the M&S object code (Source: Activity 4.3)
- Inconsistencies discovered within the M&S executable (Source: Activity 4.4)
- Inconsistencies discovered between the verified M&S symbolic code and the M&S executable (Source: Activity 4.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the inconsistencies discovered in the M&S development products

- 4.6.5 Prepare citations of the verification documentation and resolve any citation problems.

Information Required:

- M&S configuration management history (Source: Activity 4.1)
- Developer's verification products (Source: Activity 4.1)
- M&S design products (Source: Activity 4.2)
- M&S object code (Source: Activity 4.3)
- M&S executable (Source: Activity 4.4)
- Standards compliance verification results from the Developer (Source: Activity 4.5)

Information Produced:

- Integrated citations supporting the development of the verification evidence

A1.6 PHASE 5 – APPLY THE VERIFICATION PRODUCTS TO VALIDATION

Activity 5.1 – Determine the Effects of Developmental Product Inconsistencies

Activity Description: This activity verifies the consistency of the development products against the verified and validated M&S conceptual model.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions:

- An M&S conceptual model exists and that it has been validated against the acceptability criteria.
- None of the inconsistencies discovered through the verification of the development products have been corrected and therefore their effects still exist in the M&S executable.

Task Descriptions:

5.1.1 Analyze the supplemental verification needs to determine the needs for verifying against the M&S conceptual model.

Information Required:

- Supplemental verification needs (Source: Activity 4.1)

Information Produced:

- Needs for verifying against the M&S conceptual model

5.1.2 Analyze the computational anomalies discovered in the M&S conceptual model and the combined verification products with the M&S conceptual model to determine the possible effects of computational anomalies discovered.

Information Required:

- Needs for verifying against the M&S conceptual model (Source: Task 5.1.1)
- Computational anomalies discovered in the M&S conceptual model (Source: Activity 3.1)
- Integrated description of the computational anomalies discovered in the M&S development products (Source: Activity 4.6)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Possible effects of computational anomalies upon the M&S capabilities and limitations

5.1.3 Analyze the inconsistencies discovered in the M&S development products with the M&S conceptual model to determine the possible effects of those inconsistencies.

Information Required:

- Needs for verifying against the M&S conceptual model (Source: Task 5.1.1)

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- Integrated description of the inconsistencies discovered in the M&S conceptual model (Source: Activity 3.1)
- Integrated description of the inconsistencies discovered in the combined verification effort (Source: Activity 4.6)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Possible effects of inconsistencies within the M&S development products upon the M&S capabilities and limitations

- 5.1.4 Analyze the verified M&S design products and the M&S conceptual model to identify any inconsistencies between them.

Information Required:

- Needs for verifying against the M&S conceptual model (Source: Task 5.1.1)
- Verified M&S design products (Source: Activity 4.2)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies discovered between the M&S conceptual model and the design products
- Verified and validated M&S design products

- 5.1.5 Analyze the inconsistencies discovered between the M&S conceptual model and the M&S development products with the M&S conceptual model to determine the possible effects of those inconsistencies.

Information Required:

- Needs for verifying against the M&S conceptual model (Source: Task 5.1.1)
- Inconsistencies discovered between the M&S conceptual model and the design products (Source: Task 5.1.4)
- Integrated description of the inconsistencies discovered in the M&S development products (Source: Activity 4.6)
- Verified and validated M&S conceptual model (Source: Activity 3.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Possible effects of inconsistencies between the M&S conceptual model and the development products upon the M&S capabilities and limitations

- 5.1.6 Analyze the possible effects of computational anomalies and development product inconsistencies upon the M&S capabilities and limitations to determine the capabilities and limitations of the verified M&S executable.

Information Required:

- Possible effects of computational anomalies upon the M&S capabilities and limitations (Source: Task 5.1.2)
- Possible effects of inconsistencies within the M&S development products upon the M&S capabilities and limitations (Source: Task 5.1.3)

- Possible effects of inconsistencies between the M&S conceptual model and the development products upon the M&S capabilities and limitations (Source: Task 5.1.5)

Information Produced:

- Description of the capabilities and limitations of the verified M&S executable

Activity 5.2 – Evaluate M&S Validity from the Verification Products

Activity Description: This activity compares the description of M&S capabilities and limitations of the verified M&S executable with the acceptability criteria to identify the needed capabilities that the M&S executable could support and the limitations implied by the development product verification evidence, and estimate the coverage and uncertainties in the development product verification evidence.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

- 5.2.1 Analyze the description of the capabilities and limitations of the verified M&S executable and the acceptability criteria that define the required functionality to determine the functionality needs that are met, identify those criteria that are not met, and identify those criteria for which insufficient information is available.

Information Required:

- Description of the capabilities and limitations of the verified M&S executable (Source: Activity 5.1)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria that define the required functionality that the verified M&S executable meets
- Acceptability criteria that define the required functionality that the verified M&S executable does not meet
- Acceptability criteria that define the required functionality for which insufficient information is available from the verified M&S executable

- 5.2.2 Analyze the description of the capabilities and limitations of the verified M&S executable and the acceptability criteria that define the required quality to determine the quality needs that are met, identify those criteria that are not met, and identify those criteria for which insufficient information is available.

Information Required:

- Description of the capabilities and limitations of the verified M&S executable (Source: Activity 5.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

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Information Produced:

- Acceptability criteria that define the required quality that the verified M&S executable meets
- Acceptability criteria that define the required quality that the verified M&S executable does not meet
- Acceptability criteria that define the required quality for which insufficient information is available from the verified M&S executable

- 5.2.3 Analyze the acceptability criteria that the M&S executable meets and the M&S conceptual model to determine the needed M&S capabilities that the M&S executable could support.

Information Required:

- Acceptability criteria that define the required functionality that the verified M&S executable meets (Source: Task 5.3.1)
- Acceptability criteria that define the required quality that the verified M&S executable meets (Source: Task 5.3.2)
- Verified and validated M&S conceptual model (Source: Activity 3.1)

Information Produced:

- Needed M&S capabilities that the M&S executable could support

- 5.2.4 Analyze the acceptability criteria that the M&S executable does not meet and the M&S conceptual model to determine the M&S limitations implied by the M&S executable verification.

Information Required:

- Acceptability criteria that define the required functionality that the verified M&S executable does not meet (Source: Task 5.2.1)
- Acceptability criteria that define the required quality that the verified M&S executable does not meet (Source: Task 5.2.2)
- Verified and validated M&S conceptual model (Source: Activity 3.1)

Information Produced:

- M&S limitations implied by the development product verification evidence
- Verified and validated M&S executable

- 5.2.5 Analyze the acceptability criteria for which insufficient information is available to determine the information gaps in the evidence from the development product verification.

