CADASTRE SURVEY PRACTICE (SGHU 4323)

WEEK 13-eCADASTRE

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OUTLINE

• Coordinated Cadastral System

• National Digital Cadastral Database

• 3D Cadastre

• Multipurpose Cadastre
COORDINATED CADAstral SYSTEM
Introduction

Since 1995, Department of Survey and Mapping Malaysia (DSMM) has embarked on a modernisation program that saw the dramatic computerisation of both its office and field processes of its cadastral survey division. The Digital Cadastral Database was created by capturing the surveyed accurate information of all land parcels. Under the e-Cadastre project, a comprehensive nationwide readjustment of the meshwork of parcels will be carried out based on a new geocentric datum concept. The Real Time Kinematic Global Positioning System (RTKGPS) has seen the setting up of permanent stations established to provide precise geocentric positioning to assist the Coordinated Cadastral System implementation. This network is to be implemented to support the e-Cadastre project.
Introduction

The current system of cadastral survey is yet unable to capitalise on the advent of satellite based technologies. A complete revamp of the system is required before any improvement to the delivery system could be achieved. The new environment will allow various cadastral survey processes, such as planning, layout design submission, field data capture, completed job submission, quality control and approval, to be carried out remotely via the mobile telecommunication network. Global Positioning System (GPS) will provide real time positioning at centimetre resolution homogenously for the entire country and coordinates will replace relative measurements as the ultimate proof of boundary mark position. Additional features such as building footprint and space images will be incorporated into the new database in a move towards a multipurpose cadastre.
There are three main components in e-Cadastre, namely Coordinated Cadastral System, Virtual Survey System and Cadastral Data Integrity System. The implementation of a Coordinated Cadastral System is a major part of the e-Cadastre project that includes field and office reengineering to reduce processes and increase the use of digital technology.

The Virtual Survey System will equip the field surveyor with ICT, total station, GIS and GPS. The surveyor will be able to interact with the system to extract information that is essential in field operations. Most of the work is automated to reduce tedious computation.
Introduction

Cadastral Data Integrity System comprises all the office application related to cadastre, which include pre-survey verification, field survey data computation and verification, digital title plans generation and approval. In order to implement multipurpose 3D cadastre in Malaysia, new requirements are needed to capture the data in three-dimensional (on surface, above surface and below surface) to cater for strata, stratum surface. This process will be performed in the Electronic Strata Module consisting of the Strata Lodgement Module, Electronic Strata Survey Module and Strata Verification Module. The Strata Lodgement Module is developed especially to fulfil the requirement of a spatial database for strata, while the Electronic Strata Survey Module is developed to perform strata job verification on the ground and at same time perform data collection, and the Strata Verification Module is developed mainly to fulfil the needs of spatial usage for data checking from field checks.
Coordinated Cadastral System

The Characteristic (Entity)

The Aspect (Attribute)

CCS

Complete Cadastral Maps

GDM2000

Geocentric Cassini/RSO Projection System

Based on Highest Geodetic Order

Adequate Density

“Whole-to-Part” Survey Concept

Least Square Adjustment

Cadastral Control Infrastructure

Cadastral Survey Practice

Coordinates

Unique Single Set of Survey Accurate Coordinates

Unique Parcel Identifier

Legal (Contributory) Evidence of Boundaries

Appropriate Data Modeling

Layered

Digital Cadastral Database (DCDB)

Common National Coordinate System

Common National Coordinate System
Coordinated Cadastral System

- GDM2000
  - Establishing State Cadastral Control Infrastructure (CCI)
  - Tie-Up of Selected Parcel Corners to CCI
  - Development of State Cadastral Control Database (CCDB)
  - Populating DCDB With Survey Accurate Coordinates
  - Automated Re-Coordination System
  - Finalized Geocentric Based Cassini & RSO Coordinates In DCDB

