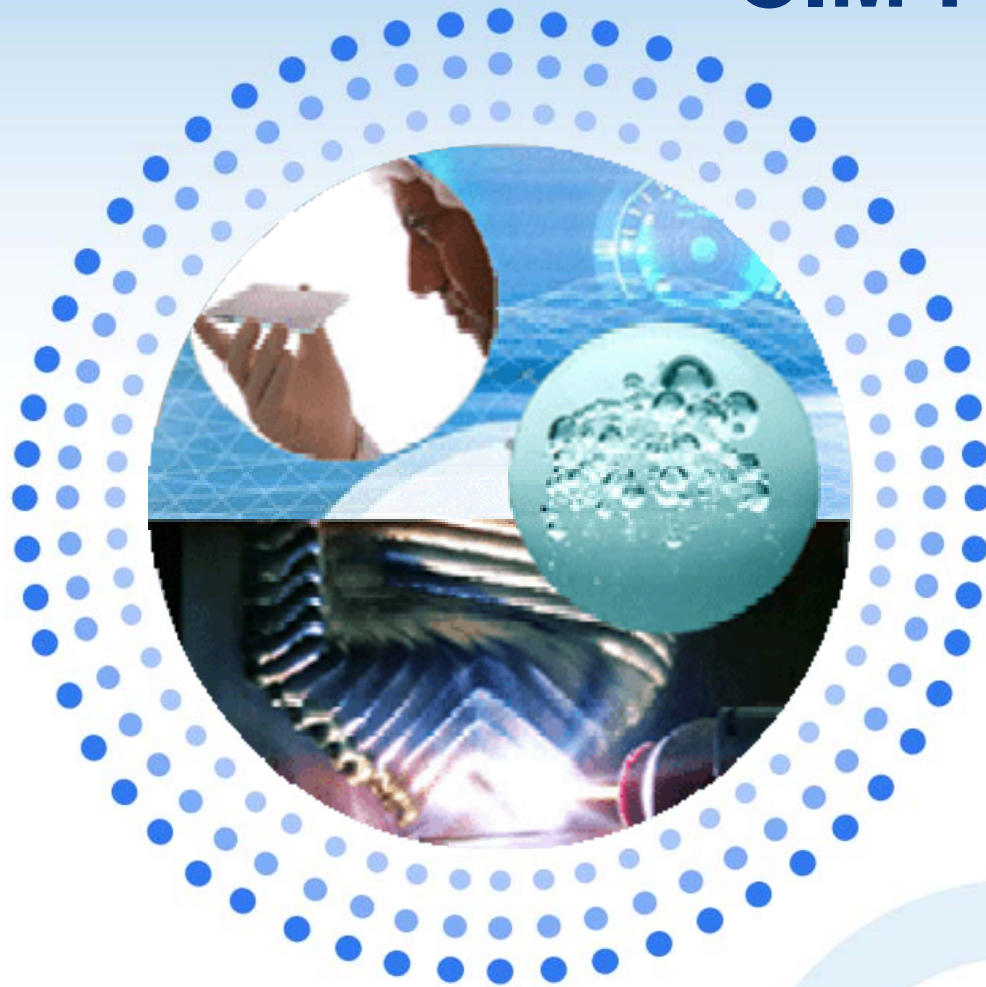


CIM FOR SMARTGRIDS



C.EFFANTIN – D.I LHAT
J.FREMONT – P.FORESTIER
T.COSTE – E.LAMBERT

EDF R&D
CIM User Group
Genval - Belgium- 2009



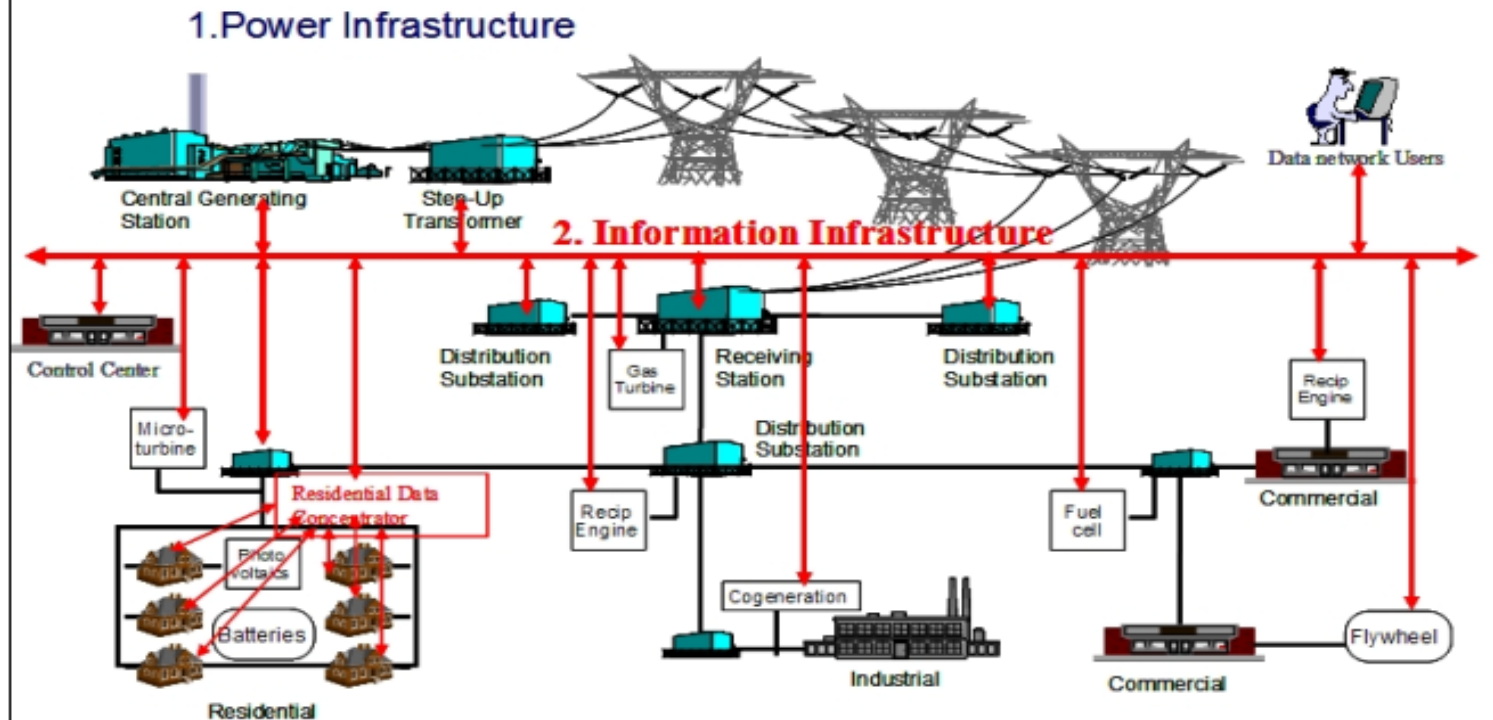
Topics

- ◎ 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

Two Infrastructures must be managed in the future, not one

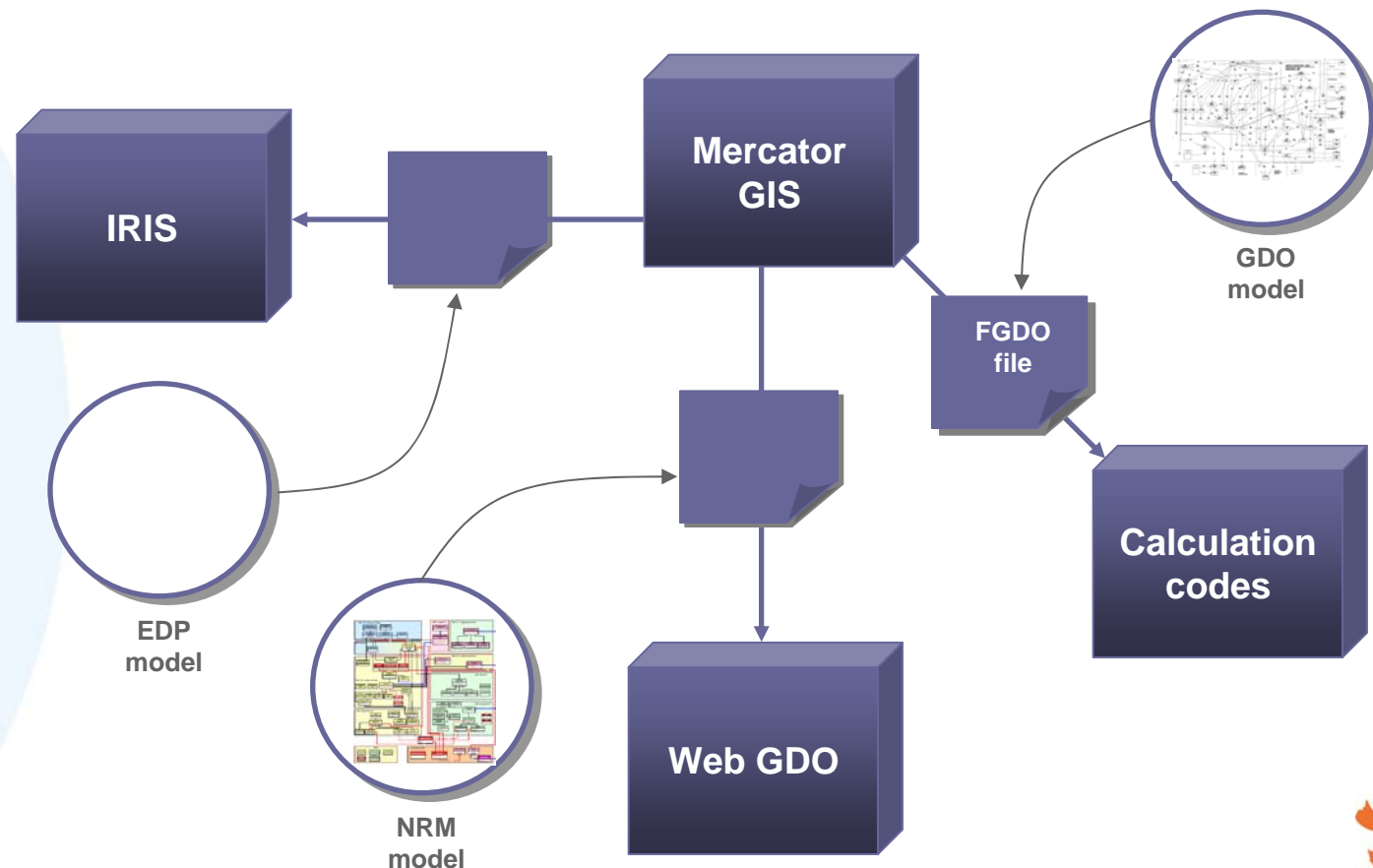


