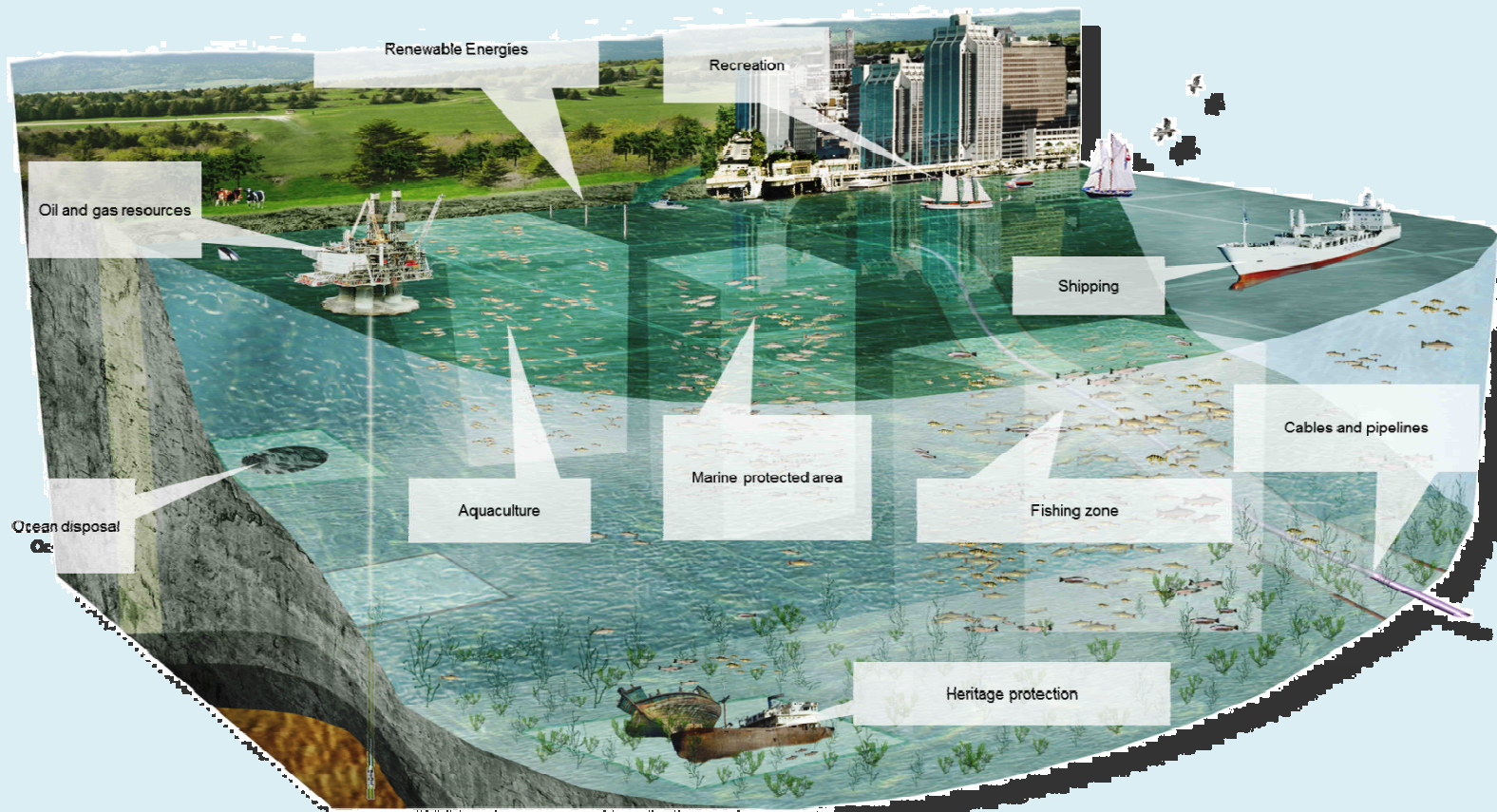




Toward the Development of LADM-Based Marine Cadastres: Is LADM Applicable to Marine Cadastres?

Michael SUTHERLAND
Charisse GRIFFITH-CHARLES and Dexter DAVIS
TRINIDAD AND TOBAGO

3D Cadastres



Complex Marine and Maritime Rights
From Peyton, Kuwalek and Fadaie 2016

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Toward the Development of LADM-Based Marine Cadastres: Is LADM Applicable to Marine Cadastres?



