Process Reference Model for Assurance				CMMI Thread Location	
PRM Process Area	PRM Goals	PRM Practices that support a goal	PRM Informative material to assist with implementing practices	CMMI Process Areas	CMMI Specific Practices that support a goal
Process Area: Assurance Process Management				Target PA(s)	PA and SP
Goal: SG1.1 - Establish the assurance process environment to achieve key business goals.					
		Specific Practice 1.1.1 Identify the business goals for assurance.		OPF Organizational Process Focus	OPF SP 1.1 Establish Organizational Process Needs
			Sub Practice 1.1.1.1 Identify the assurance stakeholders including their expectations and rights.		
			Sub Practice 1.1.1.2 Quantify business value of assurance.		
			Sub Practice 1.1.1.3 Determine quality related assurance objectives and select model and standards(CMMI C&A, ISO-27000,ISO-9000, Common Criteria etc.) which best aligns with organizational objectives.		
			Sub Practice 1.1.1.4 Determine the business continuity needs for process assets and support infrastructure including Process Asset Library and measurement infrastructure.		
			Sub Practice 1.1.1.5 Prioritize the business goals for assurance.		
		Specific Practice 1.1.2 Establish organizational processes to achieve the assurance business goals.		OPF Organizational Process Focus	OPD SP 1.1 - Establish Standard Processes
		Specific Practice 1.1.3 Deploy assurance capabilities and features across the organization that achieve the business assurance goals.		OPF Organizational Process Focus	OPF SP 3.4 Incorporate Process Related Experiences into the Orgainizational Process Assets OPF SP 3.2 Deploy standard processsses
		Specific Practice 1.1.4 Establish and implement an assurance roadmap as part of the plan for the organization.		OPF Organizational Process Focus	OPF SP 2.1 Establish Process Action Plans OPF SP 2.2 Implement Process Action Plans
		Specific Practice 1.1.5 Demonstrate continuous improvement of the organizational processes for assurance.		OPF Organizational Process Focus	OPF SP 3.4 Incorporate Process-Related Experiences into the Organizational Process Assets
			Sub Practice 1.1.5.1 Define assurance measures.		
			Sub Practice 1.1.5.2 Define relationship between quality and assurance measures.		
			Sub Practice 1.1.5.3 Measure assurance effectiveness.		
			Sub Practice 1.1.5.4 Refine organizational practices to optimize assurance objectives.		
Goal: SG1.2 - Establish the infrastructure to sustain the assurance program within the organization.					
		Specific Practice 1.2.1 Establish an Organizational policy for assurance.			OPD SP 1.1 Establish Standard Processes

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		Sub Practice 1.2.1.1 Tailor the organizational policy for assurance to the project assurance practices and standards.		OPD Organizational Process Definition + IPPD	OPD SP 1.3 Establish Tailoring Criteria and Guidelines
		Specific Practice 1.2.2 Integrate and maintain process assets for assurance across the organization in conjunction with the other system development processes.			OPD SP 1.1 - Establish Standard Processes
		Specific Practice 1.2.3 Objectively Appraise organizational assurance initiatives and processes.			OPF SP 1.2 Appraise the Organization's Processes
		Specific Practice 1.2.4 Monitor the use of assurance practices in the organization.			OPF SP 3.3 Monitor Implementation
		Specific Practice 1.2.5 Establish and maintain collaborations with external organizations promoting systems assurance.			OPF SP 1.3 Identify the organizations process improvement.
Goal: SG1.3 - Establish and maintain orgainizational behavior that supports assurance management, engineering, operations, and support.					
		Specific Practice 1.3.1 Attain leadership commitment, authority and resources.		OPD Organizational Process Definition OPF Orgainizational Process Focus	OPD SP 2.1 Establish Empowerment Mechanisms OPF SP 3.1 Deploy Orgainizational Process Assets
			Sub Practice 1.3.1.1 Coordinate organizational mission and strategy while defining the role of assurance in the engineering and related processes.		
		Specific Practice 1.3.2 Communicate the plan for assurance.		OPD Organizational Process Definition OPF Orgainizational Process Focus	OPD SP 2.1 Establish Empowerment Mechanisms OPF SP 3.1 Deploy Orgainizational Process Assets
		Specific Practice 1.3.3 Train the organization on assurance.		OT Orgainizational Training /IPM Integrated Project Management	OT SG 1 - Establish an Organizational Training Capability SG 2 - Provide the necessary training. IPM - SP 1.4 Integrate Plans (Subpractice 6 on training).
