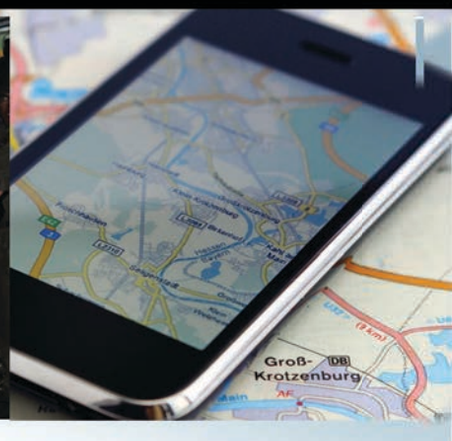
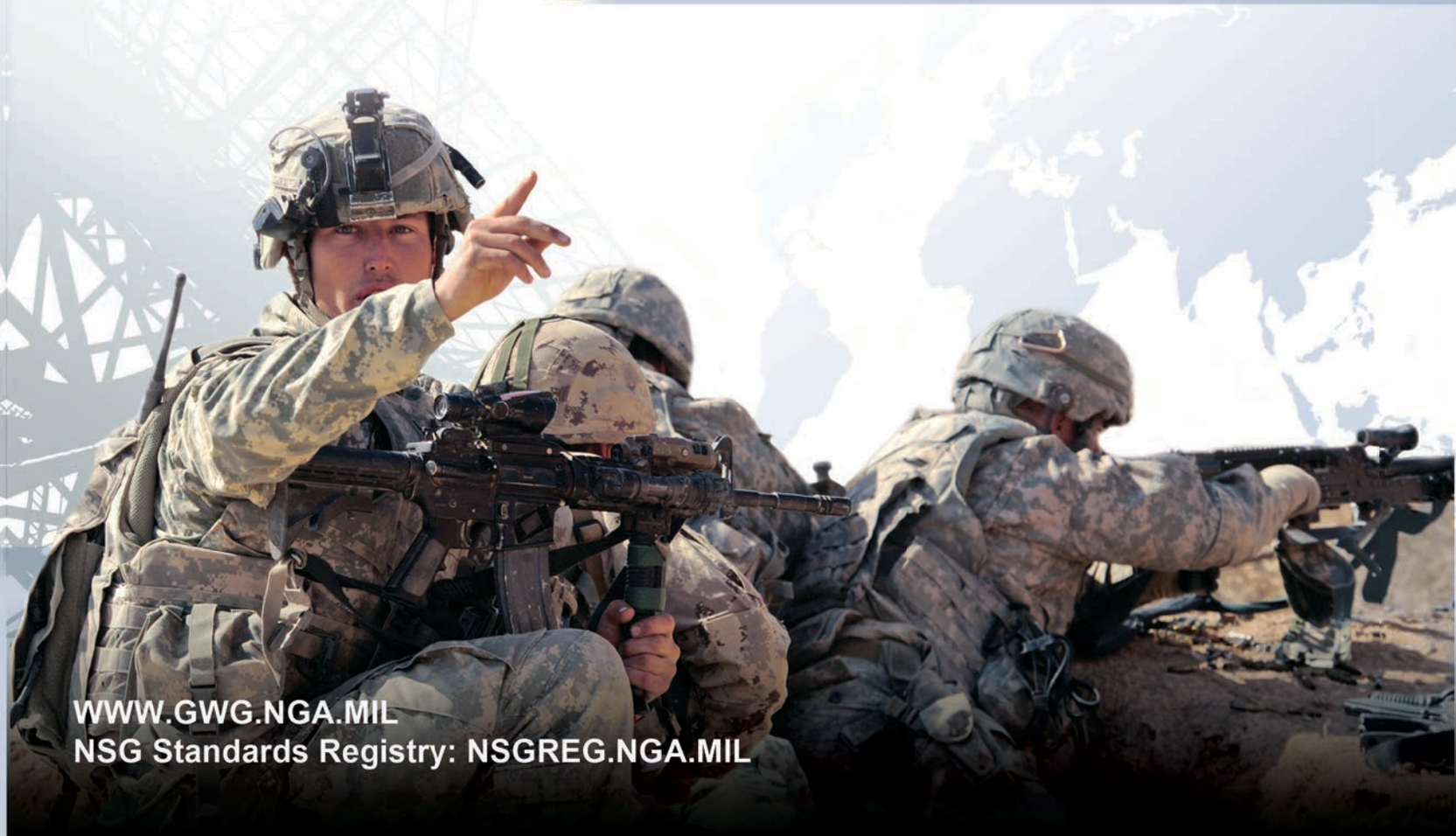


Geospatial Intelligence Standards Working Group

GWG

2010 ANNUAL REPORT



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NSG Standards Registry: NSGREG.NGA.MIL

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PREFACE

We are pleased to present the first Annual Report of the Geospatial Intelligence Standards Working Group (GWG). Inaugurated in January 2005, the GWG serves as the National System for Geospatial-Intelligence (NSG) Functional Management forum for Geospatial Intelligence (GEOINT) standards and related architecture activities. The GWG serves the Director, National Geospatial-Intelligence Agency (NGA) and the NGA Chief Information Officer who is the delegated functional manager for GEOINT architecture and standards. The purpose of this Annual Report is to provide information about the GWG activities and note our 2010 status to the NGA Chief Information Officer, the Functional Management Council, and the NSG community.

The GWG enables NGA and the NSG to provide crucial GEOINT support to our military's forward deployed forces. We accomplish that by creating and managing the engineering elements that benefit from a standards approach and an architecture that relates those standards to one another in accomplishment of the mission. Several Foundation GEOINT efforts are already directly benefiting from the recent integration of standards and architecture to include the Topographic Feature Data Management initiative, and Global Navigation Services Aeronautical and Maritime web services.

New in 2010, GWG standardization efforts are now underway to enable the consistent development, portrayal, and discovery of Human Geography data. We work in partnership with the NSG Interoperability Action Team to support program managers' efforts to implement GEOINT standards and to verify and validate conformance, compliance, and interoperability. Together we will move into a future increasingly focused on assuring more complete and interoperable application of GEOINT standards to the operational environment.

We also acknowledge, thank, and express our sincere gratitude to the members of the working group. Without their work, dedication, selfless service, and commitment towards making GEOINT standards a reality, we would not be publishing this report today.

