DEVELOPING A MULTI-PURPOSE CADASTRE IN MALAYSIA

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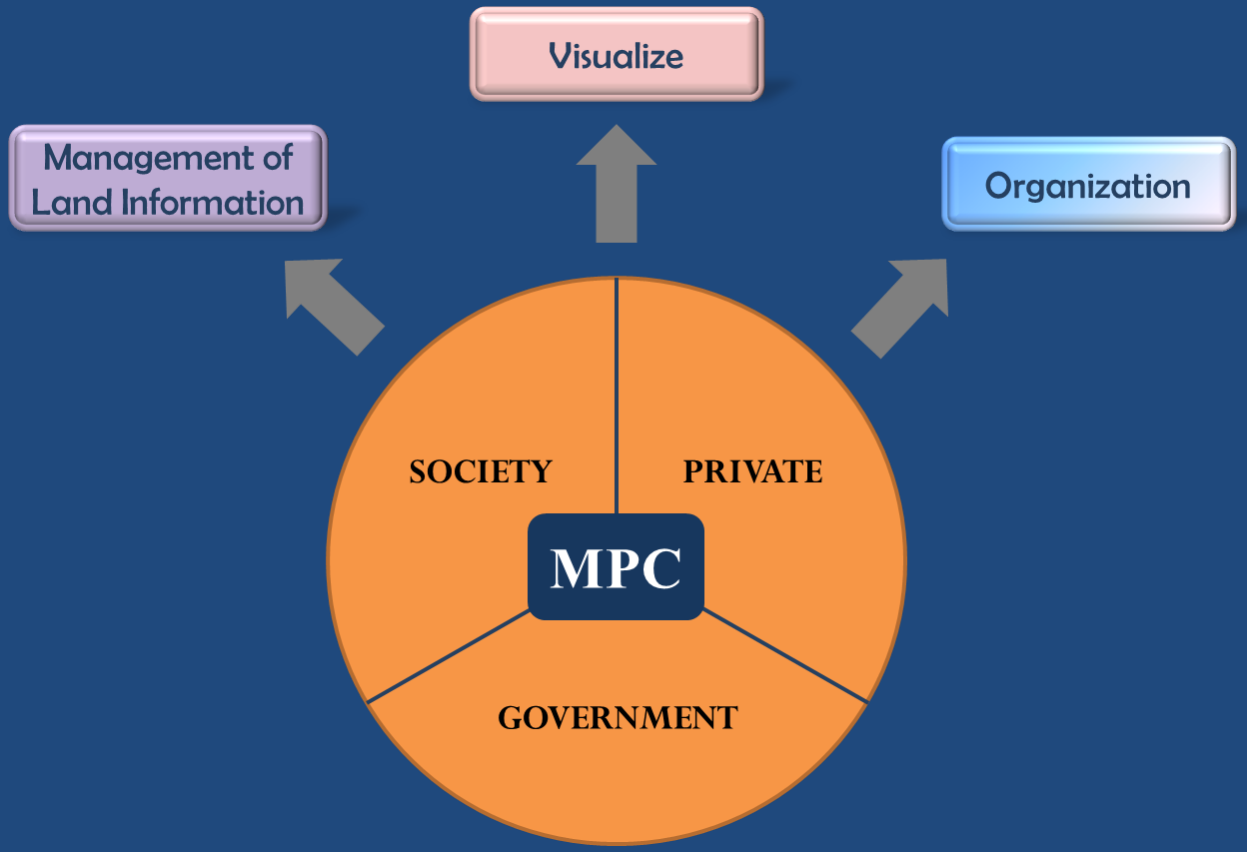
Outline of Presentation

- Introduction
- MPC Component
- MPC Core dataset
- 3-D MPC Database Development
- MPC Integration, Updating and Validation Module
- Concluding Remarks and Future Direction

Introduction

- Multi-Purpose Cadastre (MPC) has a potential to support spatially enabled government, private sectors, and society and to expand computer support in the process of visualization, organization and management of useful land information.



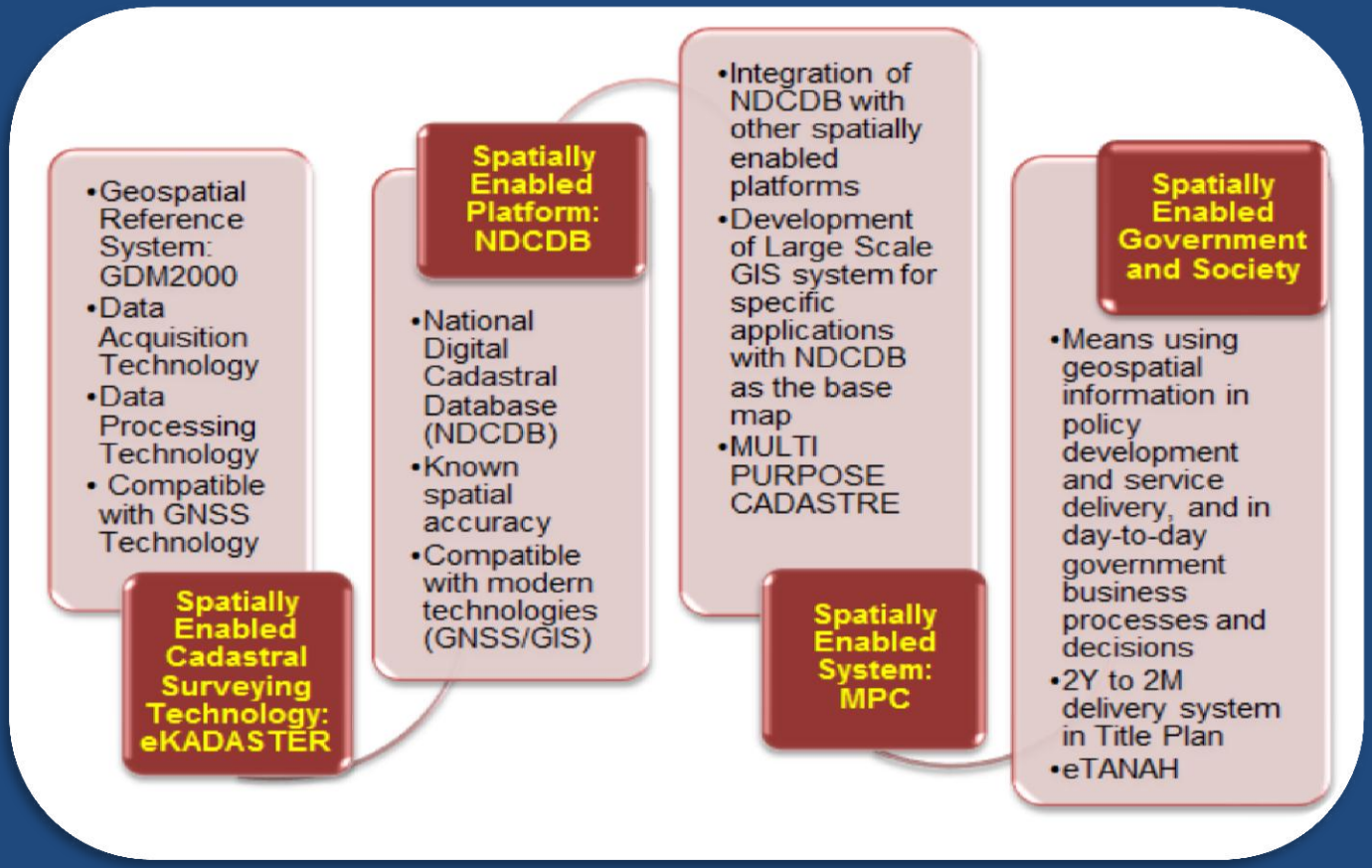
Cont…

- The content of survey accurate MPC is principally survey-accurate National Digital Cadastral Database (NDCDB) that have been populated, adjusted and undergone quality checks at every level of its formation and large scale geospatial datasets that mostly will be acquired from measurement of mobile terrestrial laser scanner survey.
- Survey accurate MPC is a spatially enabled system that integrate land information system which containing survey accurate cadastre, topography, man-made features and cultural (e.g., land use, demographics) information in a common and accurate reference framework.

