

# Seamless V&V: Concept Validation



**Federal Aviation  
Administration**

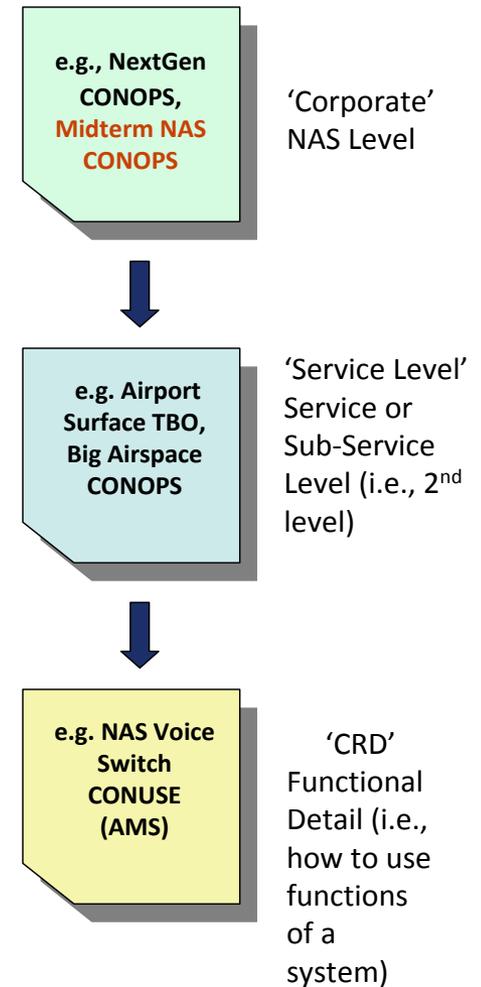
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October 23, 2008**



# Concept Documents

- **Concept of Operations** (IEEE Standard 1362-1998)
  - An operationally oriented description of user's needs, including qualitative and quantitative characteristics, that communicates how the system is expected to operate in its environment.
- **Service or Sub-Service Level Concept of Operations** (NAS SEM)
  - More insight, detail, in-depth information
  - Elaborates on capabilities and use
- **Concept of Use** (NAS SEM)
  - Extension of the ConOps, more detail, more elaboration
  - Narrative describing functional characteristics

