

EW Solutions



Industry Data Models for Data Warehousing and Business Intelligence

To purchase these models please email:
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Strategic Partner & Systems Integrator
Intelligent Business IntelligenceSM



EWSolutions' Background

EWSolutions is a Chicago-headquartered strategic partner and full life-cycle systems integrator providing both **award winning** strategic consulting and **full-service implementation services**. This combination affords our clients a full range of services for any size enterprise information management, managed meta data environment, and/or data warehouse/business intelligence initiative. Our notable client projects have been featured in the Chicago Tribune, Federal Computer Weekly, Crain's Chicago Business, and won the 2004 Intelligent Enterprise's RealWare award, 2007 Excellence in Information Integrity Award nomination and DM Review's 2005 World Class Solutions award.



2007 Excellence in Information Integrity Award Nomination



Best Business Intelligence Application Information Integration

Client: Department of Defense



World Class Solutions Award Data Management

For more information on our Strategic Consulting Services, Implementation Services, or World-Class Training, call toll free at 866.EWS.1100, 866.397.1100, main number 630.920.0005 or email us at Info@EWSolutions.com

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EW Solutions' Partial Client List

Arizona Supreme Court
Bank of Montreal
BankUnited
Basic American Foods
Becton, Dickinson and Company
Blue Cross Blue Shield companies
Branch Banking & Trust (BB&T)
British Petroleum (BP)
California DMV
College Board
Corning Cable Systems
Countrywide Financial
Defense Logistics Agency (DLA)
Delta Dental
Department of Defense (DoD)
Driehaus Capital Management
Eli Lilly and Company
Federal Aviation Administration
Federal Bureau of Investigation (FBI)
Fidelity Information Services

Ford Motor Company
GlaxoSmithKline
Harris Bank
The Hartford
Harvard Pilgrim HealthCare
Health Care Services Corporation
Hewitt Associates
HP (Hewlett-Packard)
Information Resources Inc.
International Paper
Janus Mutual Funds
Johnson Controls
Key Bank
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Loyola Medical Center
Manulife Financial
Mayo Clinic
Microsoft
National City Bank
Nationwide

Neighborhood Health Plan
NORC
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SunTrust Bank
Target Corporation
The Regence Group
Thomson Multimedia (RCA)
United Health Group
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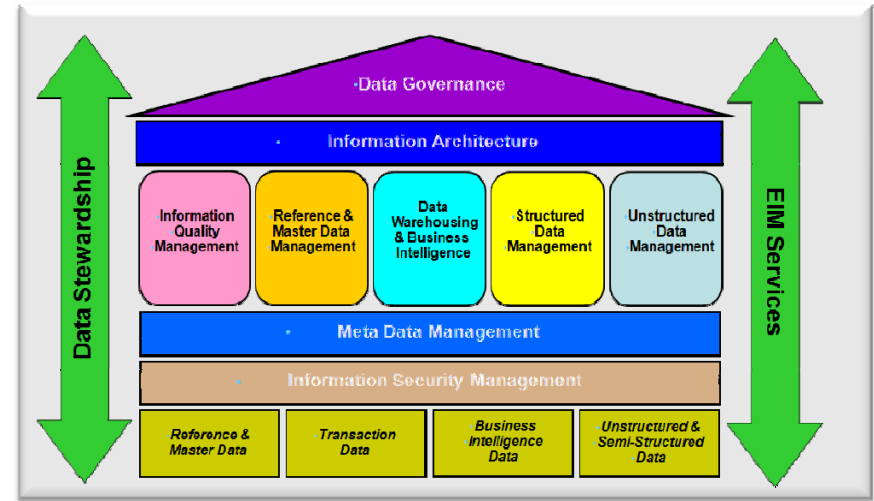
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EWSolutions' Background

- Strategic Consulting and Systems Integration
 - Data Warehousing / Business Intelligence (DW/BI)
 - Managed Meta Data Environment (MME)
 - Enterprise Information Management (EIM)
- M3sm and I3sm Methodologies for MME and DW/BI
 - Strategy, Design, Build, Deploy, and Sustain
- Success Driven
 - BP - Nominated for Helios award
 - HP – Internalized EWSolutions' M3sm methodology
 - FBI (IDW 2.0) – IC Meritorious Service Award
 - DoD (DMDRA) – Intelligent Enterprise RealWare Award; and DM Review: World Class Solution Award, Data Management
- Expertise and Thought Leadership
 - EWSolutions' consultants have published several landmark books and over 300 articles in industry trade magazines
 - Quarterly electronic newsletter Real-World Decision Support
 - Founding Member of EIMInstitute.org



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EW Solutions' Clients

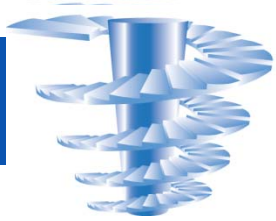


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Corning Cable Systems
Countrywide Financial
Defense Logistics Agency (DLA)
Delta Dental
Department of Defense (DoD)
Driehaus Capital Management
Eli Lilly and Company
Federal Aviation Administration
Federal Bureau of Investigation (FBI)
Fidelity Information Services

Ford Motor Company
GlaxoSmithKline
Harris Bank
The Hartford
Harvard Pilgrim HealthCare
Health Care Services Corporation
Hewitt Associates
HP (Hewlett-Packard)
Information Resources Inc.
International Paper
Janus Mutual Funds
Johnson Controls
Key Bank
LiquidNet
Loyola Medical Center
Manulife Financial
Mayo Clinic
Microsoft
National City Bank
Nationwide

Neighborhood Health Plan
NORC
Physicians Mutual Insurance
Pillsbury
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Sallie Mae
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Secretary of Defense/Logistics
South Orange County Community College
SunTrust Bank
Target Corporation
The Regence Group
Thomson Multimedia (RCA)
United Health Group
United States Air Force
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EW Solutions' Industry Data Models

- EWSolutions has leveraged many years of experience in data warehousing, data modeling, and vertical industries to produce industry models which can form the basis of scalable, extensible, and robust data warehouses for organizations of any size
- EWSolutions' consultants average over 15 years of experience and all have worked on multiple data warehouse implementations
- EWSolutions produces a quarterly newsletter about Data Warehousing / Business Intelligence and other information topics called "Real World Decision Support". Founding member of the "Enterprise Information Management Institute (EIMI.ORG)"
- EWSolution's has developed the I3sm data warehousing methodology which can be leveraged for more rapid and successful data warehouse development.