Goal : Satisfy end users and minimize integration costs



An Information Management reality

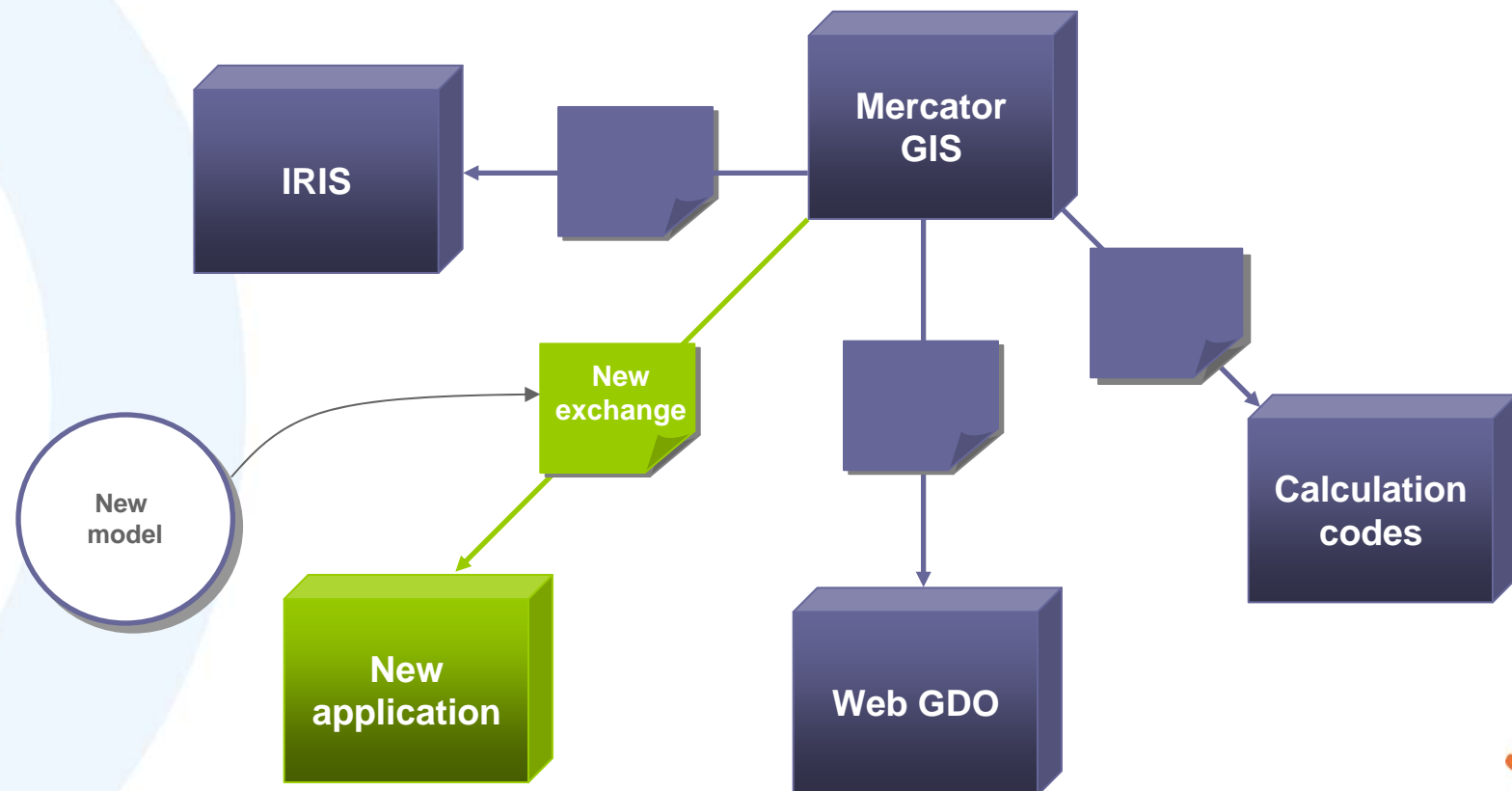
- © Inter-application exchanges of ERDF are made from **several** exchange models.





Several exchange models ... (1/2)

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





Several exchange models S

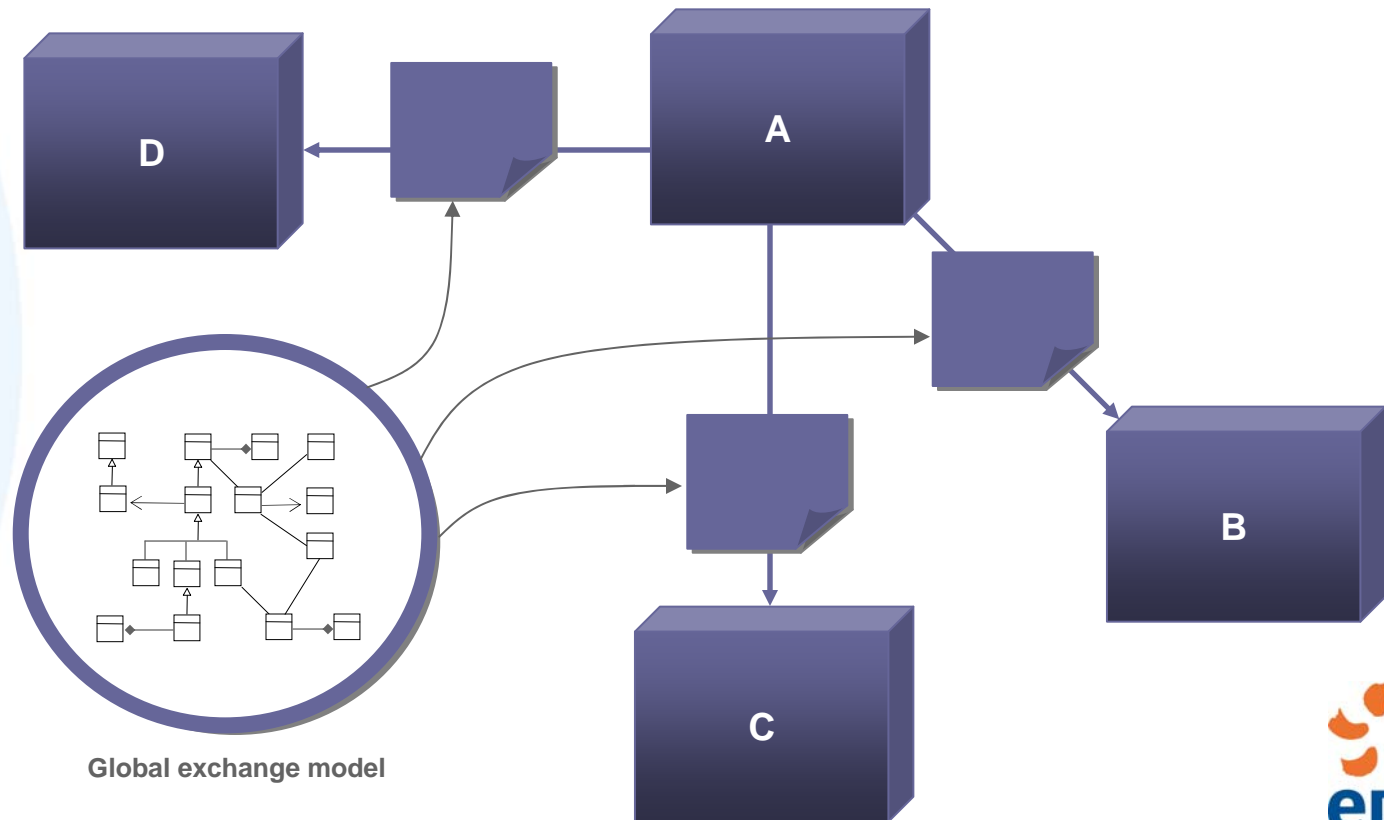
(2/2)