			Sub Practice 1.3.3.1 Ensure The organization has the skills necessary to achieve project and organizational assurance objectives.		
		Specific Practice 1.3.4 Evolve products lines toward their ultimate buisness objectives including assurance.		OPD Organizational Process Definition OPF Orgainizational Process Focus	OPD SP 2.1 Establish Empowerment Mechanisms OPF SP 3.1 Deploy Orgainizational Process Assets
Process Area: Assurance Project Management					
Goal: SG2.1 -- Manage Assurance Activities against Plans. All aspects of the technical effort are planned.					
		Specific Practice 2.1.1 Plan for assurance		PP Project Planning IPM Integrated Project Management	PP SP 1.1 Establish the Scope of the Project IPM SP 1.2 and SP 1.4 IPM SP 1.1 Est Def Process
			Sub Practice 2.1.1.1 Define project goals for assurance.		
			Sub Practice 2.1.1.2 Establish the plan to track assurance results in the project plan.		PP SP 2.7 Establish the project plan

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		Sub Practice 2.1.1.3 Plan for stakeholder involvement throughout the project plan.		PP Project Planning	PP SP 2.6 - Plan Stakeholder Involvement
		Sub Practice 2.1.1.4 Define Scope of assurance system/application/product.			PP SP 1.1 Estimate The Scope of The Project
		Sub Practice 2.1.1.5 Identify assurance tools.		IPM Integrated Project Management	IPM SP 1.3 - Establish the Project's Work Environment
		Sub Practice 2.1.1.6 Develop cost estimates for all resources required by the project to incorporate assurance management practices and procedures. .		PP Project Planning	PP SP 1.4 - Determine Estimates of Effort and Cost
		Sub Practice 2.1.1.7 Provide adequate resources to execute the assurance plans.			PP SP 2.4 Plan for Project Resources
		Sub Practice 2.1.1.8 Develop estimates for the product assurance factors that affect the magnitude and technical feasibility of the project.			PP SP 2.2 Identify project risk
		Sub Practice 2.1.1.9 Include assurance tasks and efforts in the overall project plan.		IPM Integrated Project Management	IPM SP 1.4 Integrate Plans
	Specific Practice 2.1.2 Manage for assurance			IPM Integrated Project Management	IPM SP 1.5 Manage the Project using Int Plans
		Sub Practice 2.1.2.1 Manage progress towards project goals for assurance.			
		Sub Practice 2.1.2.2 Manage involvement of assurance stakeholders according to the plan.			IPM SP 2.1 - Manage stakeholder involvement
		Sub Practice 2.1.2.3 Identify and track critical assurance interfaces and dependencies.			IPM SP 2.2 - Manage dependencies
		Sub Practice 2.1.2.4 Establish and maintain a shared assurance vision for the project.		IPM +IPPD Integrated Project Management	IPM SP3.1 (IPPD) Establish the project shared version.
		Sub Practice 2.1.2.5 Maintain tools and mitigate identified assurance weaknesses.		IPM Integrated Project Management	IPM SP 1.3 - Establish the Project's Work Environment
		Sub Practice 2.1.2.6 Conduct regular reviews of assurance activities by the project team.		PMC Project Monitoring and Control	PMC SP 1.6 Conduct Progress Reviews
		Sub Practice2.1.2.7 Execute project activities using integrated project defined processes.		IPM Integrated Project Management	IPM SP 1.5 Manage the project using integrated plans.
Goal: SG2.2 -Establish and maintain an assurance support activities for the project.					
	Specific Practice 2.2.1 **Assign tasks by allocating functions to team members with the appropriate level of assurance knowledge.**			PP Project Planning	PP SP 2.5 Plan for Needed Knowledge and Skills

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	Specific Practice 2.2.2 Communicate and coordinate all assurance decisions and recommendations.			IPM + IPPD Integrated Project Management	IPM SP 2.1 - Manage stakeholder involvement. + IPPD SP 3.5 - Ensure Collaboration among Interfacing Teams IPM SP 1.5 Manage the project using the integrated plans.
