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# Command 21 Knowledge Web

## *Increasing Speed of Command Using Web-Enabled Technologies*



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# What is the Knowledge Web?

- ◆ **ONR Sponsored, SSC-SD Implemented**
- ◆ **Basic Concept is to capture the value-added information (i.e., *Knowledge*) already being created by the command staff.**
- ◆ **Store and present this Knowledge in an easily accessible store – a Knowledge Web**
- ◆ **Knowledge Web can be organized dynamically to meet warfighter needs – often along warfare areas or component commands**
  - *Concept and Tools identical to those installed and in use aboard USS Carl Vinson*

# Related Cognitive Tasks Analyses: Common Information Requirements

- ◆ **Tactical data (multiple views if possible!)**
  - Map-based and highly graphical views / context
- ◆ **Mission Summaries and Commander's Intent**
- ◆ **Real-time info! (or close to it)**
- ◆ **Alerts / Advisories / Recommendations**
  - What isn't working according to plan? & What do we do to fix it?
- ◆ **Impacts & Indications**
  - "X" happened; how does it affect everything else?
- ◆ **Plans (and alternate COAs)**
  - Response & Timeline Management
- ◆ **Effects Summaries**
  - Various formats preferred
- ◆ **Asset / Resource Management**
- ◆ **Collaboration Tools (including VTC)**

# Command 21 CTA: 14 General Knowledge Web User Requirements

## ◆ General

- Shared SA
- Integrated Information

## ◆ Format

- Intuitive Graphical Interface
- Consistency

## ◆ Content

- Tactical Focus
- Supplemental Information
- Mission Goals & Objectives

## ◆ Content (cont)

- Anchor Desk Output
- Connectivity / Collaboration
- Cognitive Support

## ◆ Feature

- Flexible Configuration
- Drill-Down
- Information Age & Reliability
- Tactical Overlays

# Common Processes / Tasks Observed in Command Centers

- ◆ **Develop / share “Situation Awareness”**
  - Monitor tactical picture and other mission-relevant information
  - Extract / filter relevant information
  - Develop summary graphics & presentations
  - Communicate / disseminate mission-relevant information
- ◆ **Collaborate within and across echelons**
  - Synchronous and asynchronous
  - Face-to-face and distributed
  - Common and relatively unrelated goals / objectives
- ◆ **Make Mission-Related Decisions**
  - Time- or mission-critical
  - Based on incomplete and/or ambiguous information

***Problem: Available tools don't adequately support above processes / tasks!!***

# Cognitive Tasks Analysis Results: Process Problems Identified

- ◆ **BWC needs assistance integrating data and defining and displaying information to the CJTF and the battle watch when dealing with operational issues**
  - Need integrated, coherent information organized around specific problems – Intuitive “Summary” graphics.
  - Anchor Desks need ability to effectively monitor both tactical / operational displays – “Portholes into an ocean of data.”
- ◆ **“Collaboration” is problematic**
  - COTS collaboration tools not adequate, collaboration is “asynchronous” vice “brain storming”
  - Difficulty reaching across functional areas & across echelon
  - Different update rates for different functional areas
  - Only time everyone “knows” what is known is at Flag briefings.
  - Hard to know what information is “value added” to seniors & peers



# Command 21 Project: Addressing The Needs...

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- ◆ **Knowledge Web**
- ◆ **Support Tools**
  - **Summary Maker (a.k.a. “SumMaker”)**
  - **TacGraph**
  - **Knowledge Web Viewer**
    - » **Multi-head viewer**
    - » **Single-head viewer**
- ◆ **Concept / Prototype Hardware**
  - **Knowledge Walls / Knowledge Desks**
- ◆ **Training and onsite support**

