The Standards Based Integration Company

Systems Integration Specialists Company, Inc.

IEC CIM Market Model

CIM University
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Topics

- TC57 WG16 Market Model Introduction
  - Scope/Purpose
  - European Style Markets
  - North American (NA) Style Markets
- WG16 Part 301 – Logical Model
- Profiling Rules
  - Profile Generation Methods
  - Modeling Framework
- Questions

TC57 WG16 Market Model Introduction

- Mission, Scope:
  - Develop Standards for Electricity Market Communications
    - Market Participants to Market Operator
    - Intra Market Operator
  - Use of TC 57 Common Information Model (CIM)

Two Sub-teams formed and working

- Two Styles of Markets (So Far)
- "European Style" Markets:
  - Day Ahead Markets: Bilateral
  - Intra-day Markets
  - Balancing Markets
  - Collaboration with ENTSO-e
- "NA Style" Market
  - Day Ahead Markets with Security Constrained Unit Commitment (SCUC)
  - Hour Ahead Markets
  - Real Time Markets with Security Constrained Economic Dispatch (SCED)
  - Collaboration with IRC, and ISO projects
- Beneficiaries will include Market Participants, Market Operators, Vendors

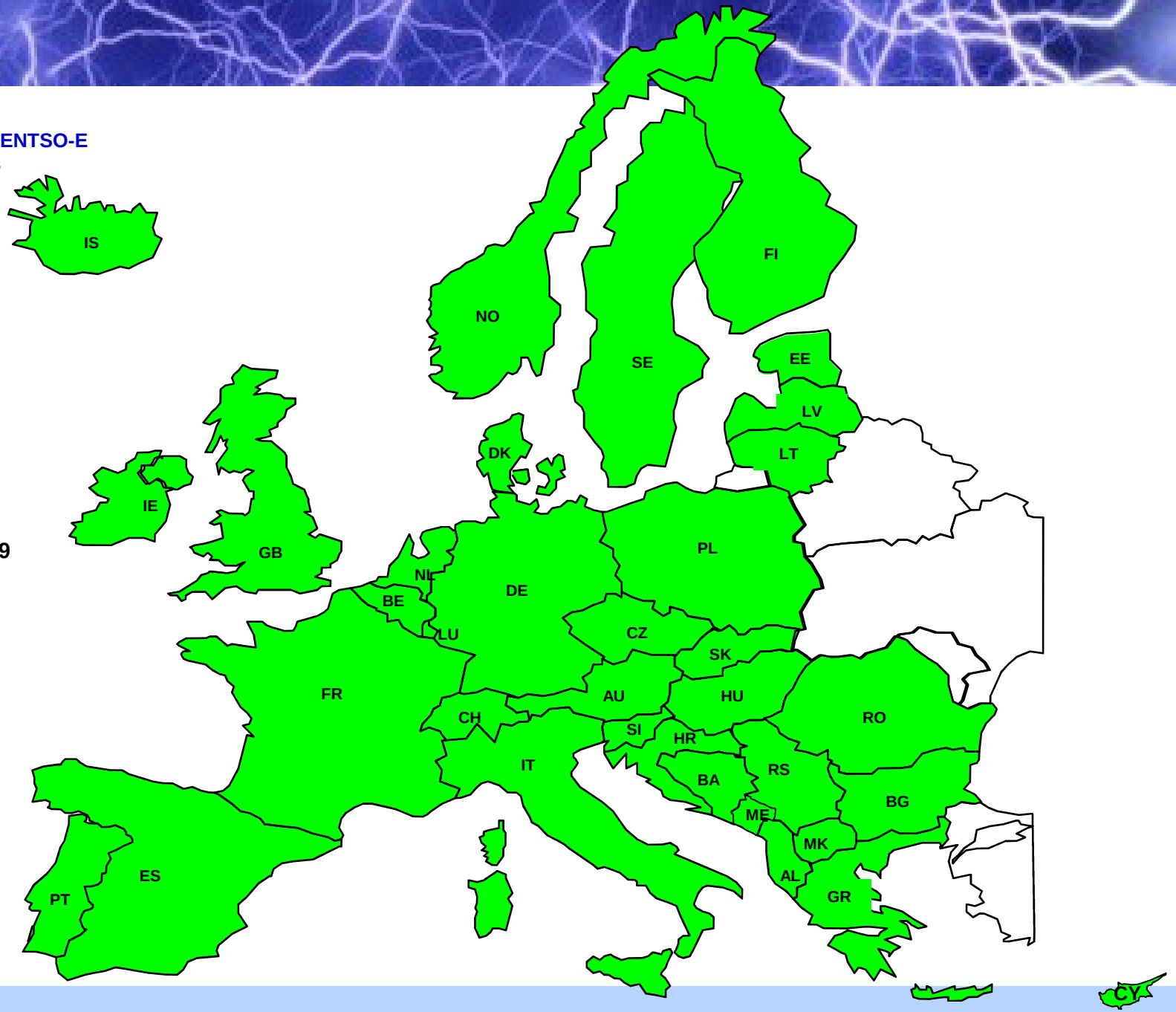
“European Style” Markets:

- Data Exchanges (Messages) to support Energy Markets
- Derived from ETSO Electronic Data Exchange (EDI)
  - ENTSO-E Scheduling System – ESS
  - ENTSO-E Settlement Process – ESP
  - ENTSO-E Reserve Resource Process – ERRP
  - ENTSO-E Capacity Allocation and Nomination – ECAN
- Mapping of existing data exchanges to CIM-based data exchanges
- IEC WG-16 working in formal liaison with ENTSO-e
- Standardization as IEC 62325