EW Solutions Industry Data Models

- EWSolutions recognizes that data modeling is an iterative process and follows a proven modeling paradigm of developing multiple levels of data models in order to align the data warehouse with the business
- This paradigm is reflected in the set of models produced for each industry
- This paradigm also enables more rapid adaptation for client requirements because of the business emphasis of the models

**The business is modeled before the solution
(data warehouse & data marts)!**



EW Solutions Industry Data Models

- Industry standards are leverage when possible to help aid adoption and standardization
- For example, HL7 utilized for healthcare models
- NIEM, GJXDM used for law enforcement
- However, these are data exchange formats – not standards for persistent data stores.
- EWSolutions modeling standards utilizes the ISO11179 standard for naming and definitions, in addition to best practices culled from many years of data modeling experience.



EW Solutions Industry Data Models

➤ Industries included:

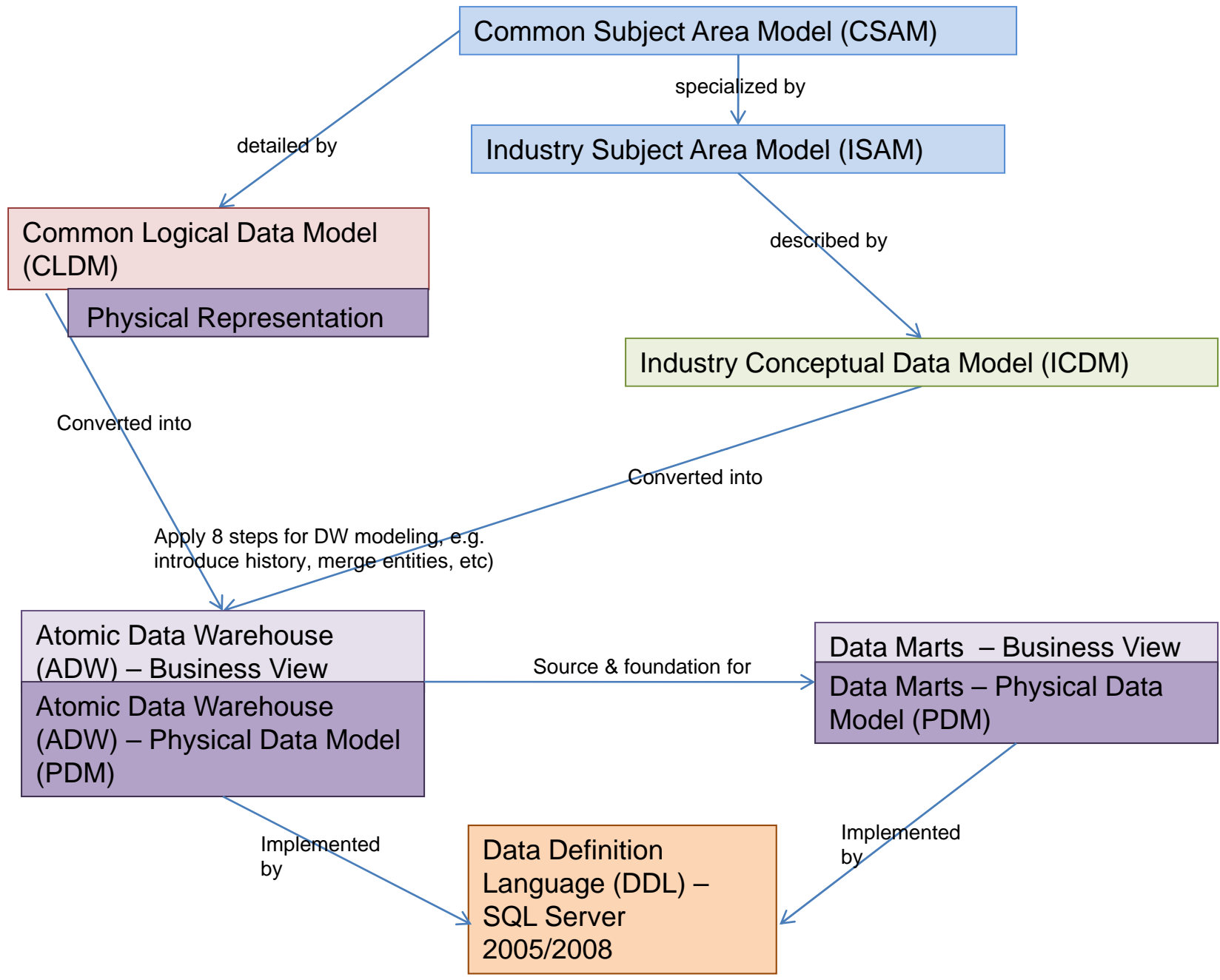
- ✓ Funds Investment (completed)
- ✓ Healthcare (completed)
- ✓ Law Enforcement (completed)
- ✓ Insurance (in process)
- ✓ Banking (in process)
- ✓ Retail (in process)
- ✓ Education (in process)
- ✓ Logistics (in process)



EW Solutions Industry Data Models

The following data models are components of EWSolutions' Industry Data Modeling process for developing an Atomic Data Warehouse (industry neutral – where possible), and industry specific dimensional Data Marts (relational, star schema)

- 1. Common Subject Area Model (CSAM)**
- 2. Industry Subject Area Model (ISAM)**
- 3. Industry Conceptual Data Model (ICDM)**
- 4. Common Logical Data Model (CLDM)**
- 5. Atomic Data Warehouse (ADW)**
- 6. Industry specific Data Mart**





EW Solutions Industry Models

Why develop all these models???