Criteria for Marine Cadastres from the Literature

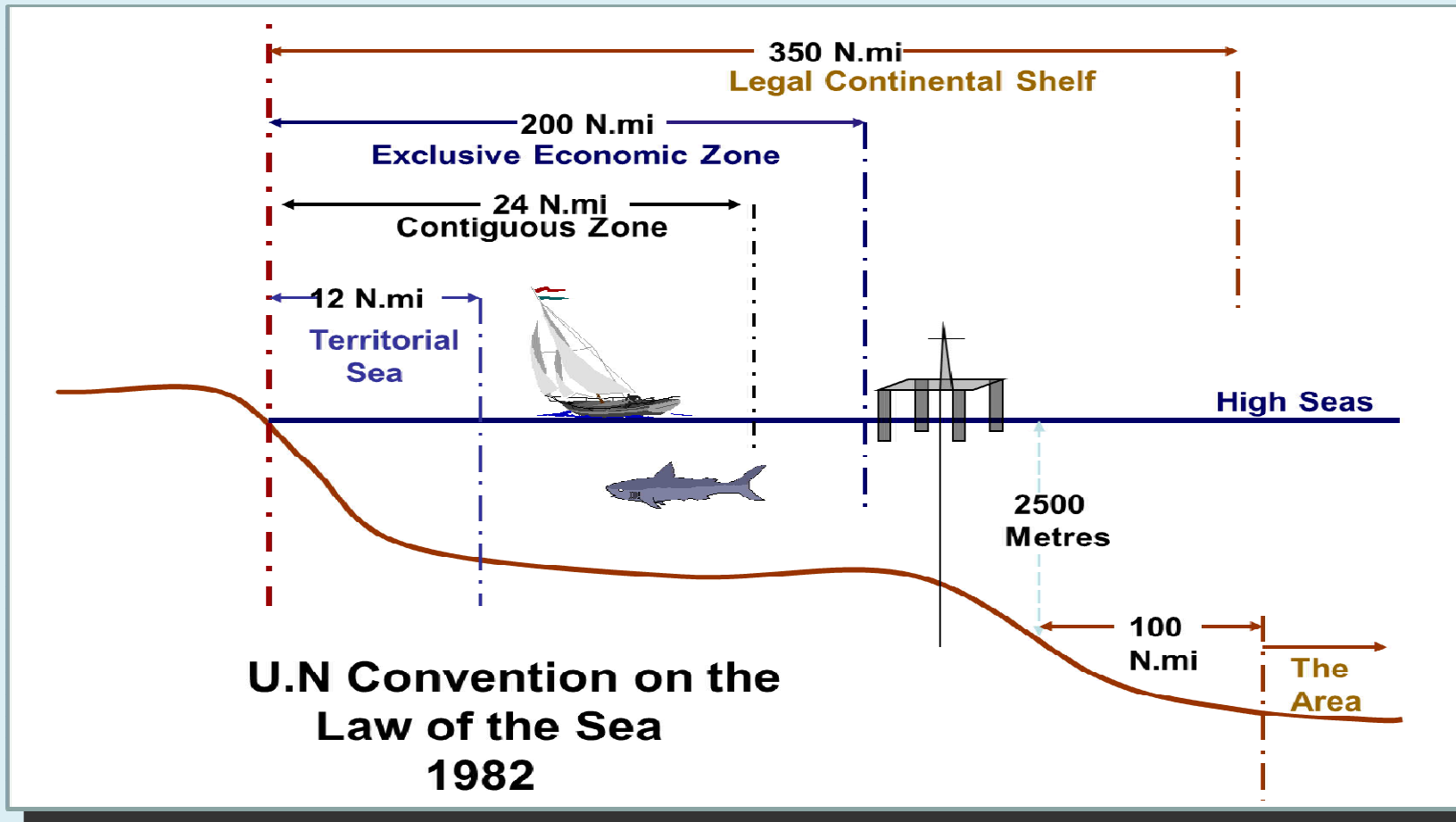
The ability to:

- Accommodate complex marine rights
- Accommodate information on stakeholders in marine spaces
- Accommodate and model complex overlapping marine boundaries
- Incorporate other relevant spatial information components
- Incorporate relevant non-spatial attributes
- Associate marine parcels with complex legal regimes
- Facilitate marine cadastre's data integration in SDIs



There are approximately eight maritime zones relevant to marine cadastres:

- Internal waters;
- Archipelagic waters;
- Coastal waters;
- Territorial seas;
- Contiguous Zone;
- Straits;
- Exclusive Economic Zone (EEZ); and
- Continental Shelf;

