Final

Report to

Geographic Data BC

Digital Image Management,

Software Evaluation Plan and Selection Criteria

September, 2001

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Change Record

Version	Date	Description
V3.0	July 20, 2001	GDBC working committee review.
V4.0	August 22, 2001	Integration of feedback from GDBC working committee.
V4.03	September 11, 2001	Integration of final review feedback.

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1. INTRODUCTION

Geographic Data B.C. (GDBC) contracted Sierra Systems to assist with its Digital Image Management (DIM) project by reviewing current business processes and recommending new processes and technology to increase efficiency of managing digital imagery.

The DIM project at this point has moved through at least two major activities. A "Data Management Architecture Review" has been completed and now "Current Assessment and Future Directions" is in progress.

The findings and recommendations from the "Current Assessment and Future Directions" project are contained in two reports entitled:

- Digital Image Management at GDBC – Current Assessment / Future Direction
- Digital Image Management at GDBC – Migration Strategy

1.1. Purpose of Report

The purpose of this report is to support the process of selecting and assessing infrastructure required to implement the strategic and tactical concepts of the findings and recommendations of the *Current Assessment—Future Directions* and *Migration Strategy* reports.

This document is intended to stand alone once a decision to move forward has been made. This decision to move forward includes the commitment to supply required capital and personnel resources to the project.

The acquisition of software products for digital image management will be based upon the selection criteria included in this report. This report is not intended to be an actual RFI / RFP, but sections of the report will provide significant material for any DIM RFI / RFP. This report is not a detailed project plan for the implementation of the selected software.

This report provides a proposed evaluation plan and criteria useful for the selection of Standards Based Commercial Off-the-Shelf Software (SCOTS) and hardware. It will assist in the selection of SCOTS component product(s) to be implemented by GDBC in the first phase of DIM and will assist in the drafting of RFI / RFPs.

The evaluation plan enables testing, comparing and ranking candidate vended products and services against each other and against requirements listed in the *Current Assessment-Future Directions* document.

The evaluation plan and selection criteria contained in this report are based on:

- business and technical requirements gathered during the current situation review,
- the business and technical solution proposed as the future direction, and
- Sierra Systems' research and experience from similar projects.

Not all DIM components are necessarily new or new to GDBC. GDBC has significant investment already into image management infrastructure, and it is expected that much of this will be incorporated into new DIM systems. Similarly, GDBC has existing standards for software and hardware, these will be applied to new DIM systems, and there is no need for evaluations of all components of DIM. There will be no reselection of, for examples, database management systems, operating systems or web servers.

1.2. Intended Audience

This report will be of interest to all GDBC staff involved in the collection, management and distribution of digital images, and also to interested key stakeholders.

The intended audience for the *Software Evaluation Plan and Selection Criteria* is GDBC Management and GDBC Information Systems Management and any purchasing process participants (e.g. BC Purchasing Commission).

1.3. Infrastructure Assembly Approach

DIM system functionality may be provided from any of:

- GDBC assembled SCOTS products;
- A vendor bundled standards based product with components;
- A multi-product/multi-vendor solution provided by a single integrator willing and able to maintain and support the solution over the long term.

The components are to fit together using specified Canadian and international standards.

This document breaks down the DIM functionality into SCOTS components, and discusses evaluation and selection. The discussed timing and strategy for evaluation are suitable for component style selection and assembly.

Phase I to III SCOTS detailed component evaluation is covered in this document. Phase IV and V evaluations are dependant on product decisions made in Phase I through III and would be difficult to evaluate at this time.

However, if the "systems integrator" or "turnkey vendor solution" approaches are taken then the timing and strategy of evaluation would need to change such that decision making (but not necessarily acquisition) occurs to a far greater degree during DIM preliminaries.

The described evaluations for components remain of value in all approaches.

2. COMPONENT BREAKDOWN

2.1. Architecture Review

The following information is repeated from the *Current Assessment / Future Direction* report for the convenience of GDBC and to serve as primary information to be included in ITQs.

2.1.1. Data Components of Digital Image Management

DIM requires persistent and secure storage as listed in the following table.

Group	Detail	Capacity
Digital Imagery	5” B&W aerial photography 10" B&W aerial photography (including Stereo Models) 10" Colour aerial photography Orthophoto Satellite imagery Controlled 10" aerial photography (B&W and Colour)	Scaleable to upwards of 600 terabytes (TB) in the very long term.
Metadata		
Graphic indexes	Digital vector base maps and BCGS grid network Vector Flight indexes including Digital flight lines, photo centers and derived photo footprints Low resolution imagery backdrops including satellite and orthophoto	
Thumbnails		

The capacity required for imagery dominates the capacity plan, to the degree that other data storage can be assumed to be included in calculations. Storage capacity will be acquired on an as needed basis, approximately as follows:

Increment	Incremental Capacity
Initial	11.5 TB
Year one	+ 4.3 TB
Year two	+ 4.3 TB
Year three	+ 4.3 TB
Year four	+ 4.3 TB
Year five	+ 4.3 TB

2.1.2. Functional Components of Digital Image Management

The digital imagery management process at GDBC is composed of four distinct, but interrelated, functional components or modules; Acquisition, Image Data Store Management, Discovery and Delivery.

These modules are illustrated in the following diagram and further described in this document:

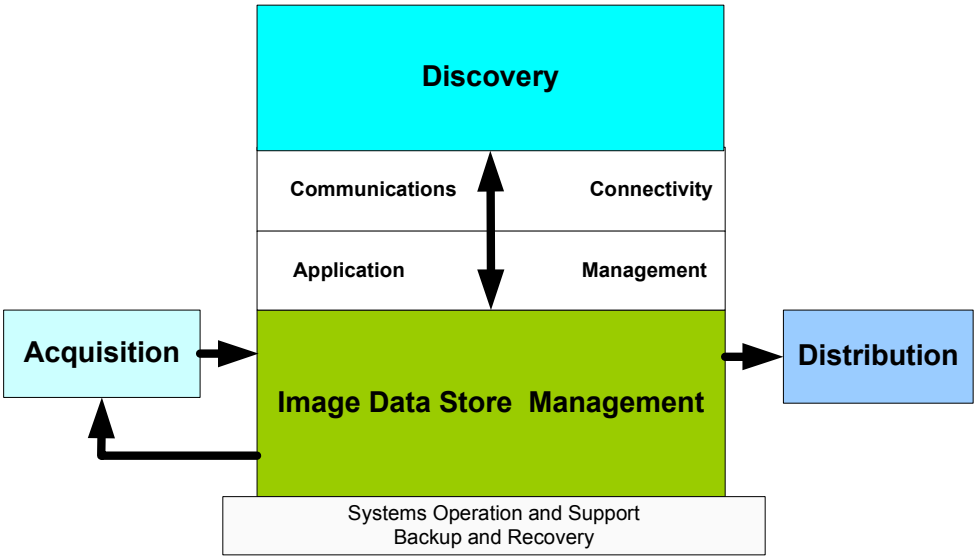


Figure 1 – Functional Components of Digital Image management

Each process (module) is distinct and discreet, however each module must support in a compatible way the other processes from a client, management, technical and user perspective. This modular approach allows for both integrated commercial solutions as well as individual 'best of breed' software.

These four functional modules are used where appropriate throughout this document to address the software selection criteria, and to provide easy cross-reference to the two accompanying reports mentioned above.

2.1.3. Logical Architecture

The proposed Technology Architecture is designed to meet the unique needs of all four functional components or modules of the Digital Image Management system described above. The major consideration for this design is the sheer volume of I/O data that is represented by digital imagery. Other contributing factors include data acquisition, data distribution, metadata management and system security.

The Logical Architecture diagram describes the *n*-tier architecture that is the basis for the recommended solution.