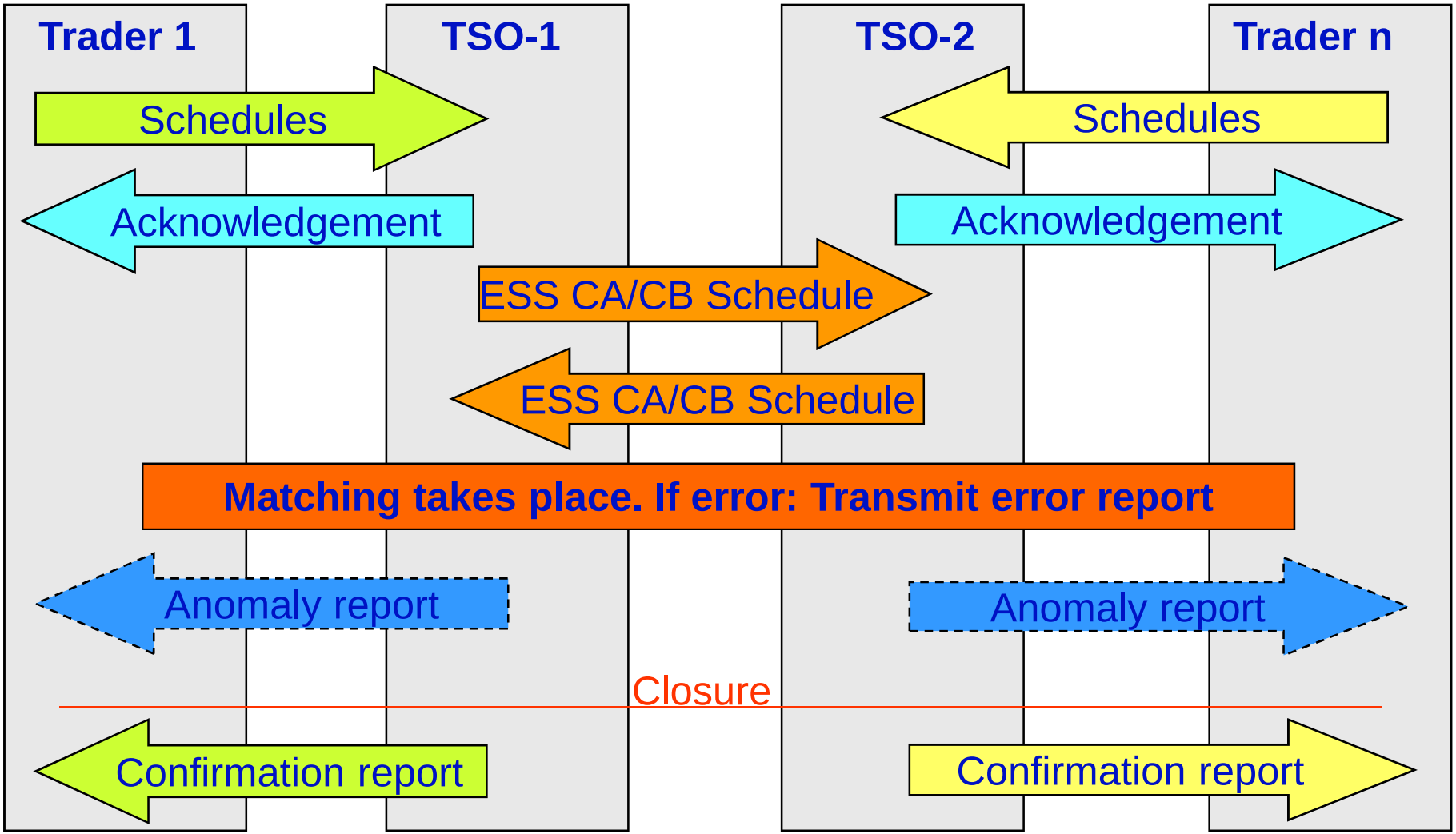
European Style Markets & ENTSO-E
42 TSOs from 34 countries

~540 GW peak load
~900 GW Capacity

****source ENTSO-e 2009**



Trader to TSO Interfaces/Communications



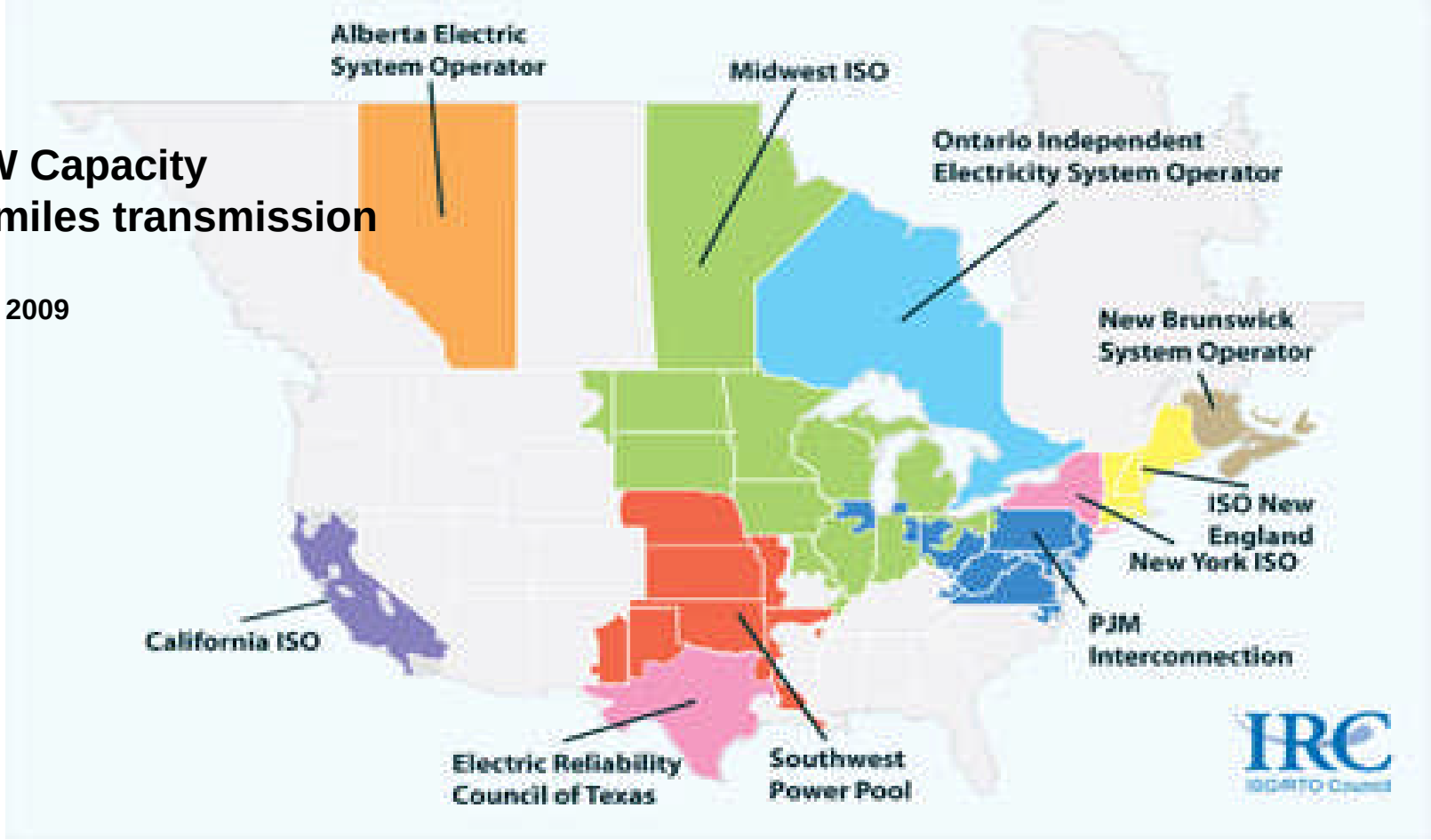
"NA Style" Markets:

- Data Exchanges to support:
  - Day Ahead Markets
  - Real Time Markets
  - Financial Transmission Rights (FTR – aka CRR)
  - Settlement
- IEC WG-16 picked up results of EPRI CME project
- Working with ISO/RTO Council
- Individual ISO/RTO projects contributed extensions to the CIM to support Energy Markets.
- Standardization as IEC 62325

“NA Style” Markets:

662 GW Capacity
278,000 miles transmission

*** Source IRC 2009**



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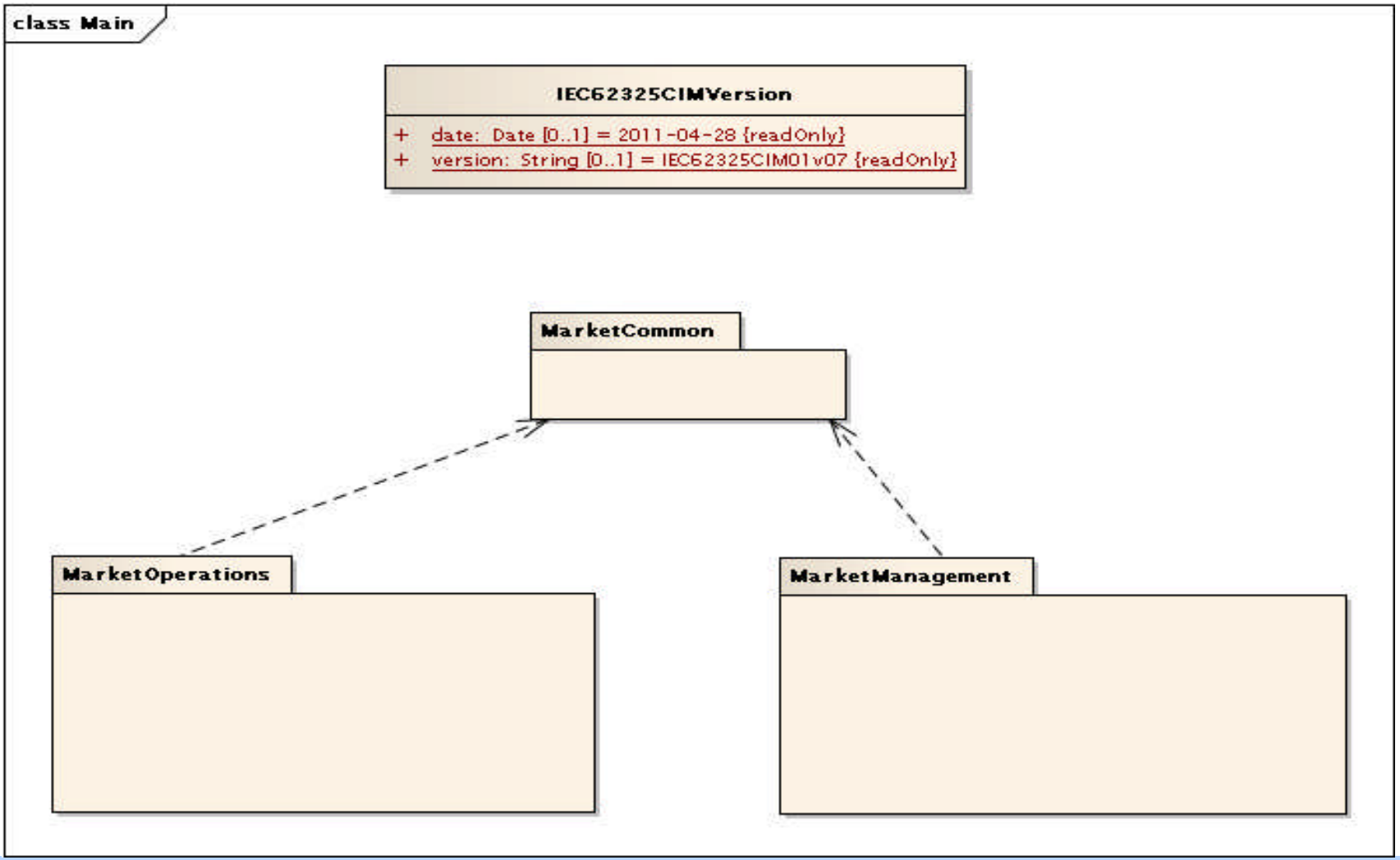
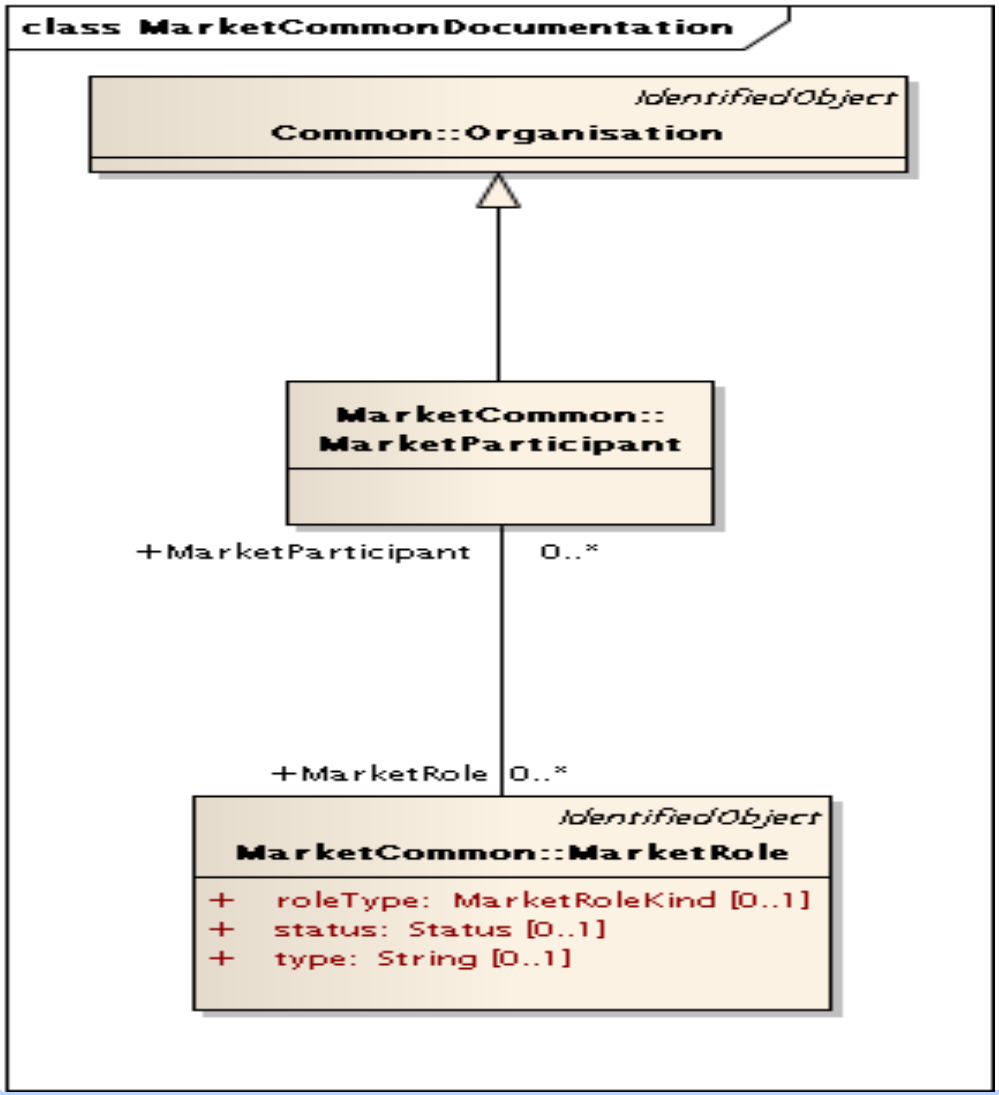
Part 301 – Market Model - Top Level Market Packages