We invite all NSG members who are interested in advancing and improving GEOINT discovery, accuracy, interoperability, and utility to monitor and participate in the GWG standardization activities. You will notice in Section 3 of this report that 2011 proves to be an even busier year. Highlights include work with the Intelligence, Surveillance, Reconnaissance (ISR) Task Force to tackle Light Detection and Ranging (LiDAR) standards for discovery and exploitation, the State Department and academia to develop Human Geography standards for over a dozen themes, and work to extend overhead persistence data models to implement the latest common sensor standards. Visit us at www.gwg.nga.mil or contact us at NCGIS-Mail@nga.mil.

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Director, National Center for
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Section 1

SECTION 1: BACKGROUND

1.1 GWG Authorities

In support of the U.S. intelligence effort as stated in Executive Order 12333, "United States Intelligence Activities," December 4, 1981 (as amended), and Department of Defense Directive 5105.60 (revised Jul 09) , 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, and international geospatial information for the DoD Components and for the non-DoD elements of the Intelligence Community (IC).

National System for Geospatial Intelligence Directive ST 8100, 1 March 2007, "Roles and Responsibilities of the National System for Geospatial Intelligence Functional Manager for Geospatial Intelligence Architecture and Standards" states that the delegated Functional Manager for GEOINT Architecture and Standards will:

- Prescribe and mandate standards and end-to-end technical architectures related to imagery, imagery intelligence, and geospatial information for the DoD Components and for the non-DoD elements of the IC.
- Establish working groups, teams, and other fora, as required, to implement GEOINT architecture and standards responsibilities.
- Represent the NSG at Standards Development Organizations, Standards Setting Organizations, and related fora to ensure that GEOINT standards relevant to the NSG meet DoD and IC needs.

1.2 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 brought into the DoD process and these voted upon recommendations are 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 then cited in the IC Standards Registry (ICSR). This IC standards governance structure is established and managed by the Office of the Director National Intelligence (ODNI) Chief Information Officer (CIO) (ODNI/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, 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.

1.3 The GEOINT Standards Baseline

The GWG concentrates on GEOINT standards and standardization activities related to enabling interoperability in net- and data-centric environments and standards supporting enabling technologies, data architectures, and software tools. In most instances, the GWG focus is 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. Information Guidance documents are another type of document that may be cited in the DISR and is used to register guidance on implementing standards.

Standards Adoption

In 2010, the GWG conducted three voting meetings each to promulgate GEOINT standards recommendations to DISR/ICSR Baselines 10-1, 10-2 and 10-3. GWG voting membership consists of 26 Core member voting organizations that represent the US Government (See Table 2 for listing), 19 (73%) of whom voted on Baseline 10-1, 11 (43%) on Baseline 10-2, and 15 (58%) on Baseline 10-3. These three baselines involved GWG voting on a total of 160 GEOINT standards adoption recommendations, a record number for the GWG and due to the voting actions taken to set the initial IC status on the GEOINT standards baseline in the newly deployed ICSR.

With the promulgation of the last Baseline in 2010 (DISR/ICSR Baseline Release 10-3), a total of 116 GEOINT standards managed by the GWG are now cited in DISR and ICSR, and over 80% of those are open standards. Consider that over 100 standards can be exercised when a web browser accesses a web page and that there are over 1,000 standards that appear in the DISR. To the uninitiated, however, this body of knowledge can be overwhelming. Therefore, the GWG has also devoted resources, including the consultation services provided by the NSG Interoperability Action Team (NIAT), to assist programs in the correct selection and implementation of these standards.

The first action taken in support of implementers is to make the standards visible and accessible. The GWG has published the DISR/ICSR GEOINT citations (and in many cases the standards documents) in the NSG Standards Registry on the World Wide Web at NSGREG.NGA.MIL. The 116 GEOINT standards in the 10-3 Baseline are categorized by the GEOINT Service Areas and assigned a lifecycle status as follows:

116 GEOINT Standards in Baseline 10-3			
Standards Lifecycle Status		**GEOINT Service Area**	
Mandated	92	GEOINT: Geospatial	67
Emerging	11	GEOINT: Motion Imagery	23
Information/Guidance	13	GEOINT: Still Imagery	26

Table 1: GEOINT Standards Baseline

The complete listing of the 116 GEOINT standards in Baseline 10-3, 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 communities, through the joint adoption process hosted by the GWG, supports NSG interoperability, maximizes convergence, minimizes divergence and demonstrates a "Best of Breed" practice for the community management of standards.

GEOINT Technical Profiles

In response to current operational requirements to profile today's Global Information Grid (GIG) and enterprise capabilities for systems developers to use in meeting their mission objectives, both the DoD and IC have undertaken efforts to compile additional technical standards guidance, architecture reference models, and testing plans. GTPs will help Program Managers (PMs) and developers understand how to best fit into the higher level architecture into which the program must integrate. In 2010, the GWG began the development of an initial GEOINT GIG Technical Profile (GTP) for Geospatial Visualization - Enterprise Service. It provides a PM-centric way of identifying which GEOINT standards cited in DISR/ICSR should be used in an acquisition program and where in the architecture they apply. GTPs augment the associated standards and provide a more holistic way to define and explain the utility of standards. Failure to incorporate an associated GTP into the program design has been documented to increase cost and make it very difficult to earn Interoperability and Supportability Certification from the Joint Staff as defined in CJCSI 6212.01.F and performed by the DISA Joint Interoperability Test Command (JITC).

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 standards in lieu of government-unique standards. Today, through the work of the GWG, over 80% (and increasing) of the GEOINT standards have been developed using public/private standards partnerships 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

Through active participation in these organizations, 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 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.

1.4 The Standards-Architecture Relationship

While the focus of the GWG is GEOINT standards, the inherent relationship between standards as a component architectural artifact makes it necessary to understand the standards in the context of their relationship within the architecture. The GWG increasingly understands this critical relationship especially where the relationship's value is most explicit, between enterprise services and technical solutions. The IC Joint Architecture Reference Model (JARM) and 10 layer model clearly define the enterprise portion as the top three layers (8-10), and the technical solution space as layers 2-7. Enterprise architects and GWG standards architects are collaborating to identify those re-usable segments of the architecture, to include use cases, information flows, component definitions and, the standards that govern them all. This framework exemplifies the benefit of standards in enabling the architecture by providing the 'glue'. The standards implication within the architecture is clearly a vertical stack that cuts across all 10 layers. The standards-based program of work of the GWG fills the gap between enterprise and solution architectures through the identification and adoption of profiles, implementation specifications, and data standards.

