

DIGEST, A STANDARD OF STANDARDS

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ABSTRACT

The paper provides background on the works of the Digital Geographic Information Working Group (DGIWG) that achieve the publication of a family of standards, Digital Exchange Standard or DIGEST, which deals with all kind of data structures on Digital Geographic Information.

Digital Geographic Information has evolved into an essential element in the planning and conduct of civil and military operations. The required data volume, demands and data complexity dictates that multinational agreements for digital data standards be established to assure compatibility. In support of this aim these standards define those aspects necessary to the exchange of digital geographic information: the data structures to be supported, the format, the feature and attribute coding scheme, the exchange media, and the administrative procedures.

DIGEST compliant products such as Digital Chart of the World (DCW) and VMap with resolutions equivalent to 1:1.000.000 and 1:250.000 scales, respectively, are finally revised.

1. History of DGIWG

The DGIWG is a multinational body responsible to member nations for coordinated advice and policy recommendations on Digital Geographic Information Systems of concern to member nations and to NATO.

The DGIWG was established in June 1983 with four nations as its members. The membership increased to six in 1984, seven in 1986, nine in 1989 and eleven in 1990.

The DGIWG has developed since then the core of the standards, DIGEST 1.2., the Feature and Attribute Coding Catalogue (FACC) and a number of raster and datasets specifications. Each is described below.

Nations represented in DGIWG through their geographic organizations are as follows:

- Defense Mapping Agency (United States).
- Directorate General of Military Survey (United Kingdom).
- Amt für Militarisches Geowesen (Germany).
- Centre Geographique Interarmées (France).
- Istituto Geografico Militare and Centro Informazioni Geotopografiche Aeronautiche (Italy).
- Institute Geographique Nationale (Belgium).
- Chief of Defense Geographic Office (Denmark).
- Topografische Dienst (Netherlands).
- Forsvarets Karttjeneste (Norway).
- Directorate of Geographic Operations (Canada).
- Servicio Geográfico del Ejército and Centro Cartográfico y Fotográfico del Ejército del Aire (Spain).
- Supreme Headquarters Allied Powers Europe (SHAPE).

2. Description of DIGEST

DIGEST is designed to enable the transfer of Digital Geographic Information between geographic information systems. These standards will enable interoperability and compatibility among national and multinational systems and users, assuring the receiver's unambiguous understanding of the geographic information that the sender intended.

2.1. Data structures.

DIGEST applies to:

- spaghetti vector data (Type 0 Topology).
- chain-node vector data (Type 1 Topology).
- planar graph vector data (Type 2 Topology).
- full topological vector data (Type 3 Topology).
- raster data (radiometric information pertaining to pixels), and
- matrix data (non-radiometric information pertaining to points at regularly identified intervals).

These structures may accommodate neutral "geodata", processed "product data", and metadata. The metadata will include (among other things) data quality information and availability.

2.2. The exchange structure.

DIGEST allows the definition of sets of geographic information to be exchanged.

The guiding philosophy has been to organize the required information into an exchange structure which includes the transmittal header file (details of the contents of the transmittal), the header data subset (the supporting information specific to the data), and the geo data subset (the actual digital geographic information data).

2.3. Encapsulation specifications.

DIGEST provides a small number of ways to encode geographic data.

- Annex A uses ISO 8211 to encode information. This encapsulation is data descriptive and is meant for bulk transfer and archival purposes where the exchange set is usually a large data structure which must be specified in great detail.
- Annex B uses ISO 8824 to encode information. The exchange of data over communication networks and the use of data disks as interactive sources of data means that the current exchange standards, based on ISO 8211, may be inadequate for these purposes. Annex B consists of a sequential stream of information, the basic information elements being equivalent to the fields used in the ISO 8211 formulation of the same data format.

- Annex C uses Vector Relational Format (VRF) to encode information. VRF is a general, user-oriented data format for representing large spatially referenced databases, that are based on a geo-relational data model and are intended for direct use. VRF allows application software to read data directly from computer-readable media without prior conversion to an intermediate form.

3. The Feature and Attribute Coding Catalogue

The Feature and Attribute Coding Catalogue, which is Part 4 of DIGEST, provides a common menu of features and attributes along with a standardized coding system. Where particular applications require the definition of a few specialized features and attributes not yet contained in FACC, a Data Dictionary may be used.

Within FACC, each feature is identified by a unique five-character code. The first character corresponds to the feature category and can have an alphabetic value from A through Z. Currently there are eight major feature categories:

- Culture.
- Hidrography.
- Hypsography.
- Physiography.
- Vegetation.
- Demarcation.
- Aeronautical Information, and
- General.

