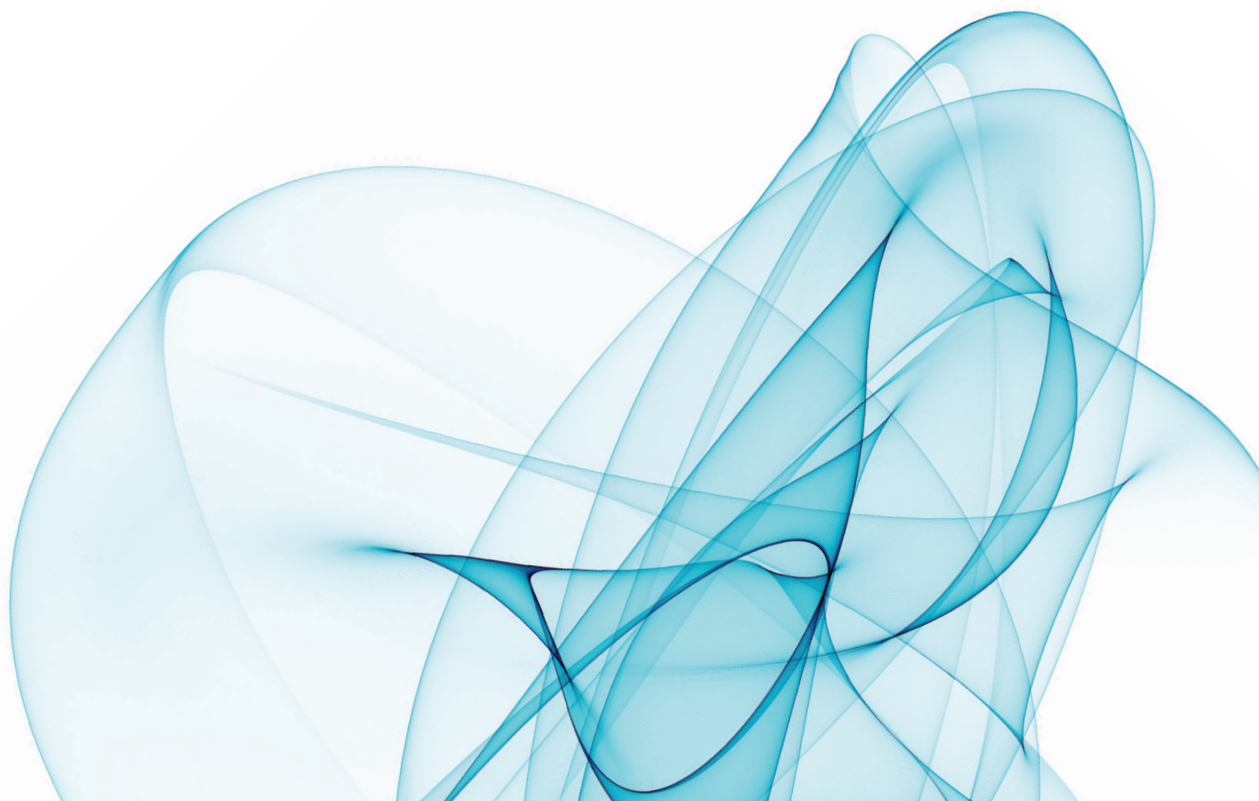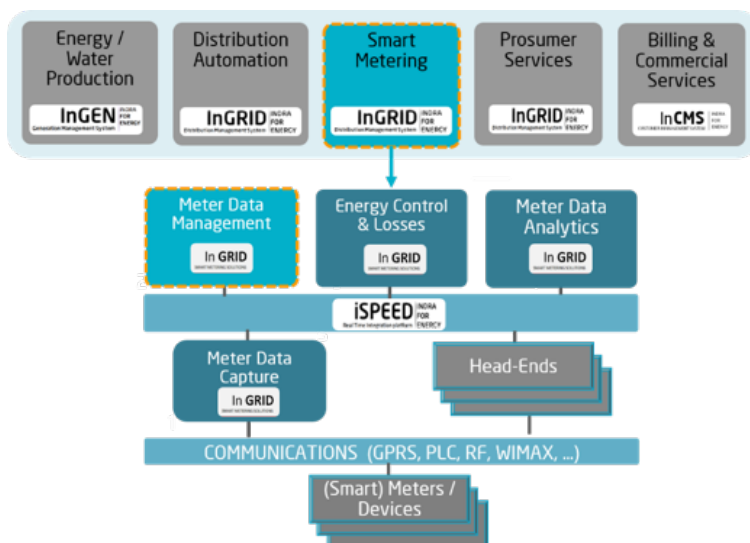# In**GRID MDM**

