SWANS Conference

The Army's Road to the Semantic Web

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Contextual Knowledge is the Force Multiplier

Contextual Knowledge

Warfighting Effectiveness = $f(D + O + M) \times (S \times L)^{T \times E1 \times E2}$

D: Doctrine
O: Organization
M: Materiel

S: Soldiers
L: Leaders
T: Training
E1: Education
E2: Experience

The Semantic Web will make Contextual Knowledge abundantly available … when?

Army Knowledge Management Capabilities

Obtaining & Disseminating

"Self-Scored"

Excellent

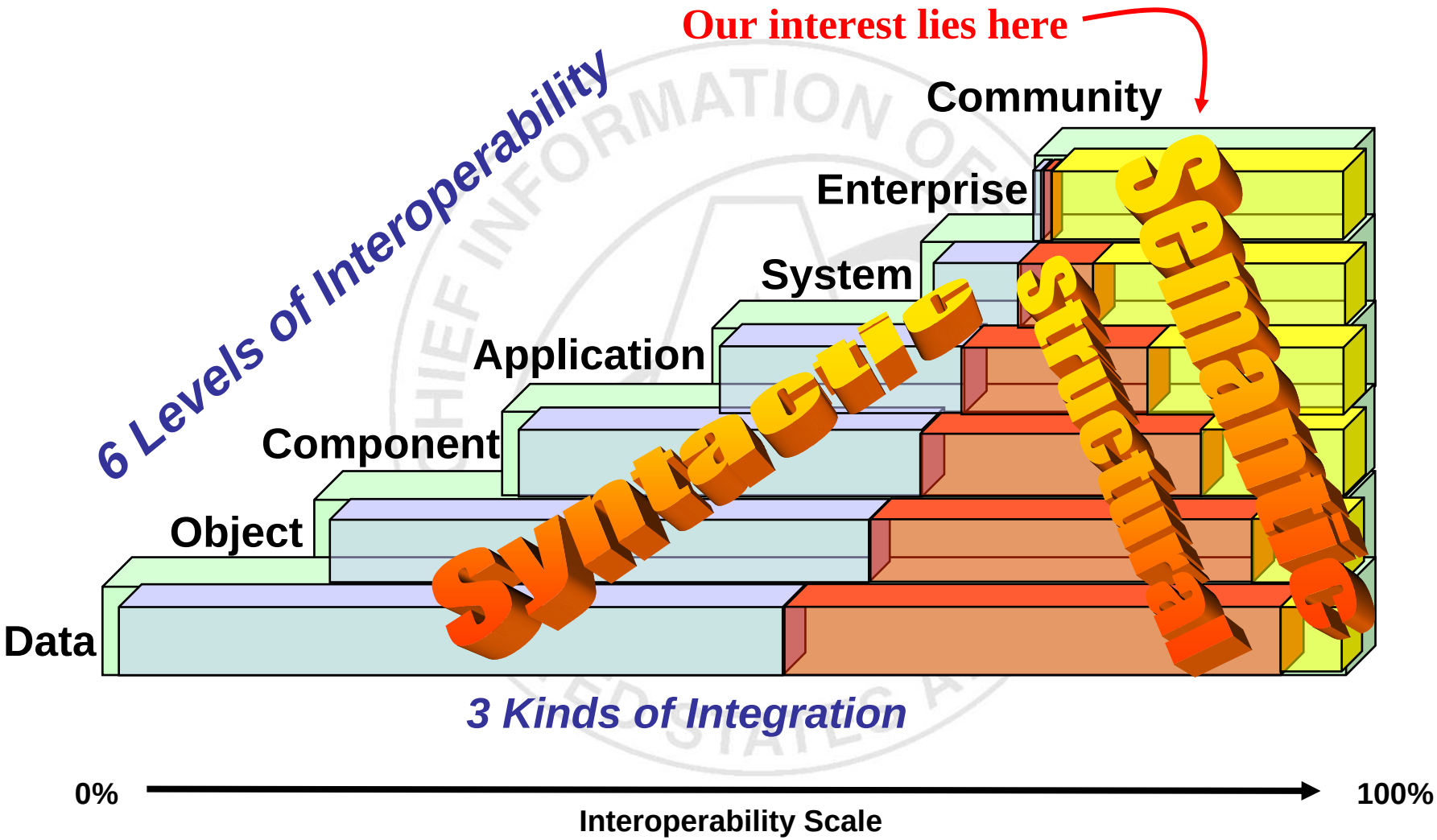
Excellent

Above Average

Average +

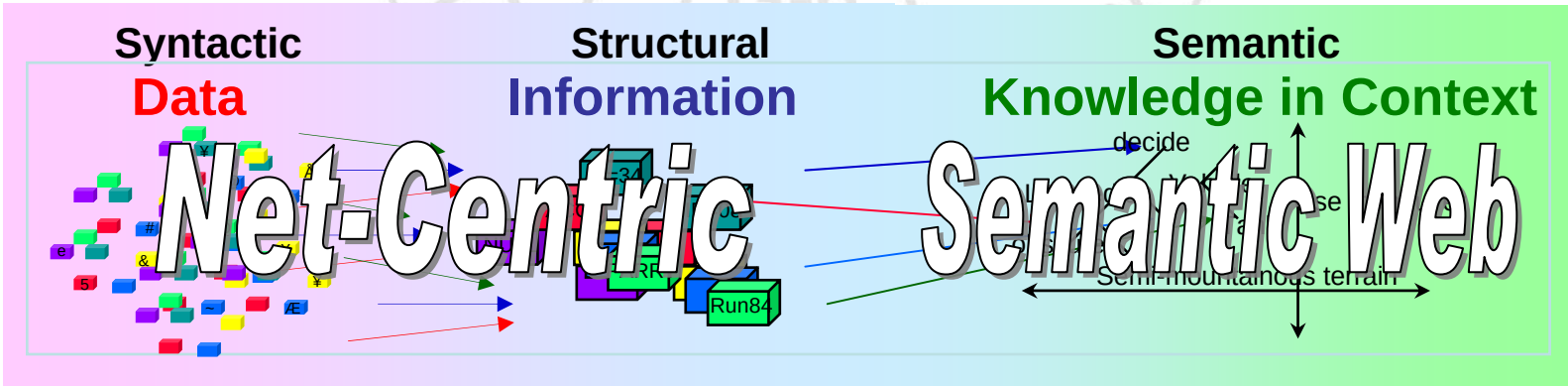
Information and knowledge in context

Dimensions of Interoperability & Integration



The Net-Centric Vision

- Power to the Edge: use information superiority as a combat multiplier
  - Move from producer-centric (TPED) to consumer-centric (TPPU) focus on products and services
- Speed of Command: lightning fast access to information
  - Move from stovepipes (tightly coupled systems) to adaptive, networked information and services (loosely coupled systems)
- Self-Synchronization: contextually relevant information flows to the correct locations as needed
  - Warfighter gets the right information at the right time as quickly as possible: intelligence, situation awareness, collaboration, logistics



