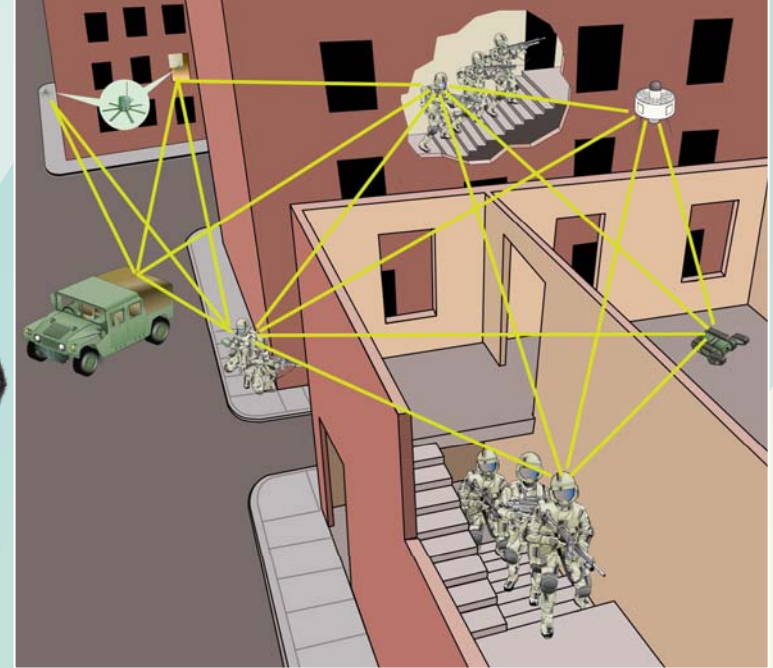


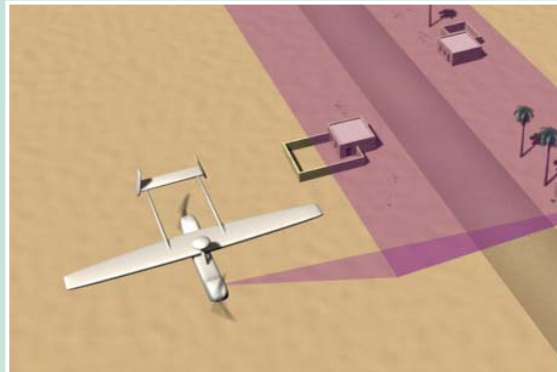


U.S. Army Research Laboratory

Actionable Intelligence for the Warfighter



Presented to:
Netted Sensors Workshop
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Focus Area: Actionable Intelligence

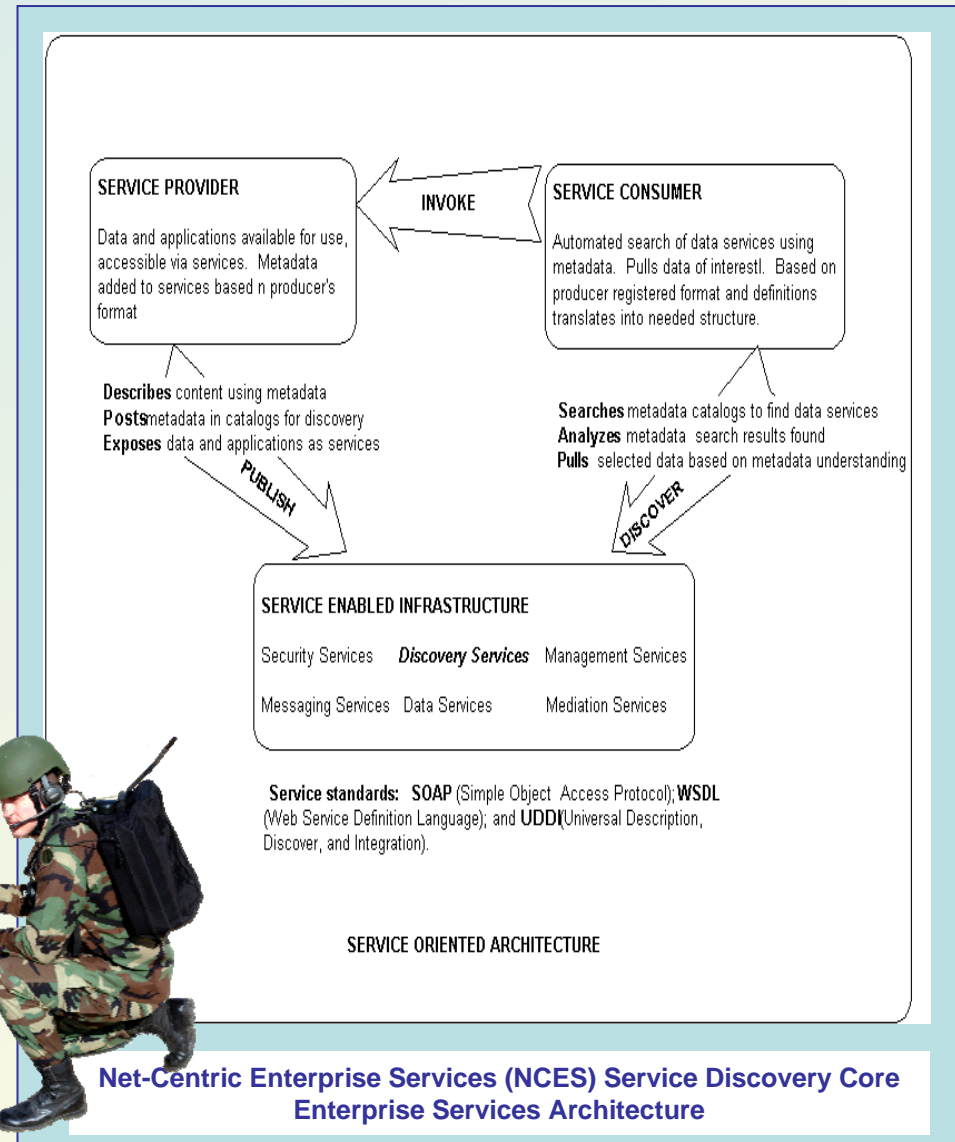
Initial CSA Guidance:

