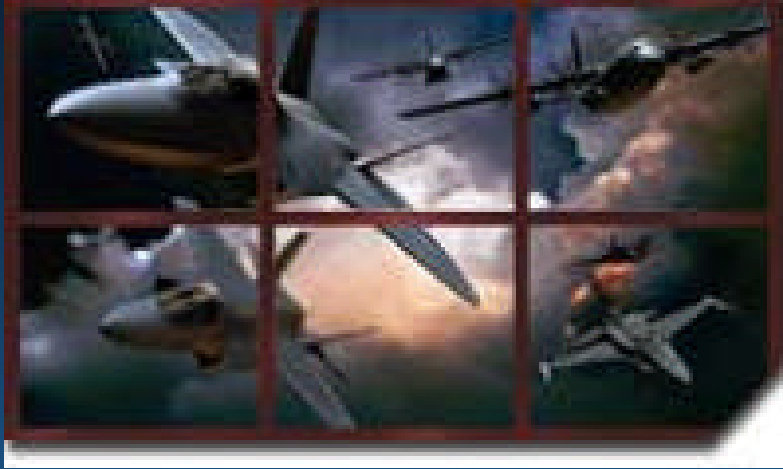


***Lockheed Martin Aeronautics
Company's CMI Implementation
Decision***

Mike Ballard

4/18/2002

About Lockheed Martin Aeronautics Company



- Lockheed Martin Aeronautics Company builds the finest military aircraft in the world.
- Our long list of dependable and highly regarded aircraft includes, the F-16; the C-130J; the first operational stealth fighter, the F-117; and the next-generation fighter, the F-22.

The company has recently been awarded the contract to build the multiservice, multimission Joint Strike Fighter of the future.

- Lockheed Martin Aeronautics Company has more than 20,000 employees with preeminent expertise in advanced aircraft design and production, modification and support, stealth technology, and systems integration.
- Lockheed Martin Aeronautics Company plant locations include [Marietta, Georgia](#); [Palmdale, California](#); [Pinellas Park, Florida](#); [Meridian, Mississippi](#); [Johnstown, Pennsylvania](#); [Clarksburg, West Virginia](#); and [Fort Worth, Texas](#), our headquarters.

JSF Program



- The Joint Strike Fighter program is the principal focus of the U.S. Department of Defense's initiative to define cost-effective, next-generation strike aircraft weapon systems for the U.S. Air Force, Navy, Marines, and U.S. allies.



JSF Video – Mission X



The 'Other' JSF Differences



- In addition to the technical challenges in the aircraft itself, there are a number of differences between JSF and previous programs which challenge the design environment.
 - ***Collaborative Environment vs. Interface Control Drawings***
 - Past shared programs were split along defined planes, with specific drawings to define the interface
 - JSF will be divided by systems as will require more complex collaboration
 - ***Foreign Partners and ITAR vs. U.S. Design Partners***
 - International Traffic in Arms Regulation brings special challenges to a collaborative environment
 - ***Near Real Time vs. Weekly or even Over Night Updates***
 - ***Trans Atlantic vs. North American***

The JSF Tool Set



- **PDM – Metaphase, Distributed/Replicated Hybrid**
 - *Metaphase admin databases are replicated, user data is distributed between two sites, other partner sites will have work group servers and replicated file data*
- **CAD – CATIA, V4/V5 Hybrid**
 - *The program will use both V4 and V5 for an extended time*
- **Interface – CMI, with customizations**
- **Visualization – VizView, VizMockup**
- **Other tools**

Requirements Development



- How did we come to this tool set? Specifically how did we choose CMI?
- Ideally one SHOULD gather all requirements before beginning architecture design
 - *But sometimes these factors are being negotiated and revised as development and pilots occur*
- The next slides give a history of how we came to this combination.