Where we are Today…

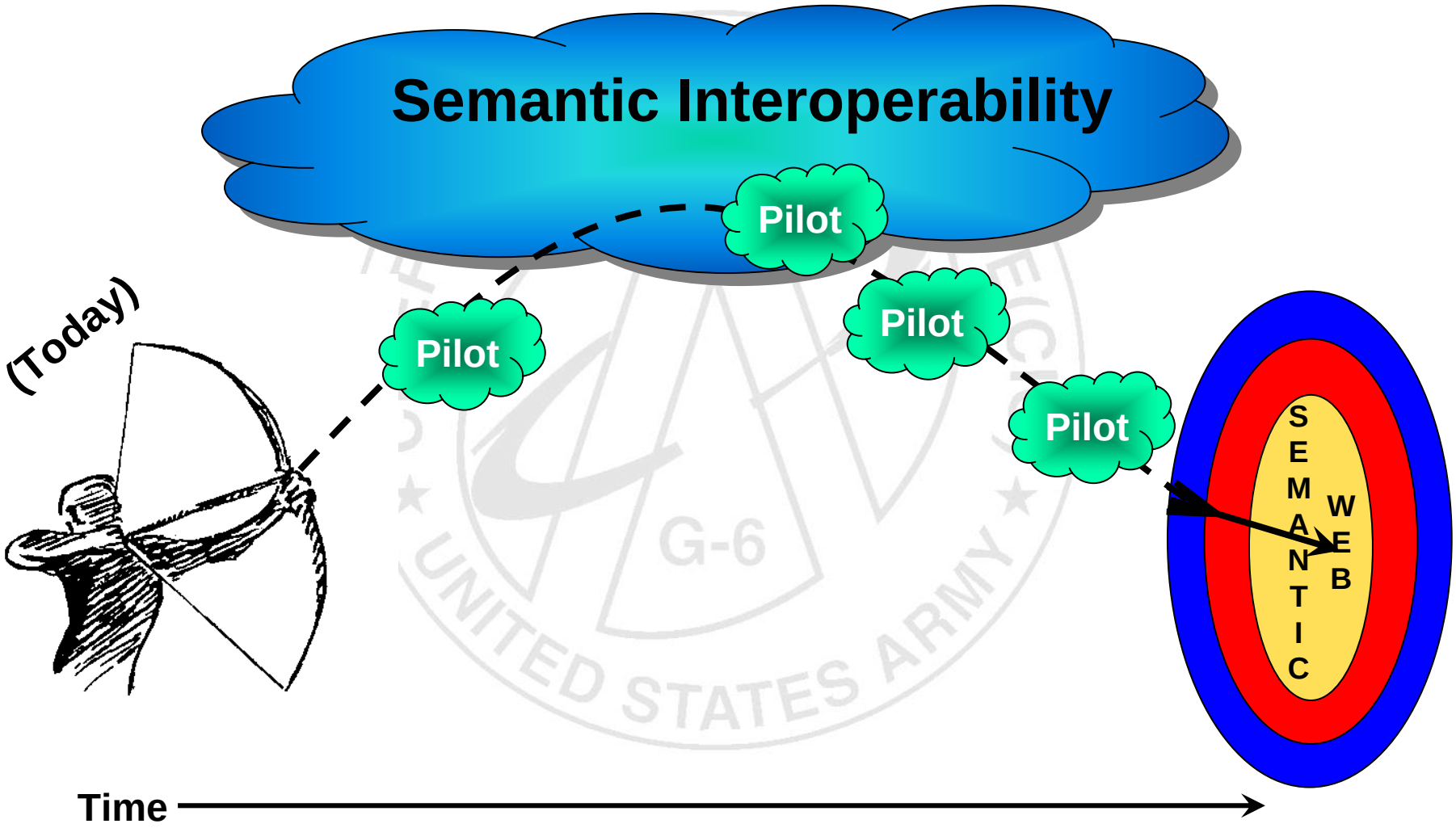
Semantic Interoperability – We Need it Now!

- Between Systems/Programs
- Within mission threads (functional areas)
- In joint & coalition environments & adaptability

