



*Advanced Collaborative
Environments (ACE) Laboratory*

Collaboration Technology Tutorial

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**U.S. Army Tank-Automotive and Armaments Command (TACOM)
National Automotive Center (NAC)**

**U. S. Army SMART Conference
16 April 02
Salt Lake City, Utah**



U.S. Army Tank-Automotive & Armaments Command



National Automotive Center

Let's try to answer a few questions...

- What is Collaboration? What does it buy you?
- What's so different, people have been collaborating for years?
- What are these new meeting & Review ideas?
- How can we use it to support M&S?
- Who else is interested? Why?
- What are the key technologies? How do you get started? What are my choices?
- What is the best strategy for achieving success? What has worked for TACOM?
- What are the limitations?
- Requires commitment by leadership, thinking out of the box, not afraid to try
- Where can I get more information?

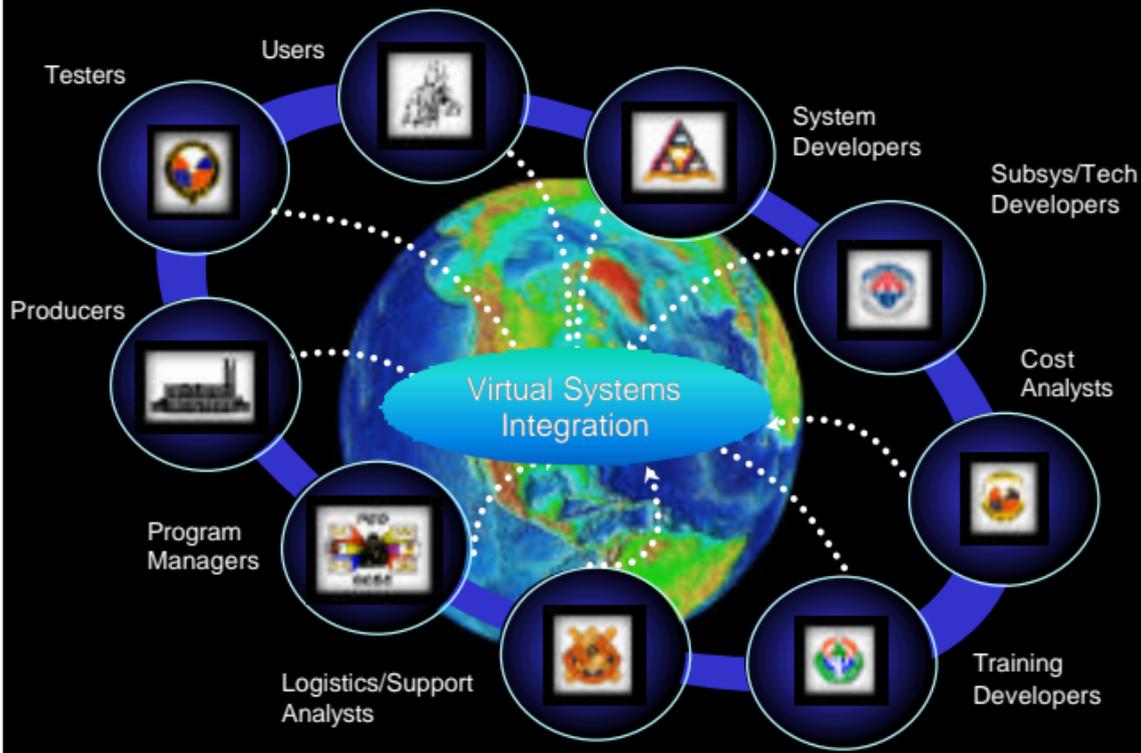


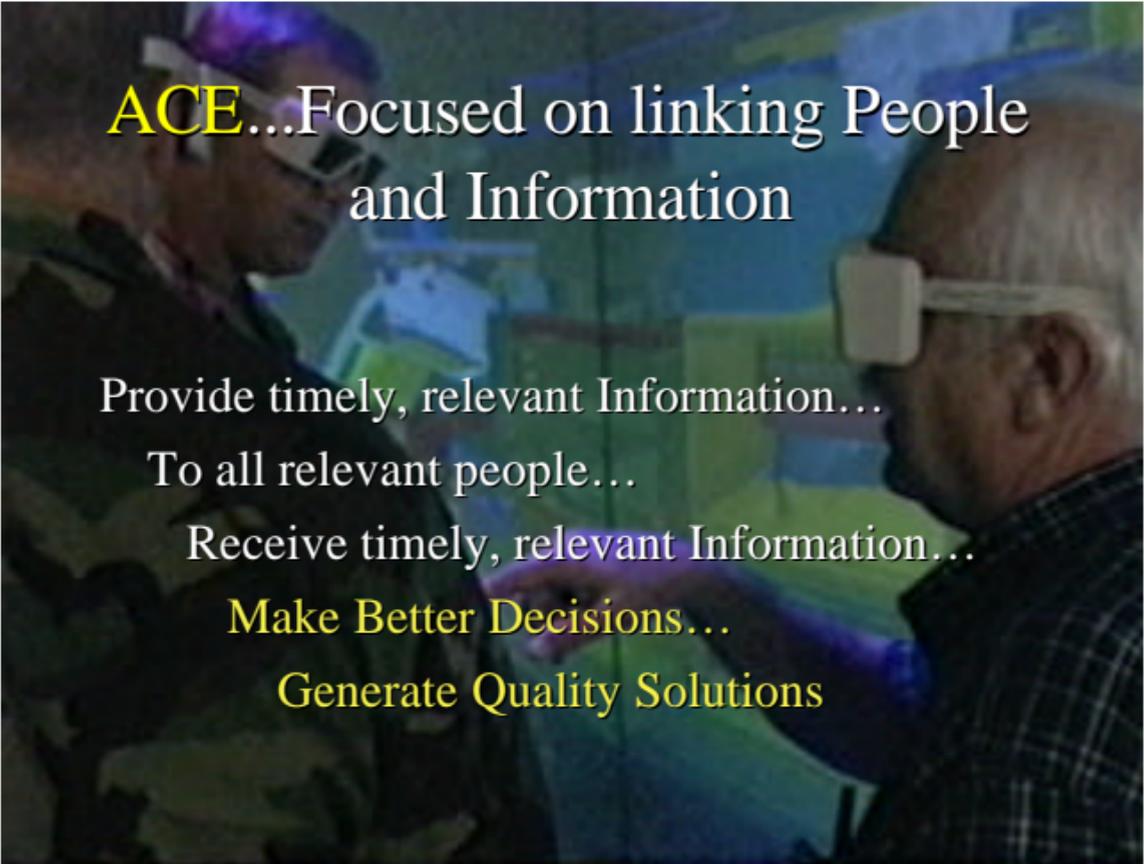
First Let's Describe
the Problem

Collaborative Environment Definition & Framework



Developing Complex Systems Needs Many Voices



The background image shows two men in profile, facing each other. They are wearing white AR glasses. The man on the left is wearing a military-style camouflage uniform. The man on the right is wearing a dark plaid shirt. They are looking at a large screen or wall covered with various charts, maps, and data visualizations. The lighting is dim, with some blue and green highlights from the screen.

ACE...Focused on linking People
and Information

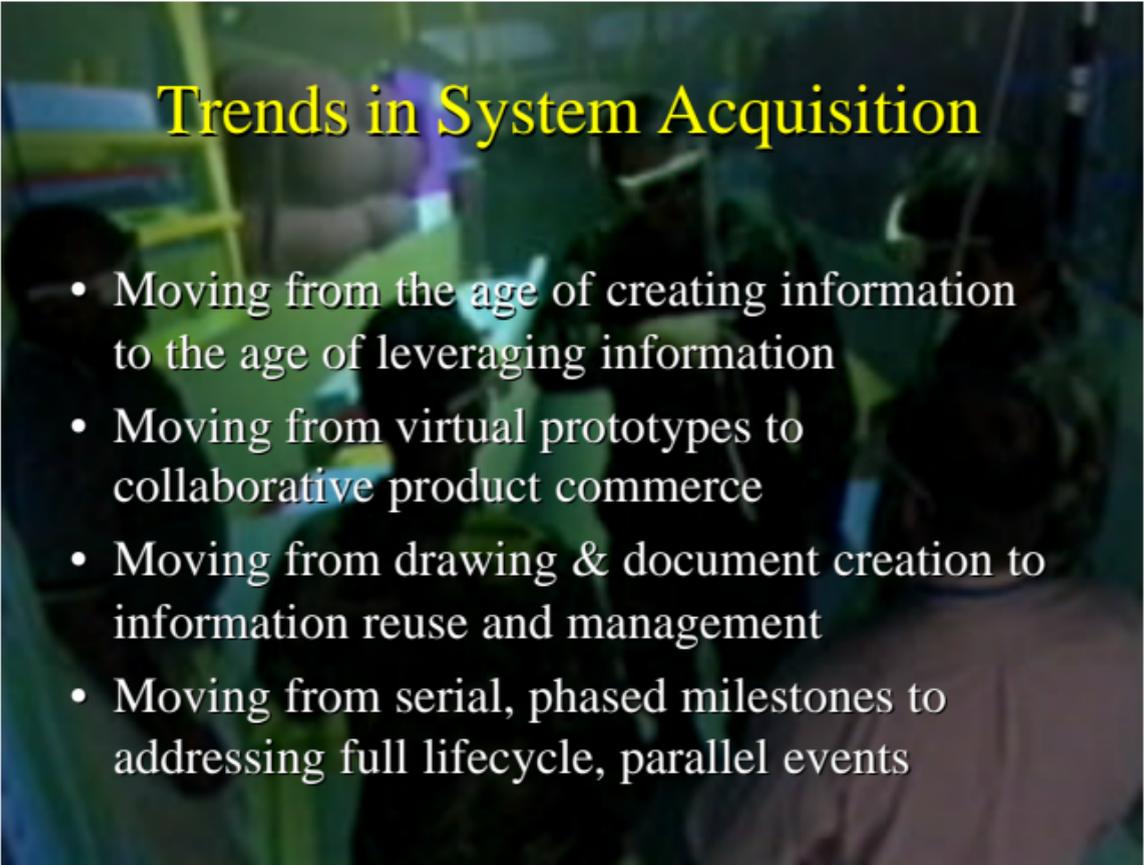
Provide timely, relevant Information...

To all relevant people...

Receive timely, relevant Information...

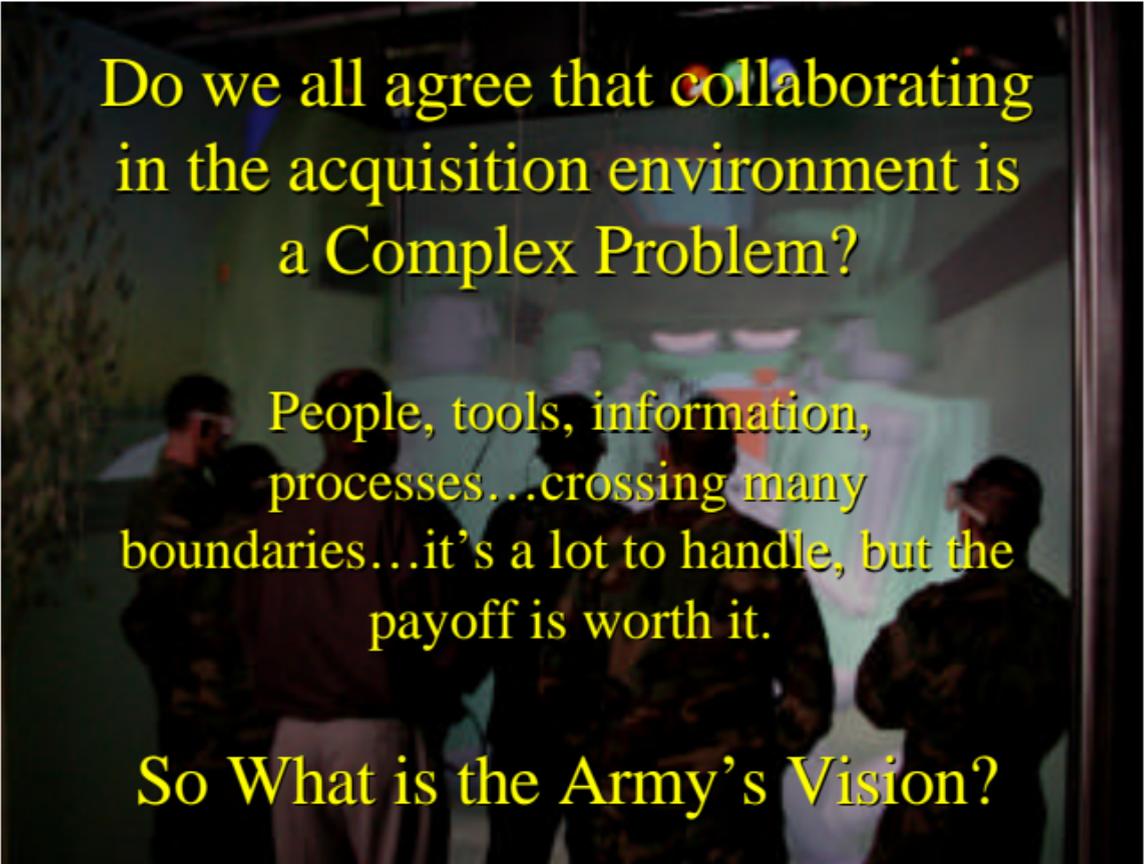
Make Better Decisions...

