Geographic Data BC

Report to

Geographic Data BC

Digital Image Management,

Migration Strategy

September, 2001

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Change Record

Version	Date	Description
V3.0	04-07-2001	Release of Document to GDBC for working committee review
V3.1	16-07-2001	Integration of feedback from GDBC working committee
V3.2	30-07-2001	Incorporate new Table of Contents

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Confidentiality/Validity

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EXECUTIVE SUMMARY

Geographic Data B.C. (GDBC) contracted Sierra Systems to assist with its' Digital Image Management (DIM) project, by assessing current business processes and recommending new processes and technology to increase digital image management efficiency within the GDBC. The DIM sub-project was carried out in two stages – Current situation assessment, and future direction. The future direction stage of the project included the development of a Proposed or "Vision" Business and Technical Solution, and a phased Migration Strategy to reach this Vision. This report contains this Migration Strategy.

Overview of Migration Strategy

The primary goal of this migration strategy is to ensure that the new DIM system and business process are implemented in a planned and controlled manner with minimal impact on the daily work activities of GDBC staff.

The migration strategy is based on the assumption that the vision and technical infrastructure described in the *"Current Assessment- Future Direction"* report are acceptable to GDBC and that sufficient resources will be dedicated to implement the proposed system and business processes. The strategy includes a phased approach to implementation that has been constructed to maximize return on investment during each phase and deliver a tangible advantage or appreciable business improvement.

The following diagram illustrates the proposed phases, and the functionality delivered at each phase:
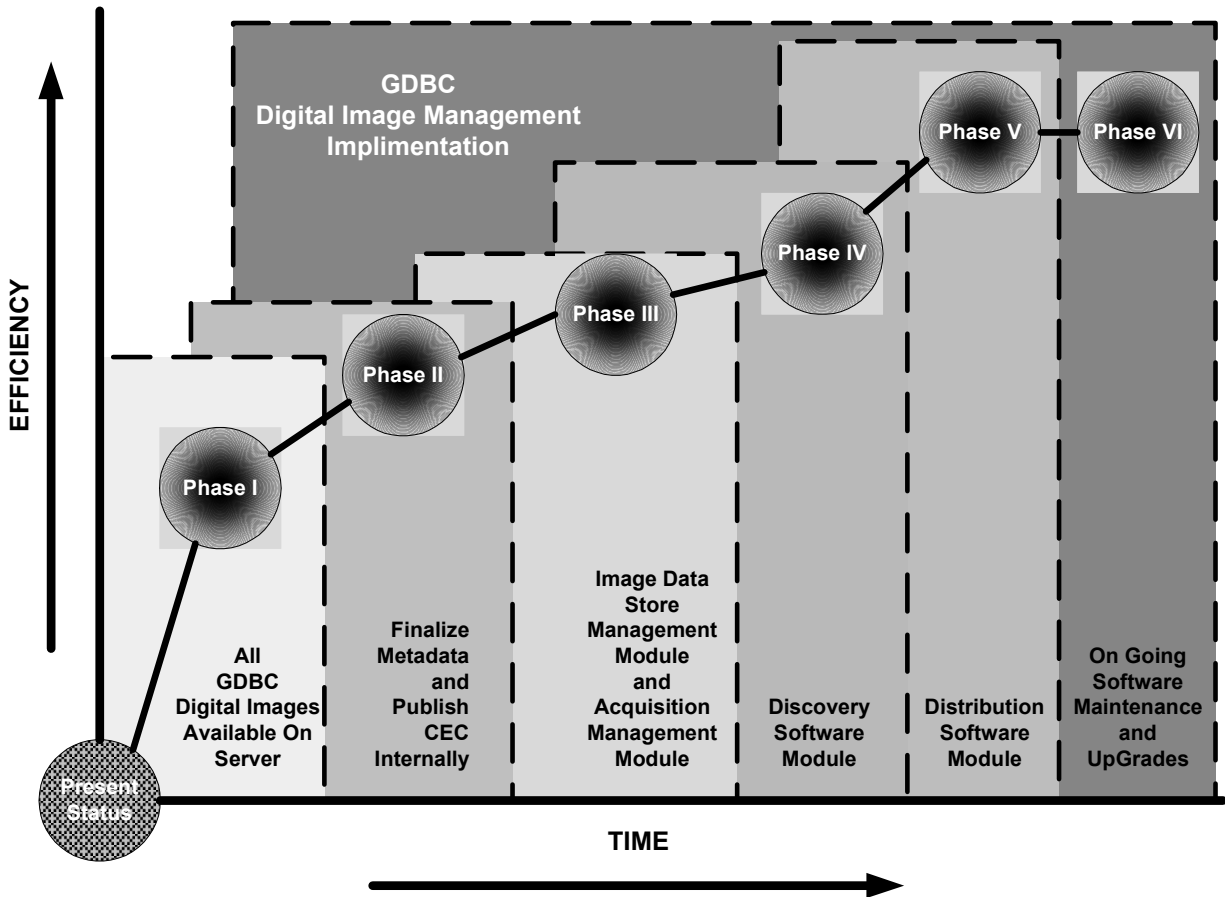
Benefits of Migration Strategy

The following table show the expected benefits at the completion of each phase of the Migration Strategy:

Phase	Milestone	Benefits
I	All digital imagery available via .LAN from server	• Removal of time, cost and effort to 'burn' archive CDs (See cost benefit / analysis in the appendices) • LAN / Intranet access to all digital images via roll number and frame • Off site backups of images to tape by Computer Operations • Removal of library management, storage and tracking of CDs

