

# “Constellations” Demystified:

Using CMMI® Models to Support  
Development, Acquisition, and Service Delivery

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22 September 2009

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- ▶ The CMMI® Framework
  - Core Process Areas
    - CMMI® for Development (CMMI®-DEV)
    - CMMI® for Acquisition (CMMI®-ACQ)
    - CMMI® for Services (CMMI®-SVC)
  - Putting Them All Together
  - Questions! and Answers?

# The CMMI Framework

“The basic structure that organizes CMMI components, including

- “common elements of the current CMMI models as well as
- “rules and methods for generating models,
- “appraisal methods (including associated artifacts), and
- “training materials.

“The framework enables new disciplines to be added to CMMI so that the new disciplines will integrate with the existing ones.”

[CMMI® Glossary]

# CMMI<sup>®</sup> Framework Purpose

“A purpose of the CMMI Framework Architecture is

- “to control the selection and use of model components
- “to construct CMMI models for various areas of interest.”

“When building a new CMMI model, developers

- “use existing well-proven components
- “that fit the needs of the new area of interest.”

“Using these existing components reduces

- “the amount of training needed and
- the adjustment of existing processes required.”

Source: *Introduction to the Architecture of the CMMI<sup>®</sup> Framework*, p. 1.

# CMMI<sup>®</sup> Framework: Model Portion

The model portion of the CMMI<sup>®</sup> Framework is composed of :

- the CMMI<sup>®</sup> Model Foundation
- shared material
- constellation-specific material (acquisition, development, services).

# The CMMI<sup>®</sup> Model Foundation (CMF)

“The CMF exists within the CMMI<sup>®</sup> Framework.

“The CMF contains sections for each of the following:

- “front matter
- “generic goals and generic practices
- “process areas
- “glossary.”

Source: *Introduction to the Architecture of the CMMI<sup>®</sup> Framework*, p. 3.

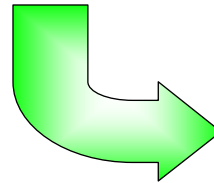
## CMF Constraint (~)

“In other words, constellations and models

- “must use the CMF
- “without deleting or changing any of its content.

### “Adding

- “process areas,
- “specific goals,
- “specific practices,
- “specific subpractices,
- “typical work products,
- “generic practice elaborations,
- “glossary entries,
- “and front matter



### Note

The SEI’s CMMI® team made a deliberate decision to incorporate approved CMF changes to the ACQ and SVC models as they were released.

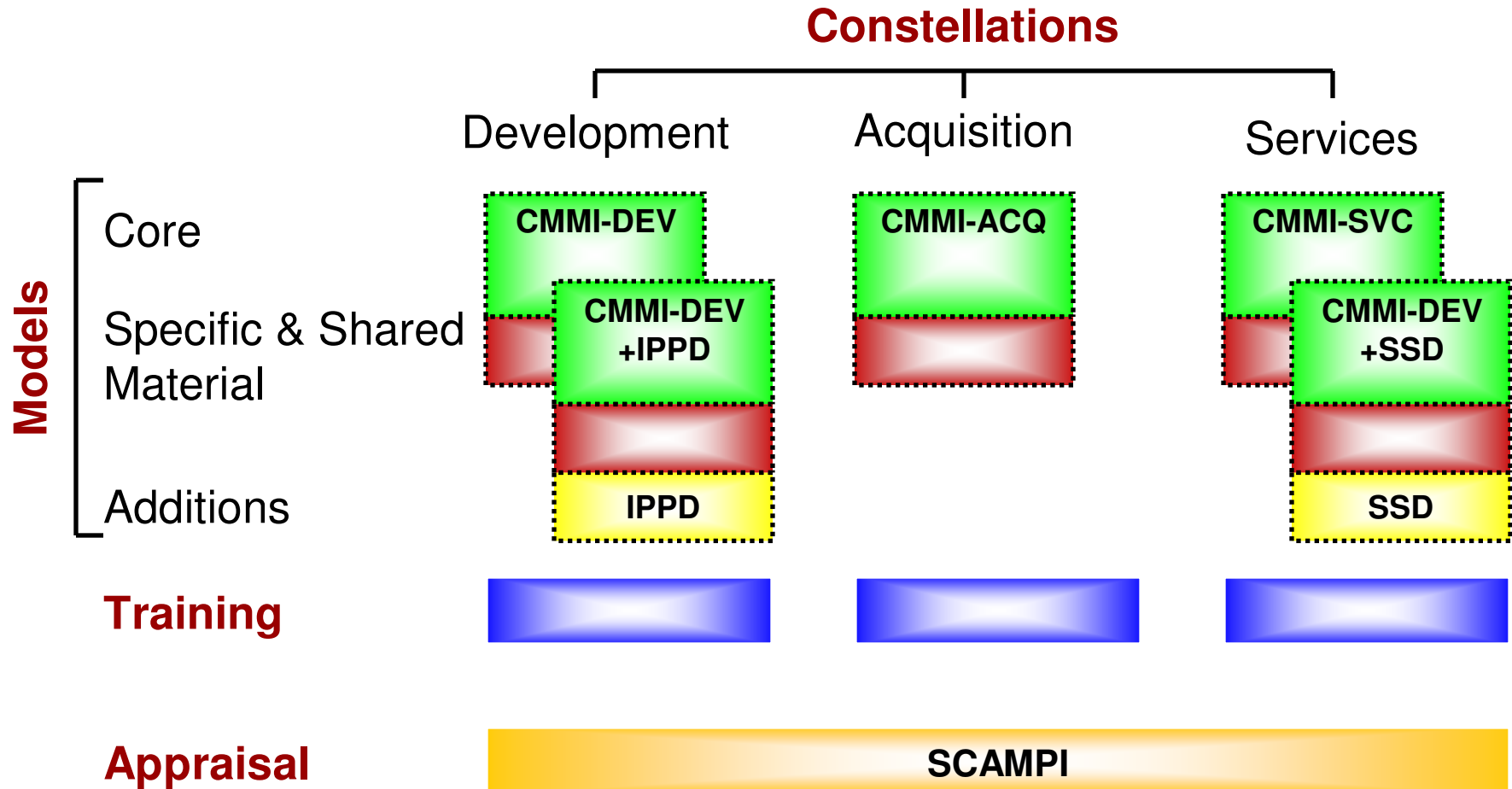
The incorporated changes refine component wording without affecting interpretation.

