

**Global Information Grid (GIG)
Information Assurance (IA)**

JCIDS Analysis

Post Independent Analysis (PIA)



NSA Corporate Capabilities Process

DC42

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1 Executive Summary

The results of the PIA are detailed in the sections below and will inform Section 7 of the GIG IA Initial Capabilities Document (ICD). Overall, the PIA Analysts concluded:

- While it is apparent that a lot of quality work took place in order to provide a thorough analysis of the functional areas and needs, it does not appear to be complete
- The GIG IA JCIDS analysis and briefing materials need refinement to demonstrate clear traceability to strategy and concept documents throughout the process.
- The FNA Use Cases must be reviewed for completeness and consistency with the DoD Analytic Agenda.
- A more complete FSA and accompanying Analysis of Materiel Approaches (AMA) will be needed.
- While the overall FAA / FNA / FSA processes require refinement, the shortcomings in the process identified by the PIA offer solid recommendations for enhancing the GIG IA ICD.
- The draft ICD reflects a series of information gaps that cannot be filled with the present set of JCIDS analysis; yet such analysis is required to complete the ICD.
- The process shortcomings identified in the PIA can be remedied without delaying the ICD processing if PIA recommendations are implemented.
- The ICD should not be finalized until additional use cases are completed, factored into the process, and accommodated in the ICD.

Approaches identified in the FSA of the GIG IA JCIDS analysis characterize materiel and non-materiel alternatives that should be documented in a GIG IA ICD for submittal to the Joint Staff in order to support Joint Staff J-6 and Office of Assistant Secretary of Defense for Networks and Information Integration (OASD/NII) during Program Review 07 and Program Objective Memorandum 08. As noted, the materiel and non-materiel approaches require further definition and assessment prior to completion of the ICD staffing and approval. Adopting a three-pronged strategy consisting of ICD community review, FAA / FNA analysis documentation improvements, and further FSA / AMA definition may offer an approach leading to sound underpinnings for the GIG IA capabilities definition. This may then lead to a defined and executable follow-on Analysis of Alternatives (AoA) and capabilities documentation strategy.

This report documents the findings of the Post Independent Analysis (PIA) of the Global Information Grid (GIG) Information Assurance (IA) Joint Capabilities Development and Integration System (JCIDS) Analysis. The PIA was chartered under the authority of the NSA Corporate Capabilities Process office, DC42, using a team of five senior capabilities analysts, one from Corporate Assessments Office (CAO) and one each from the business units of NSA: Signals Intelligence

Directorate (SID), Information Assurance Directorate (IAD), Information Technology Directorate (ITD), and Corporate Business Services (CBS). See Appendix B for a complete list of PIA Analysts and support personnel.

This PIA Report is designed to satisfy CJCSM 3170.01A requirements. The PIA used the following process:

- The GIG IA JCIDS Analysis team presented the analytic methodology and products associated with the GIG IA Functional Area Analysis (FAA), Functional Needs Analysis (FNA), and Functional Solution Analysis (FSA).
- The PIA Analysts provided comments on the analytic process and conclusions, guided by criteria derived from CJCSM 3170.01A, Appendix C.
- The PIA support team consolidated the findings of the PIA Analysts.
- The PIA Analysts reviewed the draft PIA report, ensuring it reflected the assessments and views expressed during the process.

The PIA report and its conclusions were reviewed and submitted to NSA/DC42 for action.

2 GIG IA Functional Area Analysis (FAA) Assessment

This section of the report presents the questions used by the PIA Team to assess the GIG IA FAA. It is presented with the series of questions used in the assessment, followed by the Findings and the Recommendations submitted by the PIA Team in response to those questions.

2.1 Is the FAA derived from national strategies, JOpsC, JOCs, JFCs, JICs, and UJTLs applicable to the mission area?

Findings: The PIA analysis team acknowledges the FAA appears to be derived from national strategies, JOpsC, JOCs, JFCs, JICs, and UJTLs as they applied to this mission area, but noted that there were linkage and traceability issues. The FAA team stated it used the NMS, JV2020, UJTL, and NC/C2/BA Joint Functional Concepts (JFC) but the supporting analytic documentation does not adequately depict the extraction of related activities and items. See Appendix D for additional classified findings.

Recommendation:

- √ The GIG IA JCIDS analysis team should review the FAA decomposition and consider the use of a Strategy-to-Task (STT) approach that may offer an organizing approach. Adoption of such a process could enable a clear mapping of the key items in the overarching guidance documents and arrange them in such a fashion that they can be linked to those approved operational concepts and strategies.

2.2 Does the FAA identify the tasks, conditions, and standards needed to achieve military objectives within the mission area analyzed?

Findings: The FAA lists good sources for tasks but falls short in assuring the list of tasks is comprehensive and agreed upon. The assurance that the right items were extracted and vetted may be missing. At this foundational level of the larger analysis leading to an ICD, there may be an issue of whether the proper set of tasks was extracted and whether the analysis is wholly “complete”. Looking at the GIG IA Capabilities-Based Assessment Final Report (March 18, 2005), Annex B of that report documents 14 Capabilities, with Capability Definition and Attribute Name and Definitions. This was cited as the task, condition and standards list. If true, this list does not trace back to military objectives, nor does it document the standards needed to achieve military objectives. However, the FAA created “JFC Capabilities Mapped to GIG IA Capabilities” matrix identifies capabilities (aka tasks) originating from within the primary focus JFCs (C2 JFC, Battlespace Awareness JFC, Net-Centric JFC) and charts appropriateness of the individual capabilities to the 14 GIG IA Capabilities (via ‘X’ in respective boxes). Perhaps the combination of Annex B

