Systems' Perspectives for AI Acceleration in Large Enterprises and Government Agencies

J. Gadewadikar, J. Lockett, J. Marshall

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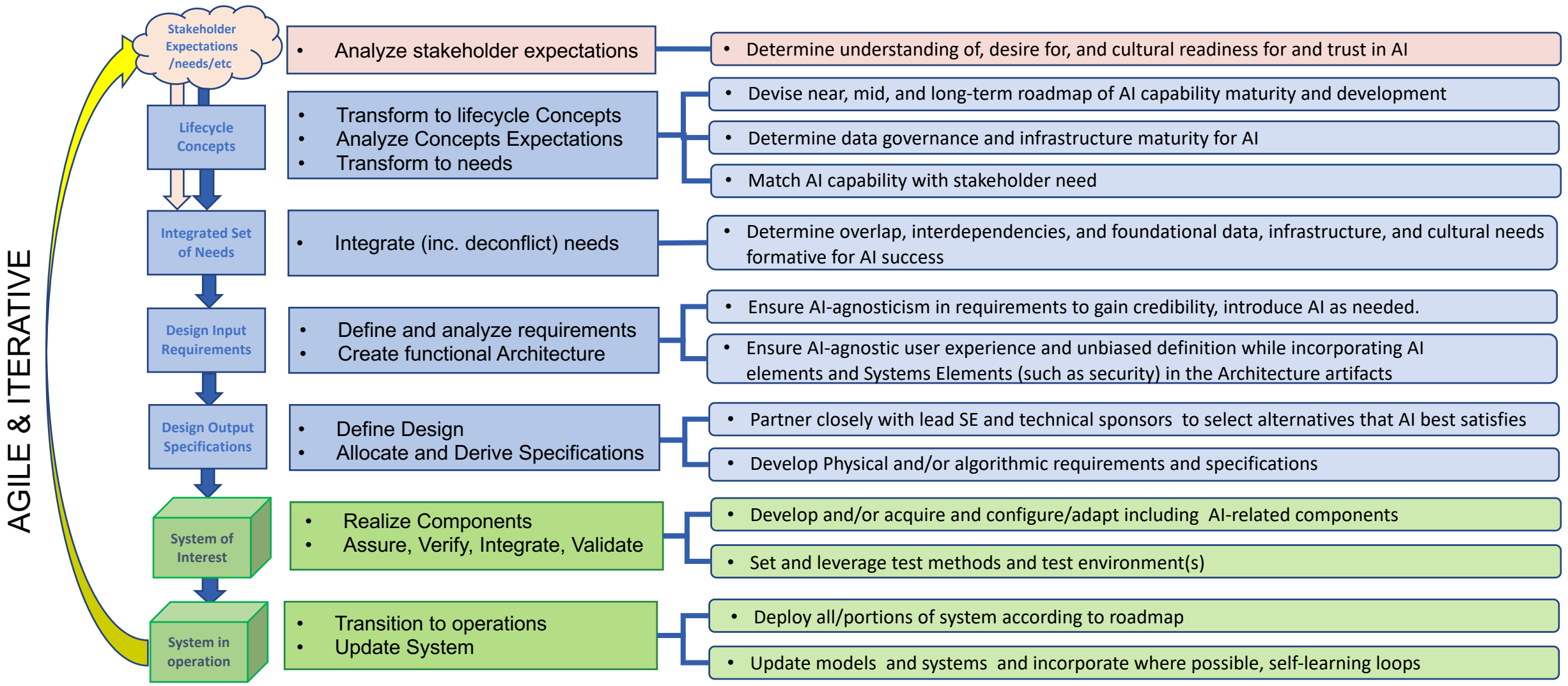
Agenda

- Criticality of Systems Engineering in AI
- Systems Engineering Lifecycle
- Deriving AI Enabled themes from current state analysis
- Creating Architectural Artifacts
- Assurance and Trustworthiness through Systems Engineering
- Conclusion

Criticality of Systems Engineering in AI

- To scale AI, agencies and enterprises require understanding of needs and capabilities, and common themes from these needs and capabilities
- Awareness of System Dependence and sequencing can be very helpful to accelerate AI
- Systems Engineering plays a critical role towards Assured and Trustworthy AI, AI that is ethical, compliant with regulations, secure, and trusted by the users
- Systems engineering is required to properly handle the development and deployment of AI and AI-enabled applications through the system engineering supported agile cycle and continues improvement and deployment

SE Lifecycle



SE is important for infrastructure, platform environment, and enterprise development of AI and AI apps.