	Specific Practice 2.2.3 Identify, understand, and mitigate risks to the assurance objectives.			RSKM Risk Management	RSKM - Monitor Project Risks SP 1.1 Determine Risk Sources and Categories SP 2.1 Identify Risks SP 3.1 Develop Risk Mitigation Plans
			Sub Practice 2.2.3.1 Manage and control the evidence meeting the customer assurance needs.		
	Specific Practice 2.2.4 Measure effectiveness of project assurance goals.			MA Measurement and Analysis	SP 1.1 Establish measurement objective SP 1.2 Specify measures.
			Sub Practice 2.2.4.1 Define project assurance goals and measures.		
			Sub Practice 2.2.4.2 Collect project assurance data to support organizational assurance measures.		MA SP 2.1 - Collect Measurement Data
			Sub Practice 2.2.4.3 Store assurance measures with project artifacts.		MA SP 2.3 - Store data and results.
			Sub Practice 2.2.4.4 Analyze collected project assurance measures and develop assurance case.		MA SP 2.2 - Analyze measurement data
			Sub Practice 2.2.4.5 Report assurance measures to the appropriate stakeholders		MA 2.4 Communicate results.
			Sub Practice 2.2.4.6 Practice continuous improvement of the measures due to issues identified in the measures.		MA SP 1.2 Specify Measures MA SP 2.2 Analyze Measurement Data
Goal: SG2.3 - Select, manage, and use effective suppliers and third party applications based upon their assurance capabilities.					
	Specific Practice 2.3.1 Understand the assurance risks related to the supplier.			SAM Supplier Agreement Management	SAM SP 1.2 - Select Suppliers
			Sub Practice 2.3.1.1 Establish assurance selection criteria.		
			Sub Practice 2.3.1.2 Establish strategy for risk management of suppliers.		
			Sub Practice 2.3.1.3 Incorporate assurance into the overall selection criteria.		
	Specific Practice 2.3.2 Select suppliers satisfying assurance selection criteria.			SAM Supplier Agreement Management	SAM SP 1.2 - Select Suppliers
			Sub Practice 2.3.2.1 Identify potential suppliers satisfying assurance selection criteria.		

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			Sub Practice 2.3.2.2 Evaluate potential suppliers satisfying assurance selection criteria.		
		Specific Practice 2.3.3 Document supplier agreements for assurance.		SAM Supplier Agreement Management	SAM SP 1.3 - Establish Supplier Agreements
		Specific Practice 2.3.4 Monitor supplier work processes and work products.		SAM Supplier Agreement Management	SAM SP 2.2 - Monitor Selected Supplier Processes SAM SP 2.3 - Evaluate Selected Supplier Work Products
		Specific Practice 2.3.5 Evaluate supplier deliverables against assurance acceptance criteria.		SAM Supplier Agreement Management	SAM SP 2.3 - Evaluate Selected Supplier Work Products SAM SP 2.4 Accept the Acquired Product
Process Area: Assurance Engineering					
Goal: SG3.1 Establish Assurance requirements.					
	Specific Practice 3.1.1 Understand the operating environment and define the operating constraints for assurance within the environments of system deployment.			RD Requirements Development	RD SP 1.1 - Elicit Needs
			Sub Practice 3.1.1.1 Identify System Assurance Context.		
			Sub Practice 3.1.1.2 Identify the system vulnerabilities with each operating environment defined for the system.		
			Sub Practice 3.1.1.3 Manage the assurance risk associated with operating the system within a defined environment.		
	Specific Practice 3.1.2 Develop assurrance requirements.			RD Requirements Development	RD SP 1.2 - Transform stakeholder needs, expectations, constraints, and interfaces into customer requirements.
			Sub Practice 3.1.2.1 Document Customer's Assurance Needs.		
			Sub Practice 3.1.2.2 Identify applicable assurance Laws, Policies, and Constraints.		
			Sub Practice 3.1.2.3 Identify abuse and failure cases for the system.		RD SP 3.1 Establish Operational Concepts and Scenarios
			Sub Practice 3.1.2.4 Identify the assurance views of system operation.		RD SP 3.2 Establish a Definition of Required Functionality
			Sub Practice 3.1.2.5 Define Assurance Requirements.		SP 2.1 Establish Product and Product Component Requirements

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			Sub Practice 3.1.2.6 Obtain Agreement of risk for Assurance level.		RD 3.5 - Validate reqts to ensure the resulting product will perform as intended in the user's environment.
