

The logo for DigitalNet, featuring the word "DIGITALNET" in a bold, blue, sans-serif font. A red triangle is positioned between the "I" and "A" in "DIGITAL".

**DIGITALNET**

The logo for BearingPoint, featuring a stylized black and gold arch above the word "BearingPoint" in a black, serif font. A small trademark symbol (TM) is located at the end of the word.

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# Preserving the CMM Investment When Transitioning to CMMI

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# Objectives

- Show how to preserve an investment in software process improvement and extend it to systems engineering
- Show how to use an understanding of the SW-CMM to implement CMMI
- Maintain an emphasis on process improvement and meeting business goals



Background

# CMM Has a Long History

- Version 1.0 released in 1991
- Thousands of organizations have built supporting infrastructures and deployed processes.
- Books, reports, training, and tools have been developed – and purchased!
- Conferences have been held and consultants have been hired.

# Evolution

- CMMI is the “next generation model”
  - CMMI extends the CMM
  - CMMI addresses and emphasizes areas not present in CMM
  - Incorporates best practices from other models
  - Adds, deletes, and changes emphasis based on lessons learned

# CMM Investments

- Organization
  - SEPG, Management Steering Group
  - SQA, SCM, Training Group
- Documents
  - Policies
  - Standards, Procedures, Guides, Templates
  - Training
- Tools
  - Process Asset Library
  - Measurement Database

# Transition Basics

- Limit discussion to ML 2 and ML 3
  - Higher level organizations need less transitioning help
- We will start with a global process improvement view and then concentrate on the details
- Transitioning is more than mapping
  - Mapping helps the “mechanics”
  - Understanding of each model is needed
    - Similarities
    - Differences
    - Interpretations



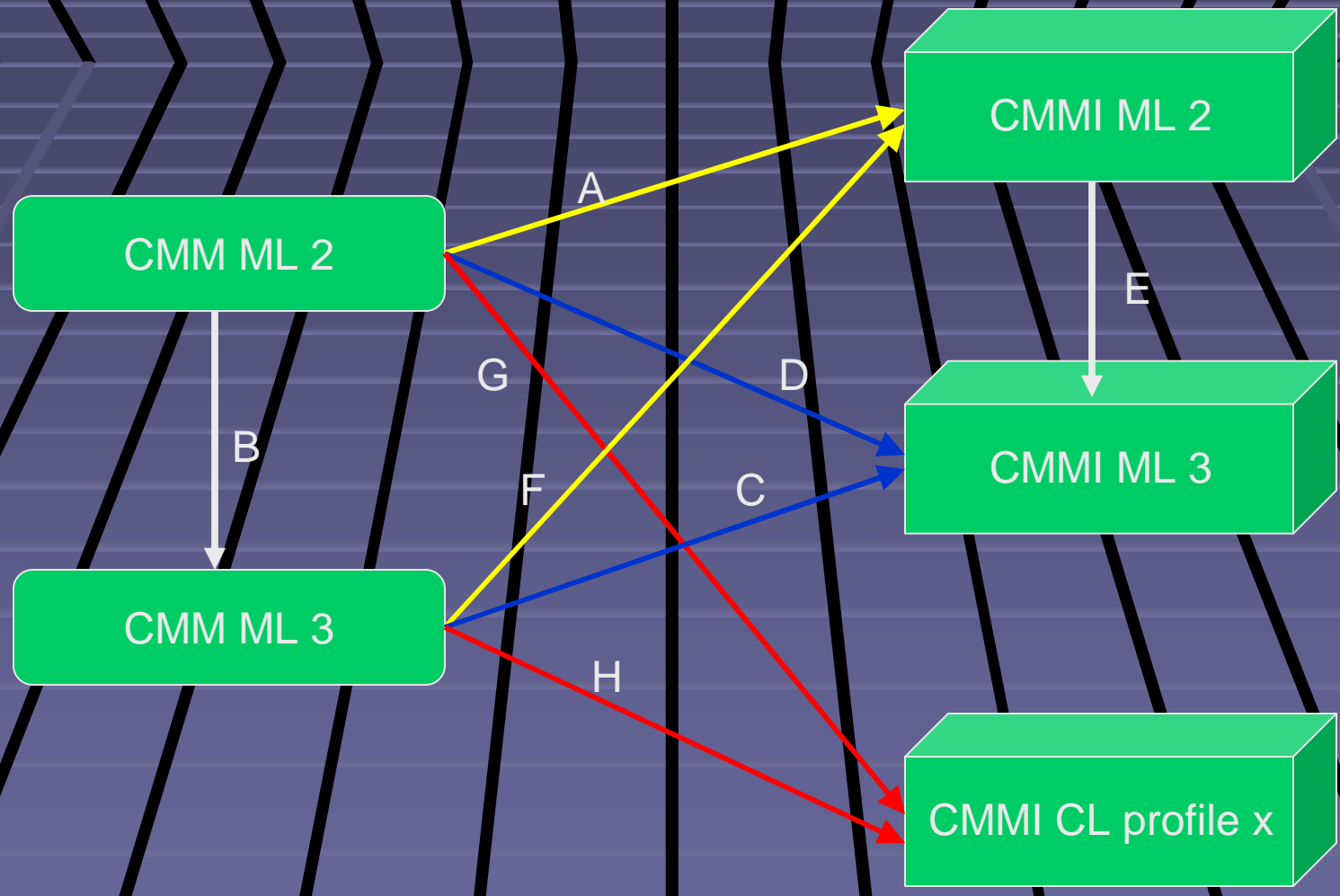
# Where's the target?