and the matrix could serve as a task / conditions / standards list, but something more concise and evident would be preferred. Further, the conditions and standards under which the various tasks were to be performed was not apparently captured. Rather, in the subsequent FNA, a derived set of “use cases” was created that does not show linkage to the conditions and standards that may have accompanied the original tasks extracted from the various strategy and guidance documents. Result – the use cases may offer some insight but may not address the issues identified in the larger JOpsC, JFC, UJTL or other source / reference documents. It is just not clear from the analytic documentation presented whether the approach and underlying data are sound and provide the basis for an analysis that will address the full suite of tasks, conditions and standards needed to achieve military (and by extension, IC) objectives. The extraction of standards applied to the accomplishment of those missions also was not evident in the FAA but was eventually presented in the FNA. However, the defined standards were linked to “attributes” of the extracted GIG IA capabilities (14 of them in the FNA) and defined, again, by a working group without indication or rationale of why certain values were selected. The question arises as to whether the analysis performed in the FAA is based on the needs and desired capabilities stated in strategy and guidance documentation both within DoD and the IC or whether they were created to represent the JCIDS Analysis Team’s assumptions. As previously noted, there are indications the analysis identified the tasks, conditions, and standards needed to achieve military objectives within the mission area analyzed but the documentation requires additional work to fully capture and document what may have been done. Specific shortfalls identified include:

- Contractors extracted tasks, conditions, and standards, but there appeared to be no government or military vetting of those initial extractions. As a result, the assurance that the right items were extracted and vetted may be missing.
- Tasks, conditions and standards are addressed indirectly and possibly incompletely with the “Use Case” methodology employed in the FNA.
- FNA attributes do not have clear linkage to the FAA and thus the Joint and national guidance documentation.
- See Appendix D for additional classified findings. These classified findings contain a recommendation that the GIG be considered, in addition to the current view of the GIG, in a fundamentally different way (i.e., it advocates a view that may not have been considered in the referenced documentation and use cases).

Recommendation:

- √ The Joint Concept documents that were used to identify tasks should be used to identify conditions and standards.
- √ Obtain stakeholder review of resulting tasks, conditions, and standards.
- √ Address FAA documentation shortfalls concurrent with other analytic resolution activities.

2.3 Do capability statements include attributes and measures of effectiveness?

Findings: It was not demonstrated that the capability statements include adequate attributes and measures of effectiveness (MOEs). The ICD for GIG IA (draft), Section 4.c(1) states 'Capability definitions must contain the required attributes with appropriate measures of effectiveness, e.g., time, distance, effect (including scale) and obstacles to be overcome.' Also, the GIG IA JCIDS Based Analysis Database allows for attribute metrics, yet less than a dozen of the 85 attributes stated any measure of effectiveness. It does not appear that measures of effectiveness are fully identified in the FAA, but they do appear later – in the FNA. It is still a little unclear how the numerical metrics were arrived at and what source they were derived from, other than just a small working group of SMEs.

Recommendations:

- √ Bring the development of MOEs and metrics back into the FAA.
- √ Provide the linkage to the top-level documents.

2.4 Are capability statements general enough that they don't predispose solution recommendations?

Findings: There was general agreement that the capability statements were satisfactory and did not predispose solution recommendations. There was some concern with the inconsistency in the format used to express the capabilities. Additionally, the capabilities database provided was not easy to use when trying to verify the IA activities that were behind the capability statements.

Recommendations:

- √ Supplement or revise the capability statements to assure consistent format.
- √ Provide easy access to the data behind the capability statements for traceability.

2.5 Was the FAA conducted as a collaborative effort?

Findings: The FAA was presented as being conducted as a collaborative effort within the GIG IA JCIDS analysis team and the GIJWG. However, there might have been too great a dependency on select SMEs during the analysis. There are questions regarding the SMEs that were consulted with – were any of them really from customer organizations, or were they all contractors with previous experience in customer organizations? Furthermore, limited consultation with, and sporadic IA community participation in, the GIJWG have not afforded the level of review and socialization the GIG IA issue requires.

Recommendations:

- √ Increase the level of attendance at GIJWG meeting, particularly with respect to Service and government representation.

- √ Provide documentation to substantiate the “collaborative” aspects of the FAA.

2.6 Were FAA-derived tasks submitted to DIA for an ITWA?

Findings: Although the Initial Threat Warning Assessment (ITWA) was identified as being completed by DIA, it was not provided to the PIA analysts for their review and assessment. The ICD for GIG IA (draft), Section 5 indicates that the ITWA was developed by DIA in support of the ICD. Additionally, during the PIA, it was documented that a request was sent to DIA and they produced an ITWA specifically for the JCIDS analysis. It appears that the ITWA and the FAA may have been produced in parallel. This observation may be premature, as the ITWA was not presented to the PIA team for review. The offer was made to email the classified ITWA to the PIA team via SIPRNET, but this was not a viable option. The PIA team assesses the lack of the ITWA availability during review to be a process related issue and does not substantially impact the assessment of the FAA.

Recommendations:

- √ As part of the PIA, all relevant documentation that supports the assessment must be presented to the assessment team, regardless of classification and other “need to know” constraints.
- √ For the purposes of the PIA and ICD, provision of the ITWA to the PIA members could resolve this item.

3 GIG IA Functional Needs Analysis (FNA) Assessment

This section of the report presents the questions used by the PIA Team to assess the GIG IA FNA. It is presented with the series of questions used in the assessment, followed by the Findings and the Recommendations submitted by the PIA team in response to those questions.

3.1 Does the FNA assess the ability of current and planned Joint capabilities to accomplish the tasks identified in the FAA under the full range of conditions and to the standards required?

Findings: There is a serious concern the three “Use Cases” may not adequately represent the most significant capabilities required of GIG IA. The creation of “use cases” that represent the joint capabilities set was well intentioned but it is unclear whether that set of “use cases” adequately fulfilled the objective to examine the tasks identified under the FAA. The FAA stated it was derived from the NMS, JV2020, UJTL, NC/C2/BA FCBs. Developing similar sorts of “use cases” derived from at least the same three FCB areas might have provided a better basis for the FNA. As a result, there are likely gaps in the analysis (e.g., at least one gap, related to the need to deliberately use certain physical routing paths, was identified during the presentation of the material to the PIA team). For the three “use cases” in the FNA, an assessment of current Joint capabilities to accomplish tasks, as it relates to IA, did occur. It is not clear whether these three “use cases” adequately represent the full range of military operations (ROMO) and the range of military readiness (peacetime, conflict, war). Similarly, whether the full range of conditions and standards were assessed, is unclear. The importance of linking to joint documentation remains important, especially in the case of addressing the GIG IA requirements which seek to serve a DoD majority.