Generate Quality Solutions



Trends in System Acquisition

- Moving from the age of creating information to the age of leveraging information
- Moving from virtual prototypes to collaborative product commerce
- Moving from drawing & document creation to information reuse and management
- Moving from serial, phased milestones to addressing full lifecycle, parallel events



Do we all agree that collaborating
in the acquisition environment is
a Complex Problem?

People, tools, information,
processes...crossing many
boundaries...it's a lot to handle, but the
payoff is worth it.

So What is the Army's Vision?

A Collaborative Environment Vision for the Army

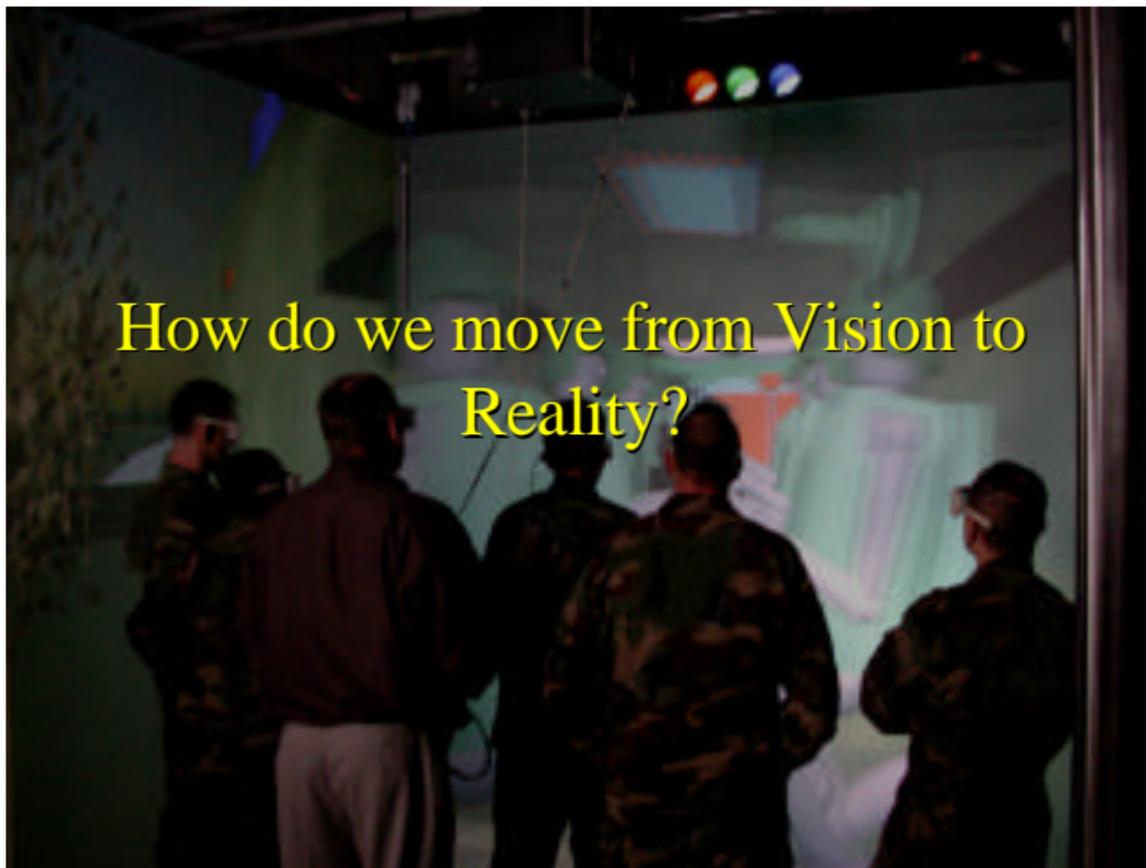


Advanced Collaborative Environments (ACE) Laboratory

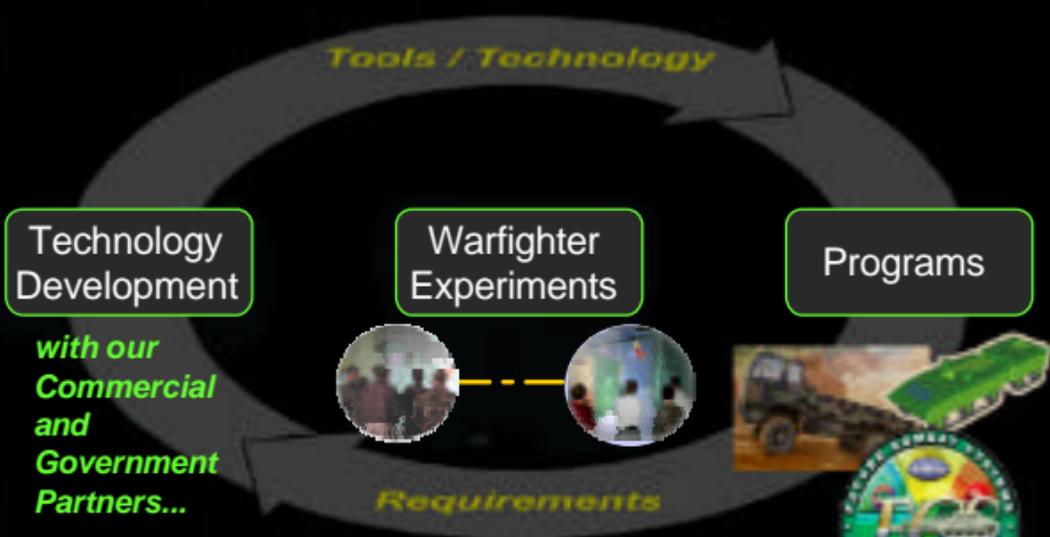
***An Army Vision -
Distributed Collaborative
Virtual Environment with
On Demand Information***

National Automotive Center

How do we move from *Vision* to
Reality?



Our Approach



FSCS

OICW

BCT

Real Challenges

Real Soldiers

Real Solutions

Who have we partnered with?

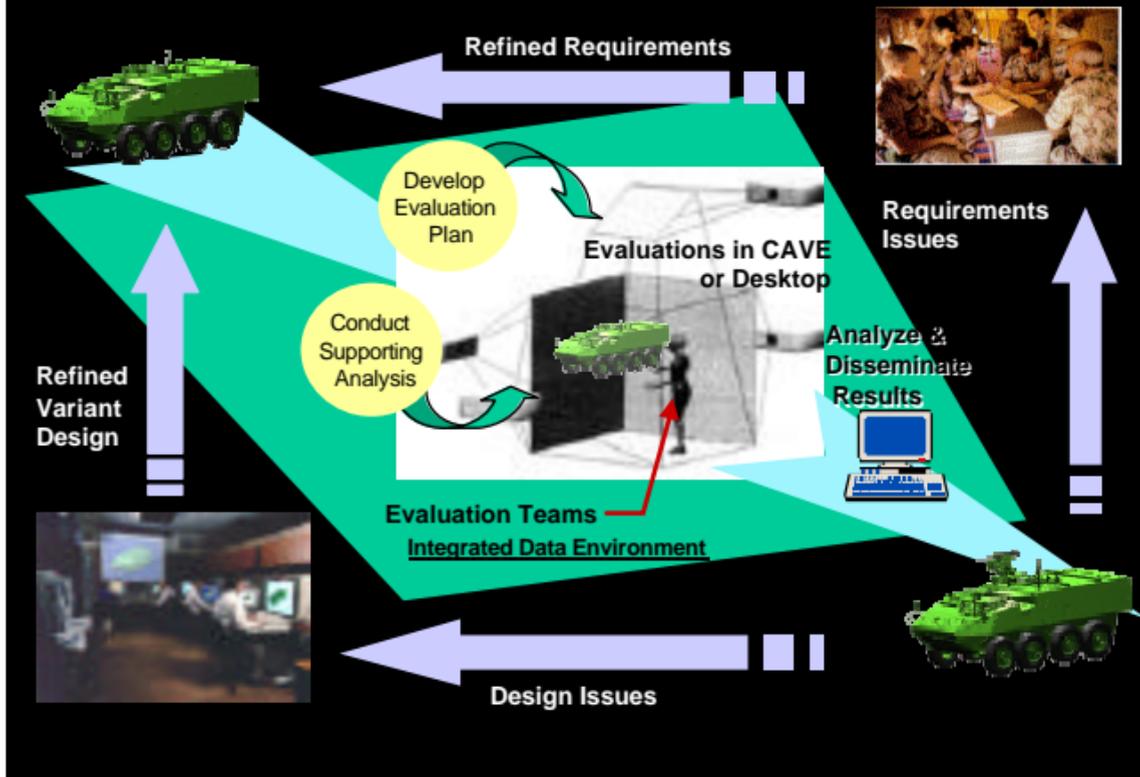
- PTC
- Fakespace Systems
- GDLS
- LMC
- SGI
- EDS
- Multigen Paradigm
- TASC-Litton
- Army Battle Labs
- TARDEC Advanced Concepts
- Army Research Lab
- PM BCT
- PM FCS
- PM Small Arms

Connecting with the TRADOC Community



- Bringing soldiers into the development environment
- Early Evaluations and Feedback
- Early Operational and Support Considerations
- Rapid and Inexpensive Trade-offs
- Support User Investigations of System Design
- Jointly investigate User requirements
- Assist in Requirements Refinements

Collaborative Evaluation Process for FCS Concepts



Ft. Knox-TARDEC Collaboration Exercise 1

PowerPoint Design Review

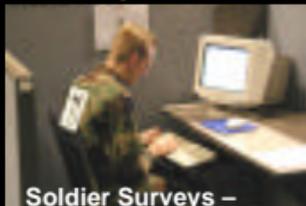


CAVE Design Review



VS.

"The CAVE allows me to really see the design. I better understood the design in the CAVE. I could touch and feel it around me."

