"I heard it through the Grapevine"

The Software Center sends periodic informational messages which are intended to provide heads-up/real time information to Software Professionals throughout the Command. These "information messages" are not intended to by-pass or replace the formal communication process or to task any DCMD or CAO activity. Forwarding of this e-mail within the DCMC Software Professional community and to other interested DCMC employees is encouraged.

Your feedback is appreciated. Software Center: 1-888-616-7598

1. HQ DCMC Web Page Down

In the last Grapevine, I discussed a briefing I provided to the East Commanders concerning the two Command initiatives (CMM Based Insight and the Software Performance Maturity Model). Briefing and concept of how we are approaching Software CAS very well received and understood. I recommended (to you) reviewing the slides as a refresher to our two initiatives. I provided a script for further assistance.

I've received numerous calls about the inability to access the information. The problem resides with the DCMC server. It is currently off line and expected to remain so until later this week. While you can access the web page, you are not able to download information. Thus, the briefing and script are attached as an interim measure.

SW_CTR.ppt Brief_Script.doc

2. Software CAS Guidebook: Lead - Guy Mercurio

A recommendation at the Sep 99 DCMC Software Symposium was development of a software CAS guidebook. Since that time, a guidebook has been in development and is nearing completion. The initial version is planned on the web on 31 Mar 00. Your comments and suggestions for further improvement at that time would be appreciated.

Lt Col Bob Lang
Director, DCMC Software Center
1-888-616-7598
rlang@dcmde.dla.mil

DEFENSE CONTRACT MANAGEMENT COMMAND

DCMC Software Initiatives Process Appraisals

Lt Col Bob Lang
DCMC Software Center
DCMDE Commander Conference
16 Feb 00

Defense Contract Management Command

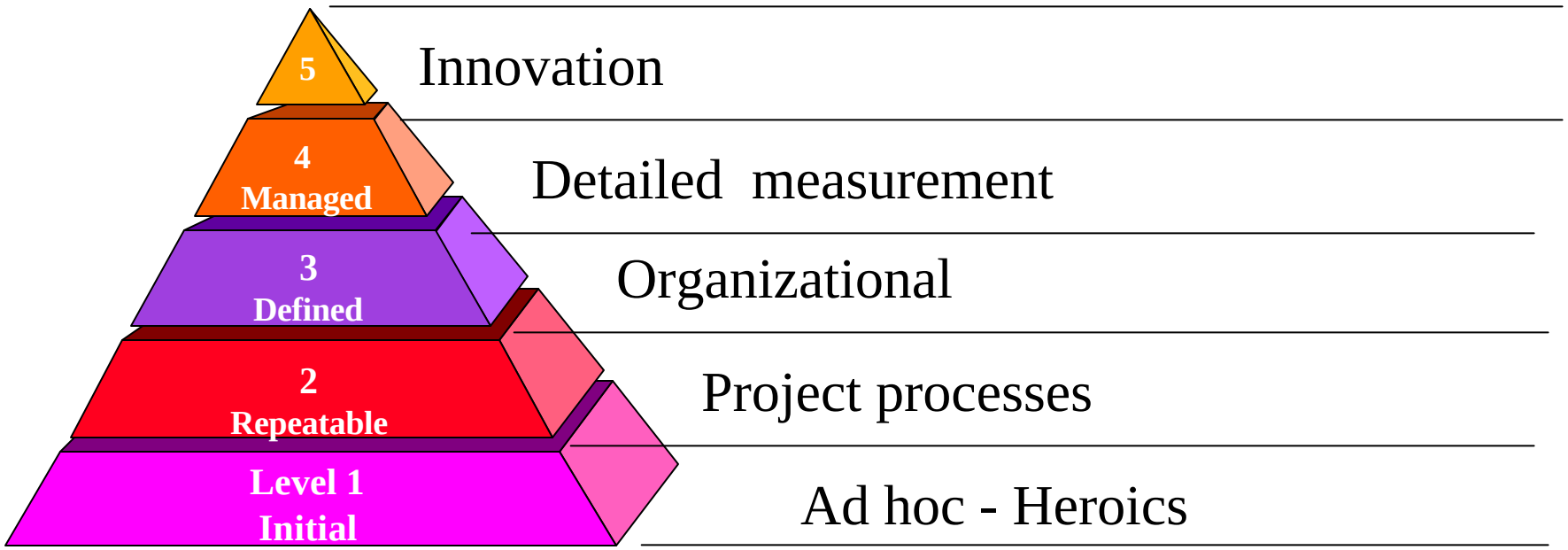
Overview

- Why Process Appraisals?
  - Federal Acquisition Regulation [42.302(a)(41)]
  - Single Most Important Aspect Regarding Quality of End Product
  - DoD Software Late and Over Cost
- DCMC Process Appraisal Initiatives
  - Take advantage of Software Engineering Institute (SEI) Capability Maturity Models (CMMs)

Defense Contract Management Command

XXI

SEI CMM Structure



- Determines software development **process** capability
- Defacto Government/Industry Standard

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It Seems to be Working

By reaching CMM level III, Lockheed Martin Tactical Aircraft Systems [over 5 year period];