Recommendations:

- √ Document previous interactions with the appropriate Joint Staff and Joint Data Support offices to ensure the “use cases” are consistent with the DoD Analytic Agenda.
- √ Conduct additional “use case” analysis for GIG IA aspects of information operations (offense and defense) as part of the approach to refine the GIG IA scope areas, focusing on the AoA as the venue within which to address a revised “use case” set.

3.2 Did the FNA produce a list of capability gaps and/or shortfalls?

Findings: Although there is a detailed list of items called “gaps”, there is concern that these may be more analogous to overall needs and, while a list was produced,

the definitions and metrics were often too generic. There is concern that there is not a recognizable prioritization of the “gaps” or a division between technical and operational gaps. There is no documentation on the origin of the standards (objective & threshold ratings) – whether objectively obtained from one of the JFC or national strategy documents, or from the subjective perspectives of the SMEs. If the objective and threshold ratings were objectively obtained, then they should be included in the Annex B list. The analysis that resulted in the binning of the capabilities into 14 categories failed to provide a feel for how important the capabilities were (e.g., were the capabilities needed in all-important scenarios, or just a couple? Were the capabilities 'essential' or 'nice to have'?). As a result, the FNA identified items that are called “gaps” but appear more to be the results of an “IA capabilities assessment” of needed capabilities. Those initial “capability assessments” are then translated into a set of “capability deficiencies” based on the defined Information Exchange Requirements (IER) for the three “use cases” previously discussed. “Risk” is assessed for each capability deficiency, without qualification of whether it is an operational or a technical risk. Subsequent to the “capability assessment” process, the “deficiencies” were then aggregated into a table that ranked the capabilities assessed, offering that ranking based on SME input without any sensitivity analysis or weighting to address the relative importance of each capability deficiency ascribed by each SME. The resultants “capability gaps” became more of “capability needs” statements but were somewhat arbitrary in their ranking based on the use of a straight line ranking without weighting or sensitivity.

Recommendation:

- √ Provide additional documentation for the FNA, if available, to present the full suite of information used.
- √ Balance the identified needs against current and planned programs to identify true gaps.
- √ Conduct additional analysis with a method that will result in a prioritization of gaps to include using an approved weighting of the capabilities.
- √ Supplement the analysis to show the source of the metrics being used, characterization of the capability or metric (to include operational or technical nature), and weighting criteria used to set sensitivity of the prioritization method.
- √ Discuss the Product / Technology Roadmap activities with NSA’s Network Infrastructure and Technology (I232) office for technology opportunities.

3.3 Does the FNA identify the timeframe in which solutions are needed?

Findings: Although the timeframe for solutions doesn’t appear to be specifically called out in the FNA, a timeframe of 2008 through 2020 is cited in the ICD. There is no written report that lays out the scope of the FNA, nor the period it covers. Discussions indicated the period of concern for the GIG IA might be from today (2005) to 2020. From the analysis presented, there is no delineation of the capability statements relative to 2020, the assessment is not identified as addressing “today’s” performance versus desired performance, and the MOEs presented were not clearly pinned to any particular timeframe.

Recommendation:

- √ The ICD mentions 2008 through 2020. The Intel “use case” mentions FYDP. If the intent is 2008 to 2020, this should be included in the description of the FNA. If the analysis was conducted on a shorter timeframe than 2008 to 2020 (i.e., FYDP), then the analysis must be supplemented or the ICD reduced in scope.

3.4 Does the FNA consider gaps or problems identified in COCOM IPLs?

Findings: There is no indication that COCOM IPLs were used in the FNA.

Recommendation:

- √ Identify current and applicable COCOM IPLs.
- √ Supplement the analysis to include the findings.

3.5 Was the FNA informed by an ITWA?

Findings: Because the ITWA was neither discussed nor presented, it was not clear if the FNA was informed by the ITWA. However, the ICD for GIG IA (draft) Appendix B.13 documents the date of the ITWA as March 25, 2005. It is conceivable that this document was available to the SMEs and the FNA team – although no evidence indicates this as being true. The PIA team assesses the lack of the ITWA availability during review to be a process related issue and does not substantially impact the assessment of the FNA.

Recommendations:

- √ Ensure that the ITWA is produced, and linkages to the identified threats are identified in the FNA report.
- √ Document the usage of the ITWA by SMEs and the FNA team.

3.6 Does the FNA discuss attributes that would resolve the gap with a link to the UJTLs?

Findings: Although the UJTL was used as a reference document in the FAA, the FNA does not discuss attributes that would resolve the lack of a link to the UJTLs. There is no clear linkage to the UJTL other than an indirect linkage to the selected Joint Force Concept capabilities statements that, again through inference, may hold the data that could be derived from the UJTL but was not explicitly presented in the analysis materials reviewed by the PIA.

Recommendations:

- √ Demonstrate UJTL traceability to the FNA.
- √ Concept capabilities statements could provide a traceable link to the UJTL.

