The Standards Based Integration Company

Systems Integration Specialists Company, Inc.

IEC 62325-301
CIM Market Model

CIM University
Austin, Texas
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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
- Profiles
  - RDFS Model Profiles – NA Style Markets
  - XSD Messages using OWL – NA Style Markets
  - XSD Messages using UML – EU Style Markets
- 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)

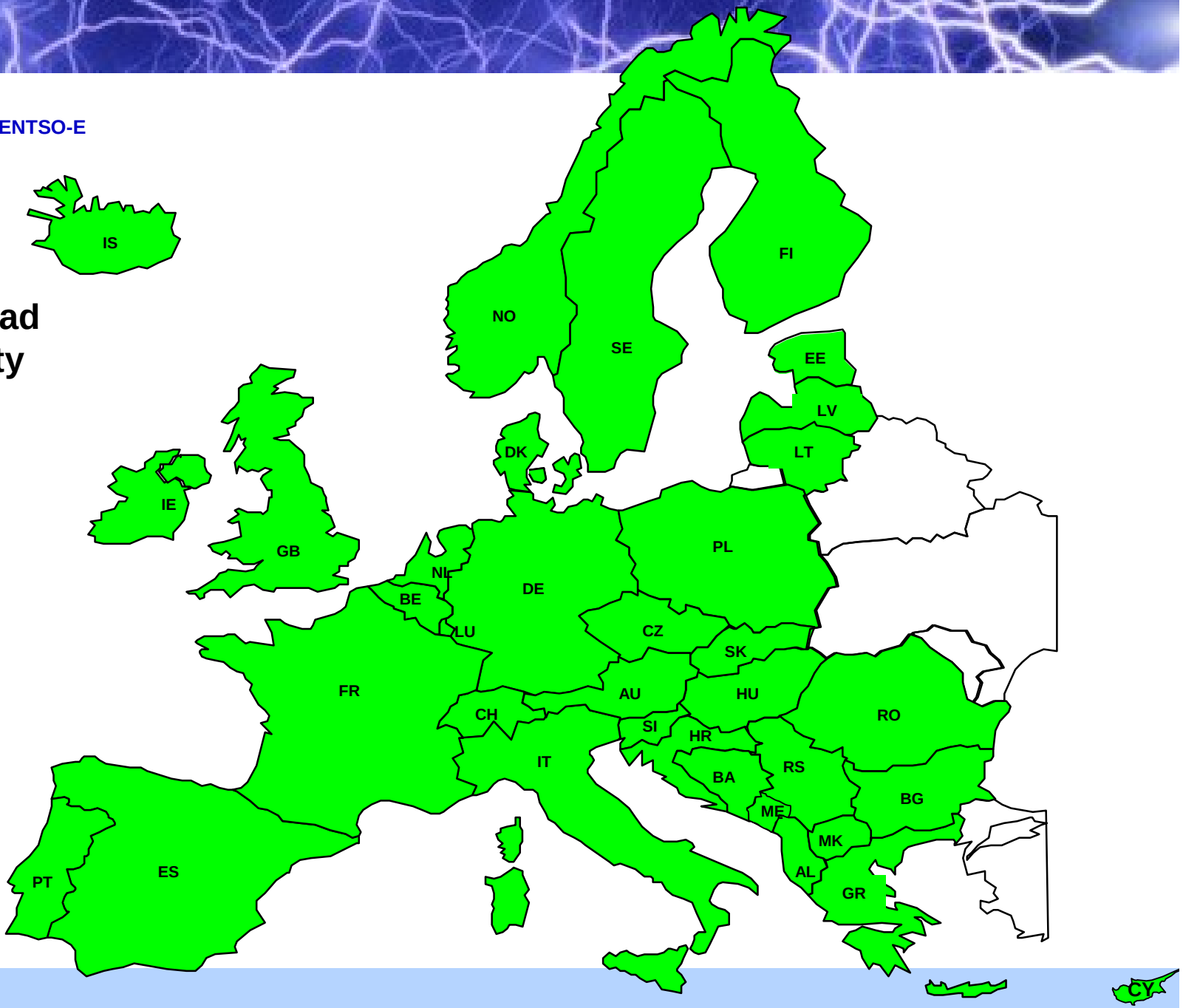
Two Sub-teams formed and working

- 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 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

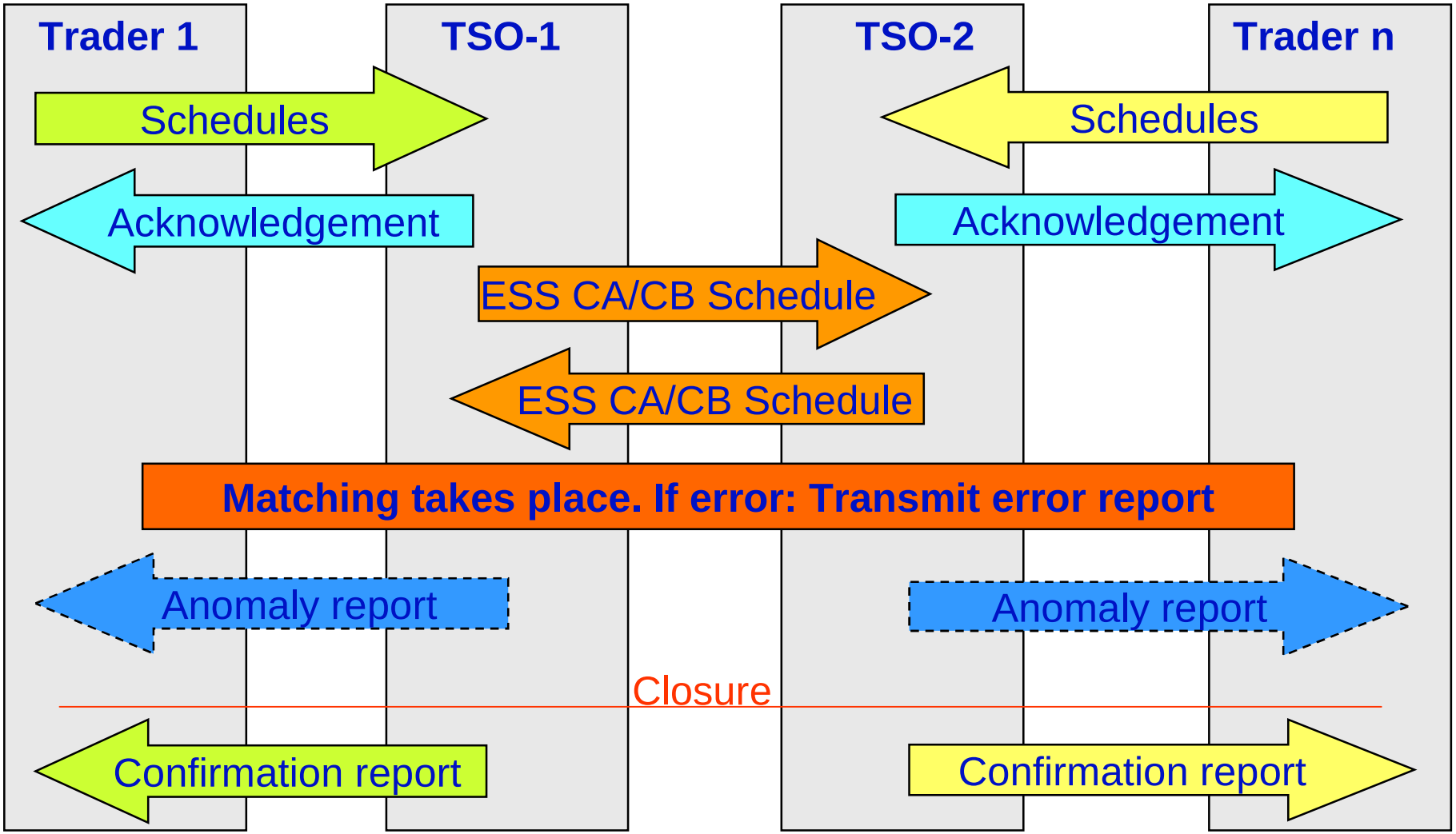
European Style Markets & ENTSO-E
42 TSOs from 34 countries



