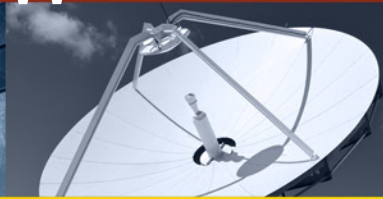


NSG STANDARDS REGISTRY

NSGREG.NGA.MIL

YEAR IN REVIEW



2011

WWW.GWG.NGA.MIL



GEOSPATIAL INTELLIGENCE STANDARDS WORKING GROUP

TABLE OF CONTENTS

PREFACE.....	5
SECTION 1: 2011 ACCOMPLISHMENTS.....	6
1.1 Overview.....	6
1.2 GWG Focus Groups.....	6
1.3 Country Codes Working Group.....	10
1.4 New Guidance for ISR Operations.....	10
1.5 GEOINT Structure Implementation Profile (GSIP).....	10
1.6 Topographic Data Stores.....	10
1.7 Overhead Persistent Infrared (OPIR).....	10
1.8 NATO Recognizes Role of Human Geography.....	11
1.9 NSG Metadata Foundation Update.....	11
1.10 Open Geospatial Consortium Interoperability Testbed.....	11
1.11 Enabling LiDAR Interoperability.....	12
1.12 Standardization of Elevation Data Products.....	12
1.13 Still Imagery Standardization Support to Emerging Capabilities.....	13
1.14 Standards-Compliant Sensor Models and Applications.....	13
1.15 Community Sensor Model (CSM) Technical Requirements Document (TRD), Version 3.0, 2010-11-15.....	14
1.16 World Geodetic System and Geomatics (WGSG).....	14
1.17 Global Information Grid Technical Profile for GEOINT Visualization Enterprise Services.....	14
1.18 GWG Awards Program.....	15
SECTION 2: GWG MOVING FORWARD – 2012.....	16
2.1 NSG Standards Registry – Developer’s Toolkit for Capability-Based Standards.....	16
2.2 NSG Portrayal Registry.....	16
2.3 Joint OPIR Ground Study Identified Data Standards Requirements.....	16
2.4 Expand Wide Area Motion Imagery Standardization Efforts.....	16
2.5 New NITF Implementation Guidance.....	17
2.6 NSG Metadata Foundation.....	17
2.7 Country Codes Working Group.....	17
2.8 OGC Open Web Services 9 Testbed 2012.....	17
APPENDIX A: GWG BACKGROUND.....	19
APPENDIX B: STANDARDS DEVELOPMENT FORUM.....	24
Table 1: GWG Focus Groups - Scope and Accomplishments Overview.....	6
Table 2: GEOINT Standards Baseline.....	20
Table 3: 2011 GWG Core Membership Roster.....	22
Figure 1: Standardization of Elevation Data.....	12
Figure 2: Sensor Models- Enabling the Evolution of the MSP.....	13
Figure 3: Joint Architecture Reference Model (JARM): 10 Layer Model.....	22

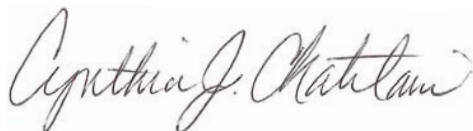
P R E F A C E

We are pleased to present the 2011 Geospatial Intelligence Standards Working Group (GWG) Annual Report. This report contains highlights of GWG 2011 activities and accomplishments along with a glimpse forward into 2012 and the anticipated activities planned for the upcoming year. All members of the National System for Geospatial-Intelligence (NSG) interested in supporting any of these activities are invited and encouraged to participate in the GWG.

The GWG serves as a U.S. Department of Defense (DoD), Intelligence Community (IC), Federal, and Civil community-based forum to advocate for IT standards and standardization activities related to geospatial intelligence (GEOINT). In this capacity, the GWG supports the Director, National Geospatial-Intelligence Agency (NGA) and the NGA Chief Information Officer in carrying out GEOINT Functional Manager responsibilities. As the NSG functional manager, NGA Director Letitia Long articulated her thoughts on this role in the November/December issue of the Geospatial Intelligence Forum publication. "My primary responsibility is the development, coordination and promulgation of standards across the NSG that apply to GEOINT systems, collectors, training and tradecraft. Effective management of standards serves to bind our community together, keep us in pace with industry common practices, and ensure interoperability of our technological solutions."

To further the development, coordination, and promulgation of GEOINT standards, the GWG provides community leadership and management of GEOINT standardization activities for the NSG. In its coordinating and advisory role, GWG activities extend to all aspects of GEOINT standardization, to include but not limited to issues related to GEOINT standards identification, adoption, promulgation, implementation, compliance, and education. These GWG GEOINT standards activities further the intent and direction highlighted in the IC IT Enterprise initiative, an initiative designed to increase IT efficiencies across the IC.

Once again, we would like to acknowledge and thank the members of the GWG. Their hard work and dedication to furthering the GEOINT mission allows for the continued success and accomplishments of the GWG. Please visit us at www.wgw.nga.mil or contact us at NCGIS-Mail@nga.mil.



CYNTHIA J. CHATELAIN
NGA, Chairman, GWG
Director, National Center for Geospatial Intelligence Standards
Deputy Director, Enterprise Architecture & Standards



DR ROBERT C. NORRIS
NGA, Director, Enterprise Architecture
& Standards

1.1 Overview

The GWG serves as the standards-focused forum for the NSG community to address and advance GEOINT standards requirements. Significant GWG highlights for 2011 include advancements in addressing the emerging standards requirements to support the human geography domain and an agreement with the North Atlantic Treaty Organization (NATO) to coordinate closely on the GWG developed human geography models. Additional highlights include the establishment of new guidance to support ISR operations, addressing safety of navigation requirements through a new version of the GEOINT Structure Implementation Profile, and the fastracking of OPIR standards for implementation. 2011 also saw significant NSG Metadata Foundation enhancements and compliance successes, and a successful Open Geospatial Consortium Interoperability Testbed activity.

The following sections provide an overview of the significant GWG activities and accomplishments from 2011. Background information regarding the GWG can be found in Appendix A, located at the end of this report.

1.2 GWG Focus Groups

The Focus Groups direct the development, evolution, and assessment of proposed and adopted GEOINT standards and related systems, technology standards for the NSG, and the associated technical architectures. They perform this function by serving as a community forum in which pertinent standards are organized into a coherent body of work and are then implemented into DoD and IC system developers' architectures. Focus Groups report their findings and make recommendations for action to the GWG. Focus Group participants work with and/or monitor key DoD/IC, Federal, Allied, Civil (national and international), and Commercial standards bodies to foster standards that address NSG service provider and end-user requirements. As a result of their engagement, Focus Groups are then able to identify new standards to propose for inclusion in the DISR/ICSR by submitting a Change Request for GWG Core member voting. Change Request recommended actions include adding new mandated and emerging standards, elevating emerging standards to mandated status, and retiring standards (often to be replaced with new versions or new standards that support new technologies). Table 3 provides an overview of the Focus Group's scope and 2100 accomplishments. Section 2 of this report provides details on many of the 2010 accomplishments.

Table 1: GWG Focus Groups - Scope and Accomplishments Overview

GWG Focus Groups - Scope and Accomplishments Overview

Application Schemas for Feature Encoding Focus Group (ASFE)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> Data structures, exchange & storage of GEOINT Data format, feature & attribute coding schemes Exchange media, administrative procedures, representations of geographic feature geometry, feature attribution information, & other geographic information Development of the GEOINT Structure Implementation Profile Human Geography Working Group (HGWG) Ground Warfighter Standards Working Group (GWWG) 	<ul style="list-style-type: none"> 80% modeling complete for Human Geography standardization establishing an NSG consensus on a common encoding for HG standards as GEOINT information for system development. NATO acceptance of GEOINT Structure Implementation Profile (GSIP) as basis for NATO Standardization agreement, enhancing the US -NATO data exchange standards relationship by 'globalizing' the suite of NSG standards. NFDD, NEC, NAS 4.0 released supporting Global Navigation and enhanced Topographic Data increasing the data quality and usefulness of TFD and GNS data stores collections across the NSG. Stand-up of Ground Warfighter Standards Working Group (GWWG) establishing a forum for the ground warfighter community (Army/Marine Corps) to agree on specific data exchange standards and mechanisms to increase data reuse and interoperability in the field. Crossed non-GEOINT bridge with acceptance of AT&L SDSFIE and AF T3D schemas demonstrating cross domain interoperability between the real property domain, the command and control community, and GEOINT.