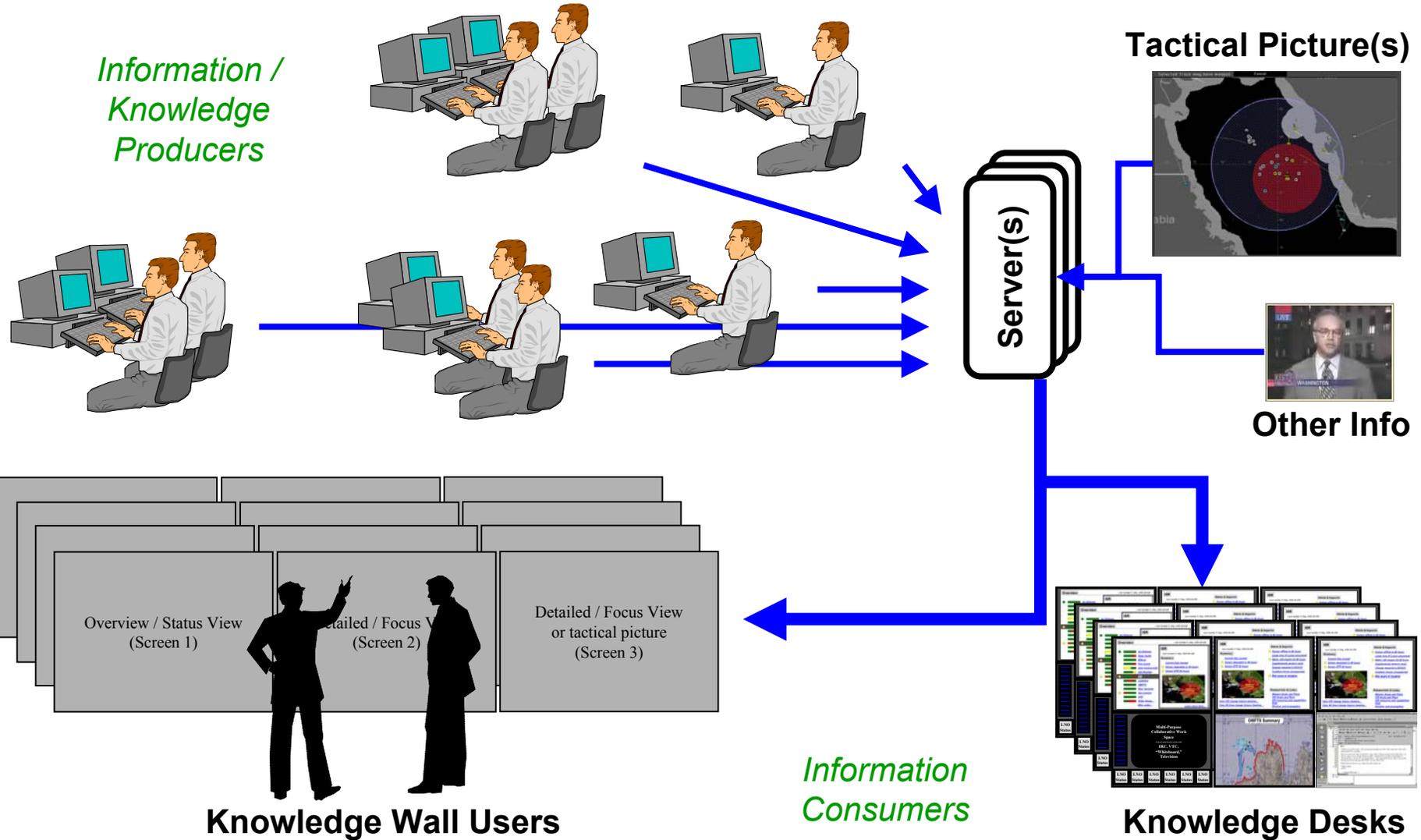
# Cognitive Tasks Analysis Results: *Content* Requirements Identified

- ◆ **Tactical data (multiple views if possible!)**
  - Map-based and highly graphical views / context
- ◆ **Mission Summaries and Commander's Intent**
- ◆ **Real-time info! (*or close to it*)**
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  - What isn't working according to plan?
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# Knowledge Web Concept



# What is a Knowledge Wall?

- ◆ **A large, easily configurable shared display of Knowledge Web content**
  - Knowledge Wall can also display:
    - » A Common Operational Picture
    - » Any number of other IT tools
- ◆ **A dynamic status board**
  - Provides near real-time status updates from functional areas / component commanders
- ◆ **A shared Situation Awareness tool**
- ◆ **Knowledge Desk is a smaller, single-user version – used for information consumption and/or production**



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# Knowledge Walls (K-Wall)

as installed at the Naval War College



***Global 2000  
Knowledge Wall***



***Global 2001  
Knowledge Wall***



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# Command 21 - Knowledge Wall

*integrated with CNAP Modernization Program video wall  
technology aboard USS Carl Vinson (CVN-70) May 2001*



**Video Wall**  
2x4 Matrix of Projector Cubes

**K-Wall**  
(K-Web Pages  
& IT-21 Apps)

**General Video**

**K-Desks (3)**  
2x3 Matrix of LCDs

**Rotating  
ASTABs**

**Tactical  
Picture**

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# Knowledge Web Demo and TacGraph Sample