Phase	Milestone	Benefits
II	Metadata standards & Management Software in place Internal Catalogue	• Identification of all existing data that will support the metadata • Identification of required metadata that is currently not available, establish new methods for acquisition. • Single centralized source of all Digital Image inventory available to all within GDBC
III	Image Data Store Management Software Acquisition Management Software Discovery Software requirements	• Increased efficiencies in controlling all Digital Images and supporting data • Ability to track each image status during value add activities • Ability for key clients to 'see' the GDBC entire imagery inventory from one source
IV	Discovery Software on the Intranet Automatic update of Catalogue	• Graphic & textual discovery search on the Web • Viewing of images via 'thumbnails' • Easy access to the Digital Image Inventory
V	Distribution Software Discovery Software on the Web	• Ability for all customers and users to discover and receive digital images. • Ability to distribute the images and supporting files either via download or appropriate portable storage device (CD, DVD, or portable hard drive). • Ability to resample images or utilize compressed images as required by the client.
VI	Ongoing Maintenance	• Continual improvement of efficiencies from new technology and hardware / software upgrades • Decreased system / application downtime

1.   INTRODUCTION

Geographic Data B.C. (GDBC) currently manages a host of digital images of various types including; aerial photographs scanned for archive and mapping purposes, scanned or "rasterized" maps, satellite imagery, and derived digital image products such as digital orthophotos. GDBC has identified several inefficiencies in the way these images are acquired, managed, accessed and distributed to both internal and external clients. The Digital Image Management (DIM) project was initiated to investigate ways of improving the efficiency of managing digital imagery through changes to business processes and new technology.

GDBC contracted Sierra Systems to assist the DIM project by assessing current business processes and recommending new processes and technology to increase digital image management efficiency within GDBC. This DIM sub-project was carried out in two stages – Current situation assessment, and future direction. The future direction stage of the project included the development of a Proposed or "Vision" Business and Technical Solution, and a phased Migration Strategy to reach this Vision. This report contains this *Migration Strategy*.

Further details of the overall objectives, scope, deliverables and approach used for the DIM project are contained in the accompanying report entitled *"Digital Image Management, Current Assessment – Future Direction"*.

The *Software Evaluation Criteria* report provides software standards, requirements and evaluation criteria to be used for the selection of COTS software product(s) for image management at GDBC.

1.1.   Purpose of Report

The purpose of this report is to document the proposed Migration Strategy for the Digital Image Management system.

1.2.   Intended Audience

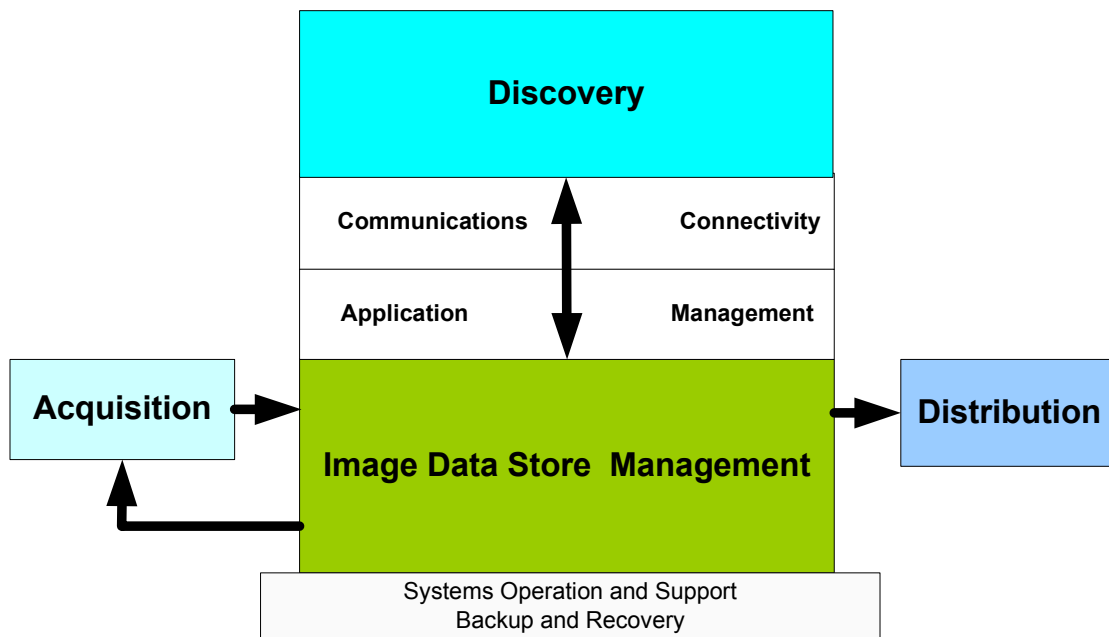The intended audience for this report is GDBC staff involved in the collection, management and distribution of digital images. It describes new business processes, and is not intended to provide detailed information on technical implementation of the DIM system. The distribution of this section will also facilitate communications with stakeholders and other participants to indicate changes and impact to service.

1.3. Primary Functional Modules

The 4 functional components described are referred to throughout this report for consistency with the other reports.

To address the objectives of the project in a systematic manner, the overall digital imagery management function was divided into the following 4 logical components or modules as illustrated in the following diagram and described below:

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                    ┌─────────────────────────────┐
                    │         Discovery           │
                    ├─────────────────────────────┤
                    │ Communications   Connectivity│
                    │              ↕              │
                    │ Application      Management  │
┌──────────────┐    ├─────────────────────────────┤    ┌──────────────┐
│ Acquisition  │ →  │                             │ →  │ Distribution │
└──────────────┘    │ Image Data Store Management │    └──────────────┘
        ↑           │                             │
        └───────────┤                             │
                    └─────────────────────────────┘
                    │ Systems Operation and Support│
                    │    Backup and Recovery       │
                    └─────────────────────────────┘
```

IMAGERY ACQUISITION

Imagery Acquisition encompasses all processes involved in the receipt and preparation of images for storage within the repository. The preparation of the imagery includes workflow procedures to load the imagery into the Image Repository and the metadata into the metadata database. It also includes the creation of products derived from the raw or base imagery. The Acquisition process will track all steps of the development and ensure that identified interim images will be stored in the Image Repository, 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 recognizes that due to technology limitations the images may be received at GDBC in a variety of storage media. The Acquisition process module populates the Repository with the images, metadata and supporting information.

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IMAGERY DATA STORE MANAGEMENT

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

IMAGERY DISCOVERY

Imagery Discovery denotes the processes and technology required for internal and external clients to search for specific images or groups of images via predetermined and ad-hoc search criteria. The Discovery process ultimately depends upon the metadata to support the search. Discovery must support geographic "area of interest" search as well as textual based searches.

The discovery module interfaces with the distribution module by triggering the process for Distribution. It may also trigger an Acquisition event requiring the creation of a derived product or service (e.g. the scanning of an analogue image currently on file). It is not the intent of the Discovery module to be used for the initiation of contract acquisition of new aerial photography at this time.

IMAGERY DISTRIBUTION

Imagery Distribution refers to the processes to deliver selected products to a client. Distribution of specific images and supporting files has multiple variances and is dependent upon selected 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 or via a portable storage device.

2. OVERVIEW OF MIGRATION STRATEGY

This report describes a proposed migration strategy for implementation of the new Digital Image Management (DIM) system and business processes outlined in the *"Current Assessment- Future Direction"* report. The Migration Strategy is intended to serve as a high level guideline for the recommended implementation phases. Specific details of each phase are not within the scope of this document. Each phase will require a detailed project plan to be developed prior to commencement.

The migration strategy is based on the assumption that the vision and technical infrastructure described in the *"Current Assessment- Future Direction"* report are acceptable to GDBC and that sufficient resources will be dedicated to implement the proposed system and business processes. The strategy has also been constructed to maximize return on investment during each phase and deliver a tangible advantage or appreciable business improvement.

Technology is continually evolving with new innovations becoming available on a frequent basis. GDBC should continue with ongoing research of relevant technology, analyze the potential benefits to GDBC and incorporate any advantageous technology where it is compatible with the architecture and vision.

The overall approach of the DIM sub-project was to examine the management of digital imagery as four distinct processes or modules; Imagery Acquisition, Imagery Data Store Management, Imagery Discovery and Imagery Distribution. These modules are described in detail in the previous section. For the purposes of this document a module is defined as a set of processes and procedures and the software and systems to support them.

The business process or modules represent Digital Image Management from the aggregated functions that logically combine within the Acquisition, Data Store Management, Discovery and Distribution. The technical architecture and infrastructure to support these business functions cannot be demarcated in the same manner. There are computer hardware servers and data stores that will be involved to support more than one business function. Thus the commissioning of a server during one phase may preclude the addition of hardware or software in subsequent phases.

2.1. Migration Strategy Objectives

The primary goal of this migration strategy is to ensure that the new DIM system and business process are implemented in a planned and controlled manner with minimal impact on the daily work activities of GDBC staff.

Each phase should determine impact on existing processes and procedures and then should clearly identify and communicated the following with all GDBC employees:

- statements of impact,

- transition times,

- procedures during the transition

- training on new procedures must be conducted.

2.2. Need for Incremental Change

GDBC staff are currently working at high capacity and it is determined that the continuation of this work must be continued during any changes that may be imposed. The migration to new hardware, software and procedures must be coordinated to allow for the inclusion of the GDBC staff for subject matter expertise. The impact of the changes and any additional training that may be required must be performed in a non-intrusive manner. These implementation requirements dictate that the changes and their impact must be controlled. Sierra System's experiences in integrating new systems have proven that planning for incremental releases is highly successful. The benefits of this strategy allows GDBC to realize immediate benefits and return on the investment as well as allowing the daily business to continue while employees are being trained and familiarized with the new applications and procedures.

In summary the strategy of incremental change provides:

- User 'buy in' by observing results and improvements early and often