GWG Focus Groups - Scope and Accomplishments Overview

Community Sensor Model Working Group (CSMWG)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> • Sensor models for GEOINT services • Production & application standards for interoperable sensor models • Interoperable sensor models to enable the efficient collection, production & distribution of GEOINT source materials 	<ul style="list-style-type: none"> • Developed and issued fully staffed and coordinated Version 3 to the Community Sensor Model (CSM) Technical Requirements Document (TRD), Version 2.1, Frame Sensor Model Metadata Profile Supporting Precise Geopositioning, and Version 1.1 of the Light Detection and Ranging (LIDAR) Sensor Model Supporting Precise Geopositioning. This new version supports continued migration to sensor agnostic mensuration and strengthening of CSM compliant Sensor Models • Provided critical technical support to NGA/S Enhanced View initiative for integration and implementation of CSM. This contributed to the success of the NGA contract for CSM compliant sensor models from commercial providers • Enhanced and maintained CSM Conformance and Performance testing software under strict configuration management which ensured the process was requirements driven. • Provided to sensor acquisition program offices CSM conformance/performance test plans for pre-FAT, FAT and post-FAT which demonstrated NGA's commitment as GEOINT FM to provide leadership and management • Developed and validated the CSM 'Next' plan for initiation during CY 2012 • Will continue to reduce cost to government for the development of CSM compliant sensor models. Reduces technology risk by including lessons learned by NGA over the last decade. Integrates new technologies for continues interoperability enhancement in the era of 'Big Data'

Geospatial Web Services Focus Group (GWS), formerly the Information Transfer Services Architecture Focus Group (ITSA)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> • Transferring GEOINT between environments - the movement of information from one system to another, that provide for posting, discovery, access, & analysis of GEOINT data stores & information stores in a distributed, real-time environment • GEOINT services & GEOINT service architecture standards -technologies that enable service chaining interoperable service components • Standards of interest to developers of services and service architecture components within a distributed, collaborative, geospatial environment, & by advanced designers of service algorithms, service chains, & service-to-service interfaces. 	<ul style="list-style-type: none"> • Adoption of OGC Web Coverage Service 2.0 as an emerging standard. WCS2.0 implements the GML Coverage application schema making exchange of coverage data between WCS and other OGC services much easier. • Adoption of OGC GML Simple Features Profile 2.0 as an emerging standard. GML SF defines a restricted set of GML and facilitates the ability to use WFS for interoperable feature data exchange with much less software development investment. • Adoption of ISO 19142 (OGC Web Feature Service) 2.0 as an emerging standard. WFS offers direct fine-grained access to geographic information at the feature and feature property level. Version 2.0 offers significant improvements over the previous version. • Adoption of ISO 19143 (OGC Filter Encoding) 2.0 as an emerging standard. FE is a companion document for use with the OGC WFS standard as well as others. FE defines a standardized method for expressing queries to OGC web services including WFS 2.0. • Adoption of OGC Sensor Planning Service 2.0 as an emerging standard. SPS defines interfaces for queries that provide information about the capabilities of a sensor and how to task the sensor. This is one of several new sensor standards that make up the interoperable Sensor Web Enablement (SWE) version 2.0 suite of standards. • Adoption of OGC SWE Common 2.0 as an emerging standard. SWE Common defines low level data models for exchanging sensor related data in a self describing and semantically enabled way. This is one of several sensor standards that make up the interoperable Sensor Web Enablement (SWE) version 2.0 suite of standards. • Adoption of OGC SWE Service Model 2.0 as an emerging standard. The Service Model defines data types for common use across OGC Sensor Web Enablement (SWE) services. This is one of several version 2.0 sensor standards that make up the interoperable Sensor Web Enablement (SWE) suite of standards. • Adoption of OGC Table Joining Service (TJS) 1.0.0 as an emerging standard. TJS defines a simple way to describe and exchange tabular data that contains information about geographic objects. This standard is useful in open source data collection. • Successful completion of OGC Open Web Services Testbed 8 (OWS-8). Numerous new capabilities were developed and several existing capabilities were refined as a result of OWS-8. Details on the results of OWS-8 are included below.



GWG Focus Groups - Scope and Accomplishments Overview

Metadata Focus Group (MFG)

Scope

- Imagery, sensor & geospatial metadata
- Coordination of activities between various recognized standards development organizations & standardized metadata across respective communities

2011 Accomplishments

- Collaborated with the Standardized Metadata Tagging Service (SMTS), Consolidated Analytic Spatial Initiative (CASI) and Consolidated Product Database (CPD) developers to integrate metadata standards into their systems enhancing the discovery of GEOINT resources.
- Developed a draft standard for metadata describing the quality of a resource. This metadata will provide users with information they need to properly assess resources for access and use.
- Developed a mapping between motion imagery, still imagery, and foundation metadata elements capturing an enterprise view of metadata. This is a critical step toward providing users a single coherent view of enterprise metadata.

Motion Imagery Standards Board (MISB)

Scope

- Motion imagery, full motion imagery, & wide area motion imagery/large volume streaming data
- Tasking, collection, posting, processing, storage, exploitation, discovery, retrieval, & exchange of motion imagery
- Associated metadata, audio & other related media types)

2011 Accomplishments

- Automation of the Video-National Imagery Interpretability Rating Scale (V-NIIRS)-designed to support more efficient tasking and retrieval of FMV and WAMI data. The automated real-time machine rating of motion imagery provides the means to perform enterprise quality assurance and save storage and bandwidth by discriminating out valueless data and allowing the user to choose data based on interpretability. This capability improves sensor procurement by providing empirical repeatable acceptance testing for interpretability and assists in creating better system specifications.
- The second iteration of Engineering Guidelines 0903 Video Moving Target Indicator providing enhanced metadata for automated tracking algorithms. This iteration included the addition of the new data element VFeature. Based upon the Open Geospatial Consortium (OGC) Observations and Measurements (O&M) standard, it provided a robust, flexible, extensible mechanism for representation and exchange of feature information. VFeature allows tracker developers to select and exploit properties they determine to be most useful, without being constrained by a predefined set supporting vastly improved tracker performance for wide area motion imagery sensor systems.

National Imagery Transmission Format Standard (NITFS) Technical Board (NTB)

Scope

- Still imagery & gridded data, formats, & compression
- Graphical, textual, & other means to annotate imagery products
- Imagery-related support data & metadata
- Imagery-derived data & metadata, to include foundation data
- LiDAR
- Image Quality

2011 Accomplishments

- NITF 2.1 Implementation Profile for Tactical Hyperspectral Imagery (HSI) Systems will standardize NITF information content in this emerging category of GEOINT.
- The Sensor Independent Complex Data/Derived Data (SICD/SIDD) product specifications allow accurate description of Synthetic Aperture Radar (SAR) data regardless of the data's source sensor or processing system.
- Edition 2 of the Implementation Profile for TIFF and GeoTIFF aligns the profile with new NSG metadata standards.
- The LiDAR Conceptual Model and Metadata Dictionary (CMMD) for Enterprise Level 1 allows raw LiDAR data to be fully described and processed to higher levels without loss of information.