**CJTF-level Knowledge Web used to  
support fictional Humanitarian  
Assistance / Disaster Relief  
Operation in the Philippines**

# Building and Maintaining a Knowledge Web

- ◆ **Warfighters shouldn't be Web Masters!!**
- ◆ **Tools have been developed to do the “web work”**
  - **Summary Maker** is a template-based tool to build Summary Pages
  - **TacGraph** facilitates development of map-based summary graphics with imbedded, web-accessible information
- ◆ **The *hardest part of information production remains unchanged* – figuring out how to create and present value-added information (i.e., *Knowledge*) that tells the right story**



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# Global 2000 Knowledge Wall

## *Preliminary Observations and Lessons Learned, and Emerging Results From Data Analysis*

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# The power of the wall

## ◆ Representative comments:

- **“Speed of Command was increased by the improved SA of the CJTF. The KW was a key factor in terms of improved Speed of Command.” (RADM Zelibor, CCG-3)**
- **With regard to turning data and information into *knowledge*: “When I walked around during game play, this (the KW) was the only place it was happening.” (RADM Slaght, SPAWAR)**
- **“With less than a week of use, the KW users were able to efficiently and effectively use the wall to fight the battle. This was not so with some of the other tools available.” (Capt Fitzpatrick, CCG-3)**
- **“The graphical summaries and bulletized links presented on the wall were better than a thousand words...” (when they were done right...) (Capt Fitzpatrick, CCG-3)**
- **“The wall was a great info dissemination device... A nexus for situation-relevant information...” (RADM Zelibor, CCG-3)**

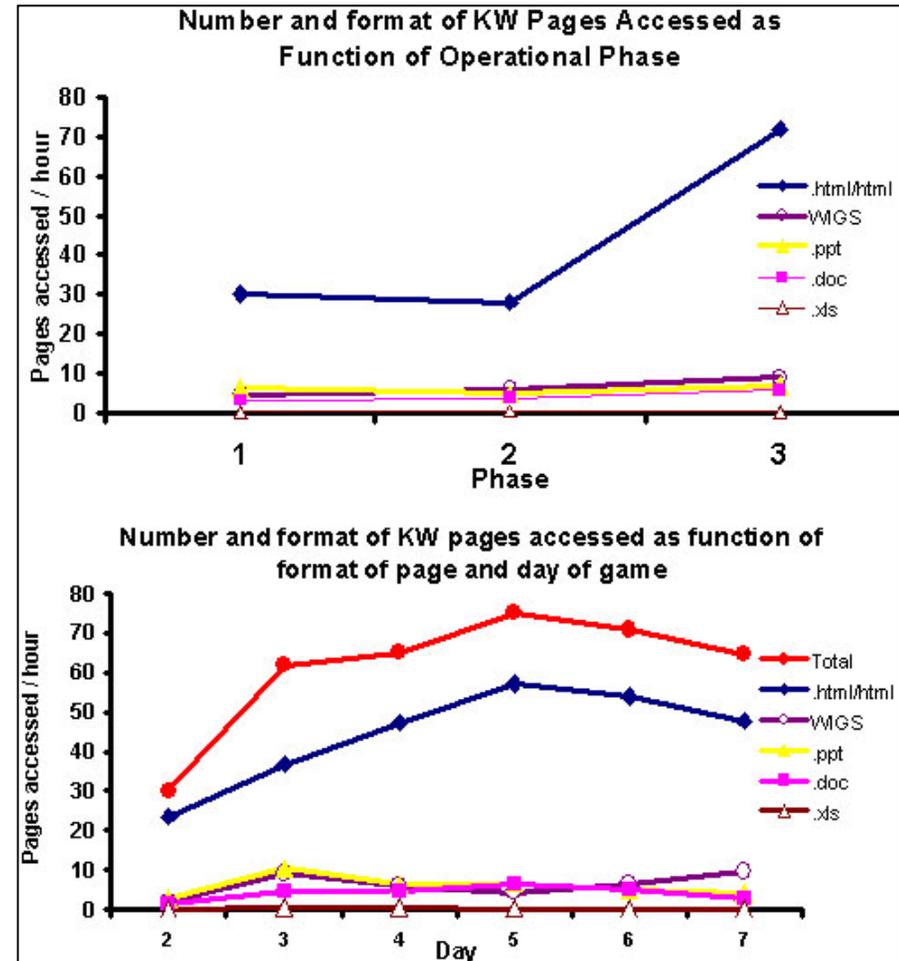
# Content is key!!