1.5 GWG Structure

The GWG is chaired by the Director of NGA's National Center for Geospatial Intelligence Standards (NCGIS) who is also the Deputy Director, Office of the Chief Information Officer, Office of Enterprise Architecture and Standards (NGA OCIO/CE). The NCGIS also provides the Secretariat staff, five of the eight Focus Group Chairs, and 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 consisting of coalition partners, standards development organizations, and industry consortia that serve as technical advisors. The GWG structure also includes eight 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 below in Table 2.

2010 GWG Core Membership Roster			
CIA	Jane Kuhar	**NII & AT&L**	David LaBranche
DARPA	Fred Schnarre	**FGDC**	Julie Binder-Maitra
DISA	Jacqueline Knudson	**PACOM**	vacant
DIA	Lisa Milne	**USAF**	Marshall Reed
DLA	Christopher Todd	**USA**	Jim Huisenga
DOE	Bryan Gorman	**CENTCOM**	William Rapke
DHS	Jon Hasse	**EUCOM**	Kenneth MacLean
FBI	Jason Richards	**JFCOM**	Marty Dunn
JCS, J2	vacant	**USMC**	Tom Terry
NGA	NGA Architecture and Standards Board (NASB)*, Standards Task Force	**USN**	Lora Turner
NRO	Michael Nier	**NORTHCOM**	Tim Duggan
NSA	Kathleen Rattell	**SOCOM**	Wes McIntosh
ODNI	Terry Kanka	**STRATCOM**	vacant
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)			Leif Sundgren
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

**The NASB is an established working group and governance arm of the NGA CIO Steering Committee (CIO SC)*

Table 2: Core and Associate Membership

1.6 GWG Focus Groups

The Focus Groups lead and participate in 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 also serve as a community forum to organize their standards into a coherent body of work and to assist in the implementation of that body of work by DoD and IC system developers. 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 (CR) for GWG Core member voting. CR 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 lists the Focus Groups & Activities.

GWG Focus Groups
National Imagery Transmission Format Standard (NITFS) Technical Board (NTB)
Motion Imagery Standards Board (MISB)
Community Sensor Model Working Group (CSMWG)
Portrayal Focus Group (PFG)
Application Schemas for Feature Encoding Focus Group (ASFE)
Metadata Focus Group (MFG)
Information Transfer & Services Architecture Focus Group (ITSA)
Overhead Persistent InfraRed (OPIR) Focus Group (OFG)

GWG Focus Groups	Types of Standardization Activities by Focus Group
National Imagery Transmission Format Standard (NITFS) Technical Board (NTB)	• 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
Motion Imagery Standards Board (MISB)	• Motion imagery, full 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
Community Sensor Model Working Group (CSMWG)	• 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
Portrayal Focus Group (PFG)	• 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
Application Schemas for Feature Encoding Focus Group (ASFE)	• 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
Metadata Focus Group (MFG)	• Imagery, sensor & geospatial metadata • Coordination of activities between various recognized standards development organizations & standardized metadata across respective communities
Information Transfer & Services Architecture Focus Group (ITSA)	• 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.
Overhead Persistent InfraRed (OPIR) Focus Group (OFG)	• 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

Table 3: Focus Groups & Activities

Section 2

SECTION 2: HIGHLIGHTS 2010

2.1 Human Geography Standardization Initiative

Chartered in late 2010, the Human Geography Working Group (HGWG), under the GWG ASFE Focus Group, is defining a standards-based dictionary and catalog for exchanging human geography data and is developing data entities, attributes, a common vocabulary, and lexicon for use throughout the NSG and the NATO/International Security Assistance Force (ISAF) coalition. This requirement derived in part from the January 2010 paper coauthored by Major General Michael Flynn, (then Deputy Chief of Staff, Intelligence (CJ2) for ISAF in Afghanistan), entitled, "Fixing Intel: A Blueprint for Making Intelligence Relevant in Afghanistan". The report critically examines the relevance of the U.S. intelligence community to the counterinsurgency strategy in Afghanistan and suggests that many of the underlying principles of modern warfare need to be expanded to focus on the human element of conflict. As a result, the establishment of the HGWG provides the structure for the NSG community to develop standards to support the increased focus on, and the expected benefits from, incorporating socio-cultural analysis into our traditional intelligence analysis discipline.

The HGWG focus is on standardization development activities associated with the implementation strategy and framework for incorporating human geography into GEOINT. Human geography uses an interdisciplinary approach to describe spatial and temporal patterns of human behavior in the context of their environment as it applies to GEOINT. The HGWG is chaired by the U.S. Department of State and the Office of the Under Secretary of Defense for Intelligence. Participation is open to the DoD, IC, Federal civil agencies, allied coalition partners, and international and commercial organizations. Once published, human geography standards and their implementation profiles will be included in the NSG Enterprise Architecture baseline, and leveraged by NGA's Acquisition Directorate (NGA/A) and program managers throughout the NSG in the development of future human geography- based capabilities.

2.2 Enhancement of the GEOINT Structure Implementation Profile (GSIP)

In 2010, the GSIP was designated as the NCGIS single standards development vehicle for harmonizing NSG GEOINT standards across the DoD/IC, civil, and international communities and is the primary standards-based mechanism for NSG transition from a product-centric Vector Product Format (VPF) environment to a data- and net-centric environment. GSIP v2.0 incorporates significant enhancements that were made to support the NGA Source Operations and Management Directorate and the NGA Analysis & Production Directorates' Foundation GEOINT to include Topographic, Aeronautical, and Maritime data capabilities, as well as internationally-agreed upon enhancements to the Defence Geospatial Information Working Group (DGIWG) Feature Data Dictionary (DFDD). The GSIP consists of an interdependent set of components that together define a common method for specifying and encoding GEOINT and related geospatial data in the NSG. The GSIP consists of five major components: 1) NSG Entity Catalog (NEC) and NSG Feature Data Dictionary (NFDD), 2) NSG Application Schema (NAS) - Part 1, 3) Data Content Specifications (DCS) and Extraction Guides (EG), 4) Reference Platform Specific Models, and 5) Platform independent Information Exchange Models. Each major component is described in detail, and provided, on the NSG Standards Registry at https://nsgreg.nga.mil/gsip/. The GSIP and its components are managed by the GWG and the ASFE Focus Group is directly responsible for its evolution. The tempo of GSIP development and formal version-releases continue to reflect requirements brought forward by NSG participants as they collectively establish and extend enhanced GEOINT data interoperability in the NSG.