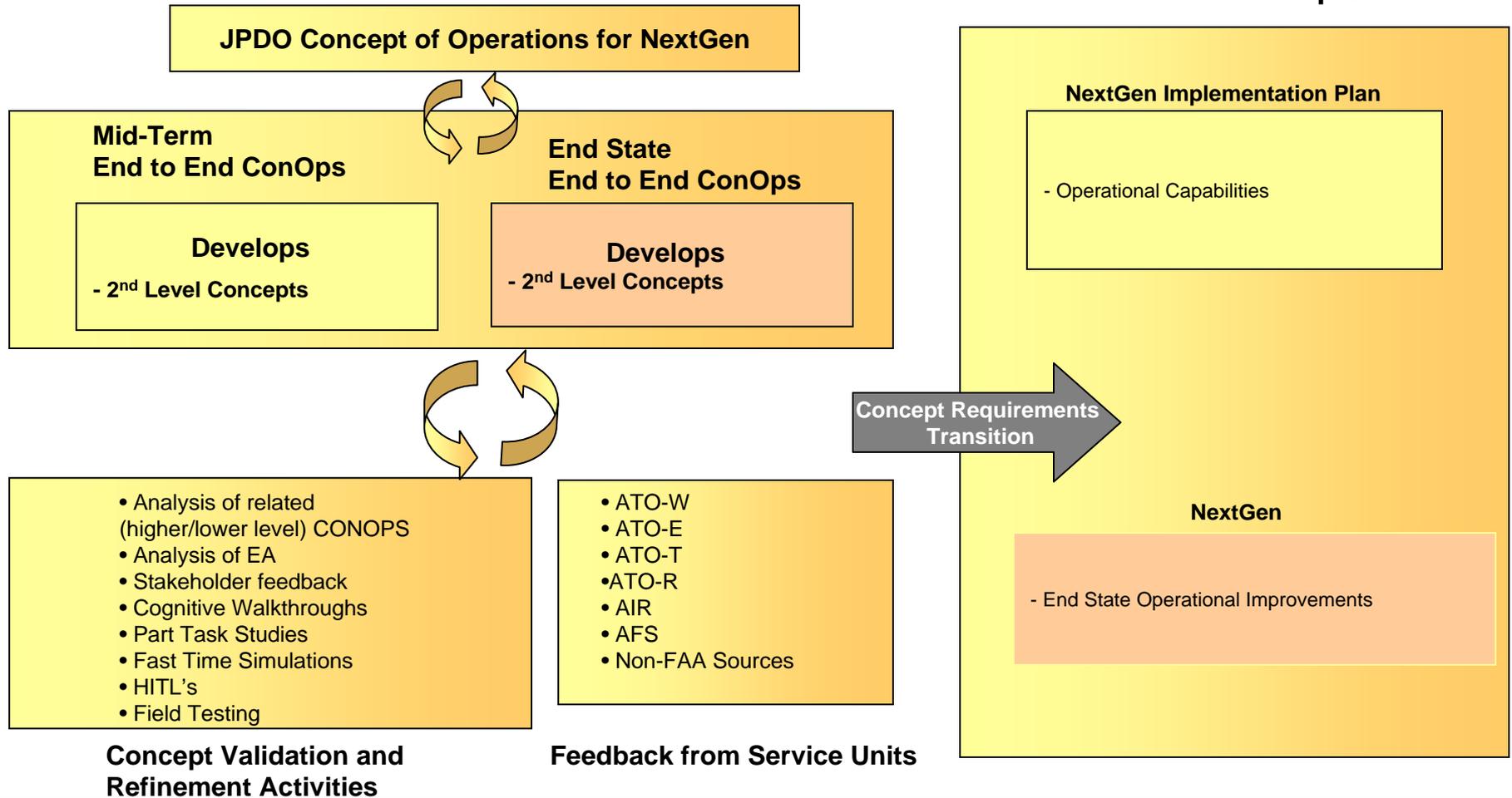
## Mission Analysis



# Concept Development and Validation Process

## ATS CD&V Group Concept and Requirements Development and Validation

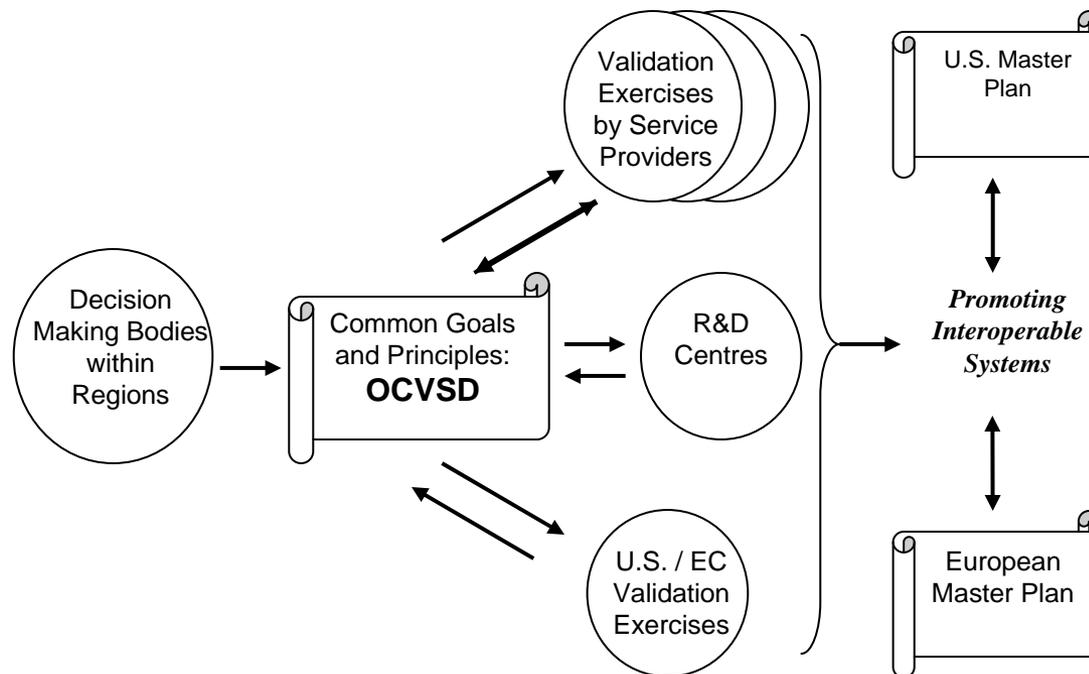
## Service Units Concept and Requirements Refinement and Implementation