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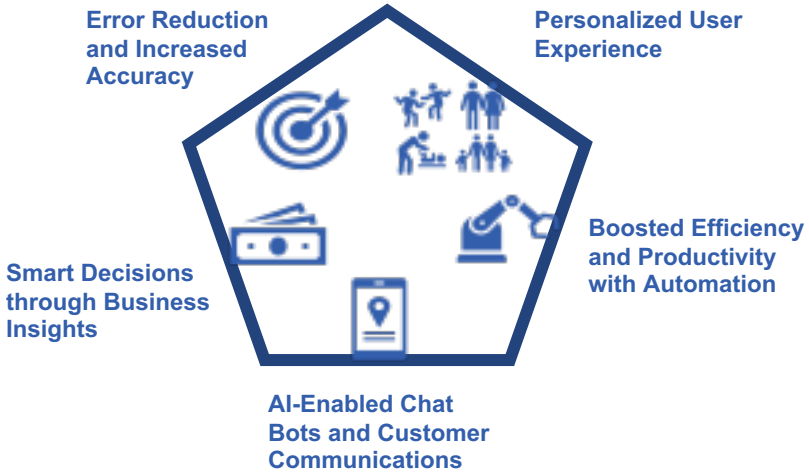
Deriving AI themes from current state analysis

Summarized Business Needs from Engagement Sessions

Cross-stakeholder needs are understood. Potential technology capabilities needed to realize needs are identified.



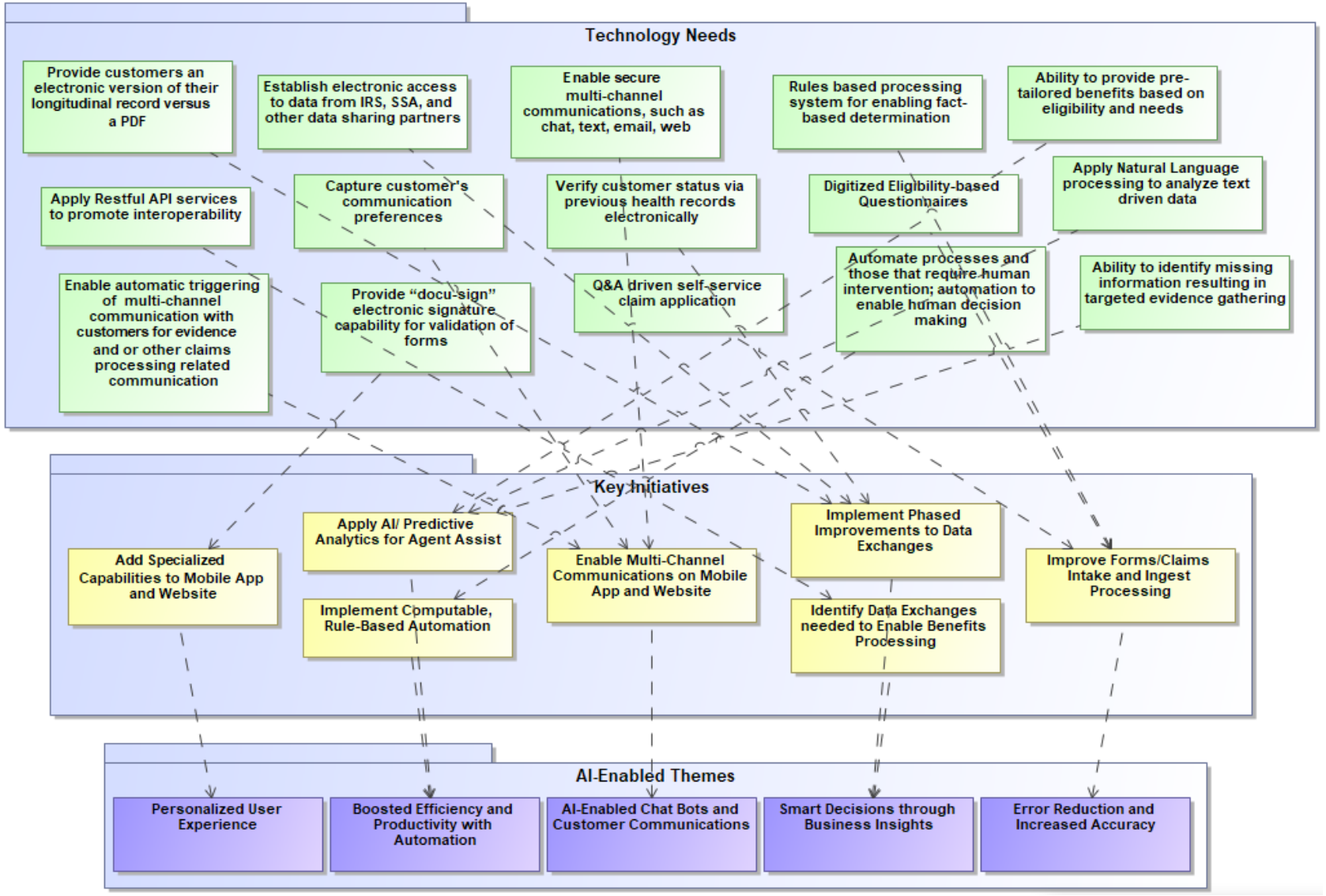
Synthesized “AI Enabled Themes” Across the Organization