GWG Focus Groups - Scope and Accomplishments Overview

Overhead Persistent InfraRed (OPIR) Focus Group (OFG)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> OPIR remote sensing, data & metadata standards to foster net-centric data services OPIR data in a net-centric Service Oriented Architecture to improve support to operations & intelligence 	<ul style="list-style-type: none"> OPIR Level 3 Std Representative Return Data Model which supports data interoperability between disparate systems. OPIR Level 3 Standard, Representative Return Data Model: HDF5 Implementation Specification which allows the OPIR Community to store and organize the data in a common format. NITF Format Version 2.1 Implementation Profile for OPIR Scene Based Datasets which has the potential to allow access to OPIR data for thousands of users.

Portrayal Focus Group (PFG)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> Portrayal standards for the visual depiction of physical features & geographically referenced activities Visual symbolization of GEOINT & symbol design, for both digital display & hardcopy media Rules & behaviors of GEOINT symbols necessary to ensure consistent rendering Interoperability in the exchange of portrayal information 	<ul style="list-style-type: none"> The NGA Portrayal Standard for Local Topographic Data Store (LTDS) Data, Version 1.0 was published in June 2011 and enables standardized portrayal of 1:50,000 and 1:100,000 scale topographic maps generated from LTDS and other NGA data stores. It is being incorporated into commercial GIS products. The NGA Portrayal Standard for Global Topographic Data Store (GTDS) Data was published in December 2011 and enables standardized symbolization of a global level Tactical Pilotage Chart generated from GTDS and other NGA data stores. As with LTDS symbology, it will be incorporated into commercial GIS products. A portrayal registry was integrated with a feature portrayal service and prototyped in OGC OWS-8. This demonstrates the utility of a portrayal registry with OGC web map services and web feature services. NGA intends to maintain GEOINT symbology in a NSG Portrayal Registry in the future.

World Geodetic System (WGS) and Geomatics Focus Group (WGSG)

Scope	2011 Accomplishments
<ul style="list-style-type: none"> Earth Gravitational Models for the WGS Global Positioning System (GPS) Precise Ephemeris information GPS Navigation message replacement standards Geodetic Survey Standards Geotechnical Standards Accuracy and positioning standards 	<ul style="list-style-type: none"> Adoption of STANAG 7172 (Edition 2), Use of Geomagnetic Models, as a mandated standard, which establishes the World Magnetic Model as the preferred model of the Earth's magnetic field for use in military systems, to standardize how it is used, and to standardize the way in which magnetic information is supplied on geographic products.

1.3 Country Codes Working Group

In 1995 the National Institute of Standards and Technology (NIST) announced their intent to withdraw the standard FIPS 10-4, Countries, Dependencies, Areas of Special Sovereignty, and Their Principal Administrative Divisions. In 2008, the NIST officially withdrew FIPS 10-4. NGA acted as the maintenance authority for FIPS 10-4, and has continued in this role as many U.S. Government systems and programs currently rely on this standard.

Between 2006 and 2010, NGA began briefing the community on the impact of the NIST withdrawal of FIPS 10-4, and on the need to develop a way forward for the U.S. Government. In June 2011, the Undersecretary of Defense of Acquisitions, Technology and Logistics (USD/ATL) directed that the DoD migrate, by September 30, 2012, from the FIPS 10-4 standard to a U.S. profile of the ISO 3166. The U.S. Government is unable to adopt the ISO 3166 standard in its entirety because, by law, it is required to use names approved by the U.S. Board on Geographic Names (BGN). ISO 3166 contains inconsistencies and some conflicts with the BGN as well as with some U.S. State Department policies.

In December 2011, the GWG held an information session to introduce a new GWG Country Codes Working Group (CCWG) to the community. Established as a working group under the Metadata Focus Group, the CCWG will officially stand up in early 2012 and serve as the NSG and federal government's community forum to manage U.S. Government country codes requirements.

1.4 New Guidance for ISR Operations

In 2011, the Motion Imagery Standards Board (MISB) established new guidance in a number of key areas of concern to ISR operations. Image quality is one of these areas. The Video-National Imagery Interpretability Rating Scale (V-NIIRS, designed to support more efficient Tasking) can now be automatically computed from motion imagery sensors enabling the tool to measure and report quality of motion imagery. This effort supports NGA's mission through its strategic intent, Geospatial Data Architecture and Management (GDAM). A second key development, falls within the area of Processing and Exploitation. The Video Moving Target Indicator provides metadata support for automated tracking algorithms supporting the NGA mission through the improvement of data utility and usability.

1.5 GEOINT Structure Implementation Profile (GSIP)

In order to enhance cross-system interoperability, the NSG specifies the use of a common GEOINT Structure Implementation Profile (GSIP). The GSIP consists of an interdependent set of components that together define a common method for specifying and encoding GEOINT and related geospatial (e.g., Common Operational Picture and METOC) data in the NSG. The components that make up the GSIP are the NSG Feature Data Dictionary (NFDD), the NSG Entity Catalog (NEC) and the NSG Application Schema (NAS). The GSIP components were introduced into the DISR in 2007 as Version 2.0.

Version 4.0 was published in August 2011 satisfying requirements to update for Safety of Navigation data, particularly NGA Global Navigation System development, and the DISR mandated Topographic Data Stores, Littoral and Riverine Requirements, and continued alignment with the DGIWG Feature Data Dictionary (DFDD).

1.6 Topographic Data Stores

In 2011, the GWG updated the mandated NSG Topographic Data Store (TDS) Content Specification to ensure consistent NSG-wide geospatial data semantics, adopt common conditions for GEOINT collection/exchange, support net-centric geospatial services, and achieve geospatial data interoperability.

1.7 Overhead Persistent Infrared (OPIR)

The Overhead Persistent InfraRed Focus Group (OFG) standards work was selected as NGA's entry to the Director of National Intelligence's Technical Exposition for members of Congress and their staff. The OPIR standards have been fast tracked for implementation, beginning FY2012 by NGA Integrated Program Office. The full report is accessible to interested parties with access to the JWICS network at <http://www.dni.ic.gov/dni/ictexexpo/11/project8.htm>

In 2011, the OFG published two standards and an associated data model that the GWG reviewed and adopted as emerging standards: OPIR Level 3 Standard, Representative Return Data Model which presents a technology opportunity for the OPIR community to use a common data model and associated data dictionary to enable interoperability in a segment of the processing; the OPIR Level 3 Standard, Representative Return Data Model: HDF5 Implementation Specification which specifies the

Hierarchical Data Format implementation for version 1.0 of the Representative Return Data Model; and the National Imagery Transmission Format Version 2.1 Implementation Profile for OPIR Scene-Based Datasets which describes the application of the NITF2.1 file format for the dissemination of OPIR Scene-Based data generated by OPIR systems; the OPIR data product standard for Representative Returns; an associated common conceptual “Joint” OPIR Data Model (JODM), and an OPIR Scene to NITF Standard profile, which guides the conversion of OPIR scene-type data sets into NITF format multi-spectral imagery thus enabling interoperability with existing tools found on NSG workstations. These standards enable the diverse OPIR Community to use common data formats and tools to create OPIR products from multiple sensors for the warfighter to solve a wide range of intelligence problems much more rapidly than from today’s disparate systems.

1.8 NATO Recognizes Role of Human Geography

The North Atlantic Treaty Organization (NATO) agreed in November 2011 to accept Human Geography as a valid requirement and program of work in the Inter-services Geospatial Information Working Group (IGeoWG) with support from NATO intelligence working groups. NATO agreed to review the HGWG developed themed models for inclusion as a NATO Standardization Agreement (STANAG) satisfying the requirement. A study draft is expected from IGeoWG in August 2012.

1.9 NSG Metadata Foundation Update

In 2011 the Metadata Focus Group (MFG) engaged with the GDAM initiative to support the Smart Data vision. The MFG developed a repeatable process for generating simple content maturity and fit for use measures from the quality information defined by the NMF Part 2 Quality Metadata standard. Basing these measures on standard metadata and rigorous processes will greatly enhance the efficiencies of analysts by allowing them to more rapidly identify those resources that best address their mission needs.