Market Common Package

- The Common Market Model describes the market participants and the role they are assuming in the market.
- Defined market roles are supplied in an Enumerated Class called MarketRoleKind
- A Market Participant could play several roles in a market

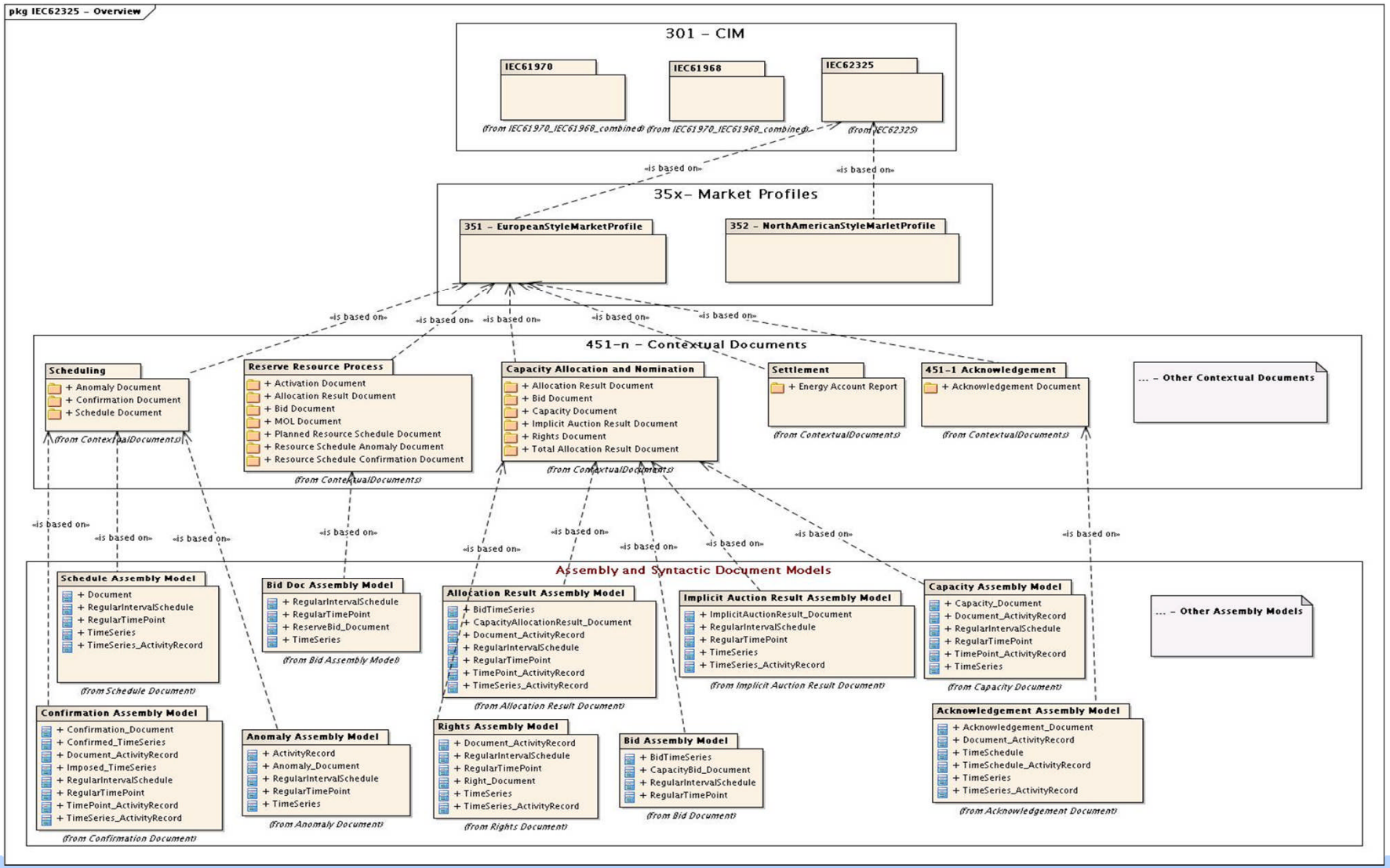
Market Common Package - Overview



Market Management Package (EU Markets)