Create an intelligence framework that is focused on reducing data to understanding to actionable intelligence and an operations/intelligence culture that supports **elimination of artificial walls between operations and intelligence.**

Actionable Intelligence provides Commanders and Soldiers a high level of ***shared situational understanding, delivered with the speed, accuracy, and timeliness necessary to operate*** at their highest potential and conduct successful operations.

Service Oriented Architectures: Distributing Actionable Intelligence to the Soldier

- Web-like (distributed, networked) infrastructure supporting providers and consumers in sharing software capabilities (services)
 - Decentralized
 - Language and platform independent
 - Standards based (SOAP, WSDL, etc.)
 - Ontology extended (OWL-S)
 - Automated discovery via publish and subscribe
- Vision: extend system functionality and speed
- Holy Grail: automated composition of services



*Every Soldier a Sensor
Every Sensor a Node on the Net*



Actionable Intelligence: Power to the Warrior at the Edge

Local/Global Tactical Overwatch



Autonomous Assets

Problems:

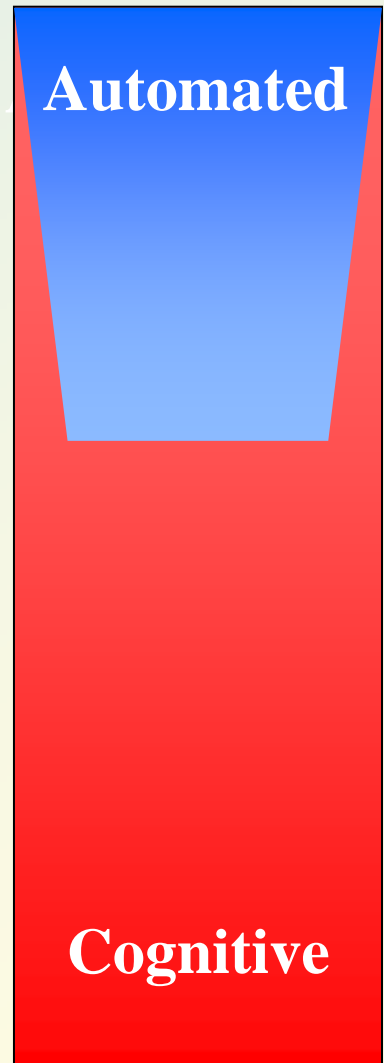
- Increased sensors
- Limited bandwidth
- **Communication can target the Soldier**
- Dynamic enemy
- **Soldier focus on the battle, not information processing**
- **Soldier not cleared to access the net**



Background: Levels of Fusion

(per TRADOC PAM 525-3-90, 22 Jul 2002, ref: Walsh)

- **Organize** use of discrete pieces of data
- **Identify** what is physically out there
- **Correlate** like information
- **Resolve** information conflicts
- **Aggregate** discrete entities into larger objects
- **Determine** how entities are working together
- **Interpret** events and actions
- **Determine** what the entities are doing
- **Hypothesize** what the enemy will do next
- **Consider** how your plans will be affected
- **Assess** how to improve information fidelity

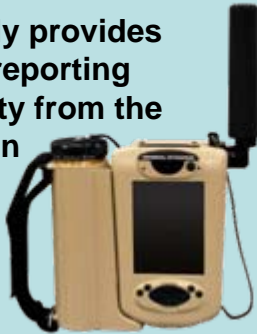


State-of-the-Art



Best global knowledge
Worst local knowledge

ES2
Every Soldier is a Sensor
Currently provides limited reporting capability from the soldier in the field



