TECHNICAL REPORT

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Geographic information — Imagery and gridded data

Information géographique — Imagerie et données quadrillées

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of ISO/TR 19121 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TR 19121, was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*, in collaboration with:

— Committee on Earth Observation Satellites (CEOS)

— Digital Geographic Information Working Group (DGIWG)

— International Hydrographic Organization (IHO)

— Open GIS Consortium, Inc. (OGC)

— ISO/IEC JTC 1/SC 24

Introduction

This Technical Report is intended to identify the manner by which ISO/TC 211 should handle imagery and gridded data in the context of its standards.

A natural image is a radiometric representation of the real world, as seen by an optical or other sensor. A synthetic image is a generated depiction of spatial data in a visual form. Both natural and synthetic image data are being used increasingly in the area of geographic information/geomatics. Gridded data is the representation of attribute values in terms of a spatial grid. All three of these forms of spatial information can be handled in a similar manner by representation in terms of a raster or matrix structure. Both a raster and a matrix are array structures that may be coded somewhat differently due to the characteristics of the data.

An increasingly large volume of natural and synthetic image and gridded data is being produced. For example, current imaging satellites include LandSAT, RADARSAT, SPOT, ERS, MOS, JERS and NOAA. Also, there are military satellite images and other public and private domain image sources. There are current plans to launch more than one hundred Earth observing satellites by the year 2005, with 60 of those scheduled for launch by the end of 1999, with some of these satellites generating as many as 22 000 scenes per day. Digital orthophoto mapping is another field in which major financial investment is being made and in which a large volume of raster data is being produced. Obviously, there will be great demand for this imagery to be in a standard format in order to be useful with other sources of data.

Large volumes of synthetic imagery are being produced by the scanning of the current large inventory of paper maps and charts, and it is expected that the volume of this data will exceed the production of vector based data sets for a long time. Synthetic raster maps include scanned paper map products, such as topographic maps, nautical charts, soil and vegetation maps and other such products. They also include raster data sets generated directly from vector data sets. Since the demand for image and gridded data is large and will be rapidly increasing in the near future, it is necessary to address this form of data in ISO/TC 211. Many countries and international organizations are producing Digital Elevation Models (DEMs). Many other forms of gridded data such as georeferenced socio-economic data including land use data, meteorological and bathymetric data are being compiled in large volumes.

Earth observation networks and information infrastructures are being developed in many countries to further improve the access and use of remote sensing data, products and services, with the objective to provide state-of-the-art interfaces between the data archives and their users. The interoperability between data archives — an important element of which is interoperable standards — will greatly facilitate a more effective operation by government bodies and the value-added sector.

The specific aim of this work item is to analyse the characteristics of imagery and gridded data and make recommendations with respect to how this data can be handled in ISO/TC 211. There is a significant overlap between many of the current ISO/TC 211 work items and those areas that require standardization to support imagery and gridded data. For example, it is possible to share many metadata elements between vector and raster representations, but some unique metadata will be required to handle particular raster related aspects.

The main interests that will benefit from the standardization of raster and matrix data formats will be the distributors and end-users of raster data. Currently, each satellite effectively defines its own "standard" based on the characteristics of its sensors. There also exists a large number of "standard" formats for the exchange and distribution of synthetic raster data such as scanned paper maps. Integration of data is difficult at best.

Although there are some aspects of sensor characteristics that are unique to particular data sources, there is a high degree of commonality underlying the basic parameters. In addition, many of the aspects of the existing ISO/TC 211 work on vector standards, such as geographic referencing, quality, metadata, positioning services, and portrayal are applicable to raster and matrix data.

Geographic information — Imagery and gridded data

1 Scope

This Technical Report reviews the manner in which raster and gridded data is currently being handled in the Geomatics community in order to propose how this type of data should be supported by geographic information standards.

This Technical Report identifies those aspects of imagery and gridded data that have been standardized or are being standardized in other ISO committees and external standards organizations, and that influence or support the establishment of raster and gridded data standards for geographic information. It also describes the components of those identified ISO and external imagery and gridded data standards that can be harmonized with the ISO 19100 series of geographic information/geomatics standards.

A plan is presented for ISO/TC 211 to address imagery and gridded data in an integrated manner, within the ISO 19100 series of geographic information standards.