3.7 Does the FNA use JROC-approved metrics from integrated architectures or propose metrics?

Findings: As noted previously, the use of Subject Matter Experts provided assessments of the capability attributes contained within the three situational “use cases”. There were metrics included in the assessments, however, there is no indication the metrics are JROC-approved and validated versus the subjective perspectives of the SMEs. It would not necessarily be a bad thing if the metrics were SME-perspectives, so long as separate documentation could be used for corroboration and linkage to the JROC-approved metrics. Some attributes and metrics were identified, but they did not appear to be well thought out. For example, the “availability of cyber-attack countermeasures” (e.g., greater than 99.9%, 95%-99.8%, etc.) appeared to be a less than rigorous method of describing the problem. No JROC-approved citation for the metrics (or MOEs) used in the FNA was evident in the analysis. The GIG IA JCIDS ANALYSIS WORKING GROUP, comprised of SMEs, developed the metrics crafted for the FNA. The validity of those measures was questioned during the interaction with part of the analysis working group and the response indicated the measures were the SMEs’ qualified estimate of the performance that each of the attributes for each GIG IA Capability would need to achieve to perform in support of the areas assessed using the three use cases. As a result, it is unclear from the analysis presented whether there was an effort to link those measures to JROC approved documentation or whether the developed measures are intended for proposal to the JROC as the measures for GIG IA Capability performance. Please note the “integrated architectures” item is being removed from the updated version of CJCS 3170-series documents but it is a solid question to query whether the FNA is linking to JROC approved documents. As noted by the analytic working group, they did not find explicit IA capability statements or MOEs when reviewing their selected set of strategy and guidance. They were challenged with interpreting the operational capability performance and identifying the IA capabilities necessary to ensure those operational capabilities could be achieved (e.g., to successful launch a missile against a target with positive control requires what type of information assurance measures to ensure successful C2, intelligence relay, and attack coordination / verification?). As a result, the development of candidate MOEs was begun but did not appear to be extended to all 14 GIG IA capability definitions identified during the FNA.

Recommendations:

- √ Ensure the metrics used as the basis for evaluation are consistent with JROC-approved and validated metrics.
- √ If the IA community believes it is not represented in the present set of JROC-approved documents and attendant capability statements, the JCIDS analysis team should move forward with defining and expanding on the MOEs necessary to describe the range of measures contributing to operational capabilities.

4 GIG IA Functional Solution Analysis (FSA) Assessment

This section of the report presents the questions used by the PIA Team to assess the GIG IA FSA. It is presented with the series of questions used in the assessment, followed by the Findings and the Recommendations submitted by the PIA team in response to those questions.

4.1 Was a DOTMLPF analysis performed for each FNA-identified gap and/or shortfall?

Findings: Although there is a list of “solution areas” for each of the five GIG IA Capabilities, it is not clear whether the list provides a point of departure to begin assessing whether the ideas offer alternatives that could be examined more fully in a follow on analysis.

Recommendation:

- √ An integrated DOTMLPF analysis of the complete set of ideas for solution approaches across all five capability areas should be completed.
- √ Completion of that analysis should use the identified candidate DOTMLPF “solutions” as the basis for examining the potential solution space within the AoA activity that will refine the ICD area of focus.

4.2 Was the expertise of DoD leveraged to identify ideas for solution approaches?

Findings: The GIJWG members were invited to participate in the analysis effort, but there is concern that not all organizations chose to participate, and many organizations did not provide consistent representation or the appropriate level of representation. The lack of documented analysis and information on the FSA identifies the need for clearer documentation to permit a PIA assessment of the participation level of DoD in the FSA.

Recommendation:

- √ Document the participation of DoD in the FSA; presented as “military SMEs” only, which would tend to exclude other members of the community.
- √ Community review and socialization of the GIG IA JCIDS analysis, ICD, and strategy for overall IA capabilities development should be enhanced.
- √ Increase the level of participation and attendance at GIJWG meeting, particularly with respect to Service and government representation. |
- √ Increase the opportunity for GIJWG interaction.

4.3 Did the ideas for solution approaches consider existing and planned programs?

Findings: There was not sufficient information provided to determine whether or not the ideas for solution approaches considered both existing and planned programs. Further, it was not clear if the “solutions” addressed the 2020 timeframe, if the timeframe for this effort is 2008-2020.

Recommendation:

- √ Demonstrate that the solution approaches are clearly linked to both current and planned programs, as well as linked to the defined overall timeframe for the GIG IA ICD.

4.4 Was an Analysis of Materiel Approaches (AMA) performed?

Findings: The presented materials indicated the AMA was performed. Section 6.4 of the draft GIG IA ICD states, “Analyses of potential materiel solutions in each IA capability area, to include examination of potential technology solutions and commercial alternatives, will be conducted as part of the Analysis of Alternatives (AoA) during the development of Capability Development Documents (CDDs) for specific IA materiel solutions.” Subsequent to this statement, the draft ICD claims to perform an AMA based on three future states – not materiel solutions. It then ponders three options for future types of materiel solutions – Steady State, Enhancement of Existing Systems, and Enterprise-wide Coordinated IA Architecture. Unfortunately, the follow-on paragraphs offer few new insights. As a result, there is no evidence the AMA was performed and the strategy to defer to an AoA precludes fully defining the scope of the ICD as well as the subsequent AoA activities necessary to craft a viable program strategy for acquisition or DCR submission. Such a lacking limits the confidence in the analysis and that it sufficiently prepares the GIG IA effort for drafting an ICD with proper scope and focus. Such a risk should be evaluated in terms of the longer term “capabilities / requirements creep” that may likely accrue given the lack of analytic completeness.

Recommendation:

- √ Address the AMA requirement during the staffing of the draft GIG IA ICD. By pursuing a refinement of the candidate “solution” areas in concert with the ICD staffing, community input will be obtained and should serve to complete the AMA functionality to a level sufficient to scope the ICD and prepare for AoA definition.

4.5 Did the AMA remain focused on potential approaches and avoid specific system recommendations?

Findings: The AMA was not performed.

Recommendation:

- √ Perform an “AMA functional” assessment to obtain Community input on the candidate approaches for satisfying the GIG IA capabilities. This work should be complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

4.6 Did the FNA sponsor coordinate with JS J-8 CAD for recommendations on the need for an independent AMA?

Findings: No information was presented to indicate whether this was accomplished.

Recommendation:

- √ The GIG IA JCIDS analysis team should coordinate with JS J-8 CAD for recommendations when developing their plan to perform an AMA activity leading to completion of ICD staffing. This work should be complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

4.7 Were the integrated DOTMLPF considerations of all solution approaches considered?

Findings: There is a lack of integrated DOTMLPF analysis. Additionally, there was concern that the FSA team did not include sufficient representation from all of the services and the enterprise areas of Battlespace Awareness and Logistics.