Information Required:

- Acceptability criteria that define the required functionality for which insufficient information is available from the verified M&S executable (Source: Task 5.2.1)
- Acceptability criteria that define the required quality for which insufficient information is available from the verified M&S executable (Source: Task 5.2.2)

Information Produced:

- Information gaps in the development product verification evidence

- 5.2.6 Analyze the M&S capabilities, limitations and information gaps implied by the development product verification evidence and the acceptability criteria to estimate the coverage of the development product verification evidence.

Information Required:

- Needed M&S capabilities that the M&S executable could support (Source: Task 5.2.3)
- M&S limitations implied by the development product verification evidence (Source: Task 5.2.4)
- Information gaps in the development product verification evidence (Source: Task 5.2.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the development product verification evidence

- 5.2.7 Analyze the M&S capabilities and limitations implied by the development product verification evidence, the information gaps in the development product verification evidence and the estimated coverage of the development product verification evidence to estimate the uncertainties in the development product verification evidence.

Information Required:

- Needed M&S capabilities that the M&S executable could support (Source: Task 5.2.3)
- M&S limitations implied by the development product verification evidence (Source: Task 5.2.4)
- Information gaps in the development product verification evidence (Source: Task 5.2.5)
- Estimated coverage of the development product verification evidence (Source: Task 5.2.6)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the development product verification evidence

- 5.2.8 Update the requirements traceability matrix with the development product verification evidence.

Information Required:

- Needed M&S capabilities that the M&S executable could support (Source: Task 5.2.3)
- M&S limitations implied by the development product verification evidence (Source: Task 5.2.4)
- Information gaps in the development product verification evidence (Source: Task 5.2.5)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the development product verification evidence

Activity 5.3 – Employ the Verification Evidence

Activity Description: This activity employs the development product verification evidence to identify factors that may constrain use and candidate output sampling areas.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

5.3.1 Analyze the M&S limitations implied by the development product verification evidence, the information gaps in the development product verification evidence and the acceptability criteria to identify the factors that may constrain use.

Information Required:

- M&S limitations implied by the development product verification evidence (Source: Activity 5.2)
- Information gaps in the development product verification evidence (Source: Activity 5.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the development product verification evidence

5.3.2 Analyze the M&S capabilities and limitations implied by the development product verification evidence, the information gaps in the development product verification evidence and the acceptability criteria to identify the candidate output sampling areas suggested by the development product verification evidence.

Information Required:

- Needed M&S capabilities that the M&S executable could support (Source: Activity 5.2)
- M&S limitations implied by the development product verification evidence (Source: Activity 5.2)
- Information gaps in the development product verification evidence (Source: Activity 5.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Candidate output sampling areas implied by the development product verification evidence

A1.7 PHASE 6 – VERIFY AND VALIDATE THE DATA AND KNOWLEDGE SETS

Activity 6.1 – Identify the Data and Knowledge Sources and Their Pedigrees

Activity Description: All M&S consist of the executable or computational models and the data or knowledge that those models require. In this activity, the V&V practitioner identifies the different data and knowledge sets that an M&S needs, the available sources of those data sets and the pedigrees of those sources.

Activity Tailoring Guidance: (Blank)

Activity Notes: This activity has tasks for collecting the descriptions of the data and knowledge and their sources (i.e., meta-data) because these tasks take time and the required information is commonly not easily available in a single place.

Activity Assumptions: (Blank)

Task Descriptions:

6.1.1 Obtain the M&S data model.

Information Required:

- M&S data model (Source: Developer)

Information Produced:

- M&S data model

6.1.2 Analyze the M&S data model to determine what data and knowledge sets the M&S needs to support the intended use.

Information Required:

- M&S data model (Source: Task 6.1.1)
- Statement of intended use (Source: Preceding accreditation activity)

Information Produced:

- Data and knowledge sets needed to support the intended use

6.1.3 Obtain the available data and knowledge sets needed to support the intended use.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: External data sources)

Information Produced:

- Available data and knowledge sets

6.1.4 Obtain descriptions of the data and knowledge sets available to support the intended use.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: External data sources)

Information Produced:

- Descriptions of the data and knowledge sets

6.1.5 Obtain the V&V history for the available data and knowledge sets.

Information Required:

- V&V history for the available data and knowledge sets (Source: External data sources)

Information Produced:

- V&V history for the available data and knowledge sets

6.1.6 Analyze the descriptions of the available data and knowledge sets to identify their sources if possible.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Task 6.1.4)

Information Produced:

- Possible sources of the available data and knowledge sets

6.1.7 Obtain descriptions of the identified sources for the available data and knowledge sets.

Information Required:

- Descriptions of the data and knowledge set sources (Source: External data sources)

Information Produced:

- Descriptions of the data and knowledge set sources

6.1.8 Analyze the descriptions of the data and knowledge set sources to identify the pedigrees of those sources.

Information Required:

- Descriptions of the data and knowledge set sources (Source: Task 6.1.7)

Information Produced:

- Data and knowledge set source pedigrees

6.1.9 Analyze the descriptions of the available data and knowledge sets and their sources to identify the data and knowledge sets for which the sources cannot be identified.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Task 6.1.4)
- Descriptions of the data and knowledge set sources (Source: Task 6.1.7)

Information Produced:

- Data and knowledge set sources that cannot be identified

6.1.10 Analyze the descriptions of the available data and knowledge sets and their sources to identify the data and knowledge sets that come from sources with no pedigrees.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Task 6.1.4)
- Descriptions of the data and knowledge set sources (Source: Task 6.1.7)

Information Produced:

- Data and knowledge set sources with no pedigrees

6.1.11 Analyze the M&S data model and the available data and knowledge set descriptions to identify the data or knowledge sets needed to support the intended use that are not available.

