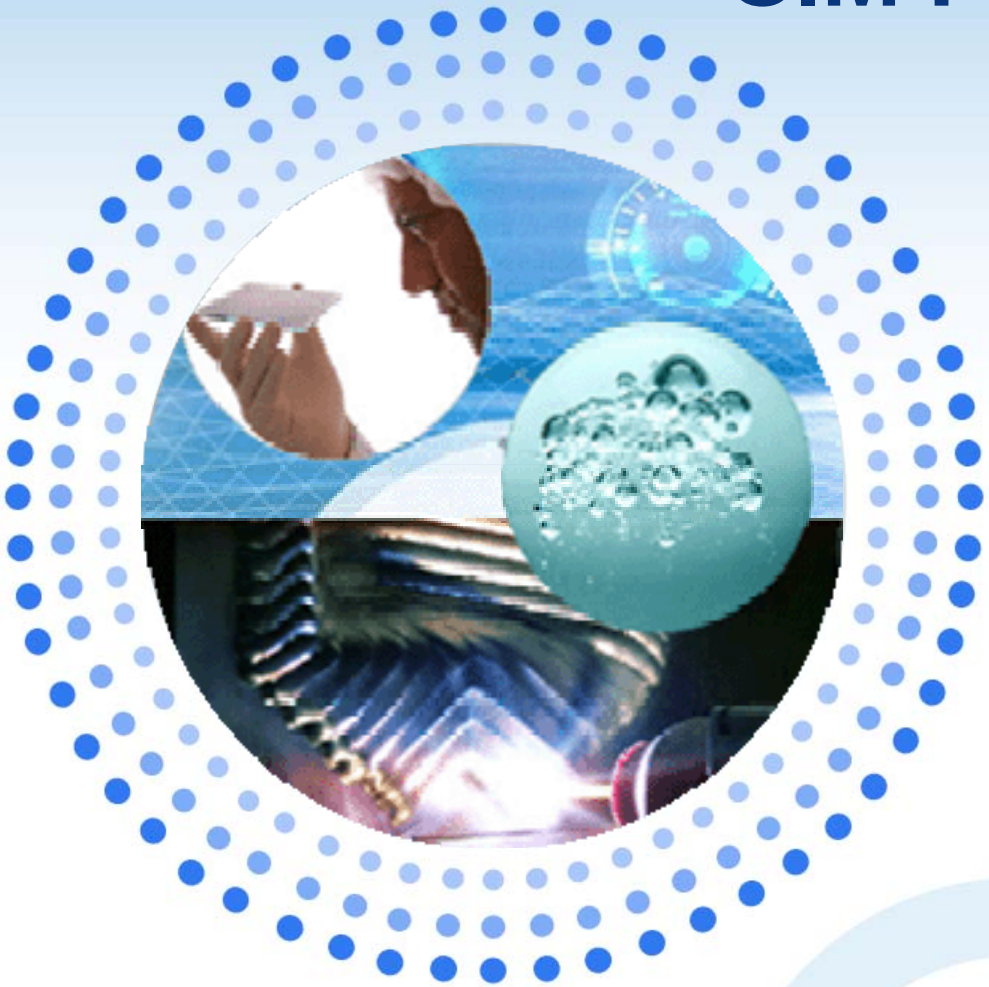
CIM FOR SMARTGRIDS



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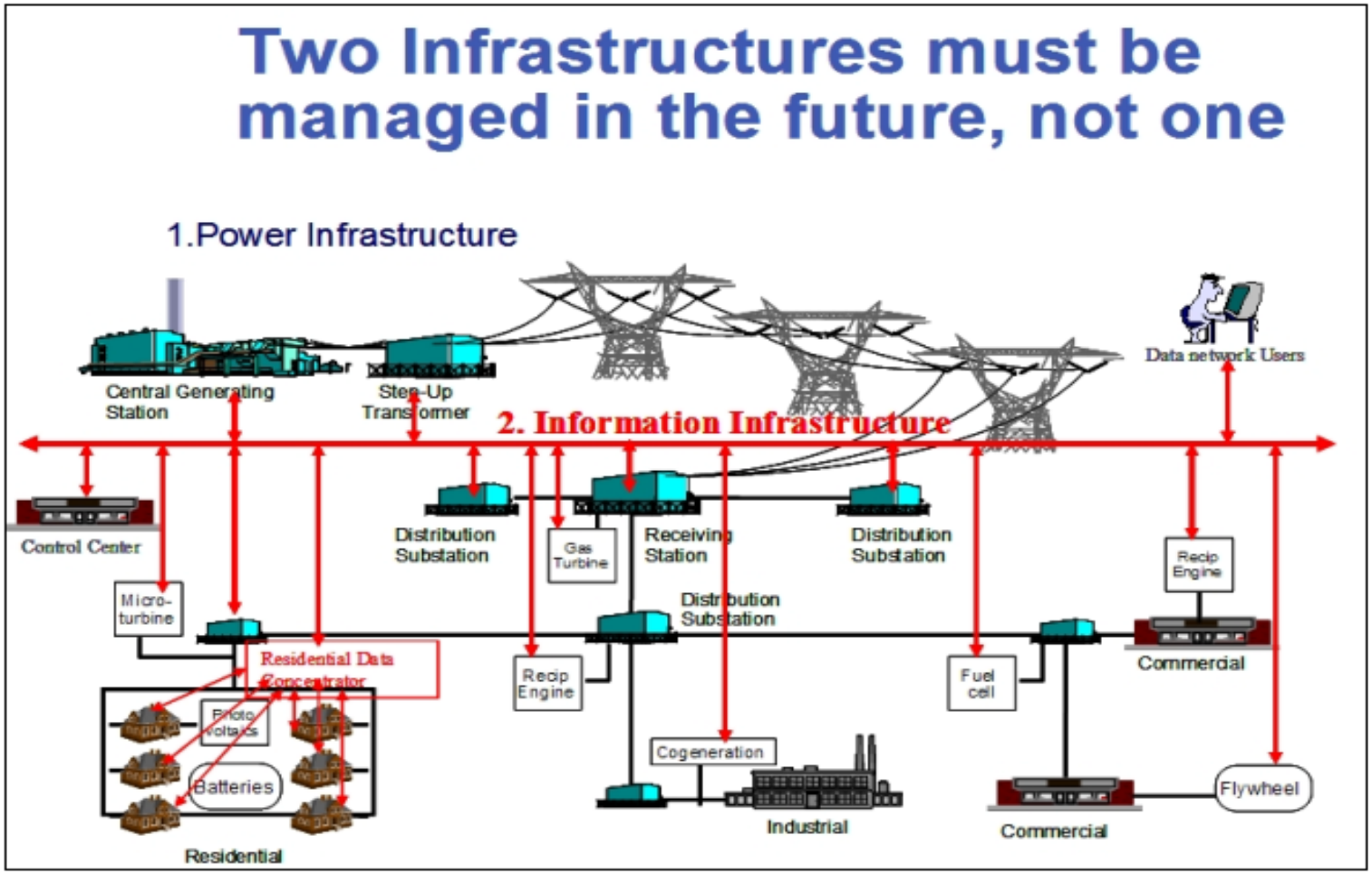
EDF R&D

CIM User Group
Genval - Belgium- 2009

Topics

- Introduction
  One Smartgrid Need
  One Information Management Reality
- MSITE : CIM-EDF Model
- Modeling METHODOLOGY and TOOLS for MSITE
- CIM ROADMAP for ERDF
- EDF R&D SMARGRID RELATED PROJECTS
- SOME CHALLENGES and CONCLUSION