MPC GIS Large Scale Base Map

MPC Component

- MPC component as shown in Figure 1 provides the means for enhancement of delivery system to the public as well as realization of connected government.

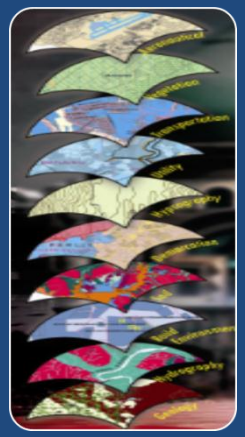


MPC Component

NDCDB

LARGE SCALE GEOGRA-PHIC FEATURES

MPC



3-Dimensional City Model

MTLS

Street Address

Building / facilities

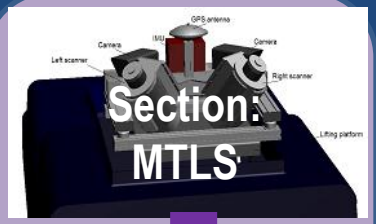
LGDC/SGDC

Large Scale GIS Base Map

NDCDB

Survey Accurate NDCDB

Section :
Upgrading
NDCDB



Point Clouds
Raw Data

Processing
Of Point
Clouds

Line Map
Digitizing

DTM
Generation

Section Data
Fusion &3D SDI

Data Fusion

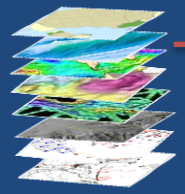
Rendering

3D City Model

3D Database

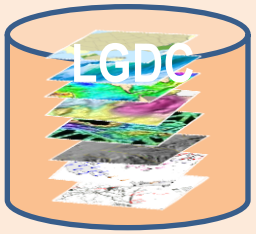
3D SDI

Position/
Control
Validation



Other/New
Data Sources

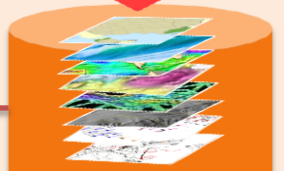
MPC INTEGRATION,
VALIDATION &
UPDATING
MODULE
(IUM@MPC)



Updating
LGDC

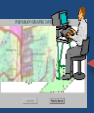
Features
Validation

Section:
Street
Addresses



2 ½ D Geodatabase

Section:
Large Scale GIS
Base Map



INTERNET

Section OWA MPC Web GIS

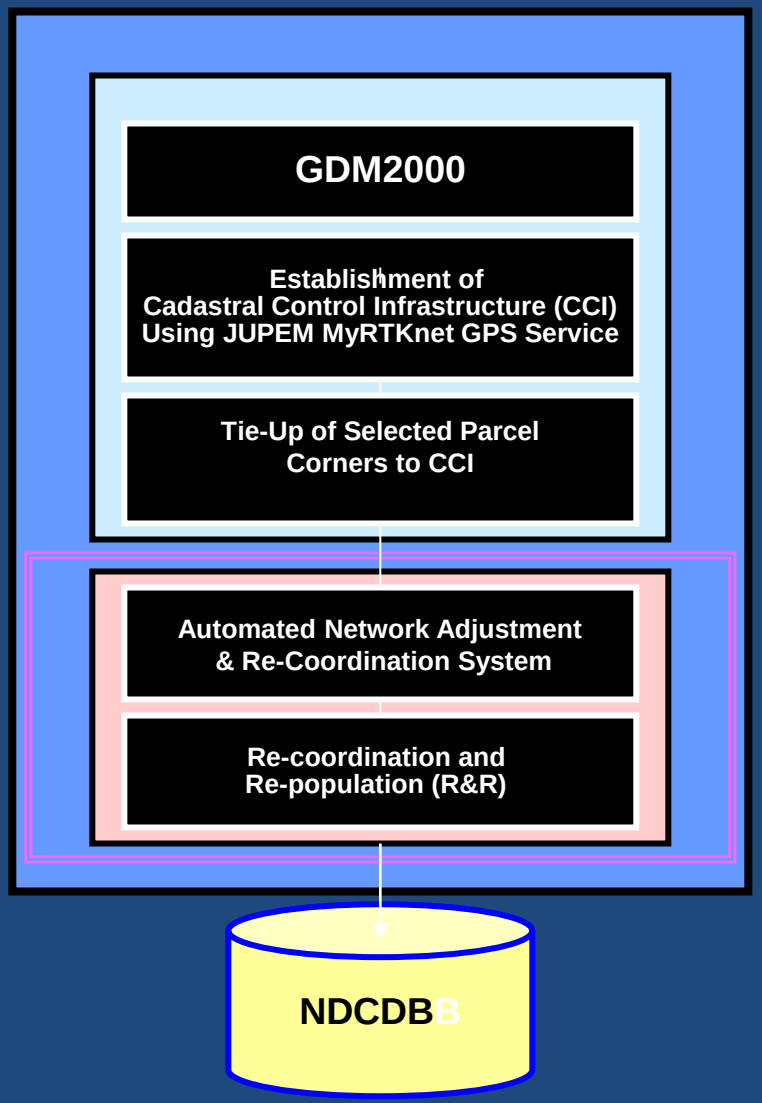
PHASE	DETAILS
1. NDCDB	Refinement and enhancement of existing NDCDB. NDCDB will provide a survey accurate fundamental layer in MPC.
2. Large Scale Geospatial Data Acquisition	MTLS will be used to capture large-scale spatial features such building, road, utility, vegetation and others features during the survey. MTLS is a main source of spatial data for MPC.
3. Large Scale GIS Base Map	Local Geospatial Data Centre dataset that consists of large scale topographic map and other GIS layer.
4. MPC Module	Application modules for integration of multiple data sources, validation of MPC database and updating new spatial features.
5. 3D-SDI	Applying data fusion method to generate 3D city model and 3D SDI using available large scale MPC database.
6. MPC Database	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).
7. Online Web Access	MPC OWA will provide a mechanism for access to spatial data as well as mapping and spatial analysis over the Internet.

MPC Core Dataset

1. National Digital Cadastral Database (NDCDB)

- The main objective of survey accurate NDCDB is to maintain a homogeneous spatial accuracy of cadastral boundary coordinates to better than 5 centimeter in urban area and better than 10 centimeter in semi-urban and rural areas
- NDCDB is the most important element in the development of large scale geospatial database in Malaysia and will facilitate the development of large scale Spatial Data Infrastructure (SDI).

Methodology For Cadastral Data Migration To The New Geocentric Datum For Malaysia (GDM2000)



Expected NDCDB Spatial Accuracy

CATEGORY	Std Dev Northing	Std Dev Easting	Cadastral Control Spacing
Urban/ New Development	± 5 cm or better	± 5 cm or better	0.5 km
Semi Urban/Rural	± 10 cm or better	± 10 cm or better	2.5 km

Total estimated number of boundary marks to be re-coordinated is about 40 million boundary marks.