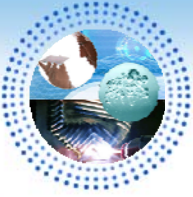
- ◎ **Increase the system complexity.**
- ◎ **Multiply abilities and skills :**
 - for interfaces development,
 - for models maintenance.
- ◎ **Inconsistency of the models** (heterogeneous object definitions).



One global exchange model

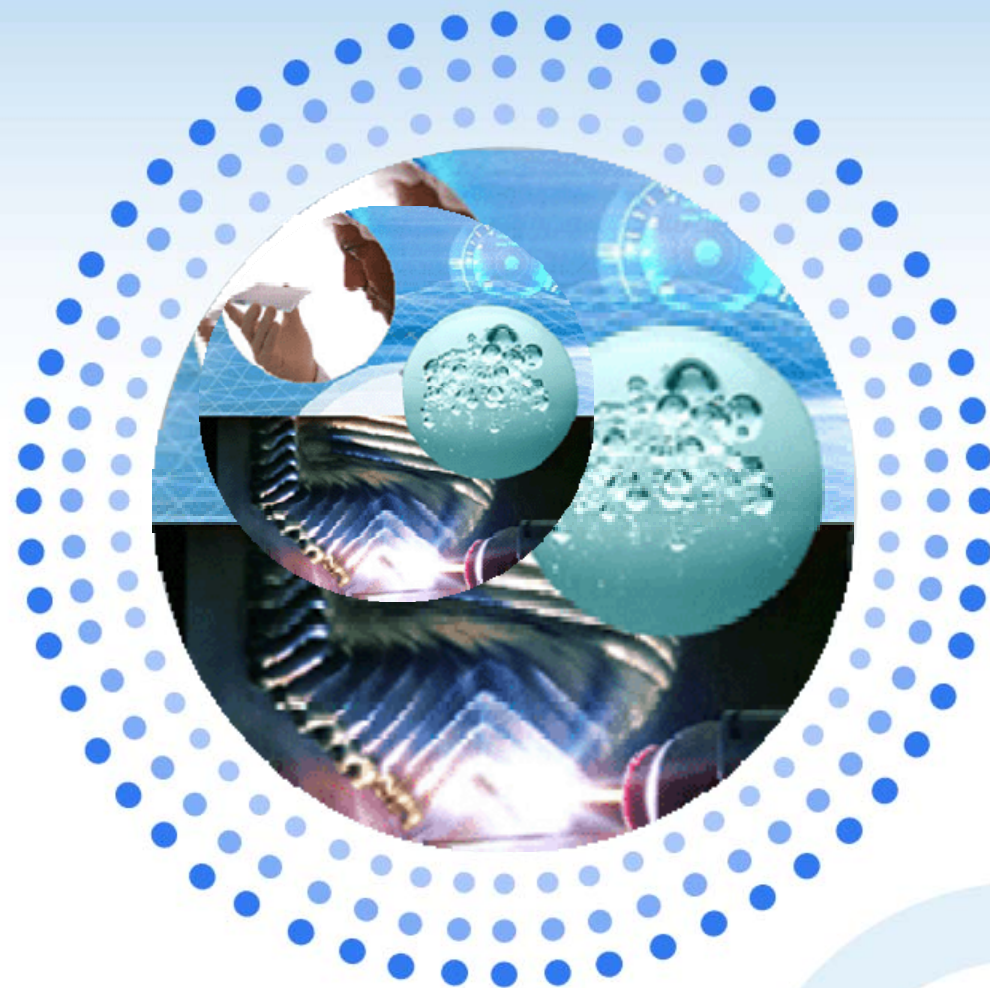
- © The purpose of a global exchange model is the possibility to re-use the same model for all the Information System exchanges.





Global exchange model 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)



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.