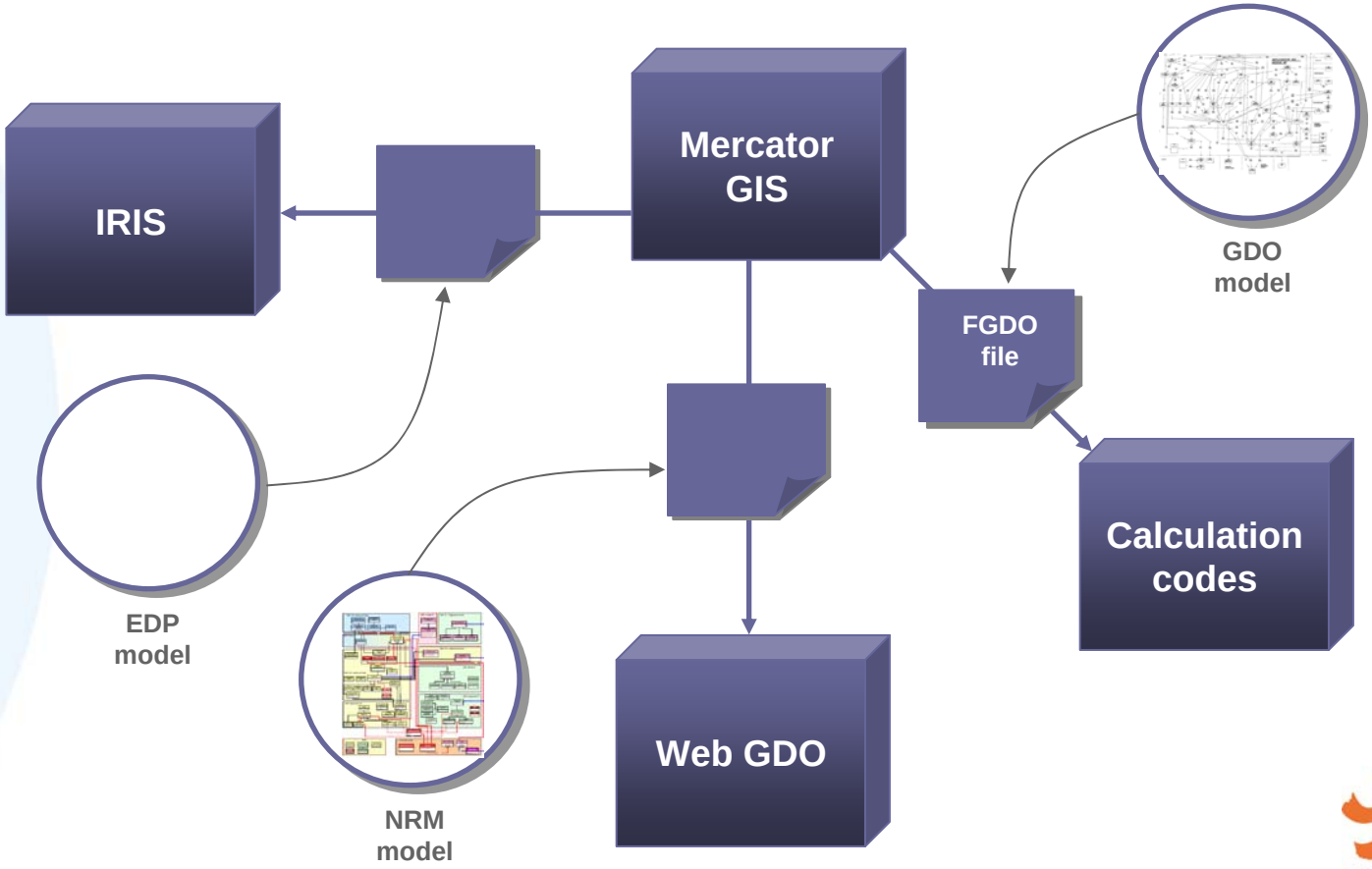
A SMARTGRID NEED



Goal : Satisfy end users and minimize integration costs

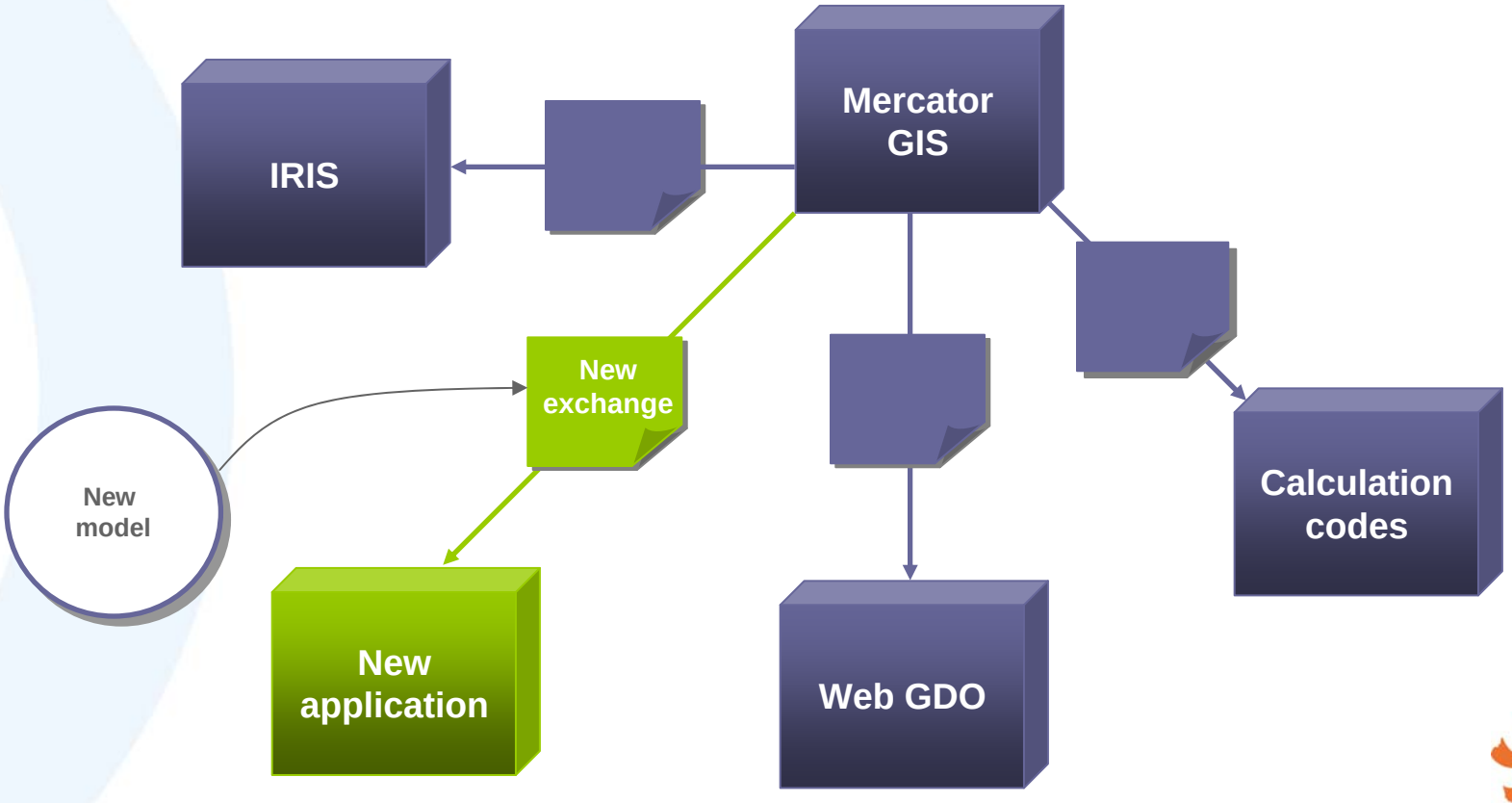
An Information Management reality

- Inter-application exchanges of ERDF are made from **several** exchange models.



Several exchange models …(1/2)

- Each new exchange often implies the creation of a new exchange model.

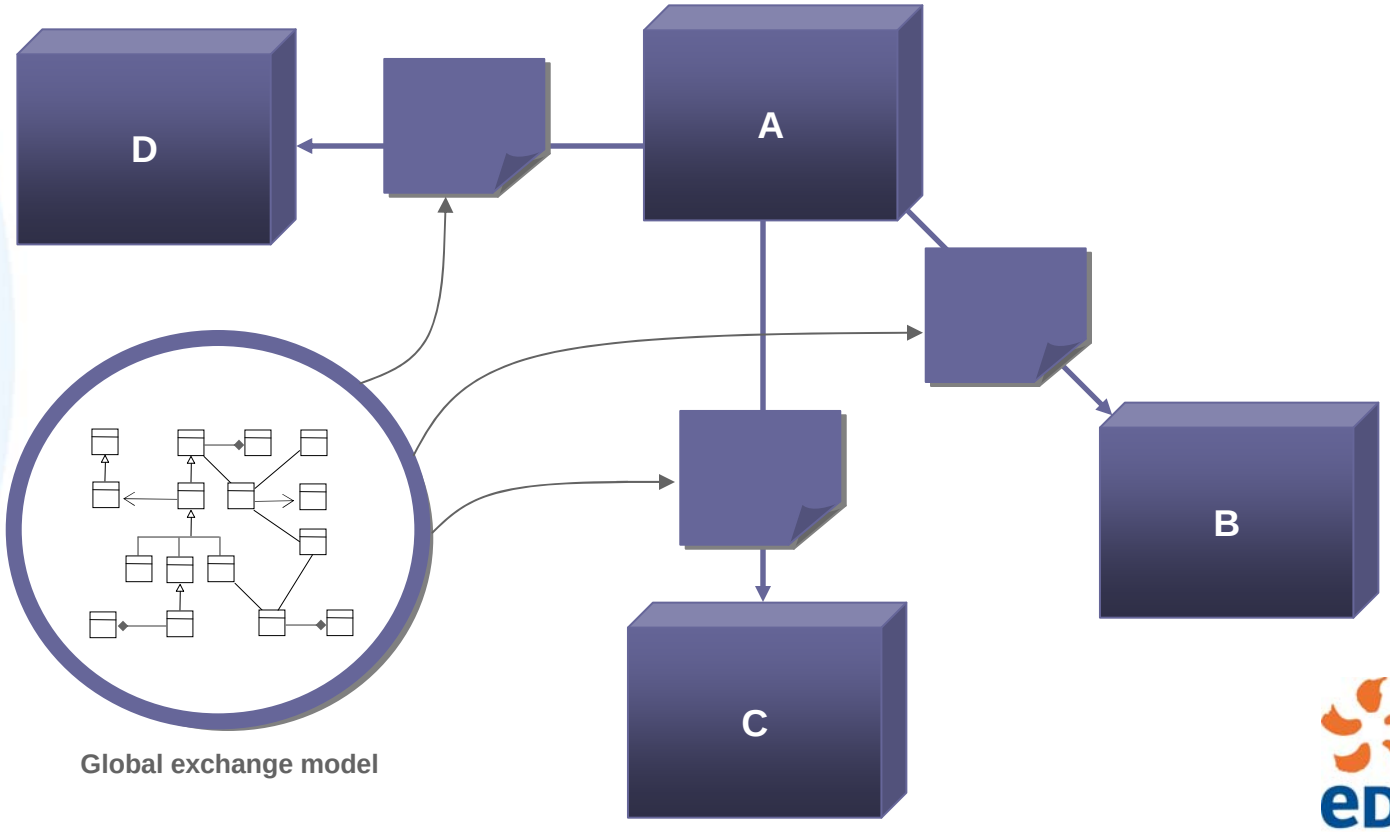


Several exchange model**S** (2/2)

- **Increase the system complexity.**
- **Multiply abilities and skills** :
  - for interfaces development,
  - for models maintenance.
- **Inconsistency of the models** (heterogeneous object definitions).