- Legal Organizational Related Actions
- Socio-Economic Related Actions

- New Cadastral Survey
- Resurvey
Coordinated Cadastral System

Specifications for Cadastral Control Network Densification

<table>
<thead>
<tr>
<th>AREA</th>
<th>PRIMARY GRID</th>
<th>SECONDARY GRID</th>
</tr>
</thead>
<tbody>
<tr>
<td>URBAN</td>
<td>2.5 km x 2.5 km</td>
<td>0.5 km X 0.5 km</td>
</tr>
<tr>
<td>SEMI-URBAN</td>
<td>10 km X 10 km</td>
<td>2.5 km X 2.5 km</td>
</tr>
<tr>
<td>RURAL</td>
<td>10 km X 10 km</td>
<td>2.5 km X 2.5 km</td>
</tr>
</tbody>
</table>

- **Connected to PGGN**
- **Connected to Primary Grid**

**Control Network Hierarchy**
- **CCI**
- **PGGN**
- **MASS**

- **CADASTRAL CONTROL INFRASTRUCTURE**
  - Tertiary: 5, 2.5, 0.5 Spacing

- **PRIMARY GEODETiC GPS NETWORK**
  - First Order: 238 stations

- **MALAYSIAN ACTIVE GPS STATIONS**
  - Zero Order: 8 Stations

**Observation**
- **Technique:** static
- **Period:** 1 – 1.5 hr
- **Baseline Relative Accuracy less than 3ppm**
- **Coordinates Diff. From 2 Bases Stn. Less than 2 cm**

- **Technique:** Rapid Static.
- **Period:** 15 – 30 min
- **Baseline Relative Accuracy**: Less than 3ppm
- **Coordinate Differences From 2 Bases stn.: Less Than 3cm**
Coordinated Cadastral System
Cadastral Control Infrastructure (CCI) Employing Whole to the Part Concept and GPS Technology
NATIONAL DIGITAL CADAstral DATABASE
National Digital Cadastral Database (NDCDB)

- Background of DCDB:
  - Digital Cadastral Database (DCDB) contains all information obtained from cadastral survey jobs related to boundaries of land parcels.
  - The existing DCDB, which covers the entire country, was developed from historical survey data (conversion from hardcopy Certified Plans to digital) as well as from current survey jobs.
  - Coordinates in the DCDB were obtained from several means and contain varying, unpredictable, and un-quantified errors.
  - Uncertainties of surveyed values are typical, but errors are more common in some rural areas.
  - To be able to support a modern cadastral system, an accurate positional record of the cadastre is imperative. The existing DCDB was not designed for this purpose.
National Digital Cadastral Database (NDCDB)

Different Types Of Cadastral Coordinates

- **RIGID COORDINATE**: Homogenous and Systematically Adjusted
  - For cadastral map plotting purposes

- **PLOTTING COORDINATE**: System/Software generated coordinate based on features location

- **SYSTEM COORDINATE**
Bowditch adjustment distributes closing errors linearly but not able to provide a unique coordinates solution.

Least Squares adjustment technique determine a unique set of coordinates for each boundary mark from a set of observed values (bearings & distances).
National Digital Cadastral Database

GEODETEIC TRIANGULATION
PENINSULAR MALAYSIA

GPS BASED REFERENCE SYSTEM
National Digital Cadastral Database (NDCDB)

- To create the National Digital Cadastral Database (NDCDB), the strategy taken consists of the following:
  - Based on the successful implementation of the Melaka’s NDCDB;
  - A homogeneous and seamless database with survey accurate coordinate;
  - Based on the national geocentric datum (GDM2000);
  - Creation of Cadastral Control Infrastructure (CCI);
  - Support the implementation of utility mapping.
National Digital Cadastral Database (NDCDB)

- NDCDB is based on a uniform reference system, i.e. Cassini GDM2000.

- NDCDB is "compatible" with the use of modern technology such as GPS/MyRTKnet.

- NDCDB have a uniform coordinate accuracy, i.e. 5cm to 10cm.