These same changes will be incorporated into a later release of the DEV model to maintain CMF consistency.

“is permitted.”

Source: *Introduction to the Architecture of the CMMI® Framework*, p. 3.

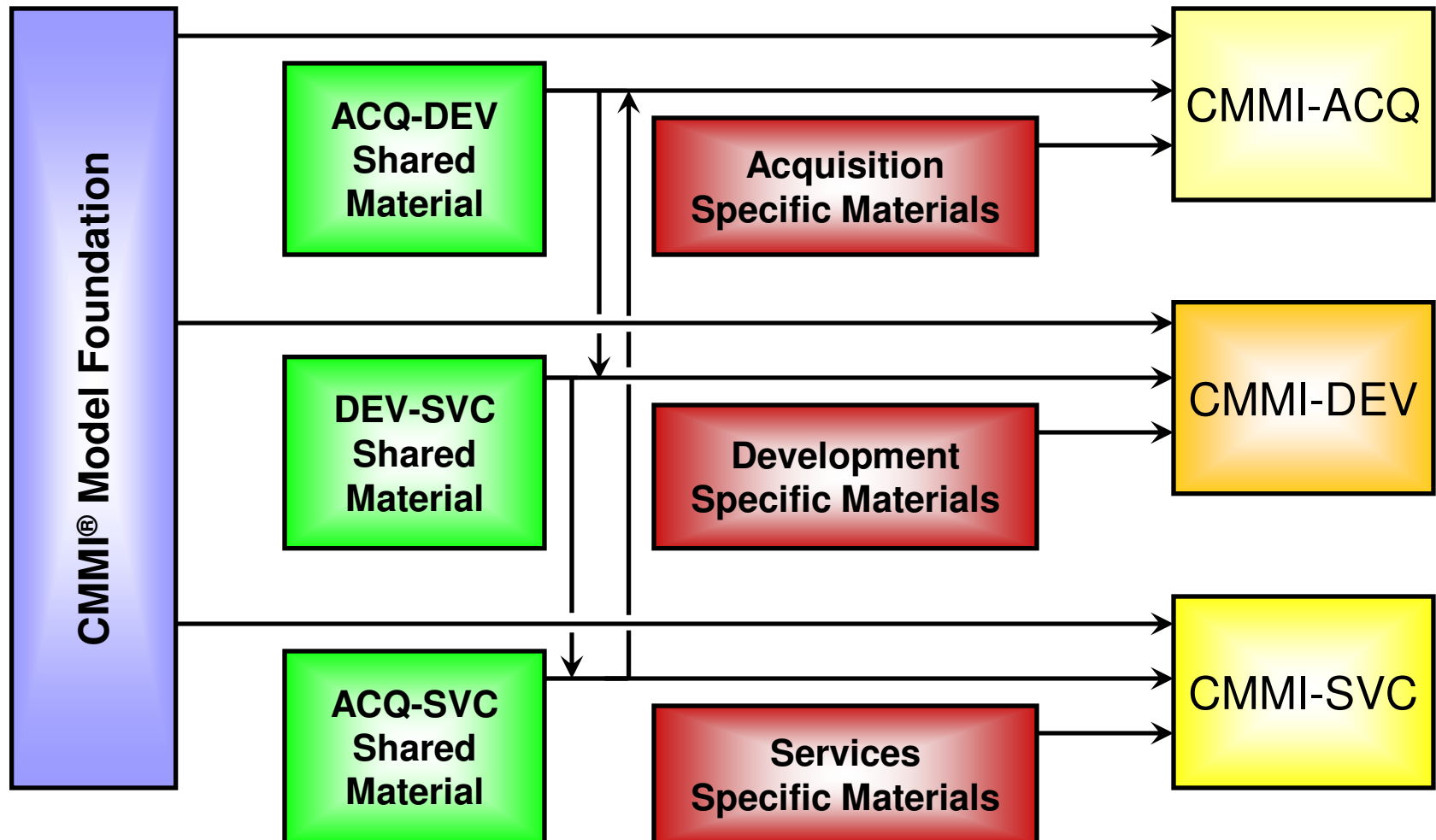
# CMMI® Framework Overview



IPPD: Integrated Product and Process Development

SSD: Service System Development

# The Model Portion Illustrated



The CMMI® Framework

▶ Core Process Areas

CMMI® for Development (CMMI®-DEV)

CMMI® for Acquisition (CMMI®-ACQ)

CMMI® for Services (CMMI®-SVC)

Putting Them All Together

Questions! and Answers?

## Process Area Defined

“A cluster of related practices in an area that, when implemented collectively, satisfy a set of goals considered important for making improvement in that area.”

[CMMI Glossary]

# The 16 Core Process Areas with Acronyms

Causal Analysis and Resolution (CAR)	Organizational Training (OT)
Configuration Management (CM)	Project Monitoring and Control (PMC)
Decision Analysis and Resolution (DAR)	Project Planning (PP)
Integrated Project Management (IPM)	Process and Product Quality Assurance (PPQA)
Measurement and Analysis (MA)	Quantitative Project Management (QPM)
Organizational Innovation and Deployment (OID)	Requirements Management (REQM)
Organizational Process Definition (OPD)	Risk Management (RSKM)
Organizational Process Focus (OPF)	
Organizational Process Performance (OPP)	

# CMMI® Core PA Categories

## Project Management

- Project Planning