One global exchange model

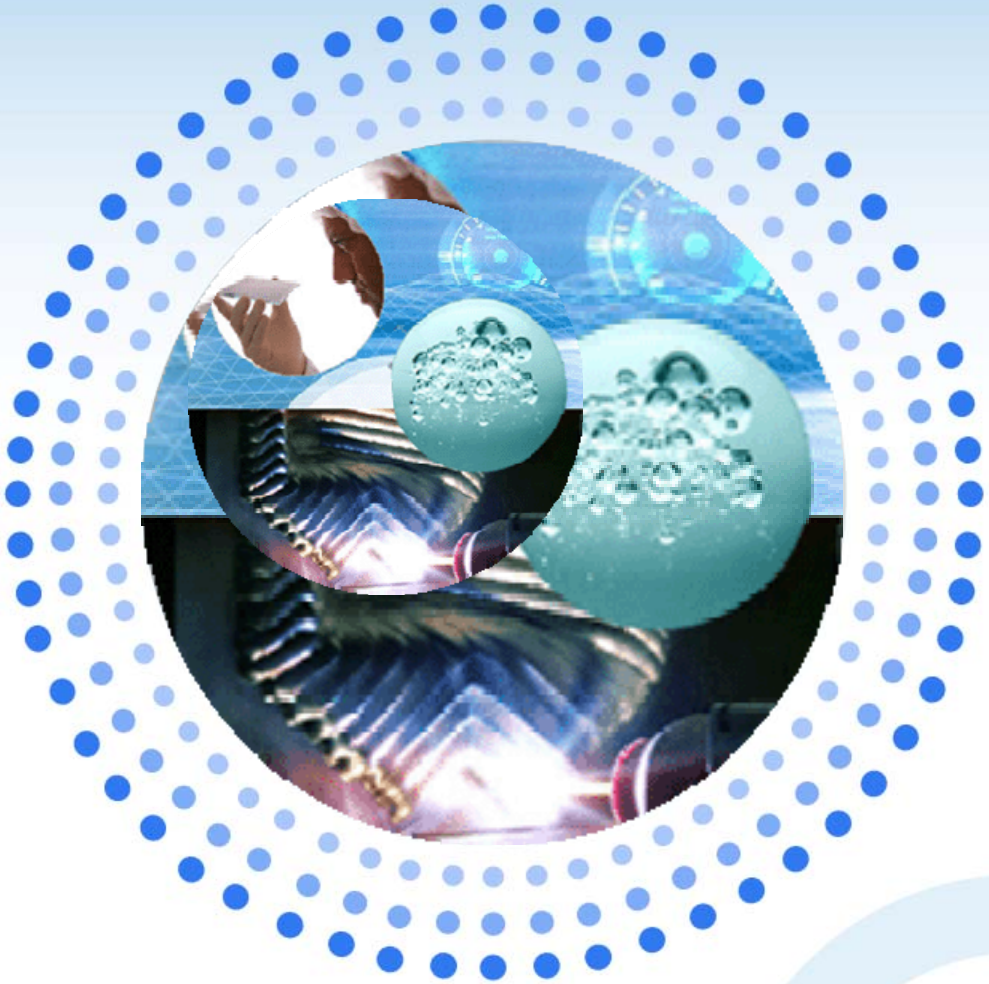
- The purpose of a global exchange model is the possibility to re-use the same model for all the Information System exchanges.



Global exchange model

Global exchange model advantages

- **Decrease the development time while creating a new interface** : informations to be exchanged are perhaps already described in the global exchange model.
- **ERDF keeps the control of the information exchanges**, even if the exchange occurs between two non-legacy softwares.
- **More consistency for the Information System datas**.



The MSITE model (CIM-EDF)

EDF R&D

The MSITE model

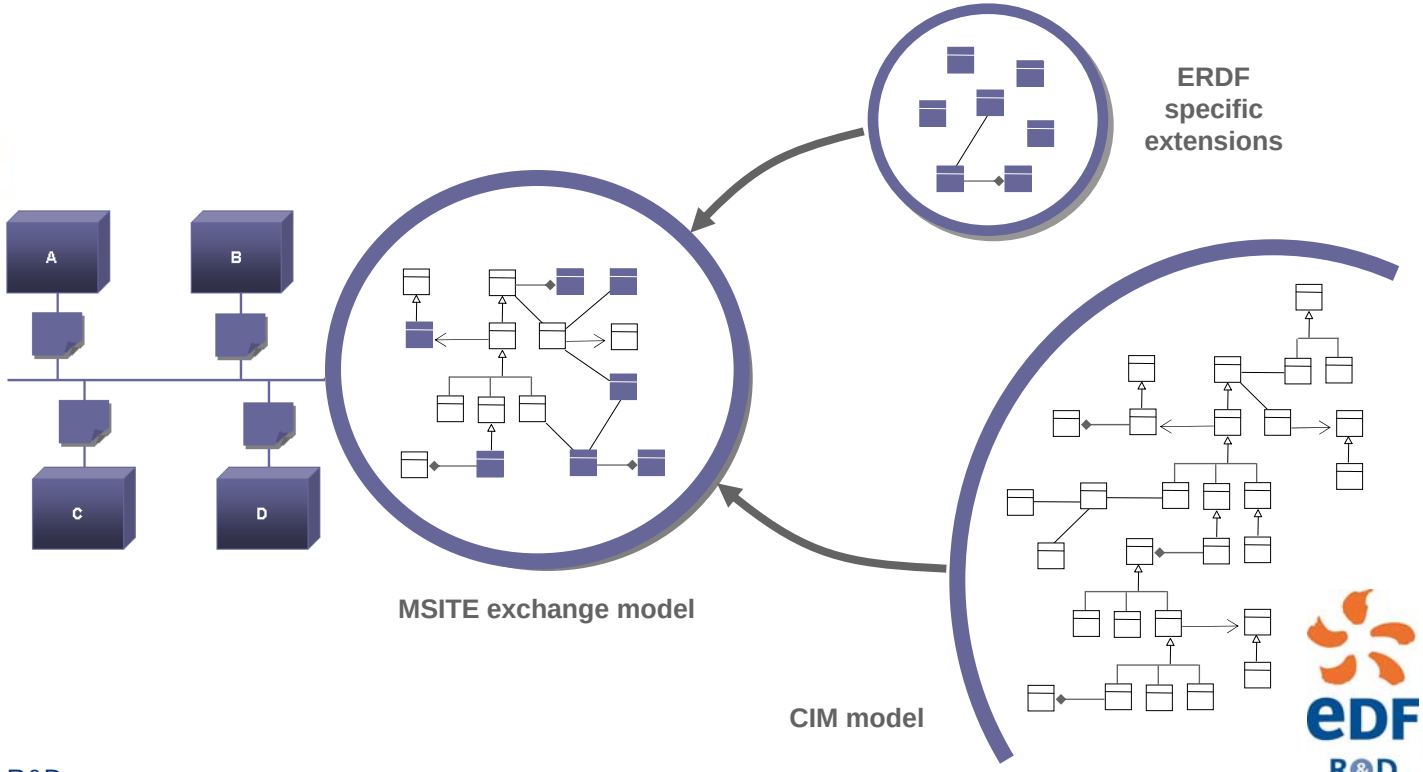
- **A standard model exchange** for ERDF…
- …which is based on **the CIM model from the International Electrotechnical Commission**,
- **…which manages the exchange model upgrades** for ERDF projects needs and regarding international standards.

Standard advantages

- **The exchange model is not created from scratch.**
- The standard may also be used for ERDF **external exchange** (RTE, suppliers,…).
- **Reinforces ERDF neutrality** for external organisations.
- **International expertise benefits.**

The MSITE model : a sub-part of the CIM

- MSITE model only retains the CIM informations which are relevant for ERDF.
- MSITE model also integrate the missing informations of the CIM model which are specific to ERDF.



MSITE history

- MSITE V 1.0 2007
  - *model compatibility with CIM version 11r1.*
  - *The model is published by EDF-R&D. Its mapping to french network elements is specified in reference documents*
  - *It describes MV-EDF network with as much details than the legacy ERDF format*
- MSITE V 1.1 2007-2008
  - *Added specificities of Paris Network for DANY4 project (renewal of the SCADA for Paris).*

MSITE history

- MSITE V 2.0 2008-2009
  - *LV-network description added*
- MSITE V 2.1 2009
  - *Extensions regarding new needs of several « MV-computation functions »*
  - *Extensions regarding GIS additionnals data on MV elements.*
  - *Adding value through CIM based model : Harmonization of MV description with added LV description*

CIM-MSITE related tools

- Internal EDF R&D Tools

  CIM C++ Framework
  CIM Java Framework
  CIM based Oracle DB

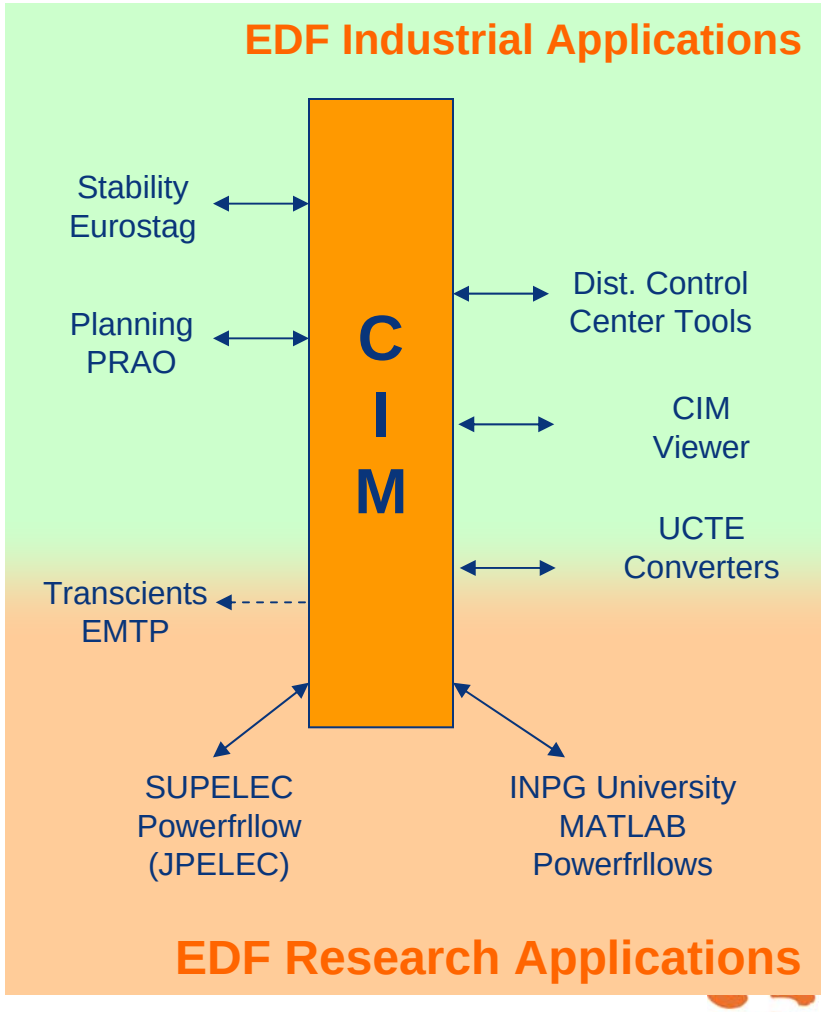
- IEC related community tools.