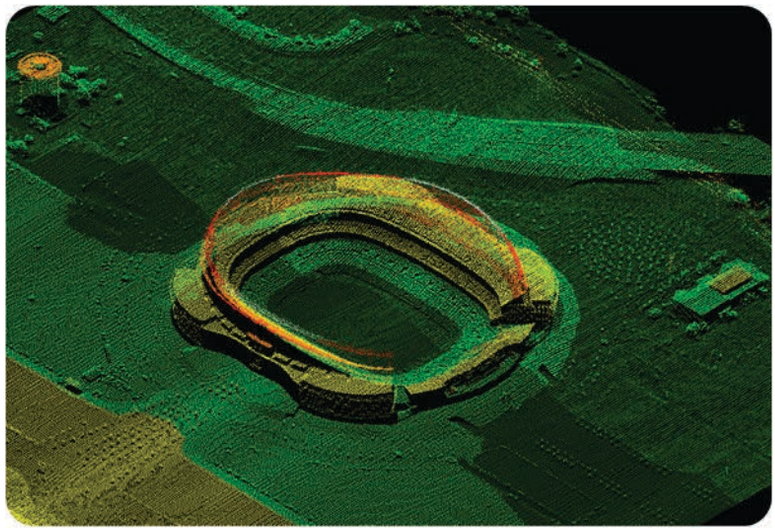
2.3 Views from the Focus Groups Program of Work

2.3.1 NITFS Technical Board (NTB)

The Standardization of Elevation Data and Exploiting LiDAR Data

Digital Terrain Elevation Data (DTED) has been produced for more than 35 years and constitutes the bulk of NGA's elevation data holdings. The DTED format is widely used throughout the NSG and NATO, but it is incapable of supporting data collected by high resolution sensors. Further, the DTED format and information

content does not align with the international geographic data standards being adopted by the NSG for other types of feature data. The NTB is working with the NGA Foundation Based Operations (FBO) Group to forecast future elevation data standardization requirements. The FBO Data Strategy specifies the population of FBO elevation data layers through exploitation of data from multiple sources including optical, radar, and LiDAR.



LidarStructure Model, Compliments of Sanborn, Inc.

The development of the High Resolution Elevation (HRE) product profile in 2009 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 is structured using a combination of international standards, ISO/IEC 12087-5 (NITF) and ISO 191XX-series metadata standards.

However, HRE is a profile for finished products. High resolution data acquired from LiDAR sensors is initially available only in LAS format, a defacto industry standard for point cloud data. The baseline LAS format is 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 LiDAR profile for NITF to carry, supplement and describe the LAS point cloud data.

Creating a more capable 'native' point cloud format is another step toward standardization of elevation data. The NGA LiDAR Systems Engineering Forum is working to develop an XML schema for inclusion of metadata within the LAS format. This would potentially make the NITF/LAS approach unnecessary should the NSG determine to support LAS natively.

By 2015, the legacy DTED coverages will be integrated with high resolution coverages using a single, format-independent content specification. The new specification will align with NSG-adopted metadata standards and allow multiple output formats to meet specific user requirements. The integration will result in all NGA elevation data being produced according to the same content standard.

2.3.2 Motion Imagery Standards Board (MISB)

Establishing standards for motion imagery encoding, metadata schemas and dissemination protocols helps prevent the proliferation of proprietary, stovepipe systems that are not interoperable. Stovepipe solutions impede the intelligence Processing, Exploitation and Dissemination (PED) process and minimize the intelligence value derived from our nation's Motion Imagery (MI) assets. The MISB's mission is to unify the motion imagery workflow, effectively maximizing the value of MI assets for all stakeholders. Architecting the PED workflow within a standards-based foundation and guiding the development, acquisition, and implementation of tools, technologies and processes positions the NSG to create solutions that have far greater value for the warfighter. Figure 1 illustrates this year's MISB's suite of standards managed in the context of the MI pipeline:

1. **Electro-Optical MI:** An image stream is collected by the sensor
2. **Compression:** The stream is typically compressed
3. **Metadata:** Metadata is added as the imagery is collected, compressed, encoded, or otherwise processed
4. **Timing & Synchronization:** Synchronization elements are added
5. **File/Transport:** The enriched imagery is transported through communication channels as streaming media, collected into files, amended, annotated, etc., and put into archives