Common themes are synthesized from the needs and potential technology capabilities with Traceability to stakeholders.

Comprised Into Initiatives and Fiscal Year Sequencing

Stakeholder business and technology needs are traced to the themes and sequenced by dependencies between initiatives.

AI Enabled Themes



- Model-Based Systems Engineering (MBSE) enables the synthesis of AI-driven themes from complex data and relationships.
- Five example themes, interdependent for success, are executed through various projects across business lines.
- Organized approach with a single source of truth is essential for managing complexity.
- AI initiatives should be prioritized based upon:
  - Potential impact
  - Feasibility
    - Alignment with goals
    - ROI
    - Stakeholder buy-in

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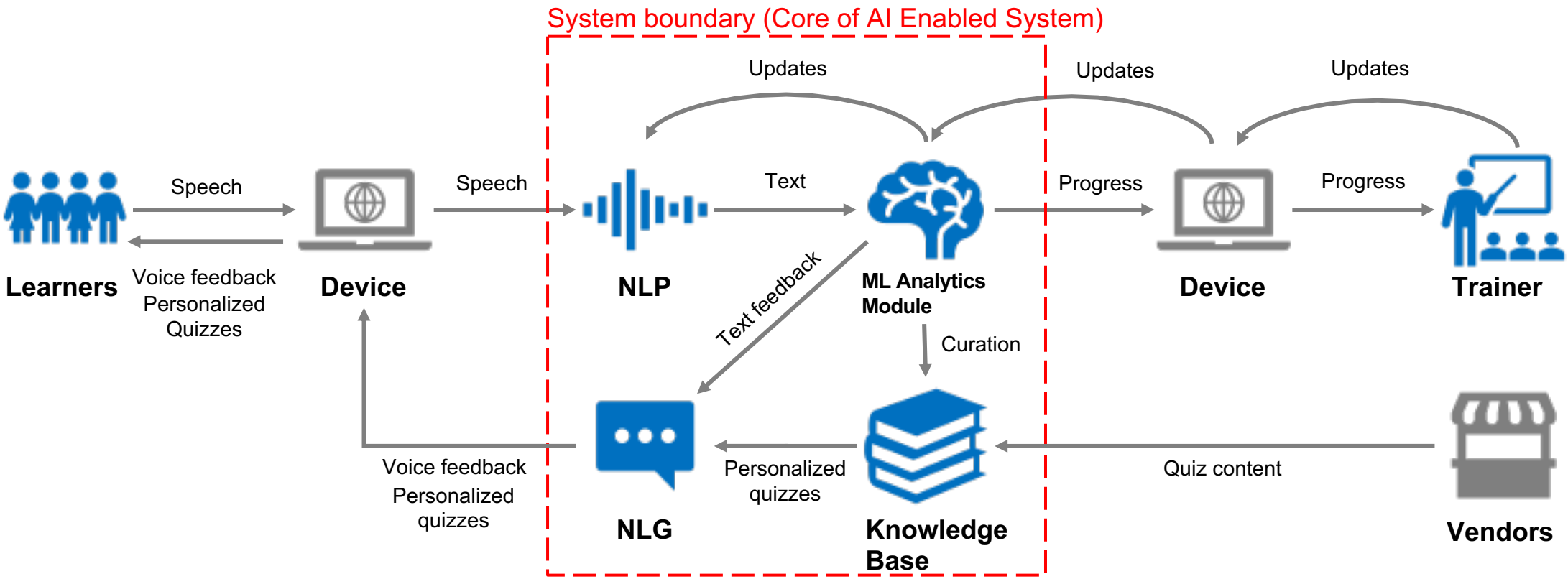
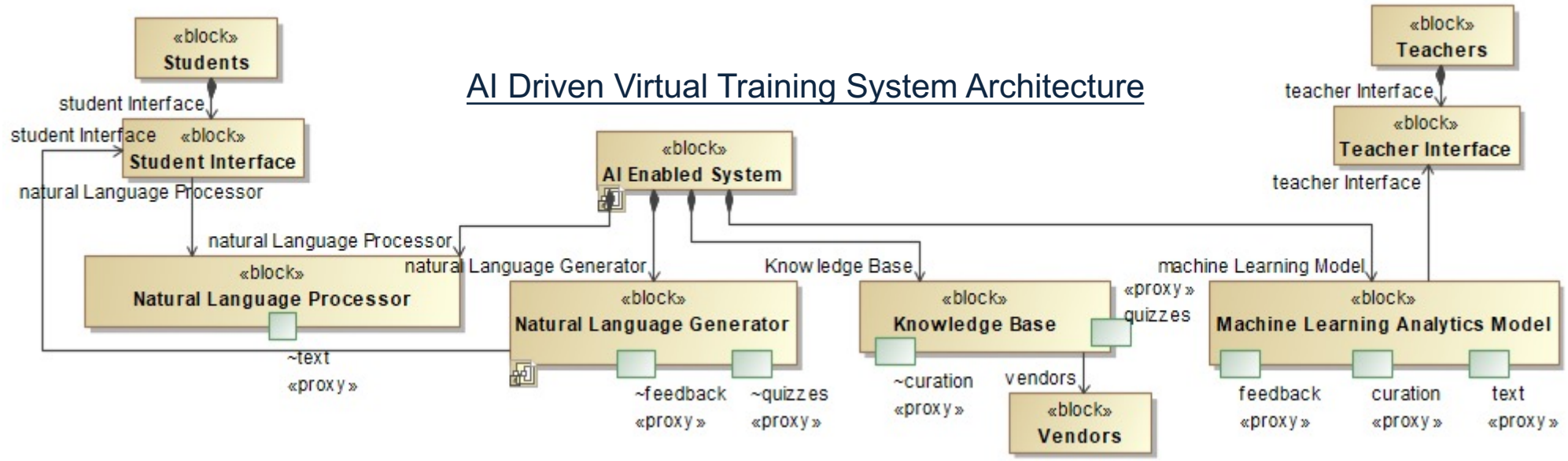
Architecture to Enable AI