- NDCDB just have a "single line" and is "compatible" with GIS technology.

- NDCDB graphic coordinates are similar to coordinate attributes.

- NDCDB will help the development of information systems, especially the "MULTI-PURPOSE Cadastre".
Methodology For Cadastral Data Migration To The New Geocentric Datum For Malaysia (GDM2000)

**GDM2000**

- Establishment of Cadastral Control Infrastructure (CCI) Using JUPEM MyRTKnet GPS Service
- Tie-Up of Selected Parcel Corners to CCI
- Automated Network Adjustment & Re-Coordination System
- Re-coordination and Re-population (R&R)

**Expected NDCDB Spatial Accuracy**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>Std. Dev. Northing</th>
<th>Std. Dev. Easting</th>
<th>Cadastral Control Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban/ New Development</td>
<td>± 5 cm or better</td>
<td>± 5 cm or better</td>
<td>0.5 km</td>
</tr>
<tr>
<td>Semi Urban/Rural</td>
<td>± 10 cm or better</td>
<td>± 10 cm or better</td>
<td>2.5 km</td>
</tr>
</tbody>
</table>

Total estimated number of boundary marks to be re-coordinated is about 40 million boundary marks.
National Digital Cadastral Database (NDCDB)

Methodology

Establishment of CCI and State CCDB

Repopulation & Re-coordination of DCDB with Survey Accurate Coordinates

Establishing State Cadastral Control Infrastructure (CCI)

Tie-Up of Selected Parcel Corners to CCI

Development of State Cadastral Control Database (CCDB)

Populating DCDB with Survey Accurate Coordinates

Automated Re-Co-ordination System

Finalized Geocentric Based Cassini & RSO Coordinates in DCDB

Study on Cadastral Survey Procedures Under CCS

Cost-Benefit Analysis of CCS Implementation
National Digital Cadastral Database (NDCDB)

Adjustment

FORMATION OF CADAstral NETWORK

DATA SELECTION

ADJUSTMENT

TRANSFORMATION

QUALITY CONTROL

TEMP NDCDB

EDITING

SURVEY ACCURATE DIGITAL CADAstral DATABASE (NDCDB)
National Digital Cadastral Database (NDCDB)
National Digital Cadastral Database (NDCDB)

Updating of NDCDB in eKadastre
MULTIPURPOSE CADASTRE
Multipurpose Cadastre Underpin A Good GIS

NDCDB forms the fundamental Dataset
FUTURE DIRECTION

Multipurpose Cadastre

To support the increasing demand for land/geographic information at all levels of government and in the private sector:

CORE DATASET:

NDCDB
Building footprints
Transportation
Hydrography
Street Adresses
Geoname
Land value
Land ownership
Demography
MPC Component

MPC component as shown provides the means for enhancement of delivery system to the public as well as realization of connected government.
MPC Component

NDCDB + LARGE SCALE GEOSPATIAL DATA + NON-SPATIAL DATA = MPC

Valuation
Ownership
Geonames
Land value
Land use

3-Dimensional City Model
MTLS
Street Address
Building / facilities
Large Scale GIS Base Map
Survey Accurate NDCDB
Multipurpose Cadastre
Multipurpose Cadastre – From Single Purpose e-Kadaster to Multipurpose Cadastre
3D CADASTRE AND MARINE CADASTRE
3D CADASTRE
Multiple use of land is increasing. The owner of a parcel of land may possess the rights to the column of air above and the column of soil under that land. At ground level, multiple use of land has resulted in the multiple exercises of rights of the use of the regions above and below ground level and in the division of rights in the ownership column.
3D Cadastre

Pressure on land in urban areas and especially their business centers has led to overlapping and interlocking construction .... Even when the creation of property rights to match these developments is available within existing legislation, describing and depicting them in the cadastral registration, poses a challenge .... The challenge is how to register overlapping and interlocking construction when projected on the surface in a cadastral registration that registers information on 2D parcels. Although property has been located on top of each other for many years, it is only recently that the question has been raised as to whether cadastral registration should be extended into the third dimension...
The Importance of 3D Cadastre

- Current cadastre registration systems, bound to ground surface topological and geometrically described parcels, have shown limitations in providing an insight into three-dimensional location of three-dimensional constructions as well the vertical dimension (depth and height) of rights established for three-dimensional constructions. In addition, the cadastre should be able to describe property ownership, including Strata Title ownership.