- Project Monitoring and Control
- Requirements Management
- Integrated Project Management
- Risk Management
- Quantitative Project Management

## Process Management

- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Organizational Process Performance
- Organizational Innovation and Deployment

## Support

- Configuration Management
- Measurement and Analysis
- Process and Product Quality Assurance
- Decision Analysis and Resolution
- Causal Analysis and Resolution

# Core PA Maturity Level Associations

## Maturity Level 2

Requirements Management  
Project Planning  
Project Monitoring and Control  
Measurement and Analysis  
Process and Product Quality Assurance  
Configuration Management

## Maturity Level 4

Organizational Process Performance  
Quantitative Project Management

## Maturity Level 3

Organizational Process Focus  
Organizational Process Definition  
Organizational Training  
Integrated Project Management  
Risk Management  
Decision Analysis and Resolution

## Maturity Level 5

Organizational Innovation and Deployment  
Causal Analysis and Resolution

# Core PAs in Context

	Proc Mgt	Proj Mgt		Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM		DAR
ML 2		PP PMC REQM		MA PPQA CM

The CMMI® Framework

Core Process Areas

▶ CMMI® for Development (CMMI®-DEV)

CMMI® for Acquisition (CMMI®-ACQ)

CMMI® for Services (CMMI®-SVC)

Putting Them All Together

Questions! and Answers?