2 References

ISO 19101:—[1)], *Geographic information — Reference model.*

ISO 19102:—[1)], *Geographic information — Overview.*

ISO/TS 19103:—[1)], *Geographic information — Conceptual schema language*.

ISO 19104:—[1)], *Geographic information — Terminology*.

ISO 19105:—[1)], *Geographic information — Conformance and testing*.

ISO 19106:—[1)], *Geographic information — Profiles*.

ISO 19107:—[1)], *Geographic information — Spatial schema*.

ISO 19108:—[1)], *Geographic information — Temporal schema*.

ISO 19109:—[1)], *Geographic information — Rules for application schema*.

ISO 19110:—[1)], *Geographic information — Feature cataloguing methodology*.

ISO 19111:—[1)], *Geographic information — Spatial referencing by coordinates*.

ISO 19112:—[1)], *Geographic information — Spatial referencing by geographic identifiers*.

ISO 19113:—[1)], *Geographic information — Quality principles*.

1) To be published.

ISO 19114:—[1)], *Geographic information — Quality evaluation procedures*.

ISO 19115:—[1)], *Geographic information — Metadata*.

ISO 19116:—[1)], *Geographic information — Positioning services*.

ISO 19117:—[1)], *Geographic information — Portrayal*.

ISO 19118:—[1)], *Geographic information — Encoding*.

ISO 19119:—[1)], *Geographic information — Services*.

ISO/TR 19120:—[1)], *Geographic information — Functional standards*.

3 Review of existing standards

Currently there exist several other efforts at standardizing aspects of imagery and gridded data in different related fields or application areas. For example the DIGEST Functional Standard addresses raster and matrix data. The IHO is currently beginning work on handling synthetic scanned charts as raster data. Of particular importance is the work ongoing in ISO/IEC JTC 1/SC 24 on Computer Graphics and Image Processing. ISO/IEC JTC 1/SC 24 has published the Basic Image Interchange Format (BIIF) which provides a standard image interchange format for a wide variety of imagery applications, including medical imaging and other non-geospatial applications. There has been extensive work done by DGIWG to harmonize the DIGEST standard with the work of ISO/IEC JTC 1/SC 24. Annex D of DIGEST is an encapsulation of DIGEST in terms of BIIF components. Also there is compatibility with the NATO Secondary Imagery Format (NSIF). It is urgent that the formal study of raster and matrix standards begins in ISO/TC 211 to ensure alignment between the suite of ISO base standards and these external standards. Parallel efforts are also underway in JTC 1/SC 32/WG 4 SQL/MM to create supporting data types and operators to manage, query, and disseminate image data. The Open GIS Consortium has recently released an RFP study document on "Coverages" that is of importance for imagery and gridded data.

The following subsections present the status of each of the external standards efforts related to imagery and gridded data. Primarily international and public domain or open standards developments are addressed. Subsection 3.9 also lists some of the more important industrial or private developments.

3.1 The International Organization for Standardization (ISO)

The International Organization for Standardization is the principal world standardization organization. It establishes international standards in a broad range of disciplines. In addition to the work in ISO/TC 211 there are several committees within ISO that are of interest with respect to the standardization of raster data.

3.1.1 ISO/IEC JTC 1 — Information technology standards

The International Organization for Standardization/International Electrotechnical Committee Joint Technical Committee 1 is responsible for the standardization of information technology. Several of its subcommittees are of particular importance to the study of raster data.

— ISO/IEC JTC 1/SC 24 — The subcommittee of JTC 1 which deals with computer graphics and image processing.

— ISO/IEC JTC 1/SC 29 — JTC 1 subcommittee responsible for the coded representation of audio, picture, multimedia and hypermedia information.

— ISO/IEC JTC 1/SC 32/WG 3 — JTC 1 subcommittee responsible for data base languages.