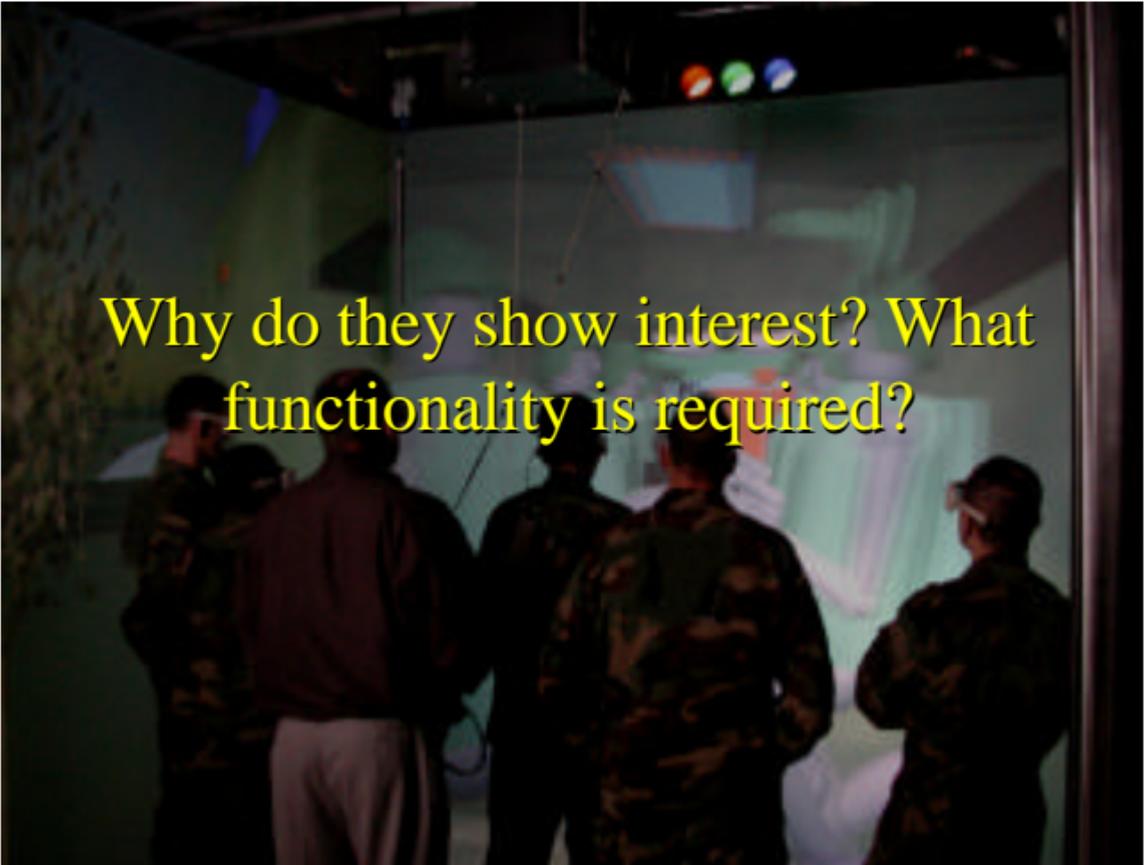


Soldier Surveys –
Data Collection



After Action Review

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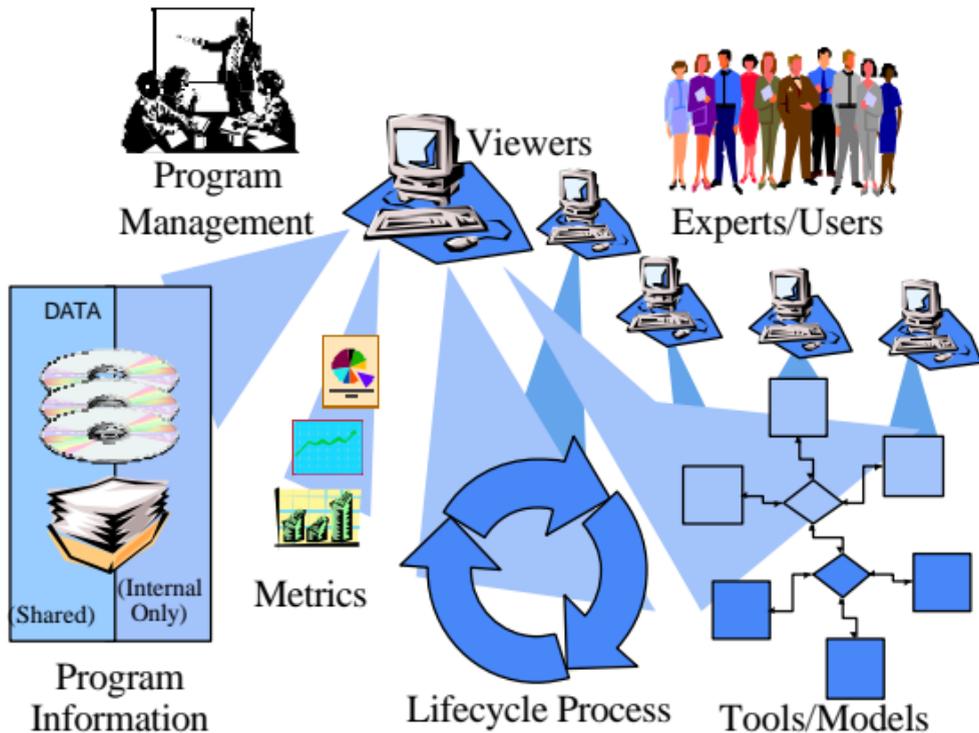
A group of people, including several in military camouflage uniforms, are gathered in a dark room, looking at a large projection screen. The screen displays a 3D model of a complex structure, possibly a building or a piece of machinery, with various colored sections. The room is dimly lit, with some ambient light from the projection and a few small lights visible on the ceiling. The text "Why do they show interest? What functionality is required?" is overlaid in yellow on the image.

Why do they show interest? What functionality is required?

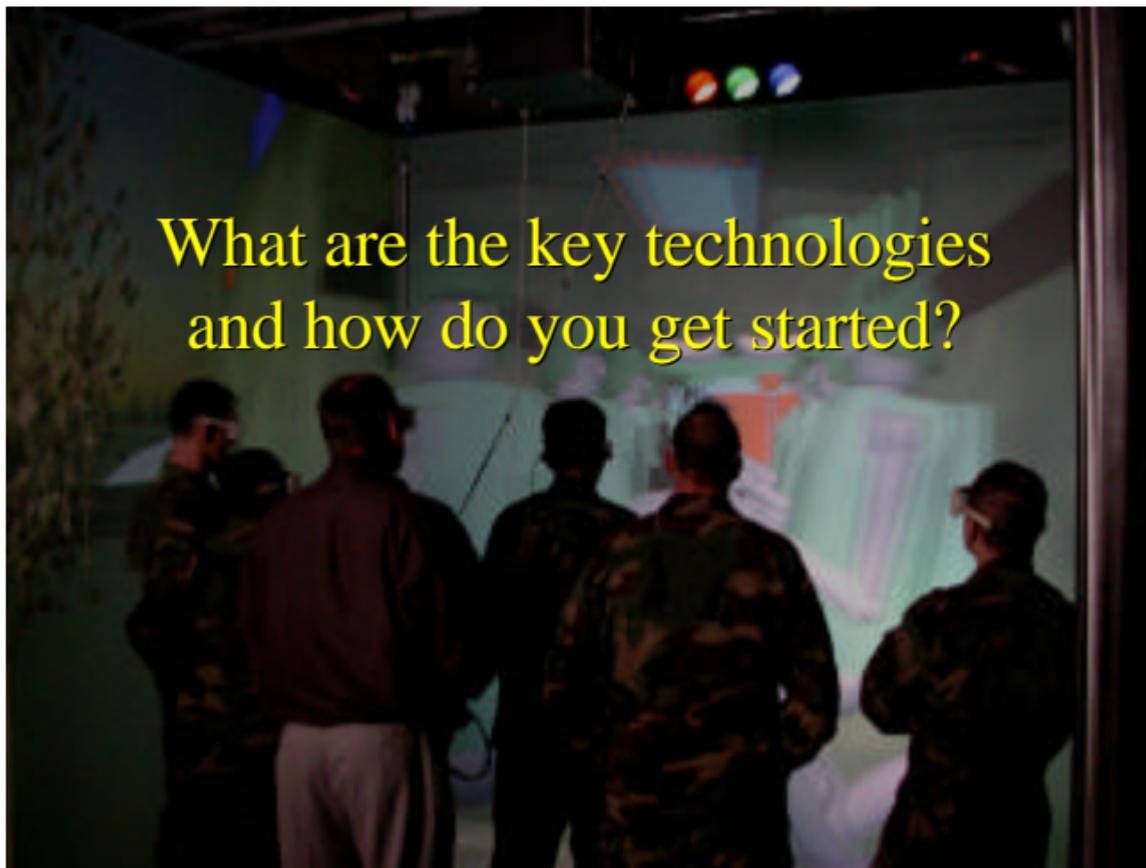
Functional View of the ACE

- People focused – liberate them from information gathering and facilitate their early and frequent contributions
- Real-time access to authoritative information sources – not copies of old info
- Available information includes system data, program data, assessment data, user data, issue-related data
- Multiple viewing technologies providing single user access and collaborative access for multiple participants
- Tools for viewing information in understandable forms and for providing timely feedback available to globally distributed locations
- Relationships between information are stored and can be queried to obtain the bigger picture and to answer why

Joining in the Collaboration



What are the key technologies
and how do you get started?



Collaborative Engineering Environments

Key Enabling Technologies

People-Information Integration

-Web-based Information Technology

-Flexible Workflow Manager

-Immersive Virtual Environments



***Tailoring Technologies for Army
People, Processes, Tools & Data***

Systems Integration Using High Tech Collaboration Tools

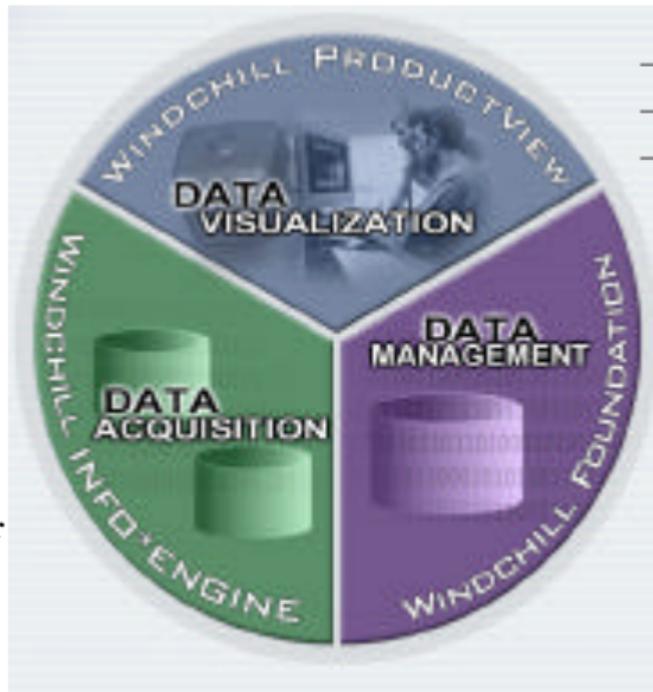


Technology View of the ACE

- Industrial strength information management system
- Web based access, viewing, and interaction with people and information
- Display technologies – desktop, PDA, VR, etc.
- Network connectivity using various technologies between multiple central sites, distributed users, and to the actual systems being developed
- Integrated development, assessment, review, and support tools
- Process and workflow facilitation toolsets
- Interfaces to existing information sources and related tools (based on commercial and defacto standards and best practices)

IDE-Windchill Components

- Info*Engine Hub
- Adapters for specific systems



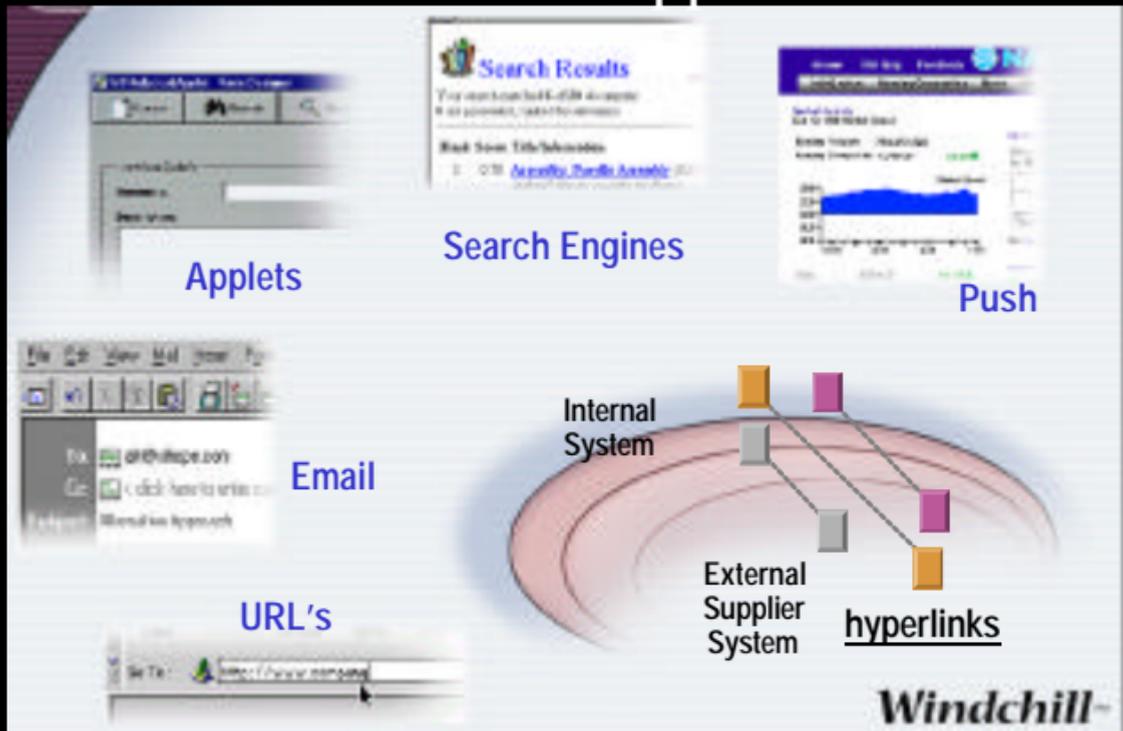
- ProductView
- HTML Pages
- Java Applets

- Foundation
- Information Modeler
- Life Cycle Application Suite

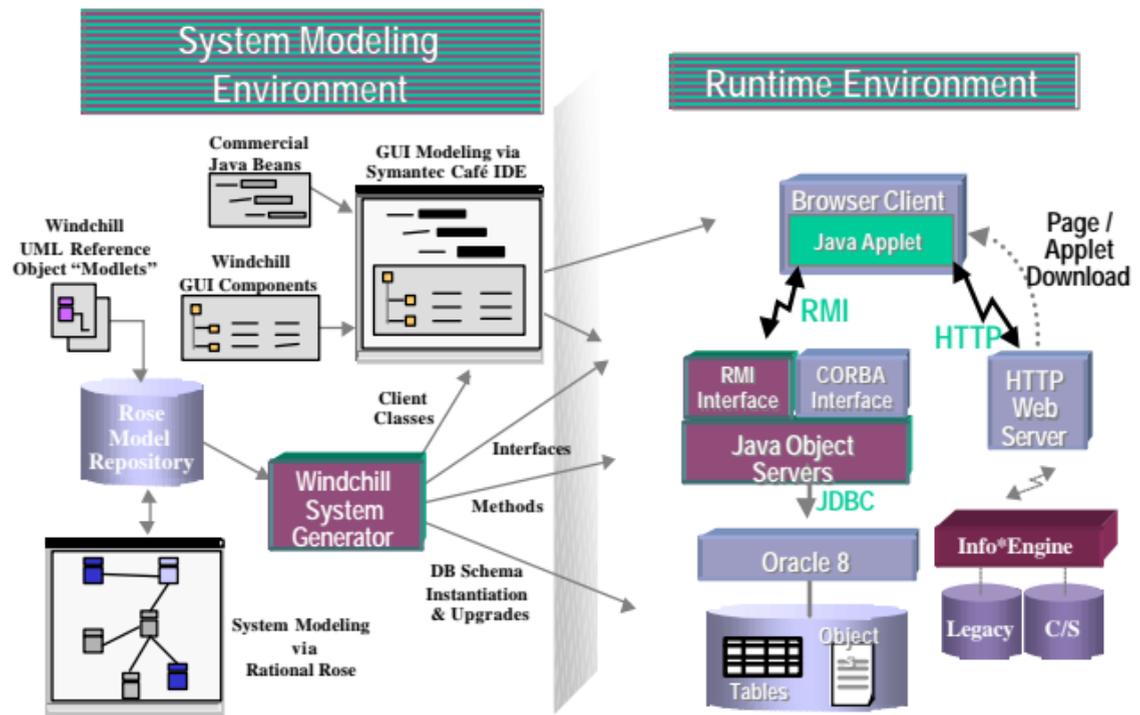
What is Windchill™?