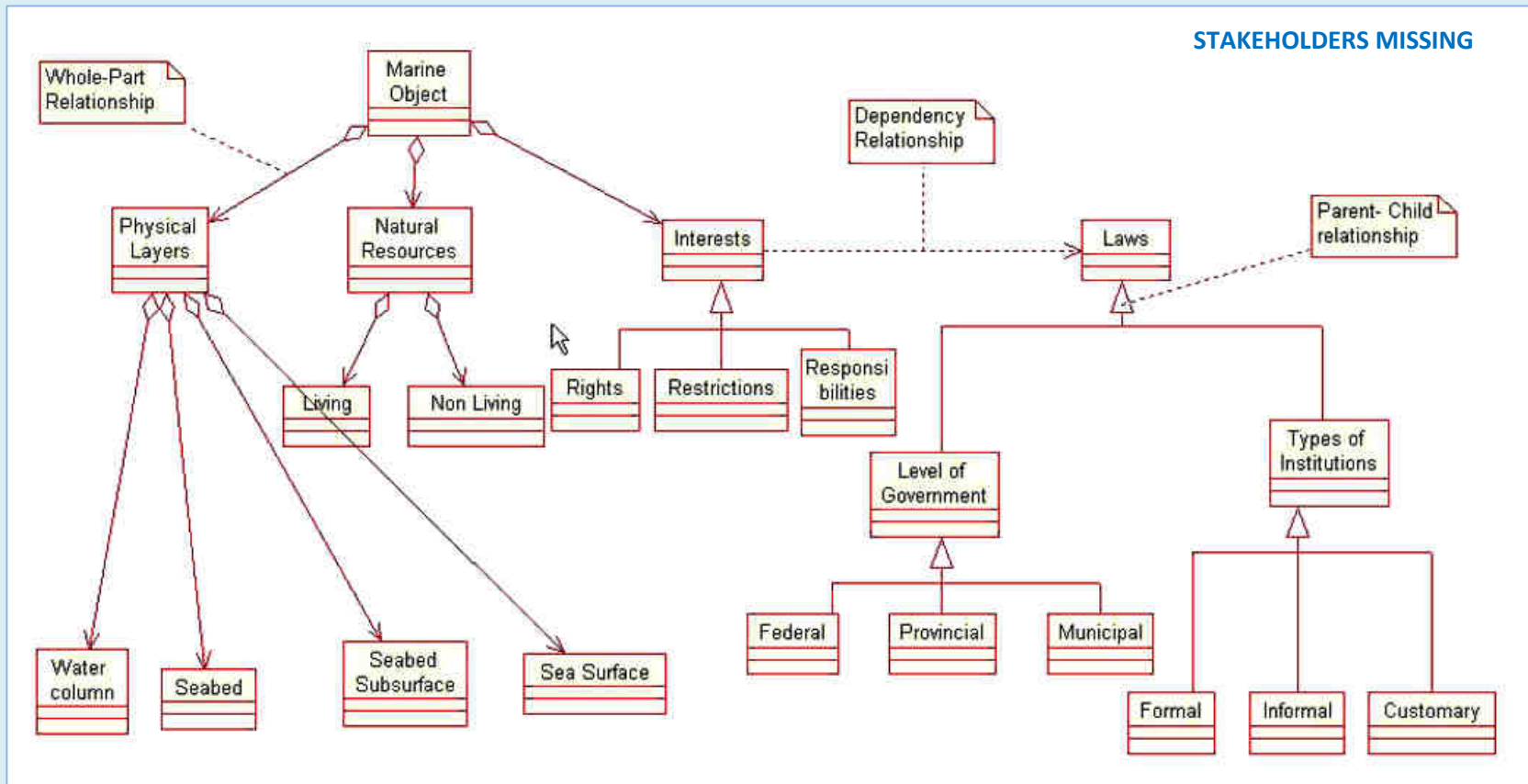


After Nichols, 2003

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<p>UNCLOS UNCLOS</p>	<p>Territorial Sea (Up to 12 nm)</p>	<p>Contiguous Zone (Up to 24 nm)</p>	<p>Exclusive Economic Zone (Up to 200 nm)</p>	<p>Continental Shelf (Up to outer edge of continental margin or 200 nm from territorial sea baselines, no more than 350 nm from baselines or 100 nm from the 2500m isobath)</p>
<p>International Rights</p>	<ul style="list-style-type: none"> •All States have rights to Innocent Passage 	<ul style="list-style-type: none"> •All States have rights to Innocent Passage 	<ul style="list-style-type: none"> •All States have freedom of navigation •All States have rights to construct pipelines or cables 	<ul style="list-style-type: none"> •All States have freedom of navigation •All States have rights to construct pipeline or cables
<p>Coastal State Rights</p>	<ul style="list-style-type: none"> •Sovereignty over Air, Water, Seafloor and Subsurface •Coastal State can direct innocent passage •Coastal state must publicize hazards to navigation 	<p>Exercise control to:</p> <ul style="list-style-type: none"> •Prevent infringement of customs, fiscal, immigration or sanitary laws and regulations within its territory or territorial sea •Punish infringement of above laws and regulations committed within its Territorial Sea 	<ul style="list-style-type: none"> •Sovereignty over Water, Seafloor and Subsurface Coastal State may exercise Jurisdiction over: <ul style="list-style-type: none"> •Construction of artificial islands •Control of pollution 	<ul style="list-style-type: none"> •Sovereignty over seafloor and subsurface, and sedentary species •Must pay royalties to UN on resource recovery