- A 3D cadastre is defined as a cadastre that registers and gives insight into rights and restrictions not only on parcels, but also on 3D property units. Thus, a 3D cadastre would be able to handle such conditions as overlapped buildings and utilities that prohibit the property from being registered according to legal and organisational aspects using a 2D cadastre.
The Importance of 3D Cadastre

In the near future, the cadastre will contain updated documentation of public and private rights, ownership, land use and real estate in various spaces. 3D boundaries and parcels in space will be determined by the 3D cadastre that serves the legal and physical objectives. A modern cadastre system should always reflect the existing situation of all property rights, including a mixture of private and public properties.

It is necessary to develop a 3D cadastre with its own legal solutions that meet its specific needs. On the other hand, the content and role of a cadastre that is related to three-dimensional properties have not changed significantly, notwithstanding the substantial impact on the cadastre system. The 3D cadastre system should provide information beyond the typical planning data and ensure registered rights above, on and below the surface of a property. Hence, land will be more optimally developed and utilised.
Practical Solutions

(a) Full 3D cadastre
• Option 1: Combination of infinite parcel columns and volume parcels, i.e. a combined 2D/3D alternative.
• Option 2: Only parcels that are bounded in 3D volume.

(b) 2D/3D hybrid cadastre
• Option 1: Registration of 2D parcels in all cases of real property registration, and additional registration of 3D legal space in the case of 3D property units.
• Option 2: Registration of 2D parcels in all cases of real property registration, and additional registration of physical objects.

(c) 2D cadastre with 3D tags linked to parcels in current cadastral registration.
Full 3D Cadastre

The concept of a full 3D cadastre introduces property rights in three-dimensional space, which is being subdivided into volume parcels partitioning the three-dimensional space. In this approach, the traditional cadastral map does not have any bearing on the three-dimensional rights that entitle persons to volumes. In other words, rights and restrictions are no longer established only on 2D parcels, but are explicitly related to well-defined volume parcels. Examples of real property objects that are defined in three-dimensional are strata and stratum units. However, to realise this full 3D cadastre solution, significant changes are required in the cadastral survey and mapping registration, land registration, as well as the technical and legislative frameworks.
Full 3D Cadastre

It is possible to establish parcels that are defined with boundaries on the surface because the volume parcels are only established in three-dimensional situations. The first option is to convert the conventional parcels representation into three-dimensional; a parcel is defined by the boundary on the surface, which is converted into an indefinite parcel columns and volume parcels that intersects with the surface at the location of the parcel boundary. With the second option, the only property objects that are recognised by the cadastre become volume parcels, forming a complete partition of space. In order to define the extent of ownership in the vertical plane, it requires extensive and complicated overall three-dimensional land title settlements prior to the cadastral survey. Moreover, the relevant land laws need to be amended, and this usually takes a long process.
2D/3D Hybrid Cadastre

The 2D/3D hybrid cadastre solution refers to the integration of the 2D cadastre with the factual situation in three-dimensional space in registering the three-dimensional objects within the three-dimensional cadastral registration. This solution requires the separate legal registration of on-surface parcels and of the three-dimensional situations, which are combined and integrated. The hybrid solution of cadastral registration of the three-dimensional situation is not judicially binding. This means that the exact legal situation still depends on reliable documents like those recorded by Certified Plan in the land registration, with the description of the volume agreed upon in the three-dimensional registration. The three-dimensional representation is the volume to which a person is entitled, i.e. the registration of the three-dimensional object defined by the surface parcel and that is bound by the upper and lower limits. Such registration can also refer to the three-dimensional physical object itself.
2D/3D Hybrid Cadastre