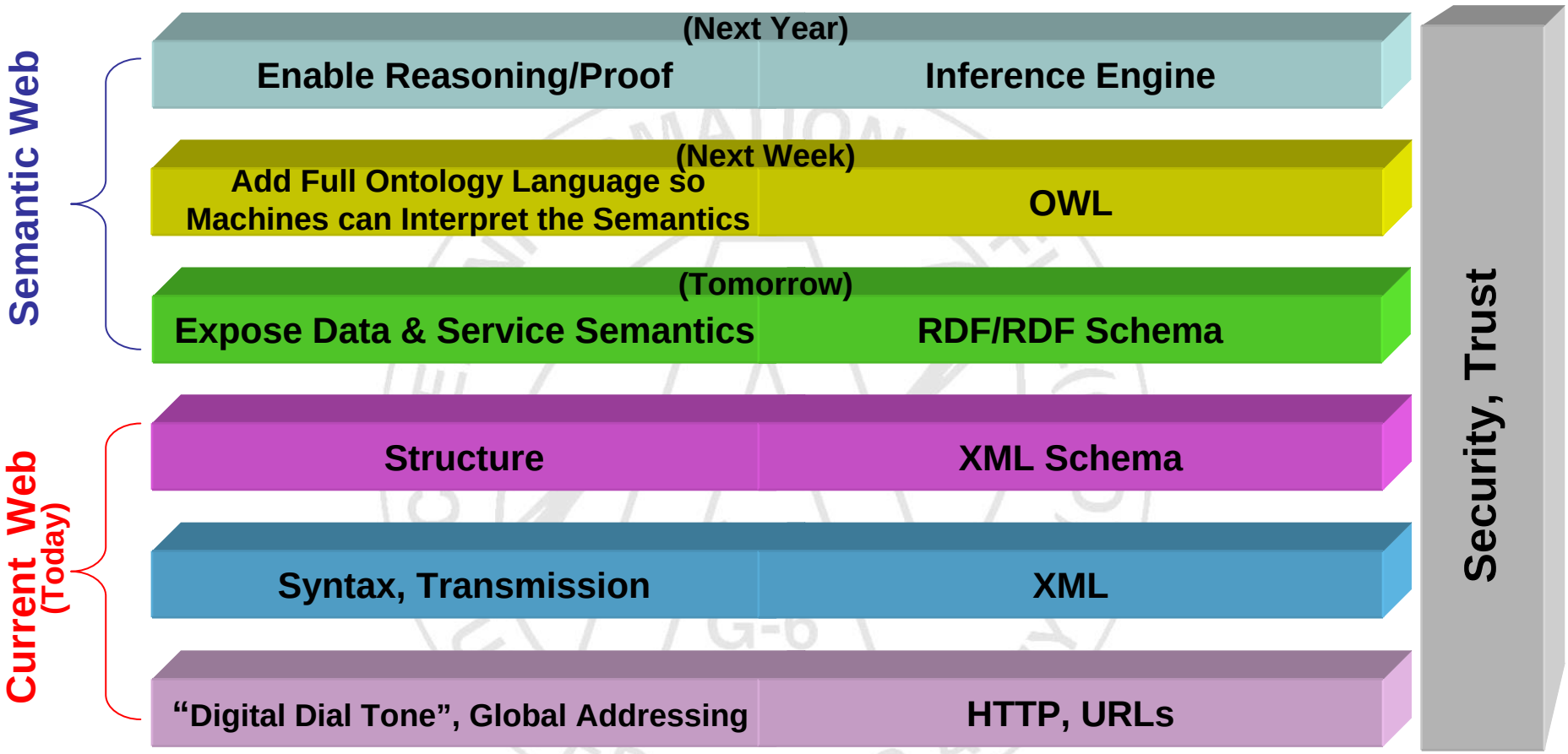
- Leader Development
- Doctrine
- TTPs

- Decision Superiority
- Out-think the enemy

Semantic Web Trajectory



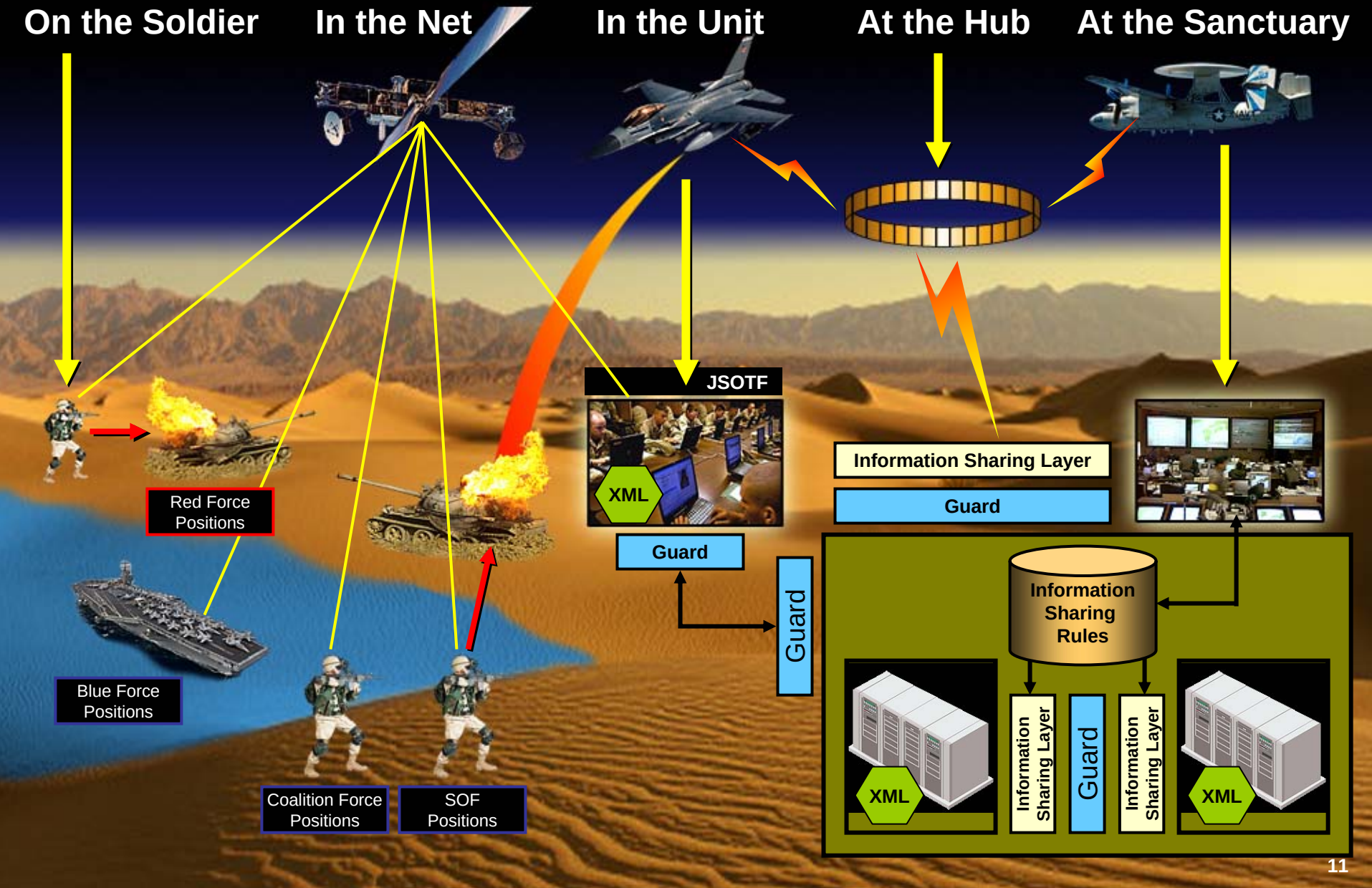
Path to the Semantic Web



- Anyone, anywhere can add to an evolving, decentralized "global database"
- Explicit semantics enable looser coupling, flexible composition of services & data.

Engineering Challenge → Where will the Services and Shared Information Reside?