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A Marine Parcel Data Model
(Ng'ang'a et al. 2004)

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St. Margaret's Bay Marine Cadastre - Windows Internet Explorer

http://64.28.139.197/marine-cadastre/default.aspx

File Edit View Favorites Tools Help

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St. Margaret's Bay Marine Cadastre

St. Margaret's Bay Marine Cadastre

Results

Map Contents

- marine-cadastre
 - NS_ocean_tourism
 - SMB_Parcels
 - St Margarets
 - Nova Scotia Municipalities
 - FME
 - Boundaries
 - Airports
 - NAFO_SubUnits_ESSIM
 - NS-NAFO_Zones
 - ESSIM_Area
 - NS-DND_Operations
 - NS-county-regions
 - Territorial_Sea
 - St-Margarets-Bathy-Surface

Navigation

100 50 0 100 Miles

Done Internet 100%

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St. Margaret's Bay Marine Cadastre

St. Margaret's Bay Marine Cadastre

Results

- marine-cadastre (-63.976, 44.5946)
 - Territorial_Sea
 - NS-county-regions
 - NS-DND_Operations
 - NS-NAFO_Zones
 - NAFO_SubUnits_ESSIM
 - SMB_Parcels

Map Contents

- marine-cadastre
- NS_ocean_tourism

Navigation

Internet 100%

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St. Margaret's Bay Marine Cadastre

St. Margaret's Bay Marine Cadastre

Results

- Territorial_Sea
 - Territorial Sea

Name	Territorial Sea
Surf_Right	Yes
Colm_Right	Yes
Flor_Right	Yes
SubF_Right	Yes
Owner	Canada
Right_Type	Sovereign
Law	Canada Oceans Act; UNCLOS
 - NS-county-regions
 - NS-DND_Operations
 - NS-NAFO_Zones