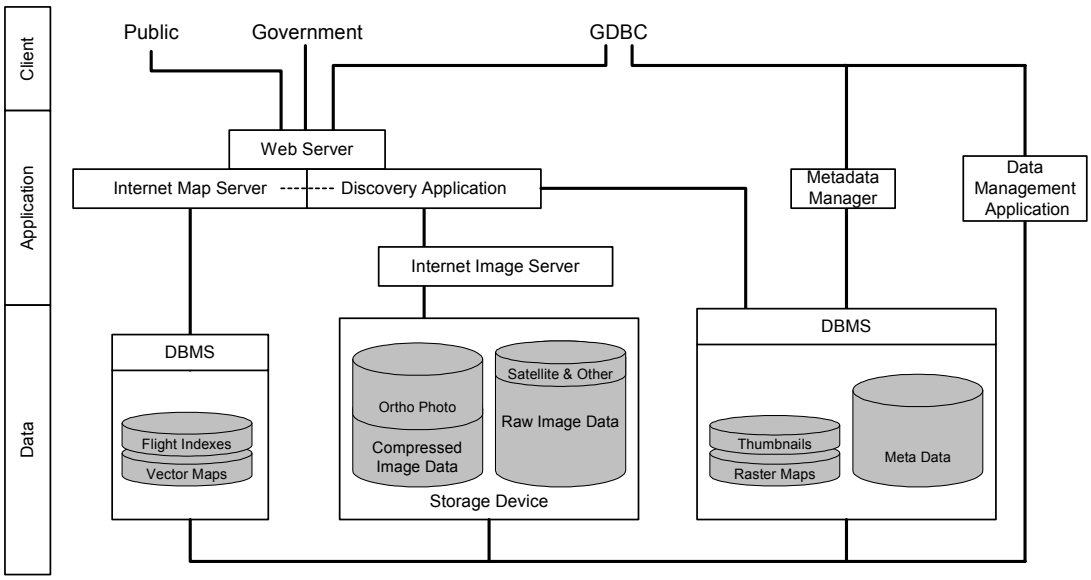


Figure 2 – Logical Architecture

2.1.4. Standards

Digital Image Management at GDBC – Current Assessment / Future Direction lists the following DIM axioms:

- At least 80% of the data management and data delivery requirements are to be met using Standards-based Commercial Off the Shelf (SCOTS) products.
- The technical architecture will be modeled as an n-tier system with components rather than as a monolithic system.
- Customer interfaces are to be implemented through HTML/Java web-style browsers, and are to be generally as thin as possible.
- The Oracle DBMS is to be used for underlying data storage and management by all application and server level components. The actual image data, however, may be stored as files in either a NTFS or UFS, under the management of an application that uses Oracle DBMS services to control access and input/output to files.
- Microsoft and Sun Microsystems operating systems are to be used exclusively and in a cooperative environment.
- GDBC technical systems and GDBC customer systems must communicate using Canadian or internationally accepted standards for communication, content and format. This removes barriers to the Internet world in general when interfacing with GDBC.

- Purchased or developed GDBC technical systems components must communicate (internally at GDBC) using Canadian or internationally accepted standards for communication, content and format. This does not preclude packaged or "one-source" solutions as long as package components can be shown to be internally conformal. This removes barriers to general component purchasing and unties GDBC from specific vendors.
- Systems facility, software tools and subject databases must be available to all GDBC and MELP staff limited only by GDBC security policy, intra/internet accessibility and by vendor license agreements.

Digital Image Management at GDBC – Current Assessment / Future Direction recommends the following standards be adopted for DIM:

- The *OpenGIS Service Architecture* should be taken as the framework for design and implementation of DIM components. Conformance to this architecture is intended to provide for primary interchangeability amongst vendor-supplied products, and to provide for standardized interfaces and outerfaces.
- The *OpenGIS Catalogue Services* should be conformed to by DIM Discovery and ordering services. This standard provides for an internationally recognisable communications and format standard for metadata and for search services. This specification is not explicit as to content, and so the *Federal Geographic Data Committee Standards for Digital GeoSpatial Metadata* – Geo Profile should be adopted to provide an internationally recognisable content standard for metadata. Alongside this, the ISO Z39.50 protocol for communication and search services should be adopted.
- The OpenGIS *Simple Features Specification For OLE/COM* and/or *for SQL* should be adopted as standards for the internal request and transmission of vector data between DIM modules. This standard will have to be approached in a pragmatic manner and non-compliant interfaces allowed if justified by cost or performance factors.
- The OpenGIS *Web Map Server Interface* should be adopted as a standard for the design of service and data transfer specifications for the vector map server and web front end applications, including those that serve imagery. It should represent a mandatory requirement for all newly implemented applications.
- For the disk arrays the following protocols must be supported: NFS v3 over UDP or TCP; PCNFSD v2 for NFS client authentication; and Microsoft CIFS with NT using NetBIOS over TCP/ IP.

The criteria listed in this report are based on the support of these standards to ensure the present and future vendor interoperability of software and hardware procured from one or more vendors. In the process, GDBC will promote and foster a set of standards that may eventually be adopted on a BC Government-wide basis, and may also lead external government agencies to accept these standards.

2.2. SCOTS Component Categories

The primary value to GDBC of this report is the contained list of SCOTS components. SCOTS components ("Database Management System" for example) are software and hardware categories generally recognised and understood in the Information Technology business arena. The usefulness of this analysis of components is that SCOTS components can be purchased from software and hardware manufacturers and that their definitions are easily recognised by vendors.

In the following tables the DIM functionality is broken down into phased SCOTS components. This is a component strategy for evaluation. Note that if a "systems integrator" or "turnkey vendor solution" approach is taken then the majority of decision making should occur in the early phases of DIM.

This list of SCOTS components was formulated by considering the following:

- Vendor offerings of tangible product;
- The functional requirements of the four DIM business modules;
- The proposed technical architecture for DIM;
- The proposed deployment strategy for DIM; and
- The Migration plan and inter-Phase dependencies.

Cross-index of SCOTS components to DIM business modules

SCOTS Component	Acquisition	Image Data Store Mgt.	Discovery	Delivery
Hardware				
First and Second tier servers	✓	✓	✓	✓
Storage Area Network or Network Appliance, including backup & recovery	✓	✓	✓	✓
High capacity network interfaces & transports	✓	✓		✓
Primary data and metadata S/W				
Image data storage, management and data server S/W	✓	✓	✓	✓
Internet image server S/W			✓	✓
Image compression formats and processing S/W	✓	✓		✓
Vector data storage, management and data server S/W	✓	✓	✓	✓
Internet map server S/W			✓	
Z39.50 Server S/W with arbitrary profile search services			✓	
Metadata data entry and management S/W	✓	✓	✓	✓

SCOTS Component	Acquisition	Image Data Store Mgt.	Discovery	Delivery
Web Server and Services				
Web server S/W with second tier interface services (Java and Active X)	✓		✓	✓
Image catalogue search S/W			✓	
Map data catalogue search S/W			✓	
E-Commerce Systems				
E-commerce services provider and SSL interfacing S/W			✓	✓
Shopping Cart Services S/W			✓	✓
Other possible components (not considered further in this document)				
Second tier (Java and Active X) Application Development Environment			✓	✓
Configurable workflow management systems or workflow systems development S/W	✓			✓
Distribution tracking S/W				✓

The SCOTS component categories need not be acquired all at the same time, but are required roughly according to the Phase schedule. Note that although acquisition may be delayed, evaluation and decision-making should progress as quickly as resources allow.

Business Modules by Phase

Phase	Acquisition	Data Management	Discovery	Distribution
I - Digital Images Online		✓		
II - Central Electronic Catalogue (CEC) and Metadata	✓	✓		
III - Image Data Store Manager and Acquisition	✓	✓		
IV- Discovery			✓	
V – Distribution				✓

(This space deliberately left blank for better table format.)

SCOTS Components by Phase

The resulting list of priority SCOTS Components is:

SCOTS Component	I	II	III	IV[1]	V
First and Second tier servers	✓	✓	✓		
Storage Area Network or Network Appliance, including backup & recovery	✓	✓	✓		
High capacity network interfaces & transports	✓	✓	✓		
Image data storage, management and data server S/W	✓	✓	✓		
[2]Image compression formats and processing S/W	✓	✓	✓		
Vector data storage, management and data server S/W	✓	✓	✓		
Metadata data entry and management S/W	✓	✓	✓		
[3]Web server S/W with second tier interface services (Java and Active X)		✓	✓		
Internet image server S/W				✓	
Internet map server S/W				✓	
Z39.50 Server S/W with arbitrary profile search services				✓	
Image catalogue search S/W				✓	
Map data catalogue search S/W				✓	
E-commerce services provider and SSL interfacing S/W					✓
Shopping Cart Services S/W					✓

[1] Phase I to III SCOTS Component Evaluation is covered in this document. Phase IV and V evaluations are too dependent on decisions made in Phase I through III to evaluate at this time.

[2] Refer to the *TRIM II, Data Compression Software Evaluation Report*, GDBC, September 2000 for evaluation details.

[3] Web services are already in place at GDBC.