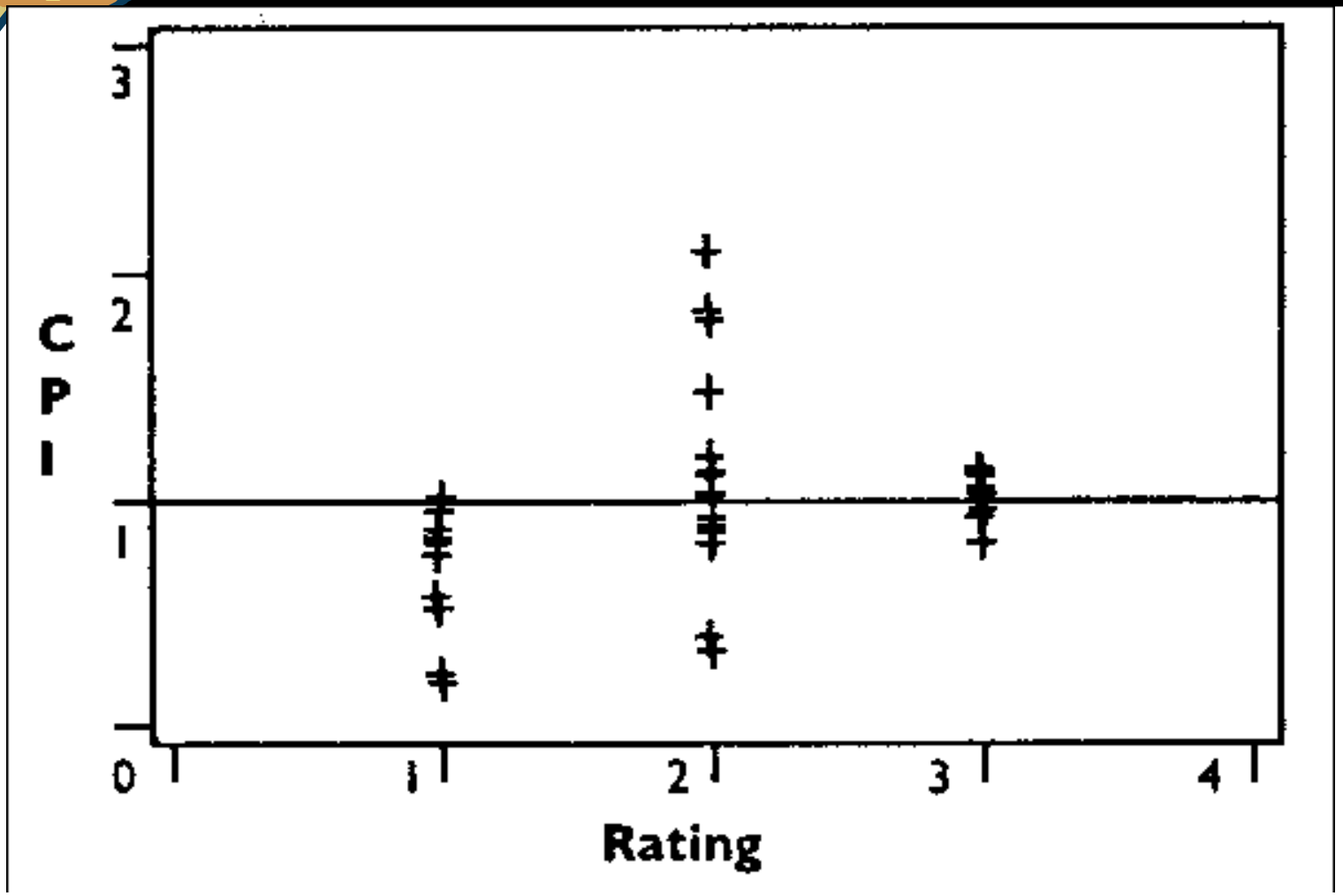
- Cut software defects 90%
- Reduced software development costs 50%

Aviation Week & Space Technology

Lockheed Martin Restructures TAS Unit as 'Fighter Enterprise, July 28 1997, page 64

Defense Contract Management Command

…And Working Across the Board



Air Force Institute of Technology

Recent DoD Policy

DUSD (AT&L) Letter, 26 Oct 99

"…requirement for [ACAT I] contract that each contractor…undergo an evaluation…[to determine] full compliance with SEI Capability Maturity Model Level 3…or... equivalent level…[or approved risk mitigation plan]"

DUSD (S&T) Letter, 2 Nov 99; DoD Needs to:

- Determine "Equivalence"
- Find single evaluation technique

Defense Contract Management Command

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DCMC Embracing

Software Engineering Institute

Software CMM

--Contractors --

Software Acquisition CMM

--Acquirers --

DCMC Initiatives

CMM Based Insight

Measures Contractor

Software Performance Reviews

Measures DCMC

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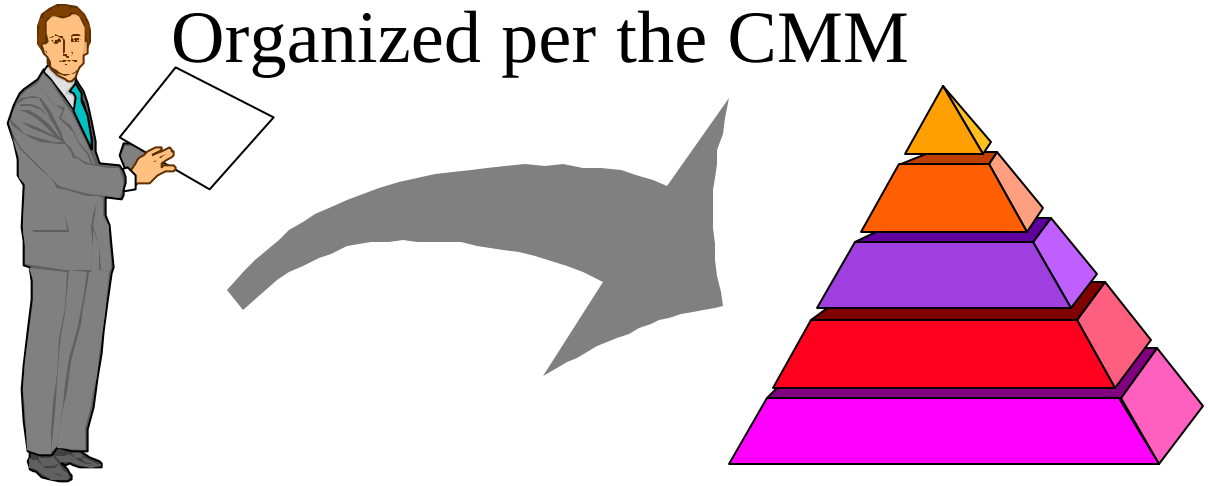
CMM Based Insight