		Specific Practice 3.1.3 Analyze assurance requirements.		RD Requirements Development	
			Sub Practice 3.1.3.1 Ensure established assurance requirements for the product flow to lower level solutions.		SP 3.3 Analyze Requirements
			Sub Practice 3.1.3.2 Verify requirements against assurance goals.		
			Sub Practice 3.1.3.3 Balance assurance needs against cost benefits.		SP 3.4 Analyze Requirements to Achieve Balance
Goal: SG3.2 - Architect a solution for assurance.					
		Specific Practice 3.2.1 Architect for assurance.		TS Technical Solution	TS SP 2.1 - Develop a product architecture.
			Sub Practice 3.2.1.1 Identify resources and trust boundaries.		
			Sub Practice 3.2.1.2 Develop the Assurance Architecture. Ensure the assurance operation of the product from the end-user's perspective and the customer assurance responsibilities are specified. Architect the error handling and failure modes to support resiliency: continuity of operations, containment and disaster recovery Identify and characterize threats to the assurance of the system. Identify and characterize risks to the system. Confirm that identified counter-measures sufficiently address threats to mitigate the risks.		
			Sub Practice 3.2.1.3 Select architectures based upon a cost-benefit analysis and assurance requirements in each of the operational environments for the system.		
		SP3.2.2 Design for assurance.		TS Technical Solution	TS SP2.1 - Design product component
			Sub Practice 3.2.2.1 Develop alternative assurance design solutions and selection criteria.		
			Sub Practice 3.2.2.2 Evolve operational concepts and scenarios for assurance.		
			Sub Practice 3.2.2.3 Select solution for assurance.		

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			Sub Practice 3.2.2.4 Employ appropriate assurance design patterns and anti-patterns.		
		Specific Practice 3.3.1 Implement a product design for assurance.		TS Technical Solution	TS SP 3.1 - Implement the Design
			Sub Practice 3.3.1.1 Identify deviations from assurance coding standards. Implement appropriate mitigation to meet defined assurance goals.		
			Sub Practice3.3.1.2 Include applicable and specific install, use, and caution information for administrators and operational users in the product documentation.		TS SP 3.2 Develop Product Support Documentation
Goal: SG3.4 - Verify and Validate the product assurance.					
		Specific Practice 3.4.1 Establish and maintain the environment for assurance verification and validation.		VER Verification VAL Validation	VAL SP 1.2 Establish the Validation environment VER SP 1.2 Establish the Validation environment
		Specific Practice 3.4.2 Verify an implementation for assurance.		VER Verification	VER SP 1.3 - Establish Verification Procedures and Criteria
			Sub Practice 3.4.2.1 Identify verification and measurement criteria used to establish the assurance case.		
			Sub Practice 3.4.2.2 Conduct peer reviews according to assurance standards and guidelines		VER SP 2.2 Conduct Peer Reviews
			Sub Practice 3.4.2.3 Verify the product for assurance requirements. Verify the resiliency (i.e. operational design, error handling, containment, continuity of operations and disaster recovery objectives.)		VER SP 3.1 Perform Verification
			Sub Practice 3.4.2.4 Test the product by testing from an attacker perspective. Verify the product through the results of threat modeling in addition to the usual verification practices of inspection, test, demonstration, and analysis.		
			Sub Practice 3.4.2.5 Identify, characterize, and resolve vulnerabilities resulting from verification.		
		SP 3.4.3 Validate an implementation for assurance.		VAL Validation	VAL SP 1.3 Establish Validation Procedures and Criteria
			Sub Practice 3.4.3.1 Identify validation and measurement criteria used to establish the assurance case.		
			Sub Practice 3.4.3.2 Validate the product using threat modeling inputs in addition to the usual validation practices.		VAL SP 2.1 Perform Validation

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			Sub Practice 3.4.3.3 Analyze the results from the threat model validation along with the usual validation practices.		VAL SP 2.2 Analyze Validation Results
			Sub Practice 3.4.3.4 Identify, characterize, and resolve vulnerabilities resulting from validation.		VAL SP 2.1 Perform Validation
Goal: SG3.5 - Identify and manage risks due to vulnerabilities throughout the product and system lifecycle.					