Need well defined business goals

- Which disciplines are of interest?
  - Software engineering
  - Systems engineering
  - Integrated product and process development
  - Supplier sourcing
- Which representation should be used?
  - Staged
  - Continuous
  - Both?



# Which Road Should be Taken?



# Road Maps

- A-E (*CMM ML2 -> CMMI ML2 -> CMMI ML3*)
  - Advantage: Straightforward progression in CMMI process improvement
  - Disadvantage: More demanding when addressing CMMI ML 3
- B-C (*CMM ML2 -> CMM ML3 -> CMMI ML3*)
  - Advantage: Straightforward progression in CMM; PI infrastructure in place when addressing CMMI
  - Disadvantage: Path from CMM ML 2 may be time consuming and require rework
- D (*CMM ML2 -> CMMI ML3*)
  - Advantage: Very aggressive but may reach goal quickly
  - Disadvantage: May be difficult (requires mastering both PI and CMMI)
- F-E (*CMM ML 3 -> CMMI ML2 -> CMMI ML3*)
  - Advantage: Using PI experience to address CMMI differences
  - Disadvantage: “Regressive” and politically distasteful
- G, H (*CMM ML2/ML3 -> CMMI CL profile*)
  - Advantage: May select those PAs that will bring the largest ROI
  - Disadvantage: May require enabling PAs to be effective

# Getting Started

- Need to know gaps between current practices and CMMI requirements.
- Determine gaps through:
  - Gap analysis (e.g., Class C appraisal)
  - Class A (SCAMPI) or Class B appraisal
  - Workshops (structured discussion of the Model and its implementation/impact on the existing processes)

# What's New in the CMMI?

and its *impact* on transitioning

# Broad Model Changes

- Process Areas
  - New PAs added
  - Some KPA practices expanded to PAs
- Generic Goals and Generic Practices
  - Emphasize institutionalization
- New best practices added
  - Formalize the lessons learned from successful CMM implementations

# Responsibility & Commitment

- Same level of commitment is required
- Senior management support and commitment
  - Policies - Organizations that simply listed CMM requirements may have to rewrite their policies
  - Adequate resources and funding
- Infrastructure groups (EPG, SEPG, PATs, Working Groups, Steering Groups) still needed