Map Contents

- marine-cadastre
- NS_ocean_tourism

Navigation

Map Labels: EAST INDIAN RIVER, SACKVILLE, 4Xr, 4Xm

Scale: 0 1.5 3 Miles

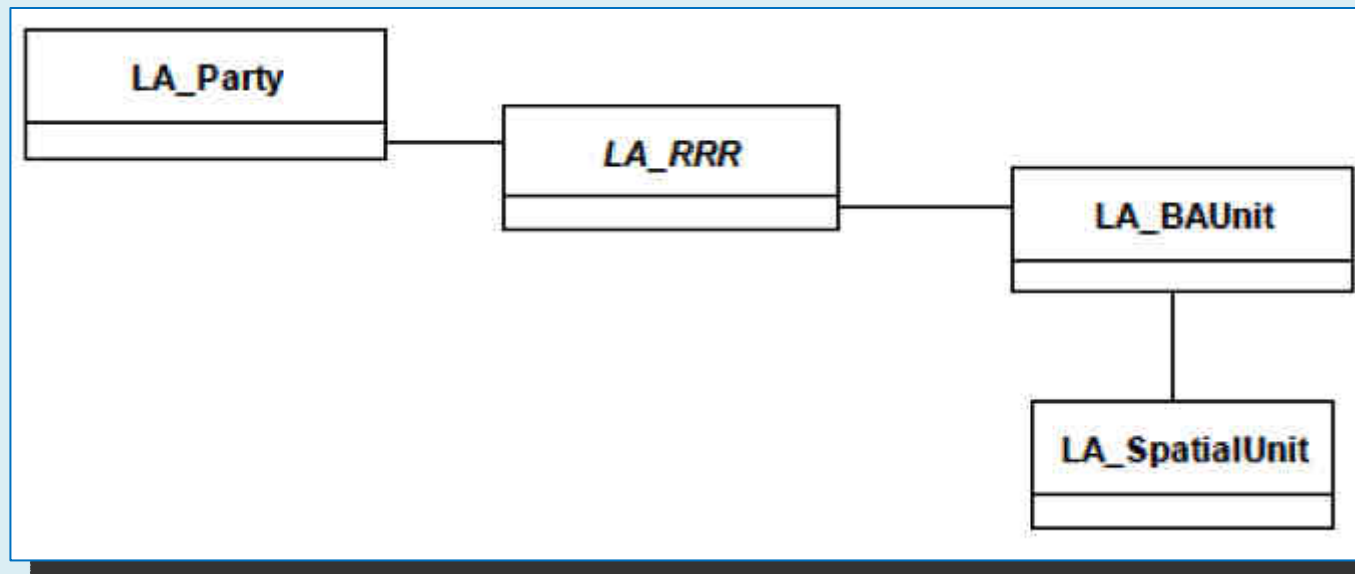
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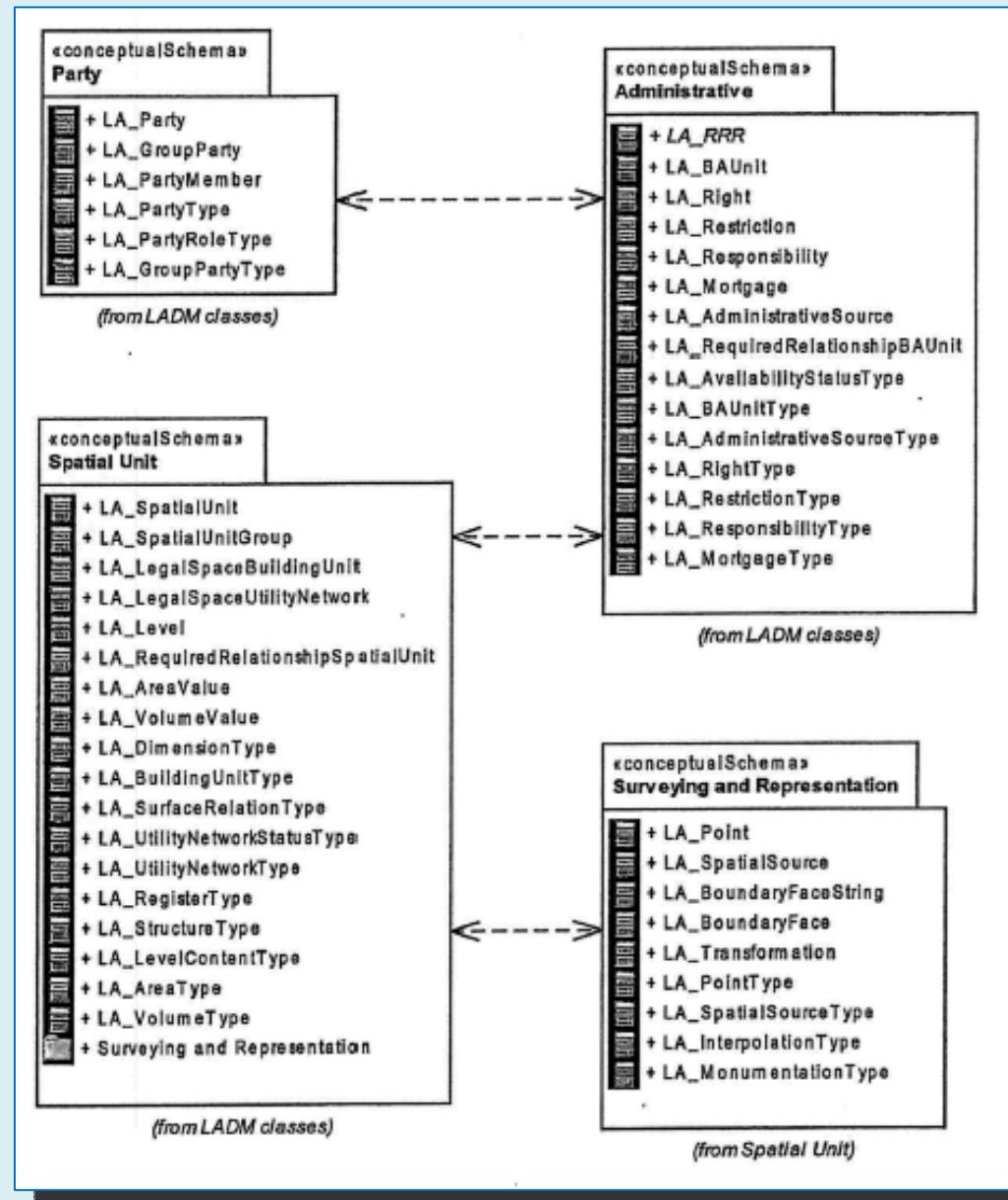
Land Administration Domain Model (LADM, ISO 19152)