XXXX



XXX



XX



X



Best local knowledge
Worst global knowledge

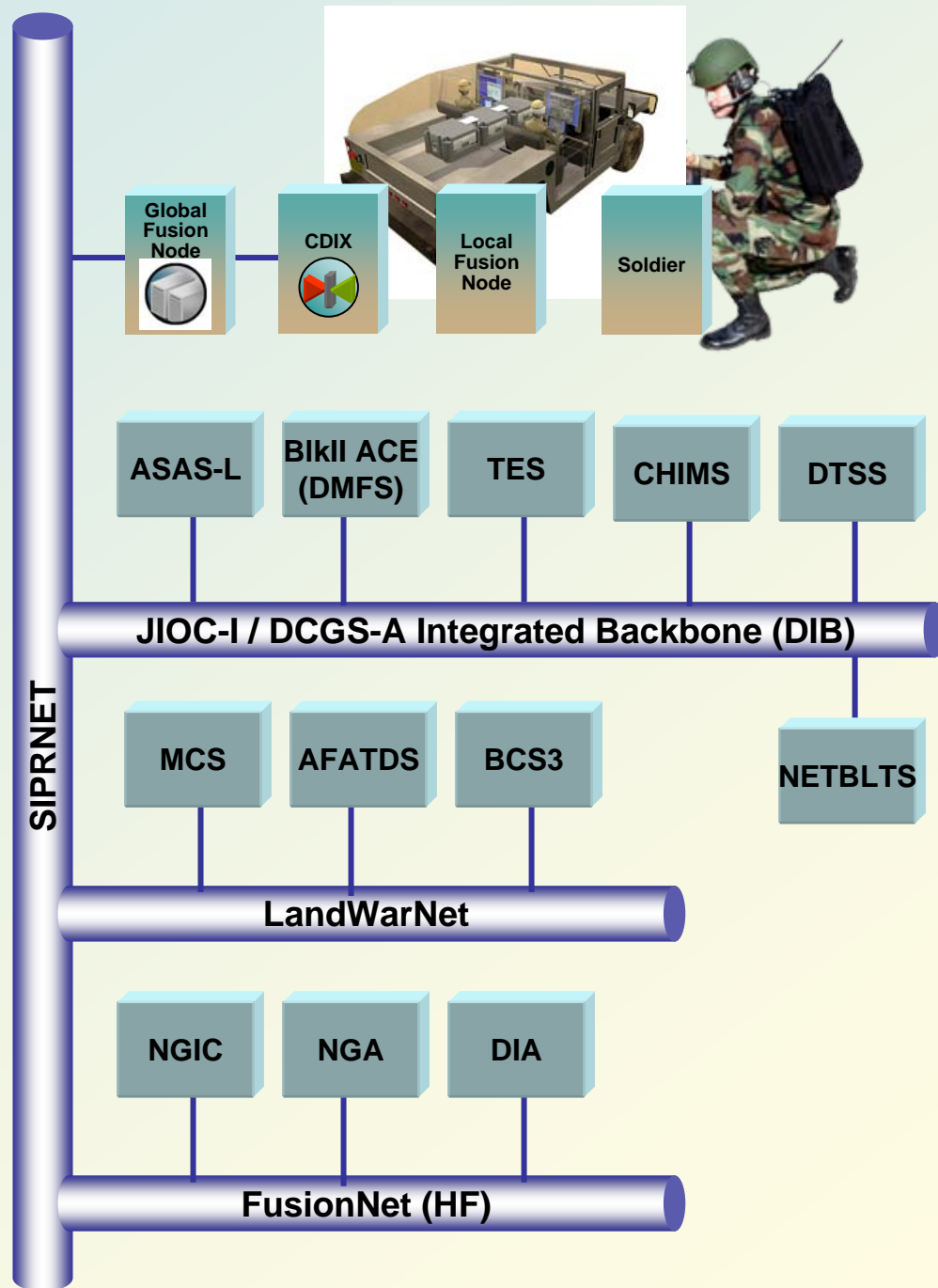


New technologies are needed to enable information exchange between the local and global worlds

- Local Fusion Node
- Global Fusion Node
- Cross-Domain Tactical Gateway
- Global/Local Interactions
- Content and Service Discovery
- Distributed Dynamic Processing
- End-user Configurations and Domain Applications
- Multimedia Collection and Reporting
- RSTA for Platforms

Connecting the Soldier to Actionable Intelligence

- Provide the near real time connectivity and computing power for war fighters and other national security users to pull the right information, at the right time
- Provide all users with the ability to publish to the network
- Provide global, assured and homogeneous access to heterogeneous intelligence data.
- Allow rapid exploitation of diverse data sources by individual and organizational users
- Remove operational-intelligence data interoperability as a constraint in developing situational awareness.