- The Market Management Model, in conjunction with the Common Package, will be used to generate a set of Message Profiles for the European-Style Markets.
- The profiles will be used when the electricity market is based on regulated Third Party Access, i.e. Transmission System Operators have to allow any electricity supplier non-discriminatory access to:
  - the transmission network to supply customers
  - the wholesale and retail market transactions (bilateral or through a Power Exchange) to exchange energy
- A layered modelling framework is used to build down to the messages.

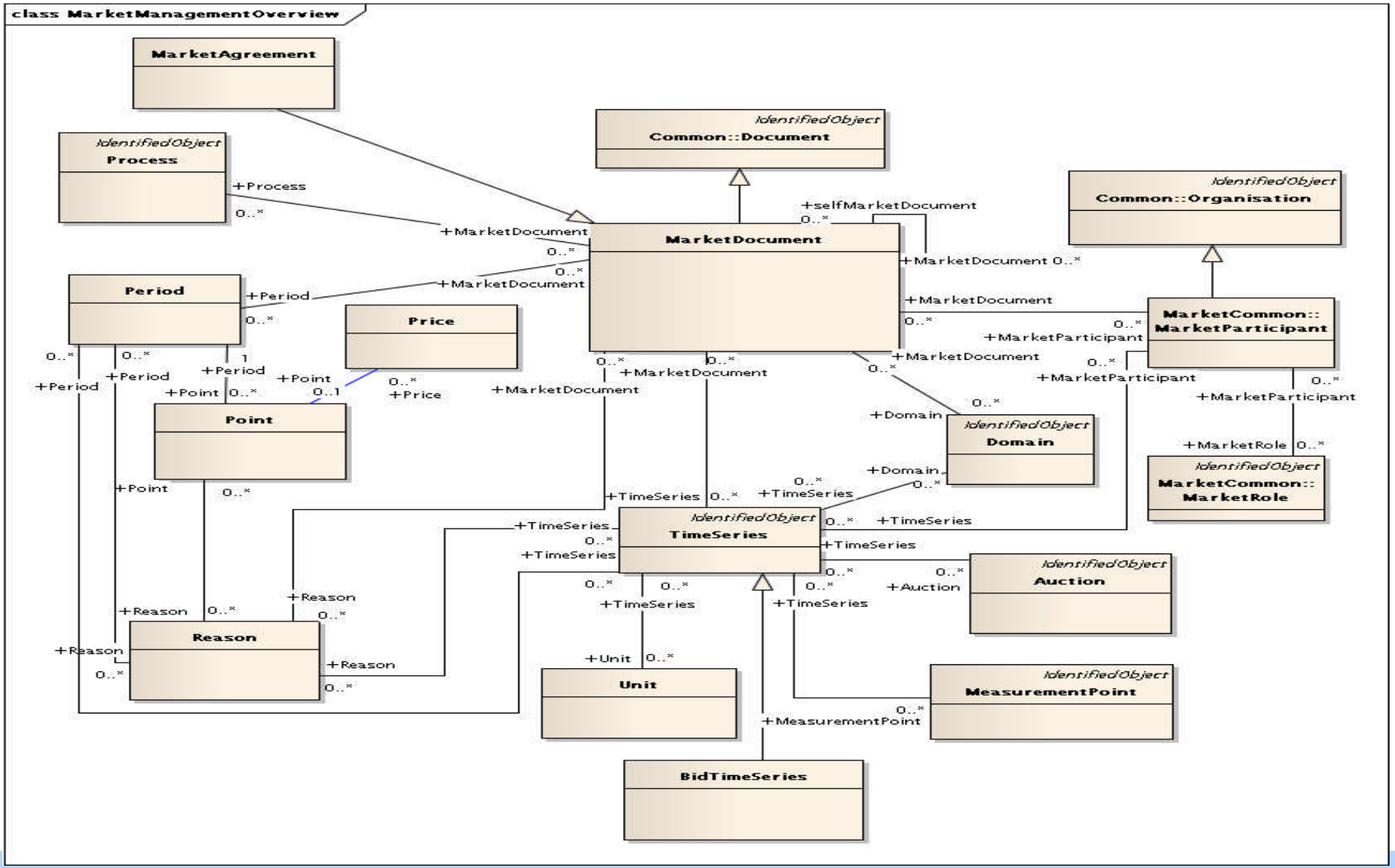
Market Management Modeling Framework



Market Management Package – Overview

- In the Market Management Model a key role is given to the concept of MarketDocument
- Transactions on the electricity market are based on contractual exchanges of information through a set of *documents*
- The exact documents depends on the business process in use for that transaction

Market Management Package Overview



Market Management Package

- Each business process necessary to run an electricity market will have a dedicated set of contextualized documents provided in the form of Profiles specified in UML.
- The market profiles are specified in parts 62325-351 and 62325-451
- The contextual documents are described in parts 62325-451
- The assembly and syntactic models are specified in part 62325-551.

Market Operations Package (NA Markets)

- Describes the set of classes to be used with the Common Market Model and other parts of the CIM to generate model profiles that include the Day Ahead and Real-Time Models.
- This profile is used for NA-Style electricity markets that are characterized:
  - By day ahead unit commitment
  - By a market operator
  - Intraday and real time balancing through central dispatch
  - Settlement based on Locational Marginal Prices (LMP).

Market Operations Package Overview

- The NA-Style market also includes the auction of Congestion Revenue Rights (CRR) which are financial instruments that market participants purchase to hedge against congestion costs.
- Meter Data Management and Billing & Settlement are also included.
- The MarketOperations package includes models to support these characteristics.