SMART ENERGY SOLUTIONS

Meter Data Management

indracompany.com

SMART METERING SOLUTION TO HELP COMPANIES ACQUIRE COMPETITIVE ADVANTAGES IN AN ENERGY MARKET AFFECTED BY GLOBAL TRENDS
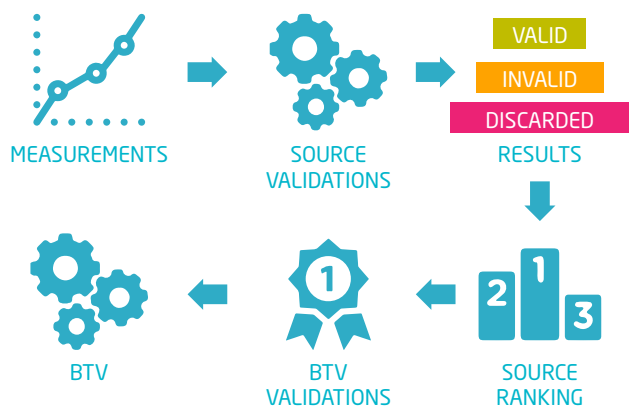

MEASUREMENT MANAGEMENT

SMART MANAGEMENT

InGRID MDM is Indra´s Metering Solution for the treatment, certification and exportation of water, gas and electricity measurement data. A central inventory linking field data with utilities corporate systems.

MEASUREMENTS → SOURCE VALIDATIONS → RESULTS: VALID / INVALID / DISCARDED

BTV ← BTV VALIDATIONS ← SOURCE RANKING

Estimations

Estimation processes associated to each metering point will be launched if there is a "**GAP**" when the optimal measurements are collected. Once these processes are finished, the system **ensures** load profiles are completed. They are marked in the system as new "Estimated" source within the ranking.

Forecasting

Forecasting algorithms calculate measurements provided to estimate **future needs** to be covered. These algorithms can be applied to various magnitudes.

Measurement Management

Validations

A Validation is a business rule that certificates the validity of a given measurement according to preconfigured criteria. Each metering point (Real and/or Virtual) has a **Validation Template** associated to it. The system offers the user the possibility to configure the available validations in the system or generate new ones.

Source ranking

The system seeks amongst all available measurements for a given time interval what source has the **highest priority**, and taking into account the validation process, marks this measurement as the **best time value** (BTV). This source ranking applies only to real metering points (not virtual points).

GAP + ESTIMATIONS =

VARIABLES + HISTORICAL DATA = FORECASTING ALGORITHMS

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DATA PERSISTENCE

INFINITE & CONSISTENT GROWTH

InGRID MDM is a solution to handle the stored information, with capacity to work easily with any new standard protocol in order to exchange information. It has a flexible, high-performance, secure platform for running diverse workloads on **SQL Database**: Static Data (inventory, coefficients ...) and **NoSQL Database**: Dynamic Data (measurement data, events, traces.).

Data Persistence

SQL & NoSQL

Web service

HES

Billing Systems
GIS
Commercial Systems
Settlement Systems

Big Data

cloudera CERTIFIED

ORACLE
Certified Specialist

Oracle Exadata 11g Certified
Implementation Specialist
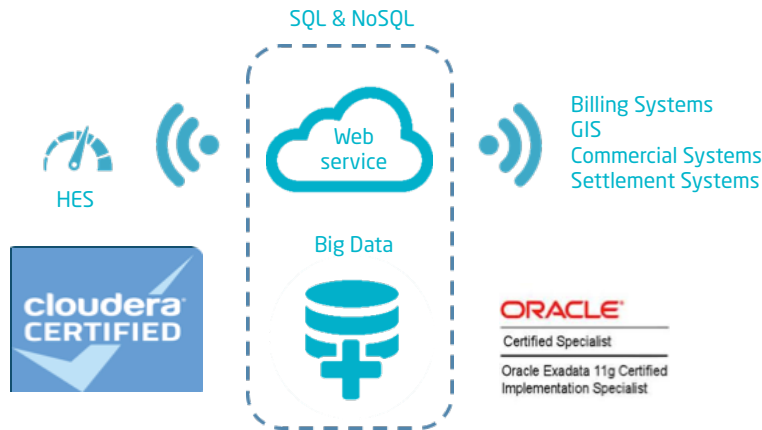
- **Massively** scalable, proprietary and open technology to store, manage and export metering data.

- Design to maximize functional query **performance** on all data using advanced business intelligent tools.

INVENTORY

ENERGY INFRASTRUCTURE DATA

Main elements of the electrical infrastructure and models represented in the system, different measurement data with option to create groups and aggregations, the actors involved in the system and master tables with configurable data.

Inventory

**Equipment:** information about devices associated to metering points registered in the system.

Metering Points: full details about metering points discharged in the system. It shows two set of points:

- Metering points: points obtained from field devices like meters, data concentrators.

- Virtual points: points calculated from other metering points by calculation formulas.

Groups/Aggregations: set of points grouped in order to automatize operations within the systems.

Tariff Structure: applies different tariff structures depending on the established contract, in order to perform pre-billing analysis.