		Specific Practice 3.5.1 Define/select strategy for management of risk due to vulnerabilties.		RSKM Risk Management	RSKM SP 1.3 Establish a Risk Management Strategy
		Specific Practice 3.5.2 Identify assurance defects and effectiveness of corrective actions in other products/systems/operations (and apply to past, present, and future activities..)		TS Technical Solution	TS SP 1.2 - Select product component solutions
		Specific Practice 3.5.3 Assess the Risks associated with the identified vulnerabilities.		RSKM Risk Management	RSKM SP 2.1 Identify the Risks
		Specific Practice 3.5.4 Prioritize risks according to a defined methodology.		RSKM Risk Management	RSKM SP 2.2 Evaluate, Categorize, and Prioritize Risks
		Specific Practice 3.5.5 Identify mitigation controls and strategies.		RSKM Risk Management	RSKM SP 3.1 Develop Risk Mitigation Plans
		Specific Practice 3.5.6 Implement corrective action.		RSKM Risk Management	RSKM SP 3.2 Implement Risk Mitigation Plans
		Specific Practice 3.5.7 Monitor risk.		PMC Project Monitoring and Control	PMC SP 3.1 Monitor Project Risks
Process Area: Assurance Support Activities					
Goal: SG4.1 Perform product assurance audits.					
		Specific Practice 4.1.1 Objectively assess the project's assurance process compliance.		PPQA Process and Product Quality	PPQA SP 1.1 Objectively Evaluate Processes
		Specific Practice 4.1.2 Establish audit procedures and plan for the assurance audit.		PPQA Process and Product Quality	PPQA SP 1.1 Objectively Evaluate Processes
		Specific Practice 4.1.3 Perform audits with necessary tools like assurance checklist conforming to predefined policies, processes and standards.		PPQA Process and Product Quality	PPQA SP 1.1 Objectively Evaluate Processes
		Specific Practice 4.1.4 Ensure sufficient audit resources are available with expertise in assurance engineering.		PPQA Process and Product Quality	PPQA SP 1.2 - Objectively evaluate work products and services. PPQA SP 1.1 Objectively Evaluate Processes
		Specific Practice 4.1.5 Initiate and close corrective actions against assurance audit non-conformances.		PPQA Process and Product Quality	PPQA SP 2.1 Comm and Ensure Resolution of Noncompliance Issues
		Specific Practice 4.1.6 Measure, evaluate, and analyze audit performance in relation to performance objectives.		PPQA Process and Product Quality	PPQA SP 2.1 Comm and Ensure Resolution of Noncompliance Issues
		Specific Practice 4.1.7 Record audit results.		PPQA Process and Product Quality	PPQA SP 2.2 Est Records

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Goal: SG 4.2 Determine root causes of assurance defects.					
	Specific Practice 4.2.1 Evaluate, select, implement and track corrective actions			PMC Project Monitoring and Control	PMC SP 2.1 Analyze Issues
	Specific Practice 4.2.2 Conduct high level reviews of performance and corrective actions.			PMC Project Monitoring and Control	PMC SP 2.2 Take Corrective Action
	Specific Practice 4.2.3 Take corrective action at the organizational level based upon systemic assurance vulnerabilities and issues			PMC Project Monitoring and Control	PMC SP 2.2 Take Corrective Action
Goal: SG 4.3 Protect project and organizational assets.					
	Specific Practice 4.3.1 Properly configure and use assurance controls.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
	Specific Practice 4.3.2 Detect and track both internal and external assurance related events.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
	Specific Practice 4.3.3 Respond to incidents according to organizational policy.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
	Specific Practice 4.3.4 Identify changes to the operational assurance posture of the project and organizational environments and ensure they are addressed in accordance with the assurance objectives.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
	Specific Practice 4.3.5 Plan for continuous availability of project and organizational environment.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
		Sub Practice 4.3.5.1 Plan and test Recovery from disaster situations for both project and business activities.			
		Sub Practice 4.3.5.2 Identify and test contingency plan.			
	Specific Practice 4.3.6 Properly maintain process and organizational information labeled with the appropriate assurance classifications.			IPM Integrated Project Management OPD Orgainizational Process Definition	IPM SP 1.3 Establish the Project's Work Environment OPD SP 1.6 Establish Work Environment Standards
		Sub Practice 4.3.6. 1 Maintain control over work product configurations.			
		Sub Practice 4.3.6.2 Identify data owner.			