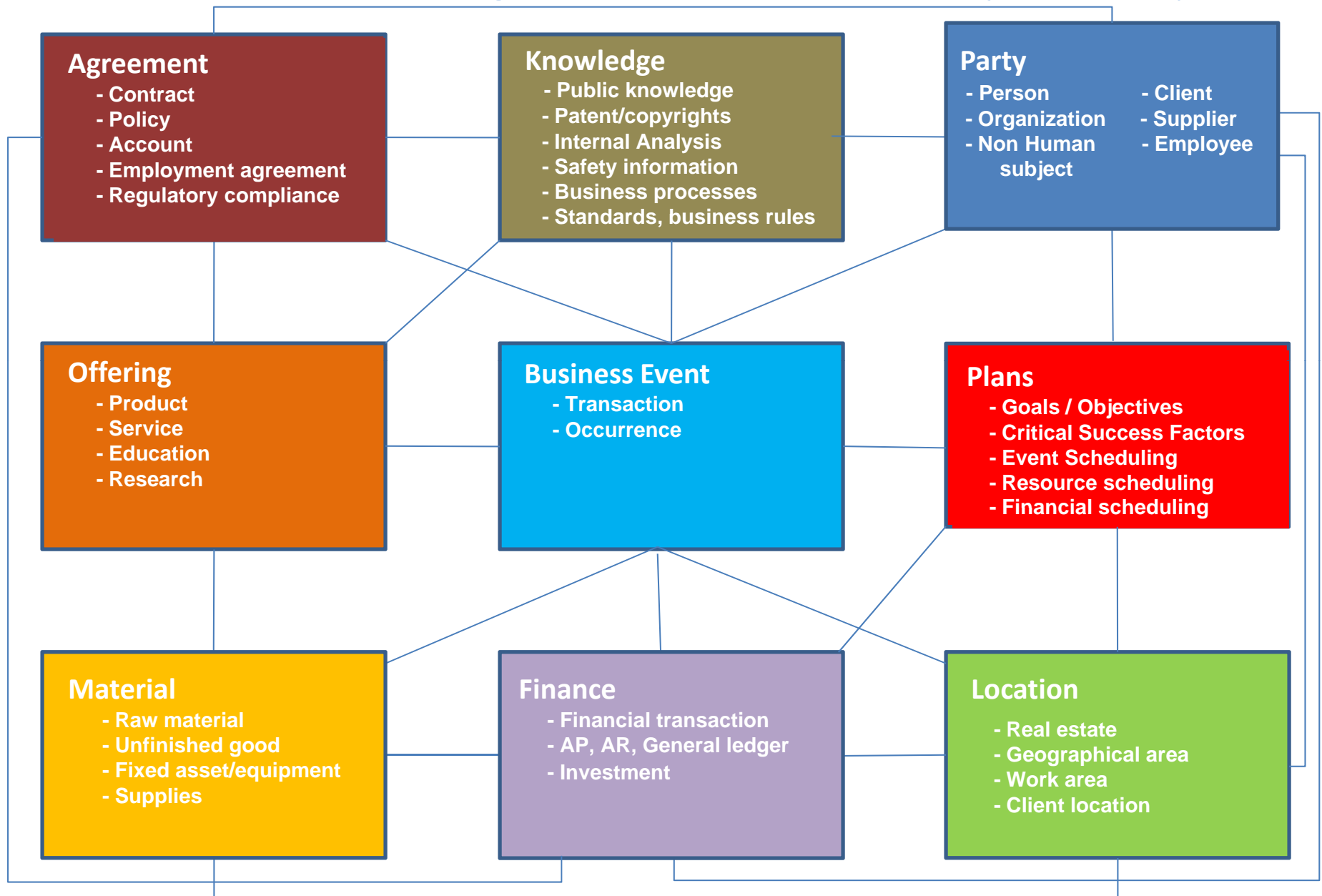
- Improve opportunities for reuse of data objects and analysis
- Framework for faster incorporation of additional industries / subject areas into the ADW – employing common entities where possible
- Improved model (and resulting data) quality – models build on each other. Best practice for data modeling – hierarchy of models (less detail to more detail), developed iteratively
- Enable faster adaptation to client requirements - high level models compare against client requirements and are adapted as necessary



Common Subject Area Model (CSAM)

- Common Subject Area Model (CSAM) applicable to nearly all industries
- The Subject Area Model (SAM) is the highest level enterprise data model and should be developed first
- Delineates (decomposes) the enterprise by key subject areas for modeling prioritization, model organization, and data governance
- Subject orientation (vs process orientation) critical component of enterprise models for normalization and reuse (data defined once, stored once) to improve data quality and usability

Common Subject Area Model (CSAM)