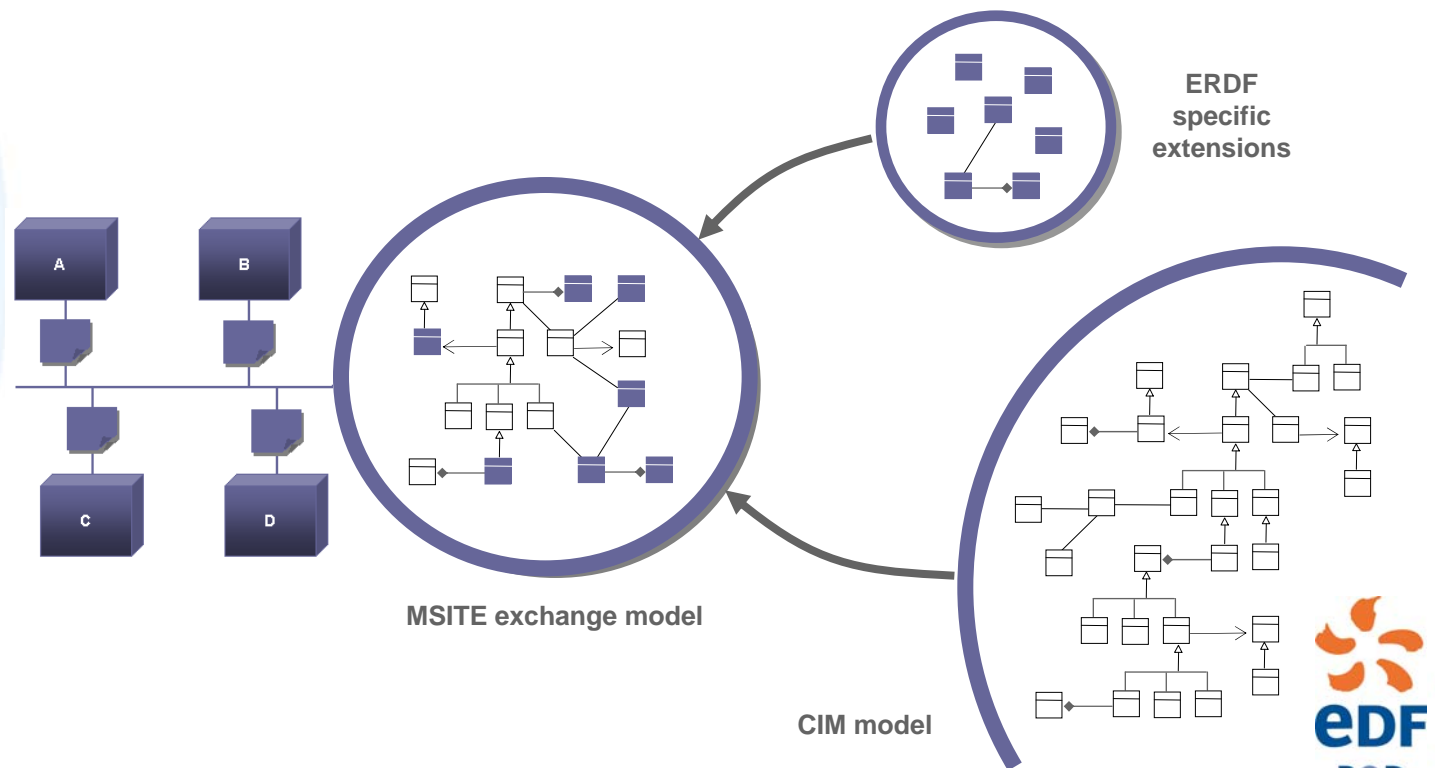
Standard advantages

- ◎ **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

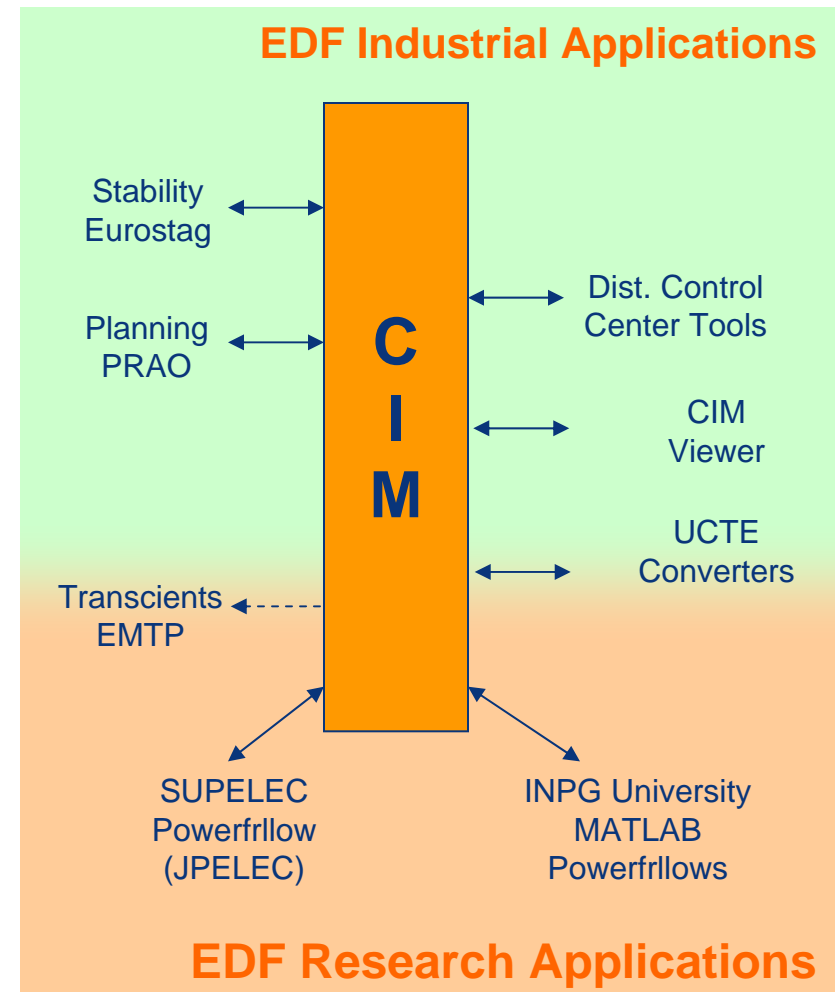
IEC related community tools.

CIMTOOL validation tool

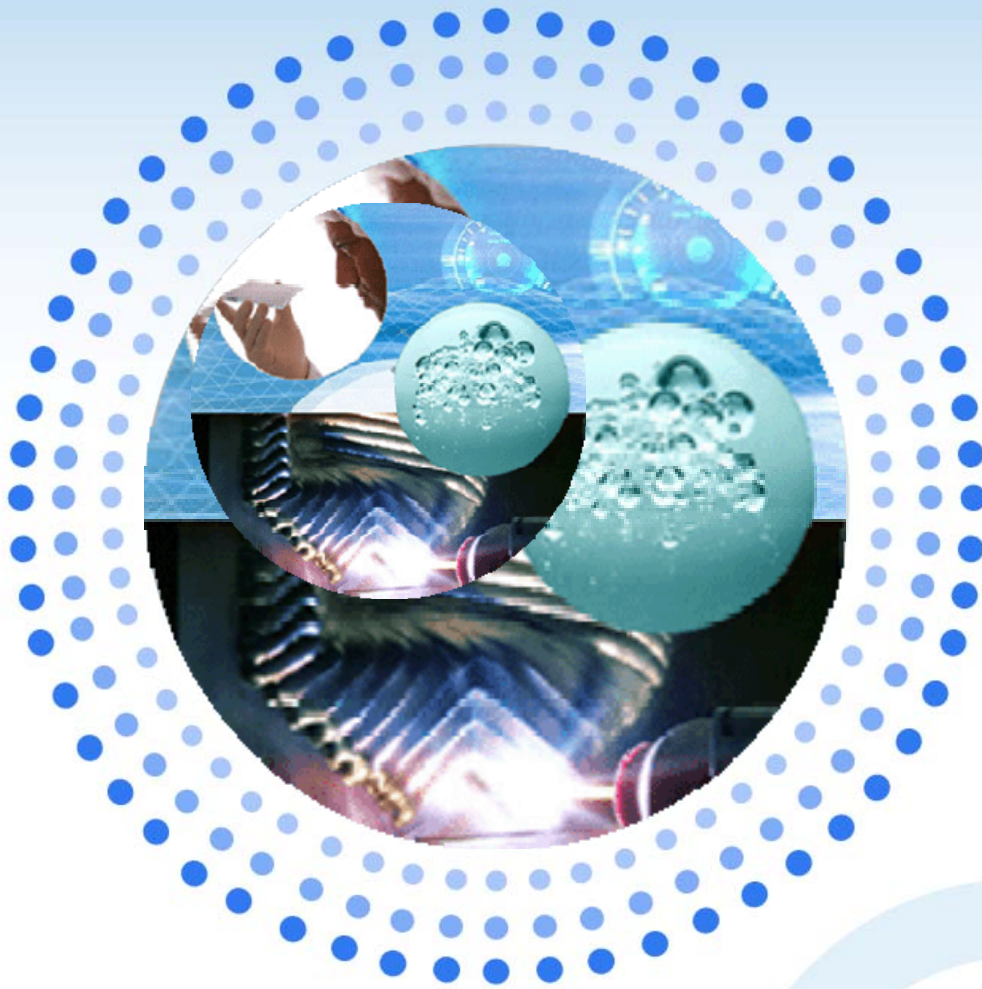
CIMPHONY validation tool

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

CIMSPY, CIMVIAN



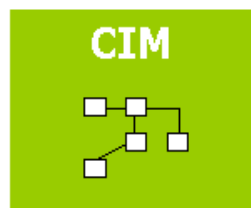
Modeling Methodology & Tools for MSITE





Methodology : CIM-UN/CEFACT

Business Process Analysis

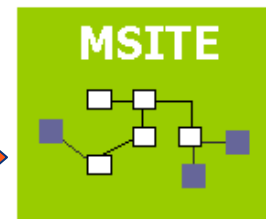


Information Model or **Core Components** (based on CIM)

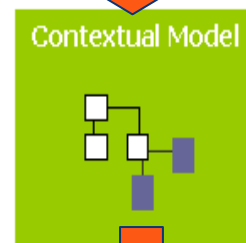
Definition of business context and constraints on Core Components

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

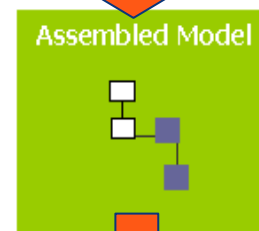
Transforming and Moving Rules of the Message conceptual Model to a Message Model Implementation



Sub-part of the CIM with complements for ERDF specificities



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



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



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



CIM Distribution profiles

◎ IEC CIM distribution profile : CDPSM (Common Distribution Power System Model)

- *Originally 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

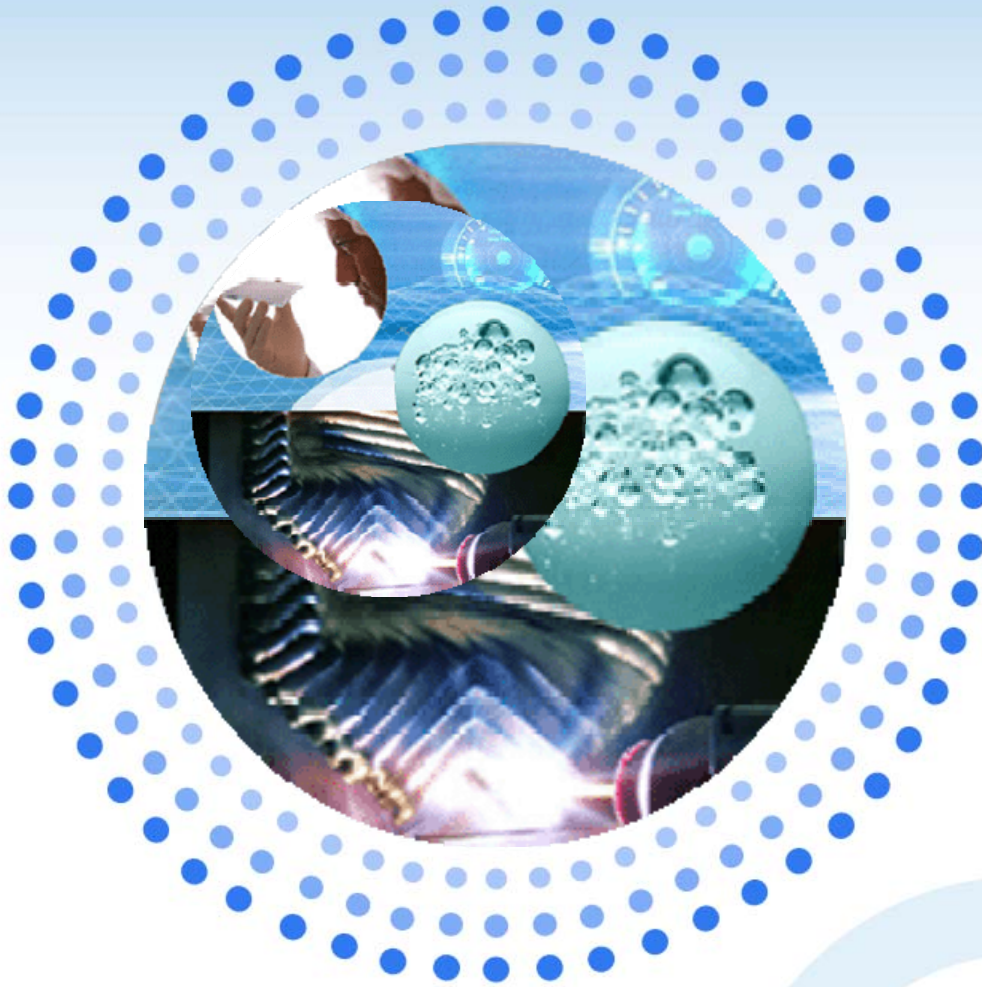
- *Dedicated to EDF Distribution network description.*