Information Required:

- M&S data model (Source: Task 6.1.1)
- Descriptions of the data and knowledge sets available to support the intended use (Source: Task 6.1.4)

Information Produced:

- Unavailable data and knowledge sets needed to support the intended use

6.1.12 Prepare the source reference list of data and knowledge set pedigrees and resolve any citation problems.

Information Required:

- M&S data model (Source: Task 6.1.1)
- Available data and knowledge sets needed to support the intended use (Source: Task 6.1.3)
- Descriptions of the data and knowledge sets available to support the intended use (Source: Task 6.1.4)
- V&V history for the available data and knowledge set (Source: Task 6.1.5)
- Descriptions of the data and knowledge set sources (Source: Task 6.1.7)

Information Produced:

- Data and knowledge set pedigree citation list

Activity 6.2 – Verify the Data and Knowledge Sets

Activity Description: In this activity, the V&V practitioner verifies the internal consistency of the data and knowledge sets with which the M&S will be accepted for the intended use. Data and knowledge sets can be very large so the V&V practitioner may need to take advantage of the numerous tools available for checking data and knowledge set consistency. These tools may be applicable to many different types of data sets from disparate sources or they may be specific for particular data sets from individual sources. The knowledge-based systems community has produced several tools to check the consistency of knowledge bases. These are usually specific for the knowledge representation used.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

6.2.1 Analyze the data and knowledge sets needed to support the intended use for consistency within sets and identify any inconsistencies that exist.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: Activity 6.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies within the available data and knowledge sets

6.2.2 Analyze the data and knowledge sets needed to support the intended use for consistency between sets and identify any inconsistencies that exist.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: Task 6.2.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the available data and knowledge sets

6.2.3 Analyze the data and knowledge sets needed to support the intended use for consistency with the M&S data model and identify any inconsistencies that exist.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: Task 6.2.1)
- M&S data model (Source: Activity 6.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the available data and knowledge sets and the M&S data model

6.2.4 Analyze the M&S design products to identify the data transformations used.

Information Required:

- Verified M&S design products (Source: Activity 4.2)

Information Produced:

- Data transformations used in the M&S

6.2.5 Analyze the data and knowledge sets needed to support the intended use and the data transformations used to verify the correctness of those transformations with that data.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: Task 6.2.1)
- Data transformations used in the M&S (Source: Task 6.2.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Inconsistencies between the data and knowledge sets and the data transformations used

- 6.2.6 Analyze the inconsistencies discovered during the data and knowledge set verification to develop an integrated description of the data and knowledge set inconsistencies.

Information Required:

- Inconsistencies within the available data and knowledge sets (Source: Task 6.2.1)
- Inconsistencies between the available data and knowledge sets (Source: Task 6.2.2)
- Inconsistencies between the available data and knowledge sets and the M&S data model (Source: Task 6.2.3)
- Inconsistencies between the data and knowledge sets and the data transformations used (Source: Task 6.2.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the data and knowledge set inconsistencies

Activity 6.3 – Validate Data and Knowledge Sets Where Needed

Activity Description: In this activity, the V&V practitioner validates the data and knowledge sets with which the M&S will be accepted for the intended use. The V&V practitioner should take advantage of the pedigree information associated with the data and knowledge sets to reduce the validation burden and validate those sets only where sufficient pedigree information is not available.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- Gaps and inconsistencies in both the data itself and the validation coverage of the data. These are different but related concepts.
- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

- 6.3.1 Analyze the sensitivity of the M&S to the data and knowledge sets to determine the importance of the data and knowledge coverage.

Information Required:

- Available data and knowledge sets needed to support the intended use (Source: Activity 6.1)
- V&V Plan (Source: Activity 1.6)

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Information Produced:

- Relative importance of data and knowledge sets for the intended use

- 6.3.2 Analyze the descriptions of the data and knowledge sets available to support the intended use, their pedigrees, their relative importance and the integrated description of the data, and knowledge set inconsistencies to identify only the data and knowledge sets that need to be validated for the current M&S configuration.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Activity 6.1)
- Data and knowledge set source pedigrees (Source: Activity 6.1)
- Relative importance of data and knowledge sets for the intended use (Source: Task 6.3.1)
- Integrated description of the data and knowledge set inconsistencies (Source: Activity 6.2)

Information Produced:

- Data and knowledge sets that need to be validated for the current M&S configuration

- 6.3.3 Analyze the acceptability criteria and M&S design products to determine the acceptability criteria that define the required functionality and quality of the data and knowledge sets and the acceptability criteria upon which the data and knowledge sets have no impact.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Verified M&S design products (Source: Activity 4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria that define the required functionality and quality of the data and knowledge sets

- 6.3.4 Analyze the data and knowledge sets that need to be validated against the acceptability criteria that define the functionality needs to determine the functionality needs that are met, identify those criteria that are not met, and identify those criteria for which insufficient information is available.

Information Required:

- Data and knowledge sets that need to be validated for the current M&S configuration (Source: Task 6.3.2)
- Acceptability criteria that define the required functionality of the data and knowledge sets (Source: Task 6.3.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria that define the required functionality that the data and knowledge sets meet

- 6.3.5 Analyze the data and knowledge sets that need to be validated, the acceptability criteria that define the quality needs and the M&S referent to determine the quality needs that are met, identify those criteria that are not met and identify those criteria for which insufficient information is available.

Information Required:

- Data and knowledge sets that need to be validated for the current M&S configuration and intended use (Source: Task 6.3.2)
- Acceptability criteria that define the required quality of the data and knowledge sets (Source: Task 6.3.3)
- Validation Referent (Source: Preceding accreditation activity)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Acceptability criteria that define the required quality that the data and knowledge sets meet

- 6.3.6 Analyze the acceptability criteria that the data and knowledge sets meet and the M&S design products to determine the M&S capabilities that valid data and knowledge sets support.

Information Required:

- Verified M&S design products (Source: Activity 4.2)
- Acceptability criteria that define the required functionality that the data and knowledge sets meet (Source: Task 6.3.4)
- Acceptability criteria that define the required quality that the data and knowledge sets meet (Source: Task 6.3.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S capabilities that the valid data and knowledge sets can support

- 6.3.7 Analyze the acceptability criteria that the data and knowledge sets do not meet and the M&S design products to determine the M&S limitations implied by the data and knowledge sets.

Information Required:

- Verified M&S design products (Source: Activity 4.2)
- Acceptability criteria that define the required functionality that the data and knowledge sets do not meet (Source: Task 6.3.4)
- Acceptability criteria that define the required quality that the data and knowledge sets do not meet (Source: Task 6.3.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- M&S limitations implied by the data and knowledge set validation

- 6.3.8 Analyze the acceptability criteria for which insufficient information is available from the data and knowledge set validation and the M&S design products to determine the information gaps implied by those sets.