3.1.1.1 ISO/IEC JTC 1/SC 24 — Computer Graphics and Image Processing

This JTC 1 subcommittee is responsible for computer graphics and image processing standards and has developed the Image Processing and Interchange, Image Interchange Facility (IPI-IIF). This standard suite provides a framework in which to handle all types of imagery. The standard is being developed in ISO as part of the work on image processing and it is intentionally broad enough to handle very diverse types of imagery, including medical X-rays and images, photographs, satellite and other sensor data, and scanned maps. It is expected that details of the metadata and other adaptations of the basic standard will be developed in different application domains, such as mapping. ISO/IEC 12087; IPI-IIF is a broad multi-part standard with a separate encoding standard, ISO/IEC 12089. The standard provides a platform-independent set of image data types, an Application Programming Interface (API), and an exchange format (IPI-IIF). The underlying encoding is ISO 8824 ASN.1.

The ISO/IEC 12087 IPI-IIF standard contains the following parts:

— Part 1: Common architecture for imaging

— Part 2: Programmer's imaging kernel system application programme interface.

— Part 3: Image Interchange Facility (IPI-IIF)

Another part of the IPI-IIF standard is ISO/IEC 12087-5: Basic Image Interchange Format (BIIF). Development of this standard was based on the collaboration of ISO/IEC JTC 1/SC 24, NATO Air Group IV, Digital Geospatial Information Working Group (DGIWG), and the US Department of Defense. The US National Imagery Transmission Format Standards (NITFS) was used as a base document for BIIF. There has been a US Government activity to harmonize the NITFS with the US Spatial Data Transfer Standard (SDTS).

This published international standard will make use of International Standardized Profiles to define and organize domain applications of the standard. The US National Imagery Transmission Format (NITF) and the NATO Secondary Imagery Format will be handled as a profile of BIIF. Commercial applications of NITF include ERDAS IMAGINE, ARC-INFO, and a Northrup package.

The BIIF standard provides a detailed description of the overall structure of the format, as well as specification of the format and data domain for all fields defined within BIIF. As part of the ISO/IEC 12087 family of image processing and interchange standards, BIIF conforms to the architectural and data object specifications of ISO/IEC 12087-1, the Common architecture for imaging. BIIF supports a profiling scheme that is a combination of the approaches taken for ISO/IEC 12087-2 Programmer's Imaging Kernel System (PIKS), ISO/IEC 10918 Joint Photographic Experts Group (JPEG), ISO/IEC 8632 Computer Graphic Metafile (CGM), and ISO/IEC 9973 the Procedures and Registration of Graphical Items. Geospatial referencing for the interNational Standard Imagery Format ISP is by way of mandatory inclusion of the geospatial support data extensions defined in Annex D of the DIGEST.

In BIIF, a translation process enables data interchange between disparate systems. Using BIIF, each system must be compliant with only one external format that will be used for communication with all other participating systems. When BIIF is not used as a system's native internal format, each system will translate between the system's internal representation for imagery and the BIIF format. A system from which data is to be transferred has a translation module that accepts information structured according to the system's internal representation for images and related imagery data, and assembles this information in BIIF format. The approach provides the proven capability to implement general purpose BIIF readers (applications) that can present the basic imagery and annotations of any BIIF compliant product file created within the constraints of a given profile of BIIF. Although more robust approaches exist to allow self-defining data structures, these approaches significantly increase the complexity for implementing general-purpose readers (applications) capable of meaningfully interpreting file constructs created by a wide variety of diversely developed generators. More simplistic imagery file formats also exist. These formats are often focused at just portraying a simple digital image and are often too limited in feature sets to meet the needs of somewhat more sophisticated, but still basic imagery applications. BIIF provides a basic capability that bridges the gap between simplistic digital image formats and the extremely sophisticated, self-defining, but potentially complex format. As such, BIIF has some inherent bounds and limitations, but remains as a very capable basic imagery format that satisfies a broad range of imagery applications.

3.1.1.2 ISO/IEC JTC 1/SC 29 — Coding of Audio, Picture, Multimedia and Hypermedia Information

ISO/IEC JTC 1/SC 29 supports a broad range of standards for the exchange of picture and multimedia data. This committee consists of a number of expert groups. The relevant standards are known informally after the names of the groups that developed them.