Wider range of information than CDPSM:

Originally 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





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.

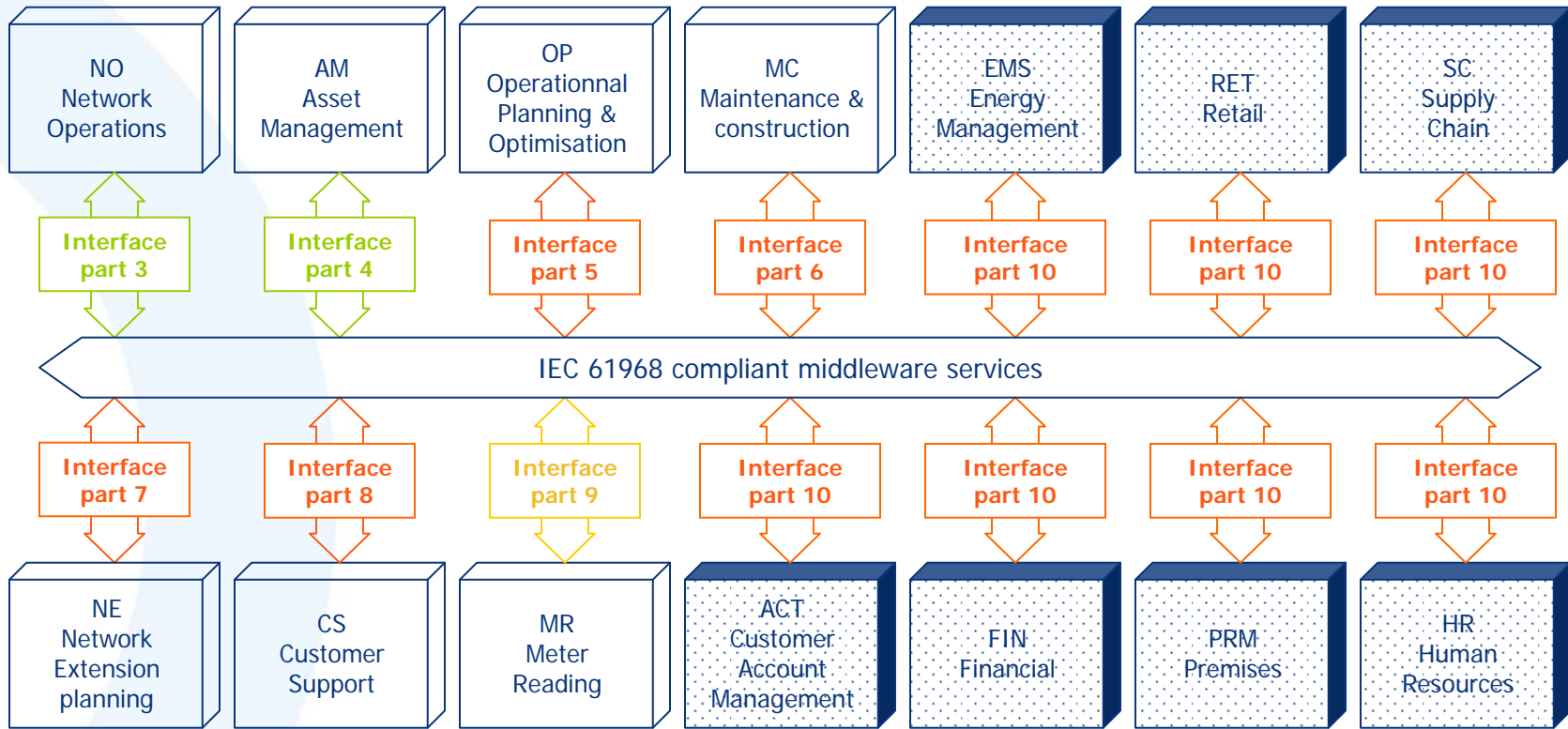


CIM roadmap for ERDF

Interface Reference Model Status

Part 1 : Architecture & general requirements

Part 2 : Glossary



Part 11 : CIM for DMS

Part 13 : CDPSM

Part 14 : Naming rules

■ International Standard

■ Draft

■ Proposal





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)