- Quicker utilization of the modules as users only need training on released components

- Manageable phases with contained objectives and resource requirements

- Ability to adapt the start of each phase to the changes that may have occurred

- Incorporation and utilization of accomplishments from previous phases

2.3. Project Planning Methodology

The migration strategy is based on the 'Rolling Wave' methodology of project management. This method utilizes the theory that; as a project is conducted there are changes in the organization regarding processes and business requirements. The overall project is defined and the target 'vision' is agreed. The project is then divided into phases. At the initiation of each phase a detailed project plan is developed. Each phase then recognizes the experience gained from the previous phase and also considers changes that may have occurred during the phase.

The 'Rolling Wave' method does not preclude GDBC from starting subsequent phases until the completion of previous phase. The dependencies of one phase on others are outlined below. The dependent phase may be started as soon as the dependent tasks are completed.

GDBC currently has procedures in place to service their clients for digital imagery. These procedures will remain in place until the replacing module or process is released into the 'production or live' environment.

2.4. Primary Task List and Dependencies

The phases are designed to provide a tangible benefit during and at the conclusion of each phase.
There are some interdependencies designed into the phases. Phases subsequent to the first phase
have dependencies that must be implemented prior to the start or some specific tasks.

Phase	Description	Dependencies

I	Current inventory of digital imagery available via LAN from server	• Commitment to the phase with sufficient resources and GDBC Sponsor.
		• Availability of Infrastructure, either existing computers or acquisition of required equipment (compliant with requirements).
		  – Servers
		  – Disk arrays
		  – Network

II	Metadata standards & Management Software in place Internal Catalogue	• Phase I - Access to the Inventory list (optional)

III	Image Data Store Software
	
	Acquisition Management Software
	
	Discovery Software requirements
		• Phase I - servers
		• Phase II - Metadata strategy
		  – Standards and Procedures
		  – Sources
		  – Metadata catalogue
		  – Security

IV	Discovery Software on the Intranet Automatic update of Catalogue	• Phase I - Completion of Metadata standards and fields • Phase III - Populated images and metadata database (sufficient to support implementation and testing) • Phase III - Repository management software to feed Discovery module • Phase III - Report generation tools and methods
V	Distribution Software Discovery Software on the Web	• Phase IV – Discovery 'order form' data fields • Phase IV – Acceptance of functionality from Intranet Discovery users.
VI	Ongoing Maintenance	• Phase I – Commissioning of Severs and Disk Storage

2.5. Organizational Change

2.5.1. Skills Required vs. Available

Detailed technical skill requirements for the implementation and ongoing maintenance of the DIM system can only be determined after the technical architecture is selected and following a formal assessment of existing staff skills, which was not in scope for this project.

The operational requirements will be obtained from the current IT department. There will be specific technology courses required for any applications or technology that is selected.

2.5.2. Roles Required

It is assumed that we are able to identify the need for the following roles to be filled:

- Data Steward – A data Steward, on the other hand, is responsible for the maintenance of the Image Data Store and ensuring that all information and images meet the Custodian established specifications and quality control. The data Steward is also responsible for safeguarding the Image Data Store from an access control and disaster recovery requirements. The Steward is responsible for ensuring that images are available to the user community in a timely manner.

- Data Custodian – A data Custodian is the "owner" of the data and is responsible for setting standards and for ensuring the data meets the business needs of the organization.

- Oracle RDBMS Data Base Administrator – preferably with Spatial experience.

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3. MIGRATION STRATEGY PHASES

The Migration Strategy is segmented into 5 phases, with a sixth phase being ongoing maintenance. Each phase has been designed to achieve measurable, increased efficiency and tangible benefits to GDBC during the migration to the new DIM System.

An overview of the phases is provided below:
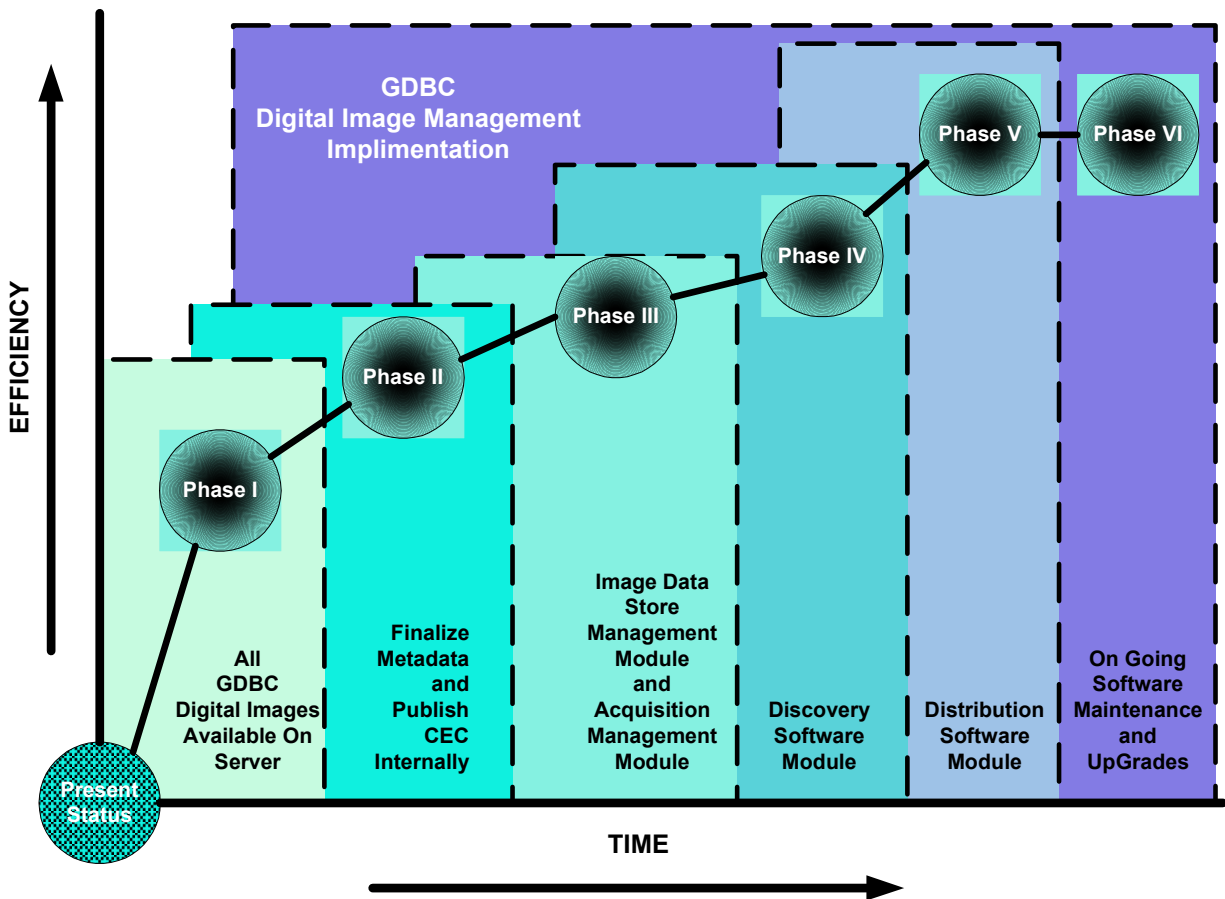
Note that the phases are not necessarily sequential. Some activities within each phase can be carried out in parallel. The phase interdependencies were described previously. The following sections describe these phases in greater detail and identify specific tasks involved.

3.1. Phase 0 Preparation

A standard list of tasks for this phase is listed below. This list is intended to provide a base starting point for this phase; each task should be validated for applicability and time estimates.

ID	Task Name	Duration	Predecessors	M-2	M-1	Q1 M1	M2	M3	Q2 M4	M5
2	**Preliminary Preparation**	**50 days**								
3	Existing Systems & Planning	1 day								
4	Establish Project Management, Roles and Respons	5 days								
5	**Infrastructure Acquisition**	**45 days**								
6	**DIM Hardware Acquisition**	**22 days**								
7	Detail Hardware Specifications	5 days	4							
8	Finalize Invitation to Quote (ITQ) for Hardwa	1 day	7							
9	Tender Hardware ITQ	10 day	8							
10	Review Hardware ITQ responses	1 day	9							
11	Negotiate and Acquire DIM Hardware	5 days	10							
12	**DIM Software Acquisition**	**45 days**								
13	Finalize Software RFI/RFP	10 day	4							
14	Tender Software RFI/RFP	15 day	13							
15	Review Software RFI/FRP responses	10 day	14							
16	Negotiate and Acquire DIM Software	10 day	15							

Note – tasks with zero days indicate requirement for further analysis and information to determine a time estimate.

Duration for tasks is representative and dependent upon quantity of resources available. Further information will be required at the beginning of the phase to complete the detailed project plan.

Hardware will be received on a 'Just in Time' basis. Some hardware will be required during phase I, but other computing devices will be dependent upon specifications of specific software selection.

3.1.1. Existing Systems & Planning

A current and in-depth review of GDBC's existing infrastructure is part of the preparation phase. This review should examine primary GDBC systems components and determine what role, if any, each component will have in the following time frames:

Phase	Impact analysis
Immediate provision of service.	• The simple continuation of day-to-day activities. • Will this component continue to do what it has been doing?
Commencement of Phase I, II or III.	• Determine desirability of retention or decide on deployment. • Will this component (storage, for example) be taken from current allocations and dedicated to the new stream?
Duration of Phase I, II or III.	• Will this component be made part of the new systems? • At what point in the Stream?
Completion of Phase I, II or III.	• Will this component be made redundant by the new systems? • At what point in the Stream?

3.1.2. Infrastructure Acquisition

Determination of the target technical vision will reduce risk of acquiring incompatible infrastructure. The evaluation and selection of SCOTS software and hardware may be started at any time as the implementation spans several phases. The earlier the overall solution is determined, the easier those supportive infrastructure acquisitions can be made. The *Software Evaluation Criteria* report provides task details for this activity.

The selected components must then be acquired according to a schedule determined by the following:

• Project planning for Phases. Tasks and deliverables depend on infrastructure to be in place, and determine dates when infrastructure is required by.

• The nature of the proposals returned by Vendors, including details of component bundling, firm pricing, staged delivery (presumed to be as requested in RFI/RFPs) and bulk discounts.

• Lead times for shipment, configuration and training.

After significant milestones are met in each Phase (all existing digitized data online, for example) the component acquisition schedule should be revised. It is not expected or desirable, however, that the selection of SCOTS components be revisited during DIM.

3.2. Phase I – Digital Images Loaded on Server

This initial phase will result in all current digital images currently on CD to be available to internal GDBC staff online using basic directory/folder structure. This phase will also eliminate the creation of images on CD for any internal usage. Any images scanned after this phase will be copied from the scanning workstation to the internal disk farm, rather than being copied to CDs.

The steps involved in this phase are:

THE FIRST STEP I THIS PHASE IS TO CREATE A DETAILED PHASE PROJECT PLAN

The plan for this phase will review the overall migration strategy, examine any dynamics in GDBC business and requirements, review any constraints regarding work efforts, expenditures, resources or technology.

At this point the detailed plan will also include risks, detailed deliverables and an impact statement on GDBC operations. A conversion of any data or work procedures will be detailed as well as any training required.

A preliminary list of tasks for this phase is listed below. This list is intended to provide a base starting point for this phase; each task should be validated for applicability and time estimates.

ID	Task Name	Duration	Predecessor
17	**Phase I - Digital Images Online**	**191 day**	
18	Establish data 'Custodian' and Steward for Di	0 day	4
19	Create and Validate Phase I Project Plan	3 day	11
20	Commission DIM File Sever and Disk Farm	10 day	19
21	Commission WorkStations for Loading	2 day	19
22	Connect Photo Lab to high-speed link	10 day	19
23	Establish and Impliment Security requirement	1 da	19
24	Establish Image loading procedures and Prio	3 day	20
25	Create Target Directory Structures	3 day	20
26	Create Quality Assurance procedures	2 day	20
27	Create 'base' online Inventory List	5 day	26
28	Create Training Program	1 da	27
29	Train Image Loading Personnel	2 day	28
30	Train GDBC Personnel (Photo Lab, Ortho, Sa	1 da	29
31	Po;ulate File Server with all existing digital im	145 da	30

Note – tasks with zero days indicate requirement for further analysis and information to determine a time estimate.

Duration for tasks is representative and dependent upon quantity of resources available. Further information will be required at the beginning of the phase to complete the detailed project plan.

Note - The estimate to copy all existing images to the disk farm is based on 2 operators with 2 CD readers available to upload images. The estimate is also based on an <u>average</u> of 10 minutes for each image and supporting files. During this phase new digital imagery will be copied to the disk farm by the department that would currently create the CD archives.

The key tasks are described further below:

ESTABLISH DATA CUSTODIAN AND STEWARD FOR DIGITAL IMAGES.

It is anticipated that the Data Steward will be responsible for the technical aspects of the final solution. Technical responsibility will include assurance of availability, and data recovery and disaster recover (backups etc.). The data custodian is the "owner" of the data and is responsible for setting standards and ensuring the data meets the business needs of the organization. The data steward will be responsible for the maintenance of the repository and ensuring that all information and images meet the Custodian established specifications and quality control. The steward will also be responsible for safeguarding the repository from an access control and disaster recovery requirements. The steward is responsible to ensure that the images are available to the user community in a timely manner.

One single custodian will be responsible for all digital images – eligibility, quality, etc.

It is recommended that the Branch Director be designated as the Custodian of all imagery managed by GDBC.

COMMISSION DIM FILE SERVER

The technical architecture section has specified a central file server configuration that will adequately serve the anticipated needs of the DIM project for the next several years. The DIM Server will be expandable, but will be configured to support the data volume and quantity of internal GDBC users.

The Phase I file structure from the technical architecture section will be developed and the Ministry Technical Department will provide the technical support to ensure that the images are available to internal GDBC staff. The Ministry Technical Department will also ensure security and that adequate backups are being conducted.

CONNECT PHOTO LAB TO HIGH-SPEED LINK

Currently the archival scanners are not supported with a high bandwidth connection to the GDBC head office. A high speed connection that will support data transfer of 100Mbs will allow the scanning lab to eliminate the current steps of creating Compact Disks and the associated overhead of validating the storage media, filing the CD and responsibility for tracking the images and

supporting information. This step will allow the Photo Lab to add the 'archive' – pre 1960 images directly to the central data repository.