Market Operations Package – Primary Functions

- Bid Definition
- Bid Schedules
- Market Clearing

Market Operations Package – Bid Definition

- NA-Style markets are based on offers to sell and bids to buy electrical products that are cleared by a market operator subject to network and resource constraints.
- Bids and offers include price quantity pairs and technical data related to the ability of the market participant to deliver the quoted products.
- The term bid is used to include offers to sell and bids to buy one or more electrical products.

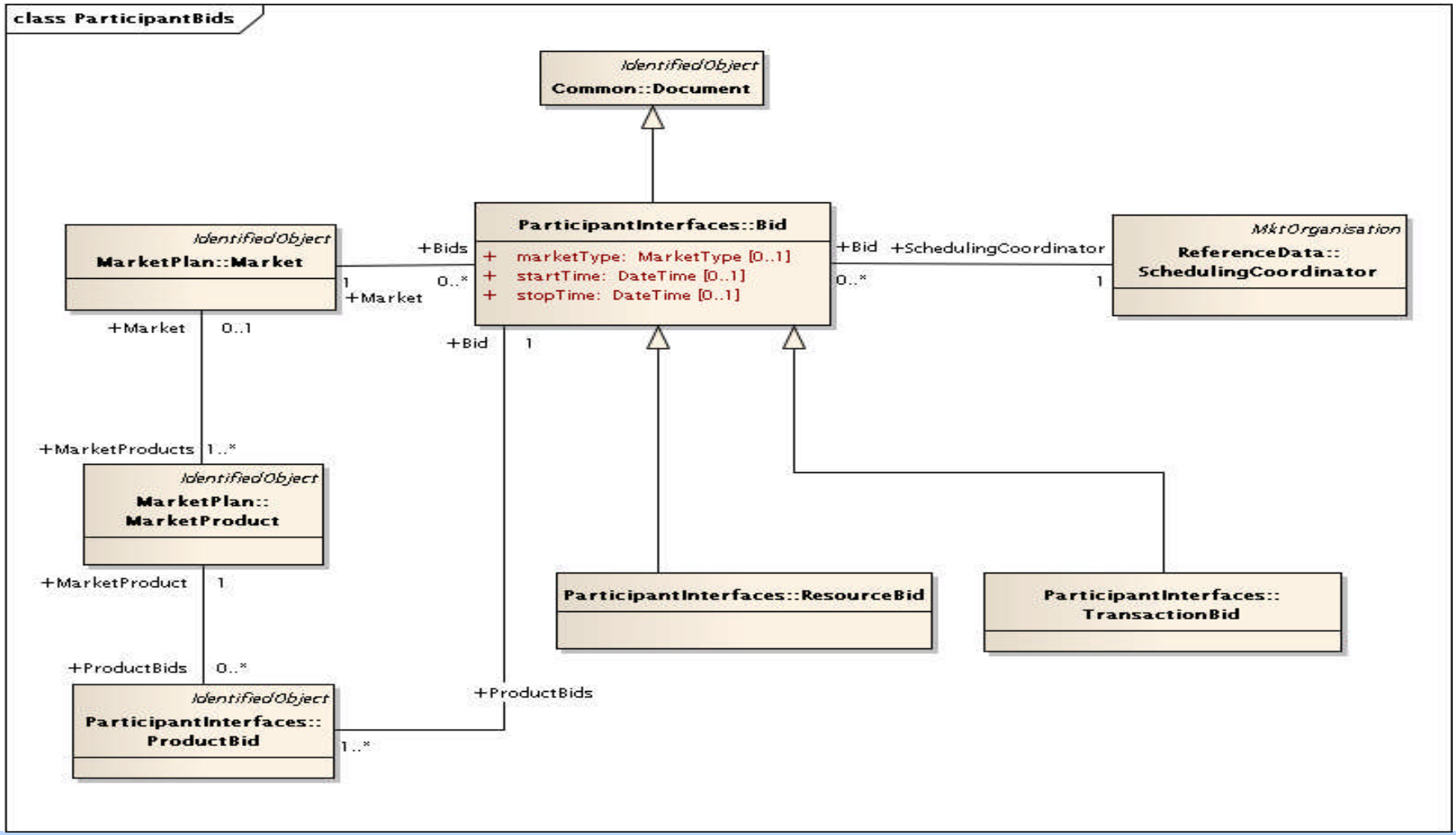
Market Operations Package – Bid Definition

- Bids are further classified as Resource Bids or Transaction Bids.
  - Resource bids are bids that are based on physical (or virtual) resources that are inside the footprint of the RTO and thus under the direct operational control of the RTO.
  - Transaction Bids are bilateral agreements made between market participants that are reported to the RTO for inclusion as constraints in the market clearing.
  - The RTO determines whether the bilateral agreements can be consummated while maintaining system reliability standards.

Market Operations Package- Bid Definition

- Bids are associated with Scheduling Coordinators that submit them on behalf of market participants
- Bids are also allowed for energy and ancillary services. A further association between the Bid class and the Market class indicates which market the bid is intended for (Day Ahead, Real Time, etc)