NDCDB MAIN INGREDIENTS

NETWORK ACCURACY REQUIREMENT

PUK 2009

Obs bearing: ±15”
Obs distance ±1cm
CRM coords: ±2cm
Adjusted Coords: ±5cm

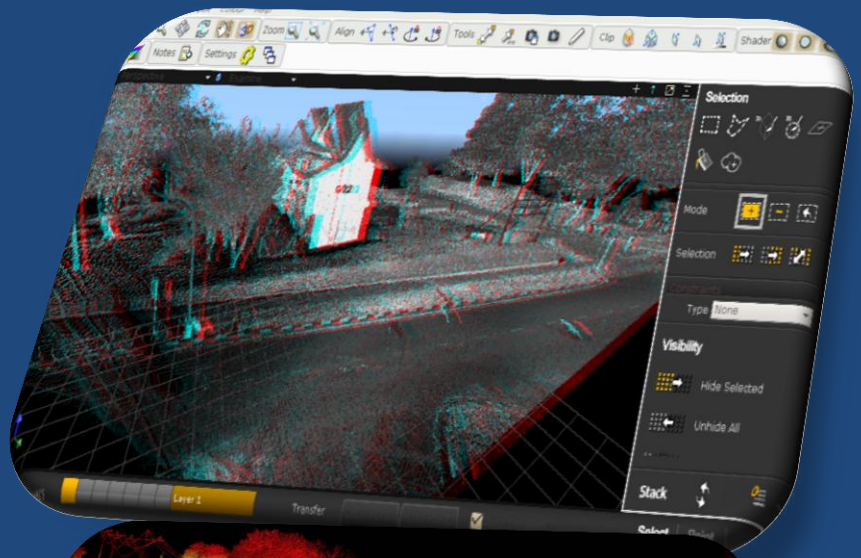
DATA SUBMISSION ACCORDING TO DSMM’S FORMAT

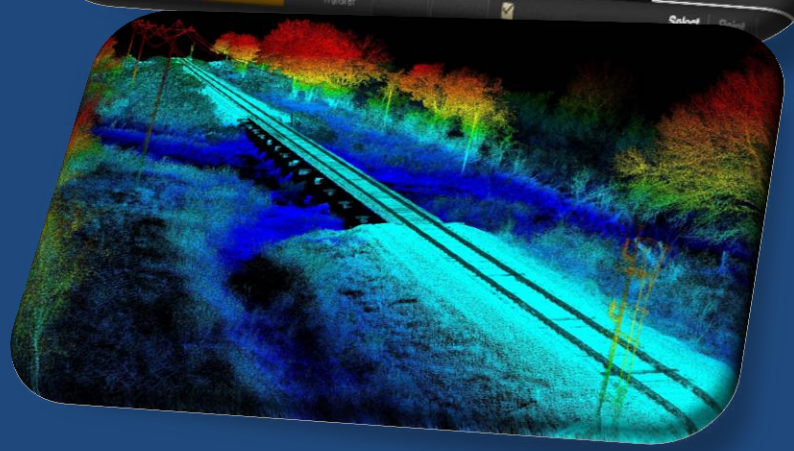
PUK 2009

16 ASCII

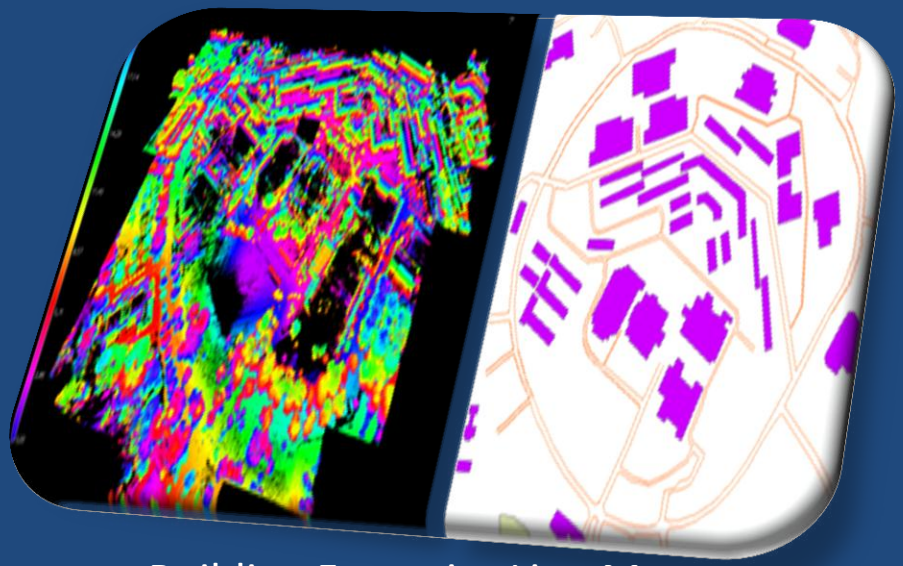
2. Large Scale 2-D MTLS based Geographic Features Dataset

- Main source of large scale geographic feature for MPC.
- MTLS 3D point clouds data is initially adjusted by post-processed kinematic GNSS procedures from separate GNSS base by a local transformation to well defined points throughout the project area to produce the final stations placed throughout the particular area.
- Point clouds will be georeferenced in GDM2000 coordinate system and Mean Sea Level (MSL).
- 3-D building extraction from point clouds requires the determination of building cues, ground elevation, building and rooftop heights.



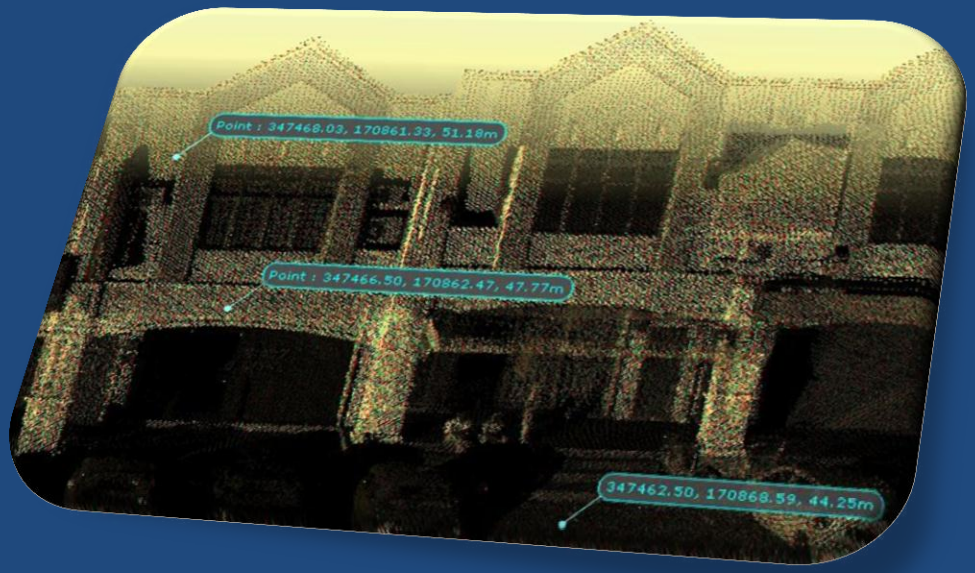


3D Point Cloud



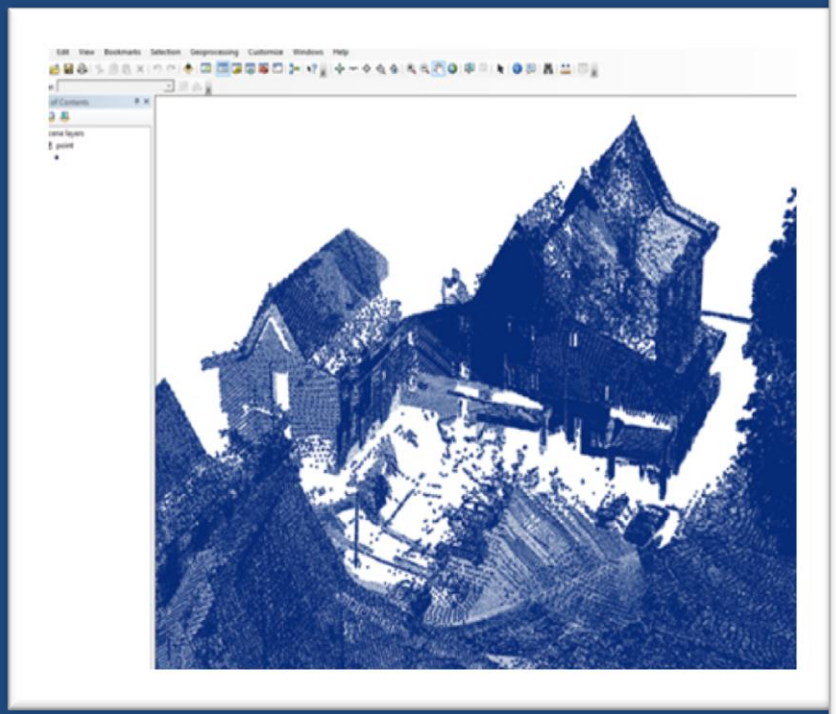
Building Footprint Line Map Extraction using 3D Point Cloud