Recommendation:

- √ The analysis team should accomplish the FSA with sufficient Service and COCOM representation and a stated goal of defining an integrated approach, performing that activity to obtain full community input on the functional solutions that address needed GIG IA capabilities. This work should be complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

4.8 Did the AMA produce a list of prioritized solution approaches based on potential effectiveness at meeting the tasks, conditions, and standards identified?

Findings: It was not apparent in the FSA that a prioritized list of solution approaches was identified.

Recommendation:

- √ Perform an “AMA functional” assessment to obtain Community input on the candidate approaches for satisfying the GIG IA capabilities. This work should be

complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

4.9 *Did the AMA prioritization include data on technology maturity, risk, supportability, and affordability?*

Findings: No.

Recommendation:

- √ Perform an “AMA functional” assessment to obtain Community input on the candidate approaches for satisfying the GIG IA capabilities. This work should be complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

4.10 *Does the AMA address the timing and coordination of delivery ability with needs?*

Findings: No.

Recommendation:

- √ Perform an “AMA functional” assessment to obtain Community input on the candidate approaches for satisfying the GIG IA capabilities. This work should be complete prior to the finalization of the ICD so that it has the opportunity to influence the ICD.

5 Summary of Analysis Findings

This section of the report presents the question used by the PIA Team to provide a summary assessment of the GIG IA analysis. The question asked was, “Is the JCIDS Analysis complete and thorough?”

Findings: While it is apparent that a lot of quality work took place in order to provide a thorough analysis of the functional areas and needs, it does not appear to be complete. The tracing of capability needs must be better and more clearly linked from the National Strategies and Functional Concepts, through the FAA and FNA, to the proposed solution sets. Forward and backward tracing (documents to solutions, and solutions back to national strategies and JFCs) is vital. As noted throughout the review of the FAA, FNA, and FSA, there is a lack of clear traceability to the joint concepts, joint tasks, and overarching strategic guidance. The intent of the effort is clear, yet the analytic process and presented materials require bolstering as part of moving forward to an ICD at this point. Multiple comments regarding “we are under a time constraint”, “we have high level interest”, and “we have to get this done” were noted. While the GIG IA is an important item in the overall transformation of DoD and IC capabilities, there is level of risk that is incurred by moving forward with incomplete analysis and lack of a clearly defined program scope. In this case both exist. The key question that must be answered by those making decisions about the GIG IA program is – are we comfortable with accepting program risk before even entering into a capabilities definition effort? Or, should we take the time to refine the up front scope and focus of the GIG IA effort to avoid potential program definition issues as we move into the program? From a historical systems engineering perspective, the choices made at the beginning will drive the majority of program cost and schedule issues. It may be useful to expend a bit more time completing the JCIDS analysis before entering into an ICD creation effort. The present ICD reflects a series of information needs that cannot be filled with the present set of JCIDS analysis and yet require such analysis to fill those needs. See Appendix D for additional classified findings.

Recommendations:

- √ Perform additional analysis of material approaches in the FSA area to provide refined GIG IA JCIDS analysis and briefing materials to show clear traceability to strategy and concept documents throughout the process.
- √ Review the FNA Use Cases for completeness and consistency with the DoD Analytic Agenda.
- √ Complete an Analysis of Materiel Approaches.
- √ Review and socialize the GIG IA JCIDS analysis, ICD, and strategy for overall IA capabilities.
- √ Adopt the suggested approach to ICD staffing, FAA / FNA documentation and FSA / AMA in concert with GIG IA ICD staffing should permit completeness in the JCIDS analysis effort.

6 Recommendations

This section of the report presents the questions used by the PIA Team to assess the aspects of the FAA, FNA and FSA as they apply to the GIG IA ICD. It is presented with the series of questions used in the assessment, followed by the observations submitted by the PIA team in response to those questions.

6.1 Determine/concur with recommendations on the best solution approaches based on cost, efficacy, performance, technology maturity, delivery timeframe, and risk

The PIA analysts concurred that the list of recommended solutions approaches and topic areas presented as the results of the FSA was reasonable; however, the panel was unable to determine the best solution approaches due to the lack of a rigorous AMA. It is recommended a rigorous AMA be conducted to augment the presented FSA results.

It is likely that most of the materiel solution approaches identified in the FSA will require further analysis and technology development. However, there is not a sufficient amount of data in the FSA to make recommendations on the development of specific solution approaches. Based upon the limited analysis data, "Defending the GIG" and "Provide Assured Information Sharing" are probably the most important areas in which to pursue further development. It is recommended that network management infrastructure be the first focus area, specifically working towards the enhancement of digital signatures use, which requires the establishment of trustworthy certificate authorities. Such trustworthy mechanisms directly support the integrity thrust, and can serve as a foundation for the other thrusts.

6.2 Determine which recommended approaches should be further developed in Concept Refinement and/or Technology Development.

It is difficult to make recommendations on potential acquisition approaches with the limited FSA data. The complexity, depth, and breadth of the IA capabilities needed to enable the GIG vision also makes it difficult to provide a consolidated acquisition strategy recommendation.

An integrated analysis of solutions across the five capability areas should be performed in order to develop the best set of coordinated, integrated DOTMLPF solution approaches. If the analysis is structured into those five major groupings, this would serve to help define the AoA activities following the approval of the GIG IA ICD and permit the definition of specific capability developments that would be submitted as either capabilities documents or as DOTMLPF Change Requests.

It is critically important to obtain a joint effort / participation and designate ownership

in several aspects critical to the GIG-IA implementation. Rather than maintaining separate offices (AF, Army, Navy, DISA) addressing Cross-Domain Solutions (CDS), establishment of a Joint CDS Program Office may be needed and should be explored further (as mentioned in the Assured Information Sharing, DOTMLPF). A unified approach to developing and implementing Cross-Domain solutions is imperative for GIG interoperability.