- What: Continuous Process Evaluations,

  Primarily based upon daily observations,

  Organized per the CMM



- Why:
  - Common Language - Government & Industry
  - Consistent application (DoD Wide Problem)
  - Eliminate/Reduce external process reviews

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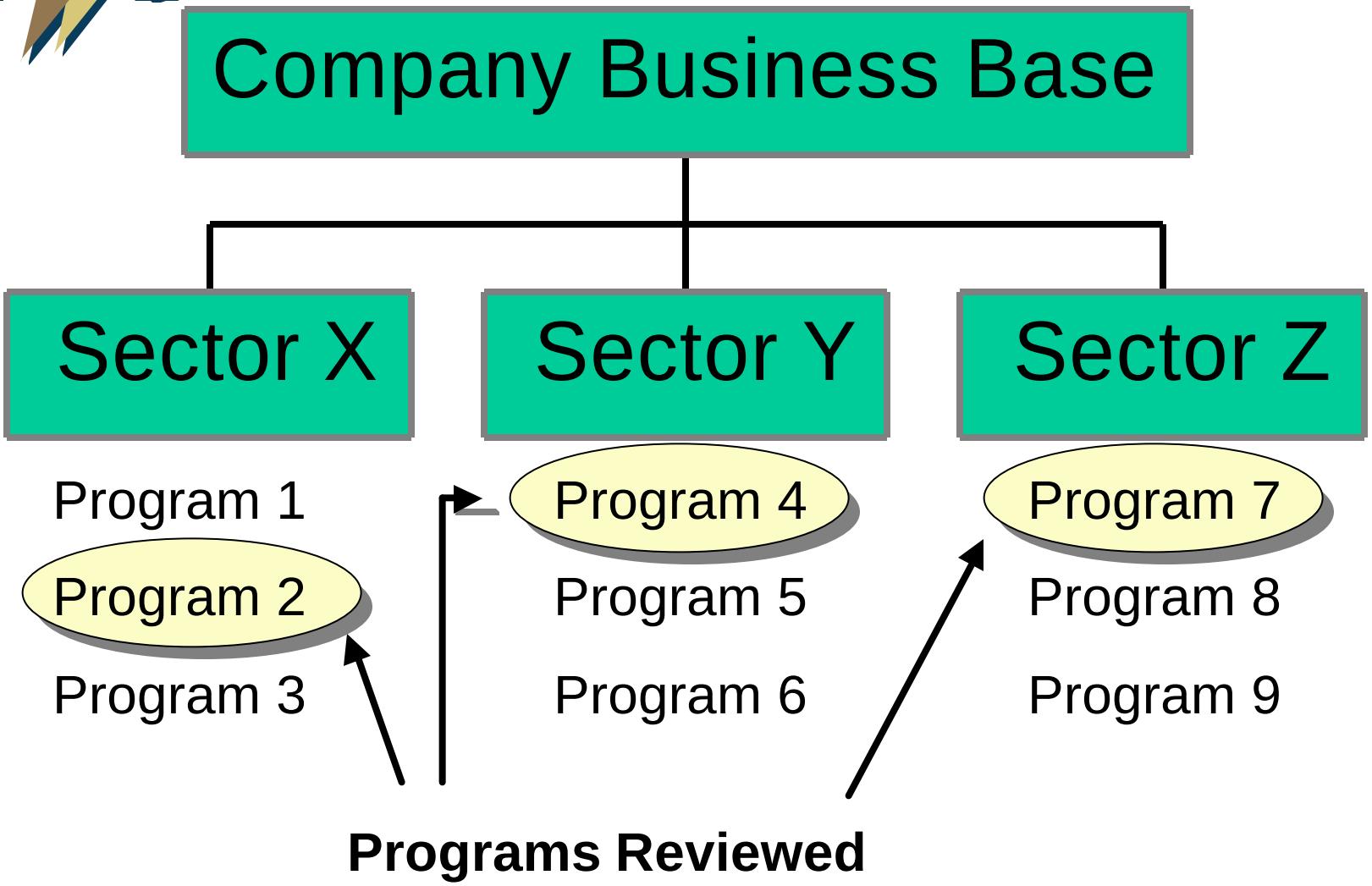
Company Internal Assessments
- Based on Representative Sample -