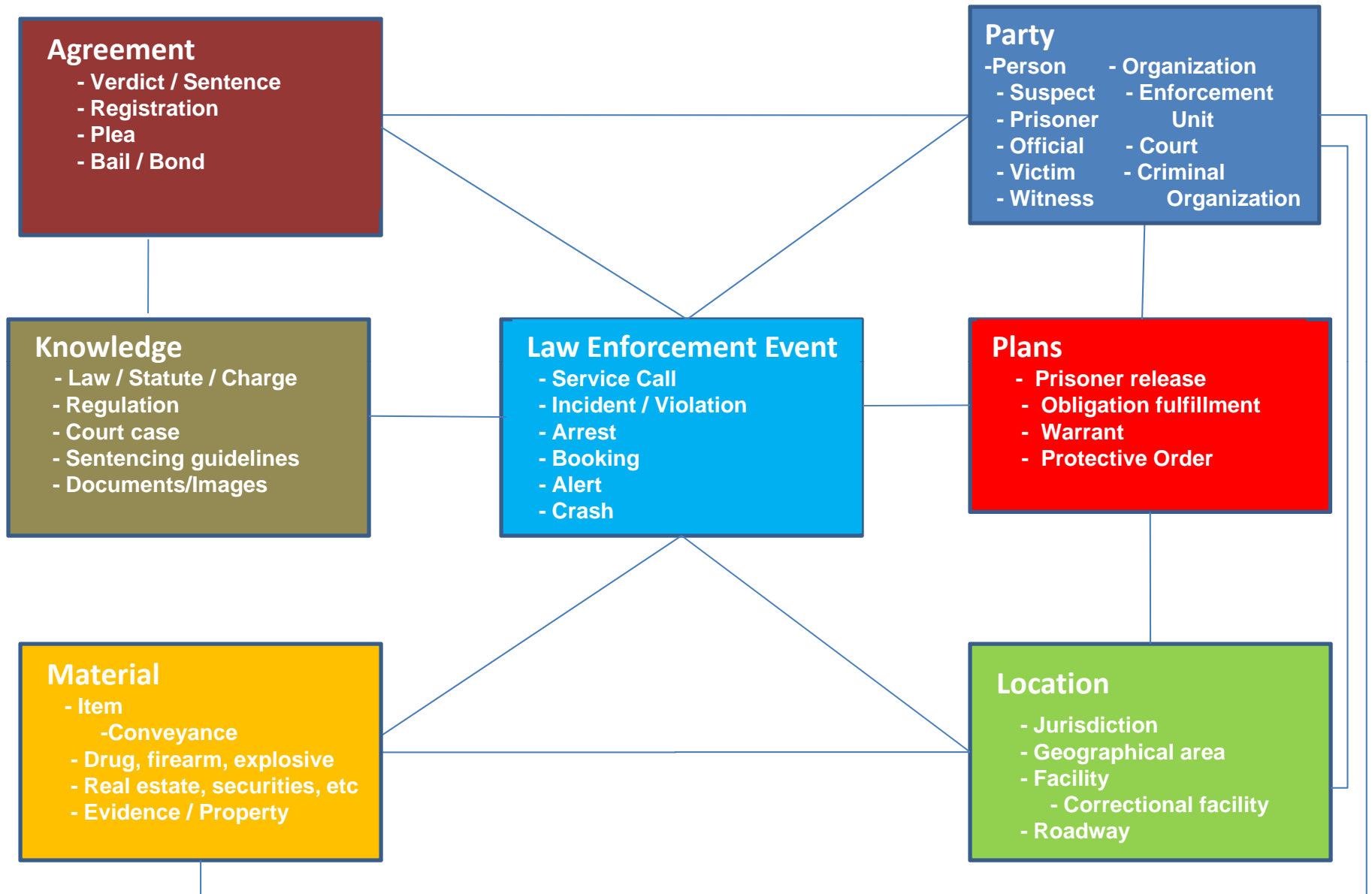




Industry Subject Area Model (ISAM)

- **Decomposes/delineates a specific industry into key subject areas using industry appropriate naming**
- Can be extended, tailored as necessary at client site
- Helps the enterprise arrive at common terms for high profile subject areas

EW Solutions' Law Enforcement ISAM





Industry Conceptual Data Model (ICDM)

“A data model that represents an abstract view of the real world. A conceptual model represents the human understanding of a system.... A conceptual data model describes how relevant information is structured in the natural world. In other words, it is how the human mind is accustomed to thinking of the information.”

OECD Glossary of Statistical Terms



Note: Abstract here doesn't mean the abstract entities which are required for logical/physical modeling. CDM should model the business and entities should be recognizable by the business in most cases



ICDM

- **A Business model, from a data (what) versus a process (how) perspective**
- Is independent of application, technology, AND business unit (i.e. enterprise focus)
- Modeled as an ERD – consists of entities and relationships (business rules). Relationships take a longitudinal perspective as is appropriate for a persistent data store
- To develop downstream, implementation models – must understand the business first
- Downstream model quality and data quality affected if relationships incorrectly identified