- **Enterprise Information Management Foundation**
 - Internet as the operating system
 - WWW for information distribution
- **Out of the box - Configuration Management, Document Management, Workflow & Lifecycle Management, Visualization, Data Acquisition**
- **Incorporates a best in class architecture, utilizing tools such as JAVA and XML.**

Native Web Approach

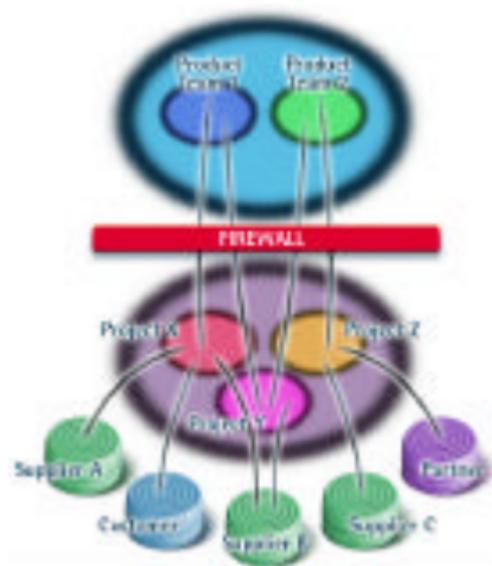


Windchill Architecture



- Collaborative product design space & tools

- Project-Based Approach
 - Document Management
 - Project Milestones
 - Deliverables
 - Meetings and Project Events
- Tools to support a virtual team
 - On-line Meetings
 - Discussion Forums
 - Workflow Processes
 - Subscriptions and Notifications
- Developed for Manufacturers
 - Product Structure Management
 - 3D Visualization and Markup
 - Integrated CAD Interfaces



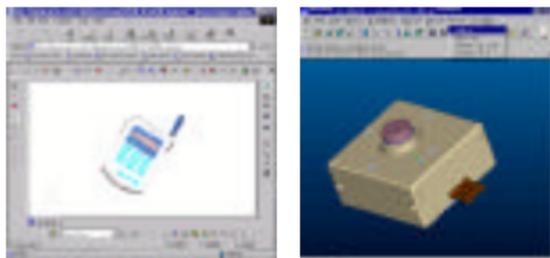
Project communication

Project Communication mechanisms:

- **Project portals**
 - User portal
 - Specific project portal
- **Email delivered notifications**
 - Status updates, overdue, completion, event, tasks, action items
- **Subscription**
 - User-driven subscriptions to project events
- **Discussion forums**
 - General project topics, deliverable discussions, meeting
- **Project log**
 - Chronological list of project events

Integrated CAD/Visualization & Markup

- Integrating CAD with the ProjectLink Project
 - Direct CAD Support - Pro/ENGINEER,Catia, AutoCAD,UG
 - Simple installation - Plug-in downloaded to CAD client
 - CAD files vaulting: - Integrated check in/check out of sets of CAD files: parts, assemblies and drawings
 - Visualization - Automatically creates thumbnails
- Automatically creates viewables
 - Product Structure - Automatically creates BOM links



Product View

Note: Also need integrated views of simulation results

Immersive VE – CAVE Device

- Multi-user environment
- Wide field of view
- Head Tracked for real-time interaction
- Extremely *useful* when need the *feeling of being inside* e.g. Like a cockpit, or tank crew compartment
- Ideal for collaboration by “crawling around”



Immersive VE – Powerwall/Reality Center Devices

- Wall Size dependent on Room Size
- Normally not head tracked
- Full Scale viewing of virtual model
- Ideal for audience style collaboration

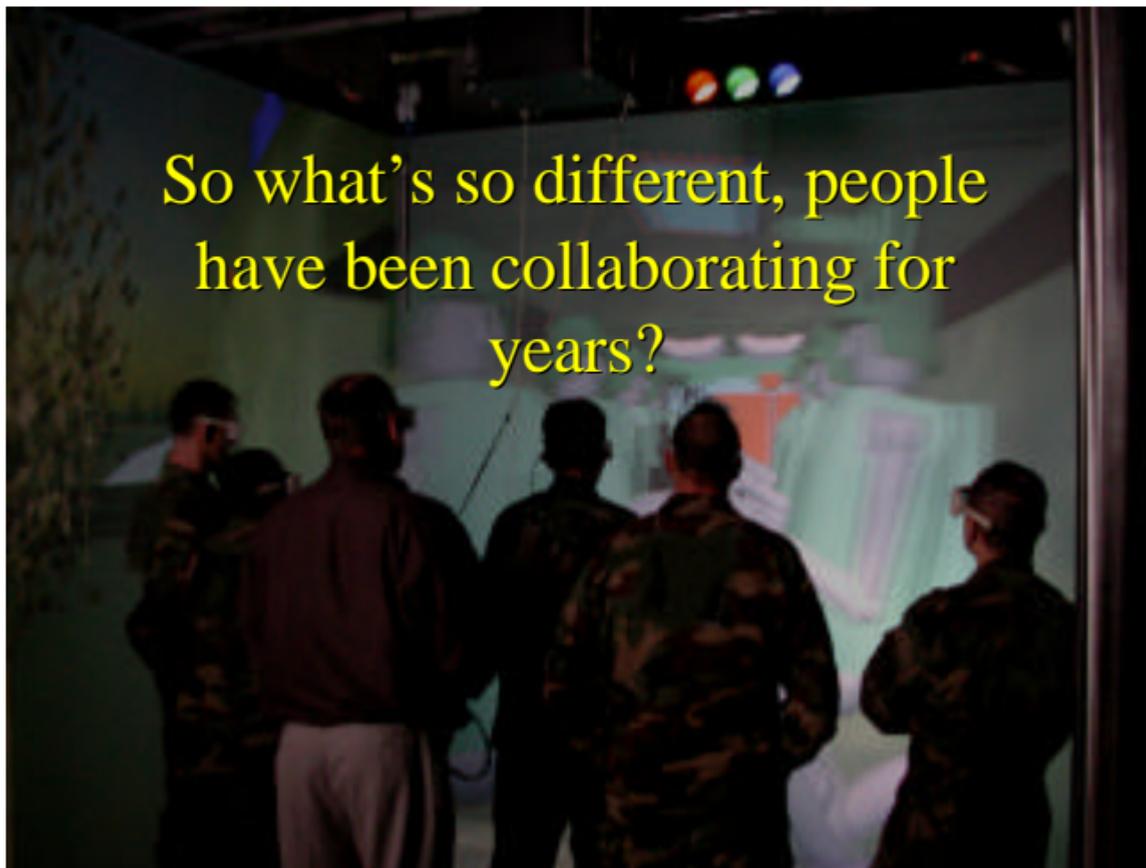


Immersive VE

Seeing, touching, interacting...improving
understanding - - even without hardware

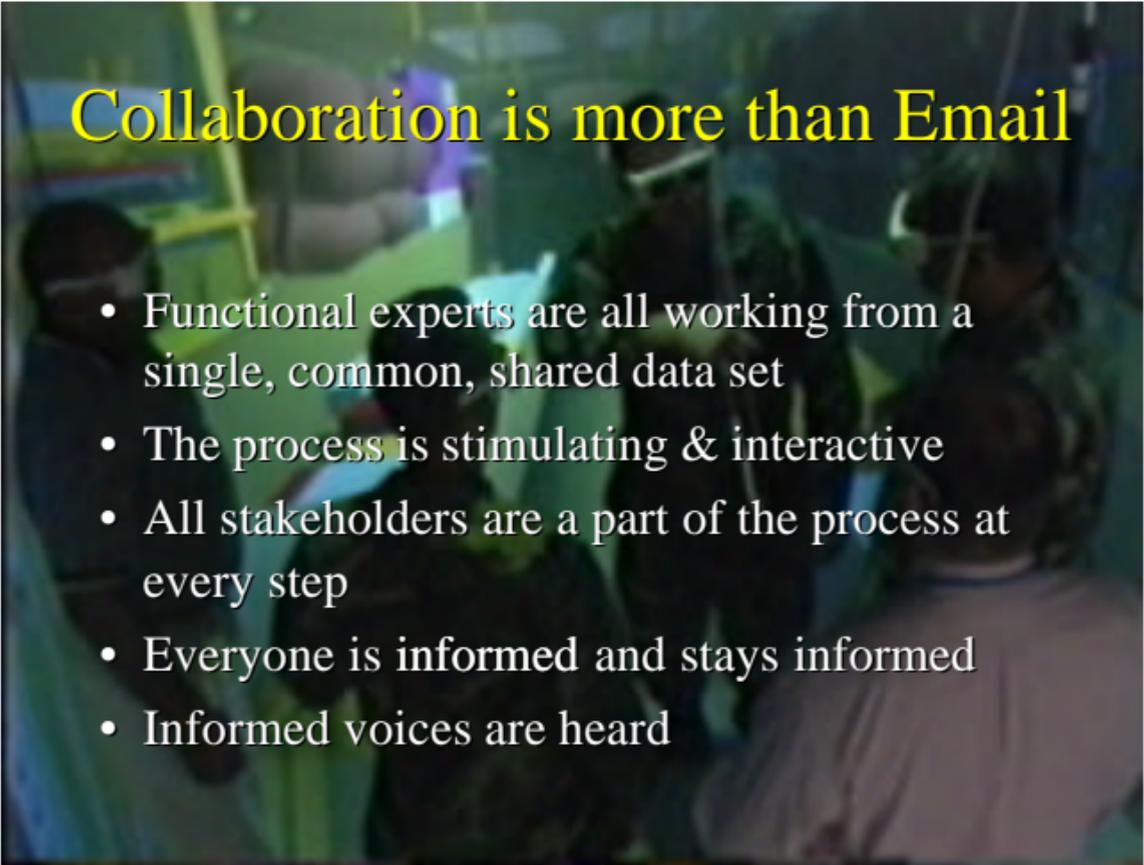


So what's so different, people
have been collaborating for
years?