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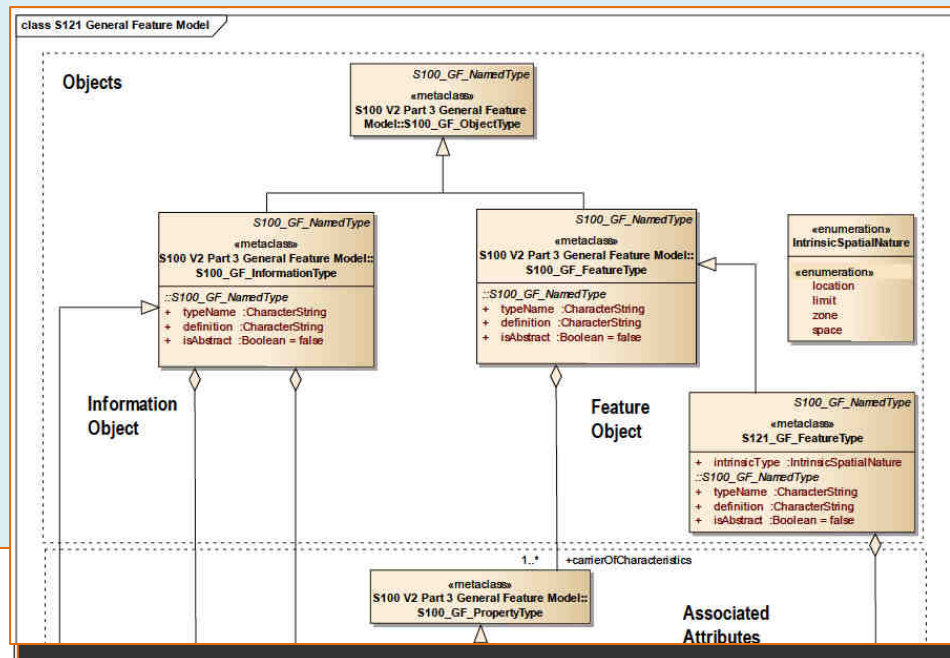
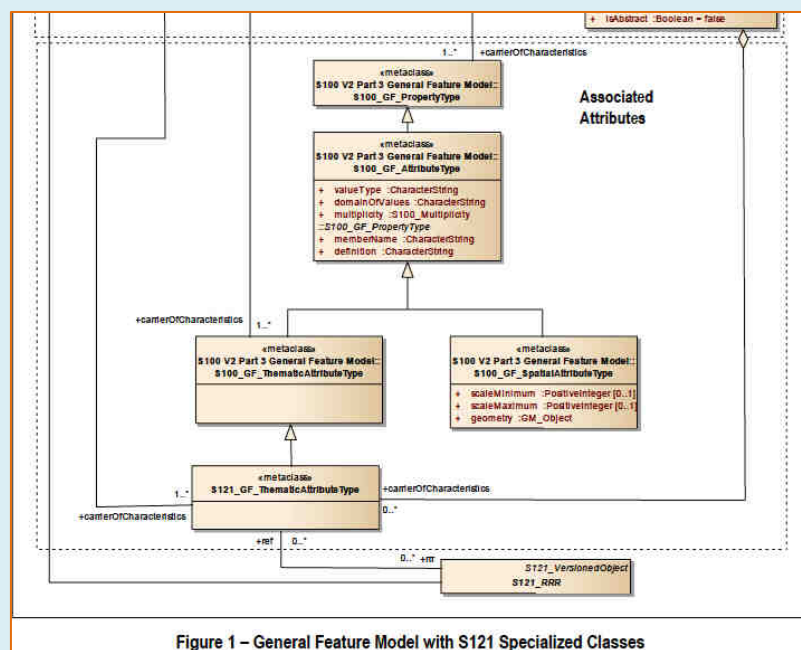
Land Administration Domain Model (LADM, ISO 19152)



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IHO Proposed S121 Data Model



“...incorporating the standard ISO 19152 Land Domain Administrative Model together with the IHO S-100 Universal Hydrographic Model to address the requirement for non-navigational information in a marine environment...”

“Rights, responsibilities and restrictions appear as attributes for an S121_BA_Unit”

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Toward the Development of LADM-Based Marine Cadastres: Is LADM Applicable to Marine Cadastres?



LADM and Marine Cadastres

The ability to:

•Accommodate complex marine rights

LADM Administrative Package:

- class LA_RRR (rights, responsibilities, restrictions);
 - subclass LA_Right (ownership right, tenancy right, possession, customary right, or informal right);
 - subclass LA_Restriction (formal or informal restraint from doing something);
 - subclass LA_Responsibility (formal or informal obligation to do something);
- class LA_BAUnit ('basic administrative unit' - an administrative entity consisting of zero or more spatial units against which one or more rights)



LADM and Marine Cadastres

The ability to:

•Accommodate information on stakeholders in marine spaces

LADM Party Package

- class LA_Party: persons, or groups of persons, or juridical persons, that compose an identifiable single (legal) entity;
- class LA_GroupParty: any number of parties, forming together a distinct entity;
- class LA_PartyMember: a constituent of a party or group party.