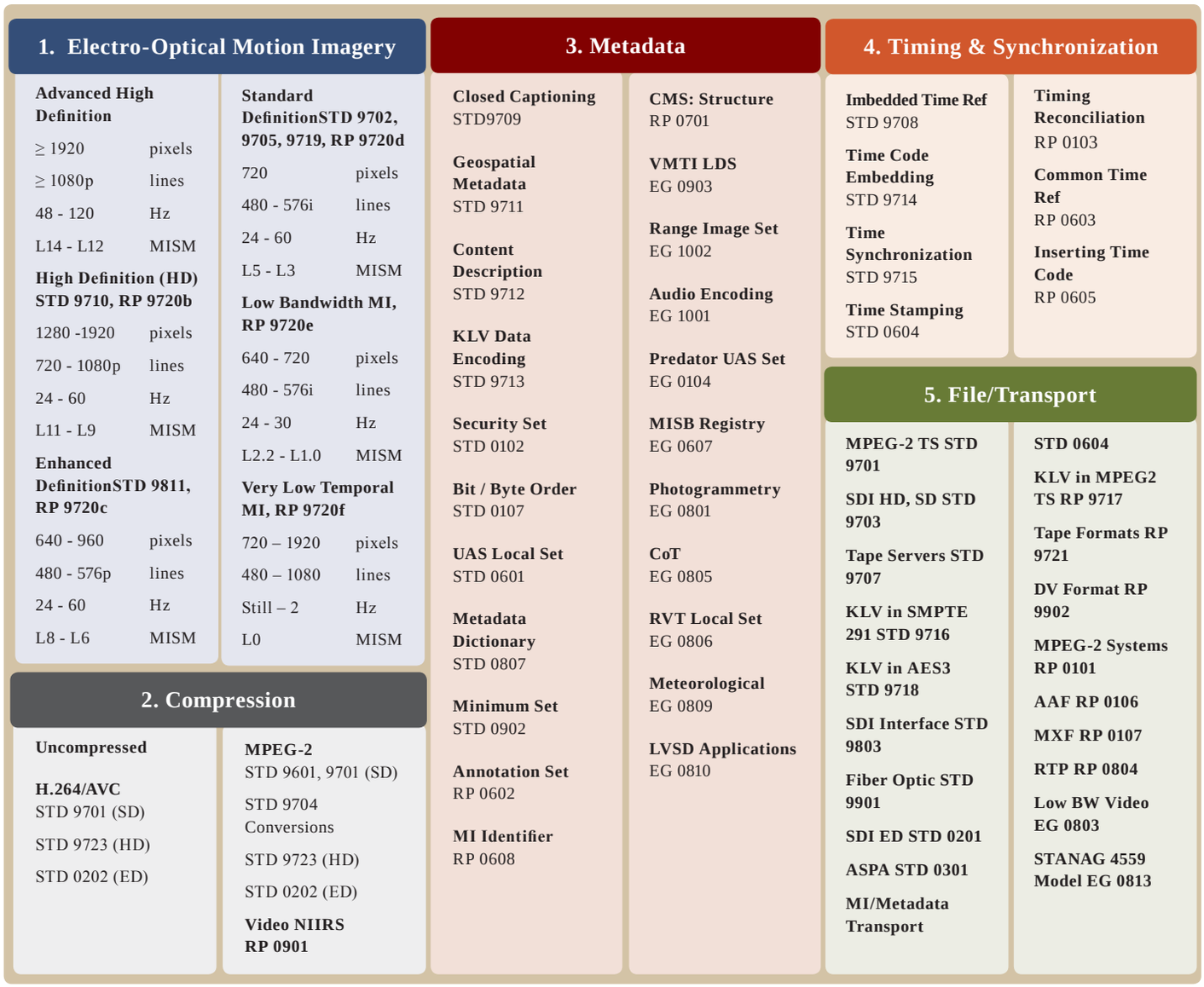


Figure 1: MISB Standards in the Context of the Motion Imagery Pipeline

2.3.3 Community Sensor Model Working Group (CSMWG)

The CSMWG serves as the community focal point for the establishment of standards and provider of services for interoperable sensor models enabling the efficient collection, production and distribution of GEOINT source materials. The principal baseline standardization product of the CSMWG is the mandated Community Sensor Model Technical Requirements Document (CSM). To date the focus of the CSM has been airborne tactical sensors. The genesis of the establishment of the CSMWG was to standardize sensor models for tactical airborne sensors. This supported a key technical objective of the Mensuration Services Program (MSP) to provide a standardized means for the production of physical sensor models for airborne tactical sensors necessary to populate the MSP plug-in library environment.

Figure 2 depicts the role of sensor models in supporting the evolution of MSP. The left side of the diagram shows the legacy environment comprised of competing, costly stovepipe exploitation software, non-interoperable sensor models and specifications independently developed by several NSG member agencies. The center of the diagram represents the transitional 2000 - 2003 timeframe when the U.S. Air Force and NGA engaged in separate programs for the development of sensor models and exploitation software. During this period the USAF initiated the Tactical Sensor Model Program and published the Version 1.0 of what is now the CSM. In the final phase, right column, NGA fully implemented the CSM resulting in the ability of the MSP to initiate sensor agnostic mensuration, single-certified NGA mensuration functions, and CSM compliant sensor models.