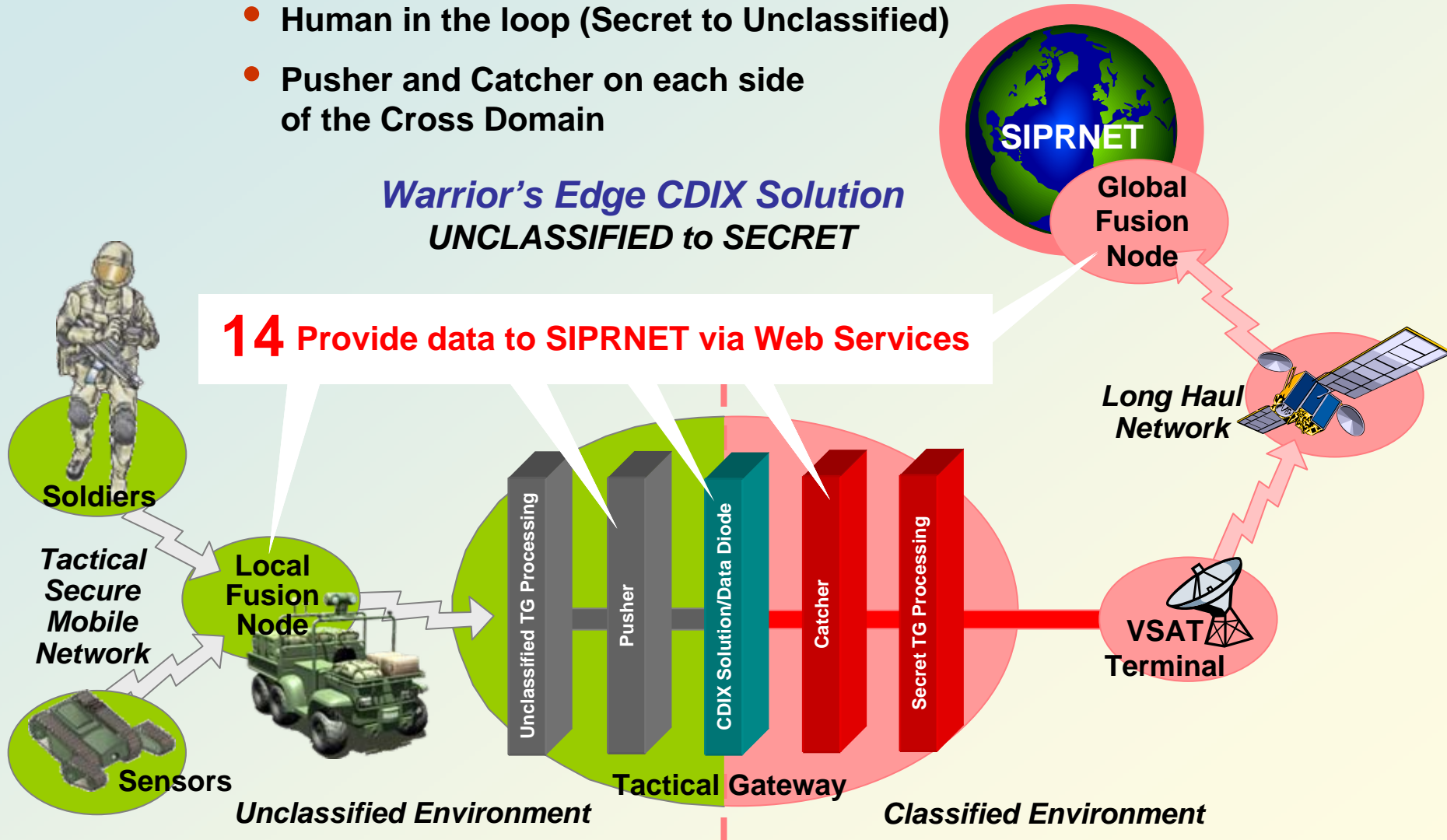


Cross-domain Tactical Gateway

- Innovative Cross Domain Solution (Unclassified to Secret - DIA Approval)
- Human in the loop (Secret to Unclassified)
- Pusher and Catcher on each side of the Cross Domain

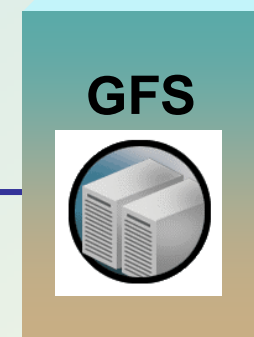
Warrior's Edge CDIX Solution
UNCLASSIFIED to SECRET