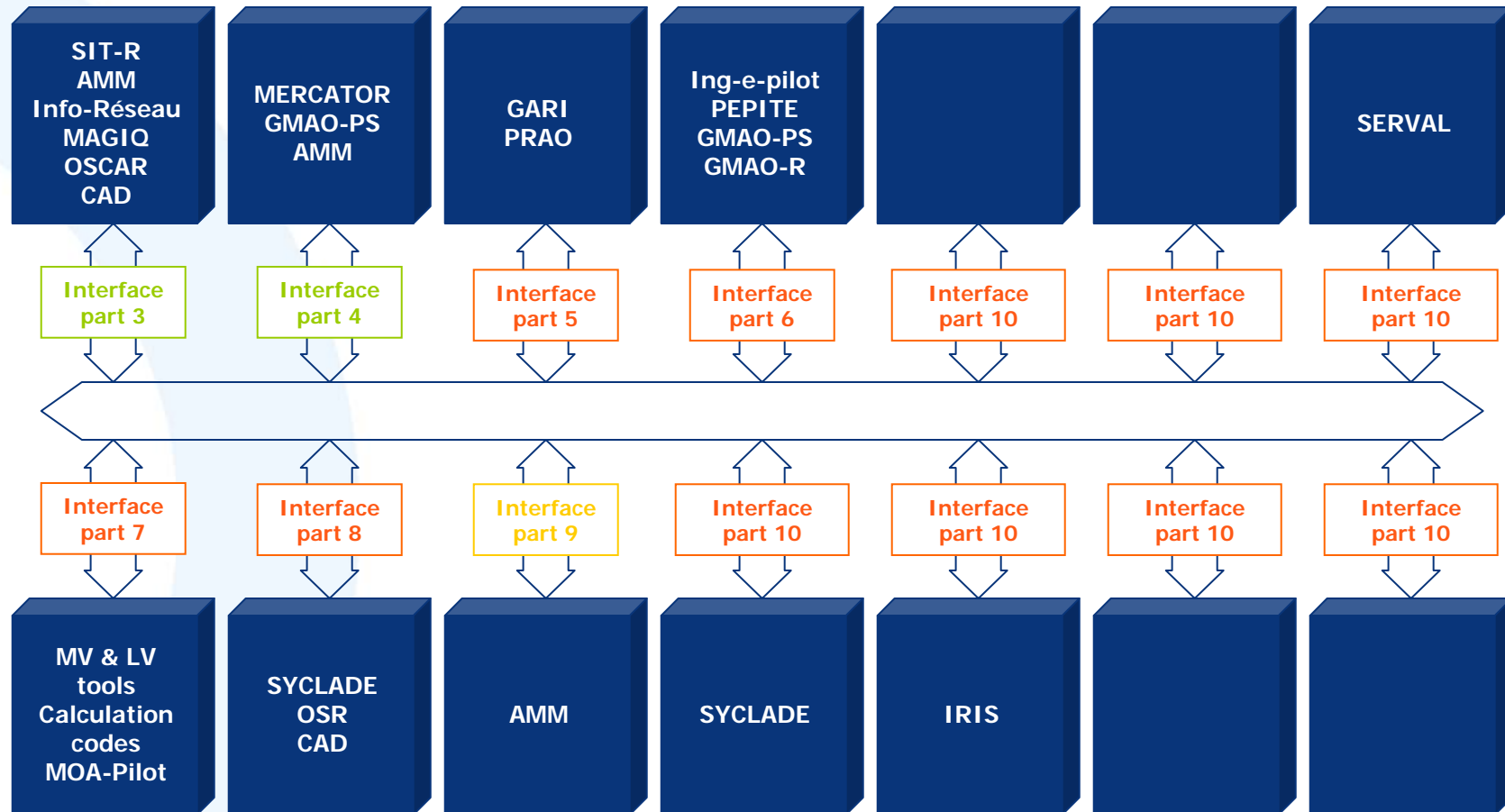
© 2010

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



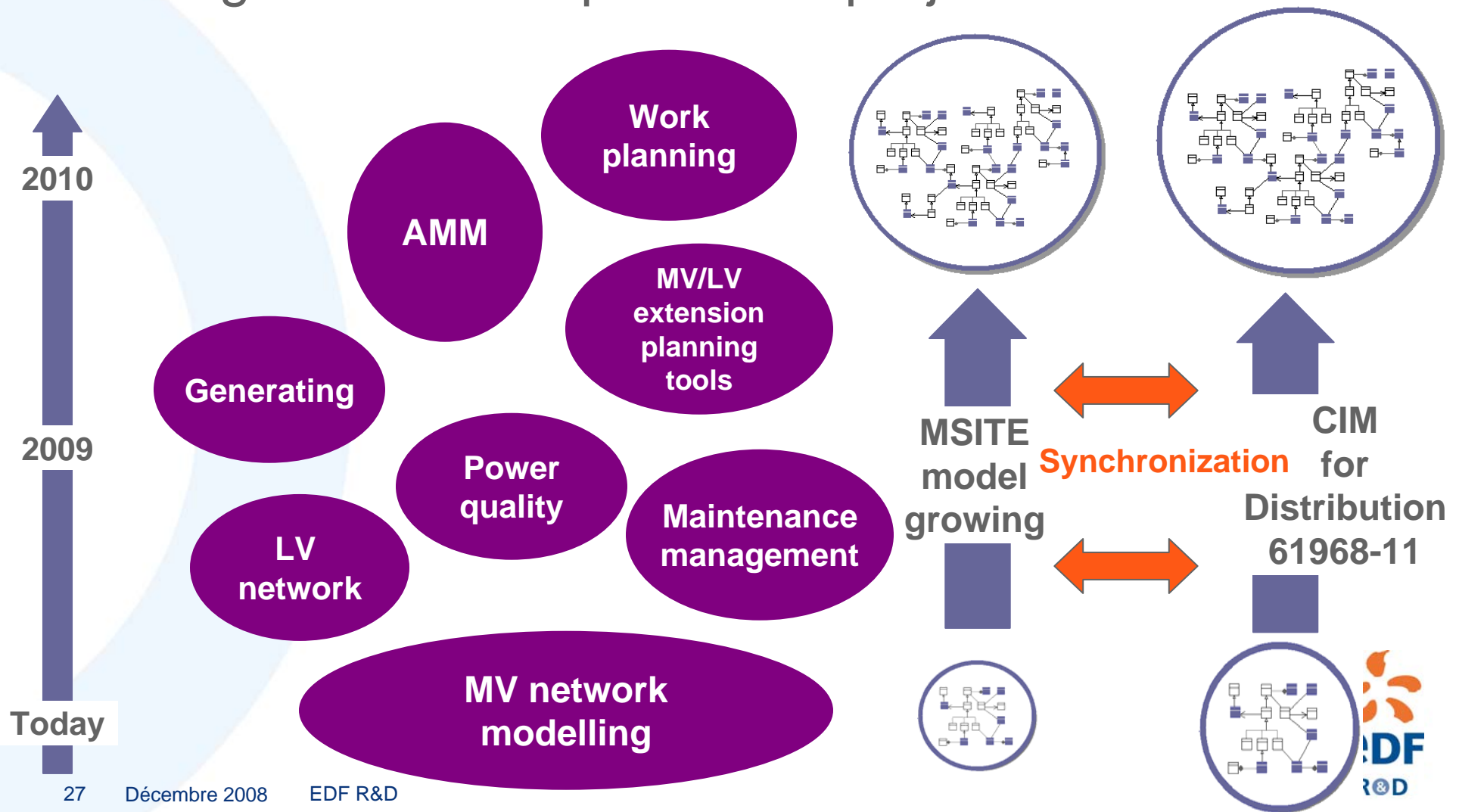
The IEC 61968 Interface Reference Model (IRM) in ERDF IS

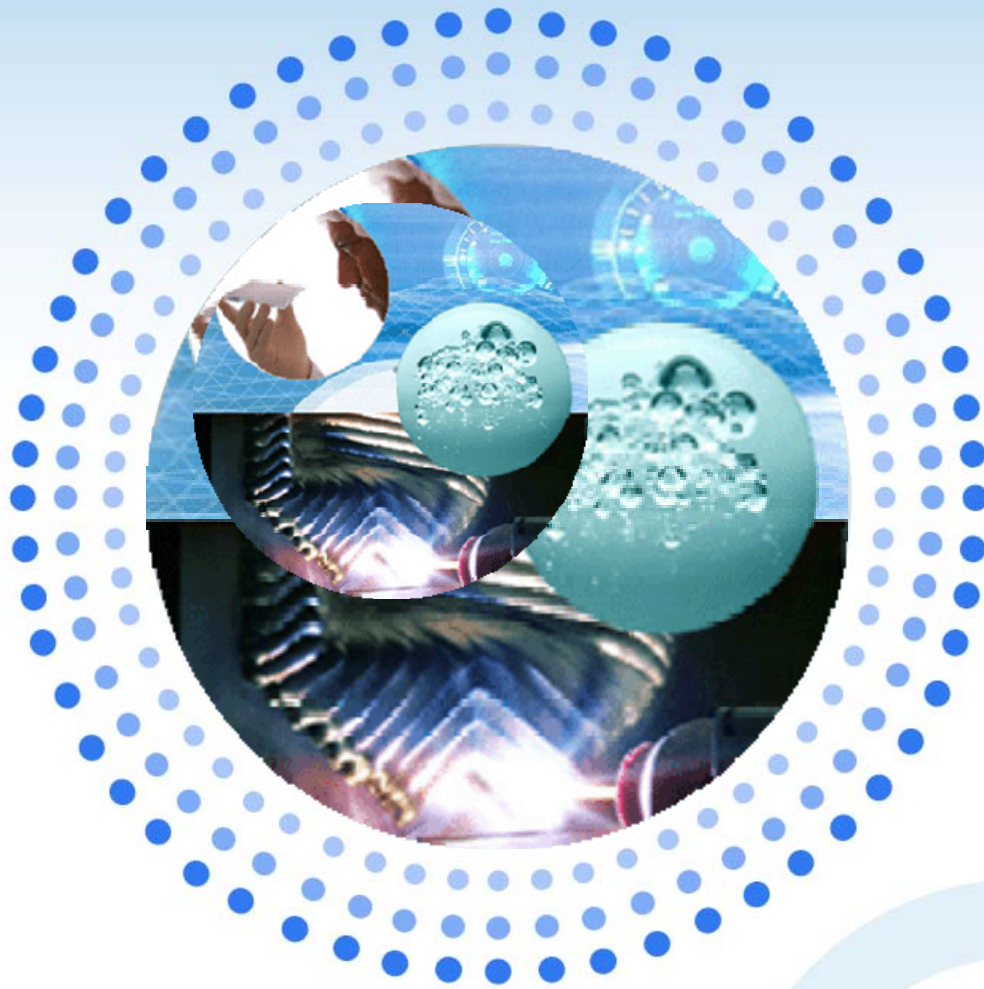




The roadmap continuation

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





Smartgrids EDF R&D related Projects



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

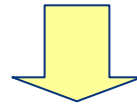
Optimization of Energy Resources

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 distribution system

4) IT applied to Distribution Systems : (R)evolution for increased performance

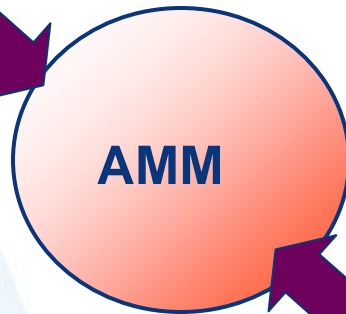


EDF R&D Distribution Challenge 2015

- ◎ 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



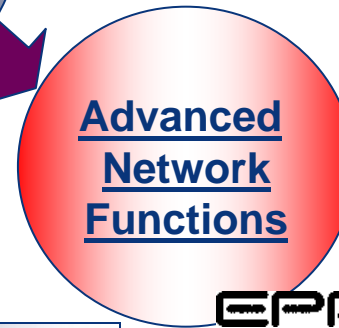
EPRI
Intelligrid /
Advanced Monitoring



DERRI (CESI Ricerca)