Requirements Development (RD)

Product Integration (PI)

Supplier Agreement Management (SAM) \*

Technical Solution (TS)

Validation (VAL)

Verification (VER)

\* Shared with CMMI<sup>®</sup>-SVC

# CMMI®-DEV PA Categories

## Project Management

Project Planning  
Project Monitoring and Control  
~~Requirements Management~~

## Supplier Agreement Management

Integrated Project Management  
Risk Management  
Quantitative Project Management

## Support

Configuration Management  
Measurement and Analysis  
Process and Product Quality Assurance  
Decision Analysis and Resolution  
Causal Analysis and Resolution

## Process Management

Organizational Process Focus  
Organizational Process Definition  
Organizational Training  
Organizational Process Performance  
Organizational Innovation and Deployment

## Engineering

Requirements Management  
Requirements Development  
Technical Solution  
Product Integration  
Verification  
Validation

# CMMI<sup>®</sup>-DEV PAs in Context

	Proc Mgt	Proj Mgt	Eng	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM	RD TS PI VER VAL	DAR
ML 2		PP PMC <b>SAM</b>	REQM	MA PPQA CM

The CMMI® Framework

Core Process Areas

CMMI® for Development (CMMI®-DEV)

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Putting Them All Together

Questions! and Answers?

Agreement Management (AM)

Acquisition Requirements Development (ARD)

Acquisition Technical Management (ATM)

Acquisition Validation (AVAL)

Acquisition Verification (AVER)

Solicitation & Supplier Agreement Development (SSAD)

\* Shared with CMMI<sup>®</sup>-SVC

# CMMI<sup>®</sup>-ACQ PA Categories

## Project Management

Project Planning  
Project Monitoring and Control  
Requirements Management  
~~Supplier Agreement Management~~  
Integrated Project Management  
Risk Management  
Quantitative Project Management

## Support

Configuration Management  
Measurement and Analysis  
Process and Product Quality Assurance  
Decision Analysis and Resolution  
Causal Analysis and Resolution

## Process Management

Organizational Process Focus  
Organizational Process Definition  
Organizational Training  
Organizational Process Performance  
Organizational Innovation and Deployment

## Acquisition

Agreement Management  
Acq. Requirements Development  
Acq. Technical Management  
Acq. Verification  
Acq. Validation  
Solicitation & Supplier Agreement Development

# CMMI<sup>®</sup>-ACQ PAs in Context

	Proc Mgt	Proj Mgt	Acq	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM	ATM AVER AVAL	DAR
ML 2		PP PMC REQM	AM ARD SSAD	MA PPQA CM

# DEV-ACQ PP Comparison<sub>1</sub>

## DEV

- SG 1 Establish Estimates
  
- SP 1.1 Estimate the Scope of the Project
- SP 1.2 Establish Estimates of Work Product and Task Attributes
- SP 1.3 Define Project Lifecycle
- SP 1.4 **Determine Estimates of** Effort and Cost

## ACQ

- SG 1 Establish Estimates
  
- SP 1.1 Establish the Acquisition Strategy**
- SP 1.2 Estimate the Scope of the Project
- SP 1.3 Establish Estimates of Work Product and Task Attributes
- SP 1.4 Define Project Lifecycle **Phases**
- SP 1.5 **Estimate** Effort and Cost

Note: Differences are highlighted.

# DEV-ACQ PP Comparison<sub>2</sub>

## DEV

- SG 2 Develop a Project Plan
- SP 2.1 Establish the Budget and Schedule
- SP 2.2 Identify Project Risks
- SP 2.3 Plan **for** Data Management
- SP 2.4 Plan **for Project** Resources
- SP 2.5 Plan **for** Needed Knowledge and Skills
- SP 2.6 Plan Stakeholder Involvement
  
- SP 2.7 Establish the Project Plan

## ACQ

- SG 2 Develop a Project Plan
- SP 2.1 Establish the Budget and Schedule
- SP 2.2 Identify Project Risks
- SP 2.3 Plan Data Management
- SP 2.4 Plan **the Project's** Resources
- SP 2.5 Plan Needed Knowledge and Skills
- SP 2.6 Plan Stakeholder Involvement
- SP 2.7 Plan Transition to Operations and Support**
- SP 2.8 Establish the Project Plan

Note: Differences are highlighted.

# DEV-ACQ PP Comparison<sub>3</sub>

## DEV

- SG 3 Obtain Commitment to the Plan
- SP 3.1 Review Plans That Affect the Project
- SP 3.2 Reconcile Work and Resource Levels
- SP 3.3 Obtain Plan Commitment

## ACQ

- SG 3 Obtain Commitment to the Plan
- SP 3.1 Review Plans That Affect the Project
- SP 3.2 Reconcile Work and Resource Levels
- SP 3. Obtain Plan Commitment

Note: Differences are highlighted.