3. EVALUATION PROCESS

3.1. Recommended Process

The recommended process for evaluation and selection of SCOTS software for digital image management at GDBC involves the following steps:

1. Finalise software and system infrastructure standards to which the SCOTS software must adhere.
2. Establish detailed criteria that the SCOTS software will be measured against based on the requirements for the four functional components of the digital image management system.
3. Establish a scheme for weighting the selection criteria including qualification as mandatory or desirable.
4. Issue RFI to identify interested vendors and to solicit company and product information.
5. Short list perspective vendors for further evaluation trials using vendor information (i.e. size, years in business, stability) and product information (price, packaging, operating system, adherence to general software and system infrastructure standards, etc.) and general fit to selection criteria.
6. Evaluations, to follow one of three styles:
    a) Evaluate and eliminate on product documentation and vendor presentations alone.
    b) Require vendor to prove conformance to standards and ability to meet requirements through vendor premises based hands on demonstrations.
    c) If required, benchmark SCOTS products short-listed in 5 above. This step includes:
        i) Set up of test environment (hardware, data sets, etc) to simulate proposed technical architecture.
        ii) Establish workflow scenarios that simulate expected use.
        iii) Execute workflow scenarios for each vendor SCOTS solution matrix.
7. Assign a score to the vendor based on the performance and adherence to the detailed selection criteria.
8. Select highest rated vendor(s) and solicit “best and final” proposal (including price proposal).

3.1.1. Package Vendors and Systems Integrators

It is considered highly unlikely that a single software vendor has a complete solution for GDBC. No single vendor has attempted to support all of the software requirements of the proposed solution for digital image management for GDBC. One of the biggest challenges for acquiring the total required solution is to ensure that all components are demonstrably compatible, and entail a minimum of integration / translation, 3rd party products or in-house developed software for component integration. The strategy of development of bridges or software component programs to integrate SCOTS software is not recommended. The need for this is an indication of lack of conformance to standards or non-existence of standards, and future support for changes in the software components will become unmanageable.

There are three scenarios that may be considered for the implementation of the DIM solution:

1. Single Vendor – Total Solution: This scenario would occur if a single vendor has a complete integrated package that supports all requirements for GDBC image management. This scenario would also be used in the event that a single software vendor or integrator is willing to take responsibility for the integration and implementation of a complete solution. In this case, further consideration must be given to contractually binding the vendor to ensure that the package vendor will guarantee future changes and upgrades to all software.
2. Several Vendors – Best of Breed: This scenario would occur if GDBC determined that the best solution available is by acquisition of several components from several vendors. The integration and implementation of the various components would then become the responsibility of GDBC. The final solution would then be assembled under the management of GDBC either by utilisation of GDBC staff or contract consultants.
3. Systems Integrator – Total Solution or Best of Breed: This scenario would occur if GDBC accepts the strategy that a 3rd party independent of any specific software component vendor is contracted to supply a complete integrated solution. At the beginning, one or both of these steps may be taken:
    a) The Systems Integrator would participate with GDBC during the evaluation of software responses. They would then propose to take responsibility to deploy the solution.
    b) The Systems Integrator would propose a complete solution with Integrator determined software components, and a plan to deploy the solution.

3.1.2. Formation of Weighted Evaluators

The evaluation of responses to any request must be done on a quantitative accountable basis. This document lists mandatory requirements; these requirements are weighted only in the perspective that failure to comply with mandatory requirements will disqualify the proposed component or solution.

There are also optional requirements listing capability that GDBC would like to have but has determined are not essential for the implementation of the final solution. GDBC staff that will be working with the various components should conduct the weighting of these optional criteria.

The overall solution provider stability and general industry acceptance of the software components must be taken into consideration. These criteria would be used to ensure that the solution would continue to be supported by the vendor over the life of the application usage at GDBC. There will also be consideration given to local / regional support and the general expertise available.

3.1.3. Paper Evaluation Vs Benchmarking

In general during RFP / RFIs, the evaluators (GDBC) identify the functional requirements of the proposed software solutions. Generally any vendor responding to an RFP / RFI will endeavour to respond positively to the requirements. It is anticipated that the vendor will respond in a prejudicial manner regarding performance or 'how well' each requirement component suits the solution.

GDBC must develop a complete evaluation criteria regarding performance. The determination of target performance of the various components individually and as a complete integrated solution will define the acceptability of the solution and support final 'best of breed' assembly. This evaluation should not be based on eliminating vendors but try to find a quantitative method to determine the best overall performance, realising that there will be performance strengths in some components but not all.

Performance should be based on, not only on the raw speed of data throughput or transaction, but must also measure the usability of the software, and this evaluation should be conducted by the respective personnel who will use the software.

Thus the software performance evaluation should include consideration for:

- Technical performance specifications—(e.g. How quickly can a thumbnail image be found and displayed?)
- Function verification—User requirements and usability (e.g. How easily can I submit an image to create a thumbnail? Does the image generalisation facility produce the expected output?)

3.1.4. GDBC Vs Vendor Benchmarking

Benchmarking or performance evaluation may be conducted after a shortlist of potential solutions has been determined. There are two scenarios that can be utilised by GDBC to quantitatively benchmark the proposed solutions:

1. GDBC benchmarking: This scenario would require GDBC to either conduct actual benchmarking or to contract to a 3rd party to conduct performance evaluation. This scenario would require that a considerable investment is made for the following:
   - Acquisition or access to the complete infrastructure / hardware target environment.
   - Development of sufficient test data to enable performance under load measurements (e.g. possible loading of several terabytes of data, metadata and other supporting files)
   - Acquisition / development of testing software and hardware (sniffers, packet analysers, image analysers, load simulators, etc.)
   - Personnel, hardware and software to recreate benchmark scenarios and reproduce 'clean' testing environments.
   - Negotiation of licenses to from multiple vendors to establish the test case environments.

2. Vendor Supplied benchmarking: The vendor is required to supply performance benchmark results in response to the performance evaluation criteria determined by GDBC. The vendors would be required to supply results of a reasonable amount of benchmarks where their software is part of the solution involving 'best of breed' scenarios, preferably from an independent benchmark organisation. The vendor would then supply 'certified' performance data, which would be analysed by GDBC during the shortlist steps of evaluation. The subsequent award of a contract to any vendor could have significant penalty clauses to ensure that the performance results are accurate.

Either scenario will yield test results for the various performance criteria. The pre-established GDBC evaluation weights will then be applied to determine potential successful candidates. Further analysis for the user based performance criteria can then either be conducted by GDBC. Also, a list of these business rule based requirements can be an input to reference interviews.

3.1.5. References

The investigation of references for vendors is critical in the acquisition of goods and services. The onus is upon GDBC to ensure that a factual and complete picture of the prospective vendor is developed from the reference checking activities.

Interview questions must be developed. The questions should be divided into logical selections and asked in such a way that the reference (who are not paid to answer) may answer them quickly. References must be willing to spend the time to complete all pertinent questions. If not, the reference must be considered incomplete and the vendor should provide an alternative reference.

A list of at least three references should be provided by vendors along with a summary of the type of products or services the vendor has provided to the reference. The personnel required to perform the reference checking should try to speak to more than one participant at the reference site. This will lead to an overall representation of the vendor experience and will also provide a

perspective of the vendor subsequent to the high enthusiasm of the purchasing and implementation cycles.

The reference may also be a source of benchmarking and functionality information about the vendor's product.

3.1.6. Evaluation & Decision

The process for procurement of the solution will be governed by the Purchasing Commission rules and procedures. There is typically little room for 'intuitive' decision-making. The final decision must be supportable by the evaluation criteria and analysis of the responses.

In the event of "ties" between vendors, rules of the Purchasing Commission would be observed. In general circumstances, price becomes the final differentiator. GDBC must strive to establish a clear non-biased means to award a contract to one vendor over another.

3.1.7. Vendor Evaluation Form

The form on this page should be sent to all vendors whose products are being considered for purchase. The form provides basic information about the vendor from which vendor stability may be determined.

Digital Image Management Project

Geographic Data BC
Ministry of Sustainable Resource Management
Ph: (250) 387-9321 Fax: (250) 356-7831

Vendor Information

Basic Information
Company Name
Address
Telephone
Facsimile
Contact Person(s)
Size of Vendor (OEM)
Number Branches
Number Employees
Number of Products
Number Current Users – Local
Number Current Users – International
Number Support Locations – Local
Number Support Locations – Total
Vendor Stability (OEM)
Number Years in Business
Growth Record
Current R & D Efforts

3.1.8. Product Information Form

The form on this page should be sent to all vendors whose products are being considered for purchase. The form should be filled in for each product.