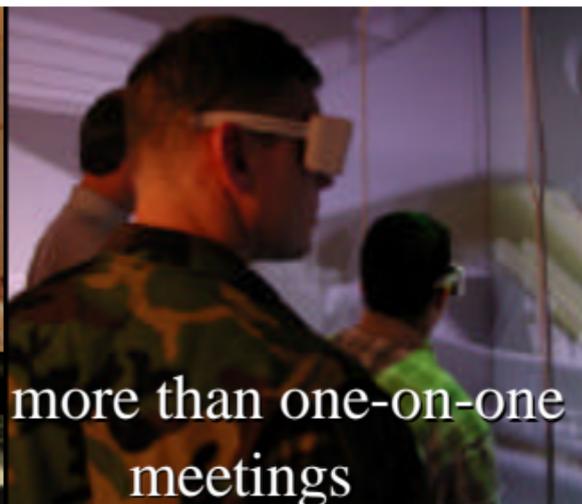
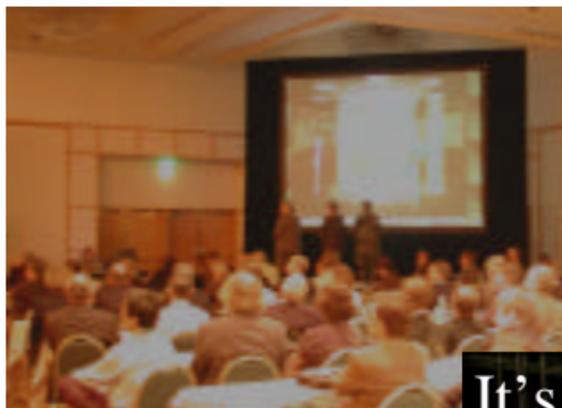
The Synergy of Collaboration



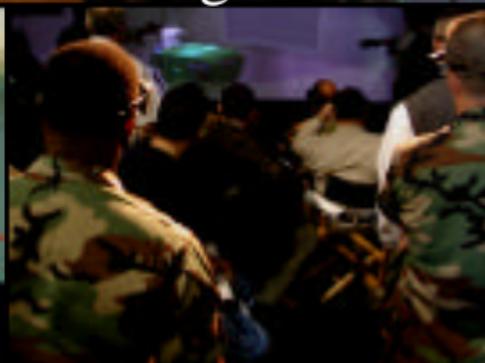
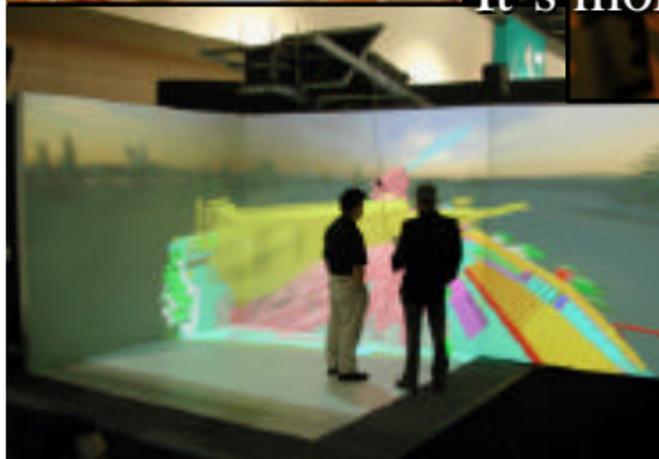


Collaboration is more than Email

- Functional experts are all working from a single, common, shared data set
- The process is stimulating & interactive
- All stakeholders are a part of the process at every step
- Everyone is informed and stays informed
- Informed voices are heard



It's more than one-on-one meetings



Supporting PM Brigade Combat Team

Design Reviews - a better way

**OLD WAY - Death
by PowerPoint**

**NEW WAY -
Interactive, Engaged**

ICV

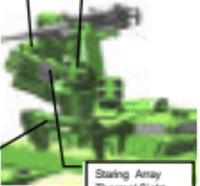
- Weapon
 - KDA Remote Weapon Station
 - M249 /30 cal
 - M249 and T. Altam
 - M249 T. Altam 300
 - Dual light armored targets at 1500m
 - -20° depression to + 60° elevation
 - Targets acquired and engaged from under armor

Day Camera
Target Acq Sight

MS Launchers
(x4)

Height reduction for
air transport

Staring Array
Thermal Sight



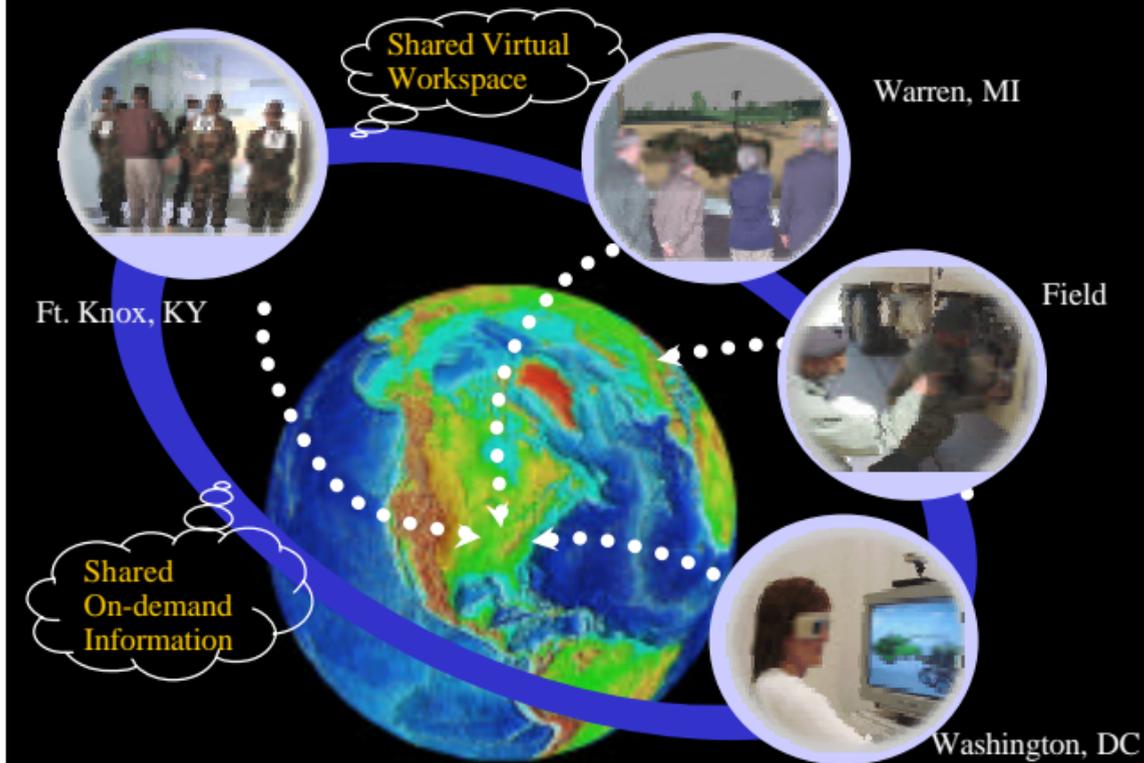


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Resolving Issues using ACE Technologies



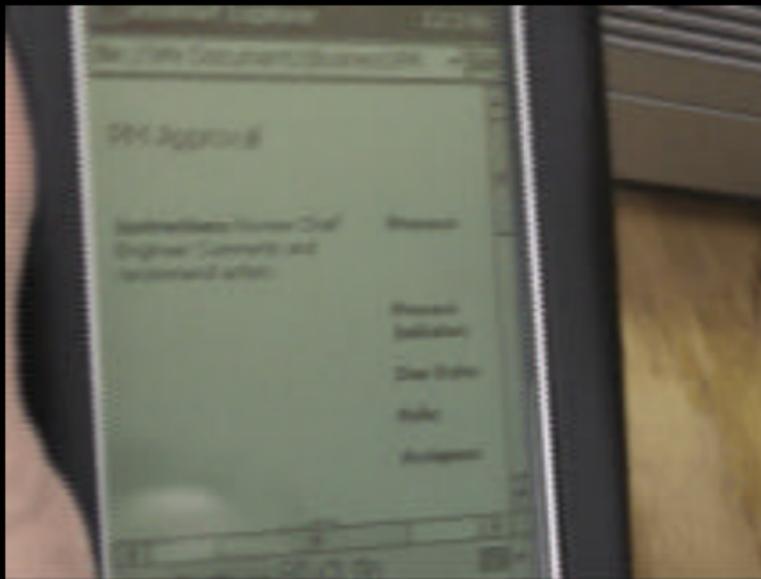


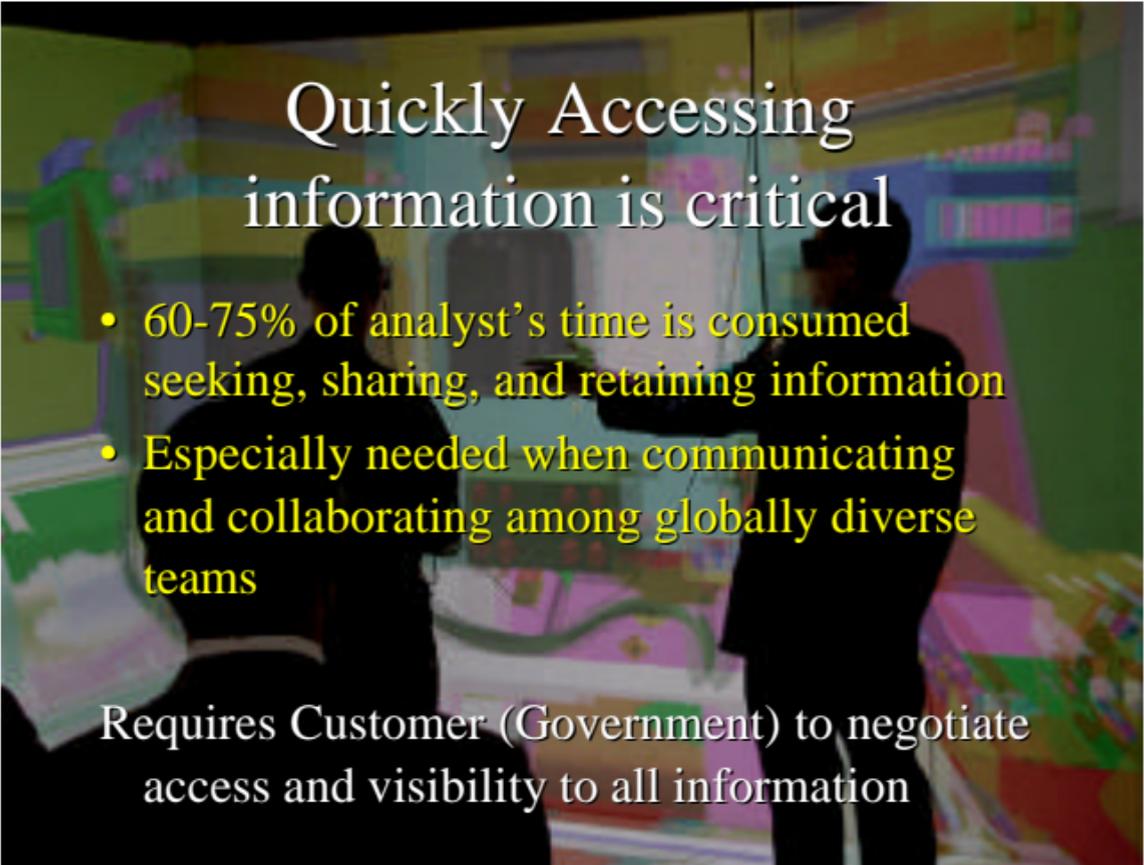
Information Available and Accessible On-demand

- Support a global business environment
- Information and data easily located and accessible
- Types of information - product, program, M&S and analysis. SME, technology
- Access to “live” information - like a helpdesk or information/expert on-call
- Threaded discussions - get related opinions and background information

“Live” Information at your fingertips

Staying connected even while out of the office...Quickly responding



The background image shows two individuals in a dark environment, likely a control room or data center, looking at a large, brightly lit screen. The screen displays various data visualizations, including maps and charts. The overall scene is dimly lit, with the primary light source being the screen itself.

Quickly Accessing information is critical

- 60-75% of analyst's time is consumed seeking, sharing, and retaining information
- Especially needed when communicating and collaborating among globally diverse teams

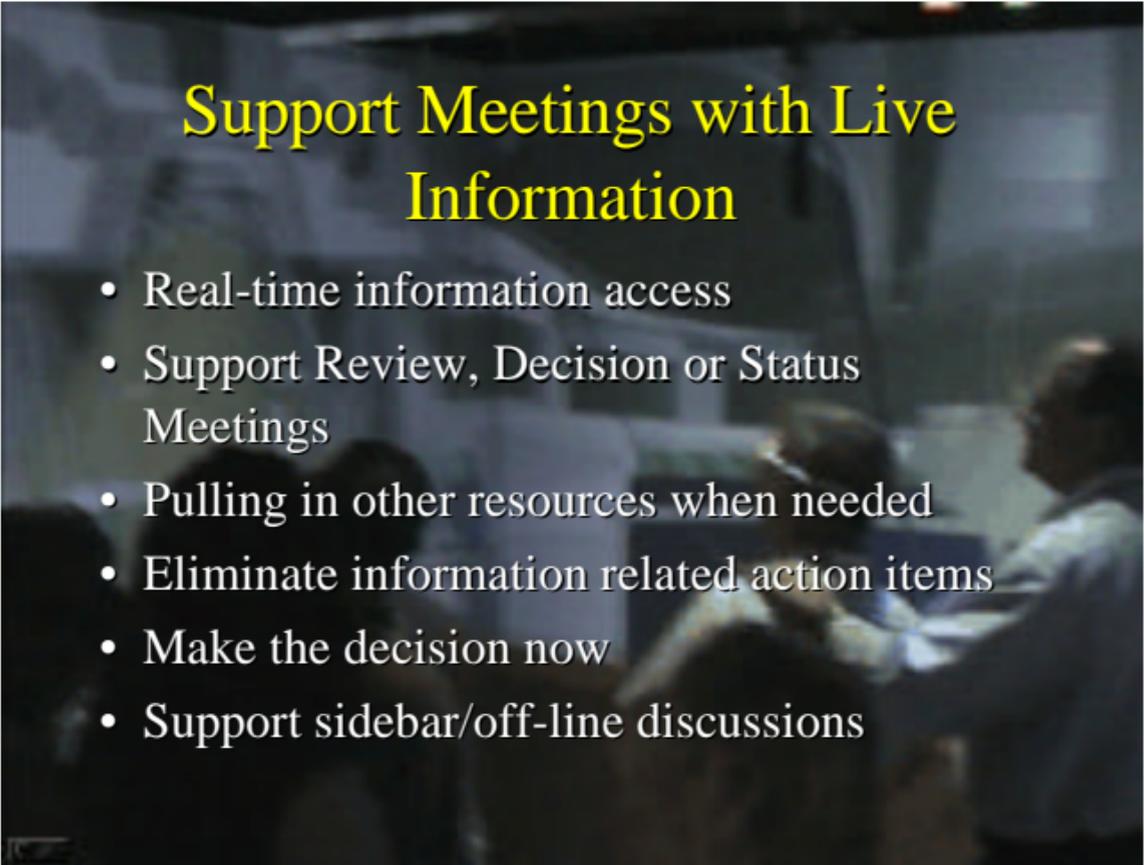
Requires Customer (Government) to negotiate access and visibility to all information