On the Soldier | In the Net | In the Unit | At the Hub | At the Sanctuary



Governance - Organizational

Draft Army Alignment with GIG ES Governance

Business Mission Area (BMA)
DoD Lead: USD(C) | Army Lead: USA

Governance

- **Acquisition** — Owner: USD(AT&L) | Army Lead: ASA(ALT)
- **Financial Management** — Owner: USD(C) | Army Lead: ASA(FM&C)
- **Human Resource Management** — Owner: USD(P&R) | Army Lead: ASA(MR&A)
- **Logistics** — Owner: USD(L&MR) | Army Lead: ASA(ALT)
- **Installations & Environment** — Owner: USD(AT&L) | Army Lead: ACSIM
- **Civil Works** — Army Owner: ASA(CW)

Warfighting Mission Area (WMA)
DoD Lead: CJCS | Army Lead: VCSA

Governance

- **Battlespace Awareness** — Owner: V. Dir Intel, J-2, JS | Army Lead: G-2
- **Force Application** — Owner: Dep. Dir JWCS, JS | Army Lead: G-8
- **Protection** — Owner: Dep. Dir FP, J-4, JS | Army Lead: G-8
- **Focused Logistics** — Owner: V. Dir. Log., J-4, JS | Army Lead: G-4
- **Battlespace Communications** — Owner: V. Dir. C4, J-6, JS | Army Lead: G-6

Information Assurance
Domain
Owner: Director, Information Assurance | Army Lead: CIO/G-6

- **Communications** — Owner: D, Wireless | Army Lead: CIO/G-6
- **Computing Infrastructure** — Owner: D, Architecture & Interoperability | Army Lead: CIO/G-6
- **Core Enterprise Services** — Owner: D, Information Management | Army Lead: CIO/G-6

Governance

Enterprise Information Environment Mission Area (EIEMA)
DoD Lead: DoD CIO/ASD(NII) | Army Lead: CIO/G-6

National Intelligence Mission Area
DoD Lead: USD(I) | Army Lead: G-2

Governance

In Work

In Work

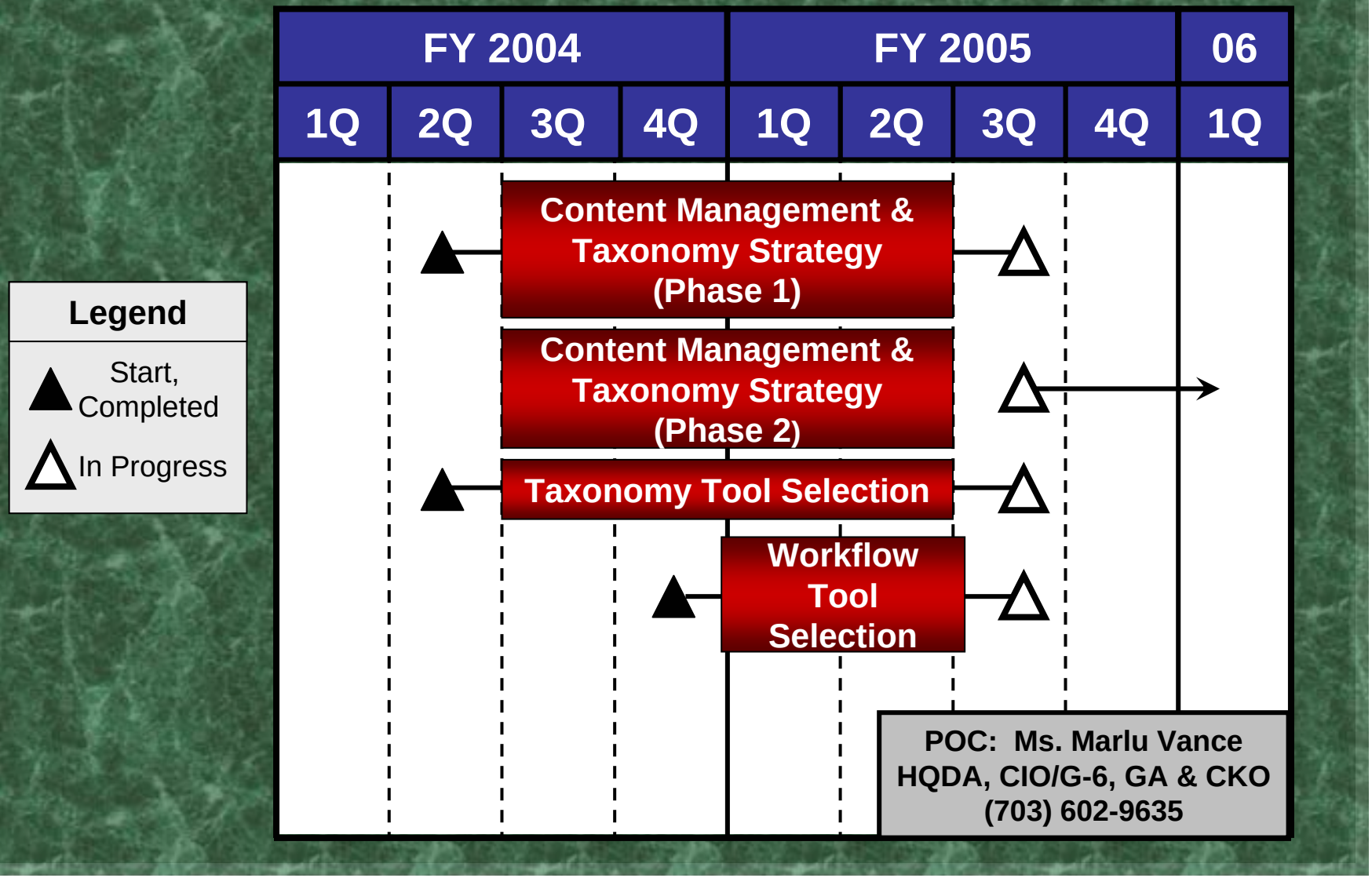
Governance

National Intelligence Technical Infrastructure Mission Area (NITMA)
Owner: ICSIS | Army Lead: In Work