- Began 5 years ago with Metaphase, the CATIA Data Manager, and CATIA V4
- The first requirement was to integrate these
 - *Devised an architecture with a link between the two databases*

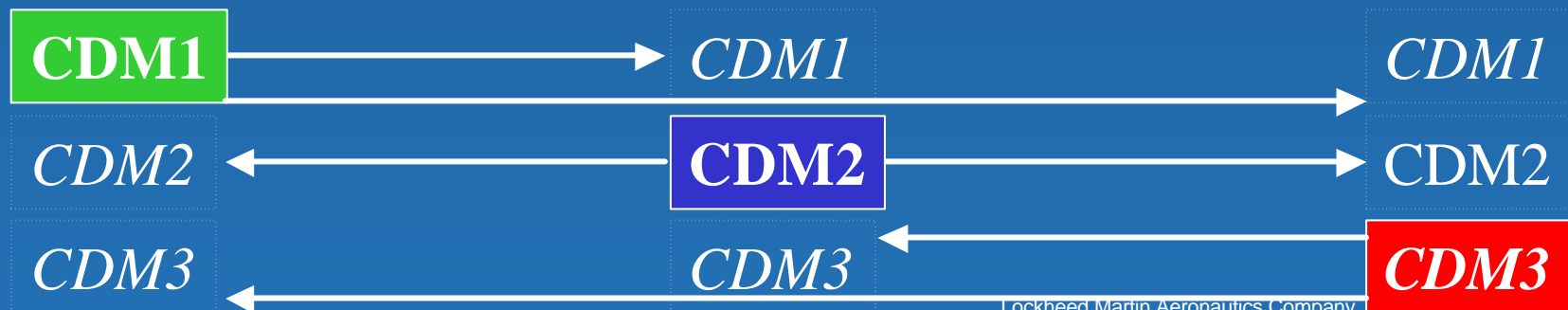


- *The first interface between them was begun with a 3rd party*
 - A link was created and used on a pilot, but it wasn't a workable solution
- *A second attempt was begun 'in-house' and a link was developed for us by CSC*
 - This resulted in a successful integration between Metaphase and CDM.

History



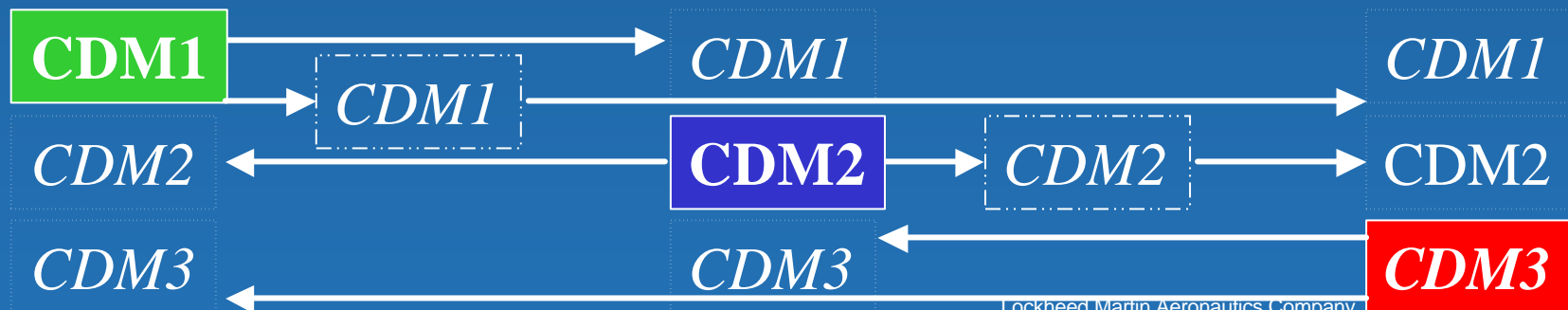
- But the program structure had evolved even as the first interface attempt was in work
- Lockheed Martin had partnered with Northrop Grumman and British Aerospace
- So a distributed solution had to be developed
 - *Metaphase could be set up distributed*
 - *CDM required more work*
 - a CDM was setup at each site
 - Distributed Oracle was used to create remote views of each CDM environment at each other site
 - The link had to be revised for the distributed situation