## ◆ Representative comments:

- “**Content** (and the people who create / provide it) makes the wall useful – without the right content, it (the KW) is nothing more than a bunch of monitors.”
- “Capt Fitzpatrick (BWC / KM), through his operational and tactical experience and his familiarity with the wall, brought up the *right information* at the *right time*. Without him, I wouldn’t have found the wall useful at all.”
- “Content is key, but with the potential for many users comes the need for tailoring the content to meet the needs of the users. Different users need different information – there is no single “right” answer (with regard to content and format).”
- “Information *must* be processed and fused for presentation on the wall. When this happened, the wall was very useful.”

# HTML Approach Seems to Work

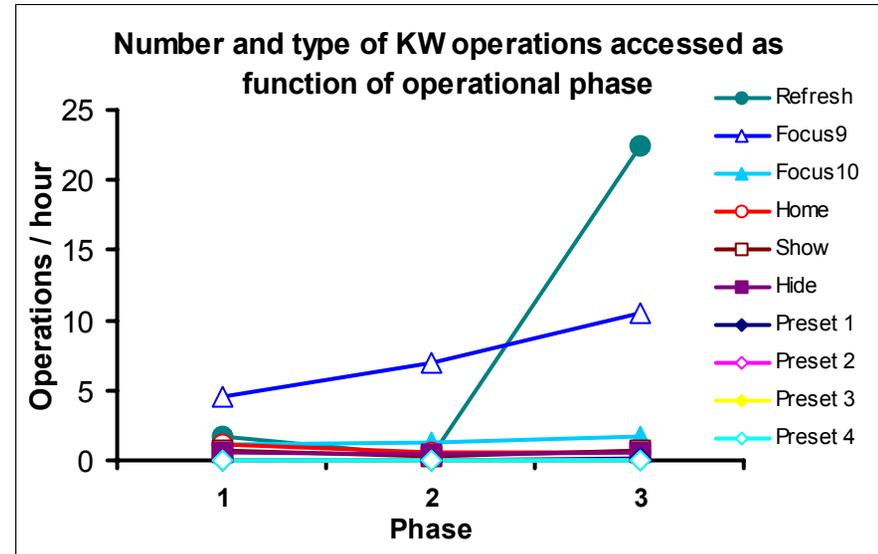
- ◆ HTML-based data was the most often accessed form of data
- ◆ Other data forms were easily available – though not the default view
- ◆ .doc and .xls views were least used
  - A number of factors probably contributed to this fact
    - » Text size
    - » Overwhelming quantity of information





# KW Use Varies By Operational Phase

- ◆ KW use during Phases II and III was significantly different than during Phase I
  - Moving Summary Pages to focus windows for viewing
  - Manual refresh of pages
    - » Need for most-recent information?
      - ◆ Implies that refresh rates may need to be adaptive...
- ◆ Presets rarely used...



# Global 2000 “gotchas”

## ◆ Representative comments:

- “From a CJTF perspective, the KW often allowed rapid and easy access to information in a format that met his needs.”  
**Counterpoint:** “The CINC, NCA, and some of the Functional Area Commanders did not like the wall – probably because its content and format did not meet their needs...”
- “Timeliness, validity, and source of the presented information is vitally important – yet there is currently no way to determine these things using the wall.”
- “KW Concept of Operations – because it de-personalizes the interaction between the CJTF and his staff – allows the information provider to push what he *has* vice what the CJTF *needs*.” - *Highlights importance of evolutionary processes.*
- “There isn’t enough room on the Summary Page for me to present what is necessary...” – *Need to re-design & optimize.*



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# Preliminary Analysis of K-Web Use Onboard USS Carl Vinson During Operation Enduring Freedom



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# USS Carl Vinson / CCG-3 K-Web Timeline



|                 |   |
|-----------------|---|
| <b>Aug 2000</b> | <b>CCG-3 participates in Global 2000 War Game</b>                                 |
| <b>Oct 2000</b> | <b>CCG-3 requests K-Web installation</b>  |
| <b>Apr 2001</b> | <b>K-Web tools approved for use aboard ship</b>                                   |
| <b>May 2001</b> | <b>K-Web / K-Desk installation onboard USS Carl Vinson</b>                        |
| <b>Jul 2001</b> | <b>USS Carl Vinson / CCG-3 deploys</b>  |
| <b>Sep 2001</b> | <b>Terrorist attack on World Trade Center / Operation Enduring Freedom begins</b> |
| <b>Jan 2002</b> | <b>USS Carl Vinson / CCG-3 returns from deployment</b>                            |