Allows “Cherry Picking ” (SEI Methodology) - show capability

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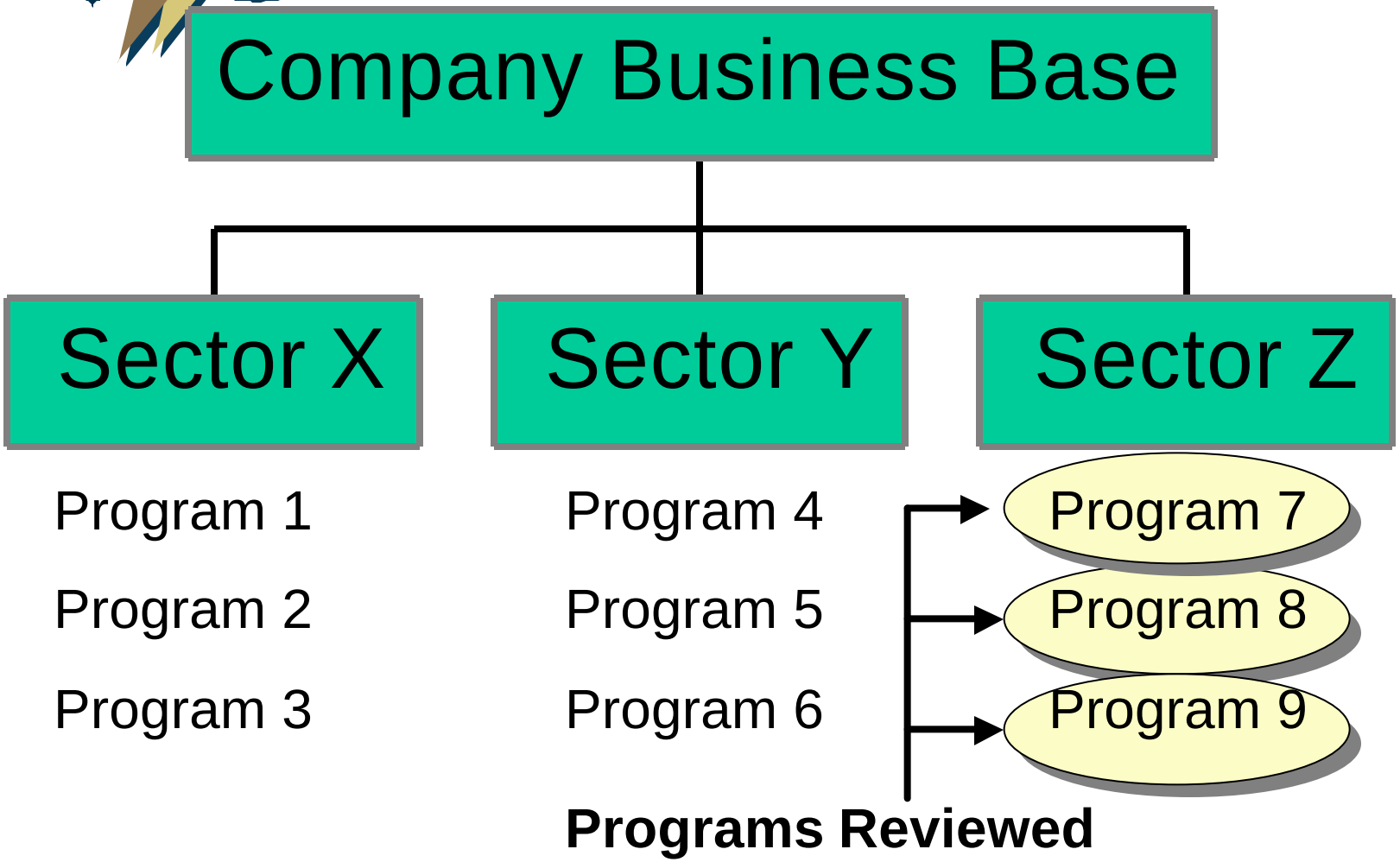
Govt SW Capability Evaluations

- Uses Comparable Domain Programs -



Rarely results in CMM rating - identifies strengths and weaknesses to identify risk

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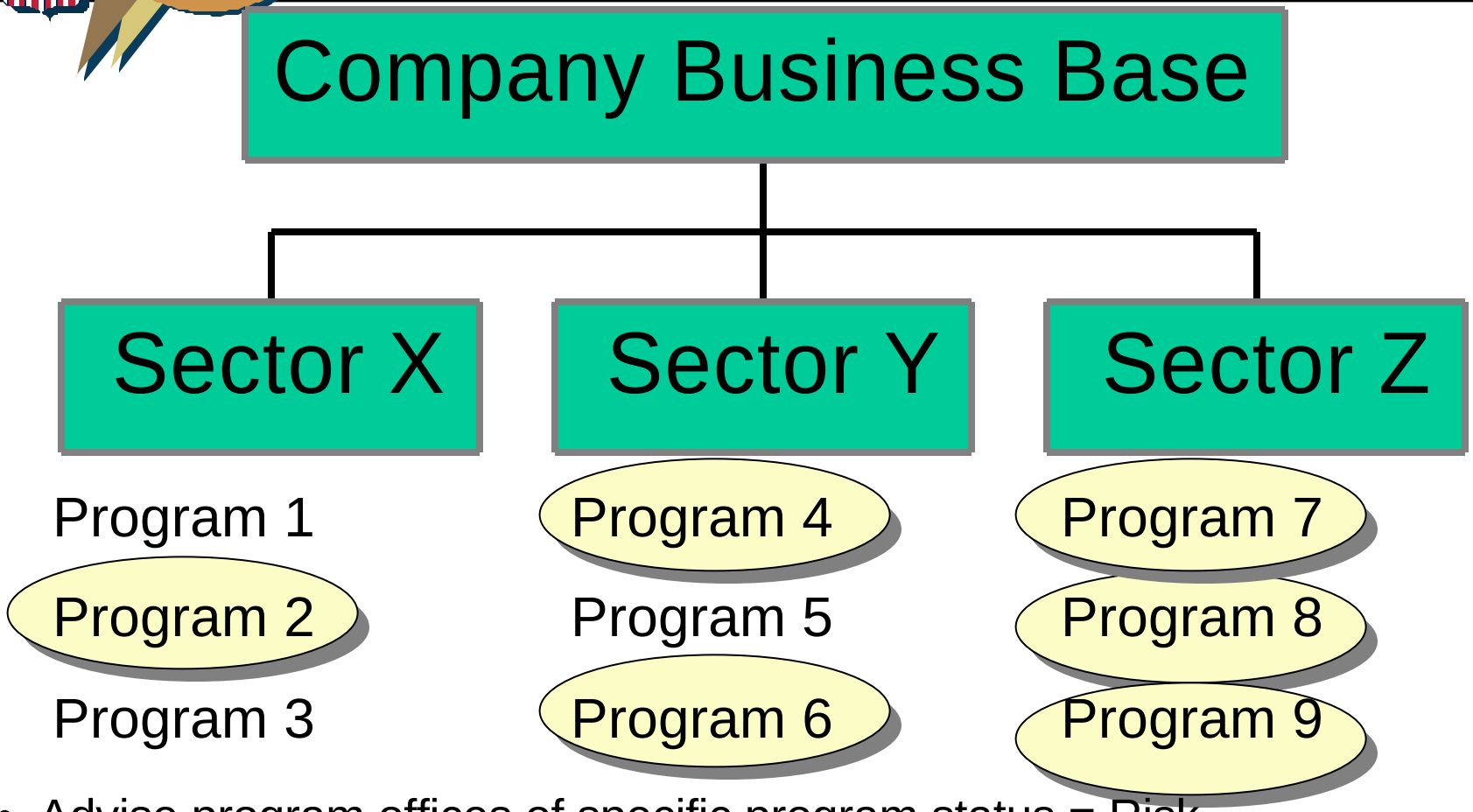
DCMC CMM Based Insight