ADDRESS(ENEL)



DIGI²TAL
Distribution Grid
Intelligence
InTegrAtion Laboratory

EPRI
Intelligrid / Fast
Simulation & Modelling





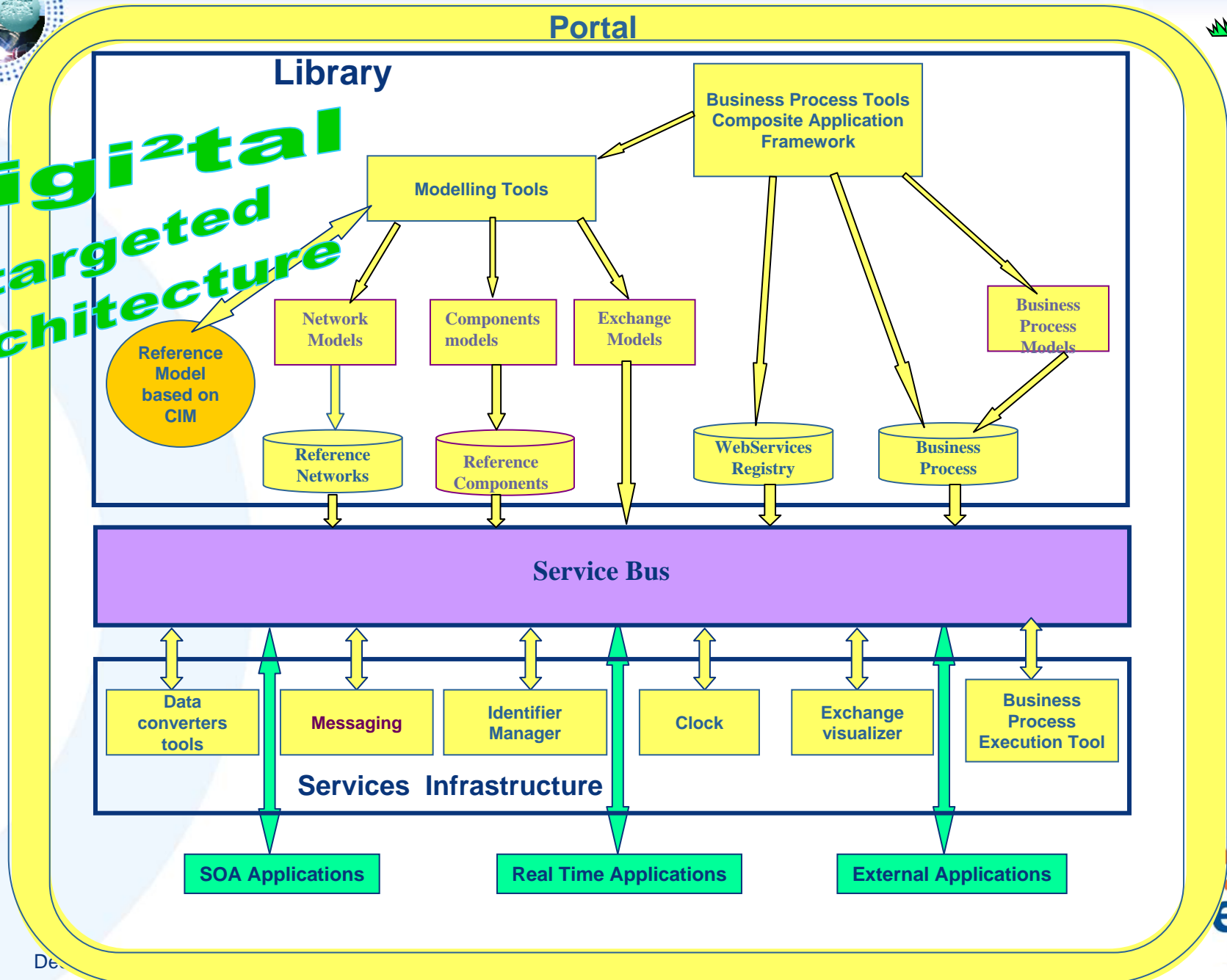
Aims of DIGI²TAL

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)



Digital targeted Architecture





DIGI²TAL Server



Recherche et Développement

Recherche | Annuaire | Portails



Laboratoire DIGI²TAL

contact: eric.lambert@edf.fr

1 - ENTREPOT DE RESEAUX

[GEDEON](#)
[SELECTION DE RESEAUX](#)

2 - CONVERSION DE FORMAT

[ASC vers CIM-CDPSM](#)
[CIM-CDPSM vers ASC](#)
[ECH vers CIM-CPSM](#)
[CIM-CPSM vers ECH](#)
[UCTE vers CIM-CPSM](#)
[CIM-CPSM vers UCTE](#)
[CIM-CDPSM vers MATLAB](#)
[CIM-CPSM vers EMTP](#)

LIENS UTILES

[CIM USER GROUP](#)
[DIGIWIKI](#) libre
[BUGZILLA \(SUGGESTIONS\)](#) libre

3 - PLANIFICATION

[EUROSTAG](#) libre
[PRAO](#) libre
[MOSARD](#) libre

VISUALISATEUR DE RESEAU

[CIM Viewer](#) libre
[MERCURY \(STRATHCLYDE\)](#)
 [MERCURY \(local\)](#)
[CIMPAPHONY TEMPS REEL](#)