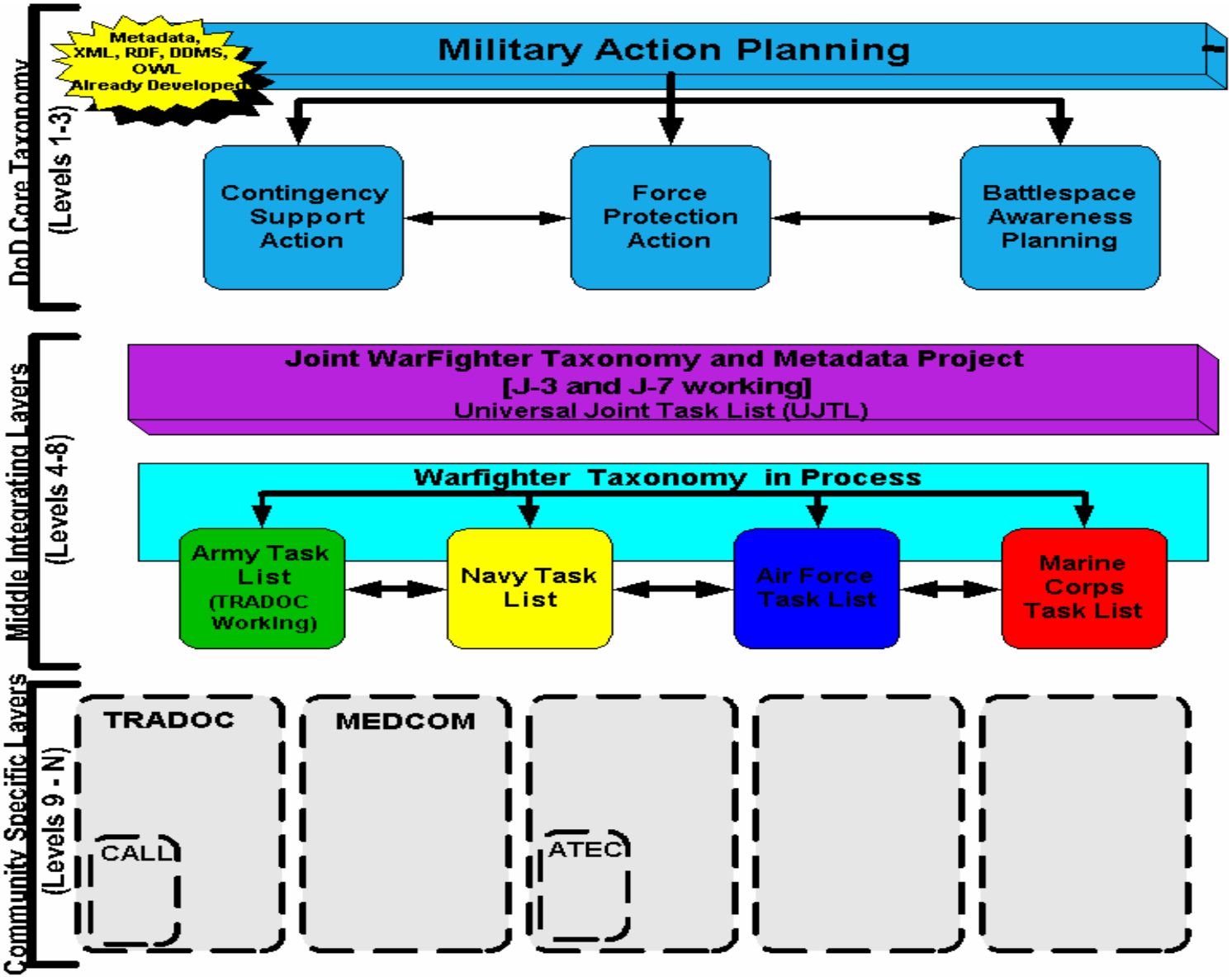
Governance – Portfolio Management

The Corporate decision-making body for the Army

Governance - Ontologies

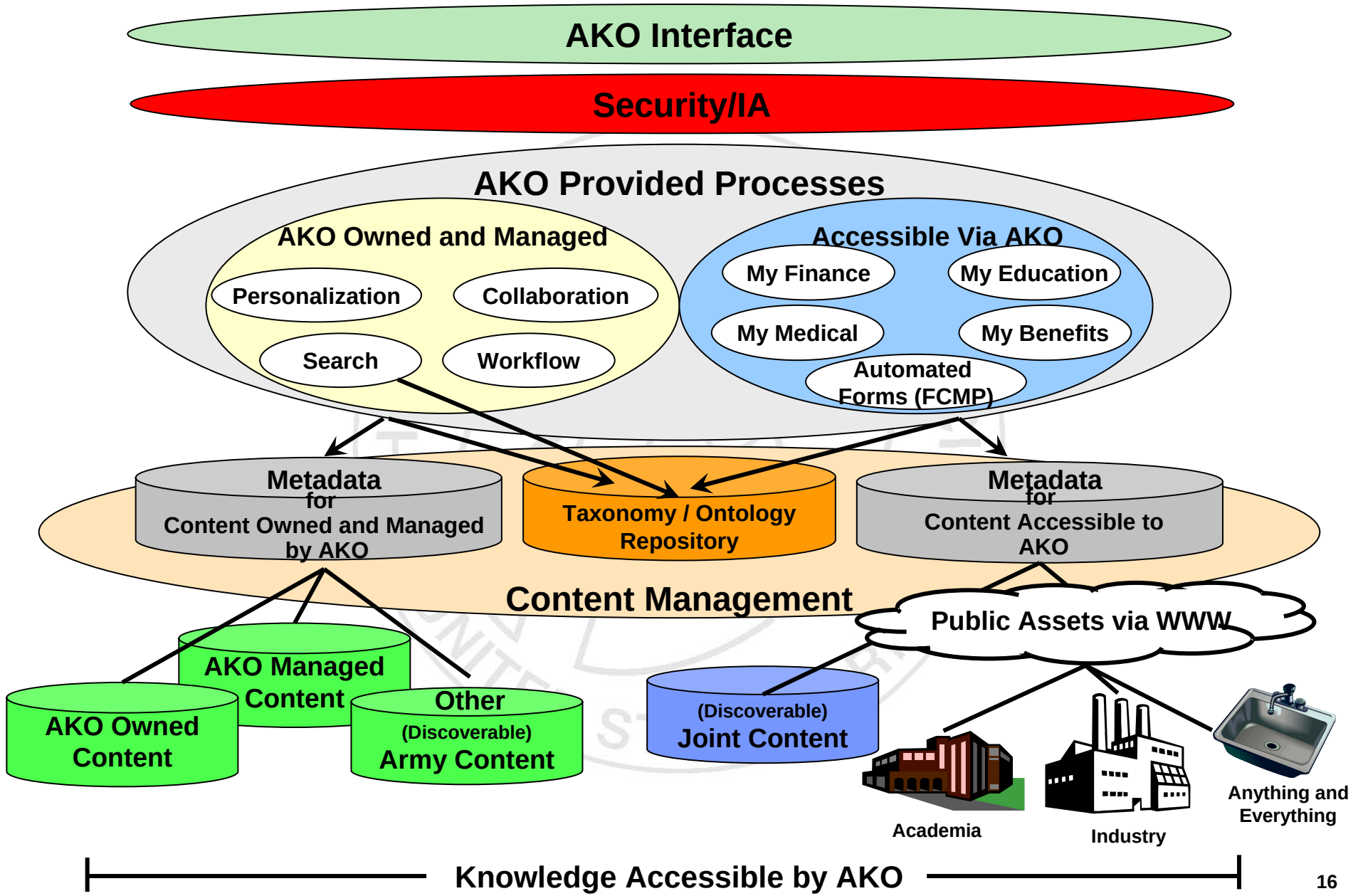


A Notional View of Army's Use of Taxonomies/Ontologies



Or The Army Risks Developing a Fragmented Taxonomy with No Value to the Warfighter