— WG 1, the Joint Photographic Experts Group (JPEG) for continuous tone pictures, and the Joint Binary Images Group (JBIG) for bi-level, rasterized, images

— WG 11 the Moving Pictures Experts Group (MPEG)

— WG 12 the Multimedia/Hypermedia Information Coding Experts Group (MHEG)

ISO/IEC 11544, *Coded representation of picture and audio information — Progressive bi-level image compression* (JBIG), is a standard sponsored jointly by the UN based International Telegraphic Union (ITU) and ISO. It provides an efficient lossless compression method for coding two tone, black/white images. The standard supports generic coding techniques for data compression and decompression for bi-level images and for limited bits-per-pixel images such as those with a limited number of grey or colour values. The scope of this work includes techniques for progressive image build-up, from low resolution to higher resolution, and techniques for image resolution reduction.

ISO/IEC 10918, *Digital compression and coding of continuous-tone still images* (JPEG), is sponsored jointly by the ITU and ISO, and is used for continuous-tone (photographic) images. Both lossy transform algorithms and lossless predictive algorithms are available with the lossy form of the standard being very efficient at up to 35:1 compression. JPEG makes use of continuous-tone digital images much more economical by drastically reducing the volume required for storage and the bandwidth required for transmission. JPEG helps enable interchange of images between different vendors, within applications, and between different applications, by providing a common coded representation of compressed image data. ISO/IEC 13818 MPEG-2, Generic coding of moving pictures and associated audio information, provides a unified coded representation of audio-visual information that supports multiple application requirements while maximising interworking. It makes use of a profile/level approach. The broad acceptance of this standard in industry enables the gradual replacement of the existing costly analogue equipment and stimulates the interworking of hitherto separate multimedia applications.

ISO/IEC 13522, *Coding of multimedia and hypermedia information* (MHEG), will provide the coded representation of final form multimedia and hypermedia information objects, to be interchanged within or across open applications and services, by any means of interchange. The objective of this standard is to ease the development of multimedia applications in open environments by ensuring the cross platform compatibility of elementary units of information called multimedia and hypermedia objects (MHEG Objects). In the present context, generic techniques (such as compression techniques) and object-oriented techniques (as used in MHEG) are gaining prominence in various areas that used to live separately, such as telecommunications, computer industry, television, and consumer electronics. In many respects, the MHEG technology proves to be at the crossing point of these sectors. The ability to provide an interchange format for digital media such as image, audio, text, graphics; the ability to interchange information objects between systems; and the ability to re-use this information in further applications, are features of paramount importance in many services such as office information systems and engineering documentation; training and education; electronic publishing; computer supported cooperative work; and on-line multimedia information broadcasting for navigation support in a digital television system.

The two SC 29 standards of particular relevance for raster data in ISO/TC 211 are the standards known informally as JBIG and JPEG. The MPEG and MHEG standards are only of indirect relevance to ISO/TC 211. They may be of use in situations where mapping information is included in multimedia applications.

3.1.1.3 ISO/IEC JTC 1/SC 32/WG 3 SQL/MM — Structure — Database Languages

ISO/IEC JTC 1/SC 32/WG 3 on data base languages is currently completing version 3 of the SQL language. SQL is the query and definition language for relational databases. Developed in parallel with this version of SQL is a separate standard called SQL/MM (Multi-Media). SC 32/WG 4 is responsible for SQL/MM (Multi-Media) and application package. One aspect of SQL/MM is ISO/IEC 13249-5 – Still image, which relates to image data.

ISO/IEC 9075 SQL is a major standard that is widely implemented. The companion standard ISO/IEC 13249 SQL/MM defines application specific data types for multi-media applications and the associated definition and query routines using the user defined features of ISO/IEC 9075 version 3 SQL3. The SQL/MM standard (ISO/IEC 13249) is structured as a multi-part standard consisting of the following parts:

— Part 1: Framework

— Part 2: Full-text

— Part 3: Spatial

— Part 4: General purpose facilities

— Part 5: Still image

The current version of the SQL/MM standard is at the final DIS (FDIS) stage in ISO/IEC JTC 1. It is closely related to the revision of ISO 9075:1999 SQL3 and will not progress to be a final standard until SQL3 is complete.