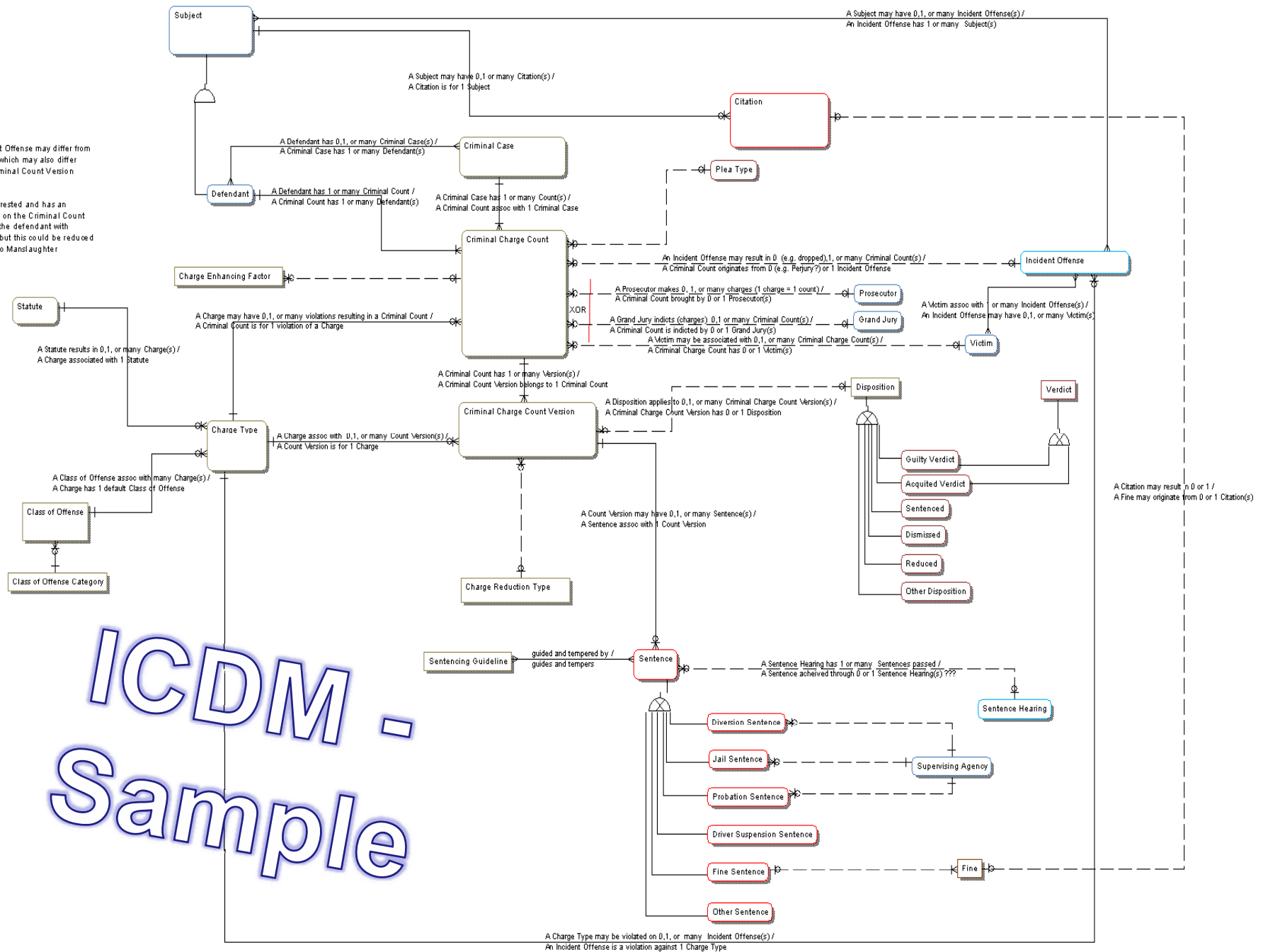


ICDM

- At the client site, the ICDM will **facilitate communication with the business** – not starting at ground zero
- Needs to be adapted, extended, tailored for the client, and finally reviewed and approved (ideally by a Data Governance Council)
- Entity outline color aligns to the color of the subject area – this aids understandability and helps to find where the entity is fully defined in the ICDM (*an entity may be included in multiple diagrams*)...
- For Law Enforcement, initial emphasis is on the lifecycle of a charge from the Service Call (e.g. 911) through to Sentencing in order to support Key Performance Indicators (KPI)
- ***E.g. how many Incident Offenses result in convictions***

The Charge on the Incident Offense may differ from the Charge on the Count, which may also differ from the Charge on the Criminal Count Version (except for the 1st Version)

For example, a subject is arrested and has an Incident Offense of Murder, on the Criminal Count the prosecutor may charge the defendant with Aggravated Manslaughter, but this could be reduced in Criminal Count Version to Manslaughter