-Continuous Eval of Programs Overseen -



- Advise program offices of specific program status = Risk
- Share data with contractor = Process improvement
- Does not provide company maturity (Only programs overseen)

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CMM Based Insight - Implementation

- Significant Effort + Solves 6+ year DoD problem
- Time table
  - ✓ Methodology: (DCMC SEI Affiliates) Feb 00
  - – Phase I: Oct 99 - Jan ~~00~~ Mar 00 (Four CAOs)
    - Validate Concept
  - – Phase II: Jun- Oct 2000 (Five CAO volunteers)
    - Verify Concept, Validate Data Collection/Tool Prototype
  - – Phase III: TBD -Tool Dependent Est: Nov 00 - Feb 01
    - Verify Data Collection/Actual Tool (Five CAO Volunteers)
  - – Command-wide start: Est Jul 2001

Defense Contract Management Command

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DCMC Embracing

Software Engineering Institute

Software CMM

--Contractors --

Software Acquisition CMM

--Acquirers --

DCMC Initiatives

CMM Based Insight

Measures Contractor

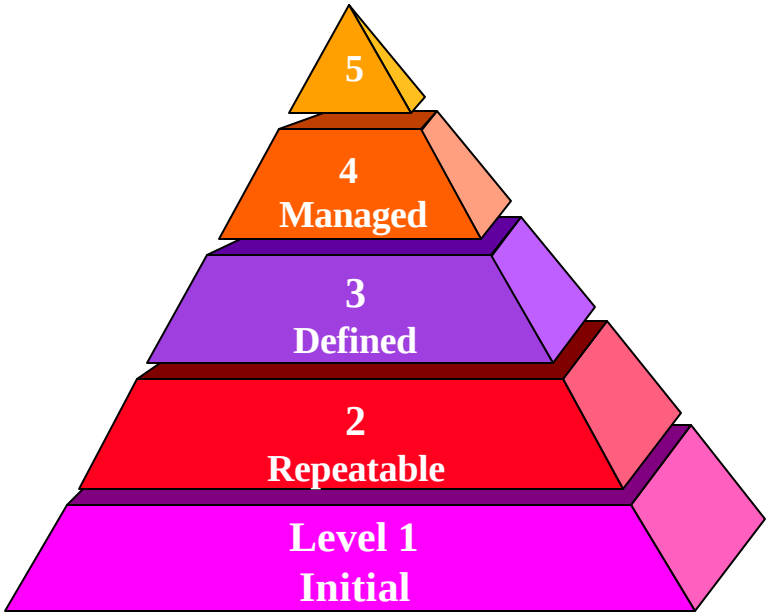
Software Performance Reviews

Measures DCMC

Defense Contract Management Command

Implementation

- Model tailored & pilot tested (Jan - Oct 1999)
- Baseline Reviews 70% complete -Finish Apr 2000
- DCMC Predominately Level 1 Organization
- Results will provide Command-Wide Roadmap



Measuring ourselves per same SEI Framework

Defense Contract Management Command

Summary

CMM Based Insight

- FAR Part 42 requires DCMC process evaluations
- Software CMM is the de facto standard
- CMM Based Insight:
  - Continuous Software CMM evaluation
  - DCMC process data in common DoD language
  - Data available for contractor and program offices
- Target deployment: Mar-Jul 2001

Defense Contract Management Command

Summary

Software Performance Reviews

- Measuring DCMC - Same SEI framework
  - Software Acquisition CMM
  - Tailored to DCMC Mission
- Reviews complete April 2000
- Results will provide Command-Wide Roadmap

Defense Contract Management Command

Additional Information

- DCMC Software Center (1-888-616-7598)
  - CMM Based Insight: Lisa Ming
  - DCMC SW Performance Reviews: Gary Gumpright
- Web Page www.dcmc.hq.dla.mil (SW Center)
  - “Worth Knowing” - This brief + backup references
  - “Initiatives” - More detailed information
- DCMC Software Conference
  - 18-22 Sep 00: In-depth training on initiatives
- HQ Process Owner:
  - Becky Grant 703-767-7339

End of Brief

Defense Contract Management Command

Application - Example (Backup)

DCMC Location X

- AMCOM concerned with poor quality software
  - Wanted level 3
- Contractor hired outside consultant to verify operations
  - Believed they were level 3
- AMCOM/DCMC challenged -CMM Observations
- Results:
  - Assessed level I.
  - Contractor on ambitious schedule to reach level III
  - DCMC monitoring progress

Defense Contract Management Command

Application - Example (Backup)

DCMC Location Y

- ACAT I Program - planned software process review
- DCMC had strengths and weaknesses per CMM
- Result:
  - DCMC data satisfied customer concerns
  - Review not needed
  - Savings of 6 man-days on site plus travel time/costs

Application - Example (Backup)

DCMC Location Z

- Contractor for Army ACAT I Program recently assessed as CMM Level 2 (Internal assessment)
- DCMC concerns:
  - Program not part of the assessment
  - Subcontractor Mgt (Level 2 Area) not met
- DCMC identifying shortcomings (risk areas) to program office in terms of the CMM

Defense Contract Management Command

XXI

Why Processes ?