The MFG engaged with the development community to implement NSG Metadata Foundation (NMF) standards in operational software. By the end of 2011 SMTS, CASI and CPD were compliant with the minimum NMF metadata set. Complimenting this effort, the MFG developed a draft policy on the population of metadata for analytic products and worked with P and JOIO to specify a common interface to be used with that policy. These activities are in direct response to issues raised in the 2011 CSART report.

The MFG also engaged with the Foundation GEOINT project to define how feature foundation data and metadata should work together in a data service. This collaboration resulted in an update to the NMF Part 1 (Core) to better support data services with a particular focus on Safety of Navigation (SON) data. This collaboration also led to the development of the first NMF extension, addressing quality metadata. Data quality and processing history are critical to the development and use of SON data.

Also in 2011, the MFG began work on an enterprise view of metadata. Working with the NTB and MISB, the MFG developed a cross-walk tracing metadata from a motion imagery source, through a still imagery archive, to NMF discovery and dissemination. This effort contributed to the development of a quality extension to the NMF by identifying a need for a lifecycle error model for GEOINT products.

1.10 Open Geospatial Consortium Interoperability Testbed

NCGIS was the lead “sponsor” organization for the Open Geospatial Consortium® (OGC®) Interoperability Testbed (OWS-8) in 2011. Other sponsors included USGS, UK Defence Science & Technology Lab (DSTL), Army Geospatial Center (AGC), Federal Aviation Administration (FAA), EUROCONTROL, National Aeronautics & Space Administration (NASA), European Space Agency (ESA), and Lockheed Martin Corporation. Sponsor organizations provide funding and/or in-kind contributions to address their requirements which are then exercised within the testbed. Testbeds are used to validate the interoperability of proposed OGC® standards, existing standards, and introduce new concepts into the OGC® standards process. NGA’s sponsorship resulted in the following significant achievements:

Ground and Video Moving Target Indicator program

- Proved OGC® standards based services could be used in support of both the Ground Moving Target Indicator (GMTI) and Video Moving Target Indicator (VMTI) Programs
- Information Models and Schemas were developed for GMTI, VMTI and NATO STANAG 4676 – ISR Tracking Standard
- New OGC® capability developed to support notifications based on OASIS WS-Notification
- New OGC® capability developed to support the concept of “bookmarking” a position within a video stream for easy retrieval

Cross-Community Interoperability

- Proved OGC® standards based services could be used to support harmonization of heterogeneous geospatial datasets (USGS and NGA data)
- Developed new OGC® prototypes for Semantic Mediation Service and a knowledge based SPARQL service
- Enhanced OGC® Catalogue Service eBRIM Profile to facilitate the semantic mediation process

Portrayal

- Proved OGC® standards based solutions for a Feature Portrayal Service with interface to a registry of portrayal symbology and a Web Feature Service
- Analyzed the use of KML for portrayal of complex symbology types

Bulk data transfer to support forward deployed operations

- Analyzed Esri GeoDatabase API to determine if it is implementable outside proprietary environment to support very large database transfers
- Prototyped a bulk transfer of a large database using the WFS and GML approach through implementation of the OGC GeoSynchronization Service
- Prototyped a mobile application of OGC GeoSynchronization Service on an Android device

1.11 Enabling LiDAR Interoperability

The LiDAR Conceptual Model and Metadata Dictionary (CMMD) Enterprise Level One (L1) document was published by NGA in 2011 and cited in the DISR as an emerging standard. L0 data is sensor-unique and is not intended for processing. The L1 standard addresses the interface between the LiDAR collector and the first stage of the processing workflow, enabling interoperability by defining a model for data exchange. It also describes unprocessed LiDAR data that would be ideal for end-to-end processing, exploitation, and dissemination. The CMMD is structured in anticipation that enormous volumes of LiDAR data will become available as the transition is made from relying solely on surveillance and mapping assets, to leveraging the myriad of autonomous vehicles that will use LiDAR in their control systems and weapons that will use LiDAR in their target sighting systems.

1.12 Standardization of Elevation Data Products

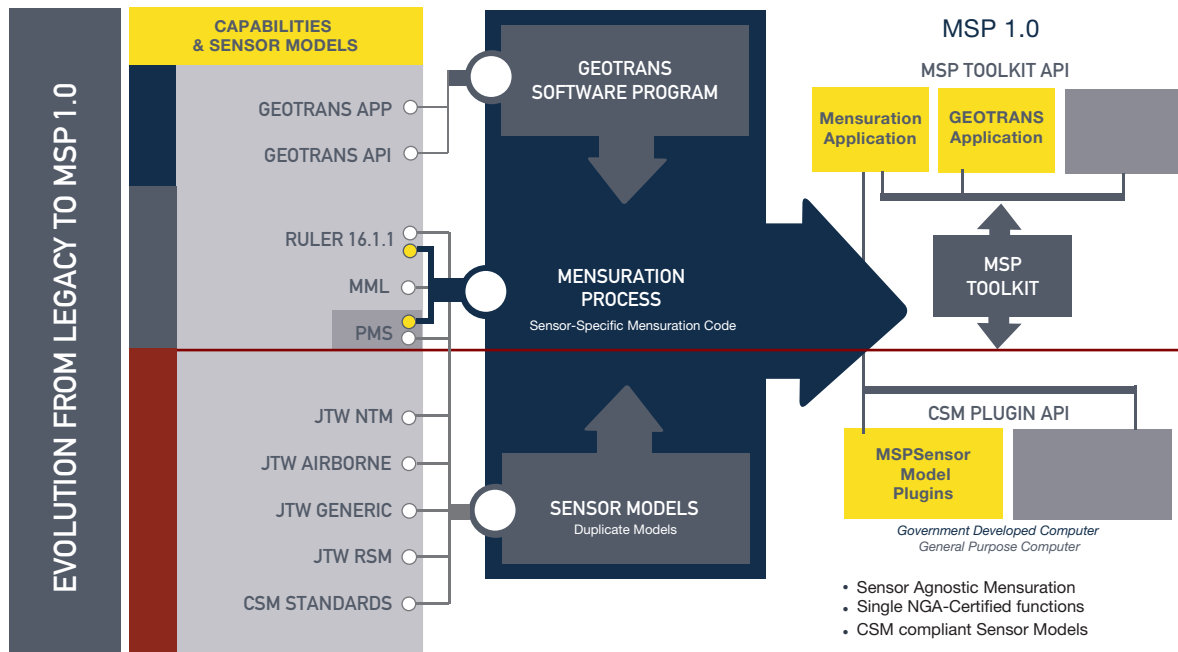
The Digital Terrain Elevation Data (DTED) format has been widely used throughout the NSG and NATO for many years, but it is incapable of supporting data collected by high resolution sensors. For this reason, NGA published the High Resolution Elevation (HRE) product profile in 2009. The profile represented a first step in the migration toward using international standards by adoption of ISO-developed conceptual schema and metadata standards. The HRE data file content requirement is based on a combination NITF and ISO/NSG metadata standards. The GeoTIFF format can also be used to encode high resolution elevation data, and like the new version of the HRE Profile, the new version of the NGA Profile for TIFF/GeoTIFF also requires compliance with NSG metadata standards.

Figure 1: Standardization of Elevation Data



HRE and GeoTIFF are profiles supporting finished elevation products, but high resolution data acquired from LiDAR sensors is initially available only in the American Society for Photogrammetry and Remote Sensing (ASPRS) LAS format, a defacto industry standard for point cloud data. The baseline LAS format is also incapable of carrying sufficient metadata to allow discovery and exchange within the NSG. This deficiency was partially addressed in 2010 with the publishing of the NITF Profile for Tactical LiDAR Systems. This profile specifies the use of NITF to carry, supplement, and describe the LAS point cloud data. Creating a more capable 'native' point cloud format would be a next step toward standardization of elevation data. The LAS format supports variable length fields which could be used to carry XML instances compliant with NSG Metadata schema. A LAS file with NSG-compliant metadata would make the NITF approach unnecessary and would allow compliance with NSG metadata schemas.