Asynchronous Support

- Preview information and data from your desktop
- Make early comments
- Prepare resources for meeting
- Come to meeting prepared
- Better prepared to contribute and to make decisions



- Organize your thoughts ahead of time



Support Meetings with Live Information

- Real-time information access
- Support Review, Decision or Status Meetings
- Pulling in other resources when needed
- Eliminate information related action items
- Make the decision now
- Support sidebar/off-line discussions

Supporting PM Brigade Combat Team

Open discussions with access to real data

Sharing information about my component while seeing how
it fits into the bigger system



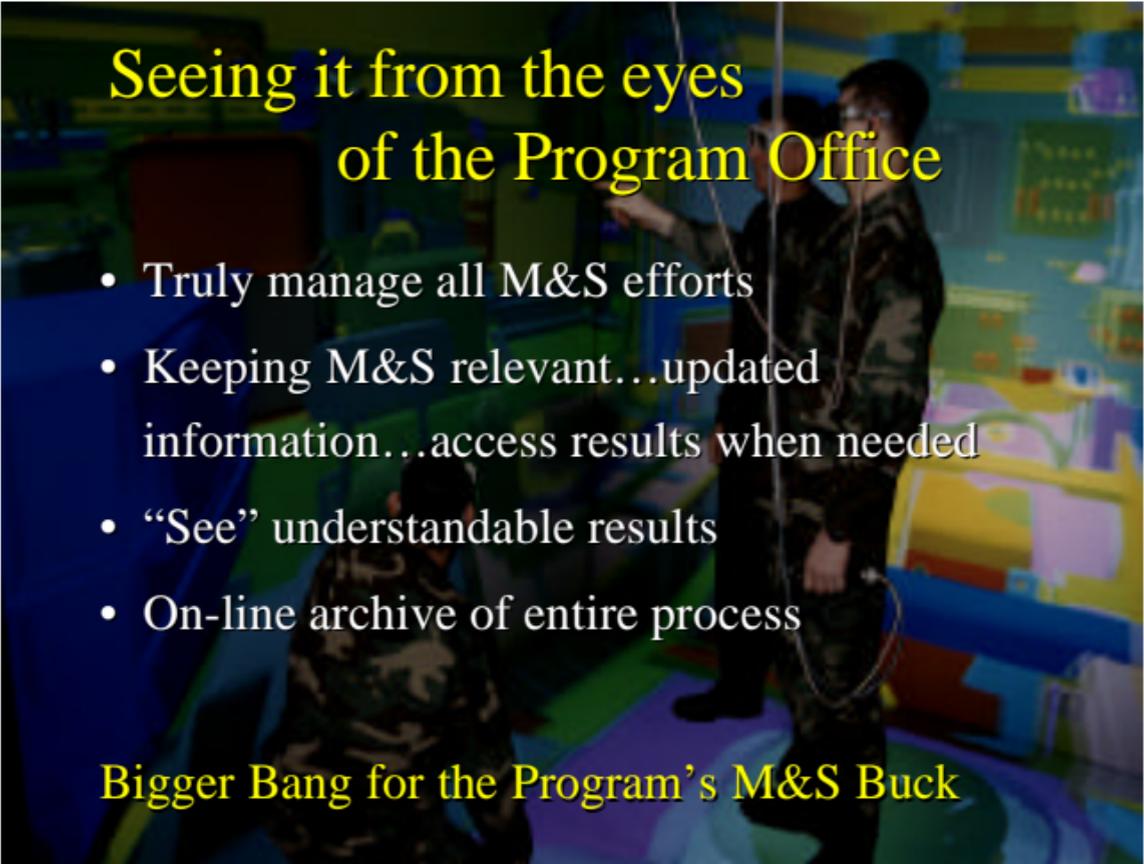
Supporting PM Brigade Combat Team

Separate sidebar meetings to further exchange ideas....don't forget to jot down some notes



M&S Plan Execution

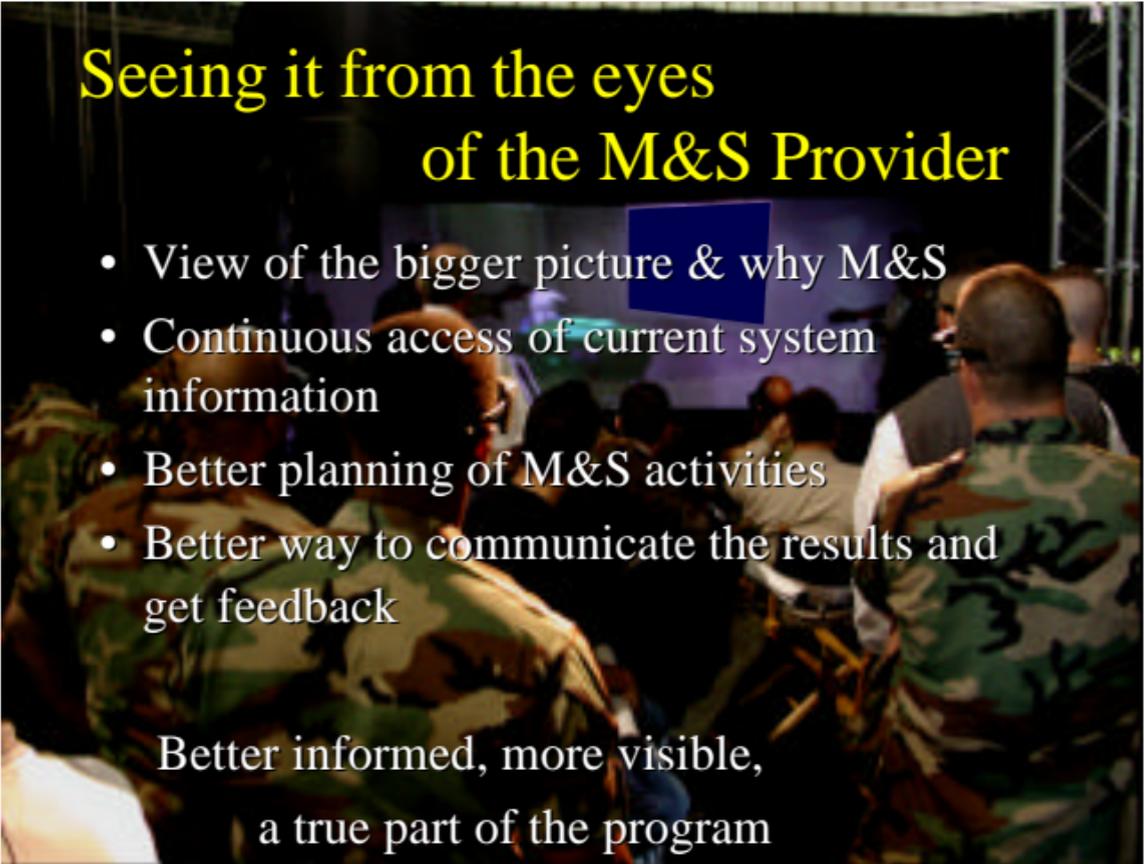
- On-line tasking, monitoring, synchronizing
- Streamline data preparation
- CM on Input/Models for VV&A
- Package input/output and related data for on-line review
- Fast delivery of output in useful form
- Traceability from requirements to decisions made



Seeing it from the eyes of the Program Office

- Truly manage all M&S efforts
- Keeping M&S relevant...updated information...access results when needed
- “See” understandable results
- On-line archive of entire process

Bigger Bang for the Program's M&S Buck



Seeing it from the eyes of the M&S Provider

- View of the bigger picture & why M&S
- Continuous access of current system information
- Better planning of M&S activities
- Better way to communicate the results and get feedback

Better informed, more visible,
a true part of the program

Enriching the Decision Making Further

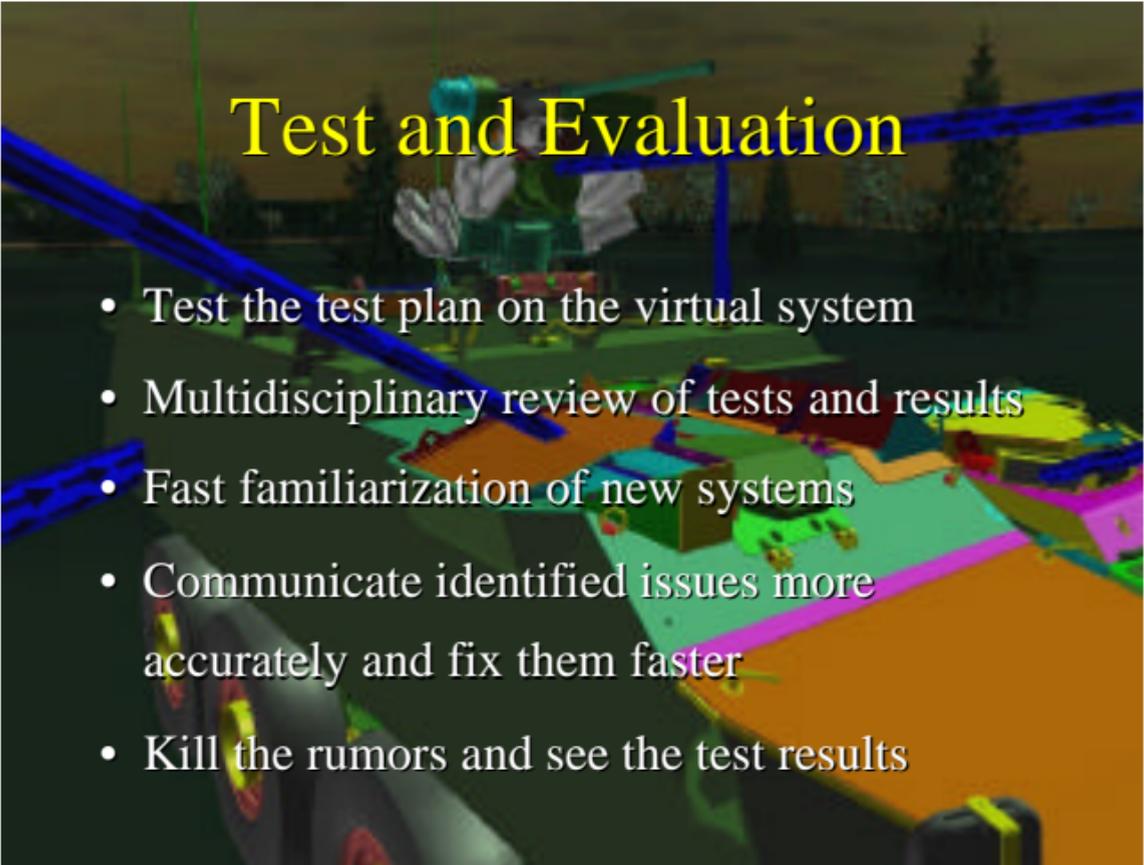
- Linking other simulations, analytical tools, & testing
- Putting results into understandable views to support decision making