# Action Plan 5: Validation & Verification Strategies



To determine a common strategy for validating and verifying the performance, reliability, and safety of ATM systems. The strategies provide guidance for validation and verification of operational concepts during R&D phases of ATM sub-system development.



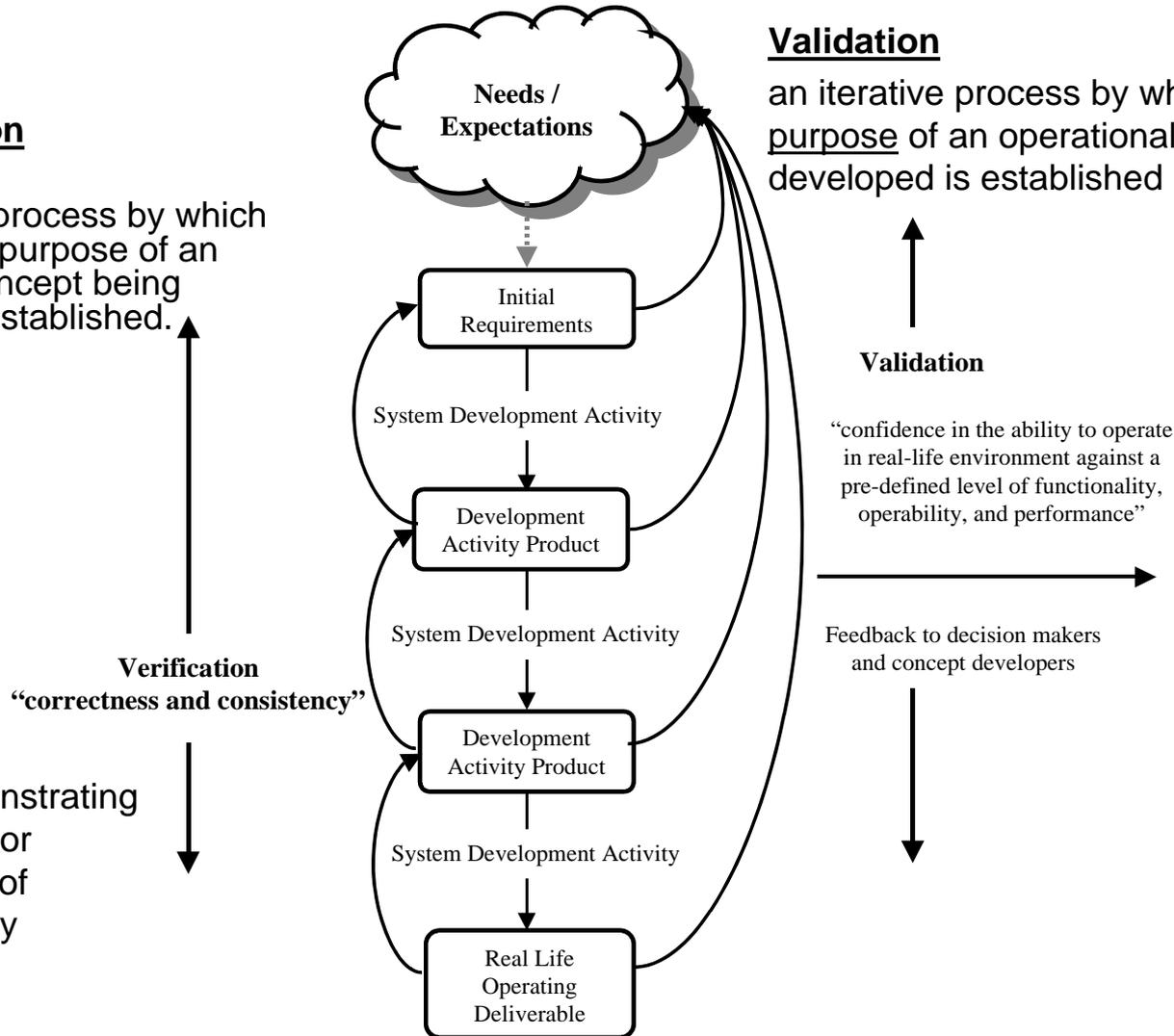
# Action Plan 5: Validation & Verification Strategies