14 Provide data to SIPRNET via Web Services





Global Fusion Services

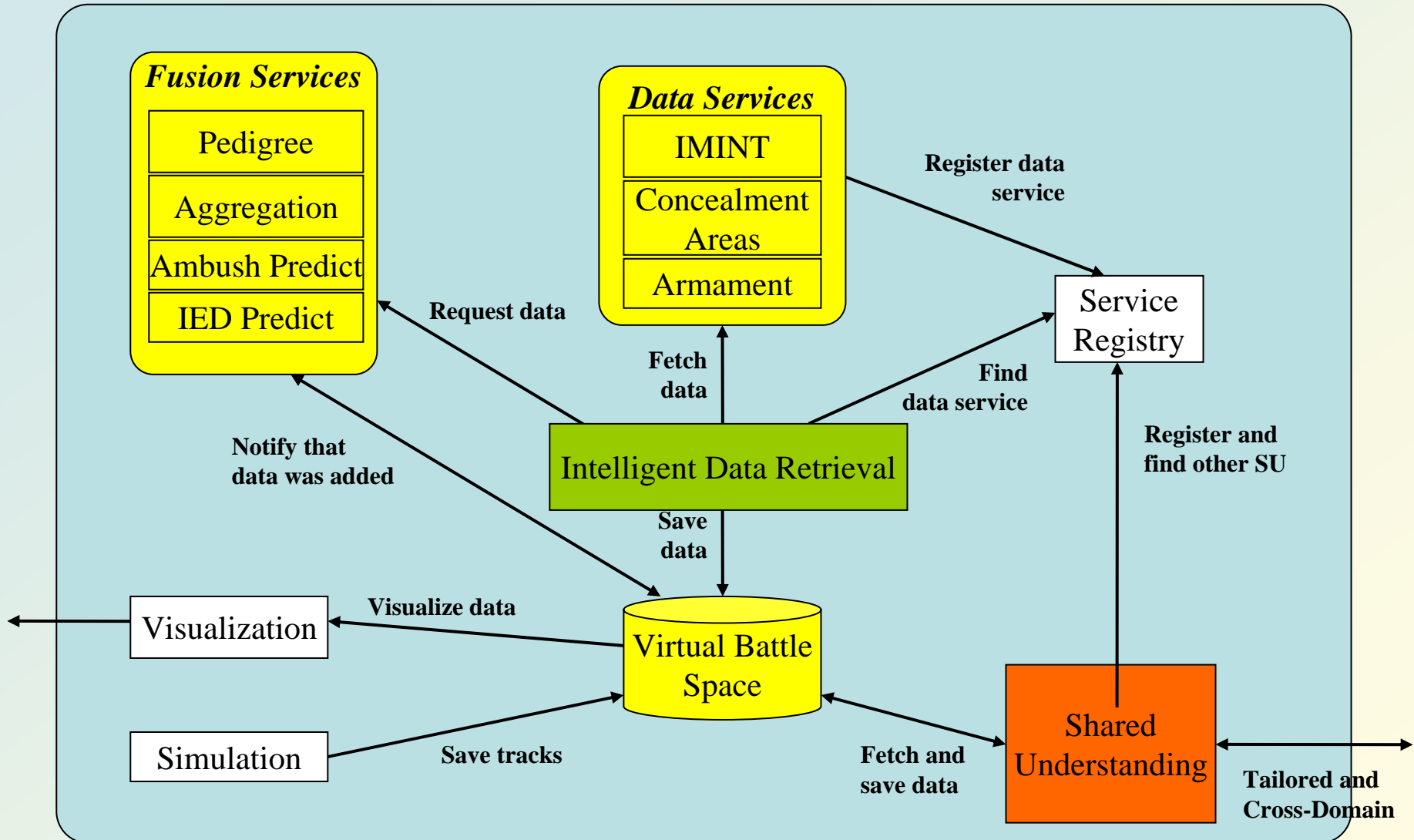


What it does:

- Resides on classified network as link between local and global worlds.
- Publishes and archives local data generated during operation.
- Fuses local and global data into tailored Intel products.
- Defines parameters of search queries from structure of local mission plan, warfighter explicit queries, and local/global events
- Persistent queries during local operation for global Intel data updates.
- Retrieves, filters and processes multi-INT data from global world.
- Alerts and disseminates to warfighter latest data products updates.
 - Perishable
 - Situational Imperative
 - Sensitive but Unclassified