~540 GW peak load
~900 GW Capacity

**source ENTSO-e 2009

Trader to TSO Interfaces/Communications



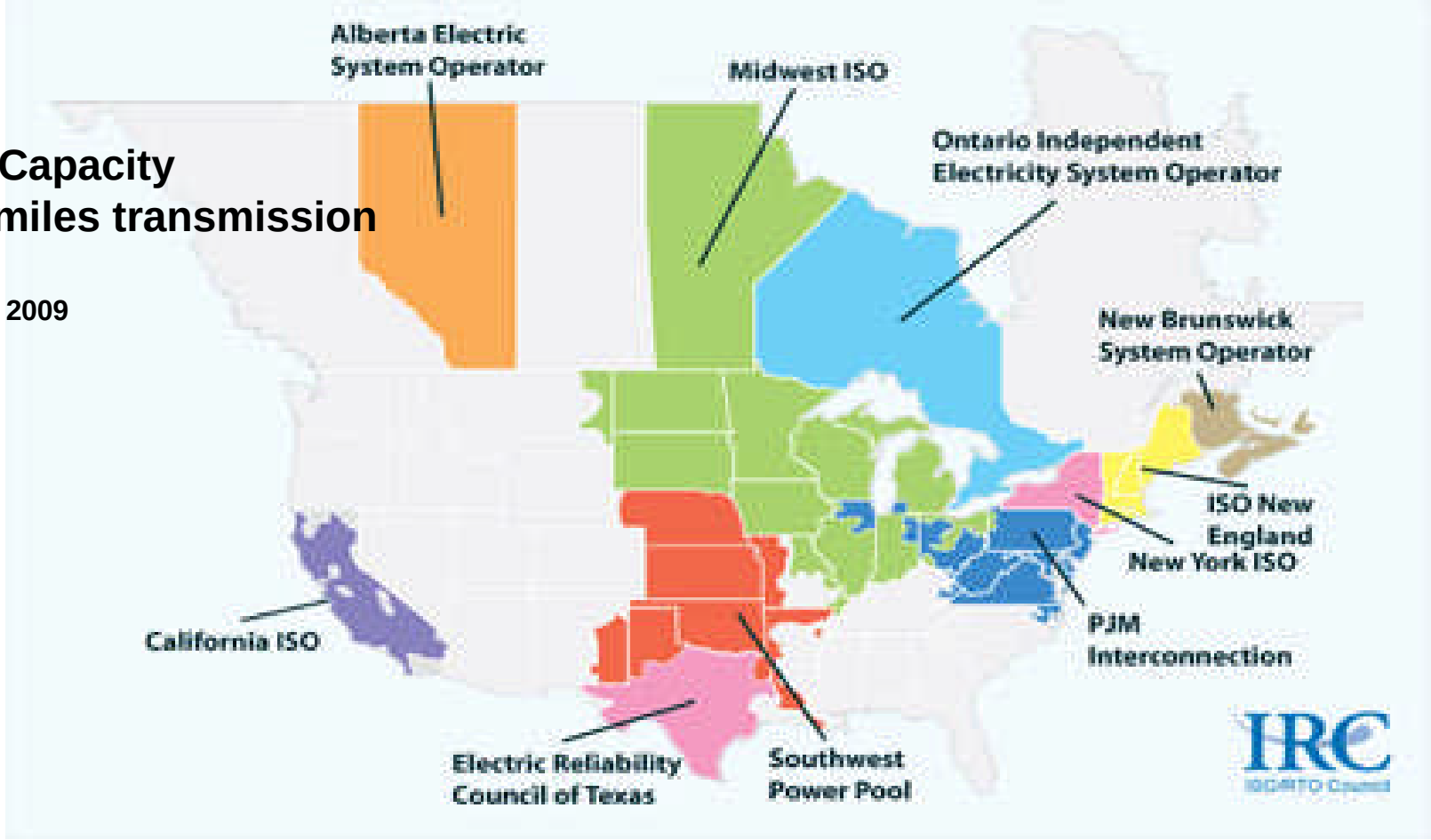
"NA Style" Markets:

- 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

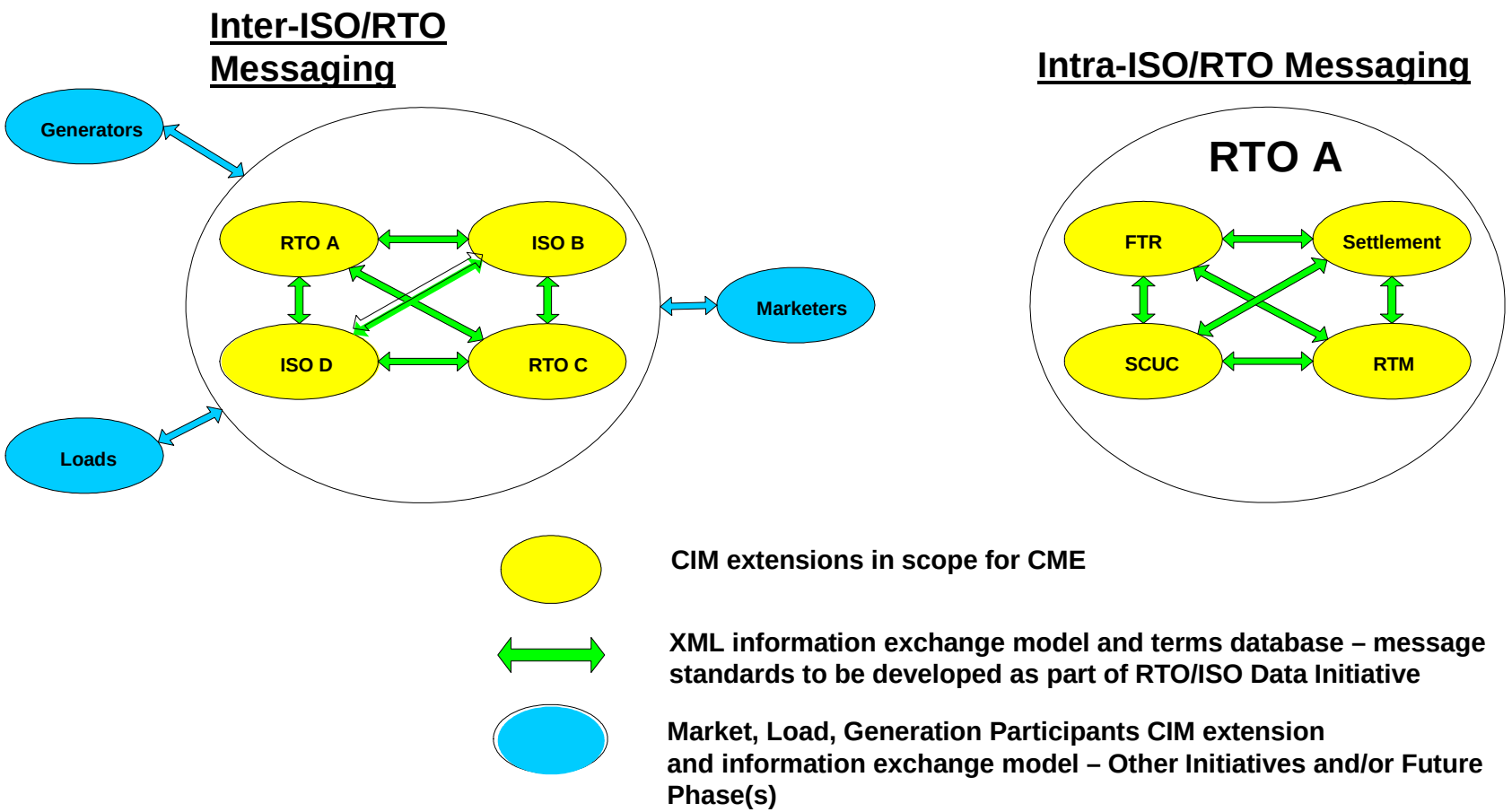
“NA Style” Markets:

662 GW Capacity
278,000 miles transmission

*** Source IRC 2009**



NA Style Market Communications



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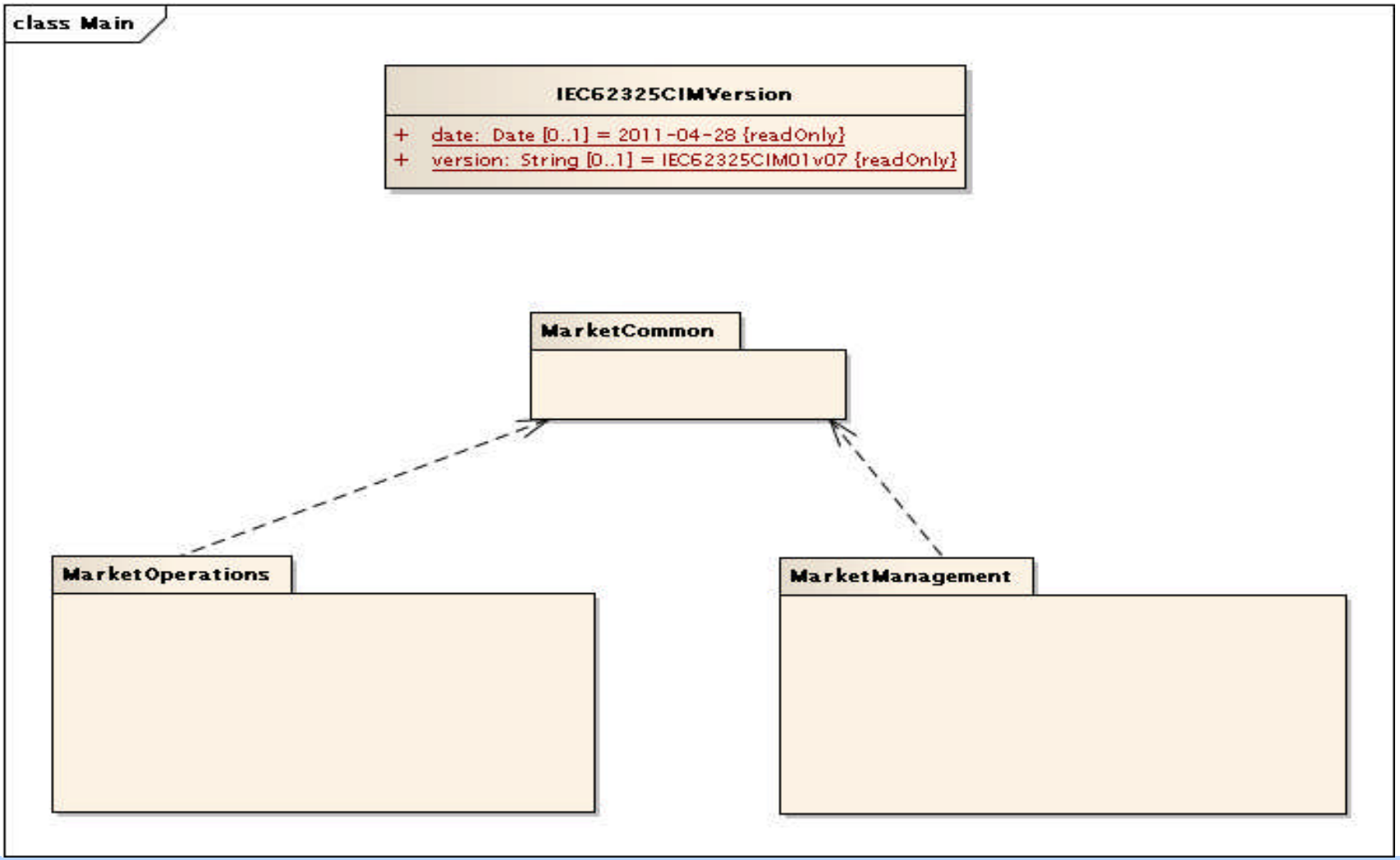
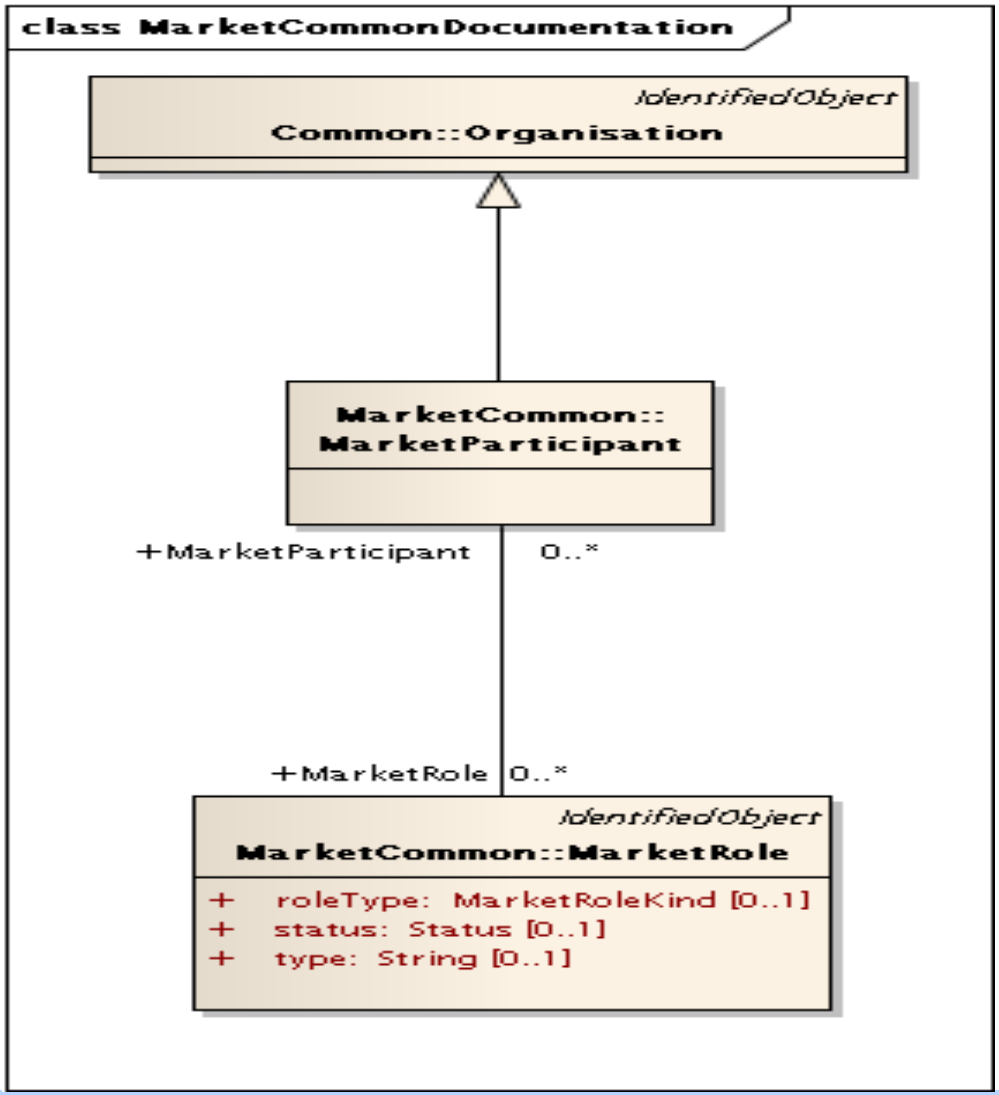
Part 301 – Market Model - Top Level Market Packages