"Today's major problems with military software development are not technical problems, but management problems"

Software Engineering Institute (SEI)

The Capability Maturity Model, Guidelines for Improving the Software Process, Carnegie Mellon University, Addison-Wesley Publishing, 1997, pg 4

Software Complexity Concerns*

A Growing Concern

- **In 1995 85% of Software Projects Finished Over Time or Budget**
- **1/2 of Projects Double Cost Estimates**
- **Projects Slip an Average of 36 Months**
- **1/3 of Projects Cancelled**

CrossTalk, Improving Software Engineering Practice, Patricia Sanders, Jan 1999

*Chart presented by Dr Etter, DUSD(S&T) to DoD Software Collaboration Workshop - 30 Jun 99

Defense Contract Management Command

…And Working Across the Board

Process linked to Performance

As maturity increases*, cost and schedule performance indices approach 100% --

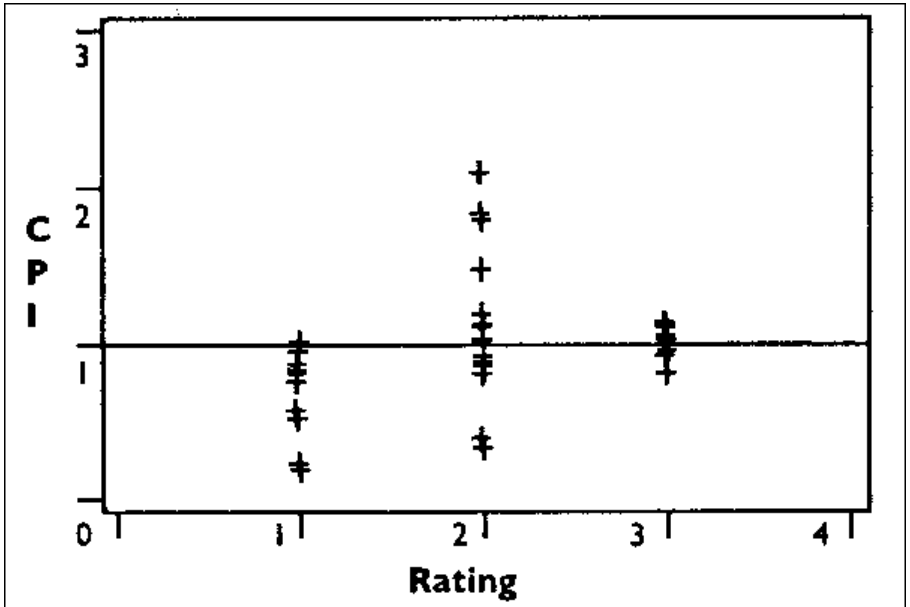


FIGURE 3: SCATTER PLOT OF CPI VS. RATING FOR HIGH AND VERY HIGH RATING RELEVANCE.

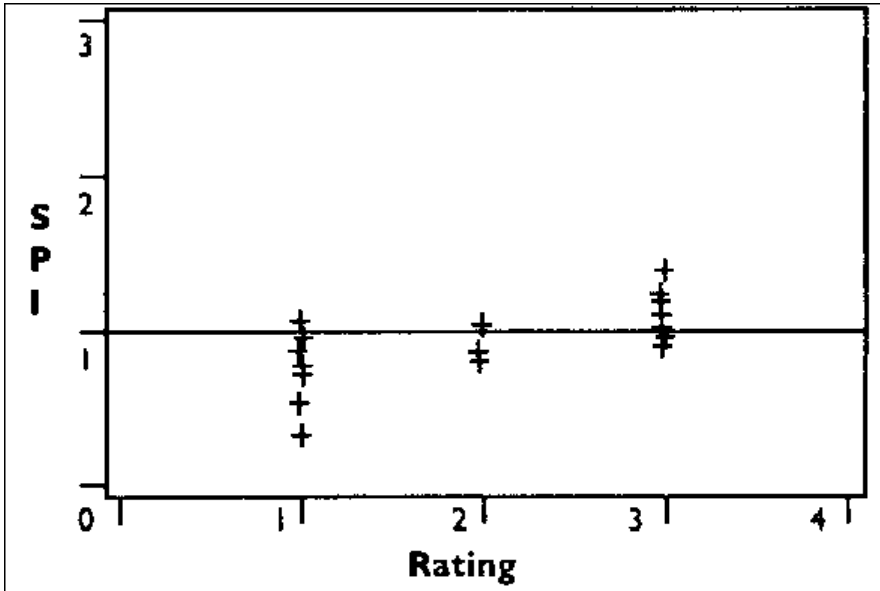


FIGURE 4: SCATTER PLOT OF SPI VS. RATING FOR LESS THAN 80 PERCENT COMPLETE.