## Concept Validation

is an iterative process by which the fitness-for-purpose of an operational concept being developed is established.

## Validation

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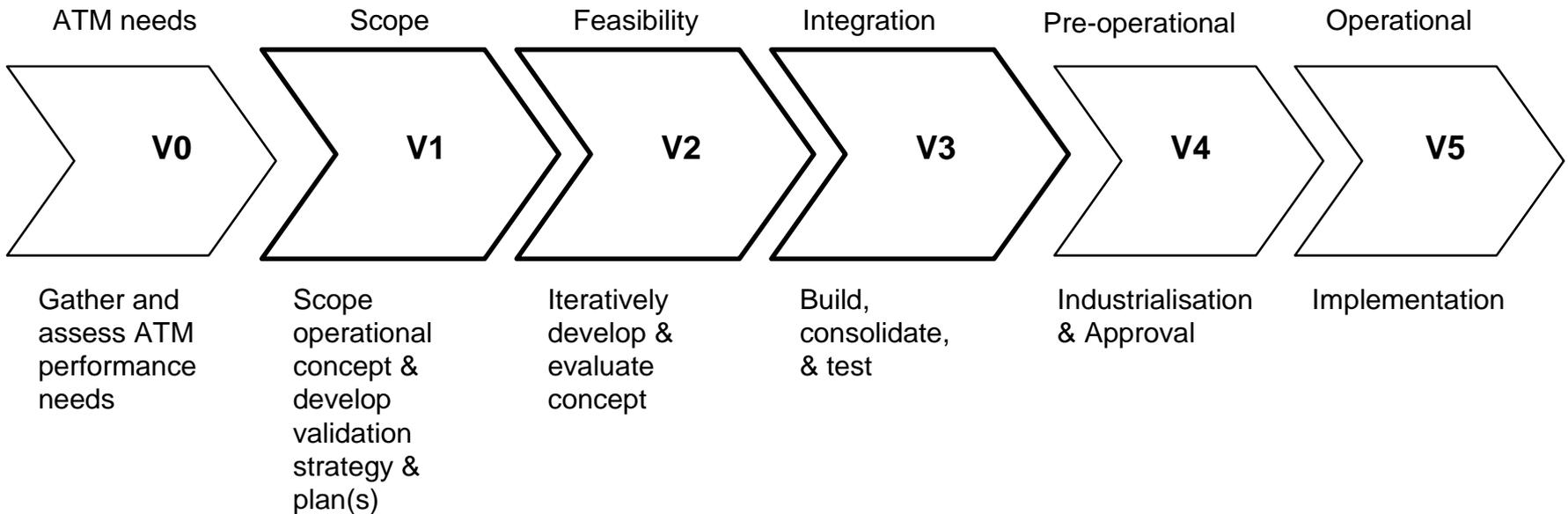
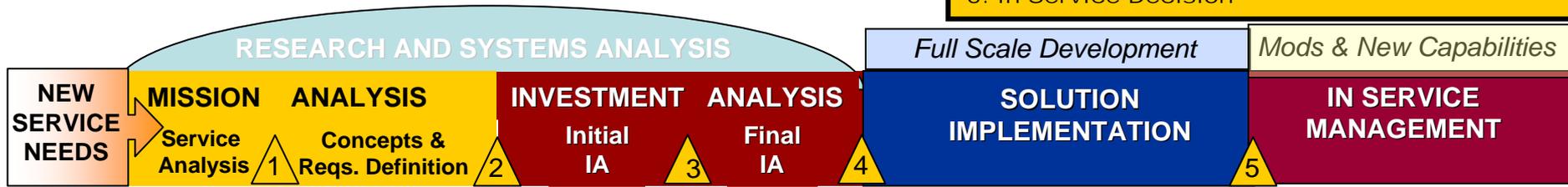