Digital Image Management Project

Geographic Data BC
Ministry of Sustainable Resource Management
Ph: (250) 387-9321 Fax: (250) 356-7831

Product or Package Information

Package Name
Package History
Date First Released
Current Release Version
Date of Current Release
Technical Requirements
Operating System(S) Supported
Minimum System Requirements
Databases supported
Basic Price of Software
Software
Trial Period
Warranty
Server based license
Volume Discount (License or Copies)
Federal Government MSO Discounts Available – Percentage
Financial Options
Support And Maintenance Costs
Key Contractual Terms

4. EVALUATION PLAN

4.1. Reuse of Existing Systems

The *Current Assessment / Future Direction* report recommended that a review of GDBC's existing infrastructure should precede the commencement of activities. This review will examine primary GDBC systems components and determine what role, if any, each component will have within new DIM systems.

This review should be completed and relevant resulting information be included in any RFI/ RFPs that may be issued for DIM.

4.2. Migration & Component Dependencies

The interdependency and independence between the Migration Strategy and the Software Evaluation plan are complex. The Migration Plan is a 'road-map' for the implementation of the acquired software, and has a basic assumption that the software components will be acquired prior to their implementation phase. The Software Evaluation Plan needs to determine the best strategy for acquiring the software.

Section 3.1.1 Package Vendors and Systems Integrators outlines three potential scenarios for vendor selection. The options of an Integrated Package from a single vendor and Implementer Assembled solution will allow GDBC to negotiate the acquisition and delivery of the software components according to the detailed implementation project plan allowing for 'Just In Time' delivery.

The Best of Breed option may result in subsequent RFPs being issued. Previously acquired hardware or software may in fact constrain other components due to restrictions or incompatibilities. For example, in the event a decision is made to utilize a component running on a Sun Solaris server this may preclude other software solution components.

4.3. Evaluation Schedule

Assuming the DIM deliverables are accepted by September 10th, 2001, the expected schedule for SCOTS evaluation is as follows:

September 24th 2001	Issue RFI.
October 3rd 2001	RFI Closing Date.
October 10th 2001	Short list vendors.
October 15th to November 9th 2001	Benchmarking, demonstrations, references.
November 9th 2001	Select Vendor / SCOTS.

5. FUNCTIONAL REQUIREMENTS

The information in this section is repeated from the *Current Assessment / Future Direction* report for the convenience of GDBC readers and to serve as primary context information to be included in ITQs. Sierra recommends that *Current Assessment / Future Direction* and most other DIM material be made available to vendors.

The functions proposed for the four primary components of the digital image management system are described below. These are the functional requirements identified for the digital image management system, sectioned by primary component. Note that *Current Assessment / Future Direction* also lists architectural and system requirements that are not repeated her, but are taken into account in the material in the *Selection* section of this document.

5.1. Product and Service Requirements

The business goal of the Digital Image Management systems is to facilitate the provision of product and service to GDBC customers related to the following:

- Scanned aerial photos for archive- Black and White, Colour and Infrared
- Scanned aerial photos (stereo-models) for TRIM or other softcopy photogrammetric mapping
- Digital aerial imagery – Monochromatic, Colour or Multi-spectral
- Digital Orthophotos – Black and White, Colour or Multi-spectral
- Digital Mosaics
- Image versions of vector maps
- Scanned index maps or other scanned vector data
- Digital Satellite Images
- Baseline Thematic Mapping products
- Scanned maps

The primary requirement of the Digital Image Management system is to enable management activities related to the creation, acquisition, assembly, updating, verification, secure and recoverable storage, manipulation, access control, representation, distribution, and archiving or removal of digital image products.

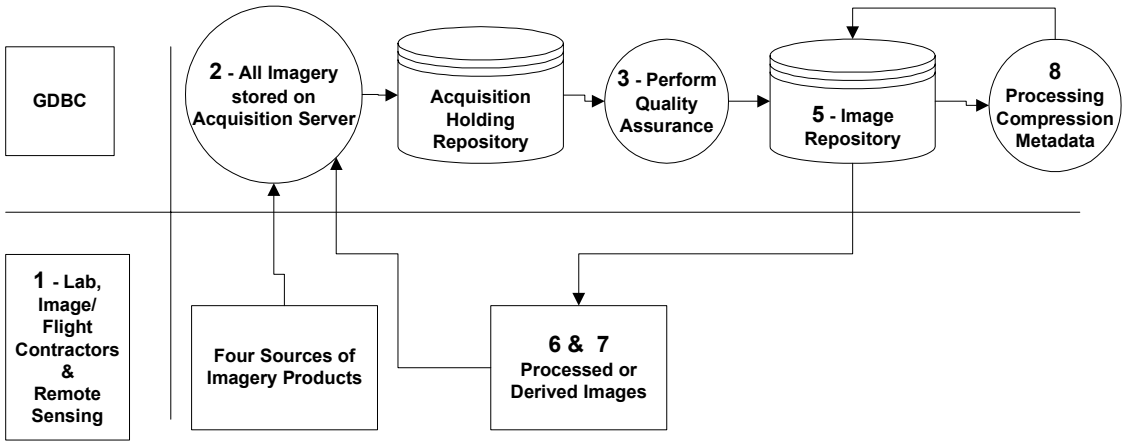
Vector data must also be managed and useable within DIM systems. This type of data is typically used during product search and indexing.

5.2. Acquisition

Imagery Acquisition encompasses all processes involved in the receipt and preparation of images for storage within the Image Data Store. The preparation of imagery includes workflow procedures to load the imagery into the Image Data Store and metadata into the metadata database. It also includes the creation of products derived from the raw or base imagery. The Acquisition process tracks all steps of the development and ensures that identified interim images will be stored in the Image Data Store, and be available for future requirements.

The Acquisition process module follows a project from its initiation to the creation of the final image products. Acquisition also recognises that due to technology limitations the images may be received at GDBC in a variety of storage media. The Acquisition process module populates the Image Data Store with the images, metadata and supporting information.

5.2.1. Requirements



The high-level process steps are:

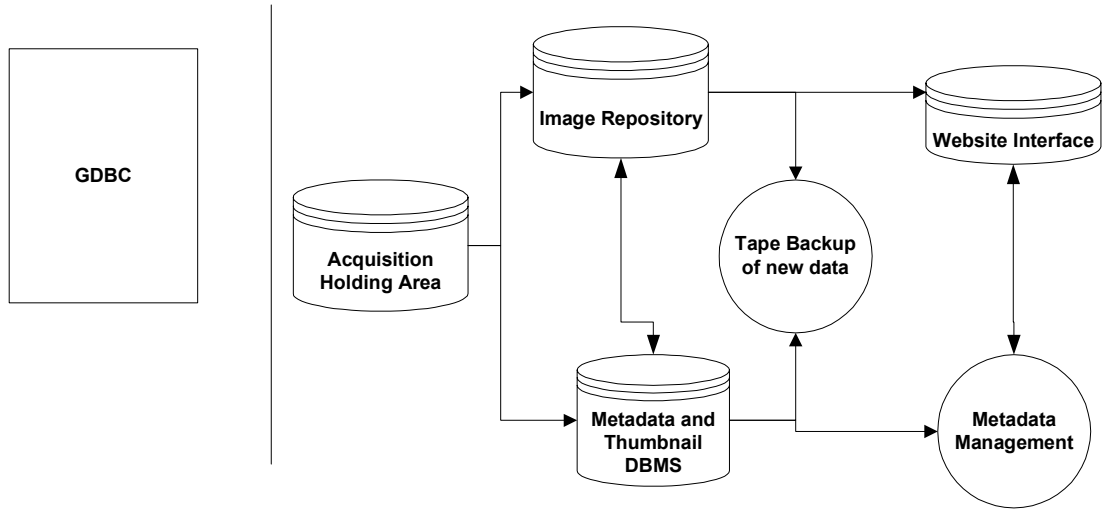
1. Five potential sources of imagery exist– 1) Image contractor, 2) Flight contractor, 3) GDBC Reprographics Lab, 4) Canada Centre for Remote Sensing and 5) GDBC Image Data Store Manager. The fifth source consists of images already available from the Image Data Store; that are used to create derived products.
2. All digital imagery arriving from these first four sources (be it from CD/DVD/tape, portable hard drive or online transfer) is stored on the Acquisition Server.
3. Digital imagery on the Acquisition Server is reviewed and inspected, which results in two possible outcomes: 1) image is rejected or 2) image is accepted.
4. Images that fail the quality assurance stage result in the contributor being contacted with the rejected data information.