Information Required:

- Verified M&S design products (Source: Activity 4.2)
- Acceptability criteria upon which the data and knowledge sets have no impact (Source: Task 6.3.3)
- Acceptability criteria that define the required functionality for which insufficient information is available (Source: Task 6.3.4)

- Acceptability criteria that define the required quality for which insufficient information is available (Source: Task 6.3.5)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Information gaps implied by the data and knowledge set validation

Activity 6.4 – Integrate and Employ the Data and Knowledge V&V Evidence

Activity Description: In this activity, the V&V practitioner integrates the evidence gained from the prior data and knowledge V&V activities into an integrated description of the M&S’s capabilities and limitations.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

- 6.4.1 Analyze the descriptions of the pedigreed data and knowledge sets, the integrated descriptions of the data and knowledge set inconsistencies, the M&S capabilities that the data and knowledge sets support to produce an integrated description of the M&S capabilities that the data and knowledge sets can support.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Activity 6.1)
- Integrated description of the data and knowledge set inconsistencies (Source: Activity 6.2)
- M&S capabilities that the valid data and knowledge sets can support (Source: Activity 6.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities that the data and knowledge sets can support

- 6.4.2 Analyze the descriptions of the pedigreed data and knowledge sets, the integrated description of the data and knowledge set inconsistencies, the M&S limitations implied by the data and knowledge set validation to produce an integrated description of the M&S limitations implied the data and knowledge sets.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Activity 6.1)
- Integrated description of the data and knowledge set inconsistencies (Source: Activity 6.2)
- M&S limitations implied by the data and knowledge set validation (Source: Activity 6.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S limitations implied by the data and knowledge V&V

- 6.4.3 Analyze the descriptions of the pedigreed data and knowledge sets, the M&S design products, the acceptability criteria, the integrated descriptions of the data, and knowledge set inconsistencies, the information gaps implied by the data and knowledge set validation to produce an integrated description of the information gaps implied by the data and knowledge sets.

Information Required:

- Descriptions of the data and knowledge sets available to support the intended use (Source: Activity 6.1)
- M&S design products (Source: Activity 4.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Integrated description of the data and knowledge set inconsistencies (Source: Activity 6.2)
- Information gaps implied by the data and knowledge set validation (Source: Activity 6.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the information gaps implied by the data and knowledge set V&V

- 6.4.4 Analyze the acceptability criteria integrated description of the M&S capabilities that the data and knowledge can support, the integrated description of the limitations implied by the data and knowledge sets and the information gaps implied by the data and knowledge set validation to estimate the coverage of the data and knowledge set V&V evidence.

Information Required:

- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- Integrated description of the M&S capabilities that the data and knowledge sets can support (Source: Task 6.4.1)
- Integrated description of the M&S limitations implied by the data and knowledge V&V (Source: Task 6.4.2)
- Integrated description of the data and knowledge set inconsistencies (Source: Activity 6.2)
- Integrated description of the information gaps implied by the data and knowledge V&V (Source: Task 6.4.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the data and knowledge set V&V evidence

- 6.4.5 Analyze the integrated description of the M&S capabilities that the data and knowledge sets can support, the integrated description of the M&S limitations implied by the data and knowledge sets and the estimated coverage of the data and knowledge set V&V evidence to estimate the uncertainties in the data and knowledge set V&V evidence.

Information Required:

- Integrated description of the M&S capabilities that the data and knowledge sets can support (Source: Task 6.4.1)

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- Integrated description of the M&S limitations implied by the data and knowledge set V&V (Source: Task 6.4.2)
- Estimated coverage of the data and knowledge set V&V evidence (Source: Task 6.4.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the data and knowledge set V&V evidence

- 6.4.6 Analyze the integrated description of the M&S limitations implied by the data and knowledge set V&V, the integrated description of the information gaps implied by the data and knowledge set V&V, and the acceptability criteria to identify the factors that may constrain use.

Information Required:

- Integrated description of the M&S limitations implied by the data and knowledge V&V (Source: Task 6.4.2)
- Integrated description of the information gaps implied by the data and knowledge set V&V (Source: Task 6.4.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the data and knowledge set V&V

- 6.4.7 Analyze the integrated description of the M&S limitations implied by the data and knowledge set V&V, the integrated description of the information gaps implied by the data and knowledge set V&V and the acceptability criteria to identify the candidate output sampling areas implied by the data and knowledge set V&V.

Information Required:

- Integrated description of the M&S limitations implied by the data and knowledge V&V (Source: Task 6.4.2)
- Integrated description of the information gaps implied by the data and knowledge set V&V (Source: Task 6.4.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Candidate output sampling areas implied by the data and knowledge set V&V

- 6.4.8 Update the requirements traceability matrix with the data and knowledge set V&V evidence.

Information Required:

- Integrated description of the M&S capabilities that the data and knowledge sets can support (Source: Task 6.4.1)
- Integrated description of the M&S limitations implied by the data and knowledge V&V (Source: Task 6.4.2)

- Integrated description of the information gaps implied by the data and knowledge set V&V (Source: Task 6.4.3)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the data and knowledge set V&V evidence

A1.8 PHASE 7 – VALIDATE THE M&S RESULTS

Activity 7.1 – Leverage the Developer Test Results for Results Validation

Activity Description: In this activity, the V&V practitioner uses the Developer’s test results to tailor the results validation effort.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- Again, even though the Developer’s test plan and test results are input to this activity, it contains a task for collecting that information because it is seldom presented to the V&V practitioner without any action. Often, the V&V practitioner must make several requests, sometimes through official channels, follow-up on those requests and ensure that the information that is delivered is complete and current. Unlike the configuration management documentation, test results can be managed by several individuals.
- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

7.1.1 Obtain the test plan from the Developer.

Information Required

- Developer’s test plan (Source: Developer)

Information Produced:

- Developer’s test plan

7.1.2 Obtain the testing results from the Developer.

Information Required

- Developer’s testing results (Source: Developer)

Information Produced:

- Developer’s testing results

7.1.3 Obtain the M&S configuration management history from the Developer.

Information Required

- M&S configuration management history (Source: Developer)

Information Produced:

- M&S configuration management history

- 7.1.4 Analyze the Developer testing results and test plan and the M&S configuration management history to identify those test results that are relevant to the current M&S configuration.

Information Required:

- Developer's test plan (Source: Task 7.1.1)
- Developer's testing results (Source: Task 7.1.2)
- M&S configuration management history (Source: Task 7.1.3)

Information Produced:

- Relevant Developer's testing results

- 7.1.5 Analyze the relevant Developer testing results and the acceptability criteria to identify the Relevant and applicable Developer test results.

Information Required:

- Relevant Developer's testing results (Source: Task 7.1.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- Relevant and applicable Developer's testing results

- 7.1.6 Analyze the Relevant and applicable Developer testing results and the acceptability criteria to determine the capabilities and limitations of the current M&S configuration.