## Verification

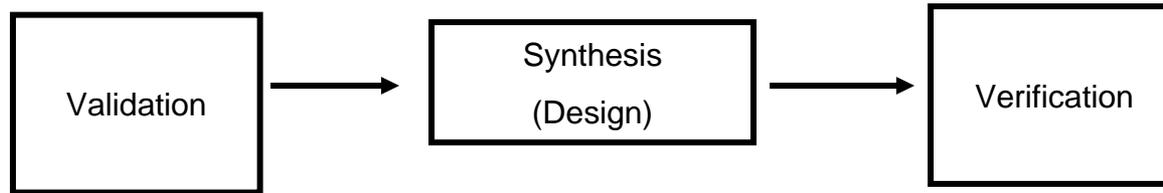
is the action of demonstrating or proving to be true or legitimate by means of evidence or testimony (OCVSD 2008).



- :KEY**
1. Mission Need Decision
  2. Investment Analysis Readiness Decision
  3. Initial Investment Decision
  4. Final Investment Decision
  5. In-Service Decision



# Different Perspectives on V&V



*NAS SEM – V&V is the System Engineering process that confirms that the system requirements are*

*Correct → validation*

*the determination that the requirements for a product are sufficiently correct and complete. (SAE ARP 4761, 1996)*

*and*

*Satisfied → verification*

*the evaluation of an implementation [system] to determine that applicable requirements are met. (SAE ARP 4761, 1996)*



# Perspectives on V&V

## T&E V&V Handbook

“The purpose of Verification is to ensure that selected work products meet their specified requirements.”

requirements. Verification is inherently an incremental process because it occurs throughout the development of the product and work products - beginning with initial requirements, progressing through subsequent changes, and culminating in the verification of the completed product.

“The purpose of Validation is to demonstrate that a product or product component fulfills its intended use when placed in its intended environment.”

environment. Validation activities may be applied to all aspects of a product in any of its intended environments, such as operation, training, manufacturing, maintenance, or support services. The methods employed to accomplish validation can be applied to work products as well as to the product and product components. The work products should be selected based upon the best predictors of how well the product and product components satisfy user needs.