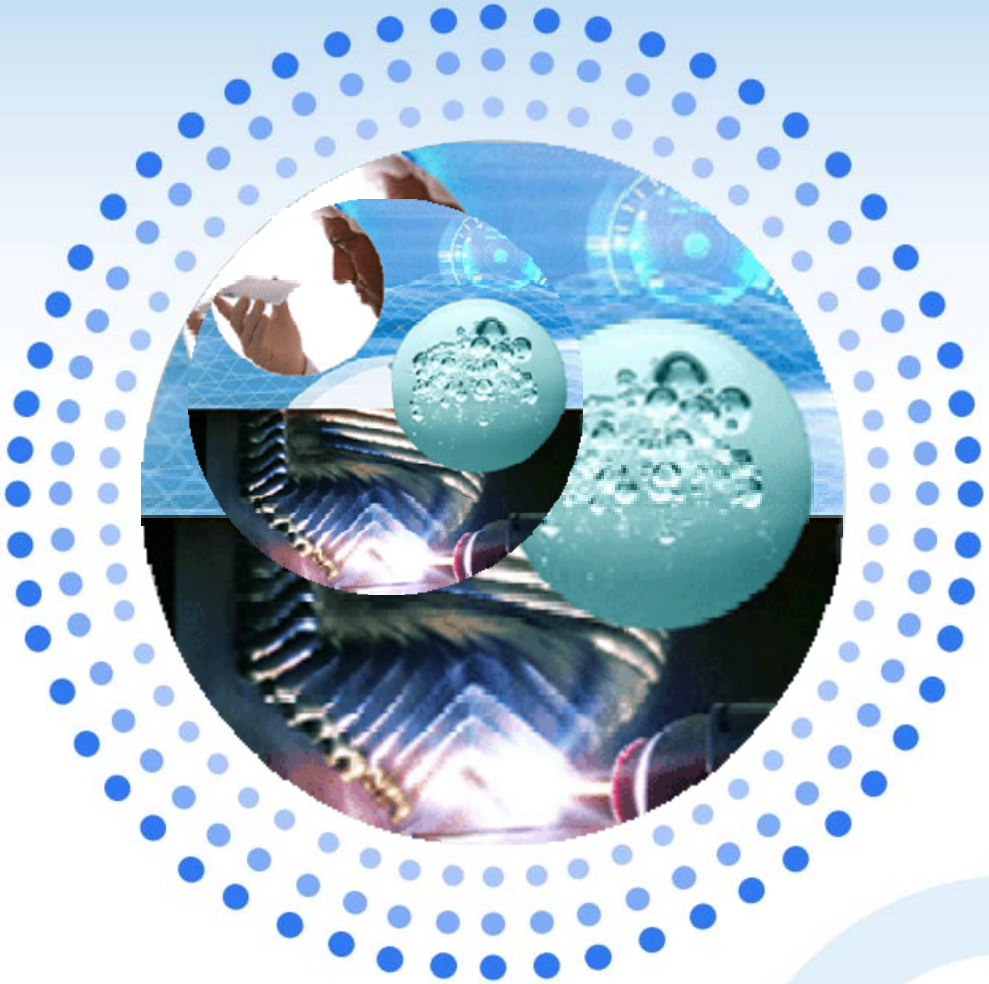
***CIMTOOL** validation tool*

***CIMPHONY** validation tool*

Has been used to validate correctness of GIS-MSITE exports (cimEDF-XML syntax)

CIMSPY, CIMVIAN





Modeling Methodology & Tools for MSITE

EDF R&D

Methodology : CIM-UN/CEFACT

Business Process Analysis

CIM

*Information Model or **Core Components** (based on CIM)*

Definition of business context and constraints on Core Components

Assembly rules and transformation rules of the contextual model in a Message Conceptual Model

Transforming and Moving Rules of the Message conceptual Model to a Message Model Implementation

MSITE

Sub-part of the CIM with complements for ERDF specificities

Contextual Model

*Business Domain Contextual Model or **Business Information Entity***

Assembled Model

*Message conceptual Model or **Message Assembly***

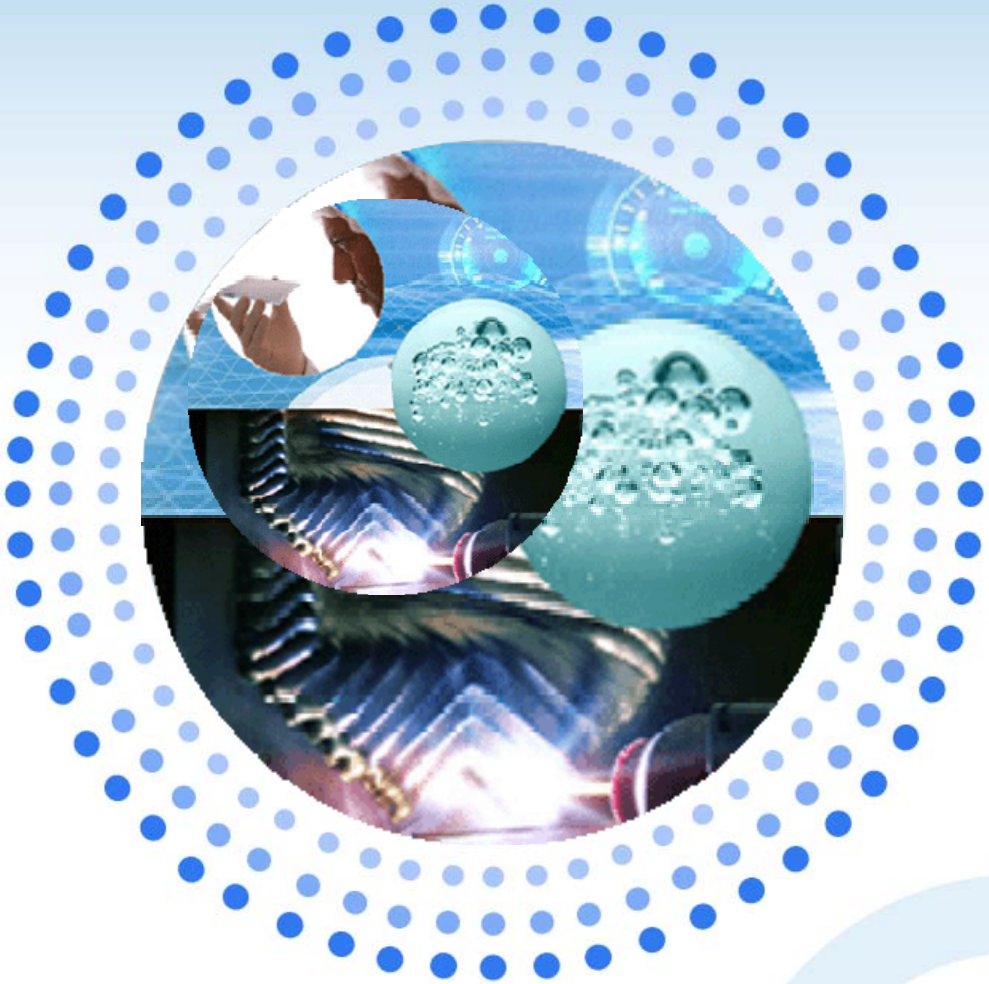
Message

*Message Model Implementation or **Syntax Binding***

CIM Distribution profiles

- IEC CIM distribution profile : CDPSM (Common Distribution Power System Model)
  - *Originaly defined from CPSM profile (transmission networks).*
    *Aims to allow load-flow computation. (related to **PowerSystemResource**)*
  - *Managed as IEC standard, kept closely compatible with CPSM.*
    Life cycle evolution relative to IEC works.
  - *IS in 2008. Maintenance cycle expected on a regular basis*
- *MSITE model and its related profiles*
  - *Dedicated to EDF Distribution network description.*

    ***Wider range of information than CDPSM**:*
    Originaly aims to assume everything described in the legacy ERDF format.
  - *Use some CIM information related to **Asset** that better suit some description needs.*
  - *Evolution life cycle relates to EDF needs, not to each CIM version.*
  - *If a new extension need appears then last version of CIM is also taken into account*



CIM ROADMAP for ERDF

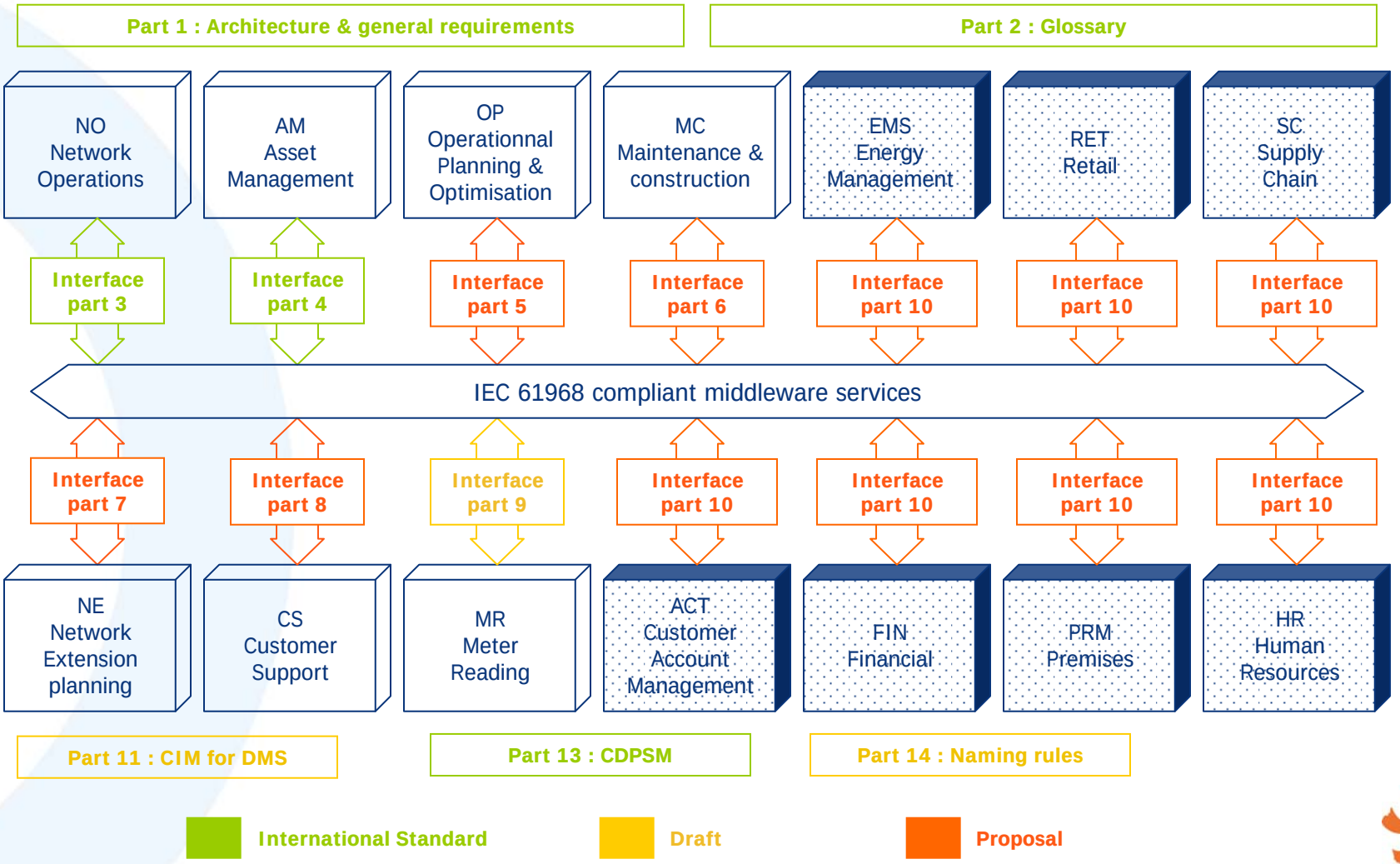
EDF R&D

CIM roadmap for ERDF

- In 2008 ERDF has mandated EDF R&D for establishing a roadmap implementing “CIM approach” in its Information System.