- ITAR

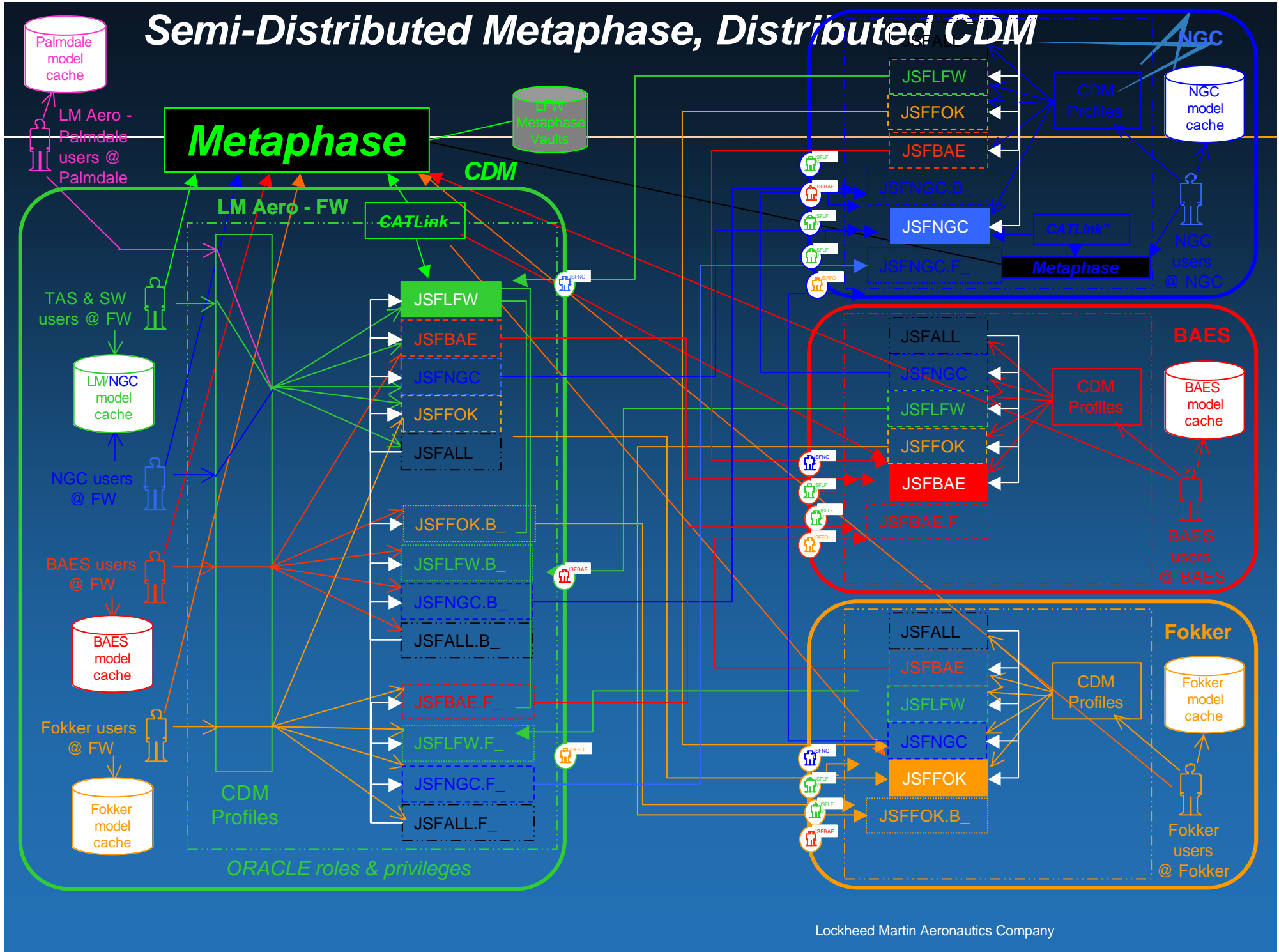
- *But with one site foreign, those models not explicitly authorized for foreign access by the State Department had to be filtered from view.*
- *For Metaphase data this was done with custom attributes and Metaphase rules and conditions using those attributes*
- *For CDM we created an intermediate filtered view for the foreign site*
- *In addition routines were added to tape off exported models for ITAR audit requirements*