The first option refers to the 3D registration of rights that are already registered with the 2D parcel as the starting point of registration. The second option is the registration of 3D physical objects themselves, which a physical object as the starting point of registration. Constructions (e.g. buildings) are integrated in the cadastral data in the current cadastral registration. The juridical and cadastral concept of ownership and property will remain the same.
2D Cadastre with 3D Tags

2D cadastre is supplemented with three-dimensional tags solution, the existing 2D cadastre is maintained in its original state, but with external references linking to three-dimensional digital drawing or three-dimensional analogue to represent three-dimensional situations. In this solution, complex three-dimensional situations are registered using ad hoc solutions within current registration possibilities, while every right that is registered can be attributed with a reference to a three-dimensional representation. The difference between 2D/3D hybrid cadastre and 2D cadastre with three-dimensional tags is that the three-dimensional representations in the second approach are maintained separately and not integrated with the cadastral data.
3D Cadastre

- The National Land Code 1965 only allows 3 types of lot/parcel, i.e.:
  - Land
  - Strata Parcel and Land Parcel in strata Scheme
  - Stratum

- The more efficient of cadastre system in future is to allow 3D lot/parcel including air space and marine space.
3D Cadastre

- Land Lot Boundary
- Airspace Lot
- Surface Parcel = Land Lot
- Land Lot Boundary
- Stratum
LOWEST ASTRONOMICAL TIDE

3D SPACE CONCEPTUAL DIAGRAM

[ X₁, Y₁, H₁ ]

[ X₂, Y₂, H₁ ]

[ X₃, Y₃, H₁ ]

[ X₄, Y₄, H₁ ]

[ X₁, Y₁, H₂ ]

[ X₂, Y₂, H₂ ]

[ X₃, Y₃, H₂ ]

MEAN SEA LEVEL

LOWEST ASTRONOMICAL TIDE

TOPOGRAPHY

Oceans

Ellipsoid

Geoid

H = h - N

Orthometric Height
Ellipsoidal Height from GPS
Geoid Height

GPS

Topography
3D SPACE CONCEPTUAL DIAGRAM

\[ \begin{align*}
[X_1, Y_1, H_1] & \quad [X_2, Y_2, H_1] \\
[X_3, Y_3, H_1] & \quad [X_4, Y_4, H_1] \\
[X_3, Y_3, H_2] & \quad [X_2, Y_2, H_2] \\
\end{align*} \]

MEAN SEA LEVEL

LOWEST ASTRONOMICAL TIDE

TOPOGRAPHY

\[ H = h - N \]

Orthometric Height
Ellipsoidal Height from GPS
Geoid Height
Overlapping Development

Penang KOMTAR and Prangin Mall
Building above and basement parking below public road

Cross sectional
Building above and basement parking below public road

3D parcel
Melaka Hatten Square
Sky-bridge above public road

Cross sectional
Sky-bridge above public road

3D parcel
KL Central Multi Storey Complex and Transportation Hub
Jean Nouvel's Guthrie Theater in Minneapolis
The Construction Of MRT Station
Need 3D Element
Multiple-use

Cross sectional
Multiple-use

3D parcels
3D scenario
Multipurpose 3D Cadastre

3D cadastre registration system is being developed. Researchers have contemplated adding 3D cadastre objects in the current cadastre data model and information, accessible by the Department of Survey and Mapping Malaysia, State Land and Mines Office, and District Land Office. Unfortunately, the two stated databases, viz. the eKadaster and the eTanah database work separately under different authorities, still do not support three-dimensional capability.
Multipurpose 3D Cadastre

The Malaysian Land Administration is based on the Torrens System where the cadastral map and the Document of Title with spatial and textual information are regarded as legal evidence, and are required under the rules and regulations in order to have full institutional coordination. Therefore, a good institution is very important in order to achieve an excellent and reliable cadastre registration system. However, due to historical constraints, it seems quite difficult to realise this unless there is full cooperation from various legal bodies, technical organisations and other land-related government agencies and private sector participants.
Multipurpose 3D Cadastre

A multipurpose 3D cadastre can be defined as an integrated land information system containing legal (e.g. tenure and ownership), planning (e.g. land use zoning), revenue (e.g. land value, assessment and premium) and physical (e.g. cadastre) information.