# RD-ARD Comparison<sub>1</sub>

## RD

- SG 1 Develop Customer Requirements
- SP 1.1 Elicit Needs
- SP 1.2 Develop the Customer Requirements
  
- SG 2 Develop **Product** Requirements
- SP 2.1 Establish **Product and Product Component** Requirements
- SP 2.2 Allocate **Product Component** Requirements
- SP 2.3 Identify Interface Requirements

## ARD

- SG 1 Develop Customer Requirements
- SP 1.1 Elicit **Stakeholder** Needs
- SP 1.2 Develop **and Prioritize** Customer Requirements
  
- SG 2 Develop **Contractual** Requirements
- SP 2.1 Establish **Contractual** Requirements
- SP 2.2 Allocate **Contractual** Requirements

Note: Differences are highlighted.

## RD-ARD Comparison<sub>2</sub>

### RD

- SG 3 Analyze and Validate Requirements
- SP 3.1 Establish Operational Concepts and Scenarios
- SP 3.2 Establish a Definition of Required Functionality**
- SP 3.3 Analyze Requirements
- SP 3.4 Analyze Requirements to Achieve Balance
- SP 3.5 Validate Requirements

### ARD

- SG 3 Analyze and Validate Requirements
- SP 3.1 Establish Operational Concepts and Scenarios
- SP 3.2 Analyze Requirements
- SP 3.3 Analyze Requirements to Achieve Balance
- SP 3.4 Validate Requirements

Note: Differences are highlighted.

# SAM as ACQ Light?<sub>1</sub>

## SAM SG 1

SG 1 Establish Supplier Agreements

SP 1.1 Determine Acquisition Type

SP 1.2 Select Suppliers

SP 1.3 Establish Supplier Agreements

## SSAD SG 2 & 3

SG 2 Select Suppliers

SP 2.1 Evaluate Proposed Solutions

SP 2.2 Establish Negotiation Plans

SP 2.3 Select Suppliers

SG 3 Establish Supplier Agreements

SP 3.1 Establish an Understanding of the Agreement

SP 3.2 Establish the Supplier Agreement

Note: Congruencies are highlighted.

## SAM as ACQ Light?<sub>2</sub>

### SAM SG 2

- SG 2 Satisfy Supplier Agreements
- SP 2.1 Execute the Supplier Agreement
- SP 2.2 Monitor Selected Supplier Processes
- SP 2.3 Evaluate Selected Supplier Work Products \*
- SP 2.4 Accept the Acquired Product
- SP 2.5 Transition Products

### AM

- SG 1 Satisfy Supplier Agreements
- SP 1.1 Execute the Supplier Agreement
- SP 1.2 Monitor Selected Supplier Processes
- \* Addressed less obviously by ATM
- SP 1.3 Accept the Acquired Product
- SP 1.4 Manage Supplier Invoices

Note: Congruencies are highlighted.

The CMMI® Framework

Core Process Areas

CMMI® for Development (CMMI®-DEV)

CMMI® for Acquisition (CMMI®-ACQ)

▶ CMMI® for Services (CMMI®-SVC)

Putting Them All Together

Questions! and Answers?

Capacity and Availability Management (CAM)

Incident Resolution and Prevention (IRP)

Service Continuity (SCON)

Service Delivery (SD)

Service System Development (SSD)

Service System Transition (SST)

Strategic Service Management (STSM)

\* Shared with CMMI<sup>®</sup>-SVC

# CMMI®-SVC PA Categories

## Project Management

Project Planning  
Project Monitoring and Control  
Requirements Management

## Supplier Agreement Management

## Capacity and Availability Management

Integrated Project Management  
Risk Management

## Service Continuity

Quantitative Project Management

## Support

Configuration Management  
Measurement and Analysis  
Process and Product Quality  
Assurance  
Decision Analysis and Resolution  
Causal Analysis and Resolution

## Process Management

Organizational Process Focus  
Organizational Process Definition  
Organizational Training  
Organizational Process  
Performance  
Organizational Innovation and  
Deployment

## Service Establishment & Delivery

Service Delivery  
Incident Resolution & Prevention  
Service System Development \*  
Service System Transition  
Strategic Service Management

\* Addition

# CMMI<sup>®</sup>-SVC PAs in Context

	Proc Mgt	Proj Mgt	SED	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	CAM IPM RSKM SCON	SST STSM IRP SSD*	DAR
ML 2		PP PMC REQM SAM	SD	MA PPQA CM

\* Addition

# SSD as DEV Light?<sub>1</sub>

## CMMI®-SVC: SSD

- SG 1 Develop and Analyze Stakeholder Requirements
- SP 1.1 Develop **Stakeholder** Requirements
- SP 1.2 Develop **Service System** Requirements
- SP 1.3 Analyze and Validate Requirements

## CMMI®-DEV: RD

- SG 1 Develop **Customer** Requirements
- SG 2 Develop **Product** Requirements
- SG 3 Analyze and Validate Requirements

Note: Differences are highlighted.