Global Fusion Node Infrastructure

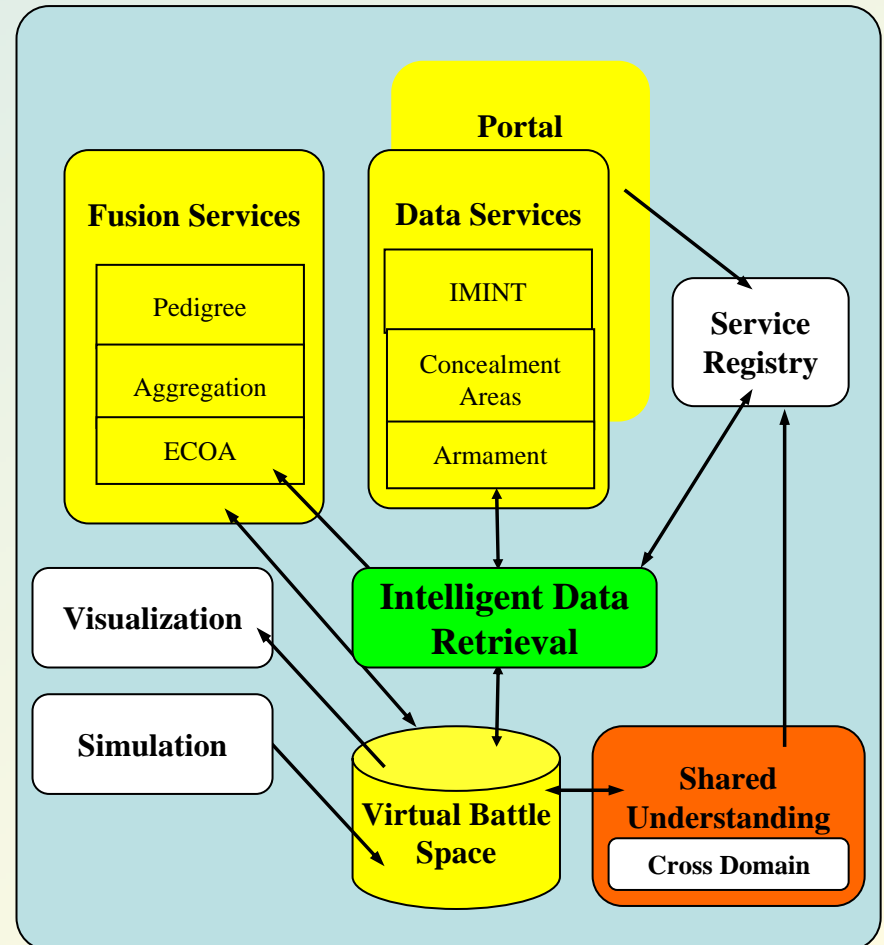




Agent Functionality

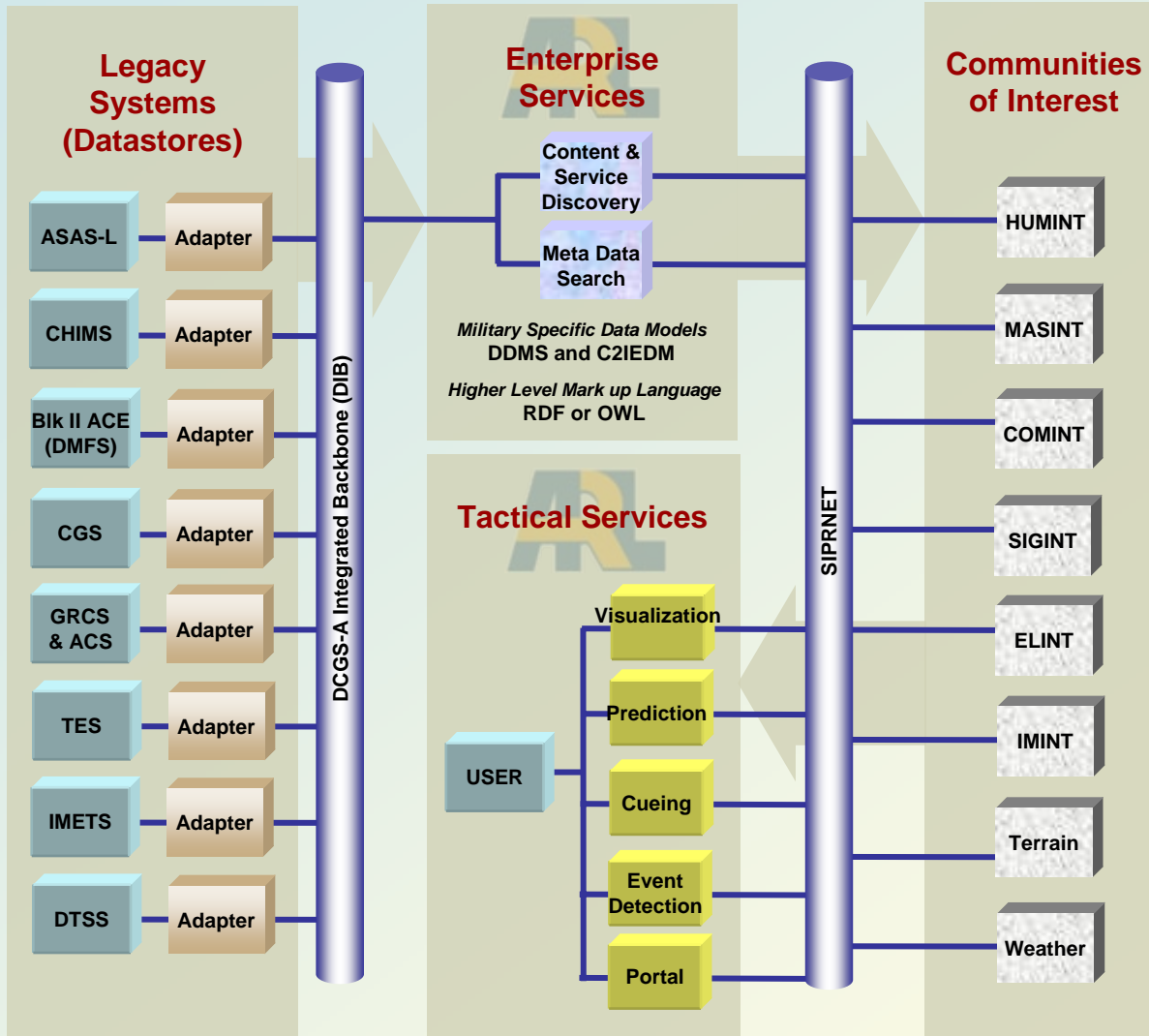
Active, persistent software components that perceive, reason, act and communicate (Huhns)

- Implemented (in EMMA) and demonstrated
 - Filters
 - Monitors
 - Alerts
 - Retrieve via subscription
 - Disseminate via publication
 - Adapt to the mission
 - Mediate across sources including
 - MIDB (facilities)
 - IMETS (weather)
 - DCGS-N (P3)
 - NetBLTS (foreign documents)
 - UAIM/Fed Search (search engines)
 - CED (air tracks)
 - XTCF (tracks)
 - NGS (images)
 - Adaptive composition of services for fusion
 - Adapt to user priority
 - Adapt to environment
 - Ontology integration
 - Cross-domain





Global: Framework for Mining / Discovery



- Post domain specific information to a community of interest
- Mine communities of interest for information for pattern/events over time/space
- Behavior detection through mining for patterns/events over time/space
- Framework for current/future datastore integration
- Evaluation through simulation-based stimulation
- Provide semantic interoperability by extending C2IEDM using RDF and OWL
- Data discovery works well, but service discovery is more complex.