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

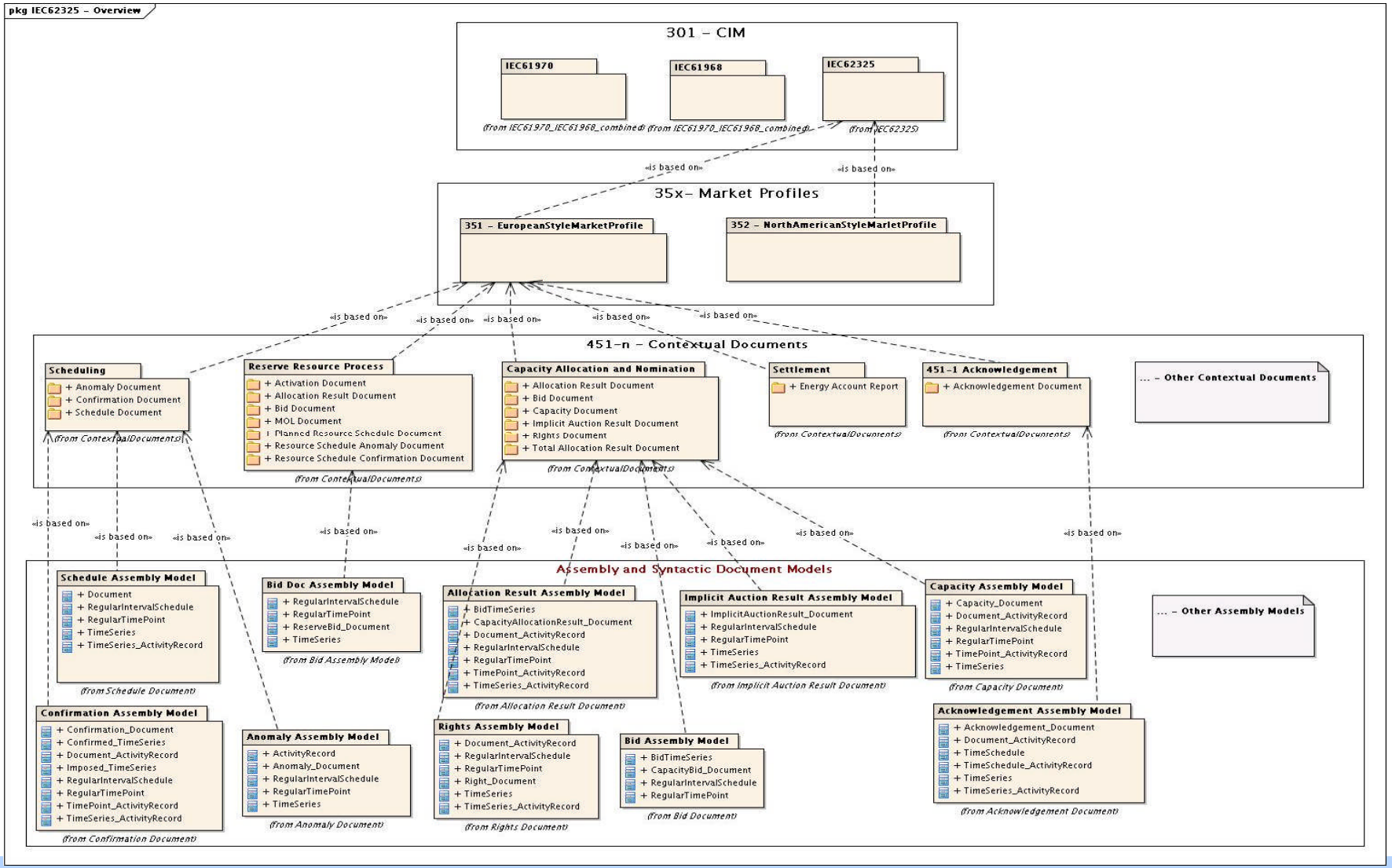
Market Common Package - Overview



Market Management Package

- 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.