- This roadmap takes into account the status of 61968 interface reference model and the roadmap established by IEC WG14 end of 2008.

CIM roadmap for ERDF
Interface Reference Model Status



CIM roadmap for ERDF (1/2)

- The first phase of the roadmap phase identifies the following tasks :
  - " Synchronize the distribution network descriptions "
    - This phase identifies the exchange between the GIS managing our assets, the remote control system and the future AMM system.
  - " Populate and use a quality repository "
    - Sharing quality data in a same format.
  - " Populate and use a Measurement repository "
    - Sharing load and generation data in a same format.

CIM roadmap for ERDF (2/2)

- The second phase of the roadmap phase identifies the following tasks :
  - " Reinforce computer assisted maintenance project "
  - " Dematerialize documents exchanged between remote control system, operation, maintenance "
  - " Reinforce the asset life cycle "
    - Follow equipments which are exchanged between applications from their purchase.

IEC WG14 ROADMAP (1/2)

- 2009

Interoperability tests on 61968-9 (FDIS)
(CIM Interfaces for Metering)

Interoperability tests on 61968-13 (IS)
(Common Distribution Power System Model)

CIM Model for Distribution (61968-11) (CDV)
Will be reinforced based on 61968-13 TF discussions

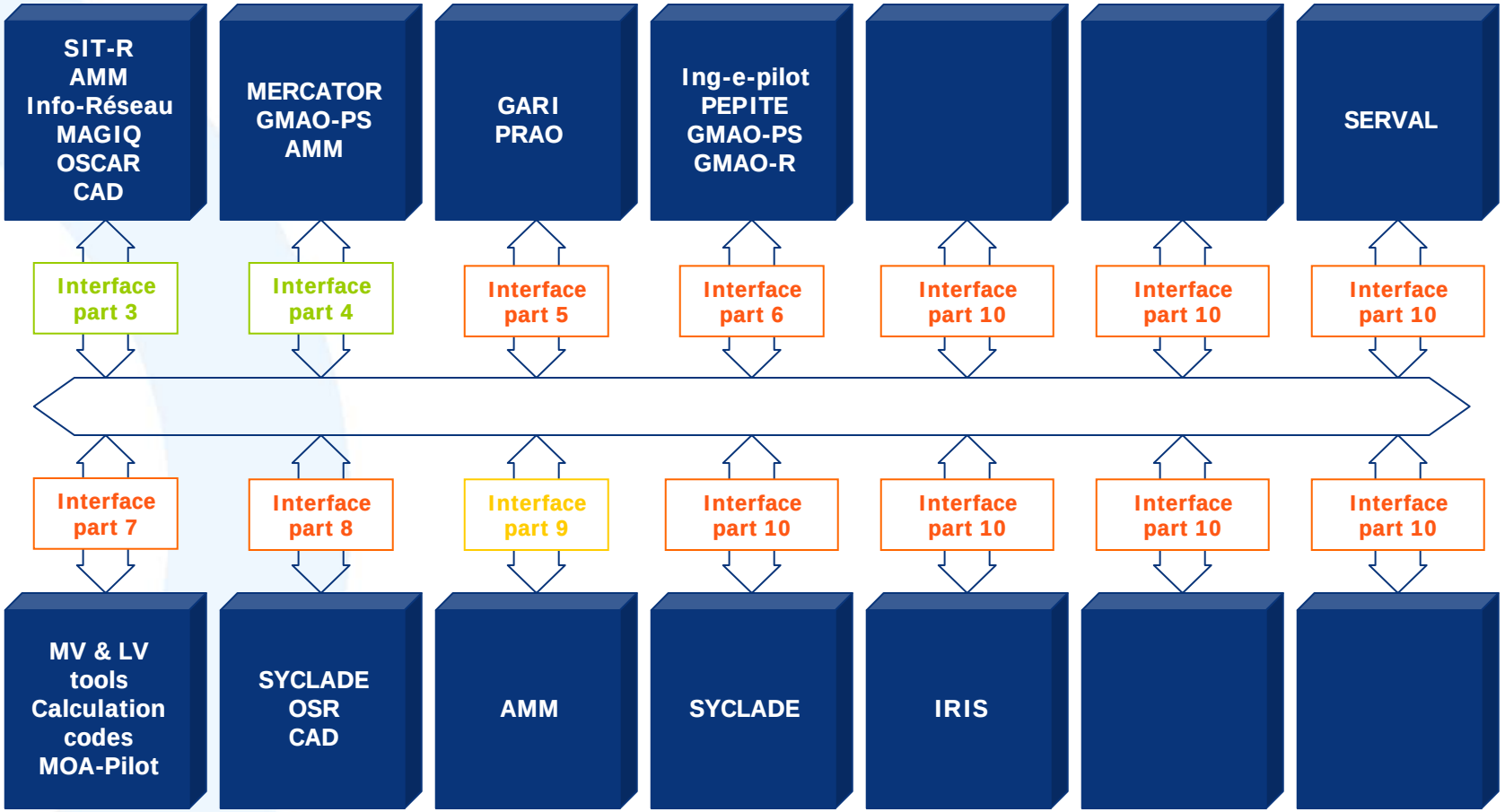
IEC WG14 ROADMAP (2/2)

- 2010

Maintenance cycle on
« Interfaces for Network Operation » (61968-3)
review IS and plan IOP tests

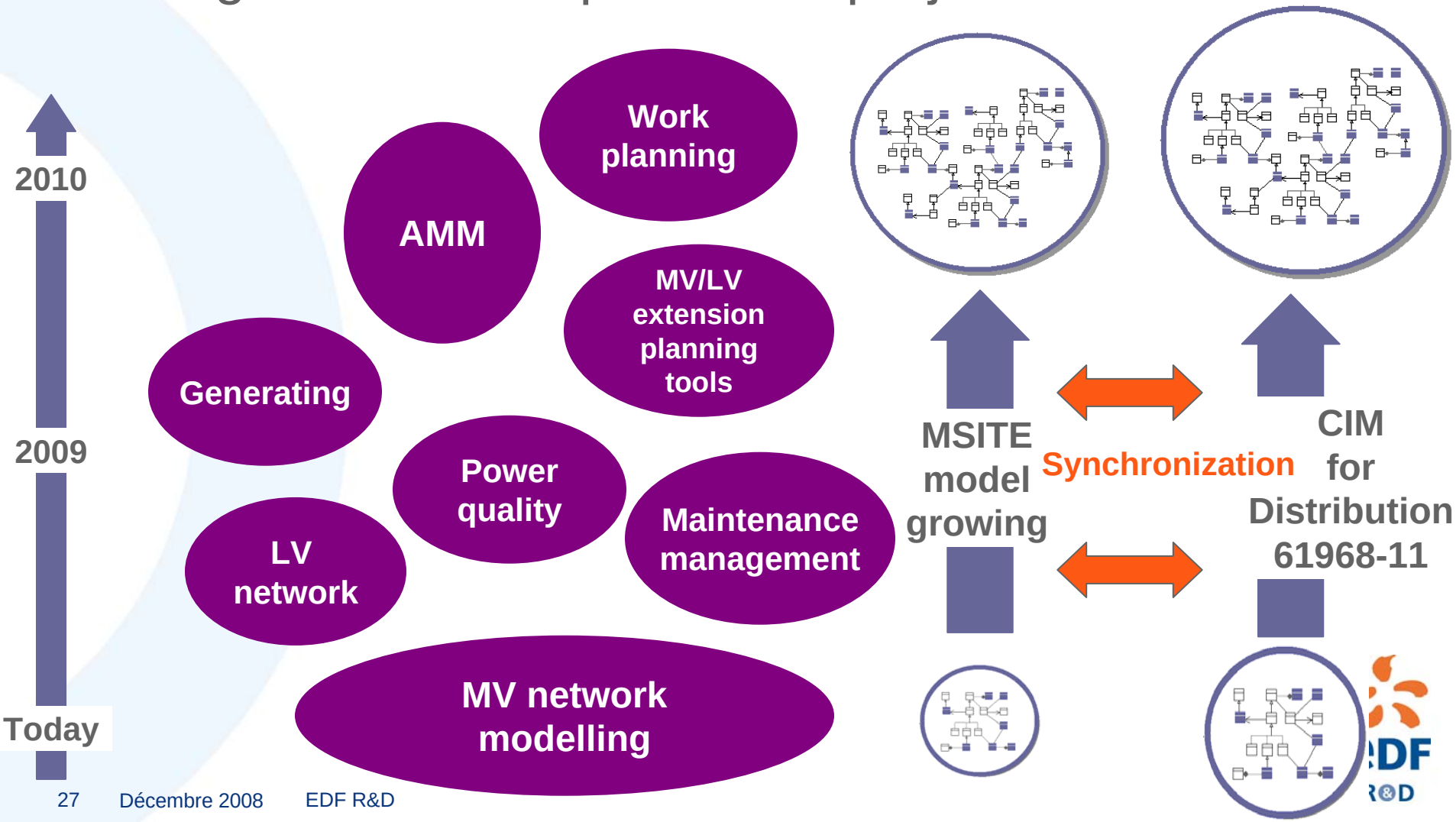
Maintenance cycle on
« Interfaces for Asset Management » (61968-4)
review IS and plan IOP tests