Each major category is further divided into subcategories identified by the second character of the five-digit code which is an alphabetic value from A through Z. Finally, the third, fourth, and fifth characters of the five-character feature code are a numeric value from 000 through 999, which provides unique feature identification within categories.

4. Raster Specifications

The DGIWG have developed exchange specifications for digital replicas of graphic products: ARC Standardized Raster Product (ASRP), and UTM/UPS Standardized Raster Product (USRP). The design objective of both specifications is provide colour-coded data at 100 microns resolution in a virtually seamless manner, margin areas removed and

adjacent map sheets merged, and permit direct display in a conformal or nearly conformal presentation.

To accomplish this ASRP uses the Equal Arc-Second Raster Chart/Map (ARC) system of reference while USRP uses the Universal Transverse Mercator and Universal Polar Stereographic Projections.

Standard Raster Graphics (SRG) is a minimum specification providing digital replicas of graphics products. The digital replication is done either by separation into red, green and blue (RGB) components, or by colour-coded layers. The resolution is 100 microns or better. Margin, border, and legend areas are included.

Ongoing works address the consolidation of existing raster specifications and the incorporation of ASRP, USRP and SRG into one single DIGEST Raster profile.

A number of new requirements for raster data are arising: imagery, georeferenced non-rectified data, compression techniques, mixed raster, vector, text.

5. Matrix data

DGIWG nations exchange digital terrain elevation data in accordance with STANAG 3809 (DTED).

The group is discussing the migration of existing DTED data into DIGEST Matrix compliant format.

6. Datasets specifications

DGIWG has also developed specifications, upon request of the Nato Geographic Conference in 1990, for datasets to support applications in 7 specific areas: Terrain Analysis, Transport and Logistics Planning, Background Display, Simulation, Air Information, Toponymy, and exchange of Neutral Data. Each dataset is required in one or more levels of detail, from the highest resolution, equal to 1:100K map scale and larger, to the lowest resolution, equal to 1:1M scale map, 1:250K and 1:500K map scales being the medium resolution level.

7. DGIWG involvement with other organisations

ISO

DGIWG has now Class A Liaison on ISO TC 211.

In the last meeting in November 94, DGIWG represented by UK, there was an agreement to set up 5 "Ad Hoc" groups:

1. Geographic Information Standards Reference model.
2. Geospatial Data Modelling.
3. Geospatial Data Administration.
4. Geospatial Services.
5. Functional Standards (defacto regional and international standards).

DGIWG keeps interest in all five groups, and specially in group 5 where DIGEST is being considered among other standards, such as S-57 and GDF.

IHO

A high priority topic in DGIWG work is to achieve as much compatibility as feasible with other Hydrographic and Aeronautical standards.

A joint IHO/DGIWG Harmonisation Working Party is currently discussing ways of increasing harmonisation of the DIGEST and S-57/DX90 exchange standards. Harmonisation requires similar/identical data models, data dictionaries and metadata so that features and attributes can be converted from one standard to another and integrated with no loss of information. Complete harmonisation to meet specific system requirements is believed to be technically achievable given the appropriate level of commitment and resources.

ICA

DGIWG representatives attend regularly to the ICA conferences.

CEN

Individual members of DGIWG attend also to the CEN/TC-287. DGIWG, as a group, encourage this participation.

8. DCW and VMap

Digital Chart of the World (DCW) and Vector Smart Map (VMap) are DIGEST compliant products.

DCW is a worldwide coverage low resolution (1:1M) product, sponsored by USA, Canada, UK, and Australia, which provides background display data in a relational model with a viewing software.

VMap is an on the way multinational production project to fulfill worldwide coverage in 2000 at medium resolution, the data coming from 1501 Series cartographic source (1:250K).

Vector Product Format (VPF) being the specific product implementation of DIGEST-Annex C, VMap Level 1 is a product profile of VPF.

9. Future activities

DGIWG has proved efficient in dealing with standardisation works. DIGEST edition 1.2. is DGIWG business card. There are also available products based on DIGEST. DGIWG will continue its work as requirements arise, not only for the benefit of their represented interests, but also for the benefit of commercial/private sectors. Current Programm of Work of DGIWG envisage new issues: implementation and maintenance of DIGEST, major revision of FACC, software tools, symbology, geospatial modelling...

Further information about the DGIWG, its work, its future activities and the status of individual standards can be obtained from the Secretary DGIWG, Directorate General of Military Survey, Elmwood Avenue, Feltham, Middlesex, TW13 7AH, England.