5. Imagery passing quality assurance is immediately copied to the Image Data Store (including digital image, metadata and supporting files)
6. Imagery requiring further processing will be distributed to third parties for processing. The subsequent product would be submitted back to and treated as new imagery (i.e. start at step 1 above).
7. Imagery requiring in-house processing is conducted and quality assurance testing. Upon satisfactory completion the images are copied to the Image Data Store and linked to the appropriate metadata.
8. Compression processes to produce the thumbnail and compressed images are performed. Quality assurance tests are conducted and upon satisfactory completion the images are copied to the Image Data Store and linked to the appropriate metadata.

5.3. Image Data Store Management

Image Data Store Management involves the storage, safekeeping, and tracking of digital images, metadata and supporting information. The Image Data Store Management component contains and enforces business rules concerning access, processing, security, modifications and offline archiving. It also includes Image Data Store backup and recovery procedures.

5.3.1. Requirements



The Image Data Store Management process is not a linear activity, but a list of activities that will ensure that the imagery and data is available, efficiently accessible and secure. The high-level process steps include:

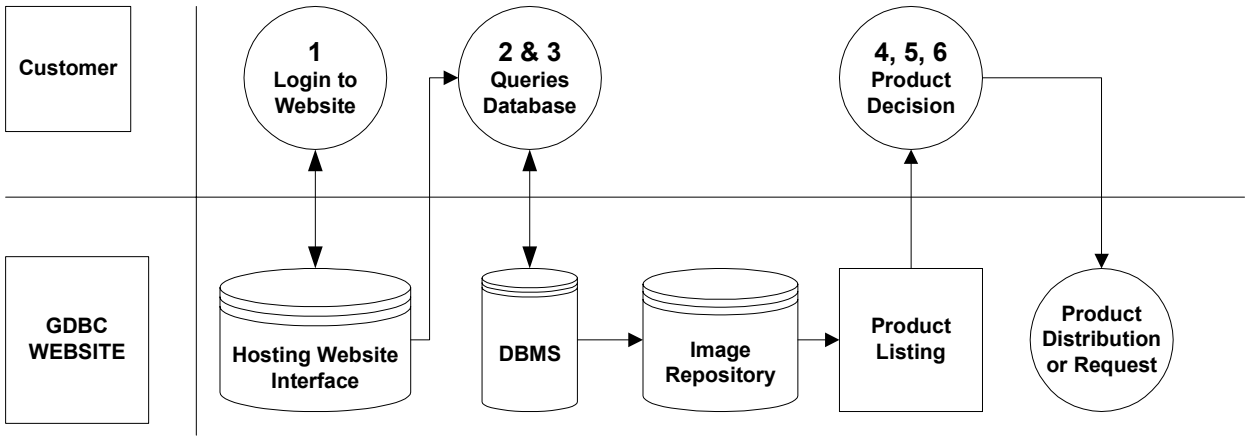
1. All imagery is copied or populated into the Image Data Store via the Acquisition process (Image Acquisition process).
2. Digital images in staging area are copied to Image Data Store (Image Acquisition process).
   - Raw images and compressed images are copied to Disk array.
   - Metadata is loaded into the DMS via the Metadata Manager application.
   - Flight, Vector and Image indices loaded to DBMS and Internet Map Server application.
   - Thumbnail images loaded into DBMS for subsequent access via the Internet Image Server.
3. Backup to tape for offsite storage of new data.
4. Ongoing Data Base Administrator activities for security, efficiency and optimisation.

5.4. Discovery

Discovery denotes the processes and technology required for internal and external customers to search for specific images or groups of images via predetermined and ad-hoc search criteria. The Discovery process ultimately depends upon the existence of metadata to support such searches. Discovery facility will support online geographic "area of interest" searches and textual based searches through LDBC facility. Manual geographic "area of interest" search is enabled through flight line perusal.

The Discovery module interfaces with the Distribution module by triggering the process for Distribution. Also triggered may be an Acquisition event requiring the creation of a derived product or service (e.g. the scanning of an analogue image currently on file). The Discovery module is not used for the initiation of contract acquisition of new aerial photography.

5.4.1. Requirements



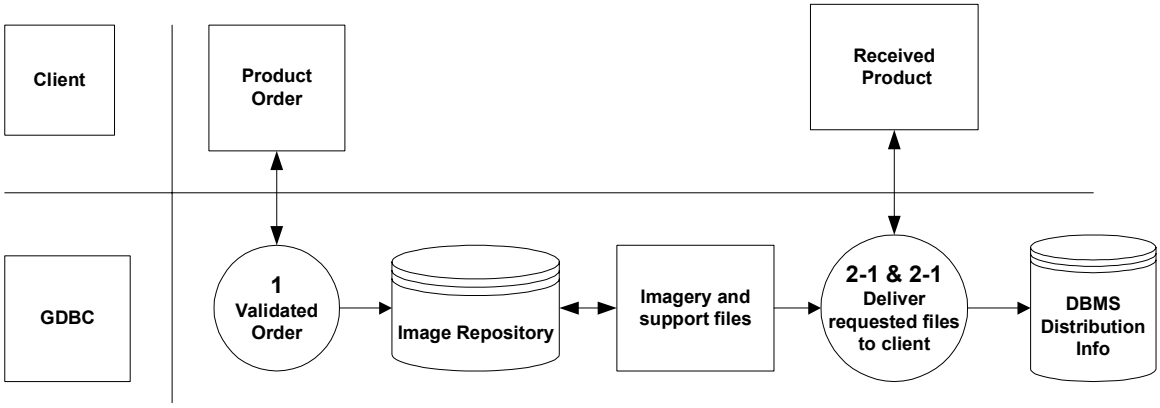
The high-level process steps are:

1. Customer accesses Website
2. Two discovery streams are presented: i) using map viewer (map navigation) or ii) direct text based queries of metadata fields.
    i) Map Viewer method will allow for a 'zoom-in to area of interest' discovery process, where footprints of photos/orthophotos/etc will be presented depended on display scale. Flight indexes (flight lines/roll numbers/photo numbers) will also be visible at appropriate scales.
    ii) The textual method will allow users to specify their search criteria by inputting data into appropriate search fields, then querying the database directly for matches.
3. Either method's result will be a listing of available products (including analogue images)
4. The user would then order the selected product(s) found to exist in the Image Data Store, and the Image Distribution process would continue processing the transaction.
5. If the specified product was not found in the Image Data Store, but data existed that would allow creation, then a request to have it acquired could be submitted.
6. If the specified product does not exist and no data was found that could create it, then the user would contact Customer Support for further actions.

5.5. Distribution

Imagery Distribution refers to the processes to deliver selected products to a customer. Distribution of specific images and supporting files has multiple variances and is dependent upon existing technology format, image file size requirements and the ability to 'transport' the image and metadata to the user. Transport is impacted by technology infrastructure and may be online (currently this is rare or non-existent, for compressed images only) or via a portable storage device, primarily CDs.

5.5.1. Requirements



The high-level process steps are:

1. Verify imagery order for appropriate account or credit approval and imagery availability
2. Determine distribution method (Option 1 or Option 2)

Option 1 – CD, DVD or portable hard drive

i) Create copy to media instructions

ii) Update order status information

iii) Receive 'copy to media' instructions

iv) Copy ordered imagery and data to media

v) Quality assure imagery

vi) Send media to packaging and shipping department

vii) Update order status information with shipping information

viii) Update image ordered history

Option 2 – Online delivery

i) Download image via the internet

ii) Online use of image as basemap or backdrop. Note: due to workstation S/W the image may in fact be "downloaded" to a temporary directory without the users knowledge.