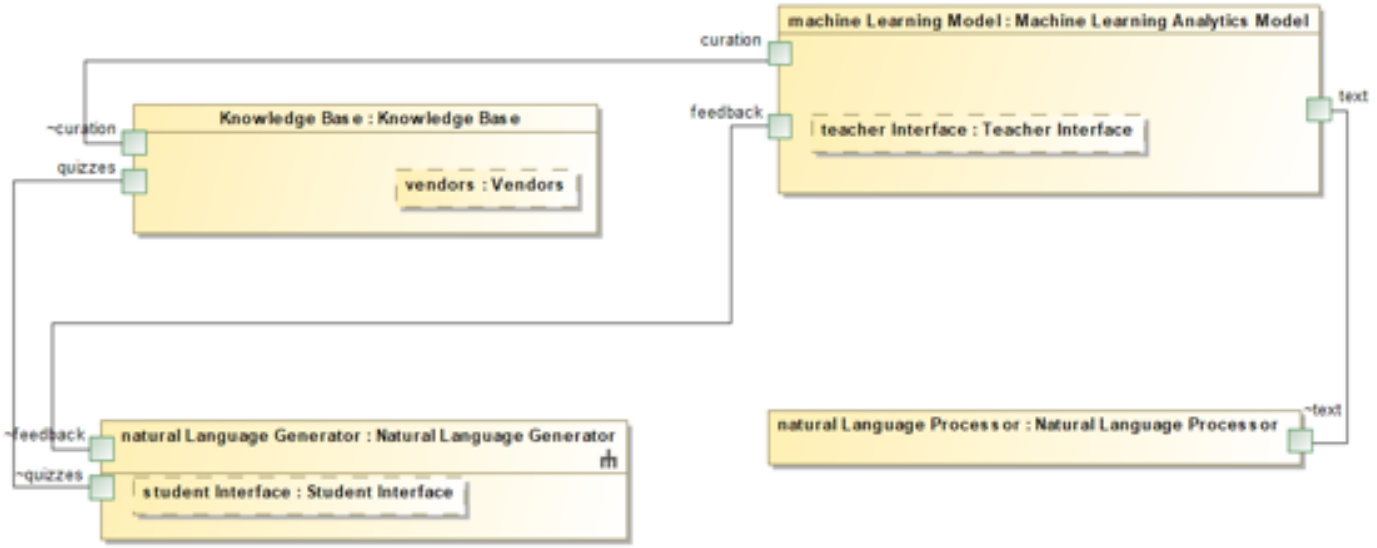
AI Driven Virtual Training System Architecture

Architecture to Enable AI

Level 1:



Level 2:



Level 1 Block Definition Diagram:
Shows system-level interactions between AI-enabled system components and external interfaces

Level 2 Internal Block Diagram:
Details information flow between AI-enabled system components and highlights port connection schemes.

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Assurance and Trustworthiness through Systems Engineering

- To Accelerate AI, it must be accepted culturally into an enterprise
- This can be gained by focusing on the Assurance and Trustworthiness of AI
- Overall, people will be more willing to accept AI if they can perceive it as a benefit to their job
- To be trusted it will require systematic testing with the complexity and system-to system integration, system and human user interaction, all these require robust and agile system engineering to automatically test against acceptance criteria.

Trialability
Potential users have a chance to experience the product

Ethics
How the product was created, the ethics and governance that it follows to mitigate bias

Image/Perception
How the product is perceived, is there to help people do their job, or take their job?

Representation
How the product is represented, whether that be a machine, audio device, etc.