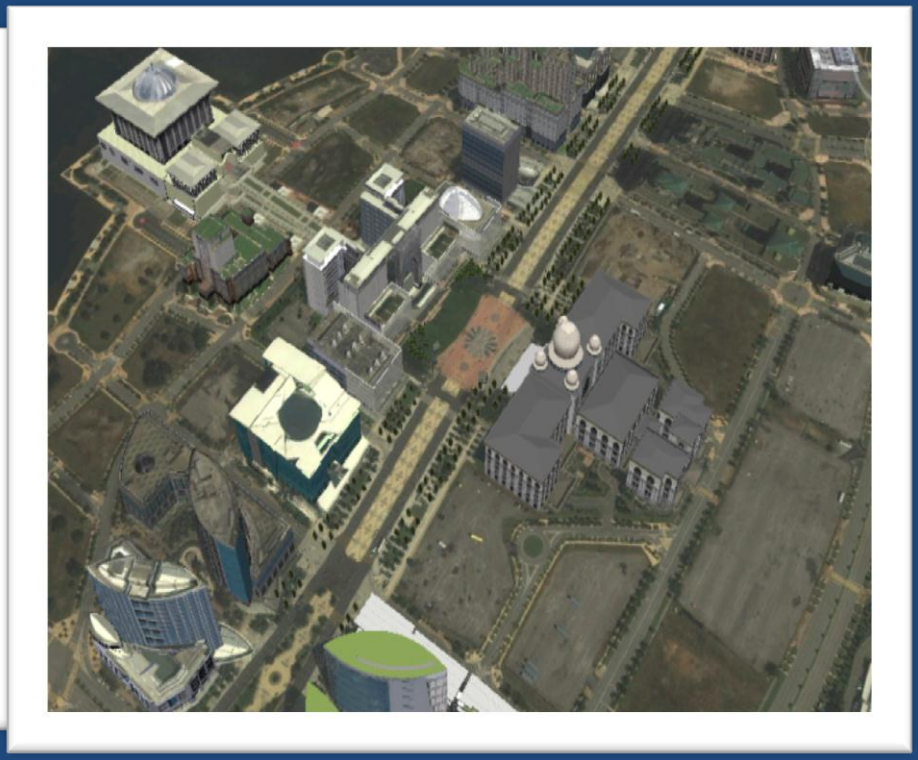
3D Features Information



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.