iii) Update order status information

iv) Update image ordered history

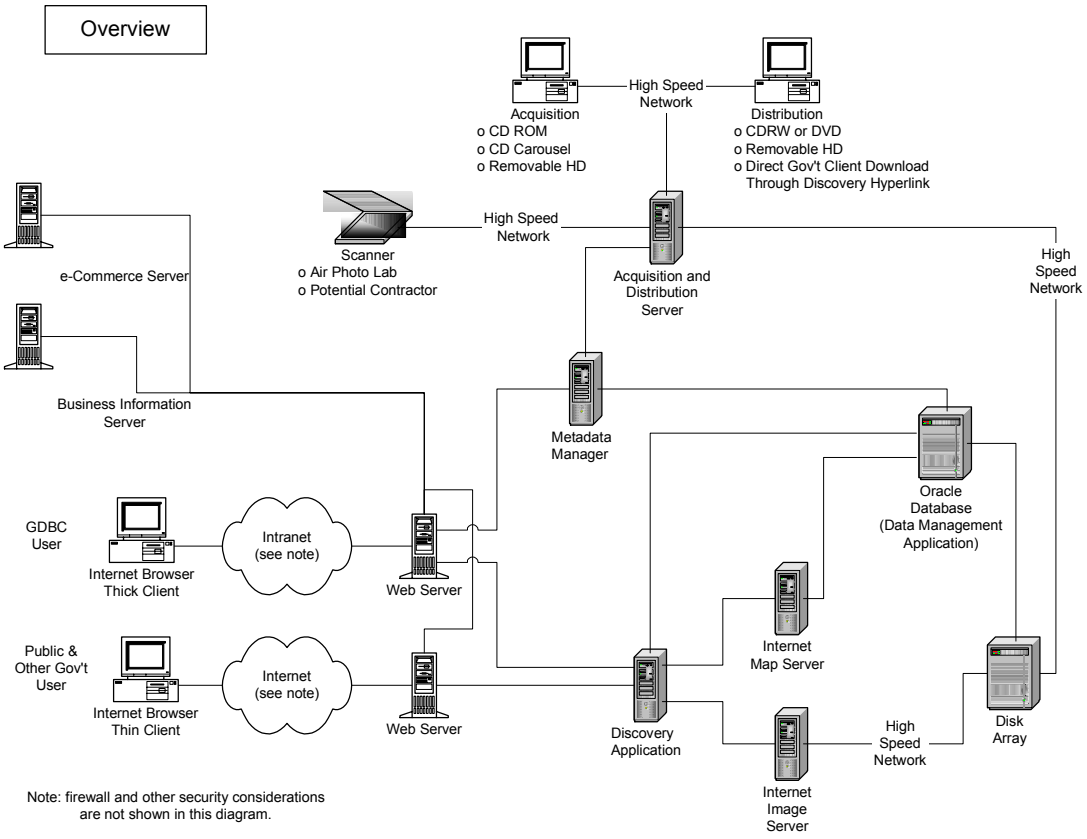
5.6. BC In View

Using assembled SCOTS products; the DIM systems must meet the specific functional requirements of the proposed *BC In View Air Photo Ordering System* requirements. This GDBC report is available online at http://home.gdbc.gov.bc.ca/BCInView.

6. PHASE I-III SELECTION

6.1. Servers

6.1.1. Overview



Preliminary Server / Network Layout

Preliminary plans for deployment indicate the need for the following computers needed in Phases I through III:

Server	Processor capacity
Database Server	High – multiple CPU
Map Server	Medium
Image Server	High – multiple CPU
Metadata Management and (later) Z39.50 Server	Low
Acquisition and Distribution Server	Medium

Note that in later Phases the following additional servers will be required; Discovery Application Server, Internet-connected Web Server, Intranet-connected Web Server, E-Commerce Server, Business Information Server.

This section does not discuss selection of servers in detail for the following reasons:

- The Ministry ISB has specific expertise and methodologies in the selection of server hardware that is above and beyond the scope of this document, and is expected to apply this expertise.
- Capacity requirements cannot be finalised before other selections have been made.
- The Ministry may decide to re-dedicate existing servers to DIM.

6.1.2. Component Requirements

As much as is possible given the time frames involved, all servers should be purchased from the same vendor. This will improve service, insure an inventory of parts exists, and optimize in-house support and reduce training needs.

Locally managed disk should be sufficient to house O/S boot up, temporary and O/S operational needs only. Every server must be able to efficiently use the (to be selected) storage services.

Each server needs memory as specified for the application services, expected I/O and use patterns it is to support. The basic design tenant is full separation of operational component blocks onto separate servers, so as to enable capacity planning, tuning and expansion.

Servers should be general-purpose computers and be scalable for network I/O, memory and CPUs.

Individual capacity needs cannot be determined until software components are chosen. When chosen, the Vendors' S/W capacity needs and possible deployment combinations will determine final capacity metrics.

Servers are to run Operating Systems from Microsoft or from Sun Microsystems.

6.1.3. Evaluators

Servers should be differentiated on the following points:

- Cost performance per TPC-C (Transaction Processing Council - OLTP), compare equally capable servers only
- Mean Time to Failure
- Mean Time to Recovery (factoring in vendor's Victoria presence)

- Cost to Maintain
- Cost to Acquire (include training costs)
- Vendor longevity

6.2. Physical Storage and Backup

6.2.1. Overview

Depending on executive priorities and planning, DIM may require 15TB of storage within the first year and may require a total of 20TB by the second year.

The proposed architectural plan calls for generalized, sharable and dedicated storage that is accessible and useable by all DIM servers. The project recommendation is that selection be limited to two technologies, either "Storage Area Network" (SAN) or "Network Appliance Storage" (NAS) technology. This limitation is based on the following factors:

- Cost of human resources to manage storage, backup and recovery is significant. Initial costs for disk are high at present but will decline asymptotically. Although, today's operational requirements have shown a trend to decreasing operator costs, these costs will continue to be significant. SAN or NAS technology optimizes human resource use to a far greater degree than other storage technologies.
- These technologies abstract storage from servers and thus free GDBC from the storage pricing structures of server manufacturers and enable "generic", standards-based storage purchasing.

Although Fibre Channel technology is more expensive than other storage I/O technologies to acquire at this time it is recommended for use throughout DIM storage connections. Fibre Channel is mandated by the estimated instantaneous throughput needs of DIM. Fibre Channel's cost will decrease over time and there is a high possibility that it will render some other technologies obsolete within five years.

DIM is not a typical application in regards to data storage. Typically, DIM data is acquired, written once to storage, is never deleted and never changed. DIM data will need to be preserved forever, as it is part of BC heritage and integral to BC management. This affects the nature of required backup facility as follows:

- Backup must be automatic and require little or no management or operations.
- The lifetime of backups is forever. Once backed up, data need never be rebacked up and does not go stale or obsolete.
- Backup media should have a very long lifespan. Note that Digital Linear Tape (DLT) is expected to last 10 years. However, due to the fact that all data will be online, backup technology can be replaced en-mass at any time, simply by rewriting data to new backup media.

6.2.2. Component Requirements

Fault-tolerant storage networks (SAN or NAS) are required only to the degree that availability policy stipulates for DIM.

The Image Data Store Management area underlies all the other modules, some of which are exposed to external users through the Internet, and therefore 7x24 operation is desirable. Availability has been deemed critical only in environmental or disaster situations. From this, it appears that the systems must be fault-tolerant (98%) but need not be highly available (99.9%).

Guaranteed non loss of data is also a requirement of Image Data Store Management, and so Image Data Store Data Management will include back up of all managed data and will include second site or off-site storage or replication.

The underlying storage devices must be "generic" in nature, and all parts of the physical storage solution (H/W as opposed to S/W) should be manufactured by multiple vendors, so as to avoid monopolistic pricing.

Storage must be scalable without limits, recognising that the network will always have I/O limitations.

The following protocols must be supported:

- NFS v3 over UDP or TCP.
- PCNFSD v2 for NFS client authentication.
- Microsoft Common Internet File System (CIFS) (providing at minimum Net BIOS over TCP/ IP communications).
- Fiber Channel interfaces and FC-MI for channel management.

Storage components must be combined with storage management facility to provide:

- Automatic discovery of newly installed resources.
- Simple operations to allocate, de-allocate and reallocate resource to servers.
- 7x24 monitoring, operator alerts and programmed recovery from failure.
- Automatic, rule-based increase of resource allocation on demand.

6.2.3. Evaluators

Storage solutions should be differentiated primarily on the following points:

- Cost per GB to acquire (include training costs). This must be projected over three years.

- Data access should be server operating system and hardware and network operating system independent, and must interoperate at least to the standard Microsoft and NFS protocol standards. SAN and NAS differ in the way that storage is allocated, in that with SAN storage is partitioned to a server and is not easily reallocated to a server with a different OS.
- Overall strategy for backup and recovery, including integration with existing GDBC facility for backup. Data protection, recovery and disaster recovery features differ greatly between SAN and NAS and between vendor offerings. Review the need for provided facility for mirroring, replication, versioning, backup and remote mirroring and compare vendor solutions for this facility.

All prospective solutions offer the following characteristics, but solutions can be secondarily compared on the degree to which they offer functionality in the following areas:

- Overall cost to maintain and operate. Ease of use and functionality of management facility.
- Vendor longevity.
- Mean Time to Failure. Each configuration is failure-sensitive, fault-resistant, or fault-tolerant, in increasing preference.
- Mean Time to Recovery (factoring in vendor's Victoria presence).
- Degree of fault tolerance and redundancy in the network components, as a factor of acquisition costs.
- Inter-component management communications should operate on a (lower capacity) peer-to-peer network.