Reference: “CMMI<sup>SM</sup> for Systems Engineering, Software Engineering, IPPD, Supplier Sourcing”, CMMI-SE/SW/PPD/SS, Continuous Version, Version 1.1



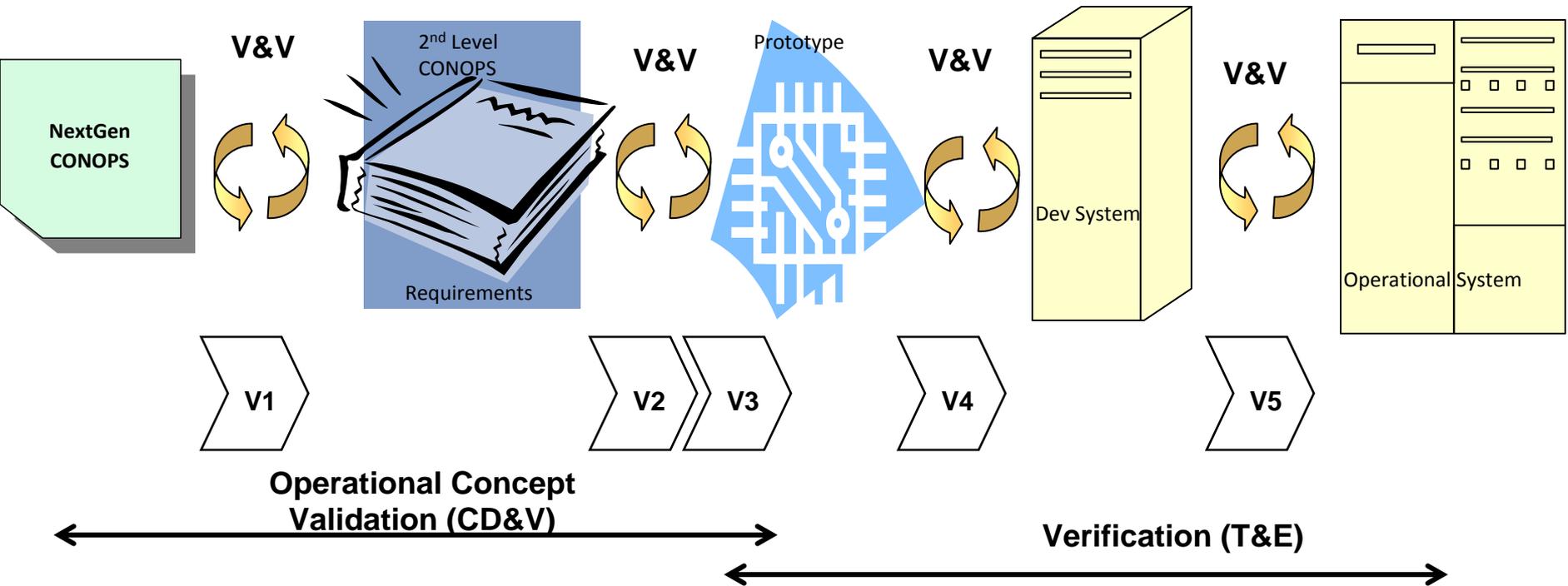
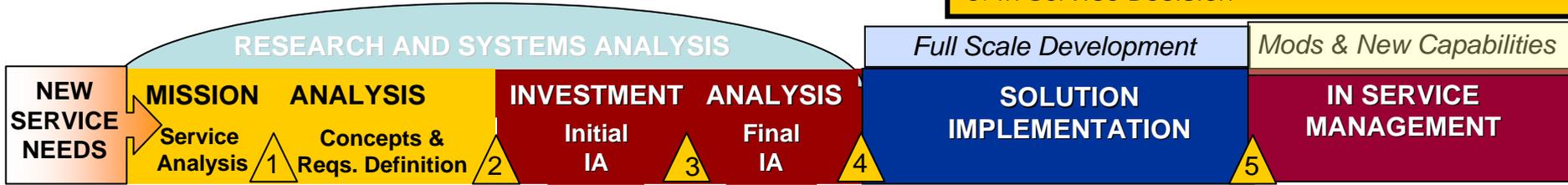
***Are we building the right system?***

***Are we building the system right?***



# V&V: Big Picture

- 1. Mission Need Decision :KEY
- 2. Investment Analysis Readiness Decision
- 3. Initial Investment Decision
- 4. Final Investment Decision
- 5. In-Service Decision



# Questions/Comments