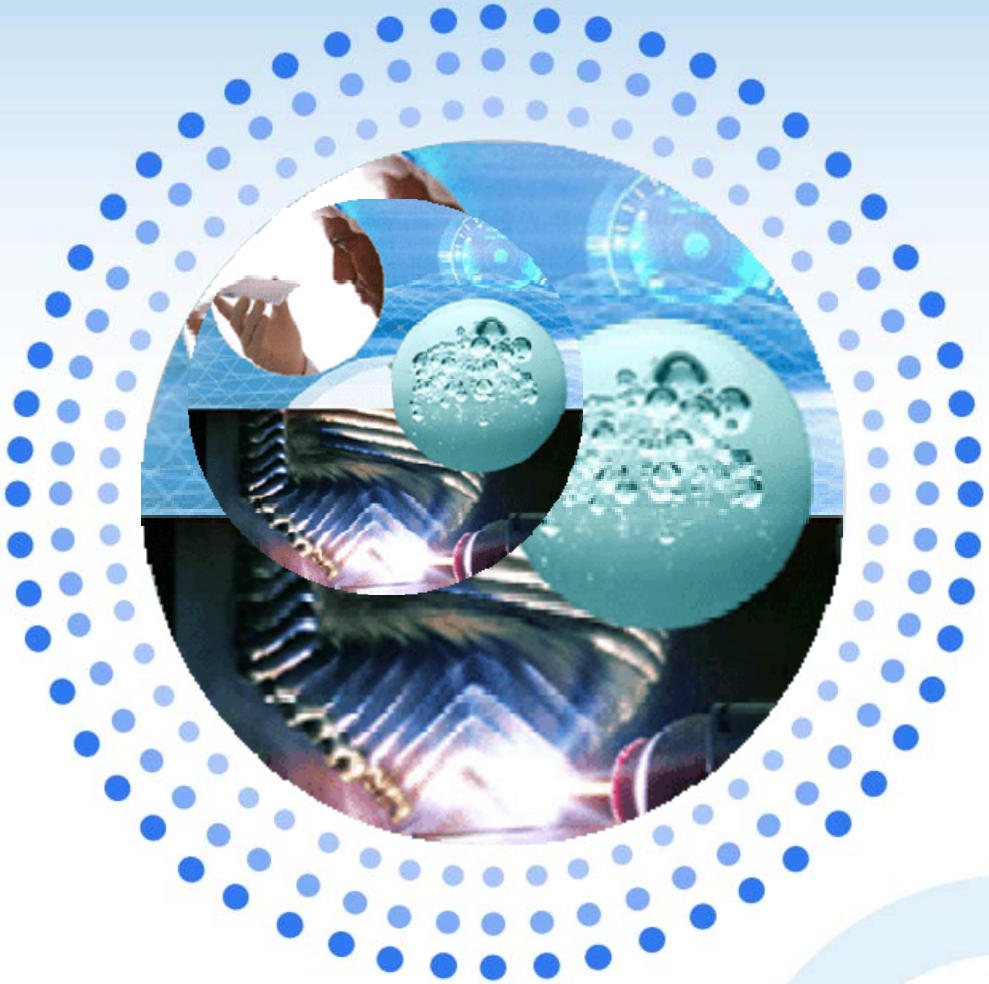
The IEC 61968 Interface Reference Model (IRM) in ERDF IS



The roadmap continuation

- SOLFEGE R&D project : generalize MSITE usage for ERDF operational projects.





Smartgrids EDF R&D related Projects

EDF R&D

Distribution systems need more flexibility : EDF R&D Distribution Challenge 2015 prepare this evolution

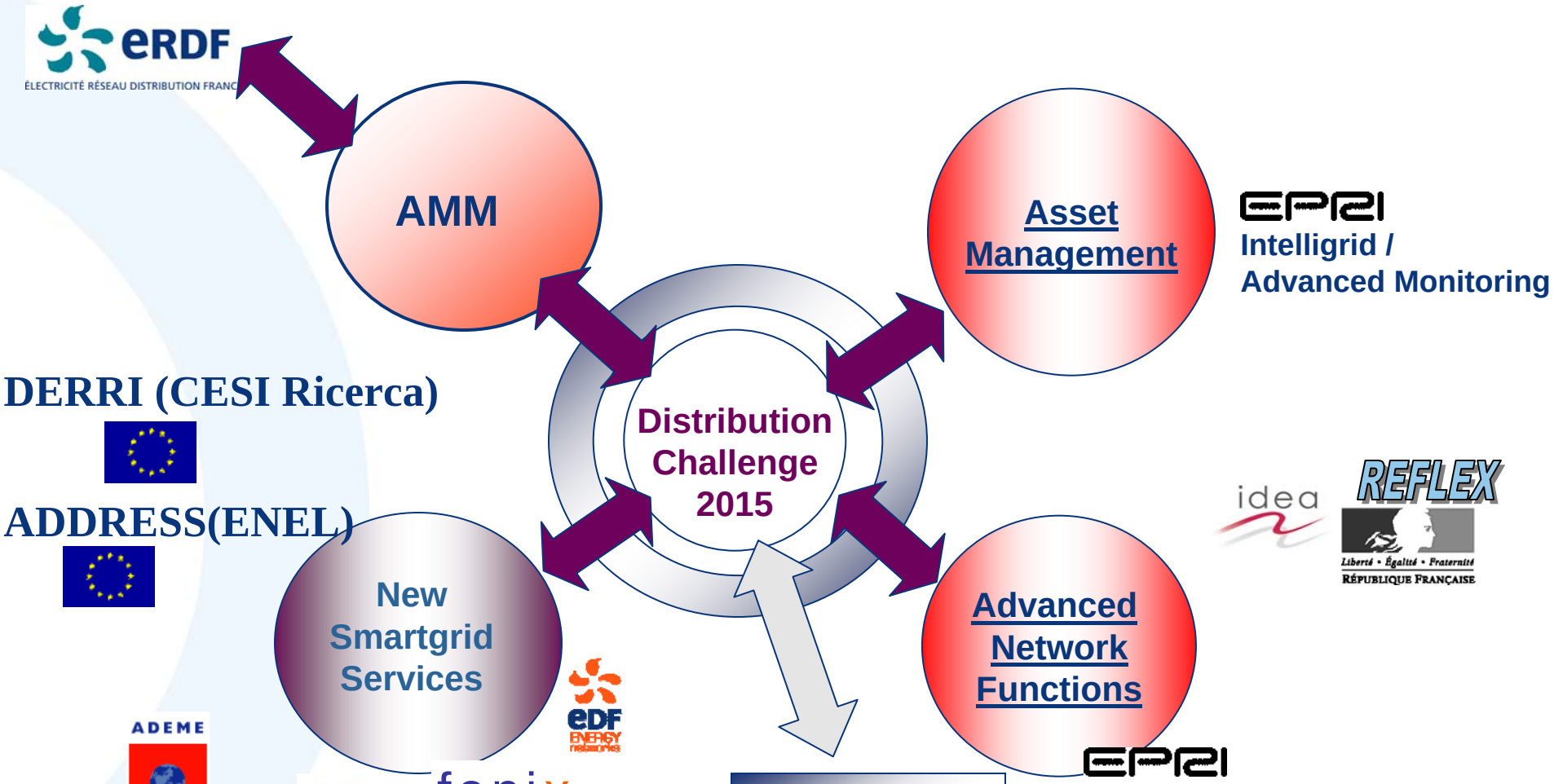
Optimization of Energy Resources
Reduction of Gaz Emissions
Optimization of Assets (aging of assets, integration of DERs)
Maintain or enhance quality of supply
Poor flexibility of Network Assets

1) Preparation of Advanced Distribution System Tools
2) Strengthen our knowledge of aging assets to optimize lifetime
3) DER on Distribution Networks : towards active distirbution system
4) IT applied to Distribution Systems : (R)evolution for increased performance

EDF R&D Distribution Challenge 2015

- Several R&D projects to enable smartgrids
  - New advanced functions prototypes : Volt-Var Control, State Estimator
  - AMM R&D platform :
    CIM 61968-9/61850/DLMS-COSEM
  - A CIM integration platform : DIstribution Grid Intelligence InTegrAtion Laboratory
    - Speed-Up prototyping, promote reusability
    - CIM Integration platform