6.3. Network

6.3.1. Overview

GDBC has a mature intranet and utilizes the services of the Metropolitan Area Network (MAN). Network provisions for DIM may be already determined by Government or GDBC policy and existing agreements.

DIM specific needs for additional network are:

- High throughput links between the Air Photo Lab and the DIM systems (Acquisition server). A dedicated 100MBPS connection is recommended as the minimum acceptable.
- DIM application level intercomponent communication. This is envisioned to be a GDBC standard 100MBPS intranet segment tying the DIM servers together.
- The SAN/NAS private segments of high-speed network for storage manager to server communication and for storage manager to storage device communication. Evaluations of this technology should be treated as part of the "Storage" evaluations and are not discussed in this section.

6.3.2. Component Requirements

The need is for a dedicated 100MBPS link between the DIM systems located at the GDBC main offices at Blanshard or Davidson and the Air Photo Lab some kilometres distant on Markham.

The service must be available at least 98% of the time. Outages of up to eight hours (this number used for discussion purposes) may be scheduled with sufficient prior notice.

6.3.3. Evaluators

Network solutions should be differentiated on the following points:

- Overall estimated annual costs for service.
- Actual dedicated bandwidth, to be compared with estimated available bandwidth on a shared link.

6.4. Image Storage and Management S/W

6.4.1. Overview

Image Data Store Management involves storage, safekeeping, and tracking of digital images.

Metadata and supporting information must be well integrated with the actual image data, with this facility provided by packaged software or provide-able through applications built to well defined and standard data and metadata management interfaces.

The Image Data Store Management component must contain and enforce business rules concerning access, processing and security.

It must concern itself with reliability, availability and recovery.

In operation, the main activity of the management facility will be to serve image data to other components of DIM, primarily the image server. The management facility must quickly locate images through spatial and attribute indexes and must quickly transmit image data.

6.4.2. Component Requirements

Data Management can be described by the software and hardware technologies used to facilitate the archival, preservation, retrieval and exploration of data. Data Management is planning, coordinating and controlling change to data.

Today's Database Management Systems (Oracle, Informix, DB2, etc.) implement and automate many aspects of data management. The DIM assumption is that whatever data management products are selected, they will use the underlying facility of the Oracle DBMS to supply "basic" data management.

DIM's requirements for data management are larger in scope than that provided by a DBMS.

Basic Data Management is:

Data Base Management:

- Provide for transaction based data input, storage and output.
- Provide for availability of data, up to full-time guaranteed availability when supported by hardware and organization.
- Provide for complete non-loss of data, up to the complete non-loss of any transaction or change except where supported by user notification and rollback.
- The combined DIM facility must supply OpenGIS data discovery services to GDBC customers. It is mandatory that the data management component supply these services at the Feature and FeatureCollection level to other components within DIM.
- The data management component must supply OpenGIS Simple Feature Access.
- The data management component must have an open, ISO defined application programming interface, preferably based on SQL/MM.
- Enable multi-user simultaneous access to data.
- Provide a standards based programming interface for access to data and a single point of contact for application interfacing to data.

Data Management:

- Provide a facility for modelling data and data structures. This should be integrated with the data base management system to enable automated application generation and user accessible data descriptions.
- Make possible the elimination of redundant storage of data.
- Enforce per-row and per-dataset access controls on an individual and group basis. Enable executive control over security.
- Provide for automated verification of data changes against business rules, including relationships, domain checking and programmed content verification. Provide for statistical analysis of data quality and content.

DIM adds these requirements, above and beyond basic data management, primarily for the use of data custodians and stewards:

- Supply facility to manage change to the data by providing record keeping and workflow automation for planning and for tasks involved in changing/adding/deleting data.
- Provide activity tracking and record changes.
- Provide for archiving and versioning.
- Provide for check-in/out and enable long and wide transactions. The size of the imagery files place unusual resource requirements on the entire system, and thus the total amount of data involved is referred to as a 'wide' transaction. A 'long' transaction is one that may take several hours or even days to complete. Although DIM data is primarily write-once, read-forever, there are acquisition functions that treat multiple images as a group. Also, with the present pace of technology change, possible subsidiary products and the operations required to produce them in the future are not well known at this time.
- Provide for integrated metadata or provide standards based open interfaces to other selected metadata management components. This facility must maintain integrity between metadata and data stores.

The data being managed is a huge database of images, requiring the following:

- Provide facility to manage 600+ terabytes of data. Be able to manage to this amount on an incremental basis.
- Manage images either natively (the management software controls storage device use), or as a collection of OS managed files.
- Be able to serve 250MB-650MB images quickly, when supported by hardware and network.
- Serves data in accordance with the GDBC specified (OGC) standards for interfacing.
- Provides for location (index search) of images through spatial and attribute indexes.

Beyond simple input, storage and output, DIM also has these requirements for processing of images that may be offered by the Image Server or by the underlying image management facility:

- The system should be able to serve clips from images.
- The system should be able to serve image generalizations.
- The system should be able to edge-tie images it presumes are in the same coordinate system.
- The system should be able to manage and use multiple coordinate systems, and to understand and use coordinate system information for projection on output.

6.4.3. Evaluators

Image Data Store Management solutions should be differentiated on the following points:

- Demonstrated success managing other similar sized image databases.
- The degree to which metadata is integrated within the product.

- Measured or demonstrated data throughput capabilities, primarily on fetch and output.
- Measured or demonstrated spatial indexing performance and suitability.
- The degree to which image compression software and facility is or can be integrated with the Image Data Store facility.
- Measured or demonstrated speed of image processing related to clips and generalizations, if provided.
- Degree of support, speed of transformation, accuracy and flexibility in regards to coordinate transformations, if provided.
- Measured performance and standards conformance of open access interfaces useable to implement "direct" high performance data reads from external organizations.

6.5. Vector Data Management S/W

6.5.1. Overview

DIM is primarily focused on image management (image) but also must manage some vector geographic data. There is only one primary vector data component that is Baseline Thematic Mapping Products. There are also a number of vector data sets produced as indexes to image data such as footprints, BCGS, and static copies of non-DIM Ministry map data sets that will be used as locators and backdrops on DIM websites for Discovery.

It may be feasible to manage these data sets with the same software tools as used for basic image management.

6.5.2. Component Requirements

The needs for vector management are identical to those for image management with the following exceptions:

- The data is vector, not image. The data must be accessible through both geographic extent and thematic content.
- The overall data volume is small. The change/addition transaction velocity is low.
- Data reads will be numerous and sometimes involve high volumes, when used as search filters during Discovery.
- The managed data may originate in several GDBC and vendor standard GIS vector data formats, ESRI, SAIF and INTERGRAPH formats for example.
- The managed data must be serve-able in originating format and also in GDBC chosen, OGC defined standardized content and format.

- The system should be able to manage and use multiple coordinate systems, and to understand and use coordinate system information for projection on output. This functionality must be supplied either by the data management S/W or by an associated vector data server.

6.5.3. Evaluators

The evaluators for vector management are generally identical to those for image management. Vector data management should also be differentiated on the following factors:

- Ability to manage and store diverse proprietary data formats, either by providing format conversion facility or by housing data in raw or original format. The quality and accuracy of format conversion differentiates products.
- Ability to serve diverse proprietary data formats, although the prime requirement is to serve a single standard.

6.6. Metadata Entry and Management

6.6.1. Overview

Metadata management software will be used to capture and manage metadata during image acquisition. It is also a component of the discovery and distribution modules.

Metadata management software must provide these key functions:

- Provide for metadata data entry in a multi-user environment, including security considerations.
- Provide for metadata modelling and storage of metadata in potentially multiple metadata content and format standards.
- Provide for metadata retrieval and display and for flexible keyword search.
- Provide statistical reporting on metadata for metadata management and also for DIM decision support purposes.
- Provide for (in later phases of DIM) Z39.50 services.

6.6.2. Component Requirements

The following requirements are mandatory:

- Implements FGDC compliant metadata including all versions of the GEO profile.
- Provides for complete use of FGDC "User Fields", for data entry, search and display. Enforces FGDC mandatory element data entry, with this feature override-able by administrators on a FGDC field basis.