The current scanning specifications being used by the Air Photo Lab are at near maximum resolution. This procedure should analyze in detail for potential file size and work effort efficiencies at other scanning resolutions. The current image scanning specification should be continued during any further analysis activities.

POPULATE FILE SERVER WITH ALL EXISTING DIGITAL IMAGES AND SUPPORTING FILES

The entire existing library of images on CDs will be copied to the DIM Server. The initial step will create an online image listing (catalogue) of all digital images utilizing the current identification methods. This catalogue should be available to all GDBC internal staff and will indicate the status of an image as to whether it is available online or it is still resident on CD. In the event that there is a requirement for an image that is still on CD there will be a process developed for any trained GDBC staff member to copy the image to the central DIM server, update the status indicating the image is now online.

3.3. Phase II – Central Electronic Catalogue (CEC) and Metadata

This phase will result in the implementation and finalization of the metadata listing and will identify all sources of metadata. The phase will also 'publish' a listing of all existing digital images in a Central Electronic Catalogue. The form and format of the CEC will be determined during this phase.

A standard list of tasks for this phase is listed below. This list is intended to provide a base starting point for this phase; each task should be validated for applicability and time estimates.

ID	Task Name	Duration	Q2 M4	M5	M6	Q3 M7
35	**Phase II - Central electronic Catalogue (CEC) and Metadata**	**61 days**				
36	Create and Validate Phase II Project Plan	3 days				
37	**Create Metadata listing**	**16 days**				
38	Document Metadata Sources and Availability for by category	3 days				
39	Finalize Production Metatdata Entities and Attributes	5 days				
40	Create Extraction / Translation Rules	5 days				
41	Determine policy for incomplete or erroneous data	3 days				
42	Finalize Metadata Enitiy Relationship Logical Model	15 days				
43	Create Physical Metadata Repository	3 days				
44	Establish and Impliment Security requirements for Metadata	2 days				
45	Estalbish and commission metadata backup methods	5 days				
46	Establish Metadata poplulation methods	2 days				
47	Create Training materials for Metadata	2 days				
48	Train metadata loading personnel	2 days				
49	Determine opportunities for automated metadata loading	5 days				
50	Create / Acquire automated metadata loading software	10 days				
51	Create Quality Assurance methods and targets	3 days				
52	**Commission metadata loading initiatives**	**5 days**				
53	Populate or load data into Metadata Repository	5 days				
54	Add all analogue photo Metadata into CEC with analogue only flag	0 days				
55	Move all Q/A and Creation logs (photo lab paper logs into CEC	0 days				
56	Conduct Quality Assurance	2 days				
57	**Central Electronic Catalogue of existing Digital Images**	**22 days**				
58	Determine CEC format and content	5 days				
59	Establish Report format from Metadata to CEC	5 days				
60	Determine data extraction or reporting tool	2 days				
61	Create initial Central Electronic Catalogue	10 days				

Note – tasks with zero days indicate requirement for further analysis and information to determine a time estimate.

Duration for tasks is representative and dependent upon quantity of resources available. Further information will be required at the beginning of the phase to complete the detailed project plan.

The key tasks are described further below:

CREATION OF A DETAILED PHASE PROJECT PLAN

Each phase requires the development of a detailed plan. The second phase will start with review of the phase I project and leverage the experience gained during the previous activities. The plan for this phase will review the overall migration strategy and previous phase, examine any dynamics in GDBC business and requirements, review any constraints regarding work efforts, expenditures, resources or technology.

At this point the detailed plan will also include risks, detailed deliverables and an impact statement on GDBC operations. A conversion of any data or work procedures will be detailed as well as any training required.

CREATE METADATA LISTING

Metadata is defined as 'data about data'. In data processing, meta-data is definitional data that provides information about or documentation of other data managed within an application or environment. For example, meta-data would document data about data elements or attributes, (name, size, data type, etc) and data about records or data structures (length, fields, columns, etc) and data about data (where it is located, how it is associated, ownership, etc.). Meta-data may include descriptive information about the context, quality and condition, or characteristics of the data.

This step will be fairly exhaustive, in that potentially large quantities of data will need to be modified, captured or appended once the activity is complete. Ideally each image is processed only once during the data and metadata loading process.

i. Finalize Metadata Requirements – The Federal Geographic Data Committee (FDGC) metadata standards provide elements to describe spatial data holdings. GDBC will need to set a minimum GDBC content standard for the Digital Image Management and define 'user specific' fields.

ii. Develop data loading strategy – Development of a data conversion strategy to populate the metadata requirements from existing flight line data and information stored in hardcopy and stand alone desktop applications (i.e. Excel, Word). This will include a method to "mine" the required data from the existing Air Photo System (APS) and the Land Data BC metadata repository.

iii. Finalize Discovery Key Words and Methods – The Stakeholder workshop clearly identified the requirement to rationalize or eliminate the dependency on film roll / frame number indices for images and cross-reference to location based indices. The utilization of the FGDC standard will help standardize keyword thesauri allowing for easier discovery of imagery.

CREATE COMPLETE CENTRAL ELECTRONIC CATALOGUE (CEC) OF EXISTING DIGITAL IMAGES.

The creation of a Central Electronic Catalogue is initially intended to be a temporary or interim step to facilitate the first phases of the DIM implementation project. The catalogue may have a long-term usability to service clients who are unable to connect to the interactive Discovery module; the hard copy would allow requests for imagery via telephone. The CEC will serve as both a file management procedure and image file status system. It will also form the basis for a GBDC compliant metadata dictionary. The file management system will initially allow the user to search via minimal parameters (film roll and frame number). The Image file status would track analogue / digital status, basic ordering information, and order status information.