LADM and Marine Cadastres

The ability to:

- **Accommodate and model complex overlapping marine boundaries**

- class LA_SpatialUnit (e.g., text, point(s); line(s); area(s)/polygon(s); volume(s))
 - Subpackage Representation (management of data collected from surveys)
 - class LA_BoundaryFace (instances of 2D and 3D representations of spatial)
 - class LA_BoundaryFaceString (instances of 2D/3D representations of spatial units)
- **Incorporate other relevant spatial information components**
 - LADM Spatial Unit Package



LADM and Marine Cadastres

The ability to:

- **Incorporate relevant non-spatial attributes**

- LADM Administrative Package (expanded in terms of additional attributes, operators, associations, and classes as needed)

- **Associate marine parcels with complex legal regimes**

- LADM Administrative Package (expanded in terms of additional attributes, operators, associations, and classes as needed)

- **Facilitate marine cadastre's data integration in SDIs**

- ...key information (e.g., parcel ID)



LADM and Marine Cadastres

- **UNCLOS Zones;**
- **Maritime zones may or may-not contain spatial units or administrative units, and may or may-not contain marine resources;**
- **Maritime zones will always be associated with maritime layers: UNCLOS rights are defined according to zones and marine layers (i.e., sea surface, water column, seabed, and seabed subsoil);**

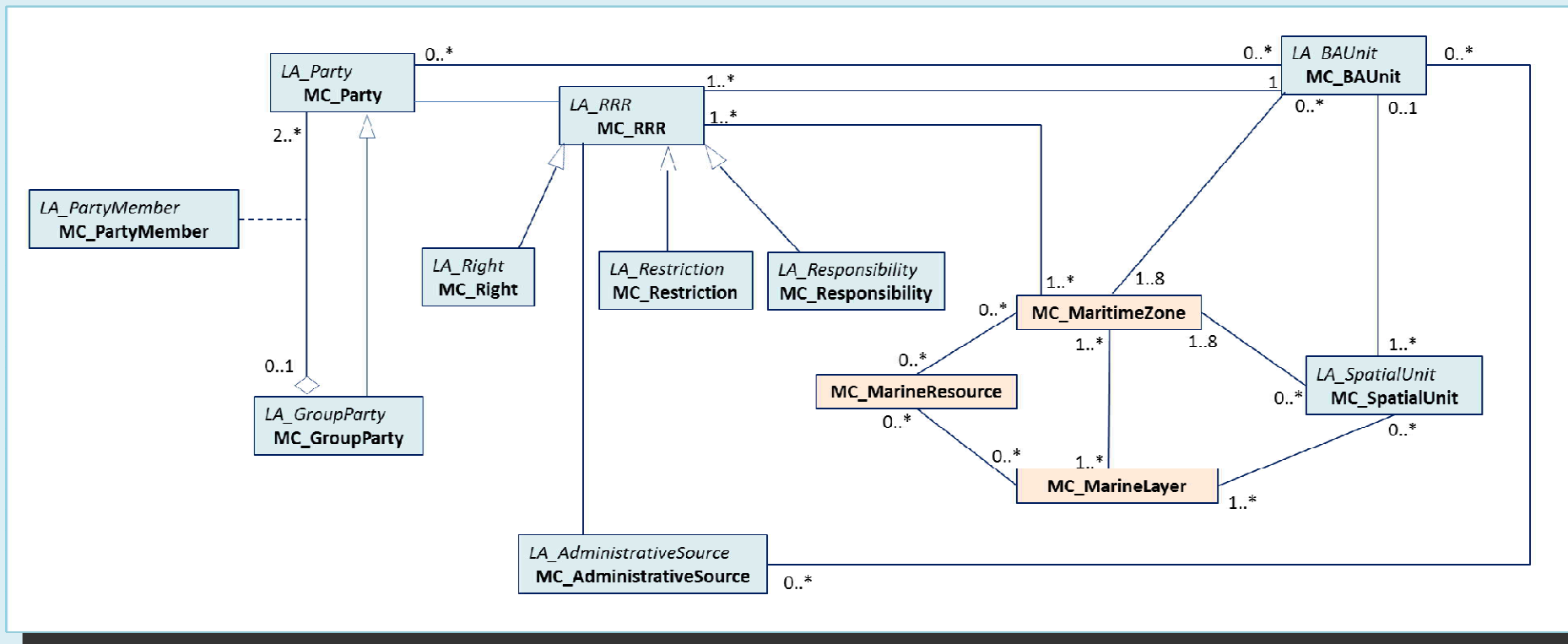


LADM and Marine Cadastres

- **Marine layers will always be associated with maritime zones.**
- **Spatial units will always be associated with a maritime zone, and with marine layers;**
- **Marine layers may or may not contain marine resources, or spatial units; and**
- **Marine resources may or may not be found in maritime zones and marine layers.**