Data from Air Force Institute of Technology Thesis, "A Correlation Study of the CMM and Software Development Performance" (www.stsc.hill.af.mil/Crosstalk/1995/sep)

* Per Software Engineering Institute's (SEI) Software Capability Maturity Model

Initiative 2: DCMC Software Performance Maturity Model

"A Level 3 development effort coupled with a Level 1 acquiring effort often equates to a Level 1 delivery capability; yet the Level 3 developer is often blamed, and the Software (SW) CMM is cited as inadequate"

Crosstalk; The Journal of Defense Software Engineering
August 1999, Pg 2

1. I'd like to talk to you today about two major initiatives we currently have underway within the command. Both deal with software process appraisals. One is externally focused on contractor processes and the second on how we, DCMC, operate as a command. Both deal with a fundamental change in the way we do business

2. I have 17 slides and a thirty minute time slot. Feel free to ask questions during the presentation and I should also have time at the end. If you are interested in more details of the studies or references I use here today, I have loaded them all into the notes section of the brief which is available on the Software Center Homepage or what will be distributed as the follow up to this conference.

Slide 2:

3. A question you may have up front - why do we do process appraisals? It is a two part answer:
    1) Required by the FAR
    2) the process used to develop software is the single most critical factor in determining the quality of the end product. That is the finding of the Software Engineering Institute, our DoD Federally Funded Research and Development Center for Software. They state "Today's major problems with military software development are not technical problems but management problems" Within the DoD, the track record is not that good. With the increase in software complexity and system operations dependence, software is predominately delivered late and over cost. However, with the increase in complexity, there has also been an increase in tools and methodology to assist

Slide 3:

4. One such tool is the Capability Maturity Model developed by the Software Engineering Institute (Again, our DoD Software FFRDC). Their model measures process capabilty based on five levels of maturity. The premise being that more mature organizations develop better software (better in terms of cost, schedule, and performance)
5. The first level is based on heroics with no defined processes. It then proceeds to level 2 where program processes are employed. Level 3 with organizational processes, Level 4 with detailed measurement to reduce special causes of variation, and finally, level 5 with the corporate push to embrace new ideas and technologies.
6. The CMM has become the defacto standard used by both Government and Industry. Government Program Offices use the CMM when conducting reviews such as for Source Selection. That is the language they speak. The contractor uses the CMM for internal improvement. That is the language they speak. We in DCMC are changing our process evaluation approach to the CMM so that we also talk this common language
7. So that all sounds nice in theory. How does it work in application

Slide 4

8. This is the reported results of a Lockheed Martin Company which used the CMM to improve operations. They moved from level 1 to Level 3 over a five year time period. The SEI keeps historical data on the time required to move between levels and it averages 27 months to get to level 2 and 24 months to get to level 3. The company reported substantial improvement in terms of cost and defects - both of which positively impact the acquisition. But is this an isolated case?

Slide 5

9. The answer is no. The Air Force Institute of Technology conducted a study relating process maturity to the final cost and schedule.
10. To understand their findings, the contractor CMM level is listed on the vertical. In this case level 1, 2, and 3
11. The cost performance index (CPI) is listed on the vertical. The line at 1 means on target or 100%. Points below the line indicate a cost overrun. Points above the line indicate a cost under-run
12. So for level 1 companies, it is possible to come in right on target. But that is at increased risk. Coming in on target is not the norm for level 1 companies with most having a cost overrun. At level 2 the data varies widely as program processes are implemented. Processes are in place with a varying degree of effectiveness. But the grouping is closer to target. At level 3 with organizational processes in place transcending to the program level with an overall approach, the variation is decreased with software coming in close to target.
13. The same is true for the Schedule performance index.

Slide 6

14. To combat the problems in software procurement, the DoD has recently adopted the SEIs Software CMM in recent policy
15. It is now a requirement for contract (ACAT I) that contractors be at CMM level 3
16. There are a few caveats such as CMM equivalent and a standardized evaluation method. This is my lead into our DCMC initiatives; they directly support the recent policy and I believe, will solve the DoD wide problem for consistency in evaluations

Slide 7

17. The SEI has developed two models. The Software Acquisition CMM on your right deals with measuring an acquirers process maturity. That is our initiative on measuring DCMC software CAS process - more on this later. The model on your left, the Software CMM deals with measuring a contractor's process maturity and is the basis of our DCMC CMM Based Insight Initiative.

Slide 8

18. .CMM Based Insight is simple in theory - we are going to conduct and record our FAR mandated process appraisals in the language of the CMM

19. We do this because the CMM is the defacto standard of the government program offices and industry. The Government uses the CMM when conducting source selections or lessor reviews. The Contractors use the CMM for internal process improvement.
20. It also provides the infrastructure for a consistent application within DCMC. Currently, we do not appraise processes the same way. Through this initiative, any program office, whether Army, Navy, or Air Force, can go to any CAO and obtain consistent information.
21. Having this data should reduce or eliminate duplicative reviews. I believe this is critical with the issuance of the recent DoD policy. We have a ways to go to implement this across the board but we are already doing portions of CMM Based insight within the command
22. Let me give you a few examples;

Example 1

23. Aviation and Missile Command was concerned with poor software quality at Sikorsky. They wanted the contractor to be operating at CMM level 3. The contractor believed they were and hired an outside consultant to verify their belief.
24. The initial results were coming in at CMM level 3. AMCOM, working with DCMC challenged that conclusion with specific examples per the CMM architecture. AMCOM told Sikorsky that if the appraisal resulted in a level 3 assessment, they would not believe it and would sponsor their own independent appraisal. However, if Sikorsky was forthright, they, AMCOM, would work with them towards achieving level 3.
25. The end result was an appraisal at Level 1.

Example 2

26. At LM Nashua, the ACAT I Army program office was concerned with process maturity and was planning a process evaluation. DCMC, already doing a form of CMM Based Insight, already had the data and satisfied the program office concern.
27. This was a minor cost savings but magnify this across the DoD, and for larger and larger reviews as our initiative comes into being, and the savings will increase. This is especially true now with the recent DoD policy driving CMM level 3 compliance.