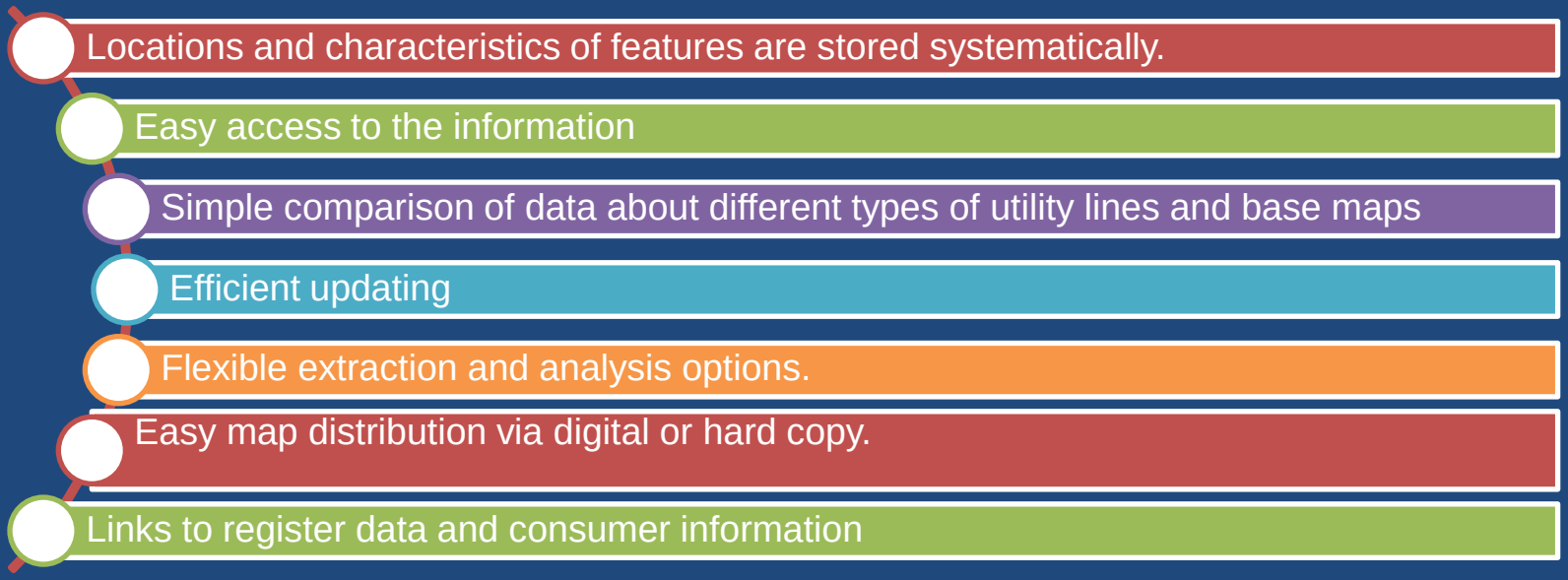
4. Utility Dataset

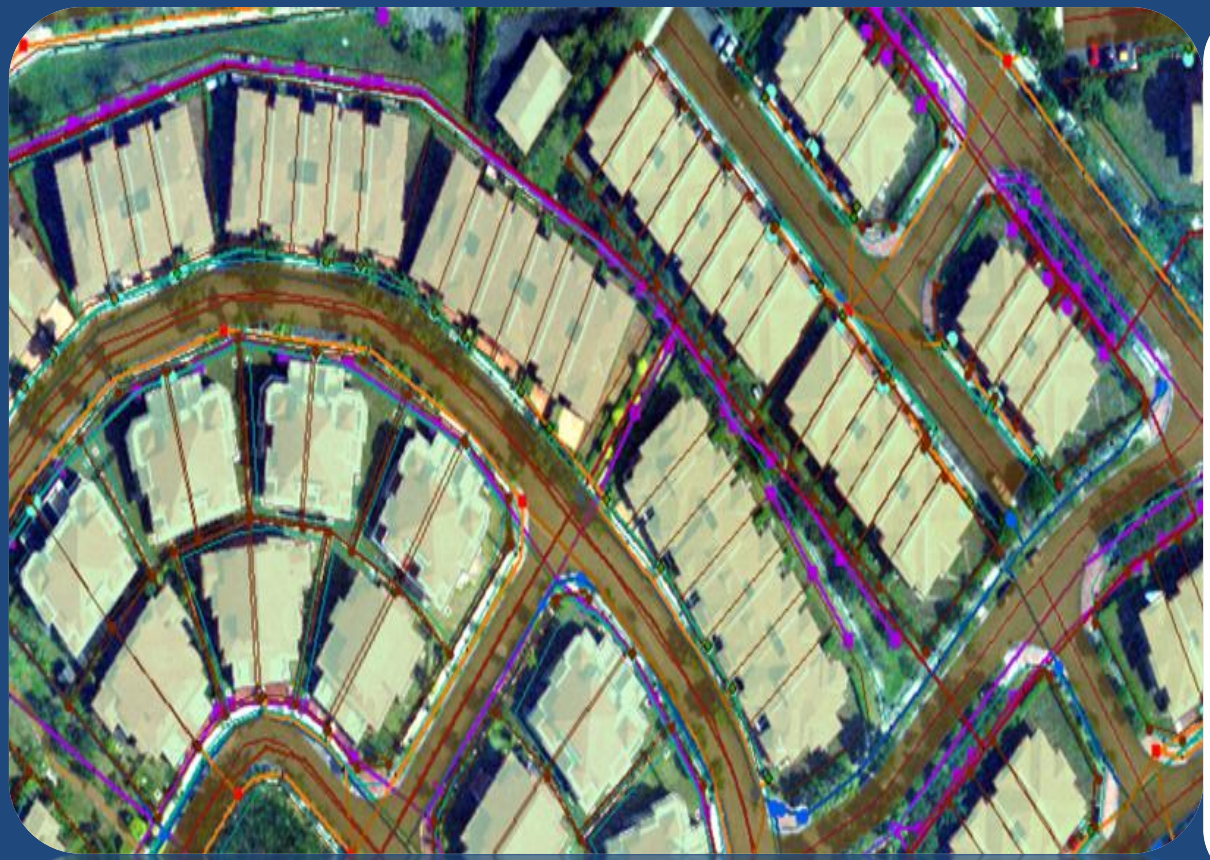
- Mapping of utility features is critical for authority in maintenance, controlling and preventive process of infrastructure development due to major investments needed for utility supply lines such as water mains, sewerage systems, telephone lines, power lines and gas mains.

- Excavation damage can be largely avoided when reliable information regarding location and description of underground utility lines are available.

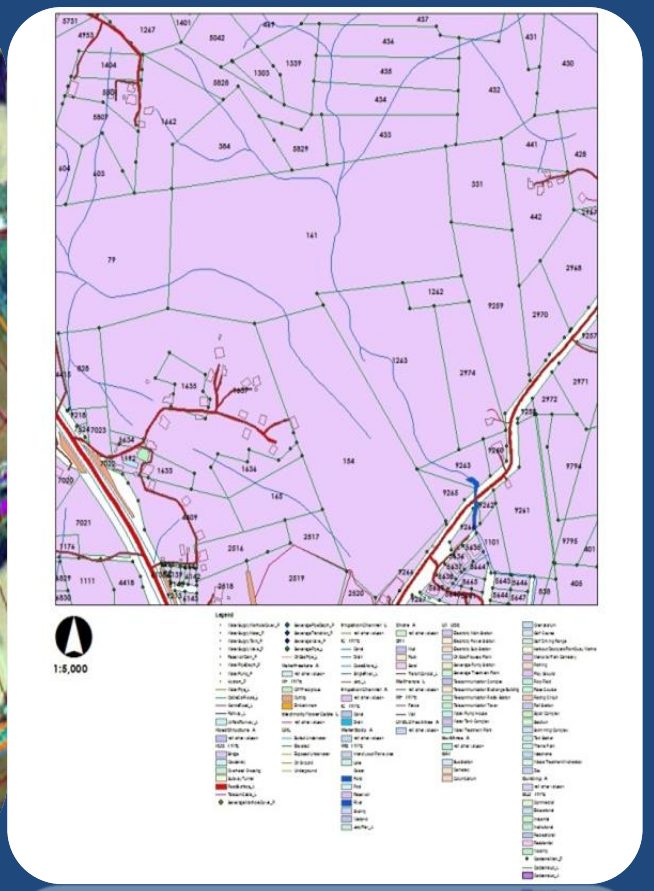
- Repair and replacement of utility lines can be carried out in the optimal manner with efficient GIS/utility mapping system.

- GIS/Utility mapping systems contribute to benefits of MPC in term of the following criteria:





Large Scale Utility Dataset



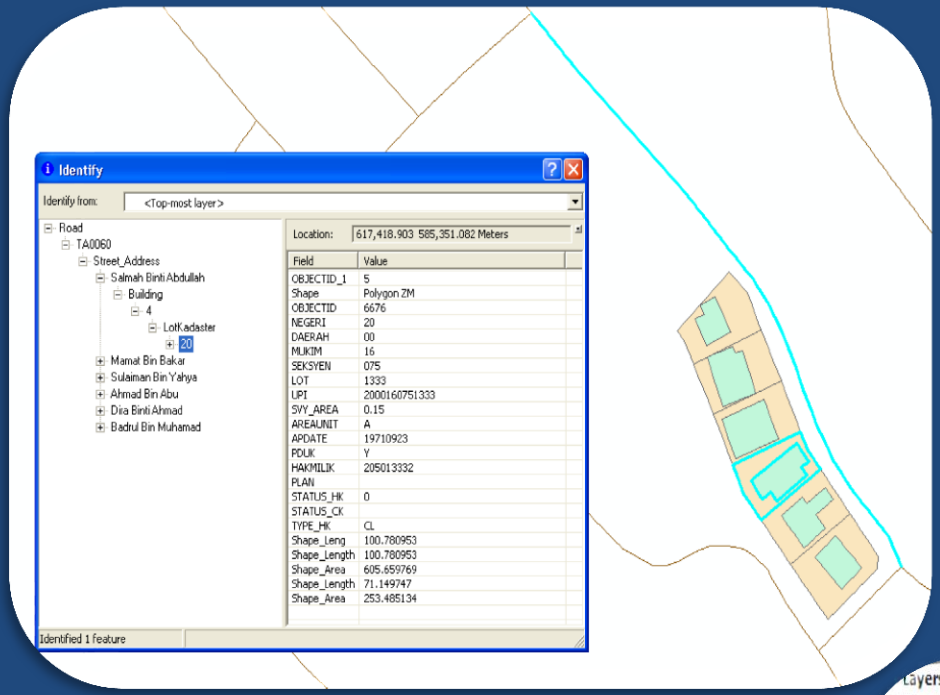
Utility Map

5. Street Address

- Address is an important information required to support realization of ubiquitous MPC.

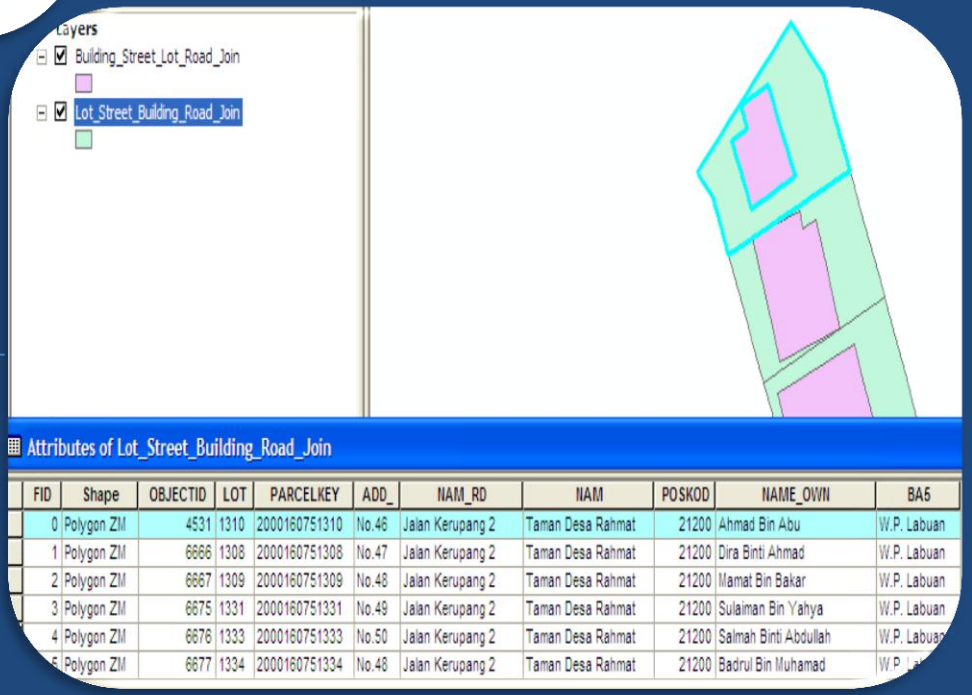
- NDCDB consists of cadastral lot information, UPI and newly created Object Identification (OID). OID also will be created for building features.