Distributed Dynamic Processing

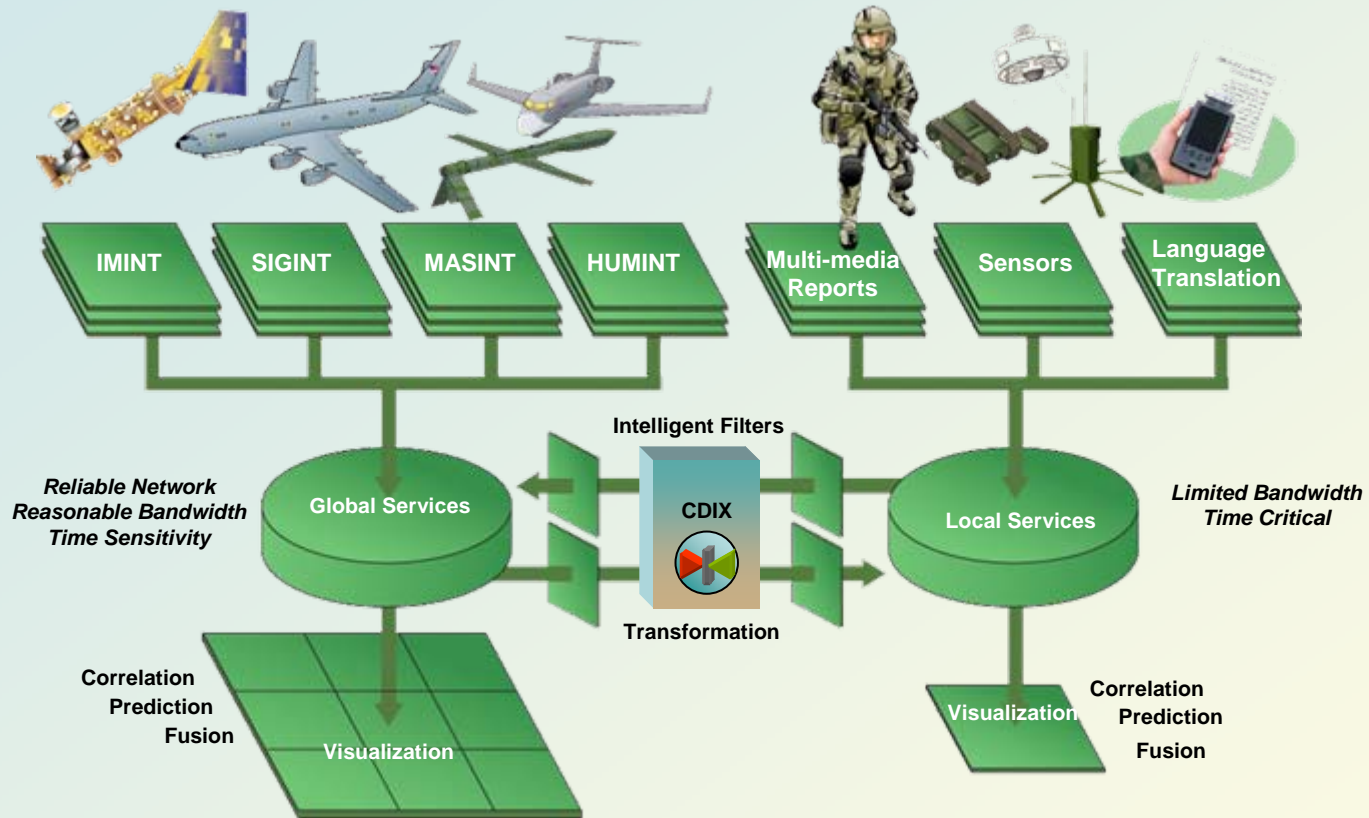
Managing the collection, flow and processing of battlefield information across a dynamic, unreliable, intermittent, and limited bandwidth tactical network

- Automated Discovery and Multiple Protocol Support (TCP UDP RUDP)
- Bandwidth Management
- Adaptive Quality of Service
- Tactical Network Resiliency
 - Topological Changes
 - Intermittent Connectivity
 - Availability
- Connectivity Maintenance and Visualization
- Web Services where Appropriate
 - Periphery of System
 - Bridge to Reliable Commercial Network Infrastructure