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# K-Web Content Production

## **Analysis of SumMaker data logs**

# Information Production Analysis Method

- ◆ **7 representative functional areas analyzed for this preliminary analysis**
  - CWC
  - Schedules
  - METOC
  - Force Protect
  - JAG - ROE
  - C3
  - Air Defense
- ◆ **Only “top-level” Summary Pages analyzed**
  - Vast amount of underlying content in K-Web not yet analyzed
- ◆ **All available data files from each of 7 areas analyzed to determine update rates and trends**
- ◆ **Representative sample of .kws data files analyzed to determine content provided**
  - 1 page from each area every 5 days

- ◆ **1328 Summary Page updates published between Sep 1<sup>st</sup> and Dec 16<sup>th</sup>**
  - Average of 12.5 K-Web Summary Page updates per day
    - » Underlying information (linked documents) updated separately – *some much more often, some less*
- ◆ **CWC and Air Defense were top producers**  
*(of analyzed functional areas)*
- ◆ **Average of 13 links provided per Summary Page**
- ◆ **Links / content provided from Summary Page**  
*(averages provide below – actual figures varied from area to area)*
  - HTML (68.7%) = other web page or web site
  - .JPG / graphic (11.4%) = pictures, imagery, drawings, etc.
  - .PPT (7.5%) = MS PowerPoint slide / presentation
  - .DOC / .TXT (7.2%) = MS Word- or text-based document
  - .XLS (3%) = MS Excel spreadsheet or chart
  - .ASP (.8%) = Active Server Page
  - .NSF (.8%) = Lotus Domino web page / database entry



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# K-Web Content Use

## **Analysis of K-Web server logs**

# K-Web Use Analysis Method

- ◆ **Period of K-Web use analyzed: Sep 29 – Nov 29, 2001**
- ◆ **Microsoft Internet Information Server (IIS) logs were collected from the CCG-3 K-Web server upon their return to CONUS.**
- ◆ ***Mach5 Analyzer* and *123LogAnalyzer* were used to conduct the analyses.**
  - **Analyses results compared and cross-checked with actual logs to verify / confirm results**
- ◆ **Misleading data, and data difficult to interpret were filtered from the results.**
  - **Relatively reliable, interpretable data presented in this brief.**

# K-Web Highlights

## K-Web Experienced Significant Use!

- ◆ **Access during analysis period:**
  - 2684 unique IP addresses\* accessed K-Web server during analysis period
  - 1322 visitors\* visited K-Web more than once
  - 1755 visitors\* bookmarked K-Web content for future access
- ◆ **Activity per day:**
  - Average of 482 visitors\* per day
    - » Ranged from 340 – 676 per day.
  - Info flow / data transfer
    - » Average data transferred per day (444.45 MB)
    - » Vast majority of data transfers took place “in-house” (over ship’s internal network)
      - ◆ Graphics / photos / imagery
      - ◆ Multi-media / movie files
    - » No discernable impact upon the network was reported by users in spite of the large amount of data transferred

\* See speaker notes for important information on the terms “IP Address,” “user,” and “visitor.”

# K-Web Users

- ◆ **Most K-Web users internal to USS Carl Vinson and CCG-3**
- ◆ **Many other Commands accessed / viewed / provided links to the K-Web**

*(based on unique Domain names / IP addresses accessing K-Web)*

- Carl Vinson BG
- 5<sup>th</sup> Fleet
- 7<sup>th</sup> Fleet
- Various METOC commands
- CENTCOM
- Collaboration at Sea systems
- CINCPACFLT
- Peleliu ARG
- Theodore Roosevelt BG
- SOCOM
- NAVCENT
- USS Blue Ridge
- Various Pentagon offices / users, multi-service
- Enterprise BG
- Essex ARG
- DIA
- PACOM
- II MEF
- 15 MEU
- Various Air Force Commands
- *Numerous Commands listed by IP address only...*

# Most “Popular” Info on K-Web

*(Each listed in decreasing order of access / preference)*

## ◆ Most viewed pages

*(.htm pages in K-Web)*

- Intel
- Overview
- Air Ops
- Intel Sitrep
- ROE-JAG
- CWC
- Strike
- Info Warfare
- Maritime Ops
- CollectX (Intel)
- BG Logistics