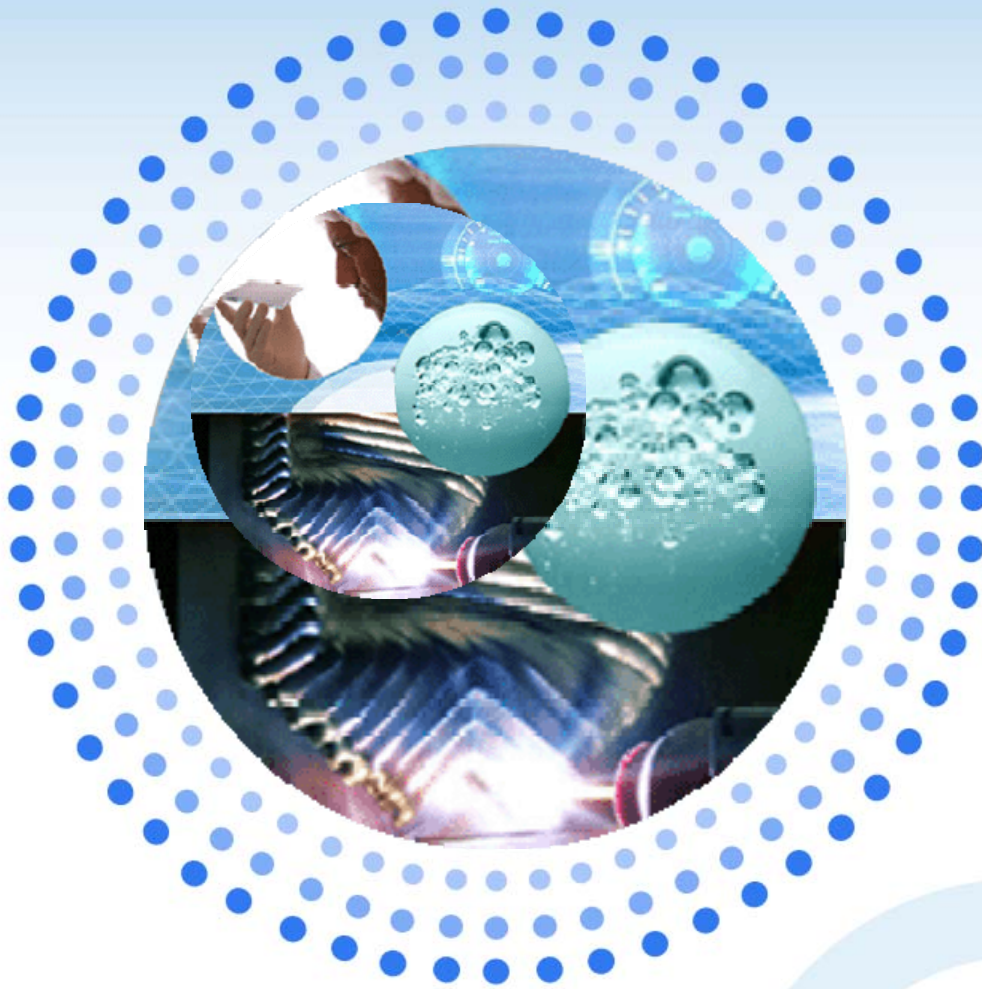
4 - TELECONDUITE

[SITR-INPACT](#)
[FAR-RECONFIGURATION](#) libre

MODELISATION

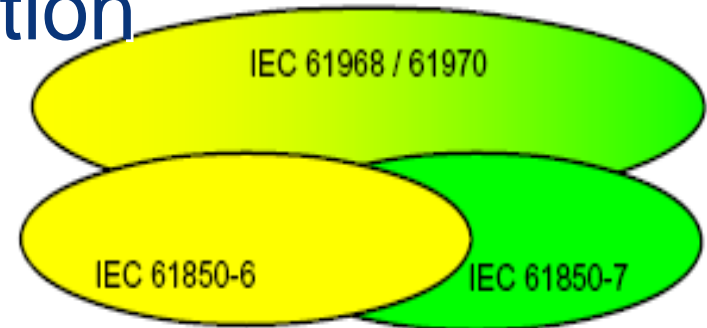
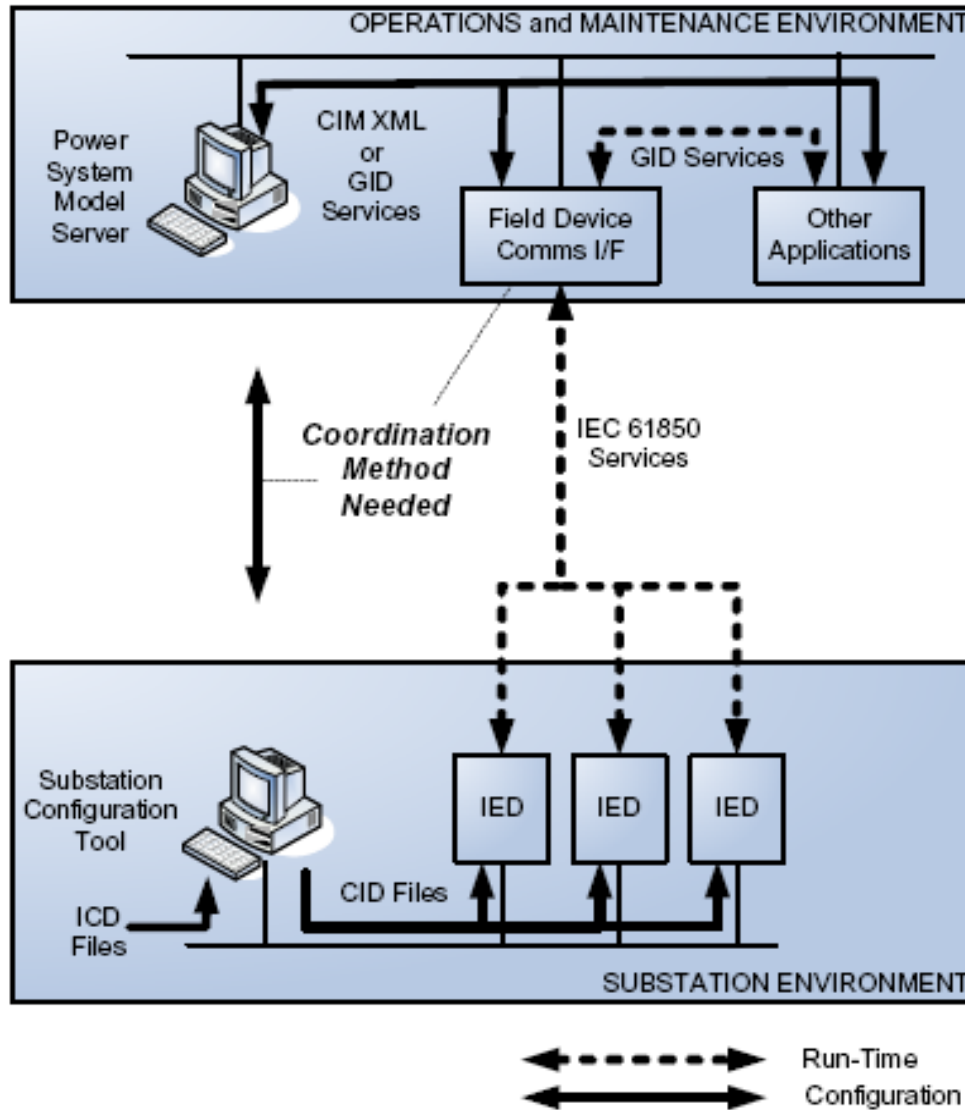
[MODELE MSITE \(CIM pour EDF\)](#)
 [MODELES DE PROCESSUS METIERS](#)

Some challenges & Conclusion





CIM-61850 Harmonisation



Configuration

Run Time

Same principles:

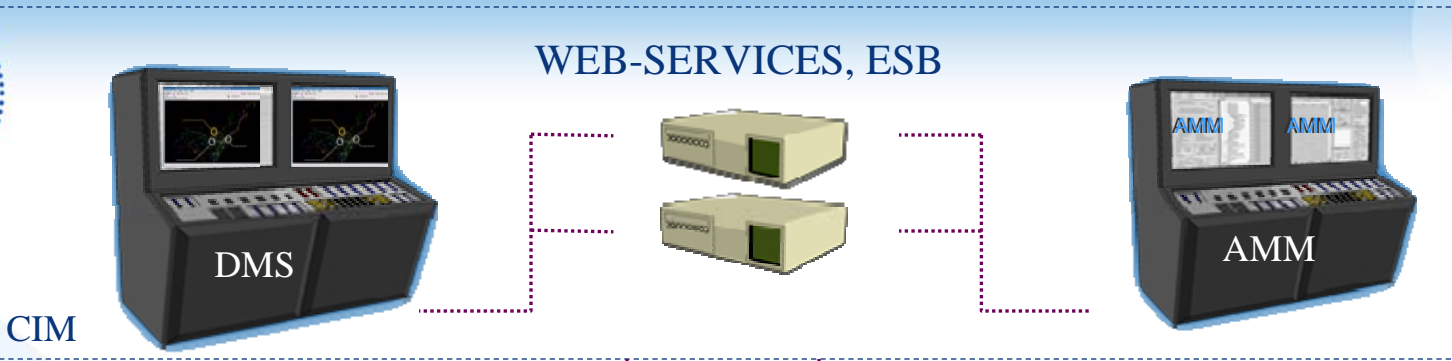
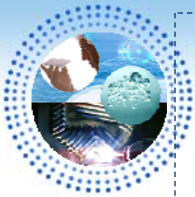
An information model
(WHAT)
[CIM, 61850]

+

A set of generic interfaces
independent of
implementation technology

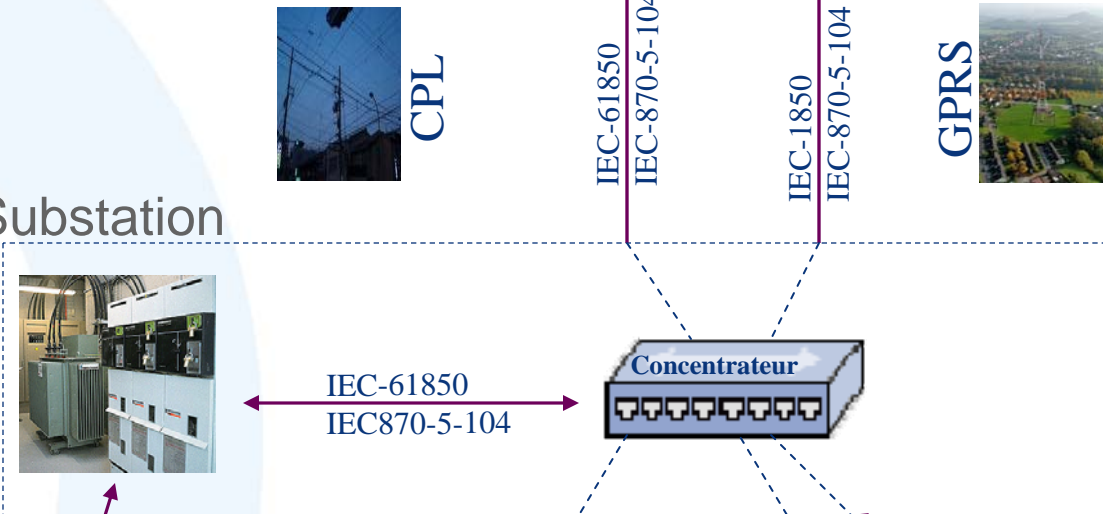
(HOW)
[GID, ACSI]





DMS, AMM
Information System

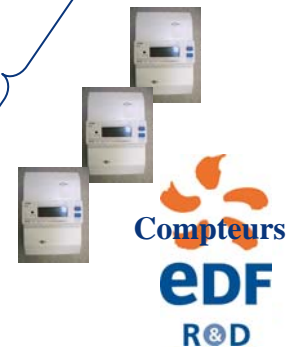
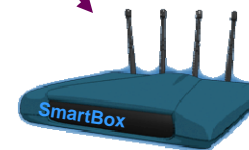
MV/LV Substation



Targeted
Architecture

IEC-61850
MODBUS

DLMS-COSEM
CPL





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 Enterprise 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)