Performance
How the product performs, is it reliable? Or is it another roadblock

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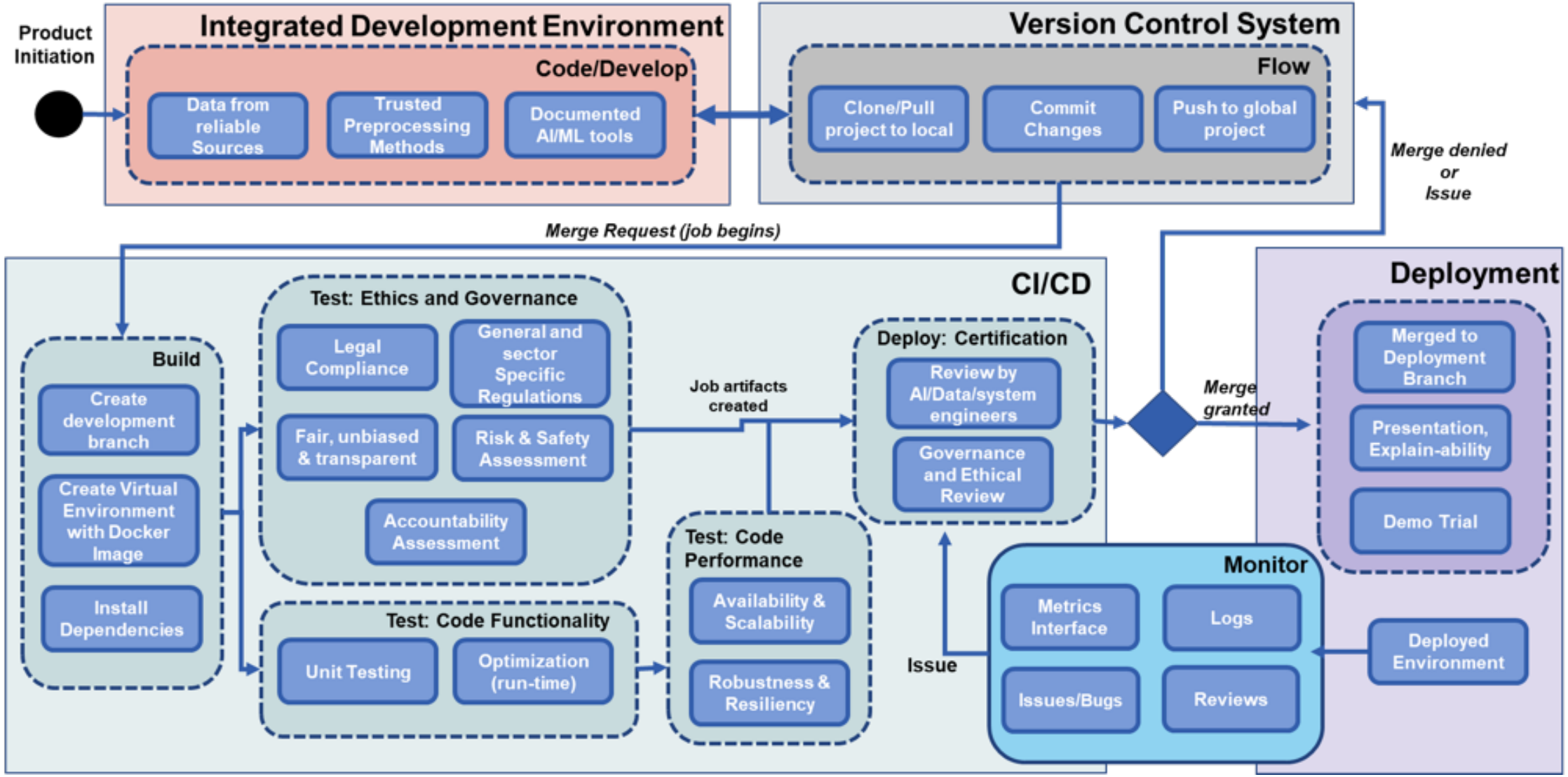
Development Pipeline



Enabling CI/CD using MBSE

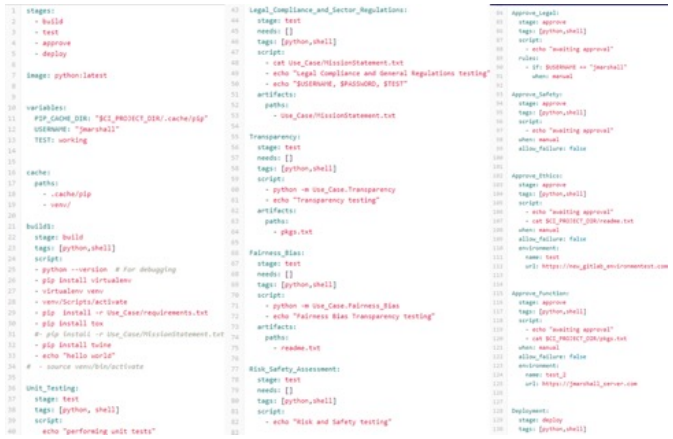
- Systems approach to create a high-level overview of the process
- Works as a functional blueprint
  - Diagrams can be nested
- Executable model to see if the process breaks down
- Able to pinpoint system fallacies via simulation
- Ability to trace/implement requirements with diagrams
- MBSE allows for the agile process to be fully utilized
- Without MBSE, requirements and design may not have a defined relationships
- Gitlab CI/CD pipeline implementation. Showing the full process of automating AI Assurance.
- The pipeline creates jobs and assigns them to specific SMEs for approval before Agile deployment.