The Use of Taxonomies, Ontologies, and Semantic Web Technologies for AKO

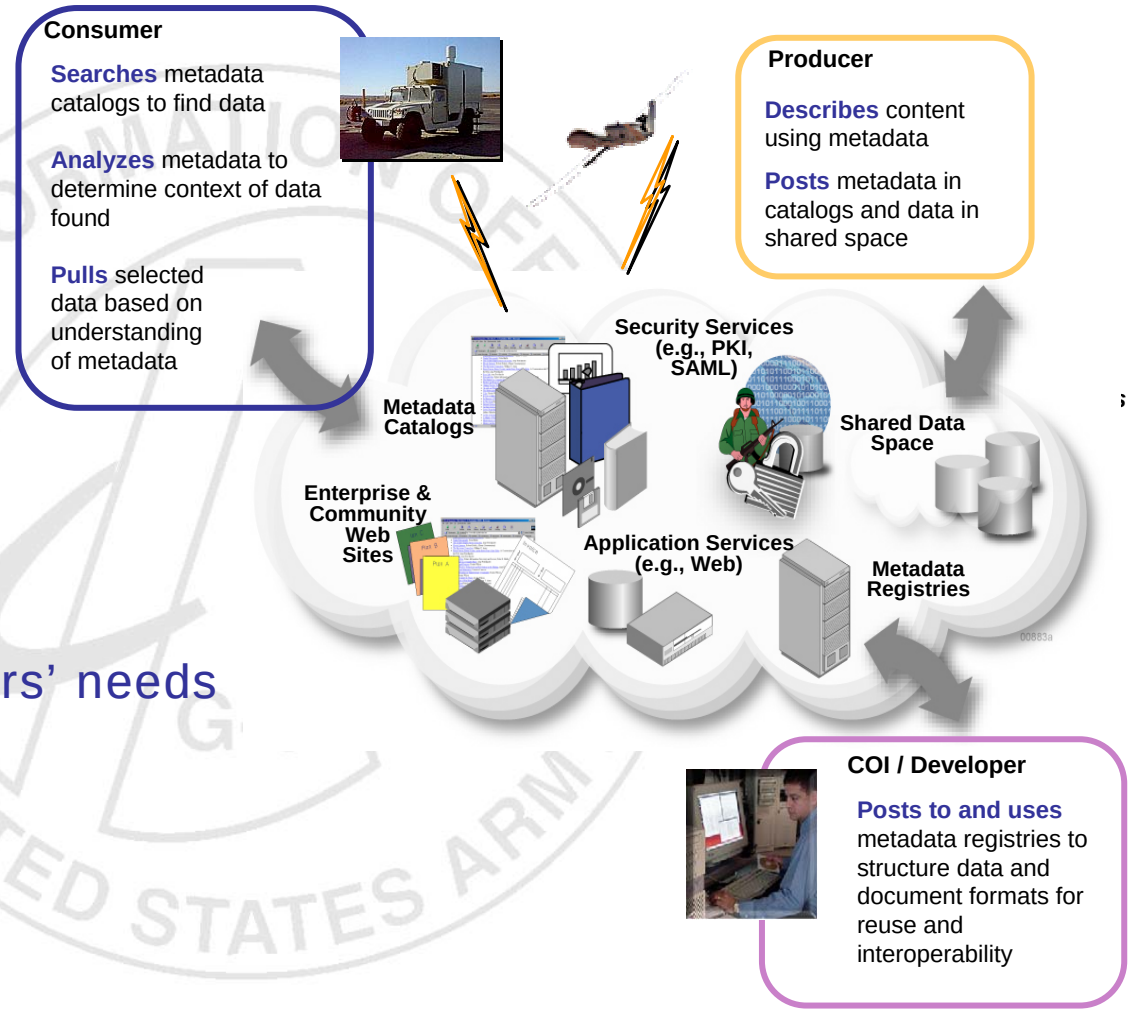


Governance – Data Standards

DoD Net-Centric

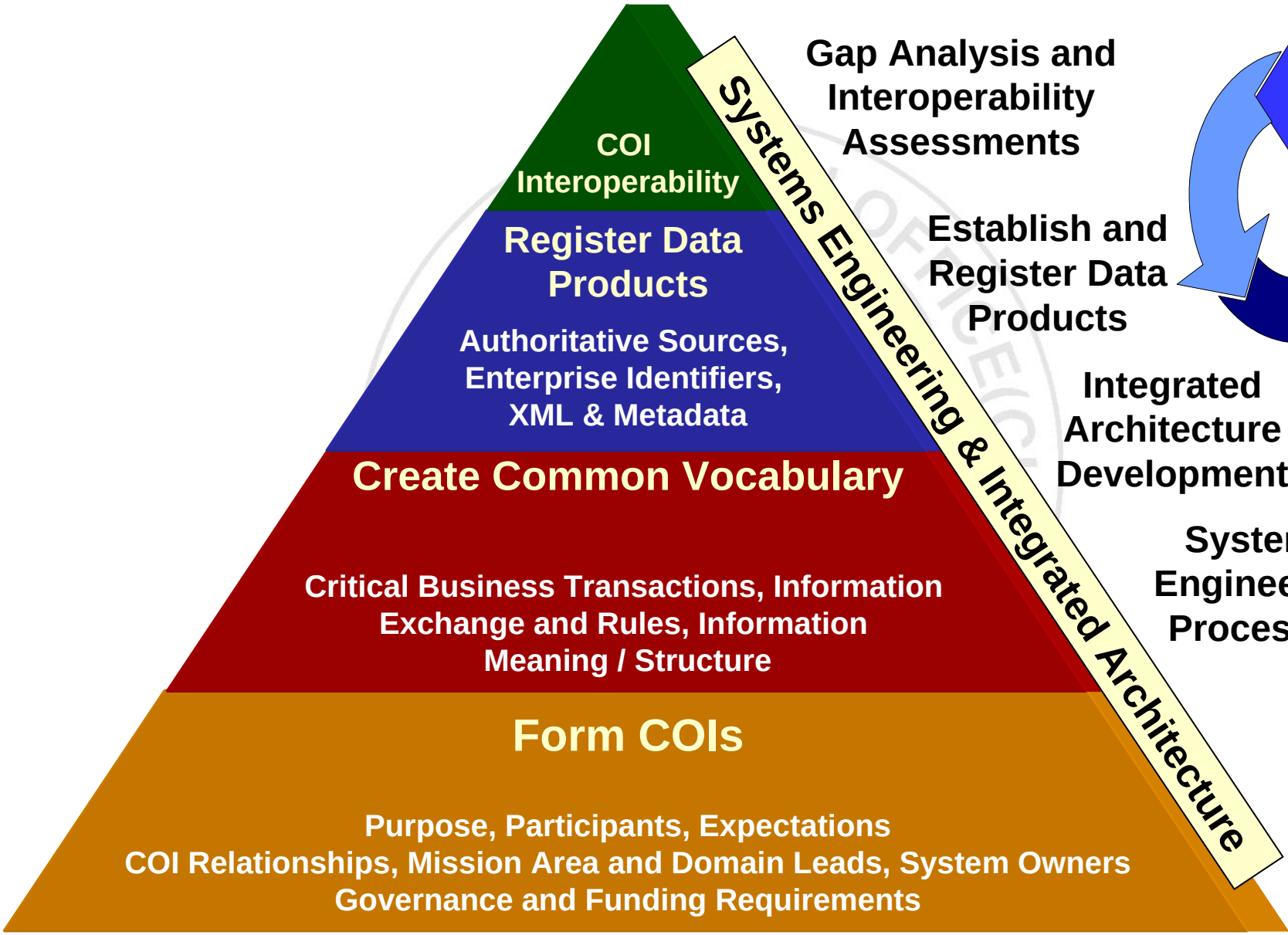
Data Goals:

- Ensure data is:
  - Visible
  - Available
  - Understandable
  - Trusted
  - Interoperable
  - Responsive to users' needs
- Institutionalize Data Management



Strategy enabled by COIs, metadata, registries, catalogs and shared data spaces

Governance – Data Standards



Tools & Technology

- GIG BE – Ubiquitous, universal access to semantic web
- NCES – Foundational layer of semantic web services
- AKO – User population identified and maintained; provides services
- BCKS – Provides human interaction for semantic knowledge now

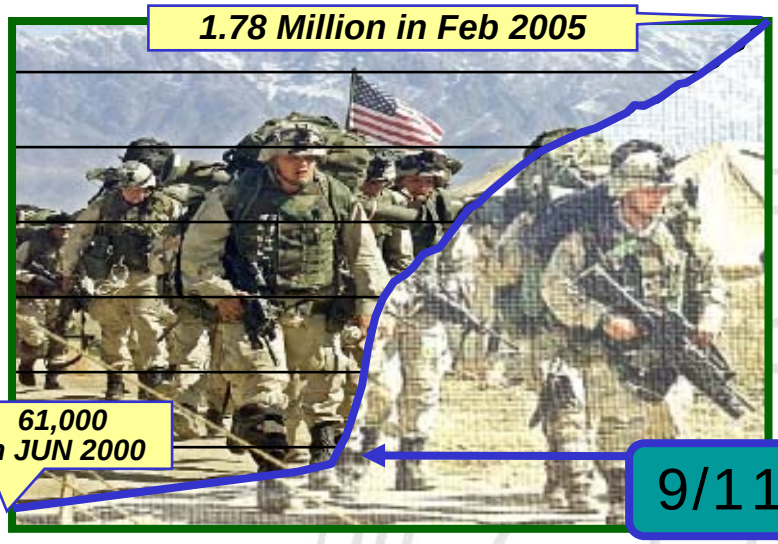
DISN (GIG-BE) 2004 - 2007

NCES – Foundational Layer of Semantic Web Services

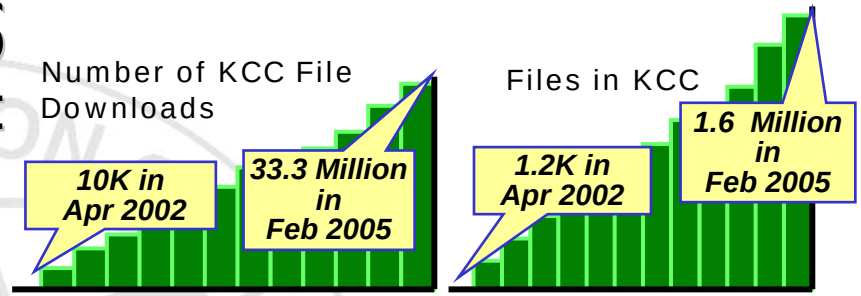
- Computer Interpret AKO Services
- Agent Ready
- User Constraints Preference

- Web services modeling framework
- Semantics Driven Web Services Discovery
- Semantics Driven Descriptions of Data and Business Logic
- Active Software Agent Information Exchange

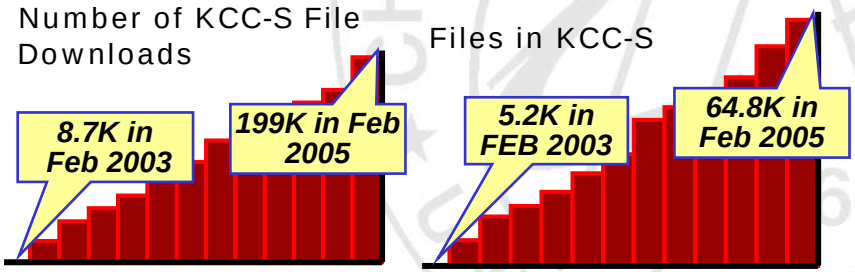
Leveraging AKO for an Army At War

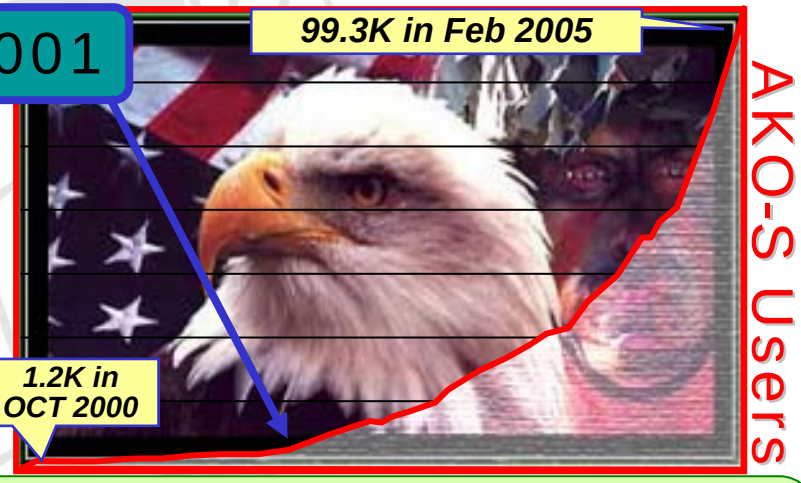


AKO Usage & Content Growth



AKO-S Usage & Content Growth





- ★ Over *13.8 Million* ***Instant Messages*** sent in February
- ★ Many ***Collaboration Sites for GWOT*** – Arab Translators, USAR, NG, CID, FRG's, etc.