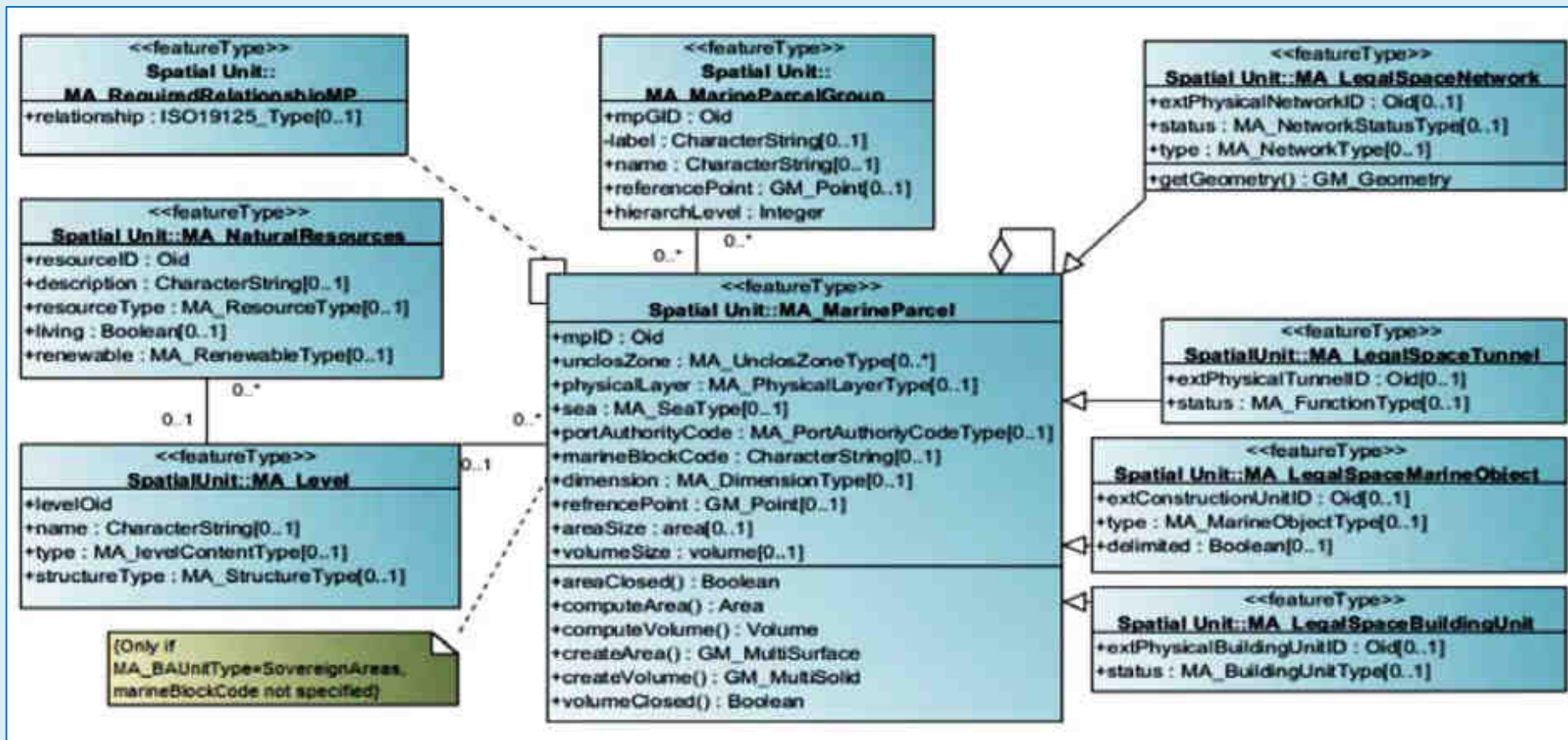


LADM and Marine Cadastres



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3D Cadastres



Marine Parcel Package (Athanasίου, 2014)

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Toward the Development of LADM-Based Marine Cadastres: Is LADM Applicable to Marine Cadastres?

YES