# Emphasis on Institutionalization

- Managing configurations -> now more visible (GP 2.6)
- Identifying and involving relevant stakeholders
  - Note: PP SP 2.6, *Plan Stakeholder Involvement* and PMC SP 1.5, *Monitor Stakeholder Involvement* should be considered
- “... according to a documented procedure.” -> “... the plan for performing the process.”
  - Includes process description, standards, assignments, monitoring requirements, ...
- Monitor and control against the plan for performing the process
  - GP 2.8 is more explicit than CMM ME practice
  - Incorporates both Measurement and Analysis and project management review



# Impact of Common Feature Changes

- Little impact on a solid CMM ML 2 or ML 3 organization
  - See Roadmap A-E (*CMM ML2 -> CMMI ML2 -> CMMI ML3*)
  - See Roadmap B-C (*CMM ML2 -> CMM ML3 -> CMMI ML3*)
- GP 3.1 requires revisiting all ML 2 PAs
  - Solid CMM ML 3 organizations would already do this

**“If an organization is looking at leveraging high maturity experience to areas with no maturity, the CMMI GPs are the basic behavioral principles that can be used in any discipline” [Paulk]**

# Maturity Level Changes

## What do CMMI requirements mean to processes based on the CMM?

- Characteristics of maturity levels did not change
- There are very few new process areas
  - e.g., MA, DAR, IPPD
  - Other “new” process areas have roots in the CMM practices (e.g., RD, TS, RSKM, etc.)
- Process requirements are more stringent and in some cases more elaborate
- Continuous representation allows more freedom in selecting processes to best satisfy organizational business objectives

# Subpractice Level Changes

- Many subpractices require “criteria”
  - RM SP 1.1, *Obtain an Understanding of Requirements*
    - 1. Establish criteria for distinguishing appropriate requirements providers.
    - 2. Establish objective criteria for the acceptance of requirements.
  - PP SP 2.1, *Establish the Budget and Schedule*
    - 6. Establish corrective action criteria.
  - OPD SP 1.5, *Establish the Organization’s Process Asset Library*
    - 2. Specify the criteria for including items in the library.

# Increased Visibility

- Moving from CMM to a higher level CMMI model component brings more visibility and impact, e.g.:
  - REQM SP 1.2, *Obtain Commitment to Requirements* was subpractice in the CMM (RM.AC 1.4)

As the requirements evolve, this specific practice ensures that project participants commit to the current, approved requirements and the resulting changes in project plans, activities, and work products.
  - CM SG 1, *Establish Baselines* is a goal but was a subpractice in the CMM (SCM.AC 4.4)
  - Many examples in the Engineering PAs derived from the CMM SPE practices

# Other significant changes

## Examples:

- REQM SP 1.4, *Maintain Bidirectional Traceability of Requirements*
  - No longer hidden as a subpractice in SPE AC 10
  - More demanding - covers both the horizontal and vertical relationships
- OPF SP 1.1, *Establish Organizational Process Needs*
  - New requirement related to organizational business objectives
  - In CMM the primary inputs were assessment results
- OPD SP 1.1, *Establish Standard Processes*
  - Ties the organization's objectives to its set of standard processes
- OPD SP 1.4, *Establish Measurement Repository*
  - Requires determination of organization's needs



# Other significant changes

- OT SP 2.3, *Assess Training Effectiveness*
  - CMMI requirements stronger than CMM (TP ME 2)
- IPM SP 1.3, *Integrate Plans*
  - New requirement, much stronger than CMM ISM AC 3
- IPM SP 2.1, *Manage Stakeholder Involvement*
  - Builds on PP SP 2.6, *Plan Stakeholder Involvement* and PMC SP 1.5, *Monitor Stakeholder Involvement*