Example 3

28. Another example, a company completed and internal appraisal which resulted in a level 2 rating. The DCMC CAO software personnel have strong reservations with that rating because of shortcomings in subcontractor management (A Level 2 Key Process Area in the CMM) and that the major government program was not part of the company assessment.
29. Now I am compelled to talk some of the appraisal terminology. It is important as Commander's that you understand what the words mean. No one is necessarily lying but it can be confusing

Slide 9

30. Companies conduct internal appraisals per the SEI framework. To determine a rating, they select a representative sample of programs across their business base. This does not mean that all programs are assessed.
31. It means that a company has demonstrated that they have the capability to operate at a given maturity level. Because they are showing a capability, they are encouraged by the process to cherry pick their best programs.
32. It is up to DCMC, through this initiative, to ensure the program office has the correct information. By correct I do not mean the company assessment is wrong. However, if the program office program is not operating at this level, it is important for us to identify that risk to the program office.

Slide 10

33. When the Government conducts Software Capability Evaluations, primarily for source selection, the focus is comparative domain programs to determine that contractors capability for a specific application. Software Capability Evaluations rarely result in a CMM rating and do not consist of programs across the contractors business base.
34. The focus of Software Capability Evaluations is to identify strengths and weaknesses for risk reduction.

Slide 11

35. For our CMM Based Insight initiative, we are looking to review, mainly through our daily observations as in-plant representatives, the maturity level of programs of programs for which we oversee. Our appraisal data will never result in or substantiate a contractors claim. We can not say that contractor x is at CMM level X. We can say that, based upon the programs we oversee, the contractors is operating at level x for this program and level y for that program.
36. Data will be freely shared with the contractor and hopefully, I think quickly by default, will rise to discussion at the Management Councils. I think this is a good thing as process improvement is the goal of the DoD emphasis.
37. So CMM Based Insight. A fundamental change in the way we conduct process evaluations. How long will it take and how are we planning to implement?

Slide 12

38. This is not an overnight change. We have been working this since May of last year and will take over a year and a half to implement. Being able to provide a consistent evaluation process across the command takes time, planning, and training. I think our initiative will also solve the DoD wide problem of an honest broker concerning process evaluations - along the lines of the single process initiative. DoD has been pursuing this actively since 1994 so I believe our schedule is ambitious but certainly doable.

39. We have developed the methodology and approach. We tapped into the talent of the handful of DCMC Software personnel who went to the SEI for a years training in this specific area.
40. We have been doing pilot testing of the concept since Oct 99 (Nashua, Syracuse, Delaware Valley, and Denver). We have learned a lot and have had to make several adjustments to the approach. Once we believe we have the bugs worked out, we want to verify that in a second round of pilot CAOs. We are planning five CAO sites and are asking for volunteers so if you are interested in getting in on the ground floor to influence the process, let me know. We currently have most of the volunteers but want to ensure we have a representative sample across the command. We are also planning a third round of pilots. This is due to tool development and integration into RAMP. The plan is to go command wide a year from July.
41. It is a long way to go but it will be fill a void within the DoD - solving a 6+ year problem with consistency in process evaluations.
42. I've spoken about how we measure contractors processes. But what about ourselves? According to the Software Technology Support Center, "A level 3 development effort coupled with a Level 1 acquiring effort often equates to a Level 1 delivery capability; yet the Level 3 developer is often blamed and the software (SW) CMM is sighted as inadequate"

Slide 13

43. As I mentioned earlier, the SEI has developed two models. The one on your left, the Software CMM to measure contractor processes and what we have previously discussed. The second SEI Model, the Software Acquisition CMM is to appraise the process maturity of acquiring offices

Slide 14

44. With the philosophy that we also can improve our processes per the CMM, we've tailored the SEIs model for DCMC application. We are now over 70% complete with baselining the CAOs within the command. Most of you are already familiar with the model.
45. Overall, we are emerging as a Level 1 organization
46. I say the following to generate conversation either here or afterwards in that we have gotten nothing but positive feedback -both written and orally. I like to think that is because we had a logical and incremental approach. We tailored the model and baselined it at six CAOs. We then used the results of that pilot to revise shortcomings of the model before we went command wide.
47. I also need to say that the model is not yet complete. I believe it is where it should be today but it needs to grow, and will, as a result of the baseline efforts. The results will drive us towards a command wide plan with guidance, training, and tools to improve performance.
48. We also need to finalize sustainment. My position is to sustain the model just as what is done with industry. A CAO works towards and measures process improvement (perhaps via USAs) and when they feel they have achieved the next higher level, they

raise their hand for an independent evaluation. I'll be pitching that to Ms. Pettibone in April when we have analyzed the results of the reviews.

Slide 15

49. So in summary, I wanted to specifically discuss the two major initiatives we are pursuing. For the first, CMM Based Insight, we are doing it because it is our requirement per the FAR. The FAR tells us what do but not how to do it. We are aligning to the Software Capabailtiy Maturity Model because it is the defacto government/industry standard. It is the language spoken by the program offices. It is the language spoken by the contractors. It is a continuous evaluation process based primarily upon CAO daily observations and the data will be shared openly with the contractor. We have a way to go but I expect command wide implementation in July of 2001. Even with that, it will take six months to a year to obtain the information necessary to appraise a program per the CMM

Slide 16

50. The second initiative deals with measuring ourselves
51. We are currently baselining CAOs and will be done in April
52. We are emerging predominately as a Level 1 organization
53. We will analyze the data to establish a command wide roadmap for improvement

Slide 17

54. That concludes my material. I provide this final slide for additional information and would be happy to answer any questions you might have.