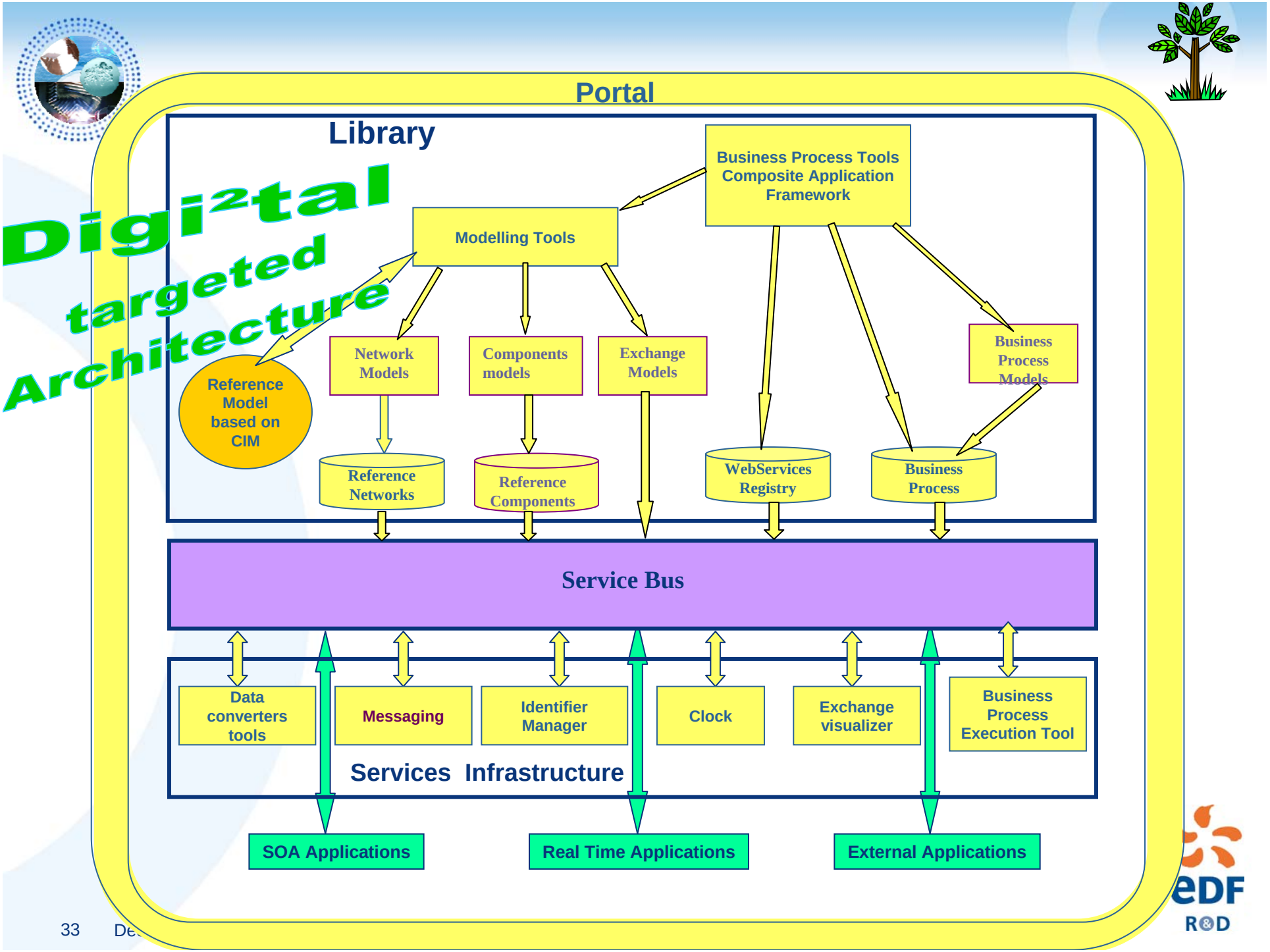
Distribution Challenge participates to external projects



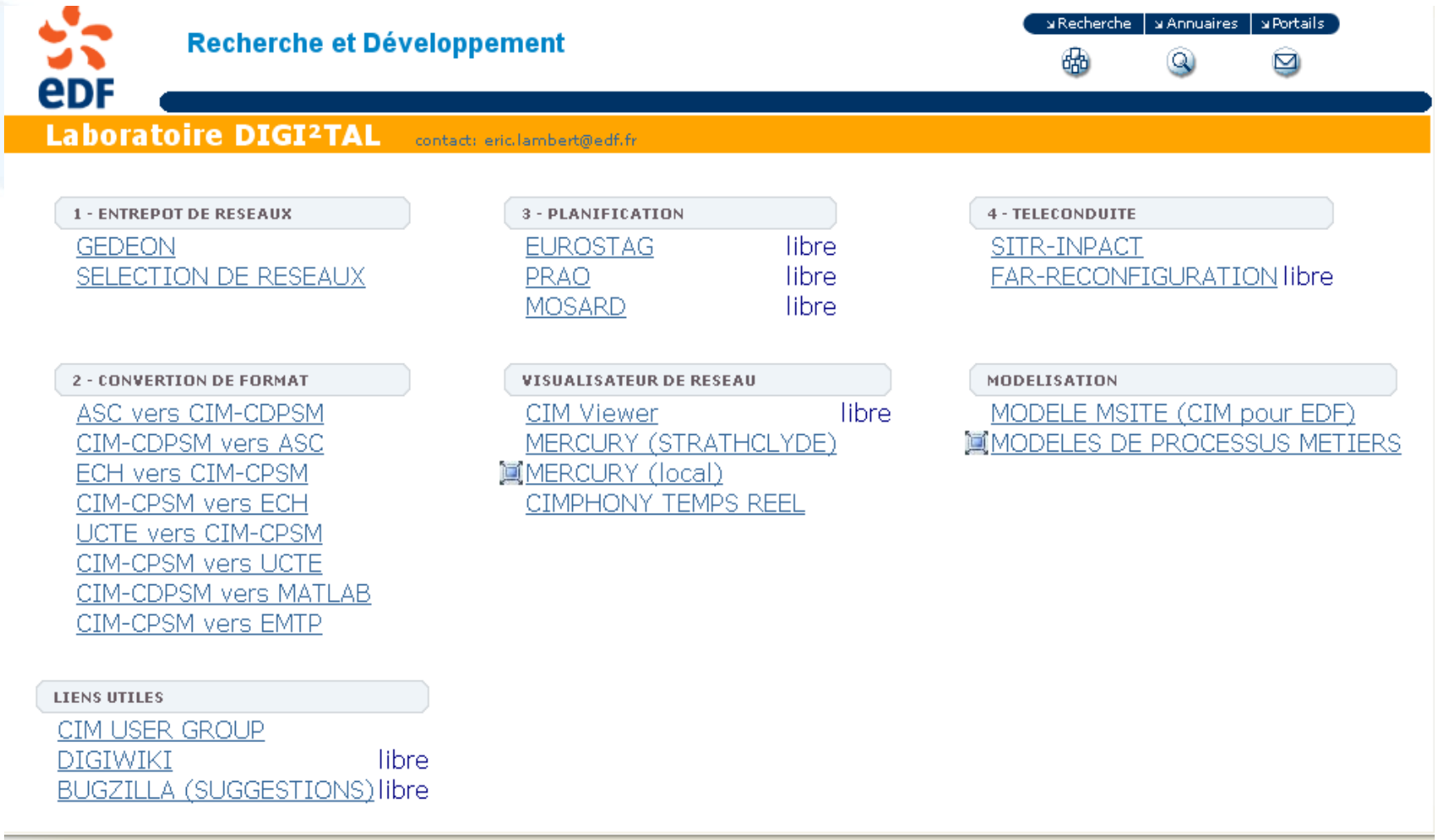
Aims of DIGI²TAL

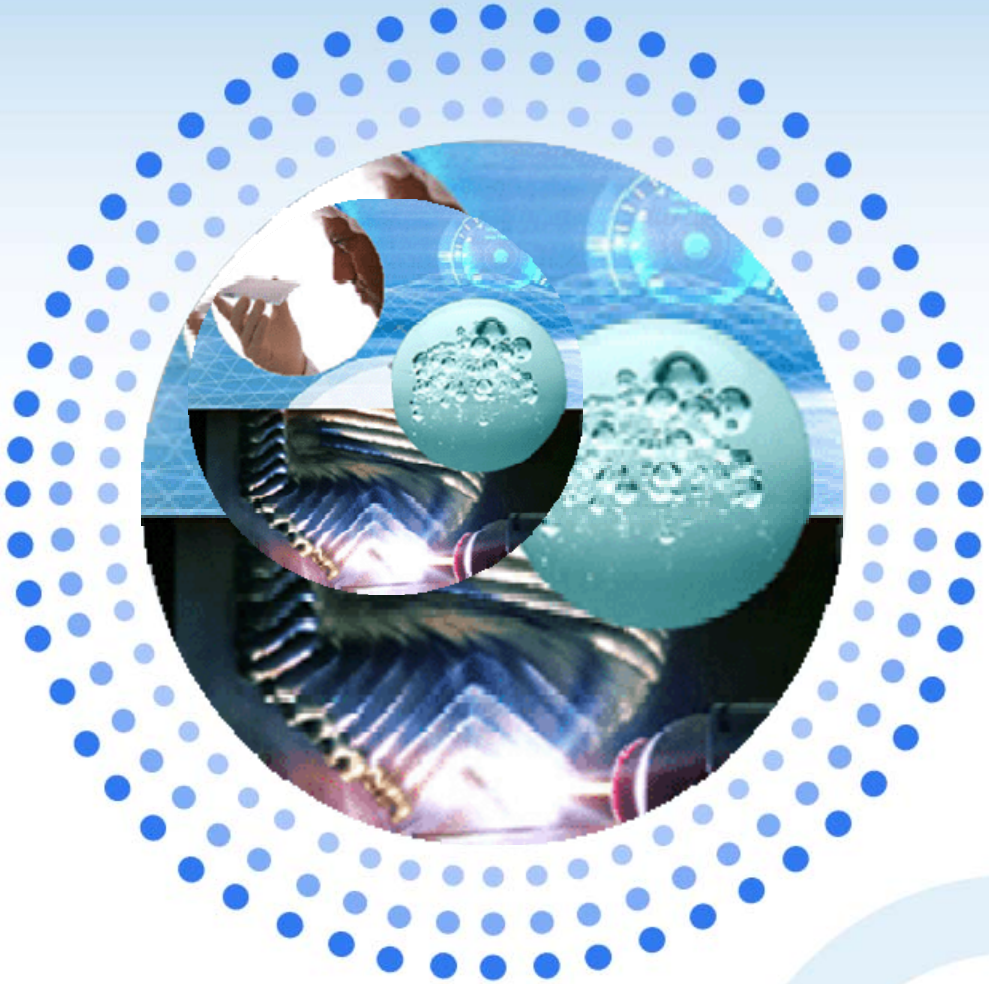
DIstribution Grid Intelligence InTegrAtion Laboratory

- A project under Distribution Challenge 2015
- Facilitate the integration of new prototypes aligned with new Electrical business needs
  - impact of the increase of DG on Distribution Network
  - load forecast
  - voltage control
- Promote reusability and interoperability
- DIGI²TAL is leveraging international organizations standards (CIM, 61850, DLMS-COSEM)


Portal
Library
Digital targeted Architecture
Business Process Tools
Composite Application
Framework
Modelling Tools
Reference Model based on CIM
Network Models
Components models
Exchange Models
Business Process Models
Reference Networks
Reference Components
WebServices Registry
Business Process
Service Bus
Data converters tools
Messaging
Identifier Manager
Clock
Exchange visualizer
Business Process Execution Tool
Services Infrastructure
SOA Applications
Real Time Applications
External Applications