Similarly, the “need to know” and “need to share” policy balance should be pursued and adjusted. In some ways NSA is bound by governing policy and guidance for information sharing based on classification level and the associated risks. We (the warfighter and IC communities) need to establish new paradigms or rules for what is allowable communications in a coalition environment and train the cross-domain decision makers to make those suitable cross-domain decisions.

In order to inform the technology development aspects of the GIG IA effort, it may be useful to discuss the Product / Technology Roadmap activities pursued being defined by the NSA Network Infrastructure and Technology (I232) office. The identified technology gaps and potential roadmap to addressing those gaps may offer but one example of the resources the GIG IA effort could leverage.

Following such an approach and further defining the key areas necessary to assure GIG IA capabilities will identify the areas that require further concept refinement or technology development. Again, as part of the three-pronged strategy, such candidates should emerge during the ICD staffing and interaction with the community to vet and expand the initial solutions offered in the initial FSA-like activity.

6.3 Analysis of Alternatives (AoA) considerations

The lack of FSA data precluded the ability to recommend AoA boundary conditions and constraints. Given the broad nature of GIG IA, the ICD may support the need for multiple CDDs and CPDs. Further, the FoS and SoS materiel approaches that will be required may need to be delivered by multiple sponsors and materiel developers. Thus, a series of AoAs may be needed to refine GIG IA capability gap solution approaches. The AoAs should be coordinated by the GIJWG to minimize overlap and ensure coverage of all necessary areas, and be linked to specific capability document creation as part of the overall capability documentation tree and related development strategy.

6.4 Overall Non-Materiel Implications

Pending the refinement of the FSA, there are some initial areas where there will be significant non-materiel implications.

A significant non-materiel implication of GIG IA capabilities development is governance. GIG IA capabilities development will need an Implementation Plan to

coordinate Architecture, JCIDS, and other programmatic documentation, interdependencies and milestones. As the sponsor of the GIG IA ICD and the Chair of the GIJWG, NSA will need to oversee and coordinate all IA JCIDS documentation. A key step in this effort is to create a draft GIG IA JCIDS documentation tree which provides an initial representation of the relationship between the probable capabilities documentation that will be associated with the recommended materiel solutions in the GIG IA ICD with current and planned program capabilities documentation. The next step will be coordinating with the lead IA capabilities development organizations of the Services, COCOMs, and Agencies to refine the document tree.

It is important to obtain IA community participation and designate ownership in several aspects critical to the GIG IA implementation. For example, rather than maintaining separate offices (AF, Army, Navy, DISA) addressing Cross-Domain Solutions (CDS), a Joint CDS Program Office is needed and should be explored further (as recommended in the Assured Information Sharing DOTMLPF analysis). A unified approach to developing and implementing Cross-Domain solutions is imperative for GIG interoperability.

Substantial doctrinal changes need to be made across DoD and the IC to establish enterprise-wide digital policy, data policy (sensor, metadata, protection – rest, transit, data based, shared across domains, availability), and perimeter protection policy. Additionally, the “need to know” and “need to share” policy balance should be pursued and adjusted. In some ways NSA is bound by governing policy and guidance for information sharing based on classification level and the associated risks. The warfighter and IC communities need to establish new paradigms or rules for what is allowable communications in a coalition environment and train the cross-domain decision makers to make those suitable cross-domain decisions.

Substantial effort in CNO will require a re-education of the workforce in policy, tools, and decision-making. The recommendation to create a Defense IA University should include training that:

- Describes the policies and usage of the five IA capabilities
- Provides for adequate leadership and education
- Initiates the IA/CND as a core competency

A Defense IA University should leverage the nearly 70 Universities that have already been deemed Centers of Excellence and which offer IA or Information Operations curricula.

This may be an avenue to implement a part of the DOTMLPF Leadership/Education solution. A valuable non-materiel solution with high impact would be to implement a DoD-wide plan in which knowledgeable people are selected and groomed to establish GIG IA, with the expectation and motivation for them to stay with that effort over at least a 5-8 year period.

The GIG IA JCIDS analysis team should begin identifying specific non-materiel solutions, or sets of solutions, that should be documented in DOTMLPF Change Recommendations (DCRs) and work through the appropriate sponsoring organization for formal drafting and coordination. That identification should be done in concert with the materiel activities, to ensure the overall IA approach remains concordant.

6.5 Describe any AoA constraints, boundary conditions, or other recommendations.

DoD's reliance on commercial technology limits the DoD's ability to change when that change is not in line with commercial approaches. A potential GIA IA programmatic strategy is to 'ride the wave', rather than swim against the current. In other words, if the commercial trend today is for availability and agility, implement that aspect of the GIG IA now. Most of the DoD's GIG needs are in-line with inevitable commercial needs.

Do not inappropriately assume that tactical needs are the same as non-tactical ones. The needs and solutions sets may be so different that it may be prudent to take different strategies in achieving them.

Consider the GIG to be a national asset, consistent with the recommendations in classified Appendix D.

7 Conclusions

Approaches identified in the FSA of the GIG IA JCIDS analysis characterize materiel and non-materiel alternatives that should be documented in a GIG IA ICD for submittal to the Joint Staff in order to support JS J-6 and OASD(NII) during Program Review 07 and Program Objective Memorandum 08.

Overall, the PIA Analysts concluded:

- While it is apparent that a lot of quality work took place in order to provide a thorough analysis of the functional areas and needs, it does not appear to be complete
- The GIG IA JCIDS analysis and briefing materials need refinement to demonstrate clear traceability to strategy and concept documents throughout the process.
- The FNA Use Cases must be reviewed for completeness and consistency with the DoD Analytic Agenda.
- A more complete FSA and accompanying Analysis of Materiel Approaches (AMA) will be needed.
- While the overall FAA / FNA / FSA processes require refinement, the shortcomings in the process identified by the PIA offer solid recommendations for enhancing the GIG IA ICD.
- The draft ICD reflects a series of information gaps that cannot be filled with the present set of JCIDS analysis; yet such analysis is required to complete the ICD.
- The process shortcomings identified in the PIA can be remedied without delaying the ICD processing if PIA recommendations are implemented.
- The ICD should not be finalized until additional use cases are completed, factored into the process, and accommodated in the ICD.