Version Control/Deployment

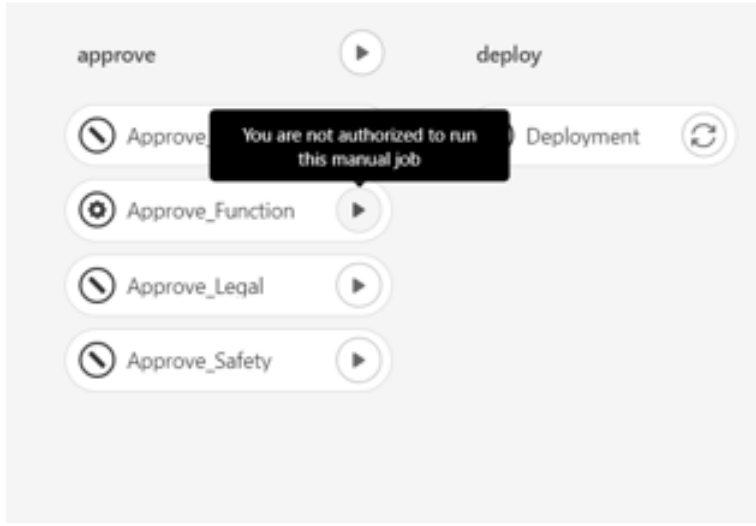
Tangible Pipeline

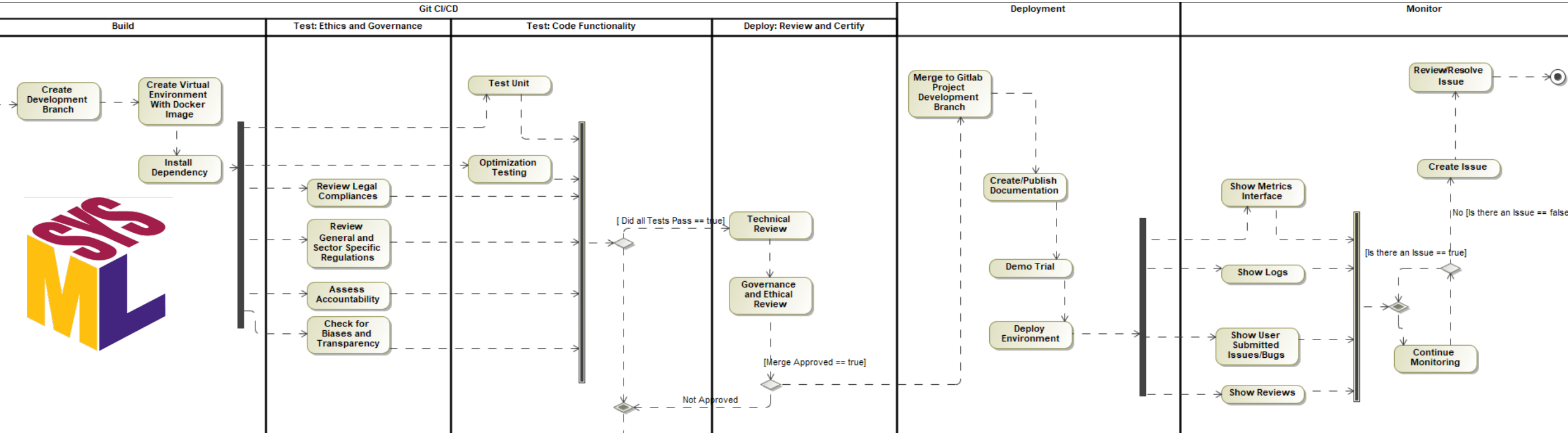
Human-readable data-serialization language that allows to configure pipelines as code

yml pipeline



GitLab Pipeline





Conclusion

- Systems Engineering is critical in Enterprise-wide AI Acceleration above and beyond individual use cases
- The work presents how to use systems engineering lifecycle to accelerate AI
- Assurance and trustworthiness can be ensured through a continuous integration and continuous deployment pipeline enables by Model Based Systems Engineering

Questions

Jyotirmay Gadewadikar, Chief Scientist – AI Integration and Systems Engineering

jgadewadikar@mitre.org

@JyoGadewadikar

https://www.linkedin.com/in/JyoMIT

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