- Geocoding process can be conducted systematically using cadastral lot number, UPI and OID .These information can be linked to zip, postal or situs method to generate street addresses based integrated MPC GIS base map.



Relationship between Road, Street Address and Cadastral Lot Using UPI and OID

Information related to Road, Street Address and Cadastral Lot

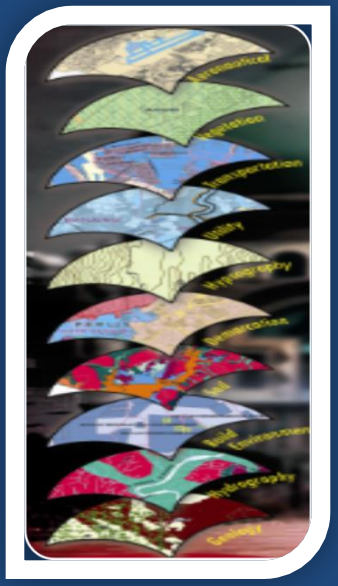


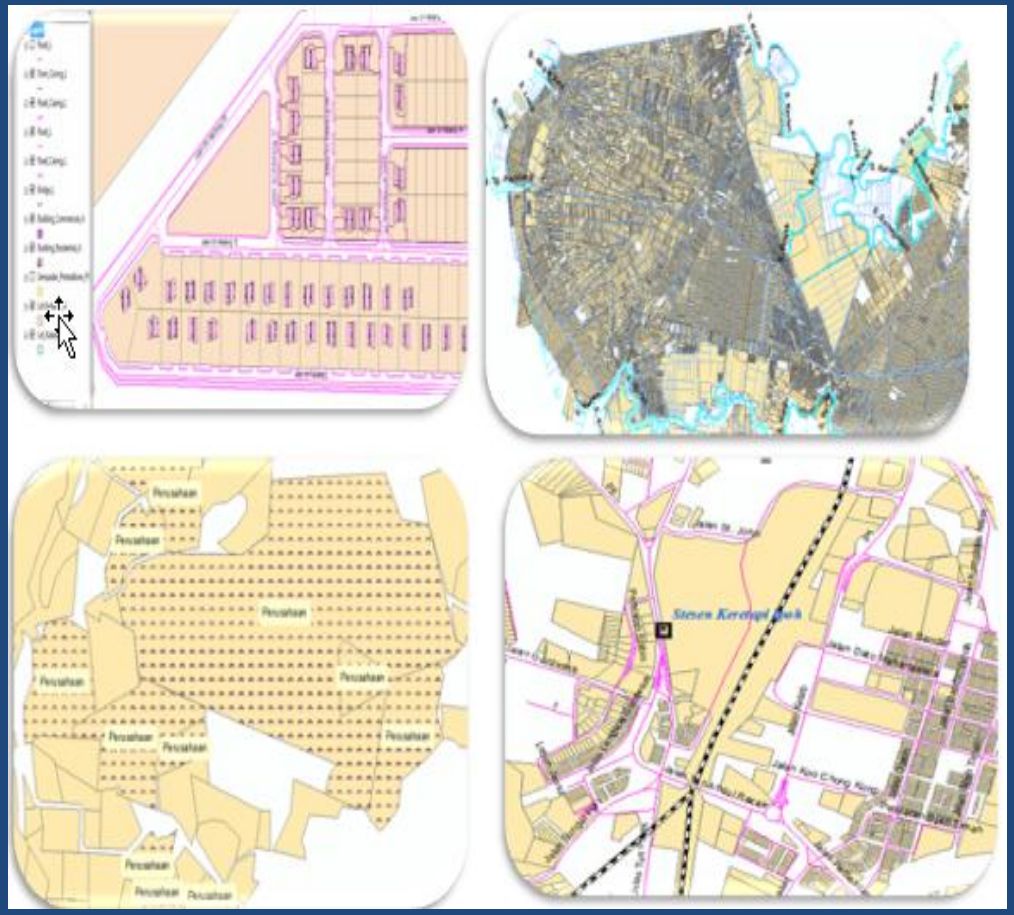
FID	Shape	OBJECTID	LOT	PARCELKEY	ADD_	NAM_RD	NAM	POSKOD	NAME_OWN	BA5
0	Polygon ZM	4531	1310	2000160751310	No.46	Jalan Kerupang 2	Taman Desa Rahmat	21200	Ahmad Bin Abu	W.P. Labuan
1	Polygon ZM	6666	1308	2000160751308	No.47	Jalan Kerupang 2	Taman Desa Rahmat	21200	Dira Binti Ahmad	W.P. Labuan
2	Polygon ZM	6667	1309	2000160751309	No.48	Jalan Kerupang 2	Taman Desa Rahmat	21200	Mamat Bin Bakar	W.P. Labuan
3	Polygon ZM	6675	1331	2000160751331	No.49	Jalan Kerupang 2	Taman Desa Rahmat	21200	Sulaiman Bin Yahya	W.P. Labuan
4	Polygon ZM	6676	1333	2000160751333	No.50	Jalan Kerupang 2	Taman Desa Rahmat	21200	Salmah Binti Abdullah	W.P. Labuan
5	Polygon ZM	6677	1334	2000160751334	No.48	Jalan Kerupang 2	Taman Desa Rahmat	21200	Badrul Bin Muhamad	W.P. Labuan

6. State Geospatial Data Centre (SGDC)

- MPC for rural area could be developed using SGDC dataset as a core geospatial data input. This is due to the creation of SGDC dataset at macro level of larger map scales at 1:10,000 and 1:25,000 for planning and control of any development in state region.

- The fundamental geospatial dataset consists of twelve (12) main categories that comply to the Malaysian Standards as follows: 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); and iv) GDM2000 - Geocentric Datum for Malaysia.