Information Required:

- Applicable Developer's testing results (Source: Task 7.1.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the M&S capabilities and limitations from the Developer's testing

- 7.1.7 Analyze the M&S capabilities and limitations from the Developer's testing and the acceptability criteria to identify any gaps and inconsistencies that may exist in those results.

Information Required:

- Description of the M&S capabilities and limitations from the Developer's testing (Source: Task 7.1.6)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the gaps and inconsistencies in the Developer's testing results

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- 7.1.8 Analyze the description of M&S capabilities and limitations from the Developer’s testing and the description of the gaps and inconsistencies in the Developer’s testing results to estimate the coverage of the Developer’s testing.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s testing (Source: Task 7.1.6)
- Description of the gaps and inconsistencies in the Developer’s testing results (Source: Task 7.1.7)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the Developer’s testing results

- 7.1.9 Analyze the description of the M&S capabilities and limitations from the Developer’s testing and the estimated coverage of the Developer’s testing to estimate the uncertainties in the Developer’s testing.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s testing (Source: Task 7.1.6)
- Estimated coverage of the Developer’s testing (Source: Task 7.1.8)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the Developer’s testing results

- 7.1.10 Analyze the description of the M&S capabilities and limitations from the Developer’s testing, the description of the gaps and inconsistencies in the Developer’s testing results, the estimated coverage of, and uncertainties in, the Developer’s testing results and the acceptability criteria to identify candidate output sampling areas.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s testing (Source: Task 7.1.6)
- Description of the gaps and inconsistencies in the Developer’s testing results (Source: Task 7.1.7)
- Estimated coverage of the Developer’s testing results (Source: Task 7.1.8)
- Estimated uncertainties in the Developer’s testing results (Source: Task 7.1.9)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Candidate output sampling areas suggested by the Developer’s testing

Activity 7.2 – Plan for Results Validation

Activity Description: In this activity, the V&V practitioner plans the results validation effort. This can involve applying design of experiments techniques to build the test cases used to sample the M&S’s output.

Activity Tailoring Guidance: (Blank)

Activity Notes:

- This planning activity requires solving the problem of describing the planning process in a way general enough to admit a number of techniques, including SMEs.
- Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)**Task Descriptions:**

7.2.1 Obtain the M&S user documentation from the Developer.

Information Required:

- M&S user documentation (Source: Developer)

Information Produced:

- M&S user documentation

7.2.2 Analyze the candidate output sampling areas from the prior V&V activities and the Developer's testing to produce an integrated set of output sampling areas.

Information Required:

- Candidate output sampling areas suggested by the historical evidence (Source: Activity 2.4)
- Candidate output sampling areas implied by the scenario and M&S conceptual model V&V (Source: Activity 3.4)
- Candidate output sampling areas implied by the development product verification evidence (Source: Activity 5.3)
- Candidate output sampling areas implied by the data and knowledge set V&V (Source: Activity 6.4)
- Candidate output sampling areas suggested by the Developer's testing (Source: Activity 7.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated set of output sampling areas

7.2.3 Analyze the integrated set of output sampling areas and the acceptability criteria to identify the M&S capabilities and limitations that will be tested.

Information Required:

- Integrated set of output sampling areas (Source: Task 7.2.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)

Information Produced:

- M&S capabilities and limitations that will be tested

7.2.4 Analyze the M&S capabilities and limitations that will be tested, verified and validated collected scenarios and the acceptability criteria to determine test scenarios that adequately represent the intended use.

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Information Required:

- M&S capabilities and limitations that will be tested (Source: Task 7.2.3)
- Verified and validated collected scenarios (Source: Activity 3.3)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Test scenarios that represent the intended use

7.2.5 Analyze the M&S user documentation, integrated set of output sampling areas, M&S capabilities that will be tested and test scenarios that represent the intended use to design the test cases for results validation.

Information Required:

- M&S user documentation (Source: Task 7.2.1)
- Integrated set of output sampling areas (Source: Task 7.2.2)
- M&S capabilities and limitations that will be tested (Source: Task 7.2.3)
- Test scenarios that represent the intended use (Source: Task 7.2.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Test cases for results validation testing

7.2.6 Analyze the M&S user documentation, test scenarios that represent the intended use, the test cases for results validation and the M&S design products to design the test procedures for results validation.

Information Required:

- M&S user documentation (Source: Task 7.2.1)
- Test scenarios that represent the intended use (Source: Task 7.2.4)
- Test cases for results validation (Source: Task 7.2.5)
- Verified M&S design products (Source: Activity 4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Test procedures for results validation testing

7.2.7 Prepare the results validation test plan.

Information Required:

- Integrated set of output sampling areas (Source: Task 7.2.2)
- M&S capabilities and limitations that will be tested (Source: Task 7.2.3)
- Test scenarios that represent the intended use (Source: Task 7.2.4)
- Test cases for results validation testing (Source: Task 7.2.5)
- Test procedures for results validation testing (Source: Task 7.2.6)

Information Produced:

- Results validation test plan

Activity 7.3 – Collect M&S Output for Results Validation

Activity Description: In this activity, the V&V practitioner executes the results validation test cases and collects the output needed for results validation.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

7.3.1 Test the M&S according to the results validation plan.

Information Required:

- Results validation test plan (Source: Activity 7.2)

Information Produced:

- M&S output from V&V testing

7.3.2 Obtain the M&S output from the T&E testing.

Information Required:

- M&S output from T&E testing (Source: T&E Team)

Information Produced:

- M&S output from T&E testing

7.3.3 Obtain the conditions under which the T&E testing was performed.

Information Required:

- M&S T&E testing conditions (Source: T&E Team)

Information Produced:

- M&S T&E testing conditions

7.3.4 Characterize the conditions under which the M&S results were collected.

Information Required:

- Results validation test plan (Source: Activity 7.2)
- M&S output from V&V testing (Source: Task 7.3.1)

Information Produced:

- M&S validation testing conditions

7.3.5 Analyze the output produced by the results validation testing and the validated M&S conceptual model to determine the M&S capabilities and limitations implied by that output.

Information Required:

- M&S output from V&V testing (Source: Task 7.3.1)
- M&S output from T&E testing (Source: Task 7.3.2)
- Verified and validated M&S design products (Source: Activity 4.2)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of M&S capabilities and limitations implied by results validation testing

- 7.3.6 Analyze the M&S capabilities and limitations implied by the results validation testing and the acceptability criteria to identify any gaps and inconsistencies that may exist in those testing results.

Information Required:

- Description of M&S capabilities and limitations implied by results validation testing (Source: Task 7.3.5)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the gaps and inconsistencies in the results validation testing

- 7.3.7 Analyze the descriptions of M&S capabilities and limitations and the gaps and inconsistencies in the results validation testing and the acceptability criteria to estimate the coverage of the results validation testing.