The Malaysian multipurpose 3D cadastre should contain all information about administrative records, tenure, value and sale & purchases records, base maps, cadastral and survey boundaries, categories of land use, streets addresses, census utilities etc.

There are many advantages for implementing a multipurpose 3D cadastre. It is especially useful for property inventory, project implementation and monitoring, utility management, population estimates, school management, census mapping and urban and rural development.
Multipurpose 3D Cadastre

A 3D cadastre registration model has been proposed recently, focusing on the combination of these two cadastre registration databases and encompassing matters pertaining to legal rights, land attributes and spatial objects geo-data. The three authorities mentioned above are the main government agencies that are responsible for the cadastre registration system; they integrate and coordinate each other in order to have an integrated and comprehensive cadastral system in Malaysia by using a 2D/3D hybrid cadastre approach.
Multipurpose 3D Cadastre

Various 3D cadastre objects, such as stratified buildings, and construction above and below the ground surface, are the responsibility of the Department of Survey and Mapping Malaysia and the State Land and Mines Office/District Land Office where it concerns object registration and ownership registration respectively. In short, 3D cadastre registration is a combination of land registration utilising the plan land parcel and the three-dimensional land parcel for cadastral registration. Three-dimensional cadastre registration encompasses considerations of the legal rights of land attributes, plane cadastral objects and three-dimensional information.
MULTIPURPOSE CADASTRE
Multipurpose Cadastre Underpin A Good GIS

NDCDB forms the fundamental Dataset
FUTURE DIRECTION
Multimurpose Cadastre

To support the increasing demand for land/geographic information at all levels of government and in the private sector:

CORE DATASET:
- NDCDB
- Building footprints
- Transportation
- Hydrography
- Street Addresses
- Geoname
- Land value
- Land ownership
- Demography
MPC Component

MPC component as shown provides the means for enhancement of delivery system to the public as well as realization of connected government.
MPC Component

NDCDB + LARGE SCALE GEOSPATIAL DATA + NON-SPATIAL DATA = MPC

Valuation
Ownership
Geonames
Land value
Land use

3-Dimensional City Model
MTLS
Street Address
Building / facilities
Large Scale GIS Base Map
Survey Accurate NDCDB
Section: Memperkasakan NDCDB

Section Data Fusion & 3D SDI
- Data Fusion
- Rendering
- 3D City Model
- 3D Database

Section: MTLS
- Point Clouds Raw Data
- Processing Of Point Clouds
- Line Map Digitizing
- DTM Generation

Position/Control Validation

MPC INTEGRATION, VALIDATION & UPDATING MODULE (IUM@MPC)