Figure 2: Sensor Models- Enabling the Evolution of the MSP



- LEGEND**
- Standard driven plug-in suite
 - GEOTRANS App- Geographic Translator Application
 - GEOTRANS API- Geographic Translator application programming interface
 - PMS- Precision Mensuration System
 - MML- Math Model Library
 - MSP- Mensuration Service Program
 - JTW- Joint Targeting Workstation
 - JTW NTM- NRO/NGA Joint Targeting Workstation National Technical Means
 - JTW Airborne- NRO/NGA Joint Targeting Workstation Tactical Sensors
 - JTW Generic- NRO/NGA Joint Targeting Workstation Generic Sensor Model
 - JTW RSM- NRO/NGA Joint Targeting Workstation Replacement Sensor Model
 - CSM Standards- Community Sensor Model Standards

By 2015, the legacy DTED low and medium resolution products will be integrated with high resolution products through a single, format-independent elevation product profile. The new profile will align with NSG metadata standards and international elevation data content standards. It will allow multiple output formats in order to meet specific user requirements. The integration will result in all NGA elevation products being produced according to the same content model.

1.13 Still Imagery Standardization Support to Emerging Capabilities

The NITF Profile for Hyperspectral Imagery (HSI), published in 2011, details the preferred format for tactical (airborne) HSI systems delivering data to the NSG, and provides HSI content standardization for the first time. Compliance with this profile will ensure that HSI datasets will be interoperable with the tools, techniques, and segments of the NSG, ensuring efficient, low-cost integration and seamless workflow for NSG end-users.

New mandated profiles of the NITF were also published in 2011 for Synthetic Aperture Radar (SAR) data. The Sensor Independent Complex Data (SICD) and Sensor Independent Derived Data (SIDD) standards were published in response to NGA's Transformational SAR Initiative. They provide a method for processing sensor-specific SAR data into a sensor-independent format at the complex image level. Previously, processing of SAR data required sensor-specific solutions.

1.14 Standards-Compliant Sensor Models and Applications

The CSMWG is the focal point for the establishment of standards, and provider of services, for interoperable sensor models enabling efficient collection, production and distribution of GEOINT source materials.

Community Sensor Model standard compliant sensor models are now available via the Mensuration Services Program for the NSG Geospatial Intelligence Information Management Systems (GIMS), NGA Visualization Services (GVS), Information Dissemination Services-Direct Delivery (IDS-D), Integrated Exploitation Capability (IEC), Imagery Exploitation Support System (IESS), Image Product Library (IPL), National Exploitation System (NES), National Geospatial Intelligence Library (NGL), National Image Derived Product (NIDP) and The St Louis Information Library (STIL). NSG applications that are now using the sensor models include the ESRI ArcGIS, DoD Common Geopositioning Services (CGS), Overwatch Systems Electronic Light Table 5500 (ELT 5500), Exelis ENVI, ILTPSE, Image Scout, Imagine, MET, Overwatch Remote View, BAE Systems Socet GXP, Socet Services and MicrolImages TNT.

1.15 Community Sensor Model (CSM) Technical Requirements Document (TRD), Version 3.0, 2010-11-15

The 2011 revision to the mandated CSM standard was in response to a 'critical dependency' requirement submitted by NGA in support of the Mensuration Services Program. Among major enhancements from the previous version of the CSM is version 3.0 allows for expandability and backwards compatibility between future versions of the standard. The CSM TRD Version 3.0 provides a precise understanding of the image and ground coordinate relationship for a specific sensor or sensor mode. The main CSM functions are the transformations between image space to ground space (ground to image, image to ground). These transformations and associated capabilities provide inputs used by the Sensor Exploitation Tools (SETs) to complete other photogrammetric and mathematical exploitation operations. This updated standard provides the means to move from duplicate sensor models and sensor specific mensuration code to sensor agnostic mensuration, single NGA-certified functions and non-duplicative CSM compliant sensor models. The technical stability of the standard was demonstrated during 2011 when two major commercial imagery providers, GeoEye and Digital Globe, were contractually required to implement the standard and deliver CSM compliant sensor models.

1.16 World Geodetic System and Geomatics (WGSG)

Established in 2011, the WGSG Focus Group serves as the NSG community-based forum to advocate for and manage the standardization of the World Geodetic System (WGS), and for activities related to its implementation, which enable the provision of timely, relevant, and accurate geo-referenced data and information in the GEOMATICS domain.

In 2011 the WGSG sponsored GWG adoption to mandate STANAG 7172 (Edition 2), Use of Geomagnetic Models which establishes and documents the World Magnetic Model as the preferred model of the Earth's magnetic field for use in military systems, to standardize how it is used, and to standardize the way in which magnetic information is supplied on geographic products.

1.17 Global Information Grid Technical Profile for GEOINT Visualization Enterprise Services

In 2011, the Defense Information Systems Agency's GTP configuration management approved the first Global Information Grid Technical Profile to guide programs in the design and development of systems that serve data for or clients of geospatial visualization services such as the Geospatial Visualization Service.

(GVS). The GTP defines the technical standards that enable multiple data holdings to be shared for use by clients using the standard based interfaces. The GTP differs from a list of standards by providing high level architectural views so that a developer will more easily understand the technical service interfaces, operations performed by those services, data and metadata content, encoding of the messages passed over these interfaces, and test requirements to provide DoD wide interoperability.

The GTP is a broad design document that includes a number of individual services. A program using it could well provide just one or two of those services and rely entirely on NGA to provide the total family, which GVS has been doing for several years. The point of publishing how it works is to allow users to combine our GVS data with their own data and that of others.

1.18 GWG Awards Program

The GWG Awards Program was established in 2008 to create a community venue for recognizing personnel for their contributions in helping to achieve the goals and vision of the GWG. Nominated individuals contributions are considered to be highly significant mission accomplishments in the area of GEOINT standardization activities for the NSG. GWG Awards are honorary recognitions given each year in two categories:

GWG Founder's Award

The Founder's Award is a lifetime achievement award that each year recognizes one individual for acts of outstanding community leadership and consensus building that foster the successful partnerships needed to tackle GEOINT standards issues. This award is presented to GWG participants in recognition of their career contributions to the standards industry.

The 2011 GWG Founder's Award Recipient was:
Dr. Guy Beakley SAIC Technical Fellow (Retired)

GWG Achievement Award

The Achievement Award recognizes the accomplishments of up to five individuals each year who, by their leadership and technical expertise, have been instrumental in the successful creation and implementation of standards that will enable maximum GEOINT systems and data interoperability.

The 2011 GWG Achievement Award
Recipients were:

- Mary Morrison-Curtis, Information Sharing Manager, Riverside Research, National Air & Space Intelligence Center
- Anthony Galassi, Chief, Standards/IID (Innovision), NGA
- Jim Arbeiter, Engineer, WiSC Enterprises
- Laura Moore, Standards Architect, OCIO, NGA



2.1 NSG Standards Registry – Developer's Toolkit for Capability-Based Standards

The National System for Geospatial Intelligence (NSG) Standards Registry supports the discovery, traceability, and lifecycle management of GEOINT Standards that may be used in the development and operation of data- and net-centric GEOINT applications. The NSG Standards Registry is maintained by the Geospatial Intelligence Standards Working Group (GWG) as a service to the NSG community. While the DISR and ICSR/ER2 contain all DOD and IC Information Technology standards, the NSG Standards Registry is the GEOINT Functional Manager's repository for all geospatial, imagery and motion imagery standards. The site as a whole provides thematic entry-points organized by business, mission, or management perspectives depending on the role of the user.