The technical details of the CEC will allow for a basic simple moderate cost application that will facilitate easy migration into the final data base solution. The CEC will be populated by manual entry or data conversion from electronic sources (Excel, APS, flight information etc.) The catalogue will eventually have a list of all imagery.

The completed implementation of all modules should support the production of the CEC for printing or offline text based discovery.

It is suggested that GDBC consider an early selection of the SCOTS Metadata management application to facilitate the capture of this metadata to the final metadata database.

ADD ALL ANALOGUE PHOTO IMAGES INTO CEC WITH ANALOGUE ONLY FLAG

This step will require data extraction from the APS system. The intent is to 'market' existing and work in progress or new photography to the stakeholders.

The digitization of the analogue images will be performed by 'scan on demand' requirements and by extension of the archival project currently being conducted at the photo lab.

The 'newer' photography (post 1961) digital scanning schedule will analyze and take advantage of the print order history to address the high use images. The Land Data BC website and ordering system has retained a significant amount of transaction history. The analysis of historic trends will guide scanning requirements and targets.

MOVE ALL Q/A AND CREATION LOGS (PHOTO LAB PAPER LOGS) INTO CEC

This step will centralize all existing image metadata. This step may require creation of a 'properties' form or a small ad-hoc entry system. This will extract information from the Air Photo System (APS) to allow for immediate notification of new analogue images. The release of the 'new' images information will facilitate discovery in a timely fashion.

3.4. Phase III – Image Data Store Manager and Acquisition

This phase will result in the implementation of the Image Data Store Manager and Acquisition modules. The modules will be used and tested by GDBC and then when satisfactory performance is achieved the images can be made available to selected stakeholders who are connected to GDBC via the MAN or high bandwidth connection.

Direct system-to-system access may be implemented in accordance of the evaluation criteria. Such ability by selected stakeholders to access the imagery via direct system-to-system, prior to release of the Discovery module will require careful consideration. This decision may be delayed until the implementation of the Discovery functions, as this 'back door' will be closed to the stakeholders at that time and the accessibility of the images will be via the Discovery/Distribution modules.

CREATION OF A DETAILED PHASE PROJECT PLAN

The third phase will start with review of the phase II project and leverage the experience gained during the previous activities. The plan for this phase will review the overall migration strategy and previous phases, examine any changes in GDBC business and requirements, review any constraints regarding work efforts, expenditures, resources or technology.

At this point the detailed plan will also include risks, detailed deliverables and an impact statement on GDBC operations. A conversion of any data or work procedures will be detailed as well as any training required.

The key tasks are described further below.

1. *FINALIZE TECHNICAL AND PERFORMANCE SPECIFICATIONS*

This step will itemize the technical and performance requirements for possible Commercial Off The Shelf (COTS) applications or products. The specifications will be grouped into categories of mandatory and optional.

These specifications will be usable in any subsequent RFPs for SCOTS products and product evaluations.

The CEC will now facilitate on-line text based discovery of image availability and effectively show the user the format of the image (digital or analogue).

2. *SELECT AND ACQUIRE REPOSITORY MANAGEMENT SOFTWARE*

This step will apply the evaluation criteria, technical and performance specifications. The procedures for acquisition of software products are conducted within the acquisition requirements of the Ministry. The software may have been selected and negotiated during the Phase 0 software acquisition with a delay. If the acquisition steps have not been performed during Phase 0 then it must be conducted at this time.

3. *IMPLEMENTATION OF THE REPOSITORY MANAGEMENT SOFTWARE*

This step will enable all of the Digital Image data to be controlled by the Repository Management software. The software will be the single point of control for images, metadata and any other supporting file information.

4. *LINK METADATA, CEC AND DIGITAL IMAGES*

This step will allow full access to the images internal to GDBC on line and via the various metadata or CEC search methods.

5. *PUBLISH CEC TO SELECTED STAKEHOLDERS*

This step will follow from the linking of metadata with the digital images into the CEC. The publishing of the catalogue will only be done after a reasonable amount of testing by the GDBC staff during their routine activities.

This step will only allow a select few stakeholders and clients to discover imagery via the World Wide Web. This phase will accommodate an Intranet strategy, where the selected stakeholders will be able to use the CEC to order specific images. It is anticipated that this will augment the ordering process via the existing LDBC website. There will be an impact on the LDBC website to accommodate potential changes. Specifically the LDBC website can be modified to accept orders for imagery listed in the CEC.

3.5. Phase IV - Discovery

This phase will result in all digital images currently controlled by the Data Store Management system to be discovered via the Web based front end. The scope of this project does not include the design of the website or discovery web pages. A significant amount of work has been

performed by Michael Ross at GDBC in establishing the 'look and feel' of the website, refer to the BC InView report (HTTP://home.gdbc.gov.bc.ca/BCInView/Default.htm).

GDBC Imagery inventory will be available from the creation of the CEC previously. The listing will allow for textual type 'Discovery' via the printed lists or electronic copies. The implementation of this phase will result in the replacement of the discovery capability of LDBC or via the CEC / Inventory list. The Discovery via graphical representation and drill down will be supported by the completion of this phase.

The key tasks are described further below.

1. *CREATION OF A DETAILED PHASE PROJECT PLAN*