Approaches identified in the FSA of the GIG IA JCIDS analysis characterize materiel and non-materiel alternatives that should be documented in a GIG IA ICD for submittal to the Joint Staff in order to support JS J-6 and OASD(NII) during Program Review 07 and Program Objective Memorandum 08. As noted, the materiel and non-materiel approaches require further definition and assessment prior to completion of the ICD staffing and approval. Adopting a three-pronged strategy consisting of ICD community review, FAA / FNA analysis documentation improvements, and further FSA / AMA definition may offer an approach leading to sound underpinnings for the GIG IA capabilities definition. This may then lead to a defined and executable follow-on Analysis of Alternatives (AoA) and capabilities documentation strategy.

Appendix A – Glossary and Acronym List

GIJWG	GIG IA JCIDS Working Group
BA	Battlespace Awareness
C2	Command and Control
DHS	Department of Homeland Security
DoD	Department of Defense
FAA	Functional Area Analysis
FNA	Functional Needs Analysis
FP	Force Protection
FSA	Functional Solutions Analysis
GIG	Global Information Grid
GWOT	Global War on Terror
IA	Information Assurance
IC	Intelligence Community
ICD	Initial Capabilities Document
ICEA	Intelligence Community Enterprise Architecture
JCIDS	Joint Capabilities Integration and Development System
JFC	Joint Functional Concept
JIC	Joint Integrating Concept
JOC	Joint Operating Concept
JOpsC	Joint Operations Concept
JV	Joint Vision
NCOW	Net-centric Operations and Warfare
OASD(NII)	Office of the Assistant Secretary of Defense for Networks and Information Integration
OV	Operational View
UJTL	Universal Joint Task List

Battlespace Awareness (BA) – Knowledge and understanding of the operational area's environment, factors, and conditions, to include the status of friendly and adversary forces, neutrals and noncombatants, weather and terrain, that enables timely, relevant, comprehensive, and accurate assessments, in order to successfully apply combat power, protect the force, and/or complete the mission.

Command and Control (C2) – The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. [

Department of Homeland Security (DHS) – Agency that mobilizes and organizes our nation to secure the homeland from terrorist attacks, and provides the unifying core for the vast national network of organizations and institutions involved in efforts to secure the homeland.

Department of Defense (DoD) – The DoD is the federal government agency that formulates national security and defense policy and integrates policy to achieve security objectives.

Functional Area Analysis (FAA) – An FAA identifies the operational tasks, conditions and measures of effectiveness needed to achieve military objectives. It uses the national strategies, Joint Operations Concept (JOpsC), Joint Operating Concepts (JOC), Joint Functional Concepts (JFC), Joint Integrating Concepts (JIC), Integrated Architectures (as available), and the Universal Joint Task List (UJTL) as input. Its output is the tasks to be reviewed in the follow-on functional needs analysis. The FAA includes cross-capability and cross-system analysis in identifying operational tasks, conditions and standards.

Functional Needs Analysis (FNA) – An FNA assesses the ability of the current and programmed joint capabilities to accomplish the tasks that the FAA identified, under the full range of operating conditions and to the designated standards. Using the tasks identified in the FAA as primary input, the FNA produces as output a list of capability gaps or shortcomings that require solutions, and indicates the time frame in which those solutions are needed

Force Protection (FP) – Any collection or combination of measures to prevent or mitigate damage or disruption to an aggregation of military personnel, weapon systems, vehicles, installations, or support

Functional Solutions Analysis (FSA) – The FSA is an operationally based assessment of potential DOTMLPF approaches to solving (or mitigating) one or more of the capability gaps (needs) identified in the FNA. The FSA's outputs are potential solutions to needs, including in order of priority: integrated DOTMLPF changes; product improvements to existing materiel or facilities alone; adoption of interagency or foreign materiel solutions that have limited non-materiel DOTMLPF consequences; and finally, new materiel starts that have limited non-materiel DOTMLPF consequences

Global Information Grid (GIG) – The globally interconnected, end-to-end set of information capabilities associated processes and personnel for collecting, processing, storing, disseminating, and managing information on demand to warfighters, policy makers, and support personnel. The GIG includes all owned and leased communications and computing systems and services, software (including applications), data, security services and other associated services necessary to achieve information superiority. It also includes National Security Systems as defined in section 5142 of the Clinger-Cohen Act of 1996. The GIG supports all Department of Defense, National Security Systems, and related Intelligence Community missions and functions (strategic, operational, tactical and business), in war and in peace. The GIG provides capabilities from all operating locations (bases, posts, camps, stations, facilities, mobile platforms and deployed sites). The GIG provides interfaces to coalition, allied, and non-DOD users and systems.

Global War on Terror (GWOT) – The GWOT is an effort encompassing military, diplomatic, and economic power conducted by the US government and its allies as they seek to combat international terrorism.

Information Assurance (IA) – Information operations that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality and non-repudiation. This includes providing for restoration of information systems by incorporating protection, detection and reaction capabilities.

Intelligence Community (IC) – The IC seeks to provide the President and the National Security Council with the necessary information on which to base decisions concerning the conduct and development of foreign, defense and economic policy, and the protection of United States national interests from foreign security threats.

Initial Capabilities Document (ICD) – Documents the need for a non-materiel or materiel approach to specific capability gap(s). It defines the capability gap(s) in terms of the functional area, the relevant range of military operations, desired effects and time. The ICD summarizes the results of the DOTMLPF analysis and the DOTMLPF approaches (materiel and non-materiel) that may deliver the required capability. The outcome of an ICD could be one or more joint DCRs or CDDs.

Joint Capabilities Integration and Development System (JCIDS) – JCIDS provides an enhanced methodology for identifying and describing capability gaps and proposals, and provides a broader review of proposals by bringing in additional participants including the acquisition community early in the process.