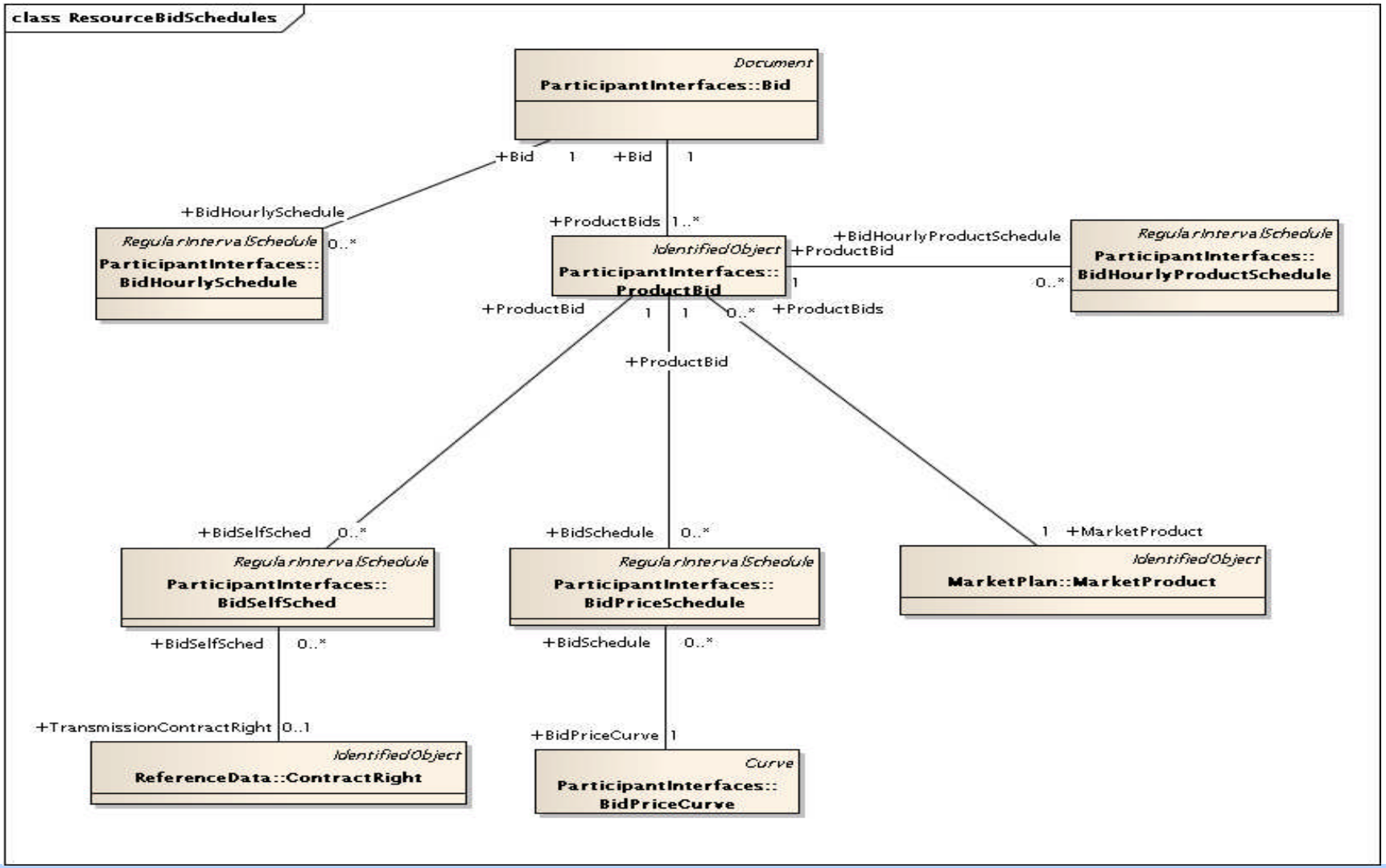
Bid Definition for NA-Style Market



Market Operations Package – Bid Schedules

- A bid may also be a self schedule, meaning that the market participant would like to operate the resource according to a certain (for example minimum) schedule.
- The market operator determines whether this resource can run with the submitted self schedule while system reliability criteria are met.
- These self schedules are settled at the LMPs determined during the market clearing.
- This model also supports bids with part of the range of bid classified as a self schedule and part as regular bid.

Resource Bid Schedule Definitions for NA-Style Market



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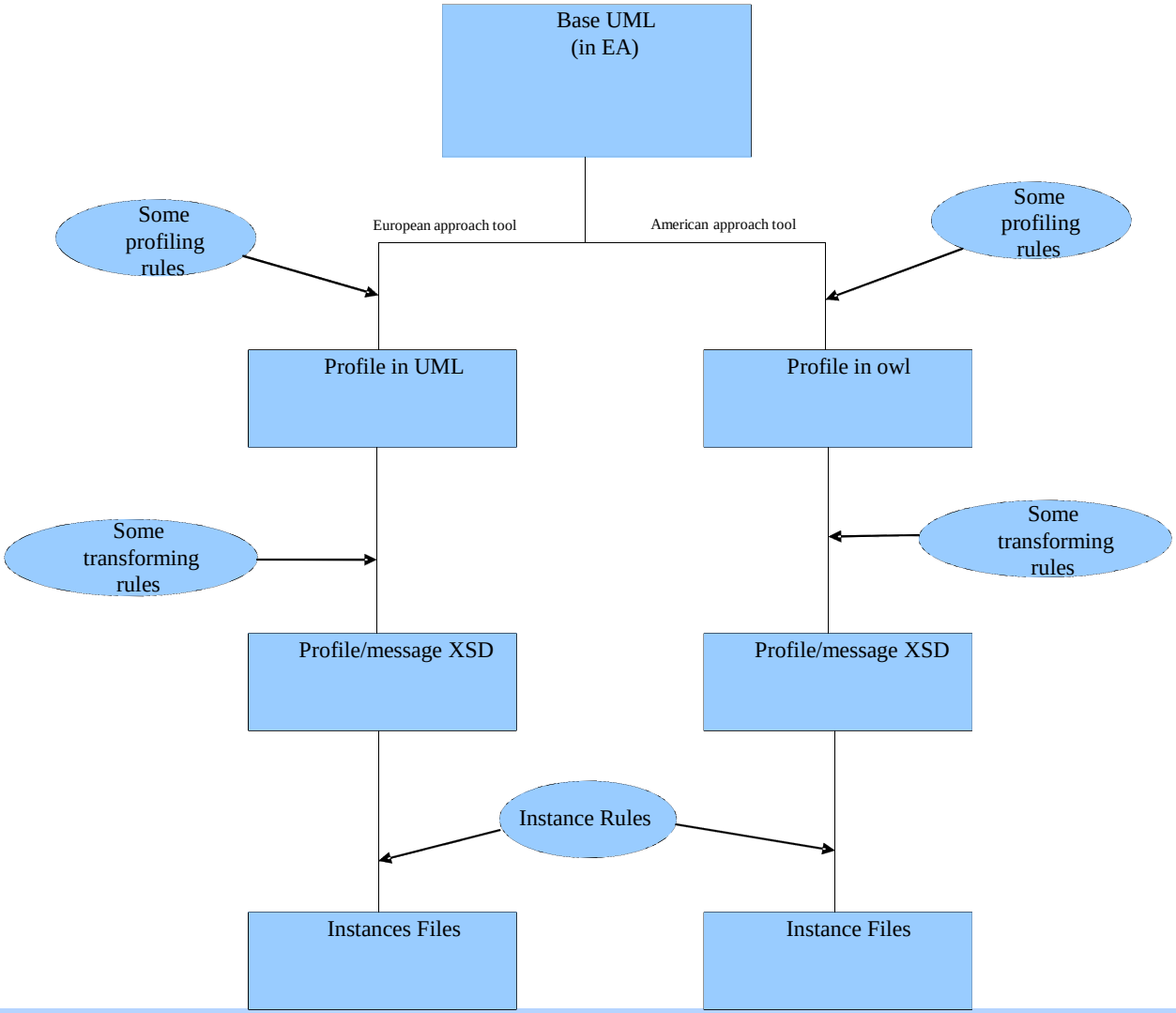
Types of Profiles