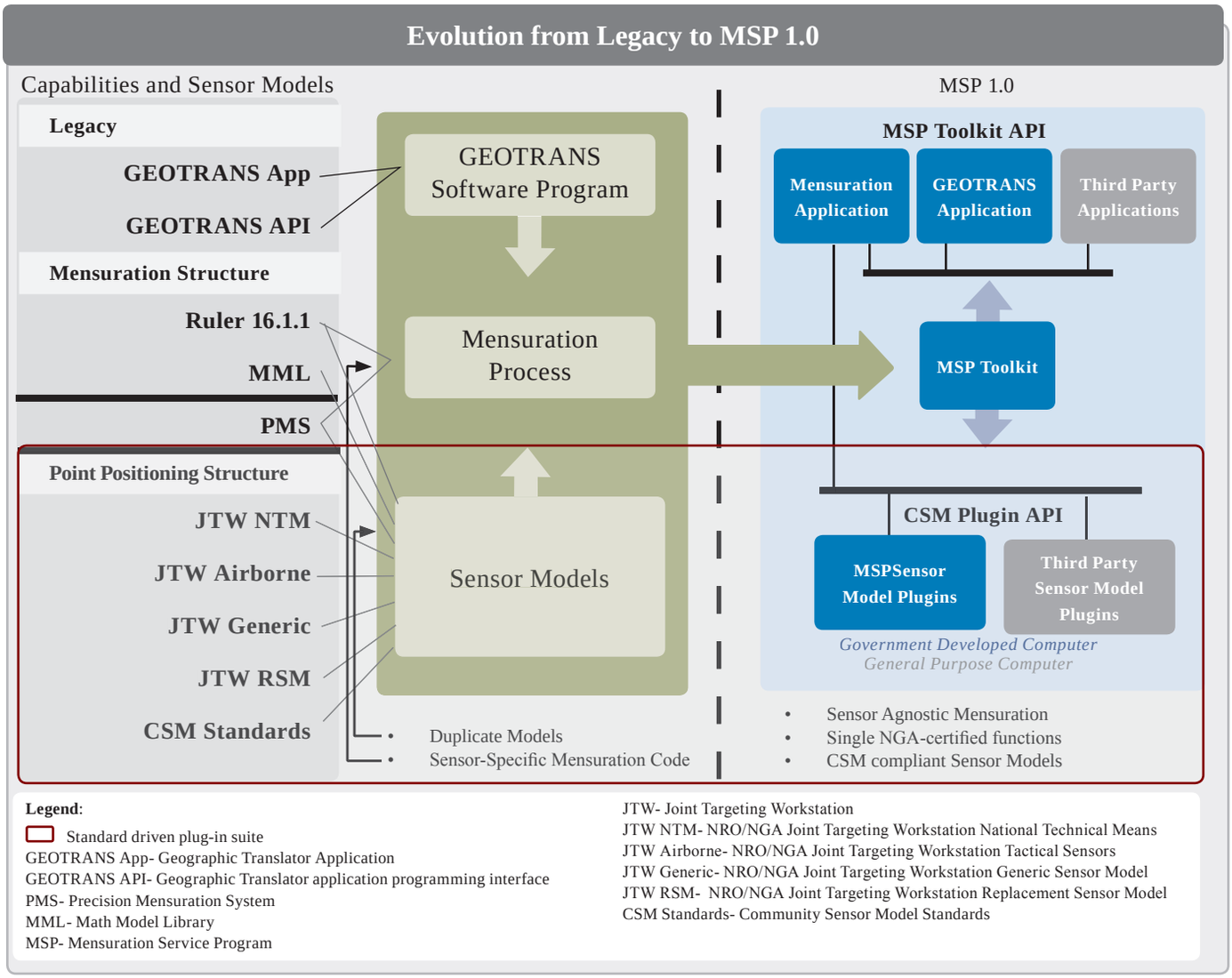


Figure 2: Sensor Models- Enabling the Evolution of the MSP

2.3.4 Portrayal Focus Group (PFG)

Topographic Data Store Symbology Development

Legacy GEOINT portrayal standards include MIL-STD-2402, Mapping, Charting, and Geodesy Symbols for Graphic Products, and MIL-DTL-89045A, Geospatial Symbols for Digital Display (GeoSym). These standards are obsolete or inadequate for the portrayal of Local Topographic Data Store (LTDS) data because:

- NGA's Topographic Data Store (TDS) content is broader in scope than the current Vector Product Format (VPF) baseline products which GeoSym was designed to portray.
- Symbol assignment rules in GeoSym and MIL-STD-2402 are based on legacy data encoding standards Feature and Attribute Coding Catalogue (FACC) and Feature and Attribute Coding System (FACS), not the current NSG Feature Data Dictionary (NFDD) feature/attribute encoding standard being used today.

To meet NSG requirements for the portrayal of Local Topographic Data Store (LTDS) data, the GWG and the NGA Source Operations and Management Directorate are developing the NGA Portrayal Standard for LTDS Data.

2.3.5 Application Schemas for Feature Encoding Focus Group (ASFE)

In 2010, ASFE developed the "Time-Space-Position Information (TSPI), Version 1.0.1, 22 Jan 2010 (TSPI v1.0.1)". TSPI provides a robust mechanism for expressing "Where" and "When" in information schemas throughout the DoD/IC. It includes the specification of the spatial, temporal, and accompanying quality assessment, characteristics of

entities (e.g., equipment, combatants and targets). The TSPI is applicable to the storage, manipulation, interchange, and exploitation of command, control, and geospatial intelligence data. Spatiotemporal data is critical to enabling mission critical capabilities such as the common operational picture, situational awareness, and precision targeting.

In 2010, the GWG mandated the "NSG Topographic Data Store (TDS) Content Specification, Version 3.0", which is an extension to the NSG Entity Catalog. It is applicable to the collection, storage, manipulation, interchange, and exploitation of GEOINT data. Systems participating within the NSG may utilize the NSG TDS Content Specification in order 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. These systems include the NGA Topographic Feature Data Model, the U.S. Army Digital Topographic Support System, Theater Geospatial Database, and the U.S. Marine Corps Topographic Production Capability.

2.3.6 Metadata Focus Group (MFG)

In late 2010, the MFG published version 2.0 of the NSG Metadata Foundation (NMF) – Part 1: Conceptual Schema Profile, which is now mandated for use and will enable the publication, discovery, and retrieval of GEOINT data across the NSG. The NMF standardization effort focuses on developing metadata standards that when implemented will break down metadata stove pipes, minimize costs and operations impacts and enhance the discoverability of GEOINT data. The NMF provides a coherent metadata framework that allows mission areas to implement the metadata they need while enabling the sharing of that metadata in a way that allows for effective use by other mission areas.