ICDM - Sample

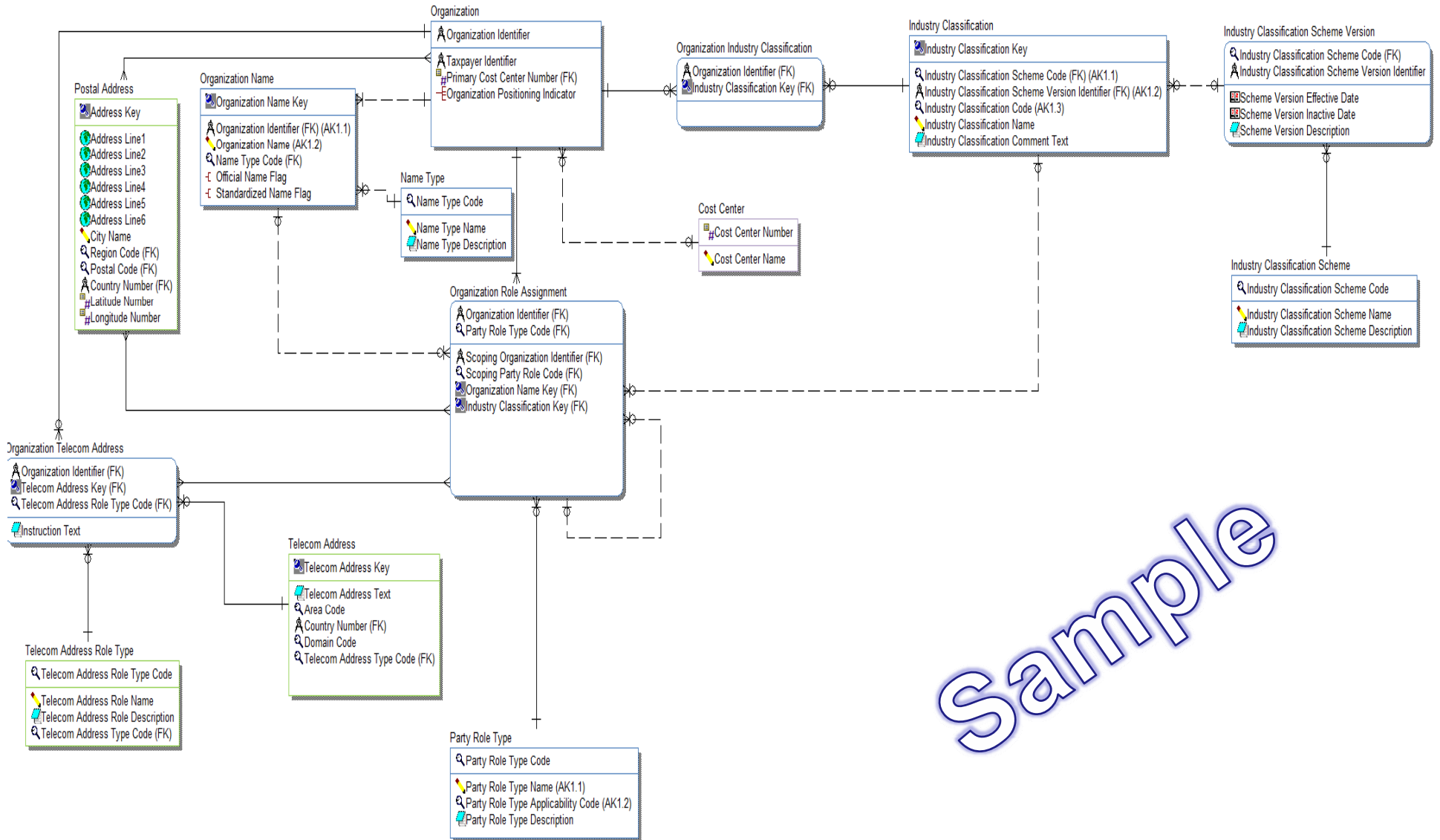


Common Logical Data Model (CLDM)

- Defines data entities that are common to most industries, e.g. Person, Organization, Product, Location
- Specialization according to industry usage is performed in the ADW model, if needed
- Also has a physical representation for datatype, length, nullability, etc.
- Normalized (3NF), however, contains some many to many relationships and subtype relationships for simplicity and understandability



Common Logical Data Model (CLDM)

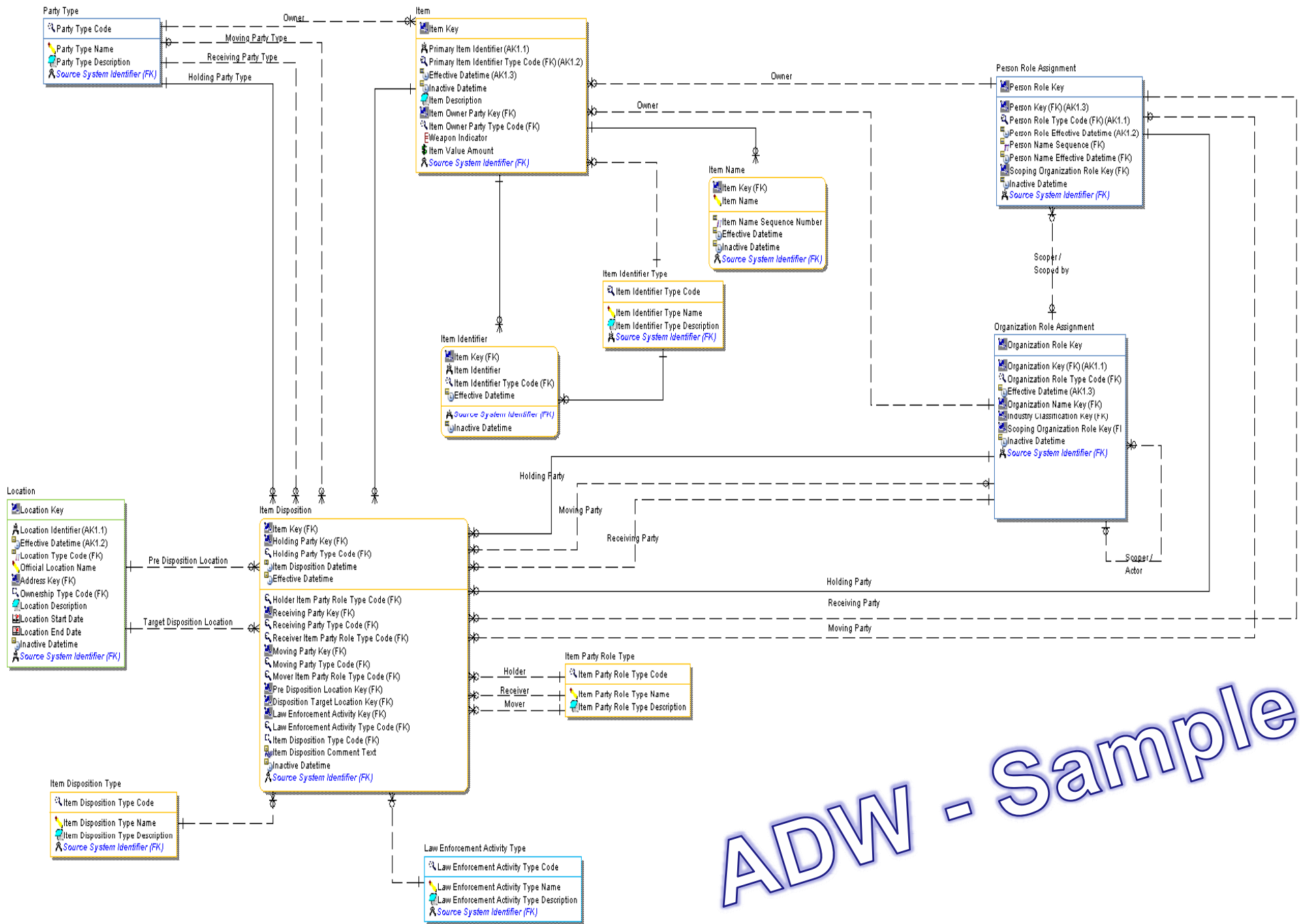


Sample



Atomic Data Warehouse (ADW)

- The Atomic Data Warehouse is the central hub in which cleansed, standardized, and integrated data is stored in a mostly 3NF format (non-decomposable, non-redundant)
- Sole source for dependant, dimensional Data Marts
- Logical and physical representations
- Many to many relationships, subtype relationships resolved
- Nearly every table has record versioning in place (except for very small, static tables) – “Effective Datetime” is part of the key (primary or alternate) to facilitate versioning
- Surrogate keys are used heavily for simplicity, ease of use, and performance
- Whenever a surrogate key is used – an alternate key(s) (AK) are used to identify the natural key(s)