Information Required:

- Description of M&S capabilities and limitations implied by results validation testing (Source: Task 7.3.5)
- Description of the gaps and inconsistencies in the results validation testing (Source: Task 7.3.6)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the results validation testing

- 7.3.8 Analyze the description of M&S capabilities and limitations implied by and the estimated coverage of the results validation testing to estimate the uncertainties in the results validation testing.

Information Required:

- Description of M&S capabilities and limitations implied by results validation testing (Source: Task 7.3.5)
- Estimated coverage of the results validation testing (Source: Task 7.3.7)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the results validation testing

7.3.9 Repeat until the results validation testing has produced complete and confident enough results.

Information Required:

- Estimated coverage of the results validation testing (Source: Task 7.3.7)
- Estimated uncertainties in the results validation testing (Source: Task 7.3.8)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Completed set of test results

Activity 7.4 – Integrate and Employ the Validation Testing Results

Activity Description: In this activity, the V&V practitioner infers the validity of the M&S from the collected M&S output.

Activity Tailoring Guidance: (Blank)

Activity Notes: Tasks identify the V&V Plan as input because they apply the techniques and tools identified in the V&V Plan to perform the analyses.

Activity Assumptions: (Blank)

Task Descriptions:

7.4.1 Analyze the results from the Developer’s testing and the results validation testing to produce an integrated description of the M&S capabilities and limitations from results validation.

Information Required:

- Description of the M&S capabilities and limitations from the Developer’s testing (Source: Activity 7.1)
- Description of M&S capabilities and limitations implied by results validation testing (Source: Activity 7.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities and limitations from results validation

7.4.2 Analyze the gaps and inconsistencies identified by the Developer’s testing and the results validation testing using the integrated description of the M&S capabilities and limitations from the M&S testing to reconcile them and produce a description of the unresolved gaps and inconsistencies in the results validation evidence.

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Information Required:

- Integrated description of the M&S capabilities and limitations from results validation (Source: Task 7.4.1)
- Description of the gaps and inconsistencies in the Developer's testing results (Source: Activity 7.1)
- Description of the gaps and inconsistencies in the results validation testing (Source: Activity 7.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the unresolved gaps and inconsistencies in the results validation evidence

- 7.4.3 Analyze the integrated description of M&S capabilities and limitations, the description of the unresolved gaps and inconsistencies in the results validation evidence and the acceptability criteria to estimate the coverage of the results validation evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from results validation (Source: Task 7.4.1)
- Description of the unresolved gaps and inconsistencies in the results validation evidence (Source: Task 7.4.2)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Required:

- Estimated coverage of the results validation evidence

- 7.4.4 Analyze the integrated description of M&S capabilities and limitations and the estimated coverage of the results validation evidence to estimate the uncertainties in the integrated results validation evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from results validation (Source: Task 7.4.1)
- Description of the unresolved gaps and inconsistencies in the results validation evidence (Source: Task 7.4.2)
- Estimated coverage of the results validation evidence (Source: Task 7.4.3)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the results validation evidence

- 7.4.5 Analyze the acceptability criteria, the integrated description of M&S capabilities and limitations from the results validation evidence and the estimated uncertainties in the results validation evidence to identify the factors that may constrain use.

Information Required:

- Integrated description of the M&S capabilities and limitations from results validation (Source: Task 7.4.1)
- Estimated uncertainties in the results validation evidence (Source: Task 7.4.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the results validation evidence

7.4.6 Prepare the source reference list supporting results validation and resolve any citation problems.

Information Required:

- Developer's test plan (Source: Activity 7.1)
- Developer's testing results (Source: Activity 7.1)
- M&S user documentation (Source: Activity 7.2)
- M&S output from T&E testing (Source: Activity 7.3)
- M&S T&E testing conditions (Source: Activity 7.3)

Information Produced:

- Citations of information supporting results validation

7.4.7 Update the requirements traceability matrix with the results validation evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from results validation (Source: Task 7.4.1)
- Description of the unresolved gaps and inconsistencies in the results validation evidence (Source: Task 7.4.2)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the results validation evidence

A1.9 PHASE 8 – INTEGRATE THE V&V EVIDENCE

Activity 8.1 – Integrate the V&V Evidence

Activity Description: This activity integrates the V&V evidence into a single consistent description.

Activity Tailoring Guidance: (Blank)

Activity Notes: (Blank)

Activity Assumptions: (Blank)

Task Descriptions:

8.1.1 Analyze the collected evidence produced by the V&V activities to generate an integrated description of the M&S capabilities and limitations.

Information Required:

- Integrated description of the M&S capabilities and limitations from the historical evidence (Source: Activity 2.4)
- Integrated description of the M&S capabilities that the scenarios and M&S conceptual model can support (Source: Activity 3.4)
- Integrated description of the M&S limitations implied by the scenario and M&S conceptual model V&V (Source: Activity 3.4)
- Needed M&S capabilities that the M&S executable could support (Source: Activity 5.2)
- M&S limitations implied by the development product verification evidence (Source: Activity 5.2)
- Integrated description of the M&S capabilities that the data and knowledge sets can support (Source: Activity 6.4)
- Integrated description of the M&S limitations implied by the data and knowledge V&V (Source: Activity 6.4)
- Integrated description of the M&S capabilities and limitations from results validation (Source: Activity 7.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence

8.1.2 Analyze the gaps and inconsistencies identified by the prior V&V activities using the integrated description of the M&S capabilities and limitations from the collected V&V evidence to reconcile them and produce a description of the unresolved gaps and inconsistencies in the V&V evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Task 8.1.1)
- Description of the unresolved gaps and inconsistencies in the historical evidence (Source: Activity 2.4)
- Integrated description of the information gaps and inconsistencies in the evidence from the scenario and M&S conceptual model V&V (Source: Activity 3.4)

- Gaps and inconsistencies in the evidence from the Developer’s verification products (Source: Activity 4.1)
- Integrated description of the inconsistencies discovered in the M&S development products (Source: Activity 4.6)
- Information gaps in the development product verification evidence (Source: Activity 5.2)
- Integrated description of the information gaps implied by the data and knowledge set V&V (Source: Activity 6.4)
- Description of the unresolved gaps and inconsistencies in the results validation evidence (Source: Activity 7.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Description of the unresolved gaps and inconsistencies in the collected V&V evidence