# SSD as DEV Light?<sub>2</sub>

## CMMI®-SVC: SSD

SG 2 Develop Service Systems

SP 2.1 Select **Service System** Solutions

SP 2.2 Develop the Design

SP 2.3 Ensure Interface Compatibility

SP 2.4 Implement the **Service System** Design

SP 2.5 **Integrate Service System** Components

## CMMI®-DEV: RD, TS, PI

SP 1.2 Select **Product Component** Solutions (TS)

SG 2 Develop the Design (TS)

**SP 2.3 Identify Interface Requirements** (RD) [~ subpractice in SSD, SP 1.2]

**SP 2.3 Design Interfaces Using Criteria** (TS) [subpractice in SSD, SP 2.2]

SG 2 Ensure Interface Compatibility (PI)

SP 3.1 Implement the Design (TS)

SP 3.1 **Confirm Readiness of Product** Components for Integration (PI)

SP 3.2 **Assemble Product Components** (PI)

Note: Differences are highlighted.

The CMMI® Framework

Core Process Areas

CMMI® for Development (CMMI®-DEV)

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▶ Putting Them All Together

Questions! and Answers?

# All Together Now... Overwhelming?

	Proc Mgt	Proj Mgt	Eng	Acq	SED	Spt
ML 5	OID					CAR
ML 4	OPP	QPM				
ML 3	OPF OPD OT	CAM IPM RSKM SCON	RD TS PI VER VAL	ATM AVER AVAL	SST STSM IRP SSD*	DAR
ML 2		PP PMC REQM SAM	REQM (DEV only)	AM ARD SSAD	SD	MA PPQA CM

\* Addition

# Instead Try This... Core...

	Proc Mgt	Proj Mgt		Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM		DAR
ML 2		PP PMC REQM		MA PPQA CM

	Proc Mgt	Proj Mgt	Eng	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM	RD TS PI VER VAL	DAR
ML 2		PP PMC <b>SAM</b>	REQM	MA PPQA CM

	Proc Mgt	Proj Mgt	Acq	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	IPM RSKM	ATM AVER AVAL	DAR
ML 2		PP PMC REQM	AM ARD SSAD	MA PPQA CM

	Proc Mgt	Proj Mgt	SED	Spt
ML 5	OID			CAR
ML 4	OPP	QPM		
ML 3	OPF OPD OT	CAM IPM RSKM SCON	SST STSM IRP SSD*	DAR
ML 2		PP PMC REQM SAM	SD	MA PPQA CM

\* Addition

# ...Equals the Whole Kit and Caboodle

	Proc Mgt	Proj Mgt	Eng	Acq	SED	Spt
ML 5	OID					CAR
ML 4	OPP	QPM				
ML 3	OPF OPD OT	CAM IPM RSKM SCON	RD TS PI VER VAL	ATM AVER AVAL	SST STSM IRP SSD*	DAR
ML 2		PP PMC REQM SAM	REQM (DEV only)	AM ARD SSAD	SD	MA PPQA CM

- Core
- DEV
- ACQ
- SVC
- DEV/SVC

\* Addition

## Still Overwhelmed?

Good. (Challenges stimulate action!)

Remember that you don't have to comprehend everything at once.

Components can be grouped/categorized according to

- constellation
- core
- category
- maturity level.

# Moving Forward

Participate in training, events, and JCSE on-line forum.

Work at it--study the models!

- Model differences often aren't as great as they appear.
- Content in one model often informs content in another.
- Your understanding and ability to apply the models will expand tremendously!

Watch for the book! [Coming *<ahem>* not soon, but coming.]

The CMMI® Framework

Core Process Areas

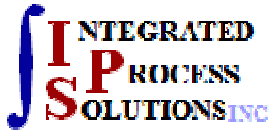
CMMI® for Development (CMMI®-DEV)

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Putting Them All Together

▶ Questions! and Answers?



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