SQL/MM Part 3 – Spatial (ISO/IEC 13249-3) relates to vector data. It defines application specific data types and the associated definition and query routines for that data. There has been a significant level of harmonization between SQL/MM Part 3 and ISO/TC 211 projects ISO 19107 and ISO 19111 and the OGC Simple Feature Model. SQL/MM effectively defines in data base terms the basic elements used in vector data models. A similar coordination has been proposed for alignment of SQL/MM Part 5 (ISO/IEC 13249-5) with the work in ISO/TC 211 on image and gridded data and the work in OGC on "coverage"[2] data. However, in the field of image and gridded data there exist a number of other standards efforts (as described in this report) that would also need to be harmonized.

The ISO/IEC 13249-5 Still Image standard defines data types for simple still images and associated text comments. A special data type is defined for an ISO/IEC 10918-4 JPEG image as a binary large object. Functions are also defined for returning specific values that are imbedded in the JPEG image definition.

3.1.2 ISO/TC 130 — Graphic technology

The ISO Technical Committee 130 on graphic technology has developed the standard ISO 12639, *Graphic technology — Prepress digital data exchange — Tag image file format for image technology (TIFF/IT)*. This is a second-generation format, developed in a public standards body, intended to replace the private TIFF format in the field of graphics technology. It is intended to be upward compatible to TIFF 6.0.

This draft International Standard specifies a media-independent means for prepress electronic data exchange. It defines image files formats for encoding colour continuous tone picture images, colour line art images, high resolution continuous tone images, monochrome continuous tone picture images, binary picture images, and binary line art images.

The Standard has two levels of conformance: TIFF/IT (also referred to as full TIFF/IT) conformance and TIFF/IT-P1 conformance. Both conformance levels are intended to support a media-independent means for the exchange of various images used in the prepress, printing, graphic arts, and information processing fields. TIFF/IT-P1 conformance provides a minimized set of options to permit simpler implementation and compatibility, where possible, with commonly available TIFF 6.0 readers and writers. TIFF/IT-P1 is intended for use where the full set of TIFF/IT options is not required.

2) Definition of term coverage, image, raster, matrix, and gridded data has not yet been determined by ISO/TC 211 and is deferred to the new stage 0 work item – NP 19124; the Coverage Schema work item – NP 19123; and the terminology team.

3.2 DIGEST (DIgital Geographic Exchange STandard)

The DGIWG DIGEST standard has included the capability to handle (raster) image and gridded data sets for many years. It includes a number of product formats that share some common metadata and a common pixel encoding structure. A significant amount of data exists using this standard.

The DIGEST version 2.0 standard was released June 1997. In addition to geospatial vector data, this standard also supports image and gridded data in alignment with the ISO/IEC JTC 1/SC 24 BIIF standard. DIGEST (Annex D), known as the Image Interchange Format, is an encapsulation of the NATO Secondary Imagery Format (NSIF) NATO STANAG 4545. Systems using geo-referenced imagery, matrix, or raster map data formatted according to NSIF should be designed to extract the needed data as specified in DIGEST (Annex D). ISO/IEC JTC 1/SC 24 is developing an ISP of the BIIF based on NITFS and NATO STANAG 4545, which will be known as the interNational Standard Imagery Format (NSIF). The current version of BIIF has pointers to DIGEST (Annex D) until such time as corresponding components exist within ISO/TC 211.

NSIF allows for the standard exchange of image (ISO 10918 Joint Photographics Experts Group and Vector Quantization compressions are proposed within the NSIF), graphic (ISO/IEC 8632 Computer Graphics Metafile), and text data. For the NSIF, the image data encompasses multispectral imagery and images intended to be displayed as monochrome (shades of grey), colour-mapped (pseudocolour), or true colour. It encompasses also grid or matrix data intended to provide geographic or geo-referencing information. Table 1 gives some of the categories of images supported by NSIF and the Image Interchange Format described in the DIGEST (Annex D).

