| Exhibit R-2, RDT&E Budget Item Justification | | | | Date February 2007 | | | | |
|---|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>RDT&E Defense-Wide, BA 7 | | | | R-1 Item Nomenclature:<br>Net Centricity PE 0305199D8Z | | | | |
| Cost ($ in millions) | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
| Total PE Cost | 8.024 | 8.696 | 10.243 | 12.747 | 1.504 | 30.103 | 30.573 | 31.045 |
| Horizontal Fusion | 0.000 | 0.000 | 0.000 | 2.732 | 0.000 | 19.394 | 19.864 | 20.211 |
| GIG Evaluation Facilities (GIG-EF) and GIG End-to-End Systems Engineering Advisory Activities | 8.024 | 8.696 | 10.243 | 10.015 | 1.504 | 10.709 | 10.709 | 10.834 |

**A. Mission Description and Budget Item Justification:**

This program element will support information management and information technology activities focused on the development, integration, testing and assessment of capabilities and applications in support of joint and coalition warfighter needs. Resources will support net centric collaborative development and operations to improve situational awareness, interoperability and operational planning efforts. This program is funded under Budget Activity 7, Operational System Development, because it supports engineering development and testing of RDT&E activities.

The Horizontal Fusion Project funding in FY 2006, FY 2007 and FY 2008 was realigned by the Department to support priority net centric transformation efforts such as information assurance, Multinational Information Sharing and Internet Protocol (IP) based capability into military communications satellites.

B. **Program Change Summary:** (Show total funding, schedule, and technical changes for the program element that have occurred since the previous President's Budget Submission)

| | FY 2006 | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|---|
| Previous POM/BES | 8.254 | 8.746 | 10.243 | 12.747 |
| Current Presidents Budget | 8.024 | 8.696 | 10.243 | 12.747 |
| Total Adjustments | -.230 | -.050 | | |
| Congressional program reductions | | | | |
| Congressional rescissions, inflation adjustments | | -.050 | | |
| Congressional increases | | | | |
| Reprogrammings | | | | |
| Transfer | | | | |
| Program Increase | | | | |

Program Change Summary Explanation:
FY 2006: SBIR -.205 million, STTR -.025 million.
FY 2007: FFRDC -.017 million, Economic Assumptions -.033 million.
FY 2008: No change.
FY 2009: No change.

**C. Other Program Funding Summary: N/A**

**D. Acquisition Strategy: N/A**

**E. Performance Metrics:**

1. User Activity and Participation. A key measurement of GIG-EF success is the amount of participation and usage of the GIG-EF in support of Joint warfighting requirements. Performance metrics in this area would include:

- Number of events, tests and experiments scheduled
- Percentage of GIG-EF time active vs. idle
- Total amount of in-kind funding from GIG developers and activities
- Aggregate funding per test
- Number of service and user participants in tests (jointness)

2. Contributions to GIG development and transition. The GIG-EF should also advance the state of the art in support of GIG implementation.

- Number of independent test reports and limited objective experiments support major GIG architectural issues (IA, IPv6/MPLS, Routing, etc.)
- Number of demonstrations in support of major GIG architectural issues (IA, IPv6, Routing, etc.)

3. Risk mitigation for the GIG.

- Demonstrations in support of GIG overall goals (ex: IPv6 by FY 2008, 10 Gb Optical HAIPE by FY 2007, etc.)
- Number of GIG E2E Systems Engineering Oversight working group requirements addressed via GIG-EF demonstration, experimentation and testing.

4. Tangible products such as frameworks and design guidance used for program assessments and reviews.

5. Specific modifications to Programs based on the frameworks and guidance that improve program compatibility and end to end performance.

6. A more collaborative environment where systems engineering organizations of individual GIG programs and the end to end systems engineering oversight organization mutually identify and solve issues related to maximizing end to end performance

| Exhibit R-2a, RDT&E Project Justification | | | | | | Date: February 2007 | |
|---|---|---|---|---|---|---|---|
| Appropriation/Budget Activity<br>RDT&E, Defense-Wide, BA 7 | | | Project Name and Number: GIG-EF/PE 0305199D8Z | | | | |
| Cost ($ in millions) | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
| Project Name:<br>GIG Evaluation Facilities (GIG-EF) & GIG End-to-End SE Advisory Activities | 8.024 | 8.696 | 10.243 | 10.015 | 1.504 | 10.709 | 10.709 | 10.834 |