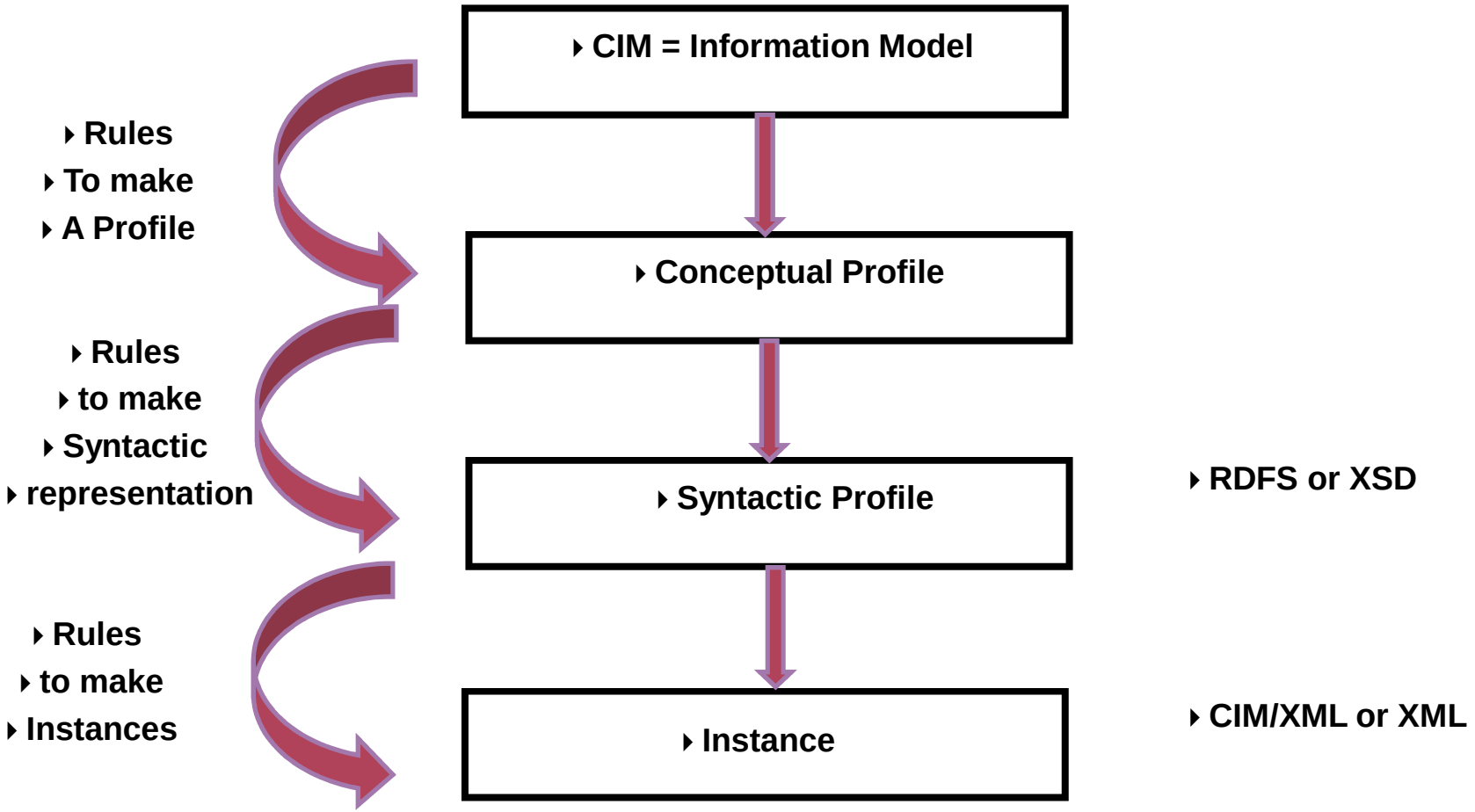
- NA Markets
  - RDF Schema Models for Full and Incremental Exchange for Day Ahead and Real-Time Models
  - XSD Message Profiles for message transactions
- EU Markets
  - XSD Message Profiles for message transactions

Profile Generation Methods

- The rules do not preclude the use of either path shown here and any conflicts are unintentional.
- In the event a rule exists that precludes the use of either path, that rule should be considered invalid and will be removed or revised in future revisions of the standard.



Profiling from Information Model



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Modeling Framework – CIM and Regional Contextual Models

- The Common Information Model (CIM):
  - provides the overall semantic model
  - is the basis on which all information interchange requirements are built independently of the Regional Contextual Model being used.
- The Regional Contextual Models:
  - are built to cover the market information interchange requirements for a given Region (i.e. the Business Context). A Region may be a continent, a specific country or an organization.
  - are based on the CIM artefacts
  - specific regional artefacts themselves cannot contradict the CIM artefacts on which they are built.

Modeling Framework – Document Contextual Models

- Specific contextualised Documents:
  - are derived to apply specific information interchange functional requirements.
  - cannot contradict the Regional Contextual Model on which they are built.
  - may introduce additional constraints to apply specific informational requirements to the context in which the documents are used

Modeling Framework – Final Assembly

- The final step applies standardized assembly rules to provide an optimised information structure for information interchange.
- All syntax specific electronic documents are built from the Assembly Models.
- The final assembly may take one of two forms:
  - RDF Instance Files (aka CIM XML files)
  - XSD XML message files

Questions

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  - Cell: (903) 477-7176