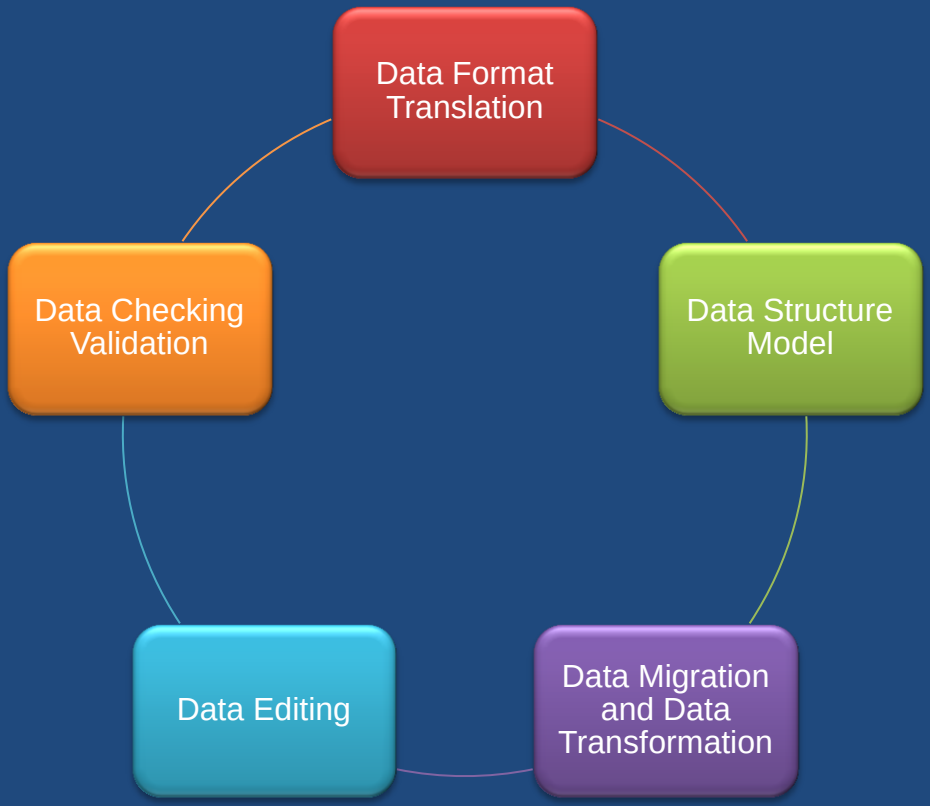



Perusahaan
Perusahaan
Perusahaan

3-D MPC Database Development

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:



3-D MPC Database Development

DATA FORMAT TRANSLATION

- Format Conversion
- Sorting of Feature Class
- map Scale

DATA STRUCTURE MODEL

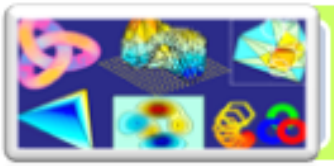
- Generating Data Structure based on MS1759 & Open Architecture

DATA MIGRATION

- Data Structure Model :MS1759
- Geodatabase
- Unique feature ID
- Geometry Merging
- MyGDI Standard
- 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

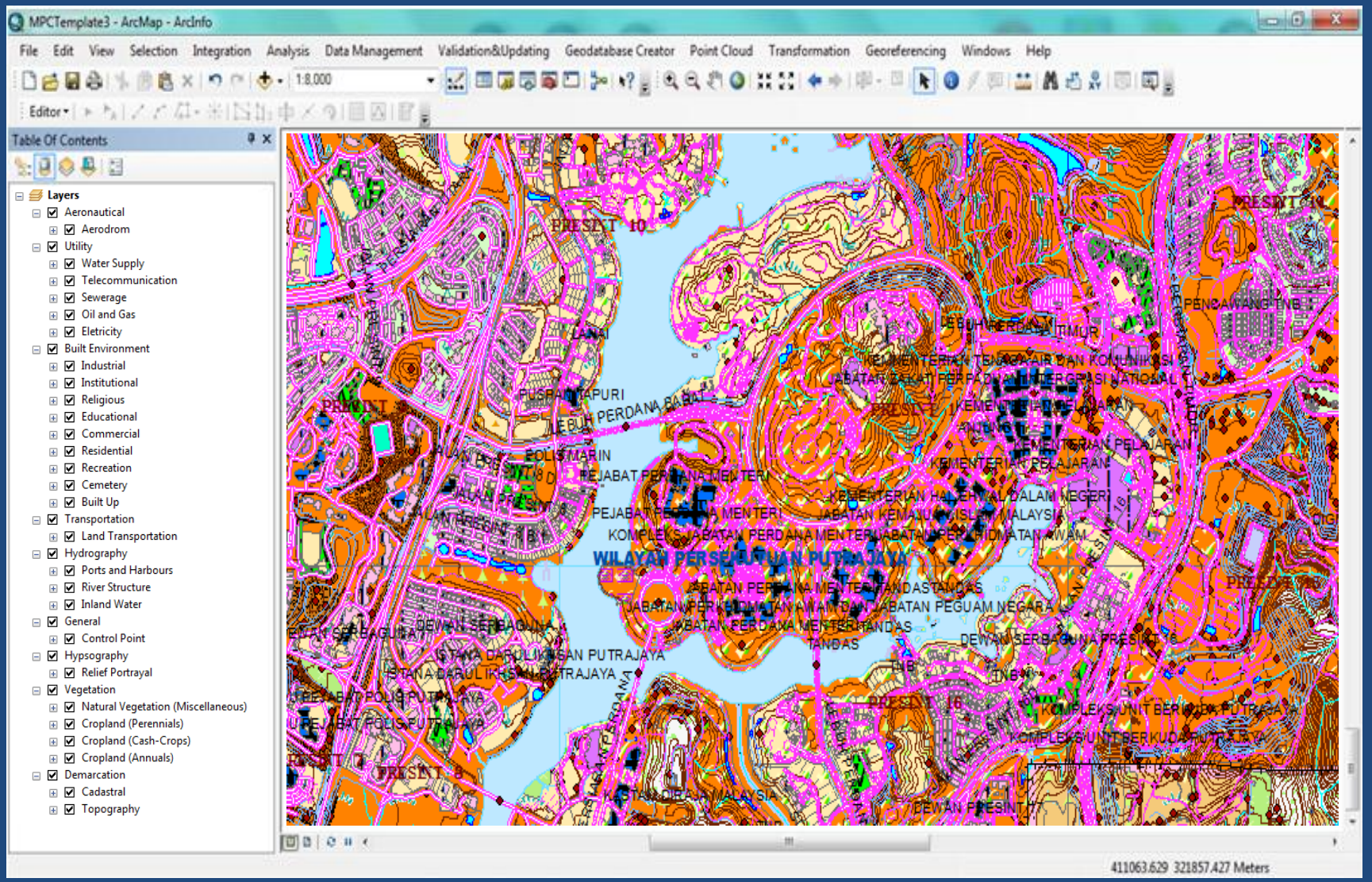
DATA VALIDATION

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

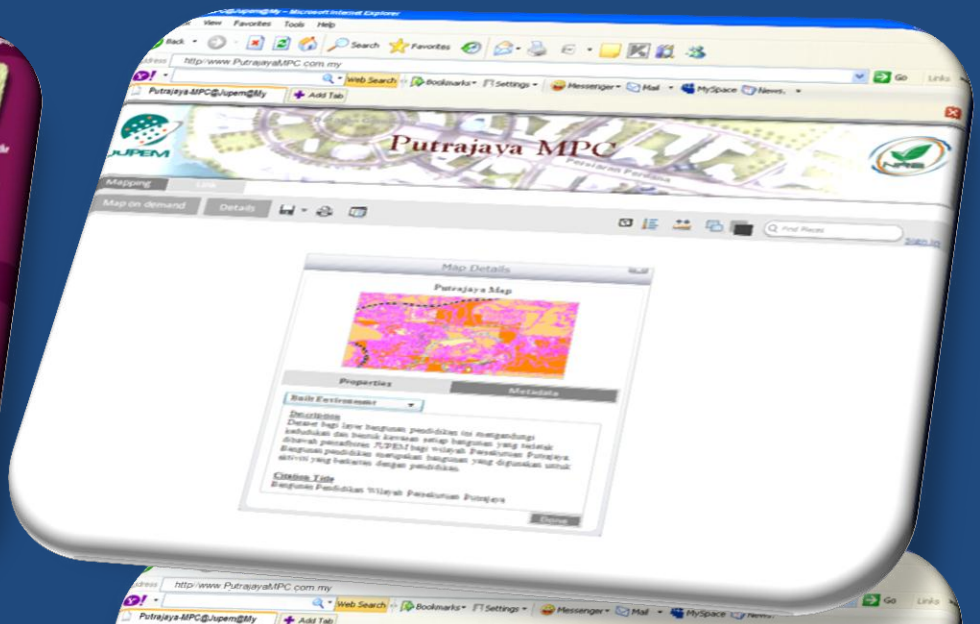
LARGE SCALE MPC DATABASE

- Compliance to DSMM & MyGDI Standard
- Spatial correlation with NDCDB
- MPC Database