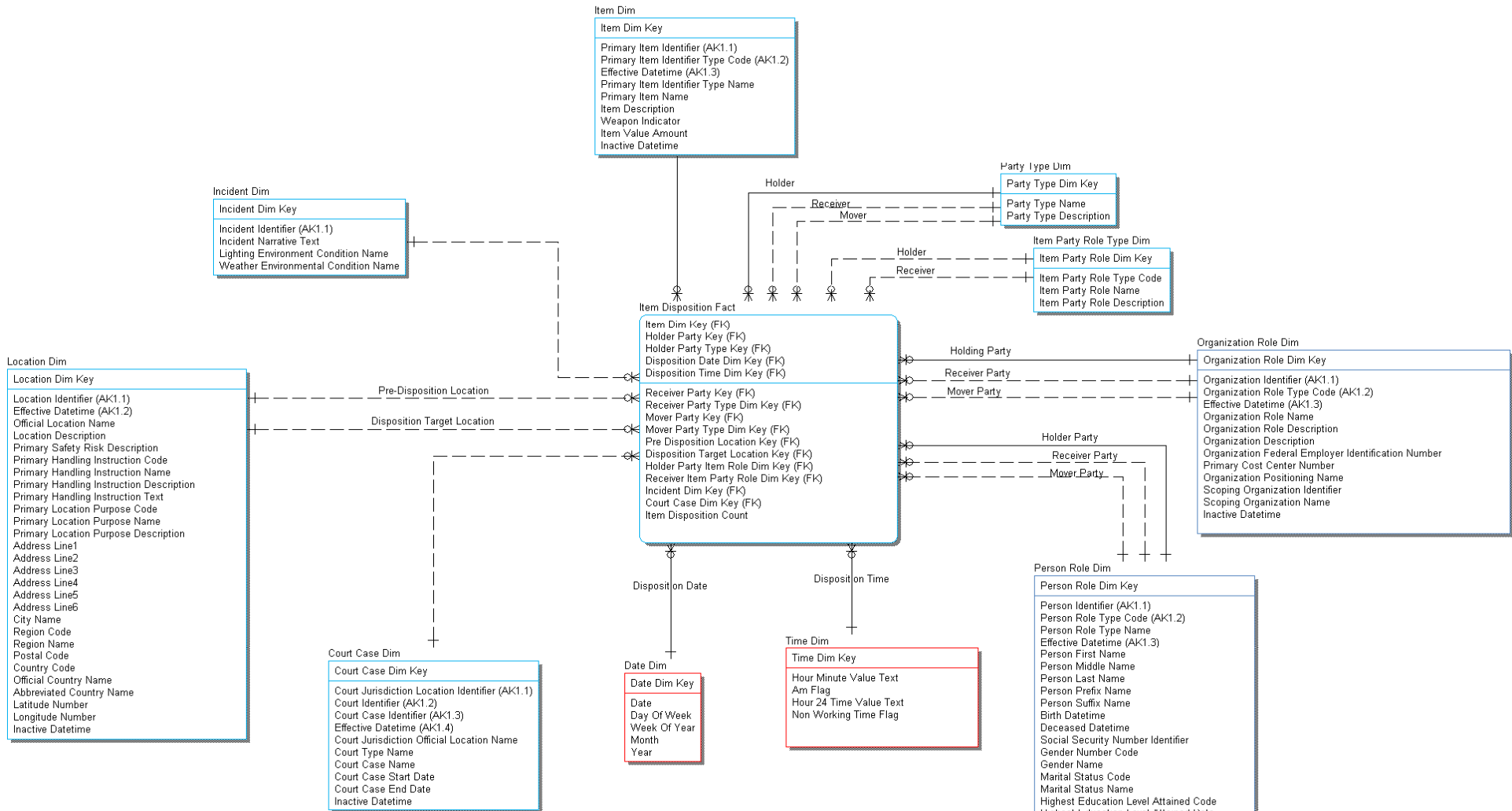


ADW - Sample



Law Enforcement Data Mart

- ❑ Dimensional model suited to high performance analytics and reporting on large volumes of data
- ❑ Utilizes conformed dimensions to enable drill-across from one analysis area to another
- ❑ Designed to support KPI's that many Law Enforcement agencies are interested in measuring
- ❑ Highly denormalized for query performance and ease of use
- ❑ Source for SQL Server Analysis Services (SSAS) (or other) cube builds
- ❑ Can be part of an SSAS HOLAP solution – highly summarized and aggregated information stored in a SSAS MOLAP cube – detailed information available for analysis using ROLAP capabilities against the Law Enforcement Data Mart



LE Data Mart - Sample



EW Solutions' Industry Data Models

Law Enforcement – Charge Lifecycle KPI's

KPI's

Arrests / Convictions

- Number of Incidents with/without Arrests
- Ratio of Arrests to Convictions
- Capture rates (e.g. warrants)

Intelligence

- Number of arrests/captures aided by information based “tips”
- Number of convictions aided by information providing support and evidence
- High frequency crime locations, times

Deployment Support

- Response time
- Correct response – sending right personnel to right incidents

Drill Down Options

- Law Enforcement official
- Law enforcement organization
- Subject, Victim, Witness, etc
- Evidence, Affected Property
- Geography
- Date / Time
- Statute
- Sentence
- Specialty / Accreditation



EW Solutions' Industry Data Models

Healthcare – Clinical KPI's

KPI's

- Hip Fracture Mortality
- Incidental Appendectomy
- Pediatric Heart Surgery Mortality Rate
- Pediatric Heart Surgery Volume
- Accidental Puncture Or Laceration
- Decubitus Ulcer
- Failure To Rescue