## ◆ Most downloaded files

- Airplan.pdf
- RAINBOW.xls
- HOTSHEET FRONT.ppt
- 2airplan.pdf
- Asset Allocation Plan.xls
- HEC Intentions.doc
- Ato.doc
- Current.ppt
- Air Ops Summary.xls
- Dim.txt
- Offdeck.pdf

# Important Caveats Regarding Web Server Analysis

- ◆ **Data collection was incomplete (not all data available)**
  - K-Web server logs cover significant period – but not entire deployment
- ◆ **Web site analysis is as much “art” as “science”**
  - Numerous technical issues impact data collected
  - Seemingly “hard” numbers can be misleading
  - Interpretation of data is extremely difficult
- ◆ **Web server logs simply log *server* activity**
  - Intent of users, and use of data can not be known
- ◆ **Differentiation between automated visits and real persons can be difficult / impossible**
  - Some web access is the result of actual human direction
  - Much web access is the result of automated browser activity, search engine spiders, replication agents, etc. *(we attempted to filter this type of access out of the results, however...)*
- ◆ **Much data not reported here**
  - Much of the data was judged meaningless, likely misleading, or too difficult to interpret

# K-Web Concept Gotchas...

- 
- ◆ **Business Rules (and adherence to them) make or break the Knowledge Web concept!**
  - ◆ **Cross-echelon and cross-function linking and use is an important aspect of the Knowledge Web concept.**
    - But, this has important implications for future design and use.
  - ◆ **Each user group has different needs; this implies that Knowledge Web access tools and overall concept must be significantly scalable**
    - Other multi-user wall designs
    - Single-user desk designs
    - Tools / templates tailored to specific tasks

# Important K-Web Principles

## ◆ Flexibility

- K-Web must be easily and rapidly adaptable to warfighters' changing needs
  - » Form
  - » Content
  - » Web / knowledge structure

## ◆ Ease of Use

- Intuitive and easy-to-use
  - » Information production
  - » Information consumption
    - ◆ Limit required user interaction to the extent possible

## ◆ Economy of Effort

- Leverage off of information tools and products *already being used / produced*
  - » Outlook / Exchange, Word, Excel, PowerPoint, Access, various graphics, multimedia, others' web sites / content, etc.
  - » Limit production of specialty products
- Require little or no maintenance by IT personnel

# Important K-Web Principles (2)



- ◆ **Adopt concept of economical “pull” vice blind “push”**
  - Use “Smart Push” as supplement
- ◆ **Limited Training Requirement**
  - Familiarity with MS Windows and Office applications assumed
  - Specialized “web master” knowledge not required
  - Training materials and QRGs available and easy-to-use
- ◆ **Focus on *Concept* vice *Technology***
  - K-Web concept not tied to specific tools or technologies
  - K-Web concept should remain viable long after specific tools / technologies become obsolete

- ◆ **Focus on *continuous Shared SA for Decision Support***
  - Continuous posting as situation evolves
  - All users maintain broad situation awareness
  - Producers provide value-added analysis of their domain to help others understand current status and its implications
  - Consumers further fuse/integrate info across domains
  - Result: Problem-oriented organization of knowledge
- ◆ **Key is *Process***
  - Guided by business rules
  - Tailored to particular user and missions
  - Easily adaptable by users as needs change
  - Simple organization of information-minimize levels
  - Detail available through drill-down
  - Use of links to minimize redundant production

# The K-Web Challenge...

- ◆ **Removing the need for traditional 8-hour briefs *by providing continuous information access* implies an *enormous increase in speed of command*. (4X improvement? 6X? More?)**
  - **How do we take better advantage of this improvement in Speed of Command?**
  - **What implications does this have to the existing ConOps? (policies, procedures, business rules)**
    - » **What do we gain?**
    - » **What do we lose?**
  - **How do we achieve the necessary integration with existing tools and infrastructures?**

# The K-Web Future...

- 
- ◆ **Command 21 program will continue to refine and improve tools to help the warfighter**
  - ◆ **Significant ONR transition funds committed to rapidly deploying tools and concepts to the fleet**
  - ◆ **Research will continue focusing on complex Knowledge Management issues**
    - **Naval War College**
    - **SPAWAR Systems Center - San Diego**
    - **I-MEF, TTGP, PMW-157**
    - **And others...**

# Questions/comments?



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