- But the JSF program wasn't through with us
- A new requirement was added to allow partners' users to visit each others sites
 - *This required access to each 'flavor' of filtered view of each other sites to be available at each site*
 - *It also required the ability to write back to each users' home site from each other site*
- The following slide is a partial view of this architecture with two foreign partners and with the visitors environments shown only at LM

Semi-Distributed Metaphase, Distributed CDM



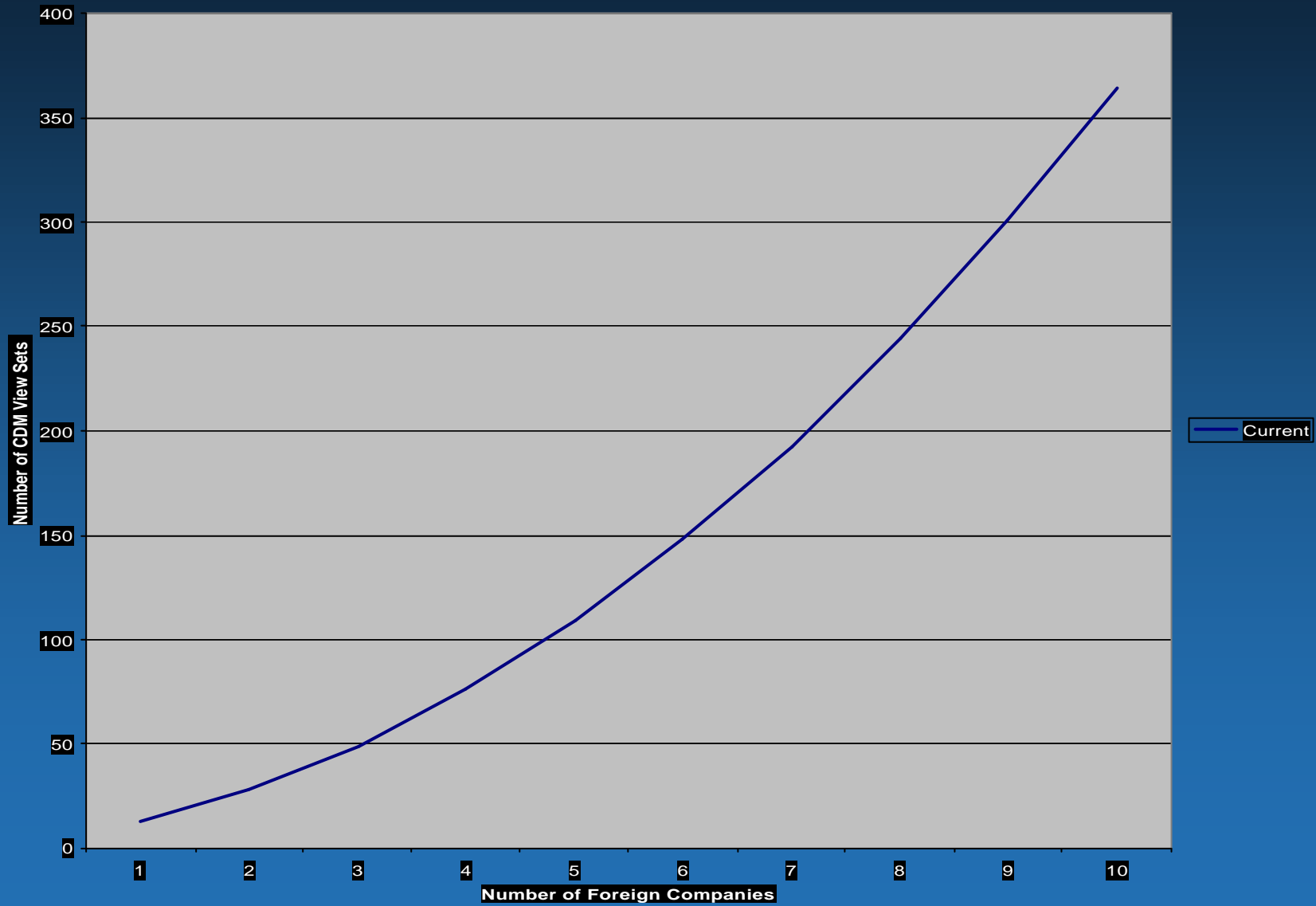


- By now our DBA was hating life
- Then the JSF was even more successful - they asked us to add up to 8 more foreign partner companies.
 - *The previous slide shows a system which would have 28 CDM view sets with visitors only at LM*
 - *10 foreign countries would require 364 view sets, still with no visitors except at LM*
- The next slide show a graph of the progression of the growth of the views

View Growth



CDM View Proliferation by Options



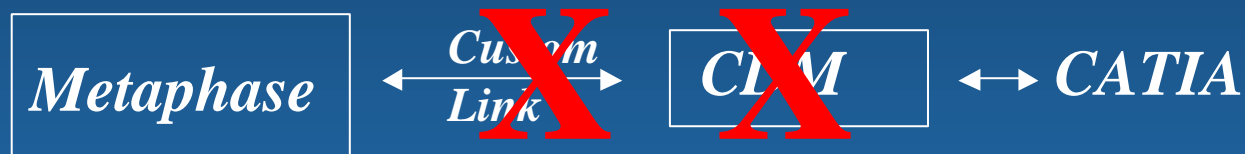


- **Clearly something had to change and Management's over all direction was to SIMPLIFY, SIMPLIFY, SIMPLIFY**
 - *A number of options were devised*
 - Metaphase only
 - CDM ->VPM, using VPM replication
 - Centralized databases
 - others