# Changes in the “Other” Direction

- Reduced emphasis on PPQA reporting structure
- No requirement for a training group in the OT PA
- No requirements for “..according to a documented procedure ...” or “The procedure typically specifies that ...”
  - But plans (GP 2.2) and process descriptions (GP 3.1) may incorporate those procedures
  - Related CMM text may be found in many CMMI subpractices
- No requirements for “The plan covers...”
  - But associated CMM subpractices may still be present, spread across several GPs and SPs



# Example of a Plan

**CMM SQA AC 2 – The SQA group’s activities are performed in accordance with the SQAP.**

The Plan covers:

1. Responsibility and authority
2. Resource requirements
3. Schedule and funding
4. SQA participates in developing SDP, standards and procedures
5. Evaluation to be performed by the SQA group
6. Audits and reviews
7. Standards used as basis of SQA reviews/audits
8. Procedures for tracking non-compliances
9. SQA group’s documentation
10. Method and frequency of providing feedback

## CMMI PPQA

- > GP 2.4
- > GP 2.3
- > GP 2.2
- > PP GP 2.7
- > SP 1.1, SP 1.2
- > SP 1.1, SP 1.2
- > SP 1.1, SP 1.2
- > SP 2.1
- > SP 2.2
- > SP 2.1, GP 2.7

# What is the impact of CMMI changes?

- Most CMM ML 3 processes should cover CMMI requirements
  - DO NOT eliminate “documented procedures” or “according to plan” if they are working
  - Refer to them in the process descriptions and improve them if necessary
- Some new requirements will have to be implemented
  - Make sure that they are adequately described and are blended into the existing processes
- What about processes and groups that are no longer required?
  - DO NOT eliminate them or change them if they are working and are effective

# Overall Impact of Changes

**“The CMMI is not just a set of processes, but a model or a guide to improve processes. Using CMMI as a model for measuring processes is a viewpoint from a mature organization.” [Garcia]**

- Most changes / amplifications should be covered in the process descriptions
  - Existing CMM-based processes should be evaluated to make sure that those changes are addressed
- Some changes will have to be introduced
  - “Change management” will be less difficult for more mature organizations
  - Organizations with a “business case” for the CMMI will have more support for change
- CMM investment will be preserved

# How the Continuous Representation Helps

- Consider enabling PAs (CM, PPQA, MA, OPD, IPM)
- Consider OPF/OPD even when attempting to achieve CL 2 across several PAs?
- When is an organization ready to implement MA?
- Can/should SAM ever be declared N/A?

# A Transition Approach

- Implement OPF (at least SG1)
- Implement GP 2.1, *Establish an Organizational Policy* for all PAs
- For PP, PMC, CM, PPQA, MA implement:
  - GP 2.2, *Plan the Process*
  - GP 2.3, *Provide Resources*
  - GP 2.4, *Assign Responsibility*
  - GP 2.5, *Train People*

# Transition Approach (2)

- Implement Specific Practices for PP, PMC, CM, PPQA, MA
- For PP, PMC, CM, PPQA, MA implement:
  - GP 2.6, *Manage Configurations*
  - GP 2.8, *Monitor and Control the Process*
  - GP 2.9, *Objectively Evaluate Adherence*
  - GP 2.7, *Identify and Involve Relevant Stakeholders*
  - GP 2.10, *Review Status with Senior Management*
- Implement SAM



# Transition Approach (3)

- Satisfy GG1 & GG2 for the basic Organizational PAs
  - OPF, OPD, OT
- Implement the engineering PAs
  - REQM, RD, TS, PI, VER, VAL
- Implement GG1 & GG2 for IPM
- Implement GG 3, *Institutionalize a Defined Process*, for all PAs



The background features a dark blue field with a series of black lines that create a perspective effect, resembling a hallway or a series of parallel paths receding into the distance. The lines are arranged in a grid-like fashion, with a central vertical line and several pairs of lines on either side that converge towards the top of the frame.