Enriching the Decision Making Further

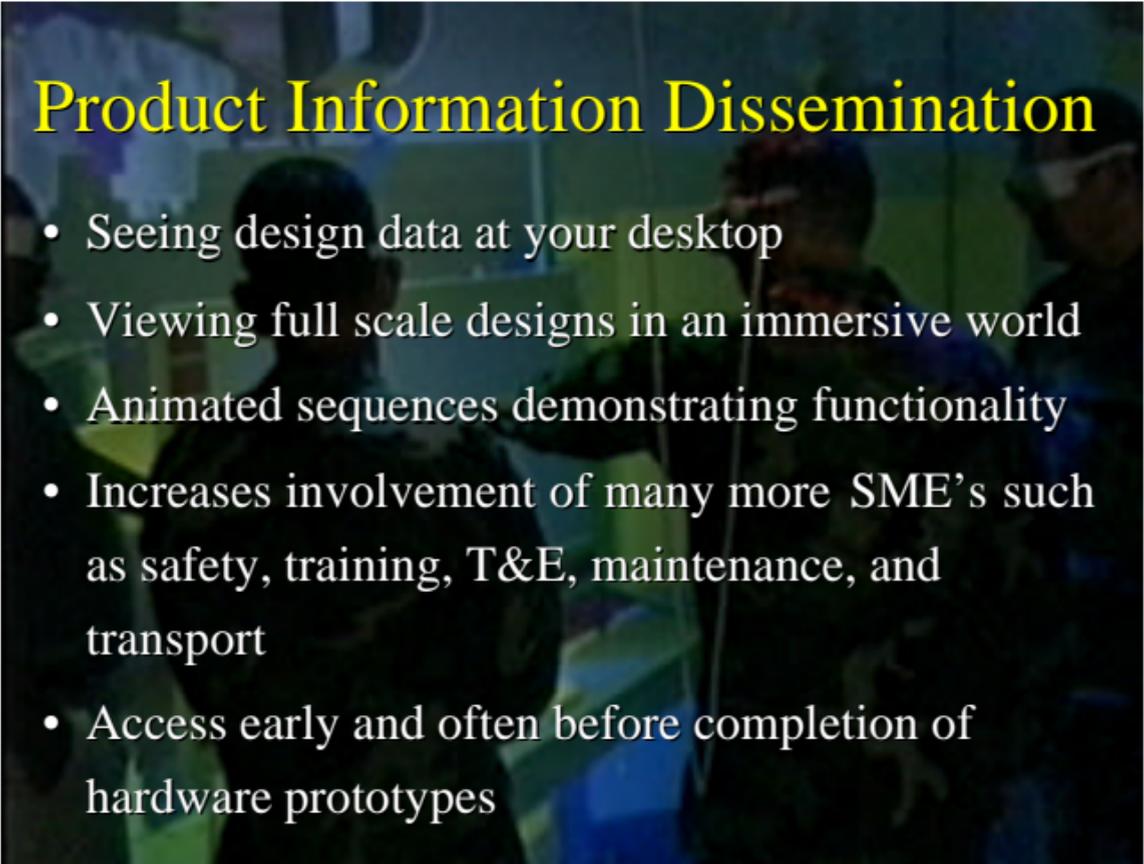
- Fire and the Extinguishing Agent



The background of the slide is a 3D virtual environment. It features a dark, overcast sky with some faint clouds. In the foreground and midground, there are various colorful geometric shapes and lines. There are blue lines that look like beams or paths, some green and yellow rectangular blocks, and a large orange area on the right side. The overall scene is somewhat abstract and appears to be a simulation or a virtual world.

Test and Evaluation

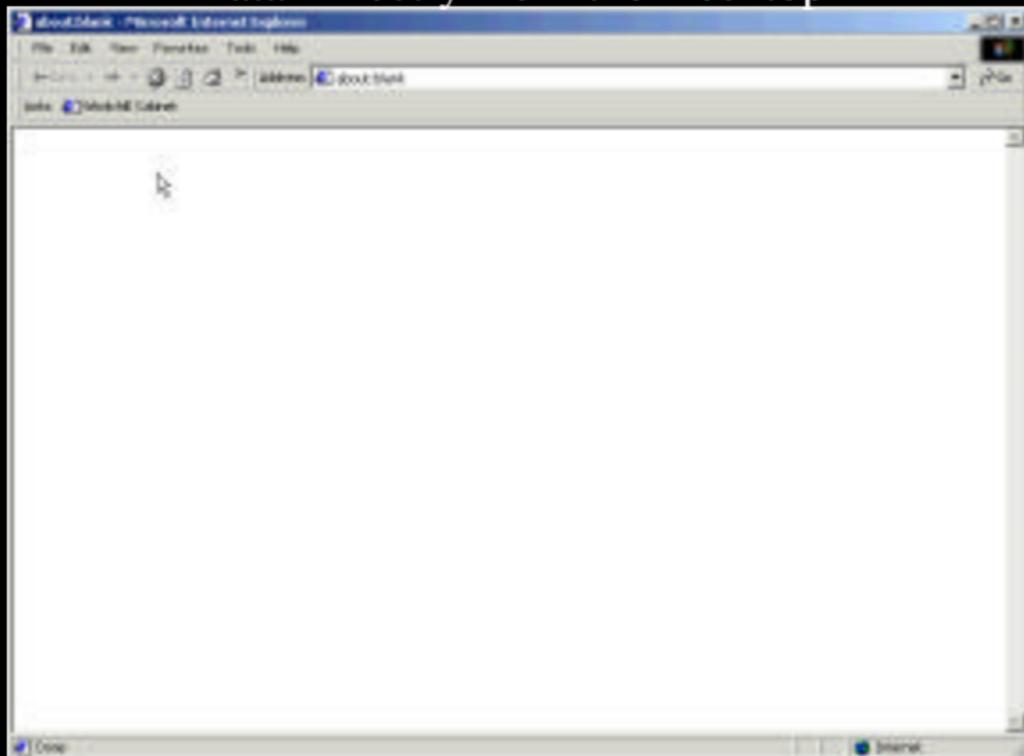
- Test the test plan on the virtual system
- Multidisciplinary review of tests and results
- Fast familiarization of new systems
- Communicate identified issues more accurately and fix them faster
- Kill the rumors and see the test results



Product Information Dissemination

- Seeing design data at your desktop
- Viewing full scale designs in an immersive world
- Animated sequences demonstrating functionality
- Increases involvement of many more SME's such as safety, training, T&E, maintenance, and transport
- Access early and often before completion of hardware prototypes

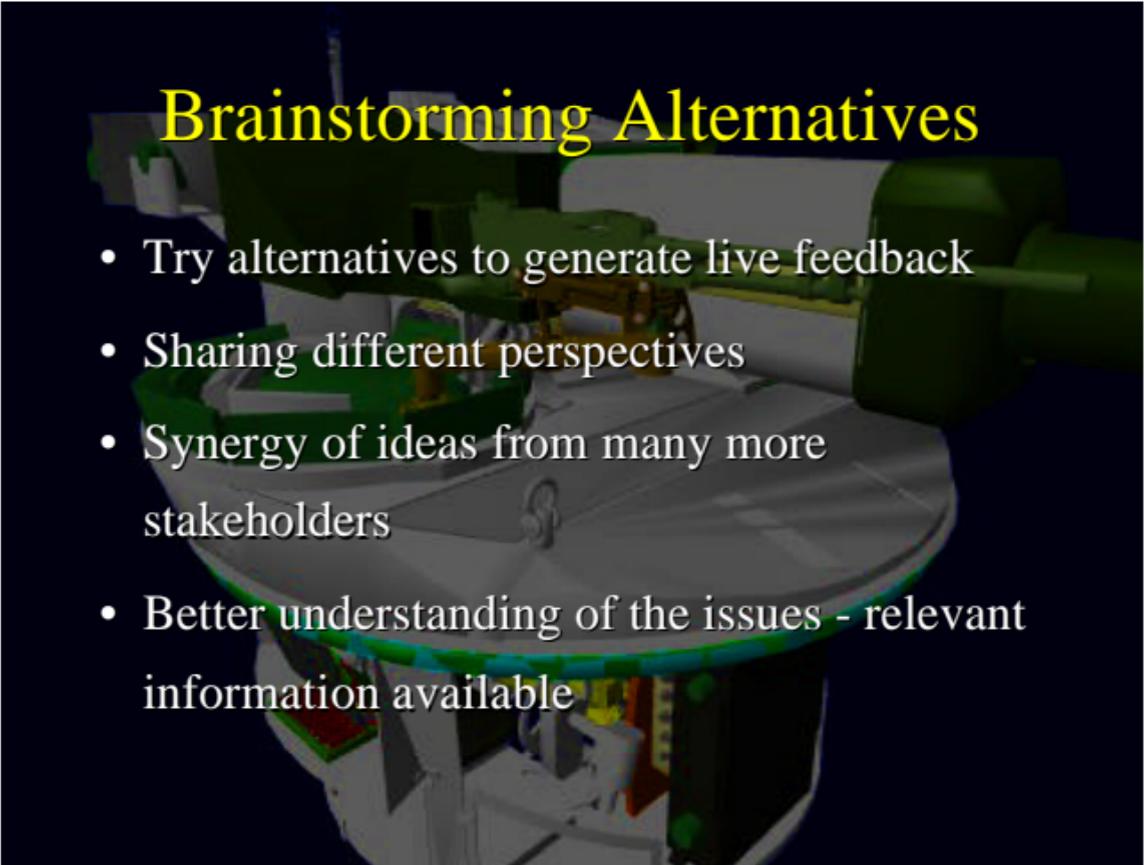
Accessing, Manipulating, Reviewing Design Data Directly from the Desktop



Supporting PM Brigade Combat Team

Add system functionality...improving system understanding



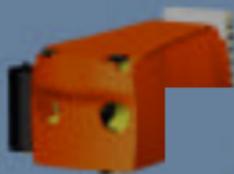


Brainstorming Alternatives

- Try alternatives to generate live feedback
- Sharing different perspectives
- Synergy of ideas from many more stakeholders
- Better understanding of the issues - relevant information available



Start with an idea,
sketch in virtual space



Brainstorm alternatives in a shared
virtual space...where many ideas can be
explored & evaluated