Section: LGDC
- Updating LGDC
- Features Validation

Section: NDCDB
- Street Addresses

Section: Large Scale GIS
- Base Map

Other/New Data Sources

Section OWA MPC Web GIS

INTERNET

Section: 2 ½ D Geodatabase
- Section: Large Scale GIS Base Map

Section: 3D SDI
- Data Fusion
- Rendering
- 3D City Model
- 3D Database

Section: MPC GEODATABASE
<table>
<thead>
<tr>
<th>PHASE</th>
<th>DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NDCDB</td>
<td>Refinement and enhancement of existing NDCDB. NDCDB will provide a survey accurate fundamental layer in MPC.</td>
</tr>
<tr>
<td>2. Large Scale Geospatial Data Acquisition</td>
<td>MTLS will be used to capture large-scale spatial features such building, road, utility, vegetation and others features during the survey. MTLS is a main source of spatial data for MPC.</td>
</tr>
<tr>
<td>3. Large Scale GIS Base Map</td>
<td>Local Geospatial Data Centre dataset that consists of large scale topographic map and other GIS layer.</td>
</tr>
<tr>
<td>4. MPC Module</td>
<td>Application modules for integration of multiple data sources, validation of MPC database and updating new spatial features.</td>
</tr>
<tr>
<td>5. 3D-SDI</td>
<td>Applying data fusion method to generate 3D city model and 3D SDI using available large scale MPC database.</td>
</tr>
<tr>
<td>6. MPC Database</td>
<td>MPC database will consists of various geospatial datasets with the following compliance: i) MS 1759:2004 Geographic Information/Geomatics - Features and Attribute Codes; ii) MS 2256:2009 Geographic Information /Geomatics - Guideline for the Determination of Geographical Names; iii) MS ISO 19115:2003 Geographic Information Metadata Referencing by Coordinates Unique Parcel Identifier (UPI); iv) GDM2000 - Geocentric Datum for Malaysia, v) Colour Code and Symbol (DSMM/MaCGDI).</td>
</tr>
<tr>
<td>7. Online Web Access</td>
<td>MPC OWA will provide a mechanism for access to spatial data as well as mapping and spatial analysis over the Internet.</td>
</tr>
</tbody>
</table>
3. 3D City Model

- 3-D city models are becoming ubiquitous and basis for city planning, development and control.
- 3-D representations of buildings and the desired amount of detail is not limited to geometric aspects, but also includes semantic information about the facade.
- Building areas covered by dense and accurate measurements are used to model spatial features such as ground, buildings, transportation network, bodies of water, city furniture, electric power lines, and vegetation objects.
3D MPC Database and Online Web Access

3D MPC Geodatabase

- FT Putrajaya MPC Database development will apply and comply to a Malaysian Standard for Geoinformatics/Geomatic.
- The development of MPC database includes five (5) functional processes as follows:

Data Format Translation

Data Checking Validation

Data Structure Model

Data Editing

Data Migration and Data Transformation
3D MPC Database Development Methodology

**DATA FORMAT TRANSLATION**
- Format Conversion
- Sorting of Feature Class
- map Scale

**DATA STRUCTURE MODEL**
- Generating Data Structure based on MS1759 & Open Architecture

**DATA MIGRATION**
- Data Structure Model: MS1759
- Geometry Merging
- Geodatabase
- MyGDI Standard
- Unique feature ID
- Seamless Process

**TRANSFORMATION**
- Coordinate Transformation of existing geospatial features to geocentric based coordinate system (GDM2000)
- Automated point to point map object transformation

**DATA EDITING**
- Spatial/Geometry Topology
- Attribute Editing

**DATA VALIDATION**
- Accuracy relative to NDCDB
- Topology
- Overlay result
- Consistency
- Completeness
- entity-attribute agreement aspects

**LARGE SCALE MPC DATABASE**
- Compliance to DSMM & MyGDI Standard
- Spatial correlation with NDCDB
- MPC Database
Web Access MPC Integration, Updating and Validation Module
MPC Integration, Updating and Validation Module
Online Web Access (OWA) is emphasis on visualization, analysis, processing of project specific geodata and exploratory aspects.

MPC OWA is needed due to the demands of geospatial omnipresent dataset such as cadastre parcel, building, road and thematic map (from data fusion method).

The MPC OWA will consists of the following:

- Features Location
- Ability to analyze context
- GIS standard
- Ability to access context information continuously
- Spatial Reference
- currently relevant for specific circumstances
- Context information
Multipurpose Cadastre
Multipurpose Cadastre – From Single Purpose e-Kadaster to Multipurpose Cadastre
THANK YOU