MPC Integration, Updating and Validation Module



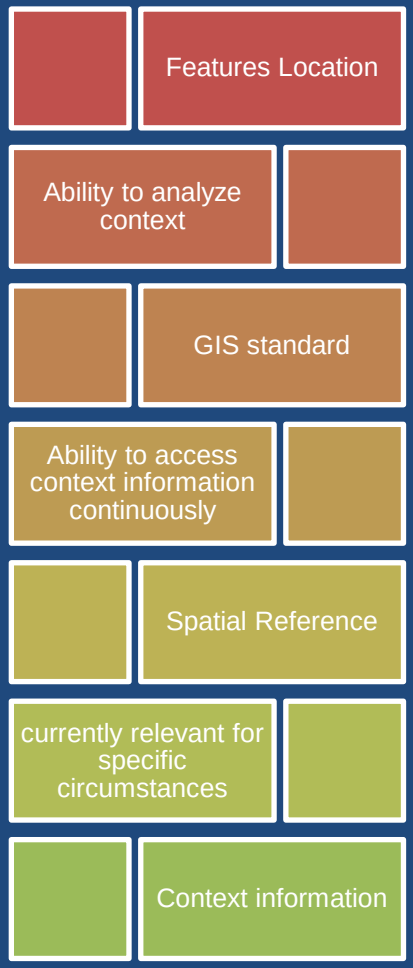
MPC Integration, Updating and Validation Module

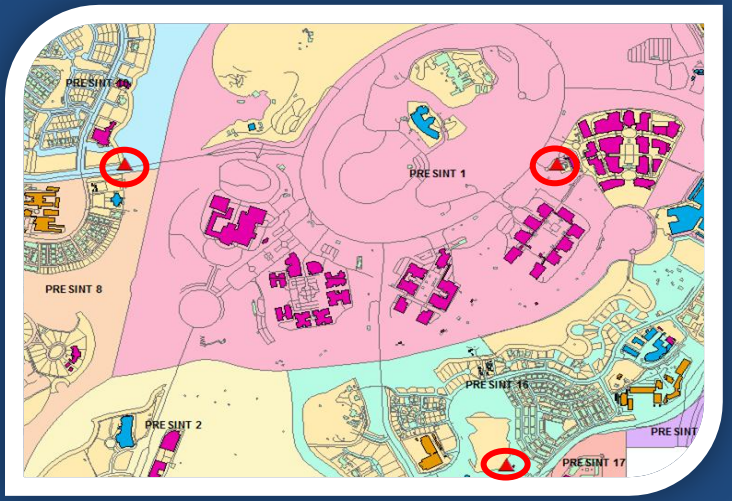


MPC Database

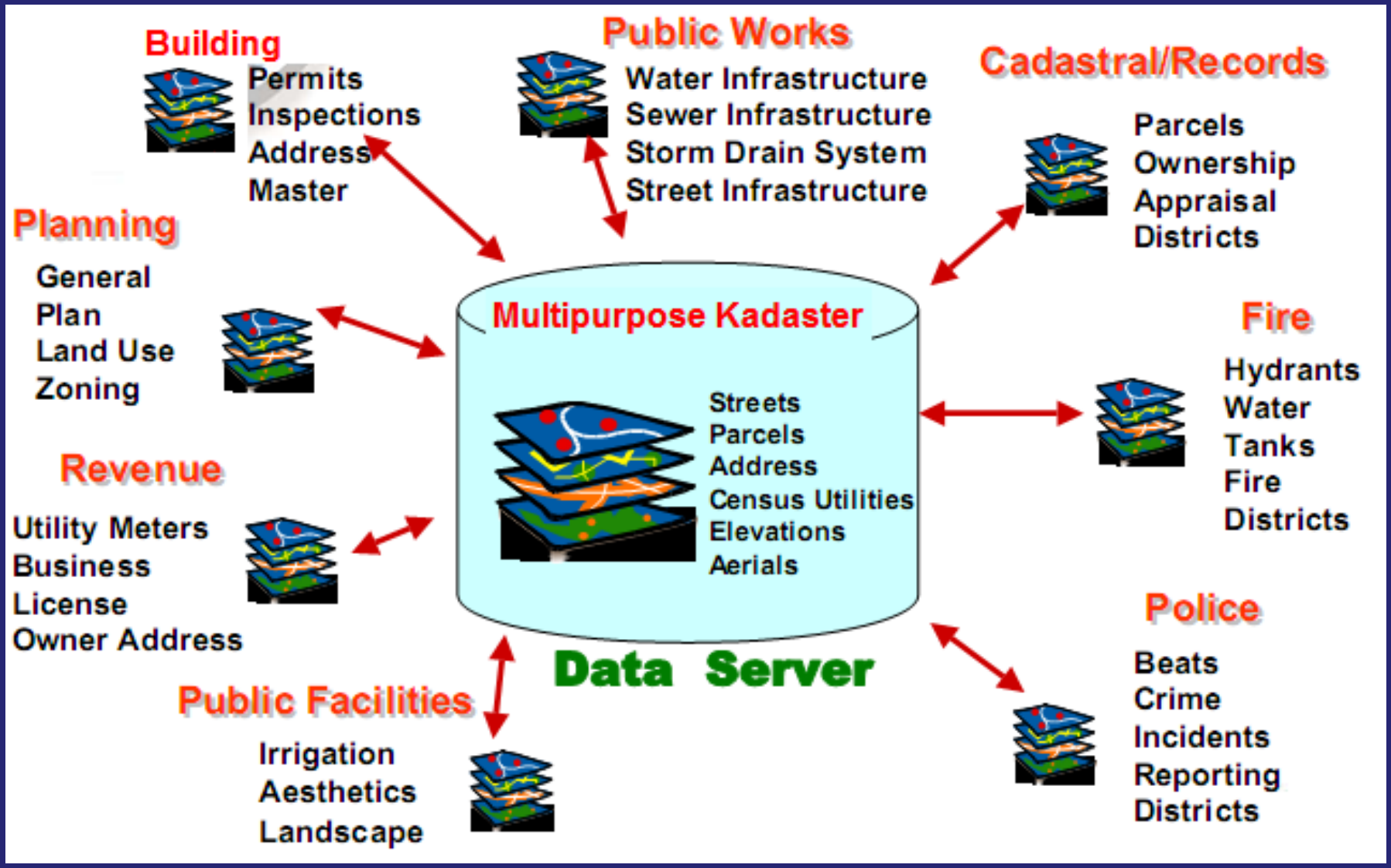
MPC OWA

- 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:





Benefits of MPC



Other Benefits of MPC

- Property Inventory
- Project Implementation and Monitoring
- Crime Prevention and Detection
- Utility Management
- School Management
- National Identity Cards
- Census Mapping
- Population Estimates
- Electoral Processes
- Agricultural Yield Prediction

Concluding Remarks and Future Direction

- The key to the success of establishing MPC is continually evolving in response to the changing humankind to land relationship and demands.
- MPC must be driven by the needs from the users that critically required for survey accurate large scale data.
- MPC will support effective land development and administration, increased and sustainable economic development activities, agricultural productivity, and environmental management.
- MPC able to support different levels of stake holders at local authority, state authority and national authority for multiple decision making processes and improved delivery system to the public.
- The pilot project towards the development of MPC for Putrajaya will provide informative insight on the future direction in implementing nationwide MPC and new cadastral management in Malaysia.

End of Presentation

Thank You