Table 1 — Categories of Images Supported by DIGEST

Image Category	Definition	Image Category	Definition
VIS	Visible Imagery	SAR	Synthetic Aperture Radar
SL	Side-Looking Radar	SARIQ	SAR Radio Hologram
TI	Thermal Infrared	IR	Infrared
FL	Forward Looking Infrared	MS	Multispectral
RD	Radar	MAP	Raster Maps
EO	Electro-optical	LEG	Legends
OP	Optical	PAT	Colour Patch
HR	High Resolution Radar	DTEM	Matrix Data (elevations)
HS	Hyperspectral	MATR	Matrix Data (other)
CP	Colour Photography	LOCG	Location Grid
BP	Black/White Photography		

Flexibility to add support for the types of data and data characteristics not explicitly defined in the NSIF standard is provided within the format through a standard extension mechanism. A set of Standard Geospatial Support Data Extensions of NSIF are defined in the DIGEST (Annex D). They are used within NSIF to convey standard geographic metadata such as geographic reference description, source description and quality description. Here are brief descriptions of these standard extensions:

GEOPS for geo-referencing parameters including datums, ellipsoids, and projections;

GRDPS for non-rectified image, raster, or matrix data that is positioned using a location grid;

GEOLO for image, raster, or matrix data rectified consistently with geographic (lat/long) coordinate systems;

MAPLO for image, raster, or matrix data rectified consistently with cartographic (E,N) coordinate system;

REGPT for registration points in either geographic or cartographic systems;

ACCPO for horizontal and vertical accuracy over regions for which the definitions are constant;

ACCHZ for horizontal accuracy when the vertical accuracy varies across the region for which horizontal accuracy is constant;

ACCVT for vertical accuracy when the horizontal accuracy varies across the region for which vertical accuracy is constant;

SNSPS for sensor parameters;

SOURC for map source information.

3.3 Spatial Data Transfer Standard: Part 5: Raster Profile

The Spatial Data Transfer Standard (SDTS) is a multi-nation standard used by the United States, Australia, New Zealand, and South Korea. On June 9, 1998, the American National Standards Institute (ANSI) formally adopted the Spatial Data Transfer Standard as an American National Standard. The official designation of the standard is ANSI NCITS 320:1998. Currently much work is ongoing in the development of various profiles to implement SDTS.

SDTS defines a general mechanism for the transfer of geographically referenced spatial data and its supporting metadata, i.e., attributes, data quality reports, coordinate reference systems, security information, etc. The overriding principle that SDTS promotes is that the spatial data transfer should be self-documenting. The data set in SDTS should contain all of the information that is needed to assess and (or) use the data for any appropriate GIS application. The SDTS base specification (Parts 1, 2 and 3) is implemented via profiles of SDTS. A SDTS profile, in general terms, may be defined as a limited subset of the standard, designed for use with a specific type of data (e.g., topological vector, point, grid, and image). Specific choices are made for encoding possibilities not addressed, left optional, or left with numerous choices within the SDTS base specification. A profile may also specify extensions to the base standard to address changing technologies, and to take advantage of other industry standards. Currently SDTS Part 4: Topological Vector Profile is a component of ANSI NCITS 320:1998. Of interest to readers of this report is the development of SDTS Part 5: Raster Profile.

Significant effort has gone on to harmonize SDTS with other standards, particularly the EOSDIS Satellite Imagery and the DIGEST suite of standards. The US Raster Convergence Group using the US Federal Geographic Data Committee FGDC standards development process is endeavouring to merge existing raster standards by means of extensions to the original formats in order to move away from the special-use standards as much as possible. Some of the standards being addressed are the Spatial Data Transfer Standard (SDTS) Raster Profile, the Basic Image Interchange Format (BIIF), the Tagged Image File Format (TIFF), and the US National Image Transmission Format (NITF). The result of this effort is a new version of the SDTS Raster profile, titled Part 5: Raster Profile and Extensions (SRPE). The SRPE will incorporate an extension based on the NSIF described in subclause 3.2. The US FGDC accepted SDTS Part 5: Raster Profile and Extensions, as an FGDC Standard on 24 February 1999.

A key concept implemented in the SRPE is the use, where appropriate, of an existing image transfer standard, such as BIIF, TIFF or JFIF (JPEG File Interchange Format), to encode the actual image data. SDTS modules supply the means to register the image data geographically as well as supply any other metadata necessary for its use in a geographic information or analysis setting.

Table 2 illustrates the basic modules of an SDTS Raster Profile transfer as defined in the SDTS Part 1: Logical Specifications. Note that Part 1 of SDTS allows many more possible encodings of raster and N-dimensional data than are allowed in the SRPE. Another profile (or an annex to the existing SRPE) could be developed to take advantage of these additional capabilities.