**A. Mission Description and Budget Item Justification:**

The Global Information Grid (GIG) Evaluation Facilities and E2E Systems Engineering (SE) Advisory Activities project provides resources needed to test key systems in an end-to-end manner, including providing for system engineers, test-bed hardware, software and fiber optic connectivity at the Naval Research Laboratory and several other test locations in the U.S. The evaluation facilities will be used to demonstrate interoperability of multiple Transformational Communications programs including but not limited to the Joint Tactical Radio System (JTRS), Global Information Grid Bandwidth Expansion (GIG BE), Teleports, and Transformational Satellite Communications System (TSAT). For these systems GIG-EF & SE would:

-Perform tests that physically demonstrate technical performance.

-Provide an independent, overarching review of technology and interface standards.

-Ensure technical issues are identified early and schedules synchronized to produce a jointly interoperable, timely and cost-effective architecture development.

-Prevent costly program reworks and restructuring, and more importantly, avoid delays in providing joint warfighter connectivity.

The effort also provides engineering, integration and hardware and fiber optic connectivity necessary to validate the performance for key transformational communication programs. The funding will also provide the engineering resources necessary for performing the Global Information Grid (GIG) end-to-end systems engineering oversight function. Resources will be applied to end-to-end systems engineering topics related to the successful integration of several programs that will form the GIG in areas such as information assurance (IA), quality of service (QOS), network management, interface definition and standards selection, and routing protocols. These resources will work in conjunction with systems engineers from key GIG programs such as the Joint Tactical Radio System (JTRS), Transformational Satellite Communications System (TSAT), Teleport, GIG Bandwidth Expansion (GIG-BE), Warfighters Internet-Tactical (WIN-T), Net-Centric Enterprise Services (NCES) and Automated Digital Networking System (ADNS) to identify and address technical issues resulting from engineering decisions made without the end-

to-end perspective.

**B. Accomplishments/Planned Program**

| | | FY 2006 | FY 2007 | FY 2008 |
|---|---|---|---|---|
| Accomplishment/ Effort/Subtotal Cost | | 8.024 | 8.696 | 10.243 |
| RDT&E Articles Quantity *(as applicable) | | | | |

FY 2006 Accomplishments: ($8.024 million)

- Created a master GIG-EF experimentation plan based on critical technical issues and testing priorities identified by GIG programs
- Drafted an EWSW traceability matrix to track testing against EWSE requirements
- Drafted a "GIG Mobile Region Topology" white paper
- Contributed to the "Network-Based Anomaly Detection – Black Core" (NBAD) whitepaper
- Developed Test Plans for IPsec/Control Plane encryption, HAIPE Discovery, QoS and IPv4/IPv6 Multicast.
- Supported the JTRS Joint Virtual Laboratory (JVL-N) Phase II network testing between NRL, SSC-SD, MCTSSA, Hanscom AFB and Ft. Monmouth.
- Supported the JTRS JCL component testing between SSC-SD and China Lake.
- Participated in performance and service conformance testing of JITC Joint IPv6 Moonv6 effort.
- Conducted IP Routing and MPLS QoS experimentation using RFC 2547bis over IPv6.
- Conducted IPv4 and IPv6 IP Control Plan Protection using IPsec.
- Conducted IPv6 Multicast Experimentation
- Conducted Path MTU (Maximum Transmission Unit) Discovery with both crypto and tunneling.
- Developed and distributed the Draft GIG-EF CONOPS
- Released Tactical Managed QoS Test Report for JRAE-05 Final Report
- Developed test plans for IPsec/Control Plane encryption, HAIPE Discovery, QoS and IPv4/IPv6 Multicast
- Conducted DoD IPv6 testing to include, but not limited to:
    - Working with JITC to determine IPv6 capabilities and issues
    - IPv4 to IPv6 translation
    - High performance streaming over IPv4/IPv6 and MPLS

FY 2007 Plans: ($8.696 million)