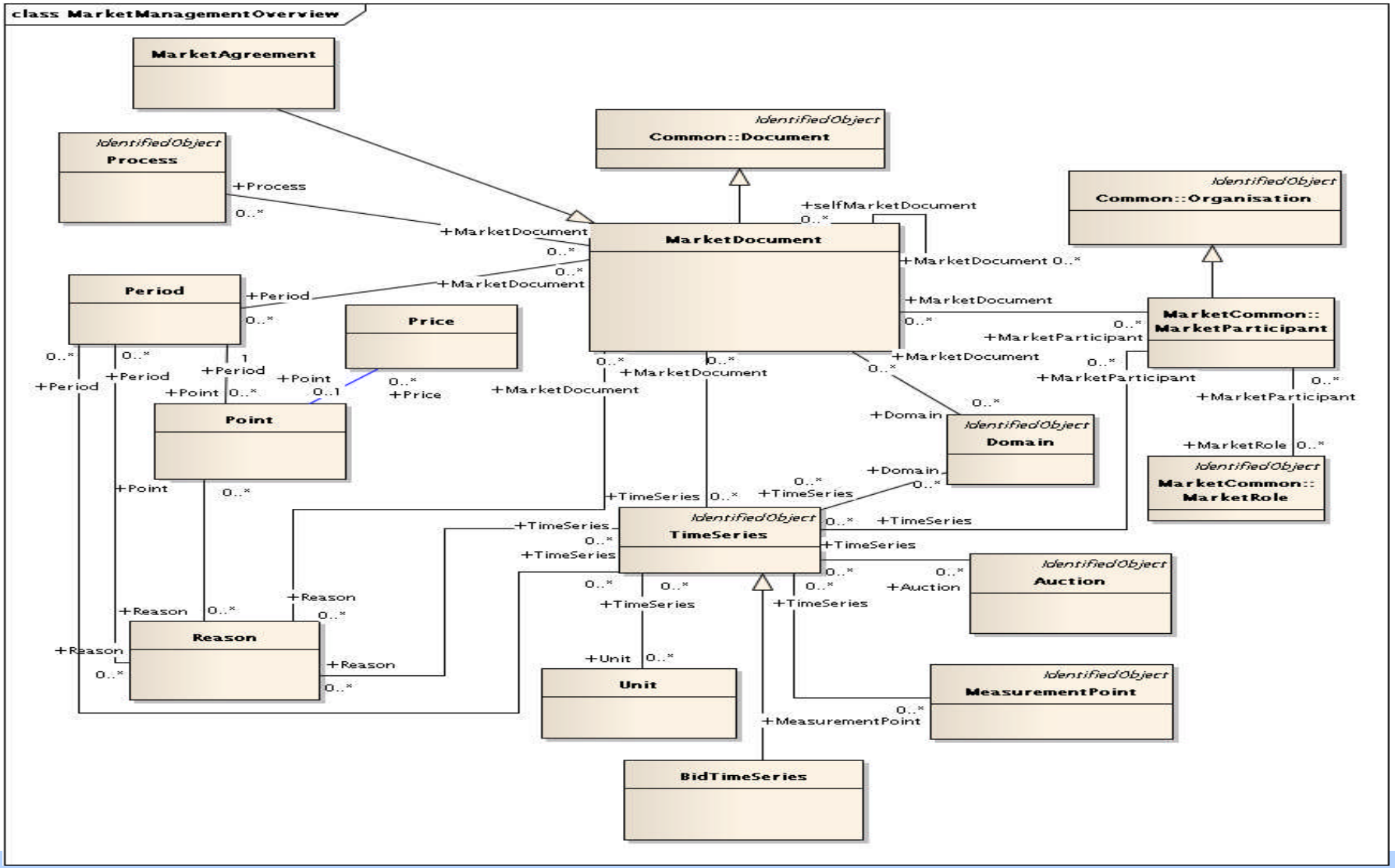
Market Management Modeling Framework



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 Overview

- 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.

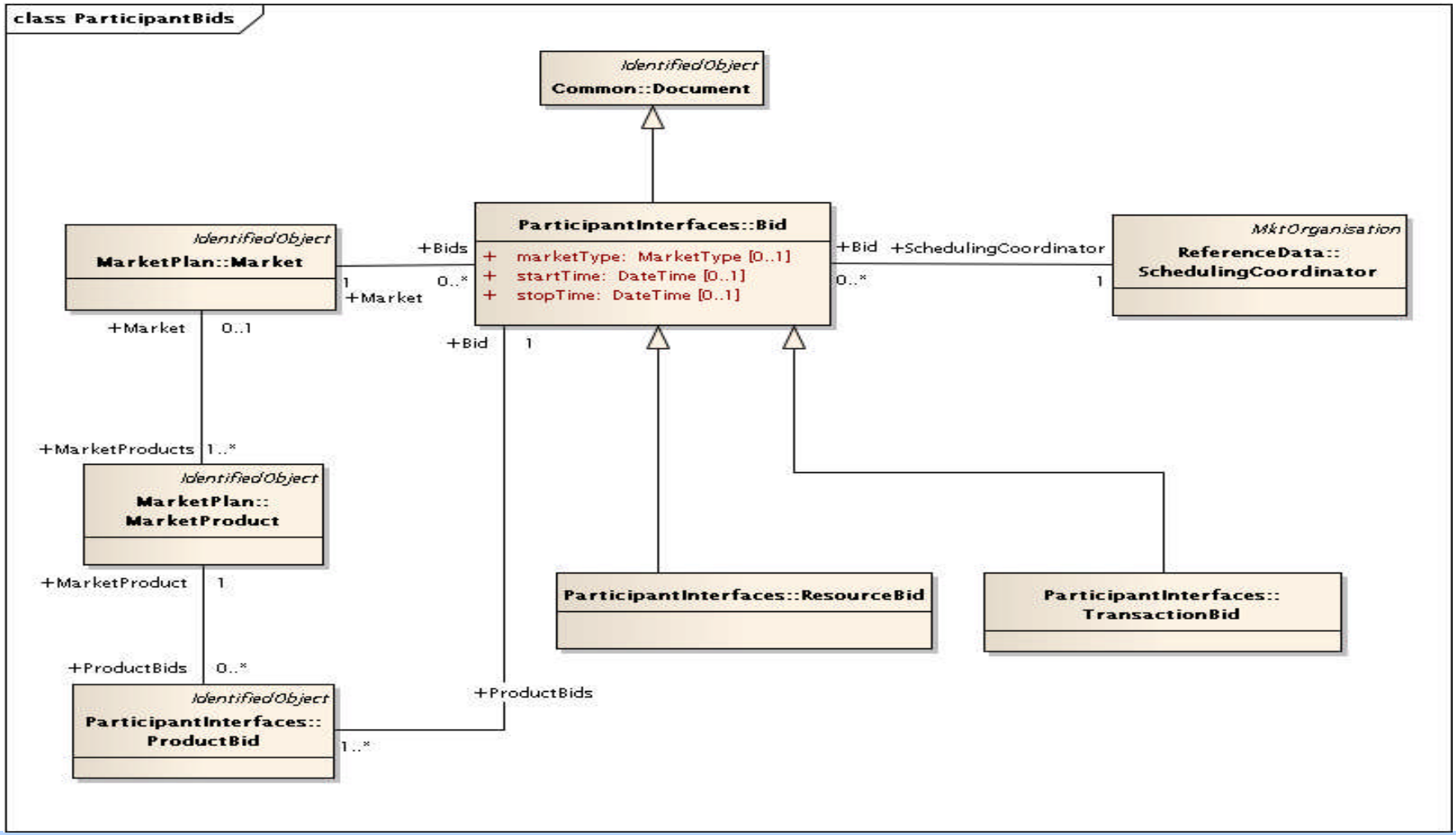
Market Operations Package – Bid Definition

- The bid is a subclass of the document class from the 61968 package.
- 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)