In 2012, NCGIS will be making it even easier for a program manager, developer, or other GEOINT professional to identify the applicable standards for their specific program based on their individual requirements. Additional features to be added to the registry this year include:

- The ability to identify all mandated and emerging GEOINT standards for a specific capability;
- Aligning all GEOINT standards against the NSG Enterprise Architecture using the Joint Architecture Reference Model (JARM) by GEOINT competency;
- Allowing a developer to add relevant standards to their 'registry shopping cart' in order to download and build against the mandated standards in the DISR and ICSR for their specific needs
- Exposing all NSG acquisition guidance and standards compliance policies through the registry so an NSG developer, vendor, or program manager is aware of the standards conformance requirements before a statement of work or request for proposal is written.
- The ability to create, modify, compare and register a customized standard schema profile from the NSG Application Schema with the use of online management systems and tools.

Using the features in the updated registry, contractors will be able to engage in a collaborative/iterative process with NGA [specifically the National Center for Geospatial Intelligence Standards (NCGIS) and the NGA Architecture and Standards Board], to identify and assess standards selected from NSG Enterprise Architecture Standards Views (StdV-1 and StdV-2) in order to implement mandated standards through the use of Capability Standards Profiles (CSP) for the specific GEOINT capability being delivered. Identifying standards by their GEOINT capability/function establishes a repeatable and sustainable process for NGA acquisition programs to identify and comply with mandated standards, and ensures those standards and compliance measures are an integral part of NGA contracts delivering specific GEOINT capabilities.

2.2 NSG Portrayal Registry

NCGIS is developing a portrayal registry for the NSG, scheduled for completion in the summer of 2012. This portrayal registry will host GEOINT symbols and the portrayal rules that associate specific symbols to feature types. The portrayal registry was prototyped along with a Feature Portrayal Service in OGC's recently concluded Open Web Services Testbed 8 in mid 2011. The NSG Portrayal Registry will provide Symbology Encoding for TDS and other GEOINT symbol sets.

2.3 Joint OPIR Ground Study Identified Data Standards Requirements

The OFG collaborated with NGA's Integrated Program Office and others to codify a set of OPIR data standards needed to support implementation of the Enterprise Architecture as defined by the Joint OPIR Ground (JOG) Study. OFG work for 2012 will concentrate on the refinement of the track and event standards (begun in late 2011) and the further extension of the Joint OPIR Data Model to accommodate the new data types.

2.4 Expand Wide Area Motion Imagery (WAMI) Standardization Efforts

In 2012, the MISB will continue to focus on solving the technical challenges of Motion Imagery exploitation as it relates to WAMI, also known as Large Volume Streaming Data (LVSD), or Wide Area Persistent Surveillance (WAPS). Additionally, the MISB will focus on refining and expanding the direction provided to the motion imagery tracking developer community. These efforts will continue to forge improvements to future interoperability and build community ISR integration focused on multi-INT sources, providing advanced GEOINT to the user.

2.5 New NITF Implementation Guidance

In 2012, new guidance will be provided on the population of NITF security fields, which were designed prior to establishment in 2009 of the Intelligence Community Abstract Data Definitions (IC.ADD) for information security marking metadata. The new guidance will assist imagery producers in populating the NITF security fields in a way that is consistent with other encodings of the IC.ADD. Additionally, the information content of NITF image mosaics will be standardized to facilitate the discovery and exploitation of mosaicked imagery and will impact various NGA standard image products and web-based delivery of imagery from commercial and National Technical Means (NTM) sources.

2.6 NSG Metadata Foundation

For 2012 the MFG will lock in accomplishments to-date by moving the enhancements to the NMF core and the NMF quality extension through the standards adoption process to become mandated standards in the DISR and ICSR. The MFG will build on the 2011 accomplishments through:

- Continued coordination with IC and DoD metadata initiatives to develop a strategy for when to use each standard and how to interchange information between them.
- Increased metadata coordination efforts with NATO, specifically coordination of the NMF and STANAG 2586. Define a strategy for information exchange between the two standards.
- Continued efforts with the MISB and NTB, encompassing a larger set of information flows including LIDAR, HSI and WAS. Identify gaps and inconsistencies in the current suite of standards then work to rectify them.
- Maturing the quality metadata model by working with 'S' and 'P' to define and document what quality metadata will be collected, how it will be collected and how it will be processed to support on-demand GEOINT.
- An expanded capability of the NMF through the development of Records Management and Imagery extensions to the Core standard.
- Coordinate with the NSG Consolidated Library program to assure that the necessary standards and data engineering have been done to support the next generation of NSG data discovery and access.

2.7 Country Codes Working Group

In late Spring 2012, the CCWG will officially stand-up. Its first task will be to coordinate the development of the new U.S. Government Country Codes Standard. NGA will publish the Country Codes Standard, and will submit the new standard for DoD and IC community adoption through DISR and ICSR governance processes. The standard content will be maintained in a new registry within the NSG Registry.

2.8 OGC Open Web Services 9 Testbed 2012

The Open Geospatial Consortium testbed is designed to evaluate and demonstrate the interoperability of OGC® standards. These may be mature standards or standards in their conceptual or early development stages where prototype implementations are built and provide feedback into the standards development process. Interoperability with standards developed outside the OGC process may also be included as part of the testing depending on sponsor requirements and the maturity of those standards. OGC testbeds bring sponsors and participants together in a rapid, hands-on collaborative engineering effort covering a six month timeframe. Evaluation of standards based solutions to address sponsor requirements provides valuable input into the applicability of those standards in a real world scenario. Successful validation of standards interoperability provides valuable input into procurement decisions.

The OGC Open Web Services 9 Testbed will begin in mid-May 2012 and end mid-November 2012. OWS-9 is structured under five threads of activity; Compliance Interoperability Test Environment, Aviation, Cross Community Interoperability, Security and Service Interoperability, Innovations. NGA sponsors each of these threads with the exception of the Aviation thread which is fully funded by the U.S. FAA and the EuroControl.

An overview of the OWS-9 Testbed activities is located on the next page.

OVERVIEW OF OWS-9 TESTBED ACTIVITIES

Compliance Interoperability Test Environment (CITE): Several new or updated test scripts and reference implementations are being developed within OWS-9. NGA is sponsoring a redesign of the OGC CITE tests to allow for a user to evaluate a service implementation using their own schemas and test data. Reporting of test results is also being redesigned to allow a user to evaluate an implementation support for all mandatory and optional elements of a standard.

Cross Community Interoperability: This thread will concentrate on the development and implementation of semantic mediation capabilities. Semantic mediation services, schemas, mappings and encodings will be developed to facilitate a semantic equivalency capability between different feature data models as well as metadata mapping models. This thread will build on the work performed in the previous OWS testbed and add new workflow and services to support data conflation.

Security and Service Interoperability: This thread will build on previous testbed work in implementing a security architecture for authentication and authorization. Evaluation of security requirements and standards applicability will define a security architecture for implementation within an OGC based SOA environment. Additionally, this testbed will take an initial review of requirements and proposed solutions for implementing security within mobile applications and devices supporting field operations.

Innovations: This thread will concentrate on development of new OGC based capabilities and provide input into the development of several new standards. The Innovations thread will begin to address the requirement for field use mobile applications supporting the ability to download a streamlined data format cached on the device and used in updating data in a disconnected user environment. This thread will also develop a service façade for converting service request/response bindings enhancing service interoperability. The Innovations thread will also address two new requirements. The first is an evaluation of the GMLJP2 standard to support the requirements of NITF specifically for the use case of both high resolution elevation data and the electronic CIB data. The second will be based on an analysis of NGA GPS products and the ability to use OGC services and data encodings to support web enabling this production process.

APPENDIX A - GWG BACKGROUND

GWG Authorities

In support of the U.S. intelligence effort as stated in Executive Order 12333, “United States Intelligence Activities” as amended on July 30, 2008, and Department of Defense Directive 5105.60 (revised July 2009), the Director of the National Geospatial-Intelligence Agency (NGA) is designated as the Functional Manager for GEOINT. The Director serves as the Department of Defense (DoD) Lead for GEOINT standards with the authority to prescribe, mandate, and enforce standards and architectures related to GEOINT and GEOINT tasking, collection, processing, exploitation, as well as international geospatial information for the DoD Components and for the non-DoD elements of the Intelligence Community (IC).