- Provide for transition to full ISO metadata standards when finalised. Provides for conversion from FGDC to ISO TC 211 Metadata Standard 19115 Geographic information – Metadata, or has a stated direction to provide for this.
- Provides database security on a per row basis.
- Allows the use of GDBC login security information sharing with O/S (Microsoft).
- Must be supported on at least one of Microsoft or Sun Microsystems operating systems.
- Provision of Data Entry Templates to provide standardized and common answers to form fields and to check validity.
- ODBC or direct interfacing to the Oracle DBMS, which is to be the primary data store.
- Ability to add additional fields to the metadata model and record. Not locked to FGDC or other content standards. Customizable as to what fields are entered/displayed for entering.
- FGDC standards definitions are viewable online and documented. GDBC defined models and fields are document-able within the facility. FGDC attributes are provided with complete documentation.
- The system has full online User Help conforming to Microsoft standards for help systems.
- Web based retrieval and display system.
- Provide full implementation of the FGDC security and access protocol.
- Provide for packet output in HTML and XML formats.

6.6.3. Evaluators

Metadata management solutions should be differentiated on the following points:

- Level of provision for HTML, XML, ASP and Portal Technology Web development.
- Support by multiple operating systems.
- Provision of automated metadata discovery or importation through analysis of imagery. Automatic (programmed as part of Acquisition) update/entry through data mining / discovery mechanisms from legacy or other DIM systems. Ability to find and extract metadata from geo-referenced images (orthophotos and geo-tiffs).
- Support of multiple (legacy and current) versions of most common metadata models (i.e. FGDC, NBII).
- Training and CBT tutorials are useful and come with extensive examples.
- Default values for fields can be set / changed for repetitive records (this is not the same as templates).
- Provision for multiple views of the metadata, such as table, spreadsheet and text list. The ability to use these for data entry.
- Web based data entry interfaces.

- Ability of the metadata management system to also provide feature or product catalogue services.
- Ability of the Z39.50 server to provide full implementation of the Z39.50 security and access protocol.
- Ability to make simultaneous update to multiple records.
- Provide for links to described product through DIM defined object keys.
- Provide for linkage from other data components of DIM back into the metadata.
- Ability to search on all metadata fields and on contained document content. Not limited to keyword search.
- Provide a full text index additional to the keyword index.
- Web based or client-server Application Programming Interface.
- Provide for security above and beyond that specified by Z39.50 and FGDC, enabling and making transparent the full ability of Oracle to deal with security.
- Provide an API or open model so that data access can be programmed directly to the API or to the Oracle DBMS.

7. BEYOND PHASE III

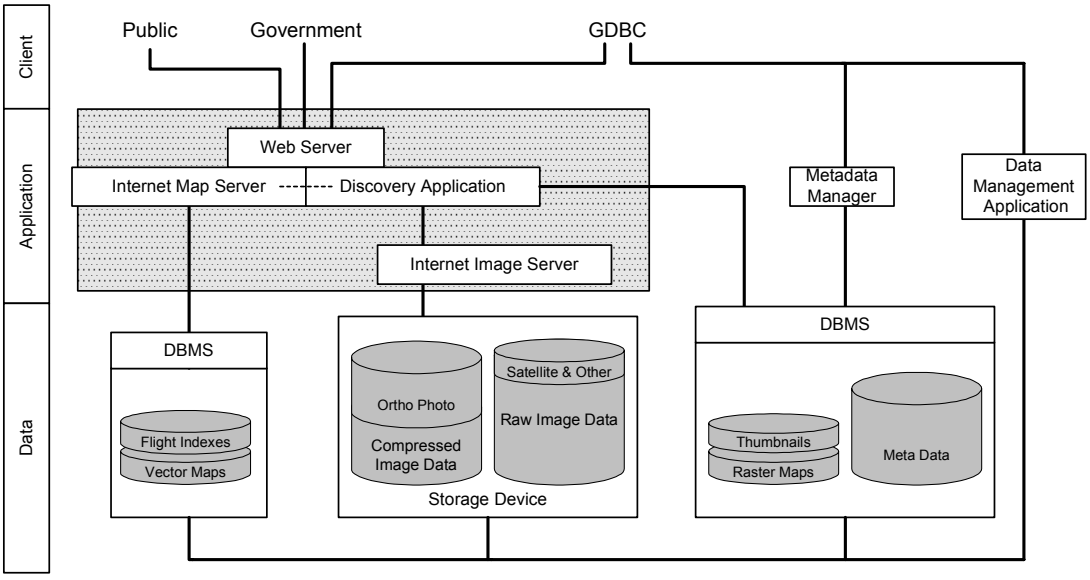
The following requirements and evaluation points are organized by DIM business module (a higher level view) rather than SCOTS components due to the dependence of the required supporting products on the decisions made during Phases I through III.

7.1. Image Discovery

The Discovery module will allow users a "one-window" portal for accessing GDBC data through a web-based interface. The Discovery portal will direct users to the availability of the data and provide information as to how it can be accessed.

The Image discovery component requires three modules or functional groups of software (see figure below).

- Internet Map Server
- Discovery Application and
- Internet Image Server



Discovery Modules

These applications reside behind the GDBC web server.

7.1.1. General Requirements

The DIM software selection for Discovery of digital imagery is of vital interest to GDBC customers. The GUI or presentation layer will be evaluated by the user time and time again and must meet expectations.

The Image Discovery software general requirements are:

- Scalable with online data availability,
- Scalable with load demand,
- Oracle Spatial DBMS, and
- Compatible with Sun Microsystems and Microsoft operating systems in a mixed environment.

7.1.2. Detailed Requirements

Internet Map Server

Table 1: Internet Map Server Requirements

	Criterion	Level
1.	Able to access Oracle Spatial data	Mandatory
2.	Thin client	Desirable
3.	Able to serve image and vector data together	Mandatory
4.	Able to server compressed image format (ECW)	Mandatory
5.	Able to communicate with Discovery application and/or metadata database	Mandatory
6.	Able to integrate spatial search interface with discovery application web interface	Mandatory
7.	Efficient roam and zoom for imagery and GIS vector data	Mandatory
8.	Supports map colour transparency (translucent) shading of vector polygons	Desirable
9.	Supports display and “drill down” searches from map of BC (image and vector)	Mandatory

Discovery Application

Table 2: Discovery Application Requirements

	Criterion	Level
10.	Provide Z39.50 search capability.	Mandatory
11.	Provide Z39.50 server functions.	Mandatory
12.	Provide spatial and database search functionality	Mandatory
13.	Web based interface	Mandatory
14.	Thin client for all users	Desirable

	Criterion	Level
15.	Thick client for internal (LAN/WAN) users	Desirable
16.	Operate on Windows or Sun Microsystems platforms	Mandatory
17.	Ability to search all fields/entire document for words other than just the keywords	Desirable
18.	The ability to download the data set and its metadata in a standard format	Desirable
19.	Ability to publish html data in FDGC Format.	Mandatory

Internet Image Server

Table 3: Internet Image Server Application Requirements

	Criterion	Level
20.	Thin client	Desirable
21.	Any required plug-ins are easily available for free distribution	Mandatory
22.	Support IE and Netscape users	Mandatory
23.	Supports ECW and GIF viewing	Mandatory
24.	Supports Integration with ESRI ArcIMS & MapObjects IMS applications	Mandatory
25.	Supports Integration with Intergraph GeoMedia WebMap	Mandatory
26.	Supports Integration with Auto Desk MapGuide	Mandatory
27.	Supports integration with GE SmallworldWeb	Mandatory
28.	Support for widest variety of GIS Platforms	Desirable
29.	Re-projection of imagery on the fly for standard map projections	Desirable

7.2. Image Distribution

Distribution will provide the facilities to disseminate requested digital imagery on line or by transportable media. A single combined Acquisition & Distribution server will support distribution activities.

The Image Distribution component will require tools to automate the business process for ordering and distributing GDBC held image data.

7.2.1. General Requirements

The general requirements for the Image Distribution Module are as follows:

- Links to an online payment service provider for e-Commerce
- Link to FTP server for download of large files (10 MB plus)
- Links to data management application for business rule definitions

7.2.2. Detailed Requirements

The detailed requirements for the Image Distribution Module are as follows:

- Provide immediate download via LAN/WAN link for Government clients.
- Provide download of thumbnails and/or compressed images to Internet clients — compressed images may require an ftp server for download, or may have to be distributed off line due to size.
- Provide a link to an e-Commerce service provider for payment services to collect fees for download or off-line media delivery where applicable.
- Initiate an off-line ordering process for creation of CD, DVD or other media delivery of image - this could include the analogue versions of the images if requested by a client.
- Provide customer order tracking information.
- Provide image order history.