2.3.7 Information Transfer and Services Architecture Focus Group (ITSA)

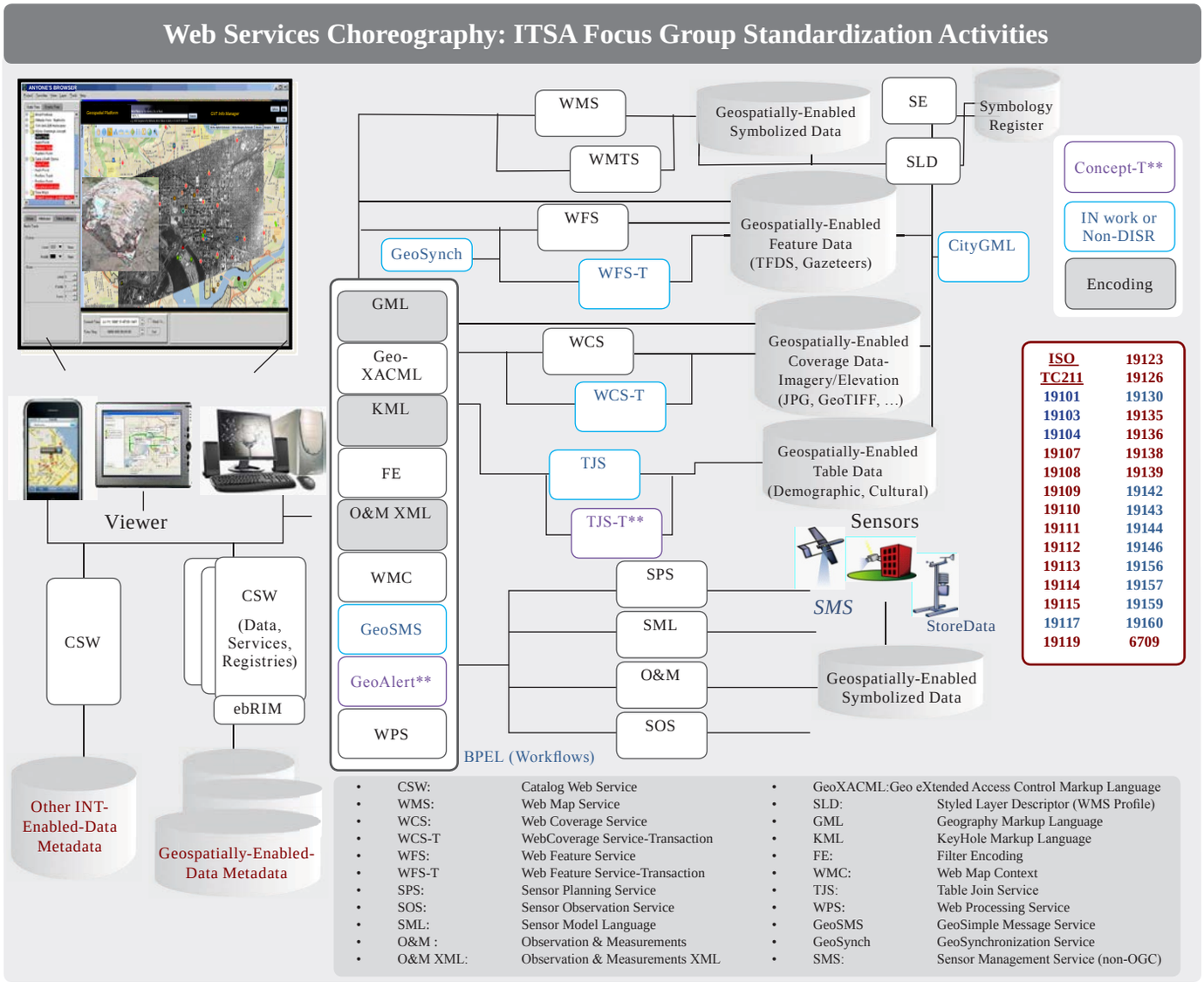


Figure 3: Web Services Choreography: ITSA Focus Group Standardization Activities

The GWG ITSA Focus Group is responsible for GEOINT web service standards. In 2010, the ITSA Focus Group continued development, promotion, and adoption of ISO TC211 and OGC standards. Figure 3 depicts, in an architectural rendering, an operational view "Fit For Purpose" view of the suite of OGC GEOINT web services. The figure shows the nodes and "need" data interfaces for data and services. To date the Focus Group has worked on or evaluated over 20 OGC and ISO TC211 GEOINT standards for citation in the DISR and ICSR. Future work will enhance the suite of standards to meet evolving NSG requirements.

2.3.8 OPIR Focus Group (OFG)

OPIR Technical Document Development

The OFG is developing technical documentation that will be published iteratively to include a data dictionary to capture and harmonize common OPIR terms, a common lexicon to document enterprise vocabulary, and OPIR Data Product Levels. In 2010, the OFG developed both a Common Conceptual OPIR Data Model (ODM) that captured elements defined in an emerging physical model, and a Logical Data Model derived from the ODM. The NGA InnoVision Directorate has funded a new sub-group of the OFG, the OPIR Parties to a Universal Standard Development (OPUS-D) Consortium, to develop OPIR data product standards, provide a logical data model and an Hierarchical Data Format (HDF v5) implementation guide for multiple sensors. OPUS-D has developed a draft OPIR data product standard for Representative Returns. The OFG also drafted the OPIR Scene Product Standard, which converted OPIR scene-type data sets into NITF format thus enabling interoperability with tools on existing NSG workstations.

2.4 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 2010 GWG Founder's Award Recipient was:

Stephen W. Kerr	Standards Architect, NGA

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 2010 GWG Achievement Award Recipients were:

Dr. W. Mark Wonnacott	Engineer, Naval Air Warfare Center
Dr. James Kasner	Motion Imagery Scientist, WiSC Enterprises LLC
Terence Wynne	Motion Imagery Metadata Expert, Riverside Research Institute
Stanley I. Grossman	Program Manager, NGA
Richard Pearsall	Standards Architect, NGA

Section 3

SECTION 3: GWG Moving Forward – 2011

Looking forward to 2011, the following initiatives will be reported on in depth in our next Annual Report:

3.1 Enable LiDAR Interoperability

Memorandums from Lt Gen John C. Koziol (Director, ISR Task Force) and Mr. Kevin P. Meiners (Deputy Under Secretary of Defense for Portfolio, Programs and Resources) on the subject of Metadata Standards for Emerging GEOINT Capabilities, points out that the Services, Agencies, and industry partners are rapidly fielding advanced and improved sensors, platforms, and analytical capabilities to meet the urgent needs of the warfighters. While LiDAR is effective in support of combat operations, it is not well integrated with the rest of the combat support environment (i.e. Defense Intelligence Information Enterprise (DI2E)). In response to such LiDAR requirements, longer-term NSG architecture options for LiDAR Tasking, Collection, Processing, Exploitation and Dissemination (TCPED) solutions are being analyzed as NGA pursues an NSG architecture solution to seamlessly incorporate LiDAR data as a foundation data source. Observing that LiDAR resources were sponsored by a variety of independent programs offices throughout the NSG, NGA determined that a cross domain, collaborative forum would be required to promote effective coordination and data services integration and as a result established the LiDAR Interoperability subgroup of the NITFS Technical Board (NTB). The subgroup has drafted a Conceptual Model and Metadata Dictionary (CMMD) for LiDAR as an initial step for standardizing LiDAR data to improve information sharing and interoperability. The CMMD serves as a template for future data standards with respect to an enterprise Conceptual Model as a fully common metadata document matures. LiDAR standards-related activities are focused on improving deployed warfighter access, discovery, retrieval, and exploitation of LiDAR data from currently deployed tactical LiDAR collectors geographically dispersed at locations within the United States Central Command Area of Operations.

3.2 Enhance the GSIP - Human Geography & Foundation GEOINT

In 2011, the Human Geography Working Group (HGWG), will develop a Data Dictionary/Catalog and after GWG community review, will provide it to DGIWG for international acceptance. The Human Geography Data Dictionary and Entity Catalog will be included in the GSIP ensuring consistency and interoperability across many GEOINT and Human Geography domains. The HGWG will also support the implementation of data standards to guide collection and data management architectures, and define and standardize the educational requirements and tradecraft skills necessary to support the integration of socio-cultural data into the GEOINT discipline.

3.3 Enhance Metadata Standards Critical to Metadata Integration and the Enterprise Architecture

On April 22, 2011, with the release of the DISR 11-1 Baseline, the MFG version 2.0 of the NSG Metadata Foundation (NMF) - Part 1: Conceptual Schema Profile will be mandated for use in new systems along with associated metadata implementation guidance as published in the NSG Metadata Implementation Specification (NMIS) Part 2: XML Exchange Schema version 2.0. In 2011, a series of crosswalks are being developed mapping metadata models against the NMF. In addition, these models are being evaluated in terms of the overall NSG architecture to identify, 1) data sources and consumers, 2) how metadata passes from one model to another and 3) whether the resulting data flow is complete, correct and coherent.