The GWG is the National System for Geospatial-Intelligence (NSG) forum that serves the NGA Director and the NGA Chief Information Officer (CIO). The CIO is the delegated functional manager for GEOINT architecture and standards and these functional management responsibilities were authorized in a unified NSG Directive for all NSG Functional Management responsibilities in Appendix K, “[Responsibilities of the Delegated GEOINT Functional Manager \(DGFM\) for Architecture and Standards](#)” of NSG Directive FM 1100, 6 May 2011, “[Roles and Responsibilities of the Department of Defense \(DoD\) Geospatial Intelligence \(GEOINT\) Manager and Intelligence Community \(IC\) Functional Manager \(FM\) for GEOINT.](#)” The GWG is led and chaired by NGA’s Director of the National Center for Geospatial Intelligence Standards (NCGIS). The NCGIS will:

- Mandate GEOINT standards for end-to-end enterprise architectures related to imagery, imagery intelligence, and geospatial information for DoD Components and for non-DoD elements of the IC, in accordance with US Code.
- Establish working groups, teams, and other fora, as required and/or authorized, to implement GEOINT architecture and standards responsibilities.
- Represent NSG at Standards Development Organizations, Standards Setting Organizations, and related fora to ensure that GEOINT standards relevant to NSG meet DoD and IC needs.

- Advise NSG acquisition program offices on the conformance and compliance level required for each GEOINT standard. NSG Acquisition programs will use these criteria in developing DoD Architecture Framework StdV-1 and StdV-2 artifacts, Information Support Plans, and master test plans.

GWG Charter

In addition to its designation as an NSG Functional Management Forum, the GWG is a Joint Technical Working Group that participates in both the DoD and IC standards governance processes. In the DoD, the GWG votes and manages GEOINT standards lifecycle recommendations reported to the Information Technology Standards Committee (ITSC) and approved by the DoD Architecture and Standards Review Group (ASRG). Approved GEOINT standards are then cited in the DoD Information Technology (IT) Standards Registry (DISR). This DoD standards governance structure is led and managed by the Defense Information Systems Agency (DISA) in its role as the DoD Executive Agent for IT Standards.

In the IC, the GWG provides the same GEOINT standards lifecycle management recommendations that go through the DoD standards governance process. These recommendations are reviewed and approved for the IC by the IC Enterprise Standards Committee (IC ESC) and the IC CIO’s Architecture, Standards and Engineering Committee (ASEC). Approved GEOINT standards are cited in the IC Standards Registry (ICSR), which resides within the Enterprise Registry and Repository (ER2). This IC standards governance structure is established and managed by the Office of the Director National Intelligence (ODNI) Chief Information Officer (IC CIO), under the authority of [Intelligence Community Standard 500-20, “Intelligence Community Enterprise Standards Compliance”](#), 16 December 2010. ICS 500-20 defines the IC framework for the adoption of IC enterprise standards best suited for achieving the DNI’s goals of interoperability and information sharing. It addresses the management of an IC Enterprise Standards Baseline consisting of a minimal, focused, coordinated set of such standards, and compliance/compliance certification of those portions of IC systems and Enterprise Architecture (EA)-related information technology items funded through the National Intelligence Program.

The GEOINT Standards Baseline

The GWG concentrates on GEOINT standards and standardization activities related to enabling technologies, data architecture, and software tools that enhance interoperability in net- and data-centric environments. In most instances, the GWG focuses on standards in three Service Areas: **GEOINT: Geospatial**, **GEOINT: Motion Imagery** and **GEOINT: Still Imagery**. In addition, each active standard cited in the DISR and ICSR is assigned a standard lifecycle status of either mandated or emerging. Mandated standards are required for the management, development, and acquisition of new or improved systems. Emerging standards are standards that may be implemented, but carry an inherent risk as they are not considered mature. Information Guidance documents may be cited in the DISR and are used to register guidance on implementing standards.

STANDARDS ADOPTION

In 2011, the GWG conducted three voting meetings to promulgate GEOINT standards recommendations to DISR/ICSR Baselines 11-1, 11-2 and 11-3. GWG voting membership consists of 26 Core member voting organizations that represent the US Government (See Table 2 for listing), of whom 21 (80%) voted on Baseline 11-1, 23 (89%) on Baseline 11-2, and 21 (80%) on Baseline 11-3. With the promulgation of the last Baseline in 2011 (DISR/ICSR Baseline Release 11-3), a total of 152 GEOINT standards managed by the GWG are now cited in DISR and ICSR.

To support standards implementation, the GWG maintains the GEOINT standards accessible via the NSG Standards Registry located at NSGREG.NGA.MIL. The NSG Standards Registry provides thematic entry-points organized by business, mission, or management perspectives allowing program managers a convenient way to discover and access GEOINT standards. The GWG publishes both DISR and ICSR GEOINT citations as well as entire standards documents, when they are publically available. The 152 GEOINT standards in the DISR/ICSR 11-3 Baseline are categorized by the GEOINT Service Areas and assigned a lifecycle status as follows:

Table 2: GEOINT Standards Baseline

152 GEOINT Standards in Baseline 11-3			
Standards Lifecycle Status		GEOINT: Service Area	
Mandated	108	GEOINT: Geospatial	90
Emerging	29	GEOINT: Motion Imagery	28
Information Guidance	15	GEOINT: Still Imagery	34

The complete listing of the 152 GEOINT standards in DISR/ICSR Baseline 11-3, also known as the “Pocket Guide”, is available via the NSG Standards Registry where it can be sorted dynamically and is hyper-linked to related content: <https://nsgreg.nga.mil/DISR-approved.jsp>. Continuing to mandate GEOINT standards for use in both the DoD and IC communities, through the joint adoption process hosted by the GWG, supports NSG interoperability and information sharing.

STANDARDS DEVELOPMENT

Consistent with Section 12(d) of Public Law 104-113, “National Technology Transfer and Advancement Act of 1995,” and the Office of Management and Budget Circular A-119, agencies are directed to use voluntary consensus or open standards in lieu of government-unique standards. Today, through the work of the GWG, there exists a significant public/private partnership in the development of GEOINT standards with organizations such as:

- The International Organization for Standardization Technical Committee (ISO) Technical Committee (TC) 211– Geographic Information-Geomatics (ISO TC211) - www.isotc211.org
- The American National Standards Institute International Committee for Information Technology Standards (ANSI/INCITS) - <http://l1.incits.org/>
- The Open Geospatial Consortium (OGC®) – www.opengeospatial.org
- The American Society for Photogrammetry and Remote Sensing (ASPRS) - <http://www.asprs.org>

NGA has standards' experts in its CIO office, InnoVision office, and other NGA components that actively participate with these organizations. Appendix "B" highlights some of these key organizations and the NGA and GWG representatives. NGA and the GWG community embrace these public/private partnerships to leverage the knowledge, skills, and talent of the broad geospatial community. Standards developed through the public/private partnership:

- Reduce overall system lifecycle costs by reducing or eliminating custom integration through the use of open standards.
- Reduce technology risk by aligning industry around standards of mutual interest, and by allowing industry to develop these standards with their own resources.
- Improve choice in the marketplace by influencing the development and adoption of standards that have been built out in the market in a growing list of commercial products.
- Enable new technologies by facilitating rapid integration of technologies and information into systems, enterprises, and services via open standards.
- Enable the extension of legacy systems to interoperate with new technologies by adapting these systems to leverage standard interfaces and encodings.

STANDARDS COMPLIANCE, CONFORMANCE, AND ENFORCEMENT

Per the authorities detailed in Appendix K, "Responsibilities of the Delegated GEOINT Functional Manager (DGFM) for Architecture and Standards" of NSG Directive FM 1100, NCGIS serves as the DoD and IC lead for GEOINT standards. NCGIS will prescribe and enforce standards and architectures related to GEOINT and GEOINT tasking, collection, processing, exploitation, and international geospatial information for DoD Components and for non-DoD elements of the IC, to include standards for GEOINT collected or produced within the NSG.