Conclusion

# Impact: It Depends

- How mature is your maturity level?
- CMMI incorporates lessons learned throughout the model
  - Freshly minted CMM ML x organizations may have concentrated on **written** requirements.
  - Organizations that have had time to evolve and add understanding will have fewer difficulties transitioning

# Impact of PAs and Disciplines

- Significantly different PAs and SGs must be addressed.
- Subtleties (e.g., at the subpractice level) must be evaluated.
- Discipline impacts must incorporated
  - Even for a SW-only organization, some SE concepts are part of the model

# Impact of Representation

- Continuous representation can make transition less abrupt.
- Competitive pressures influence representation and pace of transition
  - Management may target a maturity level
    - ✍️ Piloting – “Industry working under time-to-market pressures will not find it feasible to allocate the extra effort to pilot the CMMI, unless the decision to transition has been made.” - Menezes (in Garcia TR-007)

# Example: DigitalNet

- DigitalNet is a new company
  - < 2000 staff
- Predecessor organizations had CMM ML2 and ML3 achievements in place
  - HFSI, Wang, I-NET, Getronics Government Solutions
- Gap analyses performed
  - Class C (Jan 2003) and Class A (Oct 2003)
  - Workshops for new projects
- Transition to CMMI builds on existing processes and infrastructure
- On track to ML2 mid-2004 and ML3 at year end

# Example: BearingPoint (1 of 2)

- BearingPoint is CMM ML 4 organization
  - Geographically distributed (across the US, Europe, China)
  - Large organization, diverse domains
  - State/Local, Civil, Federal, DOD Practices participated (US)
- FasTrack is BearingPoint's proprietary OSSP
  - CMMI/SE/SW/SS/IPPD ML 5 compliant
    - Currently v2 (v1 was CMM compliant)
    - Contains "collaterals" (procedures, plan templates, checklists, tutorials, tools, etc.)
  - v2 is also based on lessons learned from internal and external implementation and tailoring
  - Built "on top" of the CMMI ↗ FasTrack tasks encompass several specific and/or generic practices
  - Enables selecting a CMMI discipline and maturity level without changing its basic process structure



# BearingPoint FasTrack (2 of 2)

## Transitioning approach

- No piloting – feedback will be used instead
- Existing large projects are grandfathered and processes modified as necessary
- Smaller projects will continue using v1 until complete
- All projects starting January 1, 2004 will start using v2
- Expect to update v2 to v2.1 by mid year
- Class C appraisals will be conducted quarterly
- Class B appraisal or SCAMPI without rating by June 2004
- SCAMPI Class A - 3Q 2004
- ISO 9001-2000 registration - 1Q 2005

# What is the conclusion?

- The CMM investment can be preserved.
- Use a “constagedeous” approach to transition
  - No regard for staged or continuous representation
  - A common sense approach that helps minimize difficulties
- Role of the EPG
  - It is vital to have a focal point for transition
    - This is specially true for ML 2 organizations or organizations that selected continuous or “constagedeous” approach
- Process architecture
  - An extendable process architecture will provide a valuable basis for transitioning

# References

- Berggren, R., *Painless Transition from SW-CMM Level 2 to CMMI Level 3*, 2003 SEPG Conference, Boston, MA
- Garcia, Suzanne, *Are you Prepared for CMMI?*, CrossTalk, March 2002
- Heffner, R., *Transition from SW-CMM to CMMI: Yes or NO?*, Southern California SPIN, June 2003
- Mutafelija, B., Stromberg, H., *Systematic Process Improvement Using ISO 9001:2000 and CMMI*, Artech House, Norwood, MA, 2003
- Paulk, M.C, M.B. Chrissis, *The 2001 High Maturity Workshop*, CMU/SEI-2001-SR-014, January 2002
- Savolou, A., T. Kasse, *The “Constagedeous” Approach to Process Improvement*, SEPG 2001, New Orleans, LA
- Software Productivity Consortium, *Practical Interpretation of the CMMI*, SPC-2002060-MC, May 2003
- Walden, D., *A Business Case for CMMI-Based Process Improvement*, PSM Conference, July 2002
  
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