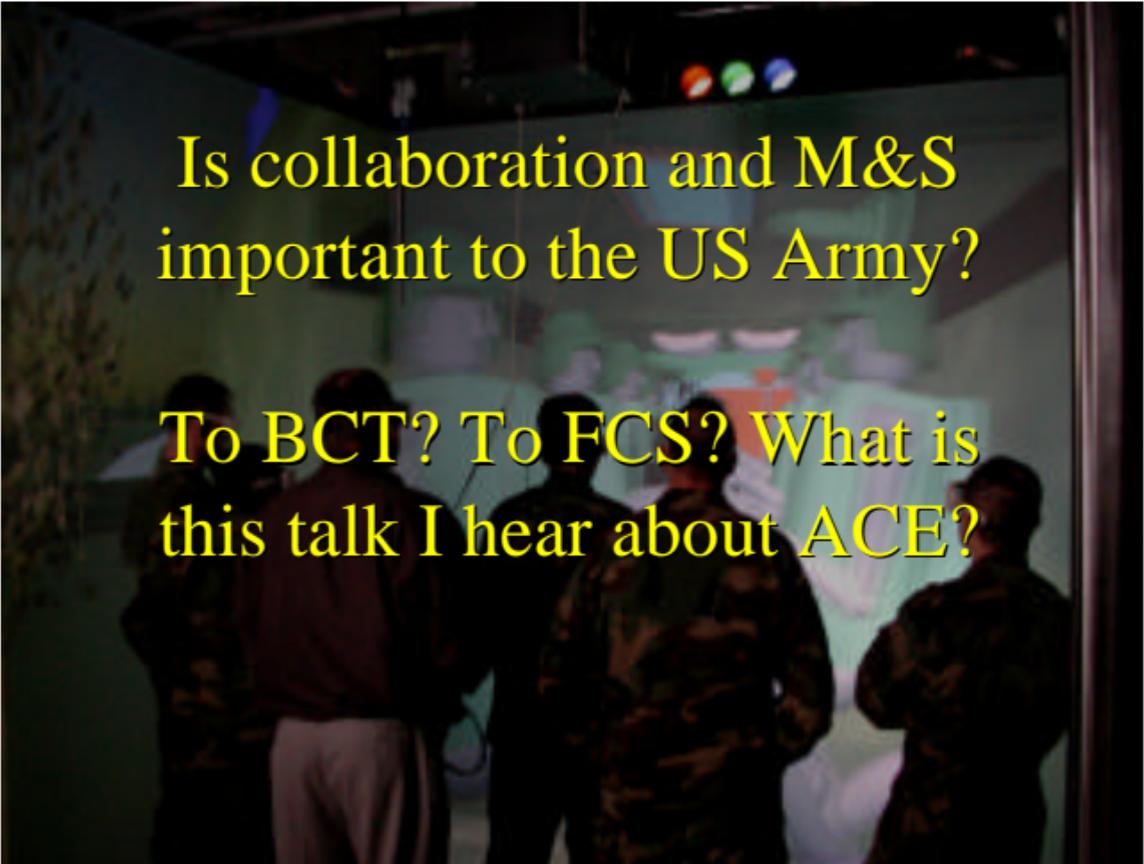
Mature the Idea



Add all the stakeholders to
enrich the design and
get buy-in

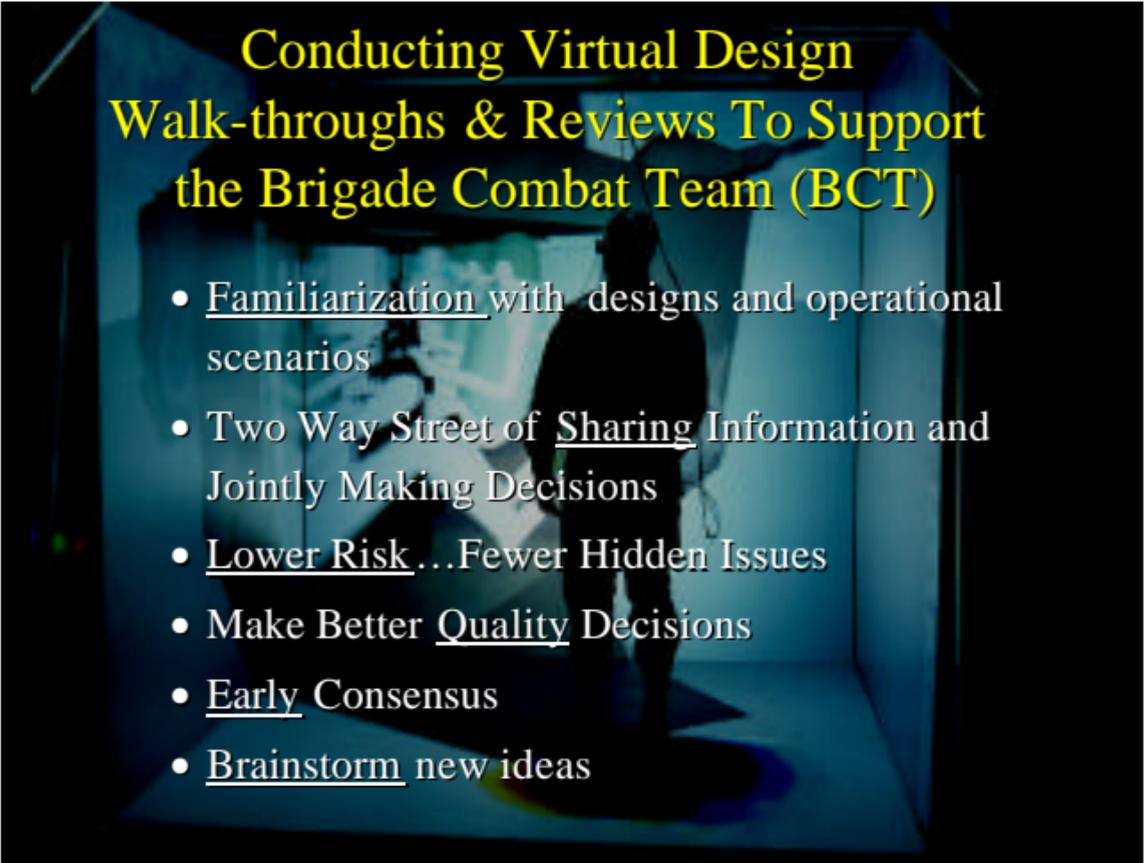
Add System Functionality



A group of people, including several in military camouflage uniforms, are gathered in a dark room, looking at a large projection screen. The screen displays a map or data visualization. The scene is dimly lit, with the primary light source being the projection. At the top of the screen, there are three small colored lights (red, green, blue).

Is collaboration and M&S
important to the US Army?

To BCT? To FCS? What is
this talk I hear about ACE?



Conducting Virtual Design Walk-throughs & Reviews To Support the Brigade Combat Team (BCT)

- Familiarization with designs and operational scenarios
- Two Way Street of Sharing Information and Jointly Making Decisions
- Lower Risk...Fewer Hidden Issues
- Make Better Quality Decisions
- Early Consensus
- Brainstorm new ideas

Virtual BCT System Prototypes & Collaborative Evaluations

From the Desktop...



IDE



...to the Virtual World

- **1000+ Informed Stakeholders**

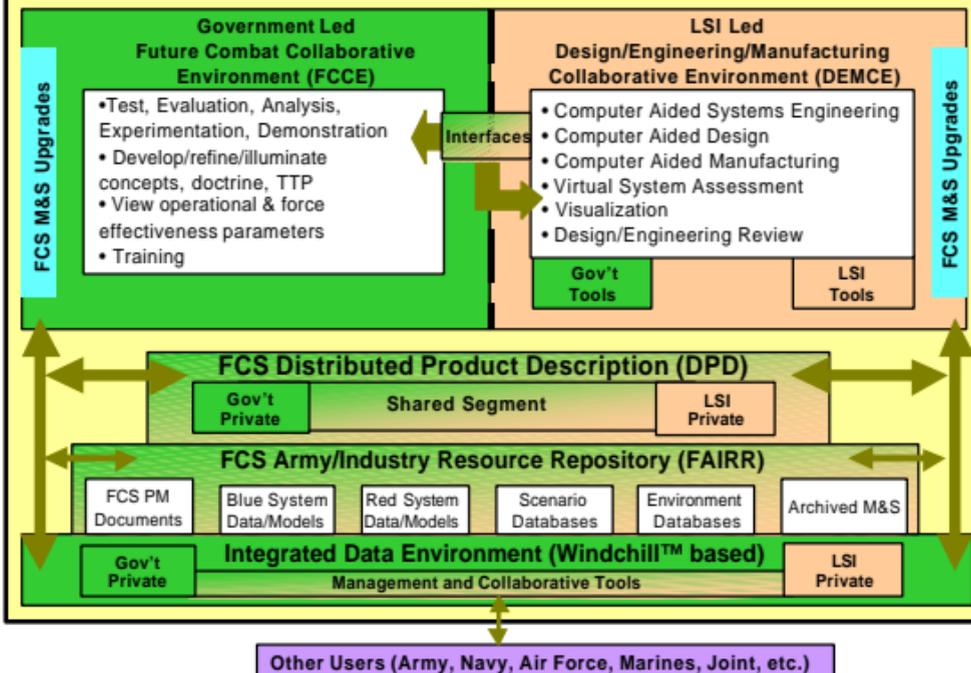
PMO BCT, TRADOC, STRICOM, ARL, ATEC, Prime & Sub-contractors, Safety, etc.

- **10 IAV Variants Available**

ICV, MGS, ATGM, MC, CV, RV, FSV, ESV, NBC RV, MED (Prior to Hardware)

**Meeting Aggressive
Schedule**

FCS Advanced Collaborative Environment



Types of FCS ACE Users

- Army Leadership
- PMO Regulars
- IPT Leads (gov't / LSI)
- IPT Members (gov't / LSI)
 - broken into groups for access control and workflows
- Working Groups Members (associated IPT) - sub IPT's
- SME - contributors in specific processes/ IPTs
 - maybe classify further
- Observers (specific focus)
- Observers (general interest)

Types of ACE Functions

- Author Documents
- Upload Documents
- Update Documents
- Review Documents w/ comments - review cycle (gov't only, joint)
 - combo of gov't-only, lsi-only, and joint - must be clearly Marked (content & comments)
 - portions of document are joint, LSI-only, gov't-only (need to be unseen)
 - permit ad-hoc changes to cycle
- Approve Documents
- Read Documents w/ feedback
 - request help in finding/accessing a document
- Feedback to any IDE documents
- Subscribe to documents of interest
- Search for Documents/People/Resources
 - all represented in IDE
- Copy URL's of favorite Documents to local space
- Request Assistance/Support, Feedback on Tool/Service
- Complete Assigned Tasks (from workflow)
- Project Management functions -
 - define/track milestones & deliverables
 - monitor status of projects/deliverables - in project-link

Types of Documents

- Briefings
- Meeting minutes
- Decision Documents - engineering, logistics
- Reference
- Analysis
- Trades

- Organize by Projects (20-30) per IPT, Shared Docs (program info, etc), Topic
- Per project
 - milestones, source data from other teams,
- Special Tool files - e.g. Risk Tool,



For example: <https://fcs-ace.army.mil>

FCS Portal (Web Page)

- Current FCS News Summary with References (URLs)

Top 10 Docs (URL's)

- Schedule Summary
- Proposal Sections Concepts
- Agreement
- Kickoff Briefing
- IPT Structure
- POC List

Pointers to Docs below

Network Connections (varying throughput)

(Encrypted Data on Wire)

ACTIVE Team Docs

Project Link TACOM-Warren

- MS B Docs
- ACE Plan
- IPT Structure
- POC List

•Agreement Released

ARCHIVED Docs

Winchill Enterprise TACOM-Warren

•Phase I Team Docs Released

ACTIVE Team Docs

Project Link BOEING

- Schedule
- IPT Activity

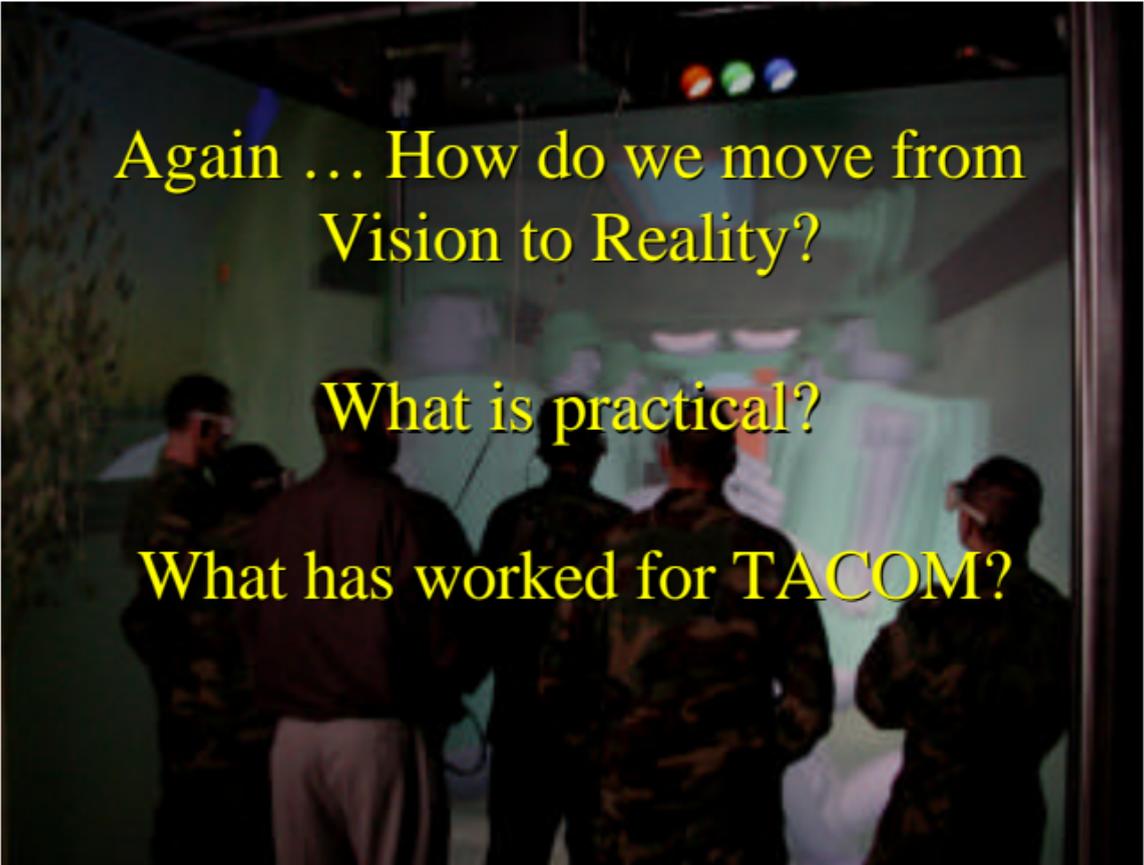
Released

ARCHIVED Docs

Winchill Enterprise BOEING

•Proposal Released

Information Repositories



Again ... How do we move from
Vision to Reality?

What is practical?

What has worked for TACOM?

A strategy that works

- Use it for the right PROCESSES
 - Support Integrated Product Team structure
 - Focus on high value processes and urgent problems
 - Functionally focused information systems
 - Remember our product life cycle is 45+ years
- Leverage the Right TECHNOLOGY
 - Use the internet, platform independent and federation technologies to provide end user capability
- Get it to the right PEOPLE

What is needed for success

- Know the functionality you want first
- Selection of System Integrator is Critical
- Requires a partnership between Systems Integrator, tool vendor, and PMO Technical Lead
- Requires investment by PMO representatives (time, work through processes)
- Start Small and Grow Incrementally
- Requires In-house IT Technical Experience

Hot Tips, Lessons learned, & Things to Keep in mind

- Requires **committed leadership** who will rely on it
- Willing to **try** at all levels of the organization
- Don't be led astray by "flavor of the month" web tool providers
- If detailed information with **configuration management** is not part of the solution - then it's not worth the effort
- Be **patient** - it takes cultural changes, it takes process changes, it takes discipline, it takes trust, it takes time - but the payoffs are worth it
- Still very few qualified professionals/vendors that can provide ACE services at a reasonable cost -- too many developers -- not enough **practitioners** -- not enough **mentors**

TACOM...
Advanced Collaborative Environments Supporting
THE ARMY TRANSFORMATION

Web-based Information
Framework

Three Vectors to Transformation

3D Virtual Environment



Legacy Force

Objective Force

Legacy Force

Objective Force