In December 2011, NGA's Acquisition Contracting Executive signed Policy Memorandum 12-02: NARI Prescription 5X 39.101-91, Geospatial Intelligence (GEOINT) Standards and Profile Implementation and Compliance, which establishes and implements clear standards compliance language for NGA contracts to enforce mandatory Geospatial Intelligence (GEOINT) standards requirements per the responsibilities of the Delegated GEOINT Functional Manager (DGFM) for Architecture and Standards. This policy also establishes a repeatable and sustainable process for NSG acquisition programs to identify and comply with mandated standards, thus ensuring those standards and compliance measures are an integral part of NGA contracts delivering specific GEOINT capabilities. Adherence to these requirements by program managers and developers is essential for delivering interoperable solutions across the NSG and fulfilling compliance requirements.

The Standards-Architecture Relationship

The GWG places a heavy emphasis on collaboration between standards and enterprise architecture to promote re-use, interoperability, and open, vendor-agnostic architectures. The IC Joint Architecture Reference Model's (JARM's) 10 layer model clearly defines the enterprise portion as the top three layers (8-10) and the technical solution space as layers 2-7. The standards implication within the architecture is clearly a vertical stack that cuts across all 10 layers. The enterprise architecture community actively identifies and documents opportunities to leverage standards across an organization. Requirements are levied on future development programs to implement their solutions leveraging applicable standards. The collaboration also promotes the development of new standards by understanding the future needs of the development community. For example, in support of an NGA agency-wide Identity and Access Management (IdAM) system, a design pattern was developed specific to implementing the IdAM in an Open Geospatial Consortium® (OGC®) paradigm. This work led to collaboration between NGA prototype efforts and international standards development organization test beds to collectively reduce technical risks and advance standards.

Figure 3: Joint Architecture Reference Model (JARM): 10 Layer Model



GWG Structure

The GWG is chaired by the Director of NGA's NCGIS who is also the Deputy Director of the Office of Enterprise Architecture and Standards (NGA OCIO/CE) in the office of the CIO. The NCGIS provides the Secretariat staff, five of the nine Focus Group Chairs, and subject matter experts that lead the GWG. The GWG organizational structure is comprised of 26 Core and ten Associate member organizations. Core member voting organizations represent the US Government. Associate member organizations consist of coalition partners, standards development organizations, and industry consortia that serve as technical advisors. The GWG structure also includes nine Focus Groups that serve as the primary mechanism for community engagement and subject matter expertise. Focus Groups both develop and adopt standards and sponsor the GEOINT standards lifecycle management adoption recommendations for GWG voting. Membership is shown in Table 2 located to the right.

Table 3: 2011 GWG Core Membership Roster

2011 GWG Core Membership Roster	
Central Intelligence Agency	Jane Kuhar
Defense Advanced Research Projects Agency	Fred Schnarre
Defense Information Systems Agency	Jacqueline Knudson
Defense Intelligence Agency	Tammy Countryman
Defense Logistics Agency	Christopher Todd
Department of Energy	Bryan Gorman
Department of Homeland Security	Jon Hasse
Federal Bureau of Investigation	Jason Richards
Joint Chiefs of Staff, J8 (formally JFCOM)	Maj. Kirby Teague
Joint Chiefs of Staff, J2	CDR. Thomas Moneymaker
National Geospatial-Intelligence Agency	NGA Architecture and Standards Board
National Reconnaissance Office	Michael Nier
National Security Agency	Kathleen Rattell
Office of the Director of National Intelligence	James Feagans
Office of the Secretary of Defense (NII & AT&L)	David LeBranche
The Federal Geographic Data Committee	Julie Binder-Maitra
United States Pacific Command	Vacant
United States Air Force	Marshall Reed
United States Army	Jim Huisenga
United States Central Command	William Rapke
United States European Command	Kenneth MacLean
United States Marine Corps	Tom Terry
United States Navy (DoD)	John Breckenridge
United States Navy (IC)	David Dallas
United States Northern Command	Tim Duggan
United States Special Operations Command	Wes McIntosh
United States Strategic Command	Jerry Chrostowski
Associate Member Organizations	
American Society for Photogrammetry & Remote Sensing (ASPRS)	Brad Dooren
Australia	Mark McInerney
Canada	Jennifer Hum-Miller
Defence Geospatial Information Working Group (DGIWG)	Michael Harbaugh (acting)
InterNational Committee for Information Technology Standards (INCITS) LI [ANSI Accredited]	Vacant
International Organization for Standardization (ISO) / Chair, TC 211	Olaf Ostensen
NATO Joint Capability Group on Intelligence Surveillance & Reconnaissance (JCGISR)	Vacant
Open Geospatial Consortium® (OGC)	Mark Reichardt
U.S. Geospatial Intelligence Foundation (USGIF)	John Moeller
United Kingdom	Michael Barwell

APPENDIX B - STANDARDS DEVELOPMENT FORUM

Standards Development Forum	NCGIS / GWG Representative & Role
American Society for Photogrammetry and Remote Sensing (ASPRS)	Cynthia Chatelain, Chair Standards Committee Dr. Robert Norris, Member Neil Sunderland, Member
Defence Geospatial Information Working Group (DGIWG)	Michael Harbaugh, Coordination Lead Jeffrey Bell, Technical Lead Daniel Gleason, Technical Lead
Geospatial Intelligence Technology (GINT) Standardization Area of the Defense Standardization Program (DSP)	Daniel Gleason, Lead Standardization Activity
Defense Standardization Program (DSP)	Daniel Gleason, NGA Lead
EUROCONTROL/FAA Aeronautical Information Exchange Model (AIXM) CCB	Jerry Leicht, Technical Lead
InterNational Committee for Information Technology Standards (INCITS) / H3 Computer Graphics, Image processing and environmental data	Laura Moore, Technical Lead Steve Rogan, Technical Lead
InterNational Committee for Information Technology Standards (INCITS) / L1 (Geographic Information Systems)	Michael Harbaugh, Coordination Lead & Voting Member
International Organization of Standardization (ISO) / International Electrotechnical Committee Joint Technical Committee 1 SubCommittee 24 for Computer graphics, image processing and environmental data	Laura Moore, Technical Lead Steve Rogan, Technical Lead
International Organization of Standardization (ISO) / TC 211	Michael Harbaugh, Coordination Lead Veronica Harris, Metadata Technical Lead
NATO Conference of National Armaments Directorates/ NATO Air Force Armaments Group/Joint Capability Group on Intelligence Surveillance and Reconnaissance (NATO CNAD/NAFAG/JCGISR)	Laura Moore, Technical Lead Steve Rogan, Technical Lead
NATO Geospatial Air Harmonization Working Group (NGAWG)	Jerry Leicht, Technical Lead
NATO Geospatial Maritime Working Group (GMWG)	Albert Armstrong, Technical Lead
NATO Inter-Service Geospatial Working Group (IGeoWG)	Michael Harbaugh, Coordination Lead Jeffrey Bell, Technical Lead
NATO Joint Intelligence Working Group (JINTWG)	Laura Moore, Technical Lead
National Institute of Standards and Technology (NIST), Sensor Standards Harmonization Working Group (SSHWG)	Neil Sunderland, Technical Lead
Open Geospatial Consortium (OGC)	Terry Idol, Technical Lead Christian Guthrie, Technical Lead David Wesloh, Technical Lead
RTCA Airport mapping DB Working Group (AMDB)	Jerry Leicht, Technical Lead
DoD Symbology Standards Management Committee (SSMC) and NATO Joint Symbology Panel	Daniel Gleason, NGA Voting Representative
International Hydrographic Organization	Albert Armstrong, Technical Lead
Society Motion Pictures and Television Engineers (SMPTE)	Scott Randall, Member
Institute of Electrical and Electronics Engineers, Inc (IEEE)	Darrell Young, Senior Member