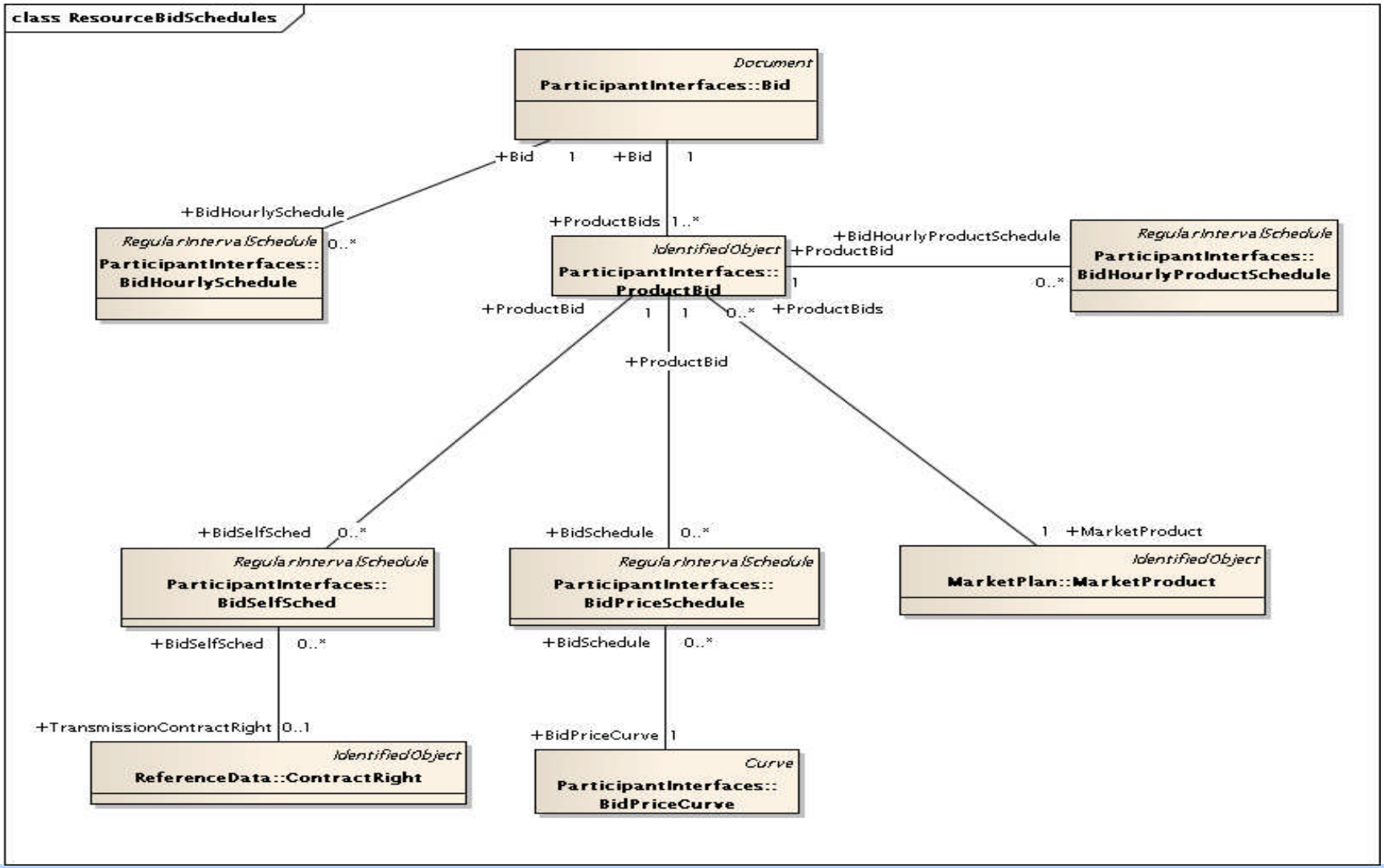
Bid Definition for NA-Style Market



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



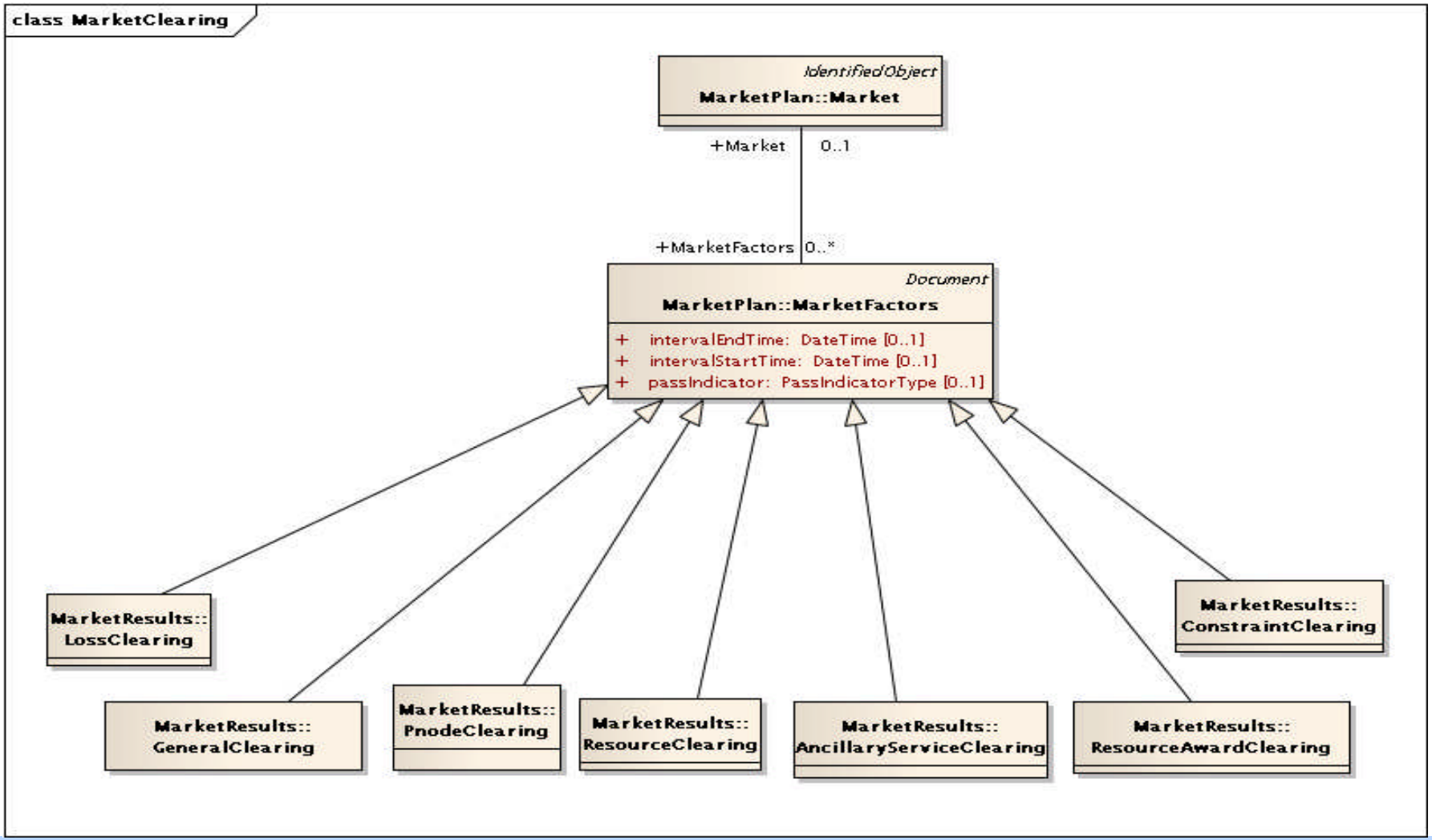
Market Operations Package – Market Clearing

- The major classes used to communicate the results of market clearing run for the NA-Style Market are:
  - The class Market is used to model the type of market (Day Ahead, Real Time, or Intraday).
  - The class MarketFactors is used to model the market time horizon.
  - The class LossClearing is used to model electrical losses during the market horizon.
  - The class GeneralClearing is used to model the identity of the market interval.

Market Operations Package – Market Clearing

- The major classes used to communicate the results of market clearing run for the NA-Style Market Continued:
  - The class PnodeClearing and its associations are used to model the cleared prices (Locational Marginal Prices) of the run.
  - The class ResourceClearing is used to model market clearing results on a resource basis.
  - The class AncillaryServiceClearing is used to model the clearing results for ancillary services on a market region basis.
  - The class ResourceAwardClearing is used to model further details of the resource clearing.
  - The class ConstraintClearing is used to model the exchange of data on constraints which are binding constraints in the optimal market clearing solution.