Joint Functional Concept (JFC) – A JFC is a description of how the future joint force will perform a particular military function across the full range of military operations 10-20 years in the future. JFCs support the JOpsC and JOCs and draw operational context from them. JFCs identify required capabilities and attributes,

inform JOCs, and provide functional context for JIC development and joint experimentation.

Joint Integrating Concept (JIC) – A JIC is a description of how a Joint Force Commander 10-20 years in the future will integrate capabilities to generate effects and achieve an objective. A JIC includes an illustrative CONOPS for a specific scenario and a set of distinguishing principles applicable to a range of scenarios. JICs have the narrowest focus of all concepts and distill JOC and JFC-derived capabilities into the fundamental tasks, conditions and standards required to conduct Capabilities-Based Assessment (CBA).

Joint Operating Concept (JOC) – A JOC is an operational-level description of how a Joint Force Commander, 10-20 years in the future, will accomplish a strategic objective through the conduct of operations within a military campaign. This campaign links endstate, objectives, and desired effects necessary for success. The concept identifies broad principles and essential capabilities and provides operational context for JFC and JIC development and experimentation.

Joint Operations Concept (JOpsC) – The JOpsC is an overarching description of how the future joint force will operate 10-20 years in the future in all domains across the range of military operations within a multi-lateral environment in collaboration with interagency and multinational partners. It guides the development of future joint concepts and joint force capabilities. The JOpsC establishes the unifying framework for the family of joint concepts, the attributes and broad strategic and operational tasks for the future joint force, a campaign framework for future operations, the broad context for joint experimentation, and the conceptual foundation for unified action towards implementing the military aspects of national strategy.

Joint Vision (JV) – A conceptual template for how to channel the vitality of our people and leverage technological opportunities to achieve new levels of effectiveness in joint warfighting.

National Aeronautic Space Administration (NASA) – NASA seeks to advance and communicate scientific knowledge and understanding of the Earth, the solar system, and the universe and use the environment of space for research; to explore, use, and enable the development of space for human enterprise; and to research, develop, verify, and transfer advanced aeronautics, space, and related technologies.

Net-centric Operations and Warfare (NCOW) – The combination of a powerful military force with information superiority, offering greater awareness of our own forces, the enemy, and the battlefield environment. Netcentric operations permit forces to focus on specific targets, protecting the lives of American and coalition forces, and non-combatants.

Office of the Assistant Secretary of Defense Networks and Information Integration (OSD (NII)) – OSD (NII) seeks to make information available on a

network that people depend on and trust, populate the network with new, dynamic sources of information to defeat the enemy, and deny the enemy information advantages and exploit weakness to support Network Centric Warfare and the transformation of DoD business processes

Operational View (OV) – An OV is a description of the tasks and activities, operational nodes, and information exchanges between nodes.

Universal Joint Task List (UJTL) – UJTL is a menu of capabilities (mission-derived tasks with associated conditions and standards, i.e., the tools) that may be selected by a joint force commander to accomplish the assigned mission. Once identified as essential to mission accomplishment, the tasks are reflected within the command joint mission essential task list.

Appendix B – PIA Participants

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Appendix C – PIA Analysis Criteria

#	Analysis	Evaluation criteria
1.1	FAA	Is the FAA derived from national strategies, JOpsC, JOCs, JFCs, JICs, and UJTLs applicable to the mission area?
1.2	FAA	Does the FAA identify the tasks, conditions, and standards needed to achieve military objectives within the mission area analyzed?
1.3	FAA	Do capability statements include attributes and measures of effectiveness?
1.4	FAA	Are capability statements general enough that they don't predispose solution recommendations?
1.5	FAA	Was the FAA conducted as a collaborative effort?
1.6	FAA	Were FAA-derived tasks submitted to DIA for an ITWA?
2.1	FNA	Does the FNA assess the ability of current and planned Joint capabilities to accomplish the tasks identified in the FAA under the full range of conditions and to the standards required?
2.2	FNA	Did the FNA produce a list of capability gaps and/or shortfalls?
2.3	FNA	Does the FNA identify the timeframe in which solutions are needed?
2.4	FNA	Does the FNA consider gaps or problems identified in COCOM IPLs?
2.5	FNA	Was the FNA informed by an ITWA?
2.6	FNA	Does the FNA discuss attributes that would resolve the gap with a link to the UJTLs?
2.7	FNA	Does the FNA use JROC-approved metrics from integrated architectures or propose metrics?
3.1	FSA	Was a DOTMLPF analysis performed for each FNA-identified gap and/or shortfall?
3.2	FSA	Was the expertise of DoD leveraged to identify ideas for solution approaches?
3.3	FSA	Did the ideas for solution approaches consider existing and planned programs?
3.4	FSA	Was an Analysis of Materiel Approaches (AMA) performed?
3.5	FSA	Did the AMA remain focused on potential approaches and avoid specific system recommendations?
3.6	FSA	Did the FNA sponsor coordinate with JS J-8 CAD for recommendations on the need for an independent AMA?
3.7	FSA	Were the integrated DOTMLPF considerations of all solution approaches considered?

3.8	FSA	Did the AMA produce a list of prioritized solution approaches based on potential effectiveness at meeting the tasks, conditions, and standards identified?
3.9	FSA	Did the AMA prioritization include data on technology maturity, risk, supportability, and affordability?
3.10	FSA	Does the AMA address the timing and coordination of delivery ability with needs?
4.1	Overall	Is the JCIDS Analysis complete and thorough?
5.1	PIA	Determine/concur with recommendations on the best solution approaches based on cost, efficacy, performance, technology maturity, delivery time frame, and risk.
5.2	PIA	Determine if recommended approaches should be documented in an ICD and/or DCR for further community review and development.
5.3	PIA	Determine which recommended approaches should be further developed in Concept Refinement and/or Technology Development.
5.4	PIA	Describe potential acquisition approaches and recommendations.
5.5	PIA	Describe any AoA constraints, boundary conditions, or other recommendations.
5.6	PIA	Describe overall non-materiel implications and make recommendations.

Appendix D – Classified Appendix (Under Separate Cover)