- Review JTRS Cluster AMF, TSAT, JC2, and NCES for compliance to end to end GIG frameworks, architectures, and design guidance
- Analyze end to end systems engineering issues by review technical documentation, working with the systems engineering organizations of each of the programs, employing modeling and simulation, and using the results of end to end systems engineering testing and influence design changes to programs to assure compatibility and to maximize end to end performance
- Work with systems engineering organizations from GIG programs to identify and address cross-program issues and influence programs to implement compatible designs that maximize end to end performance
- Continued support of GIG-EF capabilities and enhancements.
- Connect East and West coast GIG-EF hubs via 10Gbps service
- Perform End-to-End testing and experimentation in support of GIG developer and user requirements including, but not limited to:
    - HAIPE Discovery (DNS vs. BGP vs. LDAP) starting with emulators.
    - HAIPE Routing/QoS experiments
    - End-to-End QoS testing
    - End-to-End Routing and Multicast testing
    - JTRS JVL-N Testing
    - Moonv6 IPv6 participation
    - IPsec Control Plane segregation
    - Quality of Protection and Anomaly Detection
    - Application Interoperability
    - IPv6-HAIPE Interoperability and Performance starting with emulators.

FY 2008 Plans: ($10.243 million)

- Ensure the GIG end to end quality of service framework evolves in accordance with the evolution of commercial products, services, and technology
- Refine the GIG IA, routing architecture, and network management framework to be consistent with evolving commercial products, services, and technology

- Work with systems engineering organizations from GIG programs to identify and address cross-program issues and influence programs to implement compatible designs that maximize end to end performance
- Continued support of GIG-BE capability. Develop initial 40 Gb connectivity among DoD testing components (GIG-BE, TSAT, Teleports) and inter-connectivity to key GIG development sites including capability to support Inter-agency end-to-end testing with DoD, Intelligence Community, Allied and Coalition activities.
- Design and test upgrade to testing suites to support 40 Gb networks
- Perform testing in support of GIG developer and user requirements including but not limited to:
    - IPv6 transition final testing
    - JTRS WNW end-to-end testing in support of Cluster 5 (spiral 2), AMF.
    - 40 Gbps IPv6/MPLS experimentation and testing including early HAIPE concept development
    - Support NCES spiral development
    - Continued support of end-to-end warfighter interoperability experimentation via JRAE tests in coordination with USJFCOM JBMC2 activities
    - Joint C2 applications and platform testing activities such as JITC
    - HAIPE Discovery (DNS vs. BGP vs. LDAP) with HAIPIS v3 devices
    - Mobile Routing testing
    - HAIPE Routing/QoS experiments with mobile networks
    - End-to-End QoS testing with mobile networks
    - End-to-End Routing and Multicast testing with mobile networks
    - JTRS JVL-N and JTEN Testing
    - IPsec Control Plane segregation
    - Quality of Protection and Anomaly Detection
    - IPv6-HAIPE Interoperability and Performance starting with HAIPIS v3 devices

FY 2009 Plans: ($10.015 million)

- Ensure the GIG end to end quality of service framework evolves in accordance with the evolution of commercial products, services, and technology
- Work with systems engineering organizations from GIG programs to identify and address cross-program issues and influence programs to implement compatible designs that maximize end to end performance
- Continue to provide critical technology validation for GIG WGs, Components and Services/Users
- Finalize 40 Gb connectivity among DoD testing components (GIG-BE, TSAT, Teleports) and inter-connectivity to key GIG development sites including capability to support Inter-agency end-to-end testing with DoD, Intelligence Community, Allied

and Coalition activities.

- Perform testing in support of GIG developer and user requirements including but not limited to:
  - IPv6 final testing
  - 40 Gbps IPv6/MPLS experimentation
  - Enterprise authentication testing validation
  - Continued support of NCES spiral development
  - Continued support of end-to-end warfighter interoperability experimentation via JRAE tests in coordination with USJFCOM JBMC2 activities
  - DiffServ-based RSVP aggregation
  - Cross-Domain VPNs
  - QoS alternatives: Provisioning vs. signaling
  - Centralized vs. distributed discovery services
  - Control & Management Information Crossing Security Boundaries
  - Joint C2 applications and platform testing activities such as JITC
  - Mobile Routing testing
  - HAIPE Routing/QoS experiments with mobile networks
  - End-to-End QoS testing with mobile networks
  - End-to-End Routing and Multicast testing with mobile networks
  - JTRS JVL-N and JTEN Testing
  - IPsec Control Plane segregation
  - Quality of Protection and Anomaly Detection

**C. Other Program Funding Summary:** N/A

**D. Acquisition Strategy.** N/A

**E. Major Performers:** Naval Research Laboratory, SPAWAR Systems Center San Diego, MIT Lincoln Laboratories, NSA, DISA, and MITRE.