- 8.1.3 Analyze the integrated description of M&S capabilities and limitations, the description of the unresolved gaps and inconsistencies in the integrated V&V evidence and the acceptability criteria to estimate the coverage of the integrated V&V evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Task 8.1.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Task 8.1.2)
- Estimated coverage of the historical evidence (Source: Activity 2.4)
- Estimated coverage of the scenario and M&S conceptual model V&V evidence (Source: Activity 3.4)
- Estimated coverage of the Developer’s verification products (Source: Activity 4.1)
- Estimated coverage of the development product verification evidence (Source: Activity 5.2)
- Estimated coverage of the data and knowledge set V&V evidence (Source: Activity 6.4)
- Estimated coverage of the results validation evidence (Source: Activity 7.4)
- Acceptability criteria defining needed functionality (Source: Activity 1.1)
- Acceptability criteria defining needed quality (Source: Activity 1.1)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated coverage of the collected V&V evidence

- 8.1.4 Analyze the integrated description of M&S capabilities and limitations and the estimated coverage of the V&V evidence to estimate the uncertainties in the integrated V&V evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Task 8.1.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Task 8.1.2)
- Estimated coverage of the collected V&V evidence (Source: Task 8.1.3)
- Estimated uncertainties in the historical evidence (Source: Activity 2.4)
- Estimated uncertainties in the M&S conceptual model V&V evidence (Source: Activity 3.4)
- Estimated uncertainties in the development product verification evidence (Source: Activity 5.2)

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- Estimated uncertainties in the data and knowledge set V&V evidence (Source: Activity 6.4)
- Estimated uncertainties in the results validation evidence (Source: Activity 7.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Estimated uncertainties in the collected V&V evidence

- 8.1.5 Analyze the acceptability criteria, the integrated description of M&S capabilities and limitations from the V&V evidence and the estimated uncertainties in the V&V evidence to identify the factors that may constrain use.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Task 8.1.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Task 8.1.2)
- Estimated uncertainties in the collected V&V evidence (Source: Task 8.1.4)
- Factors that may constrain use implied by the historical evidence (Source: Activity 2.4)
- Factors that may constrain use implied by the scenario and M&S conceptual model V&V (Source: Activity 3.4)
- Factors that may constrain use implied by the development product verification evidence (Source: Activity 5.3)
- Factors that may constrain use implied by the data and knowledge set V&V (Source: Activity 6.4)
- Factors that may constrain use implied by the results validation evidence (Source: Activity 7.4)
- V&V Plan (Source: Activity 1.6)

Information Produced:

- Factors that may constrain use implied by the collected V&V evidence

- 8.1.6 Prepare, from the individual citation lists, an integrated list of citations of relevant and applicable information and resolve any citation problems.

Information Required:

- Citations of information used for V&V Planning (Source: Activity 1.5)
- Integrated citations supporting the compilation and analysis of the historical evidence (Source: Activity 2.4)
- Integrated citations supporting the compilation and analysis of the M&S conceptual model and collected scenarios (Source: Activity 3.4)
- Integrated citations supporting the development of the verification evidence (Source: Activity 4.6)
- Data and knowledge set pedigree citation list (Source: Activity 6.1)
- Citations of information supporting results validation (Source: Activity 7.4)

Information Produced:

- Integrated citations supporting the compilation and analysis of the collected V&V evidence

- 8.1.7 Update the requirements traceability matrix with the collected V&V evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Task 8.1.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Task 8.1.2)
- Requirements traceability matrix (Source: Activity 1.6)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- Requirements traceability matrix updated with the collected V&V evidence

Activity 8.2 – Derive the Conclusions from the Integrated V&V Evidence

Activity Description: This activity develops the conclusions, recommendations and lessons learned from the integrated V&V results and the V&V Plan. It also develops the presentations of the V&V results (e.g., graphics, tables).

Activity Tailoring Guidance: (Blank)

Activity Notes: (Blank)

Activity Assumptions: (Blank)

Task Descriptions:

8.2.1 Develop presentations of the collected V&V results (e.g., graphics, tables).

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Activity 8.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Activity 8.1)
- Estimated coverage of the collected V&V evidence (Source: Activity 8.1)
- Estimated uncertainties in the collected V&V evidence (Source: Activity 8.1)

Information Produced:

- Presentations of the collected V&V results

8.2.2 Prepare a summary of the collected V&V results.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Activity 8.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Activity 8.1)
- Estimated coverage of the collected V&V evidence (Source: Activity 8.1)
- Estimated uncertainties in the collected V&V evidence (Source: Activity 8.1)

Information Produced:

- Summary of the collected V&V results

8.2.3 Prepare a summary of the lessons learned from the V&V effort.

Information Required:

- Collected lessons learned from exercising the V&V process (Source: Activity 1.6)

Information Produced:

- Summary of the lessons learned from the V&V effort

8.2.4 Analyze the summary of the collected V&V results, summary of the lessons learned from the V&V effort and M&S requirements to develop the V&V recommendations.

Information Required:

- Summary of the collected V&V results (Source: Task 8.2.2)
- Summary of the lessons learned from the V&V effort (Source: Task 8.2.3)
- M&S requirements (Source: Activity 1.1)

Information Produced:

- V&V recommendations

Activity 8.3 – Prepare the V&V Report

Activity Description: This activity prepares the V&V Report from the integrated V&V evidence.

Activity Tailoring Guidance: (Blank)

Activity Notes: (Blank)

Activity Assumptions: (Blank)

Task Descriptions:

8.3.1 Analyze the V&V Plan to develop the problem statement for the V&V effort.

Information Required:

- V&V plan (Source: Activity 1.5)

Information Produced:

- V&V effort problem statement

8.3.2 Prepare a summary of the M&S.

Information Required:

- V&V plan (Source: Activity 1.5)

Information Produced:

- Summary of the M&S

8.3.3 Prepare a summary of the techniques and tools applied to execute the V&V tasks.

Information Required:

- V&V plan (Source: Activity 1.6)

Information Produced:

- Summary of techniques and tools applied in the V&V effort

8.3.4 Prepare a summary of the conditions under which the M&S was tested.

Information Required:

- Documentation from prior testing efforts (Source: Activity 2.2)
- Relevant and applicable Developer's verification products (Source: Activity 4.1)
- M&S executable verification testing conditions (Source: Activity 4.4)
- M&S validation testing conditions (Source: Activity 7.3)

Information Produced:

- Summary of the conditions under which the M&S was tested

8.3.5 Describe the integrated evidence.

Information Required:

- Integrated description of the M&S capabilities and limitations from the collected V&V evidence (Source: Activity 8.1)
- Description of the unresolved gaps and inconsistencies in the collected V&V evidence (Source: Activity 8.1)
- Estimated coverage of the collected V&V evidence (Source: Activity 8.1)
- Estimated uncertainties in the collected V&V evidence (Source: Activity 8.1)
- Factors that may constrain use implied by the collected V&V evidence (Source: Activity 8.1)
- Integrated citations supporting the compilation and analysis of the collected V&V evidence (Source: Activity 8.1)

Information Produced:

- Description of the integrated V&V evidence

8.3.6 Analyze the problem statement and the description of integrated evidence to develop the V&V recommendations.

Information Required:

- V&V effort problem statement (Source: Task 8.3.1)
- Description of the integrated V&V evidence (Source: Task 8.3.5)

Information Produced:

- V&V recommendations

8.3.7 Describe the key participants in and contributors to the V&V effort.

Information Required:

- Key participants' background and expertise information

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Information Produced:

- Key participants' description

8.3.8 Obtain the resources expended from the V&V project accounting team.

Information Required:

- V&V expenditure information (Source: V&V Project Accounting Team)

Information Produced:

- Resources expended in executing the V&V effort

8.3.9 Describe the resources expended in executing the V&V effort.

Information Required:

- Resources expended in executing the V&V effort (Source: Task 8.3.8)

Information Produced:

- Description of the resources expended for the V&V effort

8.3.10 Summarize the lessons learned from the V&V effort.

Information Required:

- Collected lessons learned from exercising the V&V process (Source: Activity 1.6)

Information Produced:

- Lessons learned from the V&V effort

8.3.11 Prepare the V&V report executive summary.

Information Required:

- V&V effort problem statement (Source: Task 8.3.1)
- Summary of the M&S (Source: Task 8.3.2)
- Description of the integrated V&V evidence (Source: Task 8.3.5)
- V&V recommendations (Source: Task 8.3.6)
- Lessons learned from the V&V effort (Source: Task 8.3.10)

Information Produced:

- V&V report executive summary

8.3.12 Assemble the V&V Report.

Information Required:

- V&V effort problem statement (Source: Task 8.3.1)
- Summary of the M&S (Source: Task 8.3.2)
- Summary of techniques and tools applied in the V&V effort (Source: Task 8.3.3)
- Summary of the conditions under which the M&S was tested (Source: Task 8.3.4)
- Description of the integrated V&V evidence (Source: Task 8.3.5)
- V&V recommendations (Source: Task 8.3.6)

- Key participants description (Source: Task 8.3.7)
- Description of the resources expended for the V&V effort (Source: Task 8.3.9)
- Lessons learned from the V&V effort (Source: Task 8.3.10)
- V&V report executive summary (Source: Task 8.3.11)

Information Produced:

- Draft V&V Report

8.3.13 Analyze the draft V&V report for internal consistency and correct any inconsistencies.

Information Required:

- Draft V&V report (Source: Task 8.3.12)

Information Produced:

- Corrected draft V&V report

8.3.14 Circulate the corrected draft V&V report for review and collect comments and recommendations for change.

Information Required:

- Corrected draft V&V report (Source: Task 8.3.13)

Information Produced:

- Comments and recommendations for change received on draft V&V report

8.3.15 Modify the corrected draft V&V report from the comments and recommendations for change received.

Information Required:

- Corrected draft V&V report (Source: Task 8.3.13)
- Comments and recommendations for change received on draft V&V report (Source: Task 8.3.14)

Information Produced:

- Modified V&V report

8.3.16 Analyze the modified V&V report for internal consistency, correct any inconsistencies and prepare the final V&V report.

Information Required:

- Modified V&V report (Source: Task 8.3.15)

Information Produced:

- Final V&V Report

Activity 8.4 – Support any Archival of the V&V Products

Activity Description: This activity supports any needed archival of the V&V products.

Activity Tailoring Guidance: (Blank)

Activity Notes: (Blank)

Activity Assumptions: The Users will decide whether and where to archive the V&V products.

Task Descriptions:

8.4.1 Obtain the locations for the archived V&V products.

Information Required:

- Selected archive locations (Source: User)

Information Produced:

- Selected archive locations

8.4.2 Obtain the points of contact for the selected archive locations.

Information Required:

- Selected archive locations (Source: Task 8.4.1)

Information Produced:

- Archive location points of contact

8.4.3 Obtain the choices of resource catalogs within which to publish the V&V product descriptions.

Information Required:

- Applicable resource catalogs (Source: User)

Information Produced:

- Applicable resource catalogs' information requirements

8.4.4 Arrange for archival of V&V products through the archive points of contact.

Information Required:

- Archive location points of contact (Source: Task 8.4.2)

Information Produced:

- Requirements for V&V product archive

8.4.5 Determine required formats and media for archived material.

Information Required:

- Requirements for V&V product archive (Source: Task 8.4.4)

Information Produced:

- Archival format requirements
- Archival media requirements

8.4.6 Translate the V&V products into the required format.

Information Required:

- Archival format requirements (Source: Task 8.4.5)
- V&V Plan (Source: Activity 1.5)
- V&V Report (Source: Activity 8.3)

Information Produced:

- Formatted V&V Plan
- Formatted V&V Report

8.4.7 Transfer the V&V products onto the required media.

Information Required:

- Archival media requirements (Source: Task 8.4.5)
- Formatted V&V Plan (Source: Task 8.4.6)
- Formatted V&V Report (Source: Task 8.4.6)

Information Produced:

- Transferred V&V Plan
- Transferred V&V Report

8.4.8 Deliver the archival V&V products to the archival location.

Information Required:

- Selected archive locations (Source: Task 8.4.1)
- Transferred V&V Plan (Source: Task 8.4.7)
- Transferred V&V Report (Source: Task 8.4.7)

Information Produced:

- Delivered V&V Plan
- Delivered V&V Report

8.4.9 Determine the requirements for resource catalog descriptions.

Information Required:

- Applicable resource catalogs (Source: Task 8.4.3)

Information Produced:

- Resource description requirements

8.4.10 Prepare descriptions of the archived V&V products.

Information Required:

- Resource description requirements (Source: Task 8.4.9)
- V&V Plan (Source: Activity 1.1)
- V&V Report (Source: Activity 8.3)

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Information Produced:

- V&V Plan description
- V&V Report description

8.4.11 Publish the archived product descriptions in the applicable resource catalogs.

Information Required:

- Applicable resource catalogs (Source: Task 8.4.3)
- V&V Plan description (Source: Task 8.4.10)
- V&V Report description (Source: Task 8.4.10)

Information Produced:

- Published V&V product descriptions