The Decision

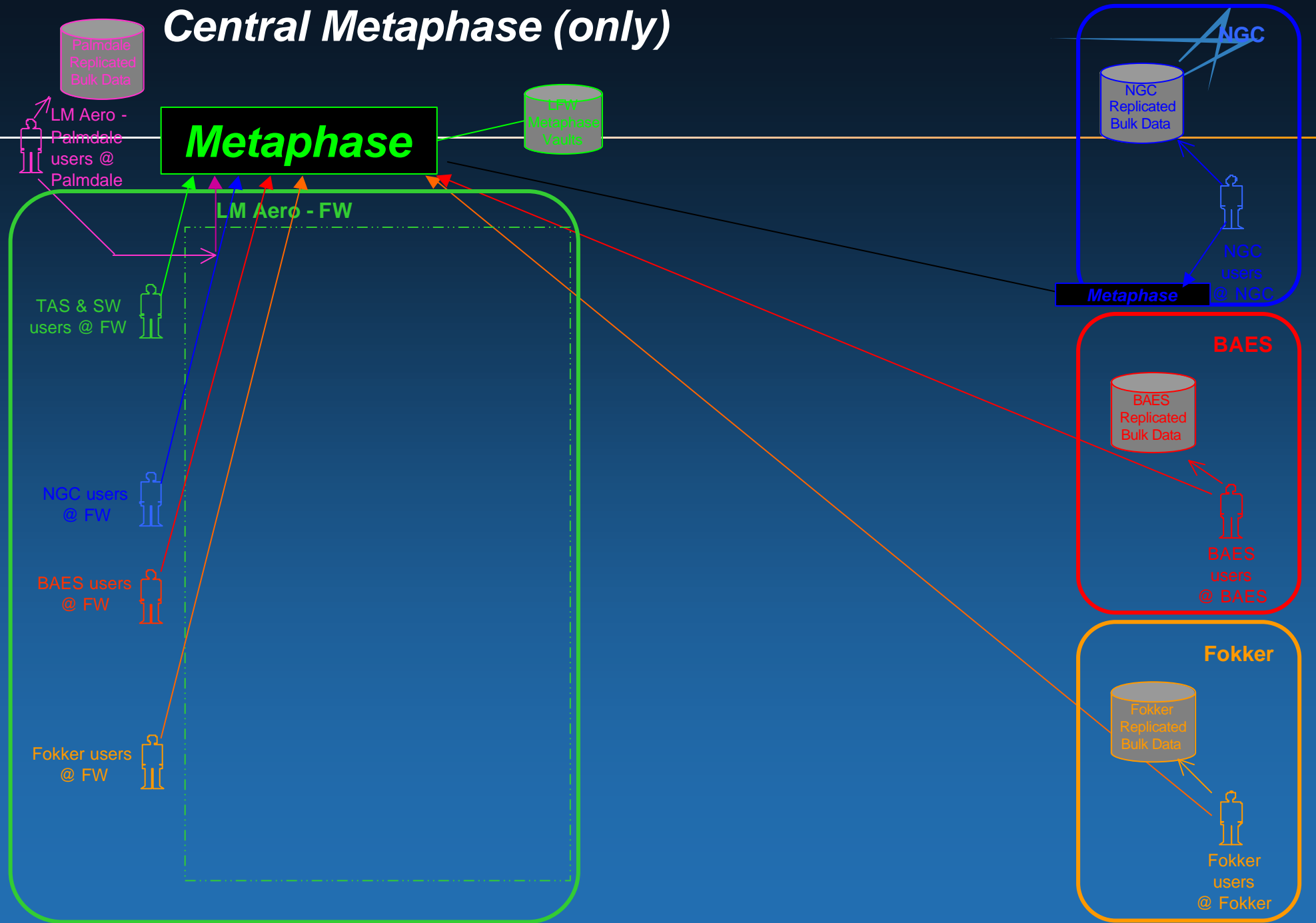


- Vendors were invited in for 1 to 2 weeks each to debate the options involving their products
- The pros and cons of each option were ordered, numbered and graded
- In the end, the simplest of all options came out ranked best
- This option was to use only one data manager, Metaphase



- This also knocked out our interface, since it was written to CDM
- The following slide is a comparative picture of the architecture with Metaphase only

Central Metaphase (only)





- We had been aware of CMI for some years, but with CDM in the architecture had not pursued it.
- Now with Metaphase only, CMI exactly fit the situation and was already an existing proven, commercial product
- So in the near future our overall system architecture is being changed to Metaphase with CATIA linked with CMI.



- Using a customized version of CMI
 - *Auto selection of V5 or V4 models in the work bench when both are present*
 - *Filtered selection of models and documents in the workbench when both are present*
 - *File based integration with the VisView product*
 - *others*



- **But in the mean time JSF had more surprises for us**
 - *The use of CATIA V5 has been accelerated but will be used in combination with V4 for the foreseeable future*
 - *The NT platform has been added for some partners*
- **So we need CMI to support CATIA V5 and the NT**
- **And, fortunately T-Systems is working on these issues**



- **Higher Level V5 Support Issues**
 - ***NT Support***
 - ***Support for the various model types, CATPart, CATProduct, CATDrawing etc***
 - Support for the CATProduct brings requirements for structure exchanges and synchronization with Metaphase
 - ***Support for MOLs / application dependent links***
- **More Detailed V5 Operability issues**
 - ***Support for multiple documents and models per part***
 - ***Support for non-part CATProducts***
 - ***Support for V5 'components' as parts, or as convenience groups***

The End

Thank you!
Questions?