Market Clearing for NA-Style Market



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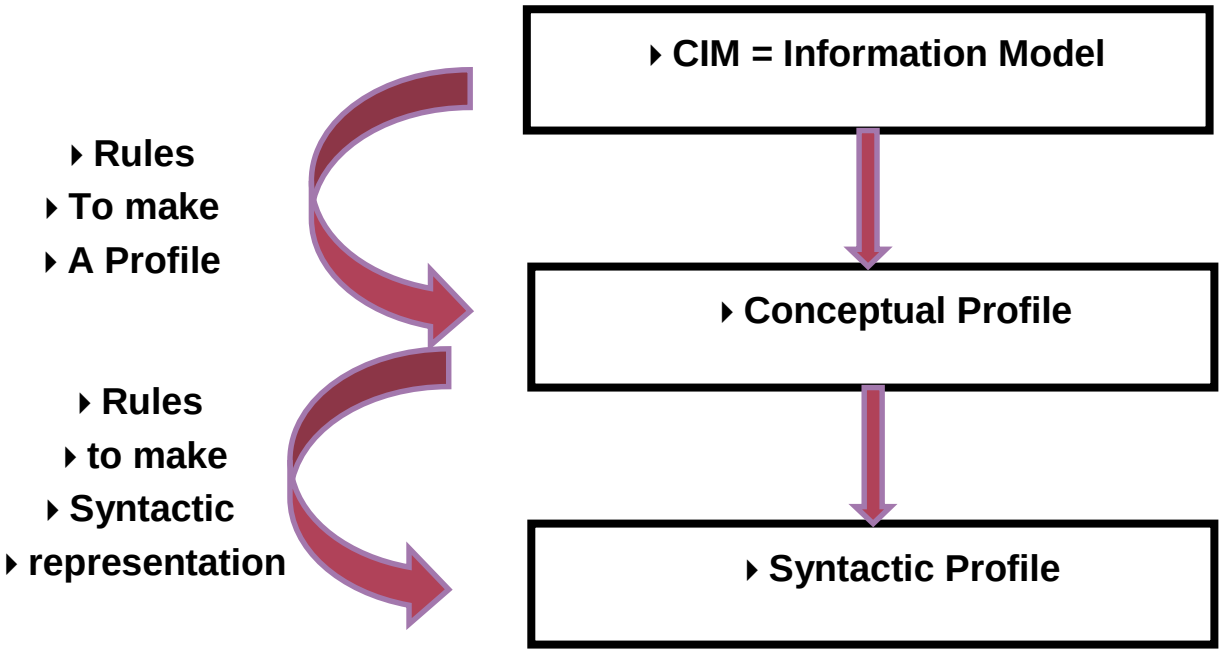
Profiling from Information Model



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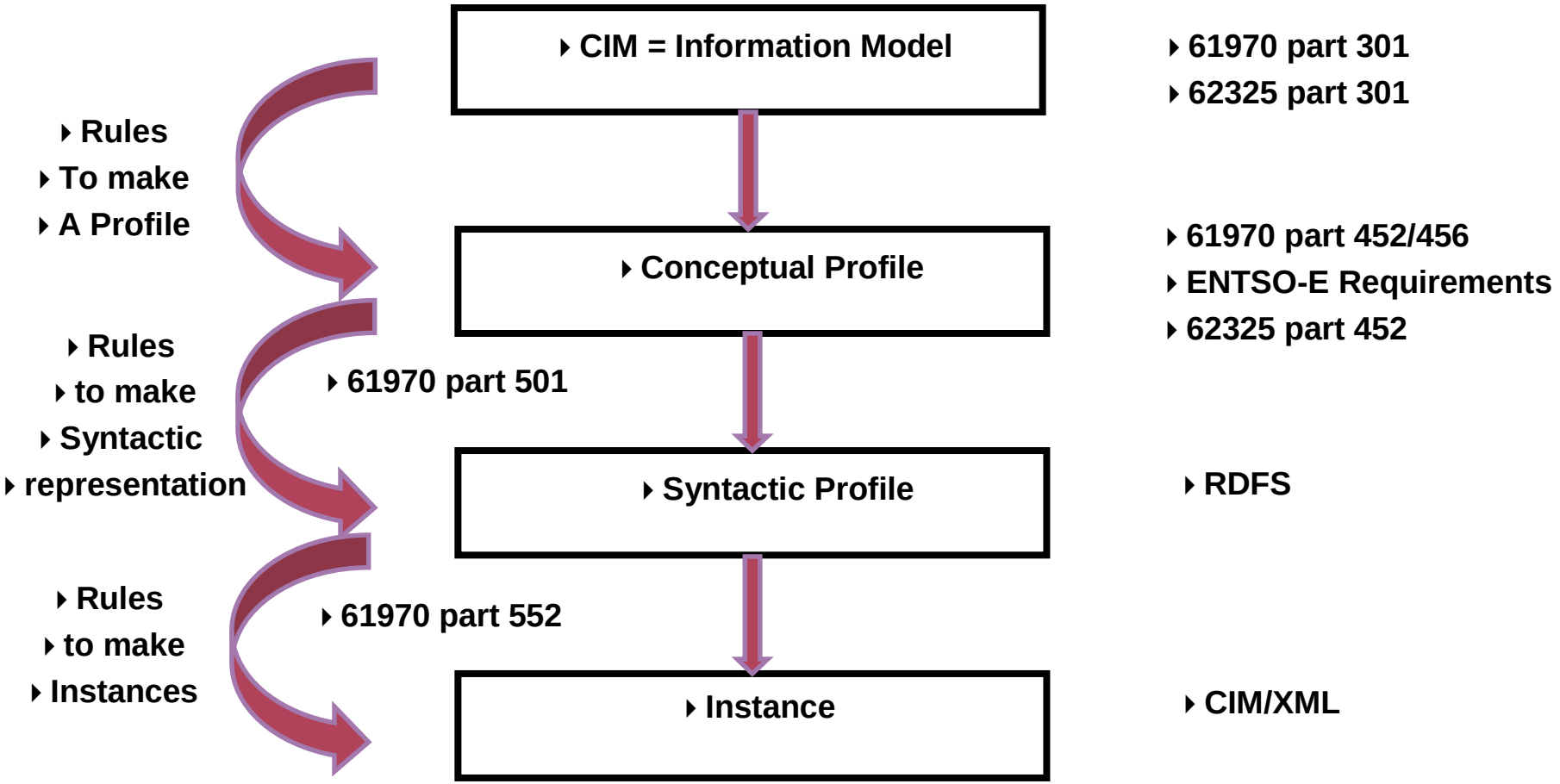
WG16 RDFS Model for Full and Incremental Exchange – Used for NA-Style Day Ahead and Real-Time Models