Drill Down Options

- Date/Time
- Patient Characteristics
- Procedure Types
- Discharge Types
- Provider Positioning Type
- Staff Specialty/Training/Certification

Correlations/Measures:

- Care Events to Time Lags to Procedures
- Rate



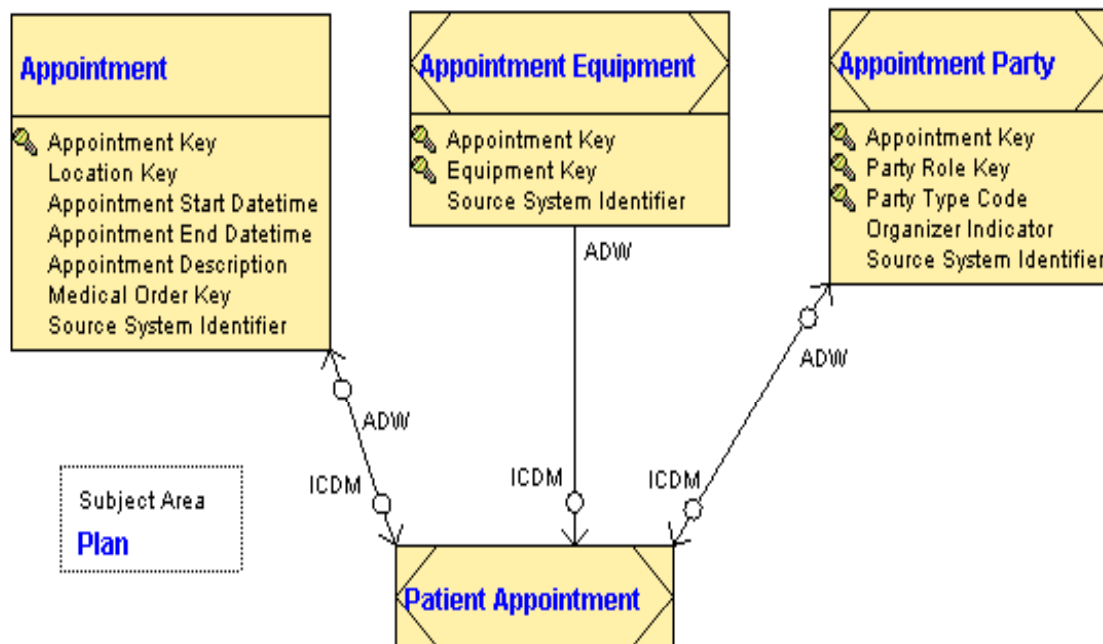
Data Rationalization

- Data Rationalization establishes and visualizes meta-relationships between model objects across/within models (often in different model files and different modeling tools) and with other meta data to provide more complete semantics and to facilitate improved management and governance of our data
- AKA “vertical data lineage” vs. horizontal data lineage – e.g. Information Supply Chain
 - ✓ Identifies the higher level objects the model object is derived or conceptualized from
 - ✓ Or the lower level objects that implement the model object
- ✓ **Because the rationalization meta-relationships are established and stored – models can be more rapidly adapted at the client site!**
- Models and data rationalization meta data can be imported into Rochade for visualization, reporting
- Provides improved management, analysis, and semantics



Data Rationalization

- ❑ Provide vertical vs horizontal lineage (e.g. Information Supply Chain)
- ❑ This increases reuse of data and analysis, better management (e.g. change management), data governance, semantics



ASG Rochade used to visualize the meta-relationships across model levels and model files



EW Solutions' Industry Data Models

- Best practices identified in EW Solutions I3sm data warehousing methodology are adapted as applicable
- Each table contains a “Source System Identifier” to identify the source or sources for a specific record. Based on client requirements may need to become part of a primary or alternate key to ensure uniqueness (**e.g. same product id – different meaning in different systems...**)
- All physical tables have multiple meta tag columns to provide:
 - Traceability to the specific load process
 - Load / update dates
 - Confidence level (provide intelligence to users about the data)
 - Delete flag (does the record still exist in the source)
- **The models are meant to be adapted and extended for client requirements**



Physical Model

PATIENT_REFERRAL

PT_RFRL_KEY: Integer IDENTITY

PT_RFRL_ID: Integer NOT NULL
EFF_DTM: datetime NOT NULL
RFRL_DTM: datetime NOT NULL
RFRG_PRVDR_PRSN_ROLE_KEY: Integer NOT NULL (FK)
RQSTD_PRVDR_PRSN_ROLE_KEY: Integer NOT NULL (FK)
PT_PRSN_ROLE_KEY: Integer NOT NULL (FK)
RFRG_ORD_KEY: Integer NULL (FK)
RQSTD_PRVDR_LOCN_KEY: Integer NOT NULL (FK)
PT_POC_KEY: Integer NOT NULL (FK)
INACT_DTM: datetime NOT NULL
SRC_SYS_ID: smallint NOT NULL (FK)
LOAD_DTM: datetime NOT NULL (FK)
UPDT_DTM: datetime NOT NULL (FK)
CUR_VAL_FLAG: char(1) NOT NULL (FK)
LOAD_CYC_KEY: Integer NOT NULL (FK)
CONF_LVL_NBR: Integer NOT NULL (FK)
SRC_SYS_DEL_FLAG: char(1) NOT NULL (FK)

❑ Meta tags appear only in the physical model

❑ DDL is generated from the physical model – options to tailor the DDL available. For example, foreign key constraints are not generated in the DDL due to bulk loading concerns.



DDL

- The physical models are designed to run on most RDBMS's
- Table/column names restricted to 32 characters so that DDL can be generated for SQL Server, Oracle, DB2
- Adaption to RDBMS's would require minimal amount of conversion
- Additional meta data exported where the RDBMS supports this
- For example, business names for tables/columns, definitions can be included in the DDL for inclusion into the RDBMS catalog
- In SQL Server, this meta data is stored as an extended property and so is accessible to database users



Questions

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