DIGI²TAL Server

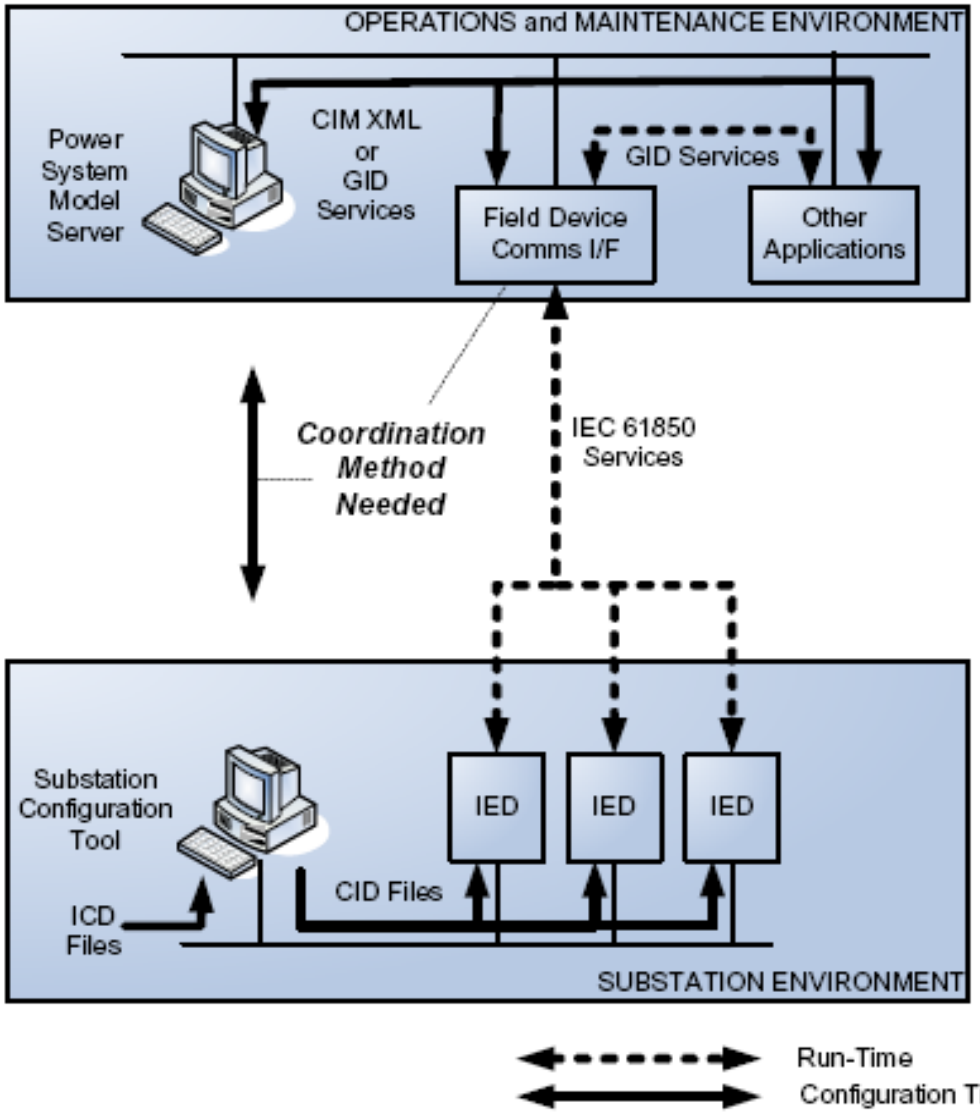


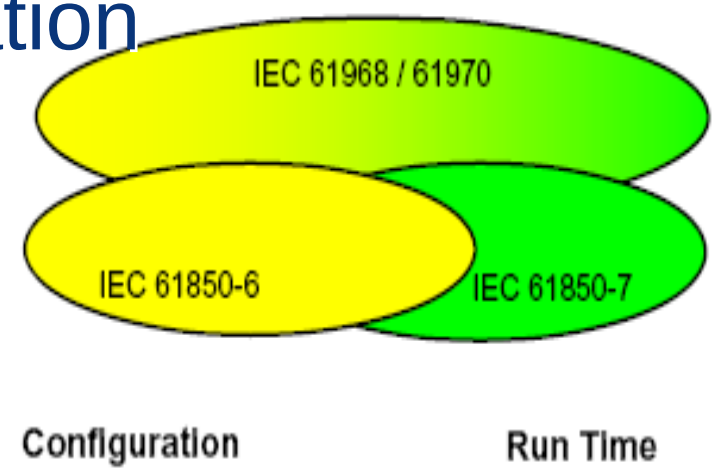


Some challenges & Conclusion

EDF R&D

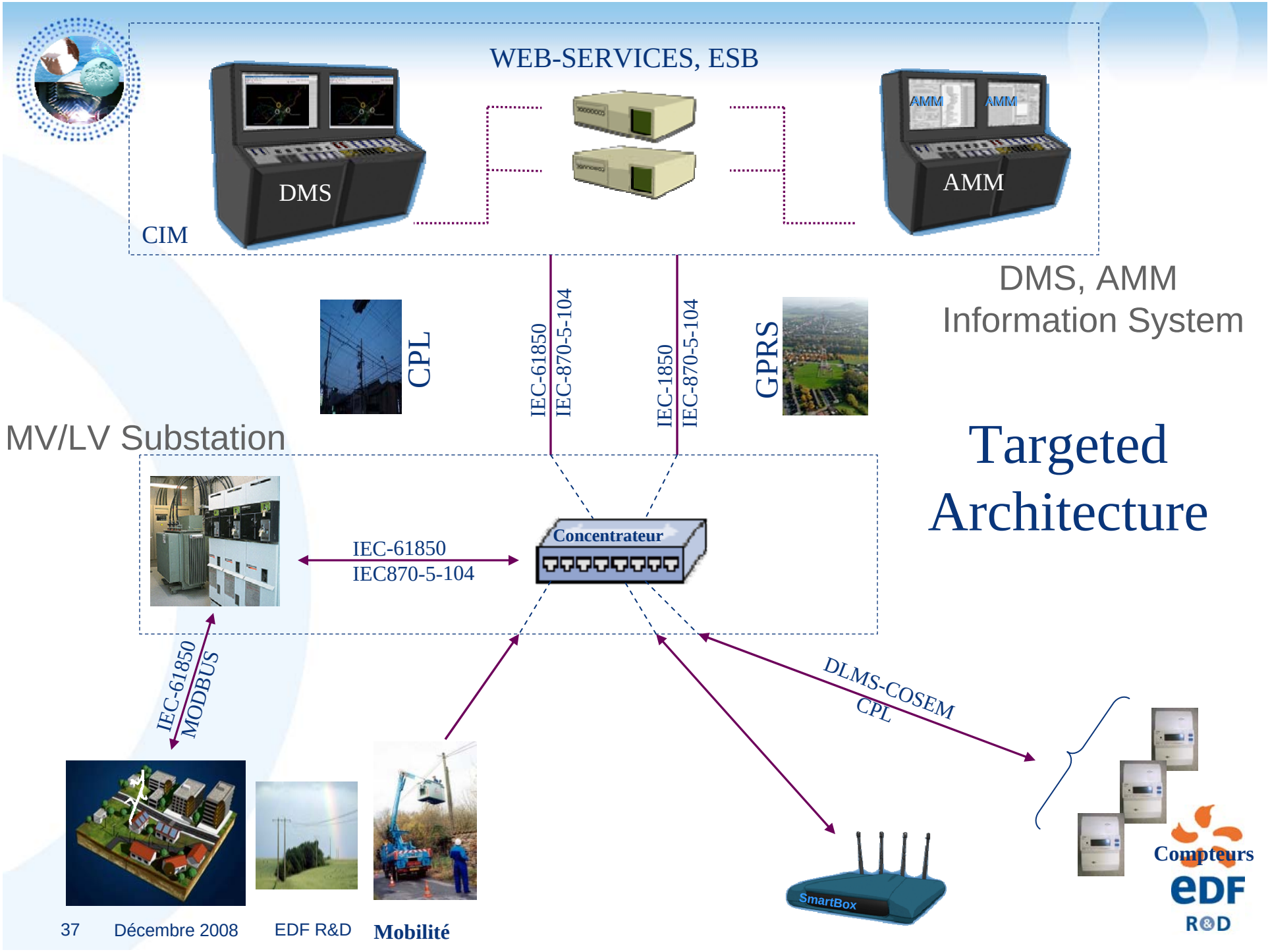
CIM-61850 Harmonisation





Same principles:

An information model
(**WHAT**)
[CIM, 61850]
+
A set of generic interfaces independent of implementation technology
(**HOW**)
[GID, ACSI]


WEB-SERVICES, ESB
DMS
AMM
AMM
AMM
CIM
DMS, AMM
Information System
CPL
IEC-61850
IEC-870-5-104
IEC-1850
IEC-870-5-104
GPRS
MV/LV Substation
Targeted
Architecture
IEC-61850
IEC870-5-104
Concentrateur
IEC-61850
MODBUS
DLMS-COSEM
CPL
SmartBox
Compteurs
EDF
R&D

Participate to EPRI IOP tests for Distribution

- End of 2009
  - 61968-9 CIM for Metering Interfaces
  - 61968-13 Common Distribution Power System Model
    - Maintenance cycle of CDPSM
      - Balanced networks
      - Unbalanced networks
      - CIM Consistency with
        61970-452 (CPSM)
        61970-456 (steady state solution)

        then in 2010 with 61968-4 (GIS-DMS interfaces)

CONCLUSION

- IEC CIM Roadmap for Distribution must lead to IOP tests

- ERDF is building an Entreprise Information Management System to support smartgrid
  - Business Process Analysis must be reinforced

- EDF R&D provides services and tools implementing a CIM/61850 Model Driven Integration Approach

- CIM-61850-DLMS/COSEM is seen by EDF R&D as the technical backbone for Smartgrids in Europe

- Acceptance of CIM by TSOs is key for DSOs adoption

Smart-Grids need Smart-Teams

SOME MEMBERS of EDF R&D « SMART » GRID TEAM

- Sylvie Mallet – R&D AMM project Manager
- Didier Ilhat – CIM Model Manager – CIM for ERDF (PARIS GIS/DMS)
- Cyril Effantin – Methodology & Tools expert. WG16 CIM-ETSO TF
- Jérôme Frémont – R&D project manager – CIM for ERDF
- Philippe Forestier – R&D Digi²tal project manager
- Thierry Coste – 61850 expert – ADDRESS WP4.4
- Patrick Métayer – C++/Java, ESB expert
- Vincent Godefroy – XML, Ontology expert
- Yves Chochon – R&D project manager – CIM for ERDF Asset Mgt project
- … thanks to our other contributors (past & present)