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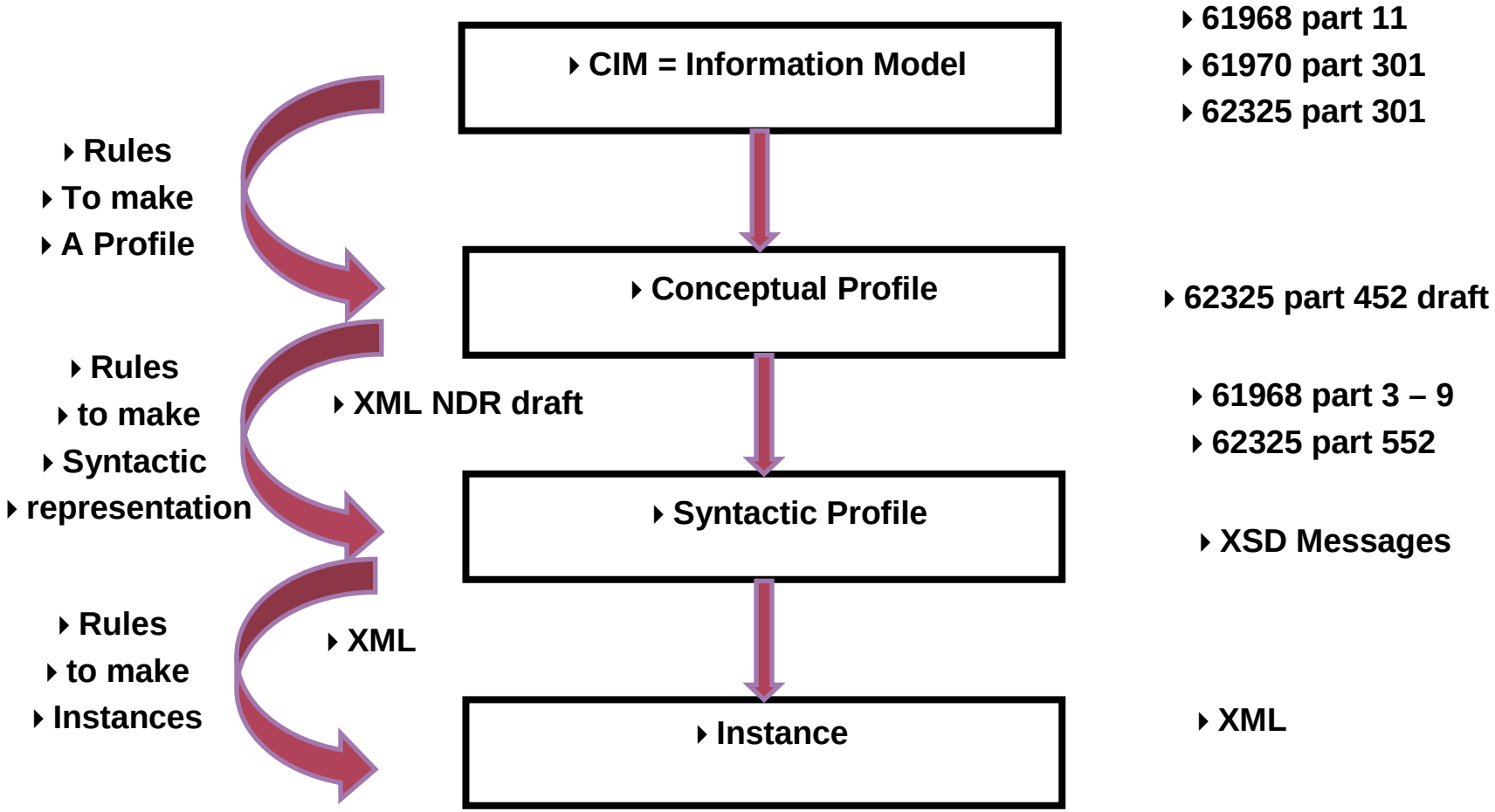
WG16 XSD Message Profiles for the NA-Style Market
Used for all NA-Style Market Messages



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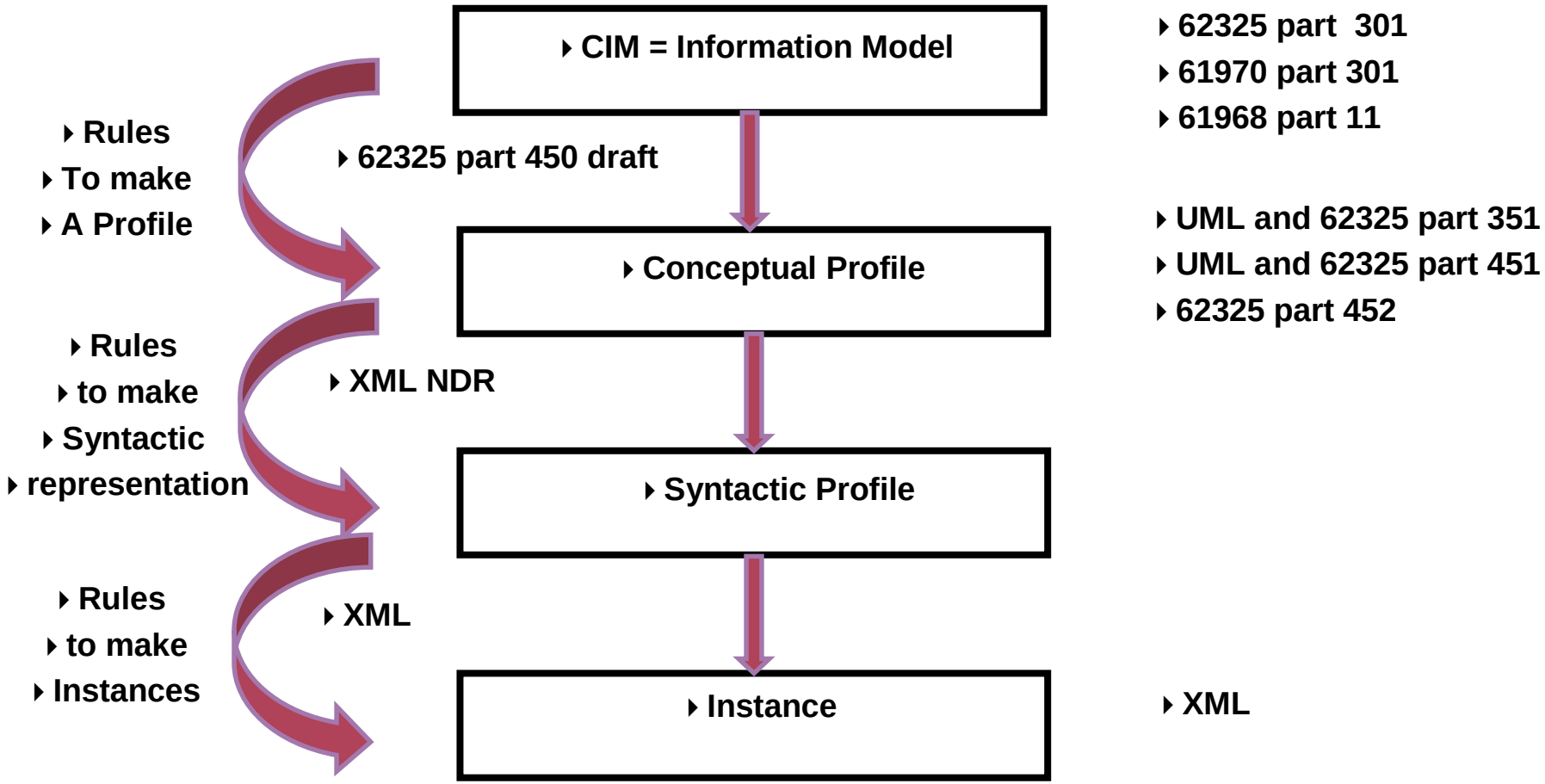
WG16 XSD Message Profiles for the EU-Style Market
Used for all EU-Style Market Messages



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Questions

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- Or call:
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