Supporting Our Army at War – Relevant and Ready !

Machines can't yet put knowledge into context…

…Not there yet, so…

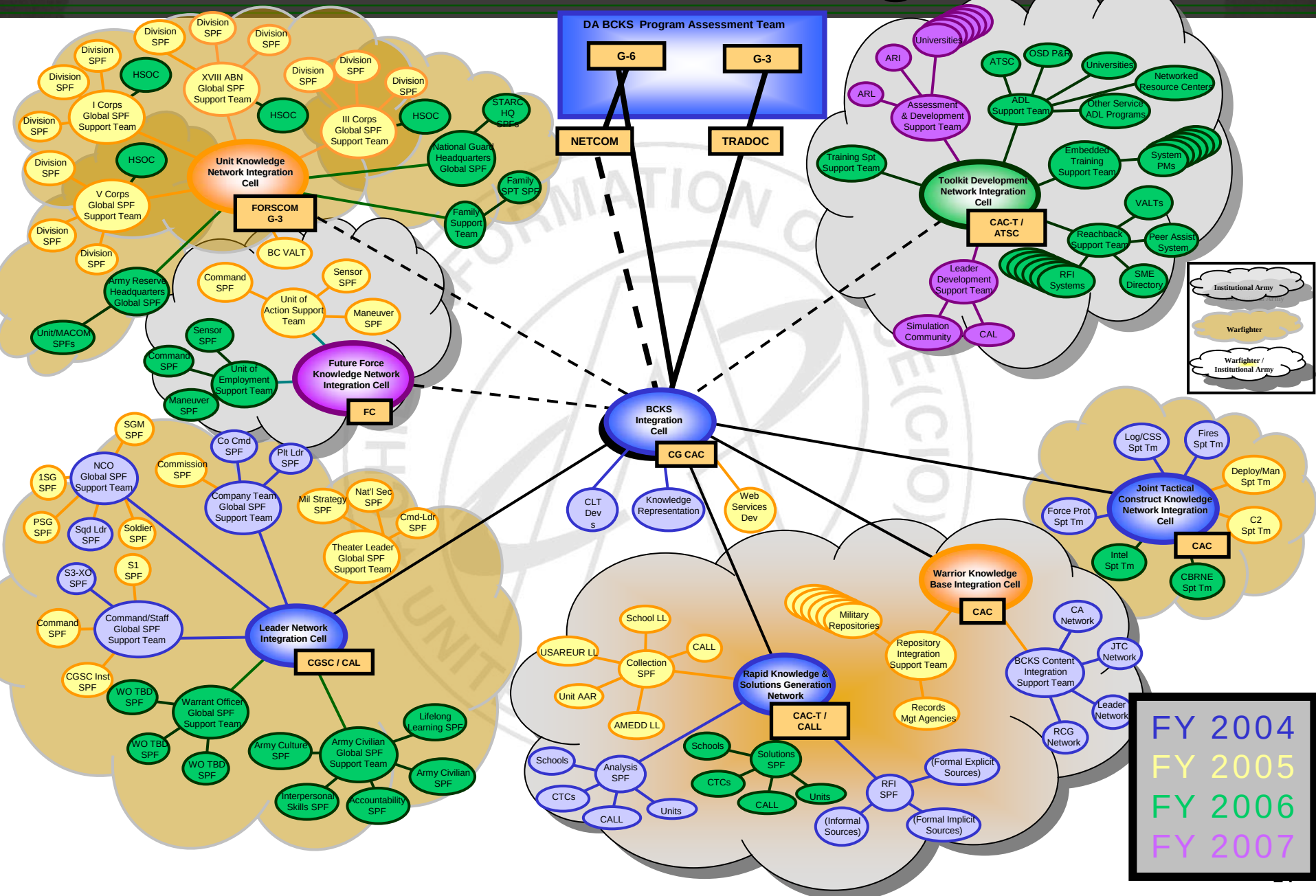
SPFs

CoIs

Knowledge, today, is put into context through human discussions.

CoPs

Battle Command Knowledge System



BCKS Integration with NCES

DoD Metadata Registry

NCES Services
- Discovery
- Security
- Storage
- Collaboration
- Messaging
- Global Access

Adaptive Leaders

STAMIS and System-of-Record Update Data Feeds

XML and OWL are the Common Language

Training

CSA & SecArmy recognized the need for Semantic Interoperability and Knowledge Transfer in GWOT

- Revalidated AKM Strategy as part of Army Transformation
- Solidified AKO as an enduring piece of Army Transformation
- Sending more soldiers to cultural training (Incentives)
- Sending more soldiers to language training (Incentives)
- Created CKO position and funded BCKS

Situation Assessment

TECHNICAL MATURITY

Semantic Web technology is emerging	There are many new tools, but most mainstream development, database, and middleware tools do not build or exploit ontologies now
Army will not be on bleeding edge	However, it is time for substantial pilots and evaluations

ARMY WILL TAKE A MEASURED APPROACH

The Army Roadmap to the Semantic Web

Develop ontologies for the Semantic Web

- As part of COI efforts to define what information should be shared, take the opportunity to generate semantic information (metadata, description, etc) for use in generating ontologies

Develop new Semantic Web-based databases, systems

- Extend SOAs to include semantics (meaning)
- For databases and systems:
  - Capture their semantics in RDF/S & OWL immediately as a semantic conceptual model, then generate logical, physical models

Enable legacy databases, systems to be Semantic Web-based

- Do the database, systems have models (Entity-Relation, Object-Oriented)?
  - If so, make these models into ontologies using RDF/S, OWL
  - If not, analyze these & create ontologies for them
- Focus on unbundling & exposing specific high-value services and data

Bottom Line

- The Army has a methodical approach and roadmap to the Semantic Web
- Foundation is being laid

- The Army will be implementing pilots and semantic interoperability en route to the Semantic Web

Questions ?

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