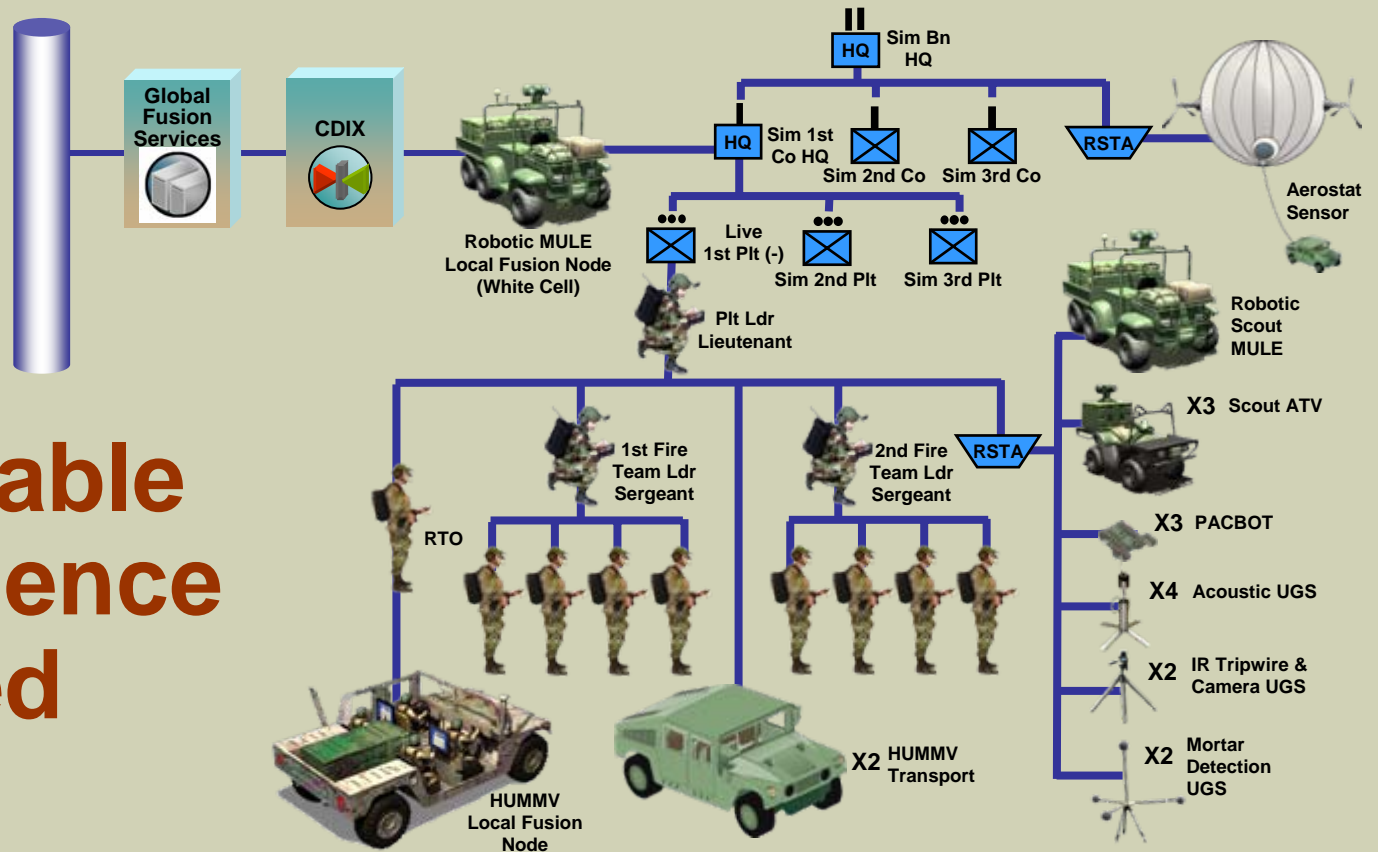
Local/Global Interactions



- Global assets tipping local assets
- Local Assets filling in the gaps for global assets
- Local/Global monitoring to detect plan/operation deviation
- Refining Global information to relevant local events
- Providing inferred explanation and assessment through narratives
- Pusher and Catcher on each side of the Cross Domain Solution



ARL's Actionable Intelligence Testbed



Leveraging Horizontal Fusion

- Establish hardware baseline
- Performed end-user evaluation
- Ad Hoc comms and networks from CTA
- Integrated ATO software capabilities
- NETBLTS deployment at GISA

Continued Commitment

- C2CUT ATO
- FBKFF ATO
- TWNA (Tactical Wireless Network Assurance)
- Machine Translation Research

Future Work

- Warriors at the Edge need real-time information on relevant tactical events based on both global and local perspectives
- Netted sensors alone do not provide actionable intelligence
- The SOA concept move us in the right direction
 - Semantic interoperability across repositories helps
 - Increased network access helps
 - Interface standards help
- But local and global fusion concepts must be advanced too
 - Dynamic distributed real-time local fusion
 - Global information fusion tailored for the user
 - The interaction between global and local processes must be refined
 - The SOA facilitates multi-int fusion, but it does not accomplish it
 - Small fusion services
 - Service discovery and composition
- CDIX Policy is a barrier to true Local-Global interaction