The fourth phase will start with review of the phase III project and leverage the experience gained during the previous activities. The plan for this phase will review the overall migration strategy and previous phases, examine any changes in GDBC business and requirements, review any constraints regarding work efforts, expenditures, resources or technology.

At this point the detailed plan will also include risks, detailed deliverables and an impact statement on GDBC operations. A conversion of any data or work procedures will be detailed as well as any training required.

2. *LOAD REPOSITORY WITH COMPRESSED AND THUMBNAIL IMAGES*

The repository will contain 3 'versions' of each image

i.   Raw Images – These images are the full-uncompressed version. The images will be very large in file size and will be the source for compression or possible conversion to various proprietary file formats. The raw image load will have begun in Phase I of the project, and is an ongoing activity. This phase will link the Image Data Store with the repository for the subsequent Distribution phase.

ii. Compressed Images – These images will be compressed by the selected compression algorithm software and will require a minimal 1:10 compression ratio. This compression will be 'lossy', but are anticipated to be acceptable for most clients' needs 80% of the time (reference to Compression Software Analysis Study).

iii. Thumbnail Images – These images are low-resolution representations of the Raw Images and will be used for clients to verify the content requirements prior to ordering or downloading.

Ideally, the compressed and thumbnail 'versions' of the images would be created 'on-the-fly' from the raw images. However, this step assumes that the processing time involved would be too great at this time, and these versions would be pre-processed and stored in the repository. The increase in total storage space is anticipated to be less than 15%.

PUBLISH CEC TO ALL STAKEHOLDERS AND ON LDBC WEBSITE

This step will follow from the linking of metadata with the digital images into the CEC. The publishing of the catalogue will only be done after a reasonable amount of testing by the GDBC staff during their routine activities.

This step will now allow all stakeholders and clients to discover imagery via the World Wide Web. At this point GDBC is faced with 2 options:

Option 1 – Continuation and enhancements to the LDBC website. Changes to the ordering process via the existing LDBC website. There will be an impact on the LDBC website to accommodate potential changes.

Option 2 – Implement discovery through the 'Discovery' software.

Sierra Systems' recommends Option 2.

3.6. Phase V - Distribution

This phase will result in increased efficiencies of distribution of digital images to the user's location in the size and format requested by the client. This phase will also expose the Complete Digital Image Management system to the general public via the World Wide Web.

The key tasks are described further below:

1. *CREATION OF A DETAILED PHASE PROJECT PLAN*

The fifth phase will start with review of the phase IV project and leverage the experience gained during the previous activities. The plan for this phase will review the overall migration strategy and previous phases, examine any changes in GDBC business and requirements, review any constraints regarding work efforts, expenditures, resources or technology.

At this point the detailed plan will also include risks, detailed deliverables and an impact statement on GDBC operations. A conversion of any data or work procedures will be detailed as well as any training required.

2. *DECISION REGARDING NON-WEB BASED DISTRIBUTION METHODS*

Ideally the distribution of imagery online will be done via the Distribution Server. However it is anticipated that there will be a significant period of time before all digital imagery can be distributed directly online due to file size constraints. There are three significant options available to GDBC in regards to distribution of digital images on portable storage devices.

Option 1

GDBC distributes imagery on portable storage devices to all clients.

Option 2

A third party performs distribution of all imagery on portable storage devices to all clients. This would require that the third party establish a high-speed (bandwidth) direct link to the repository.

Option 3

GDBC distributes imagery on portable storage devices for all government clients and a third party is responsible distribution to all non-government clients.

REVIEW DISTRIBUTION TECHNICAL REQUIREMENTS (FILE FORMATS, DISTRIBUTION MEDIA – TAPE, CD, DVD, PORTABLE HARD DRIVE)

This is an ongoing process due to the dynamics within the high technology industry. The step will also review related technical applications currently used by GDBC and their major stakeholders.

PUBLISH CEC TO ALL STAKEHOLDERS AND ON LDBC WEBSITE

This step will follow from the linking of metadata with the digital images into the CEC. The publishing of the catalogue will only be done after a reasonable amount of testing by the GDBC staff during their routine activities.

This step will now allow all stakeholders and clients to discover and access imagery via the World Wide Web. It is anticipated that this will augment the ordering process via the existing LDBC website. There will be an impact on the LDBC website to accommodate potential changes.

3.7. Phase VI - Maintenance

This phase is included to recognize that there will be ongoing activities to ensure that the DIM applications continue to service the client's needs. This phase should include technical maintenance and business process requirements and subsequent modifications and enhancements.

It should be understood that this phase really starts at the beginning of the implementation of software or hardware and will continue until such time as the application is decommissioned.

4. FURTHER CONSIDERATIONS

It is expected that the full implementation of the DIM Systems will take several years. During this time further advances in technology are also expected. The development of this new technology will impact the DIM System, providing opportunities for increased efficiencies. GDBC needs to continually monitor advances in related technology during the DIM implementation, with the goal of integrating this technology into the proposed solution. A few examples of possible advance in technology are:

- Increased availability of Internet bandwidth

    This would facilitate quicker distribution of larger images reducing the reliance on portable storage devices.

High Compression for Digital Imagery (Lossless)

-     This would facilitate quicker distribution of larger images reducing the reliance on portable storage devices.

Digital Aerial Photography Cameras

The technology to create 'original' digital imagery at flight should become more cost effective over time, eliminating the need for subsequent scanning.