3.4 Deliver the Global Information Grid Technical Profile for GEOINT Visualization Enterprise Services

The GEOINT Visualization Services (GVS) suite provided by NGA is designated, by the DoD CIO, as a DoD Shared Enterprise Service for geospatial visualization. In 2011, the GWG will publish the Global Information Grid (GIG) Technical Profile (GTP) for the Geospatial Visualization-Enterprise Service (GV-ES) which will define the technical standards that enable multiple data holdings to be shared using the GV-ES system. The GV-ES GTP also defines the technical service interfaces for GV-ES, the operations performed by those services, the data and metadata content, the encoding of the messages passed over these interfaces, and test requirements to be accepted into the system.

3.5 Satisfy U.S. Govt Country Code Requirements (Federal, State, & Civil)

NGA and Defense Information Systems Agency (DISA) are leading an Information Technology Standards Committee (ITSC) tiger team effort to develop a strategy to address the requirements and technical challenges associated with the transition of country code standards.

3.6 Advance the OPIR Program of Work

The OPIR Focus Group (OFG) will refine the Track and Scene product standards, extend OPIR data models to address LiDAR and Common Sensor data models, and position OFG standards and models for implementation.

3.7 Still Imagery Standardization Support to Emerging Capabilities

The NTB will be guiding the development of new NGA implementation profiles for still imagery derived from motion imagery and National Imagery Transmission Format (NITF) representation of hyperspectral data.

3.8 Expand Wide Area Motion Imagery Standardization Efforts:

The Motion Imagery Standards Board (MISB) will continue to maintain and extend the body of guidance related to Full Motion Video, and in 2011 will also shift its attention to Large Volume Streaming Data (LVSD, also known as Wide Area Motion Imagery, Wide Area Persistent Surveillance data) and to supporting the automated processing and semi-automated exploitation approaches required to deal with the enormous quantities of data that motion imagery is delivering.

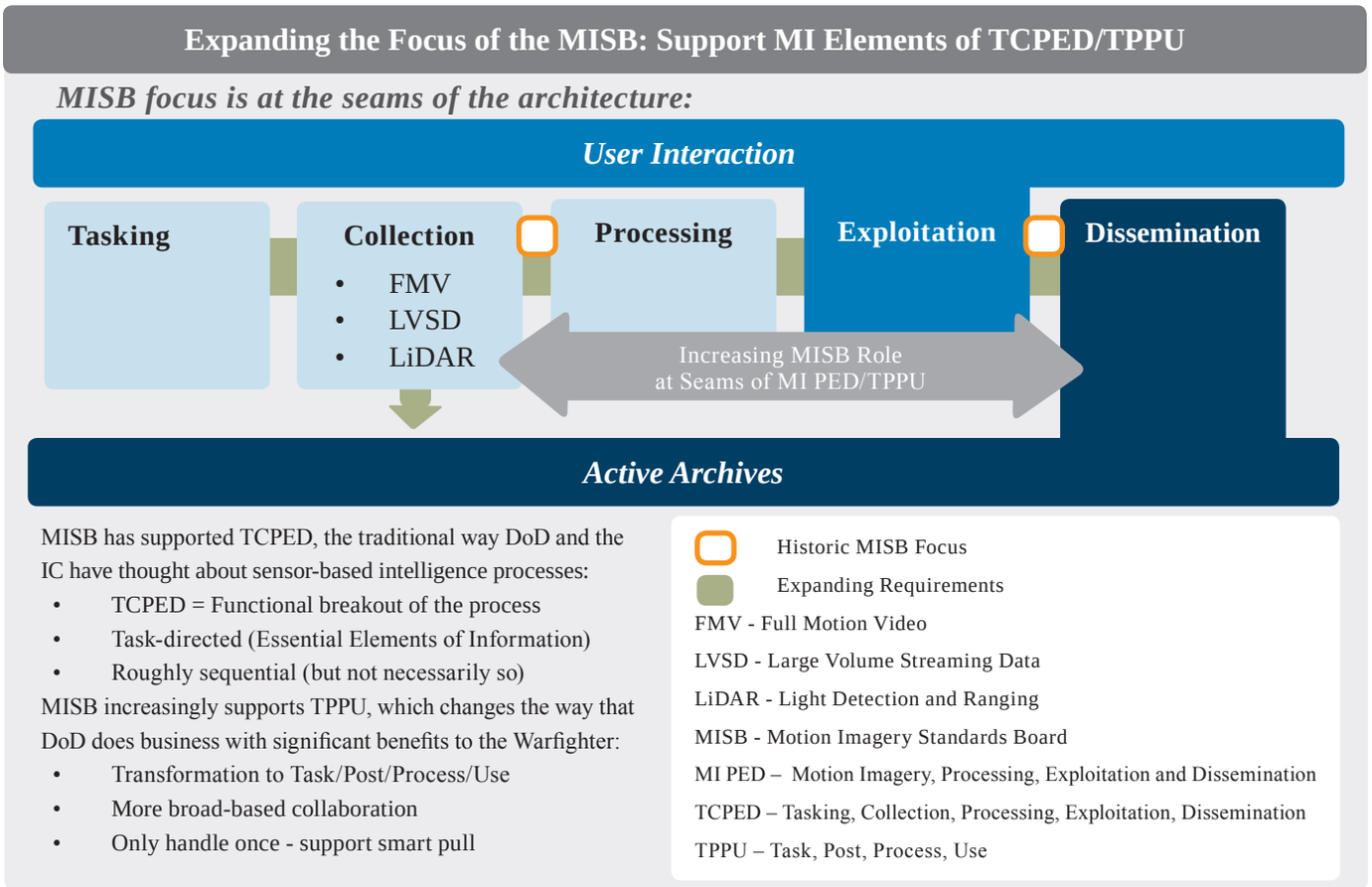


Figure 4: Expanding Focus of the MISB

The 2011 key initiative areas the MISB expects to engage in include:

- Standards in direct support of effective, efficient, and collaborative analytics
- Standards support for the multiple stages of automated tracking
- Standards for hyper-compression of massive motion imagery data sets
- Standards support for the shift from feature- to activity-based intelligence

GWG