Owners/Customers: Data identification of clients and owners that are registered in both InGRID MDM and Customer Billing System.
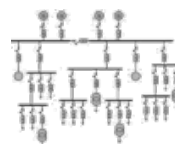
Network model: Graphical tool that allows the user to draw and display the network topology corresponding to each zone.

Master tables: static master data used within the system, configurable by the user (file format, validations, sources, tariff structure, etc.).

DASHBOARD

GREAT INFORMATION DISPLAY

Different dynamic dashboards summarize the most important information regarding the application. The aim is to show the user a **quick view** of the system status and the most relevant information.

MAIN DASHBOARD

MEASUREMENTS

REPORTING

CONFIGURABLE DOSSIER

Manual / Automatic reports with pre-configured templates by the user using **BIRT Tool**. **Generation** and **exportation** of all system data in several formats, such as:

- Microsoft Excel, Word or Power Point
- PDF
- HTML
- TXT

SOURCE COMPARISON

AGGREGATED MEASUREMENTS

ADDITIONAL FEATURES

INTERESTING FUNCTIONALITIES

Traceability

This module includes all functions related to the system´s **auditing** and **monitoring**. All user and system actions are traced for further incident resolution.

Scalability

The system has **dynamic load balancing** that can be configured online from the web interface, thus liberating the more saturated **nodes** and send such load to less saturated ones.

Revenue Proctection

This module includes balance and **fraud detection** tools, allowing the user to control the input and output of power into the grid while **minimizing losses** and detecting possible fraudulent activities.

Prebilling

This module includes the configuration and generation of **bills/invoices**. Tariff structures with different prices and periods are modifiable by the user.

Security

This functionality creates and configures the different **users** that have access to the system and related **permissions** and elements they can interact with.
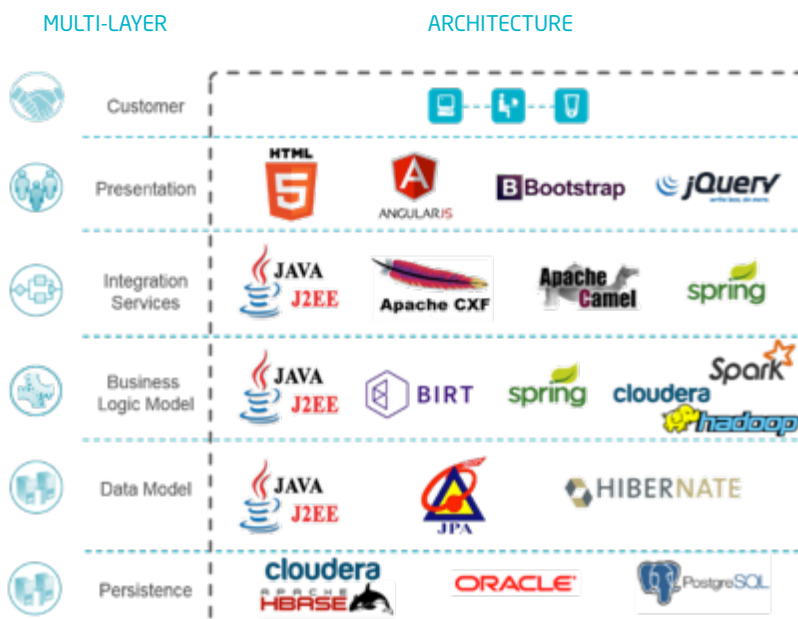
Interfaces

The system is able to **exchange** and share information with any third system, both input and output. Through **Web Services**, the user can shift data, and update the inventory and other system components.
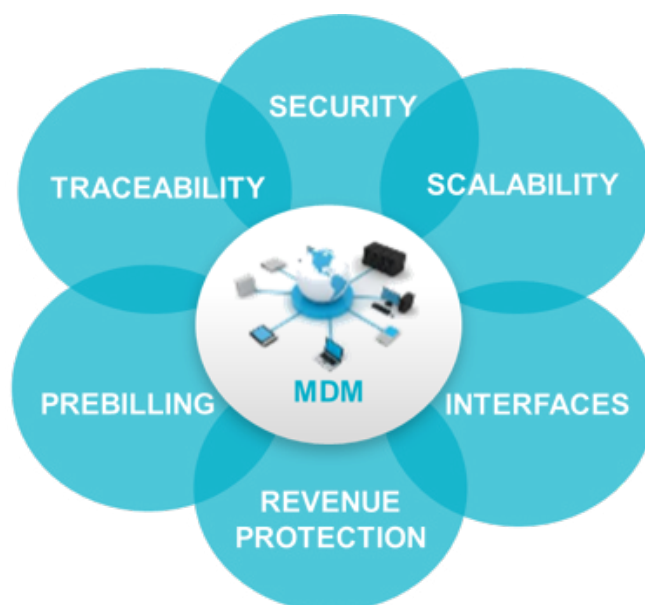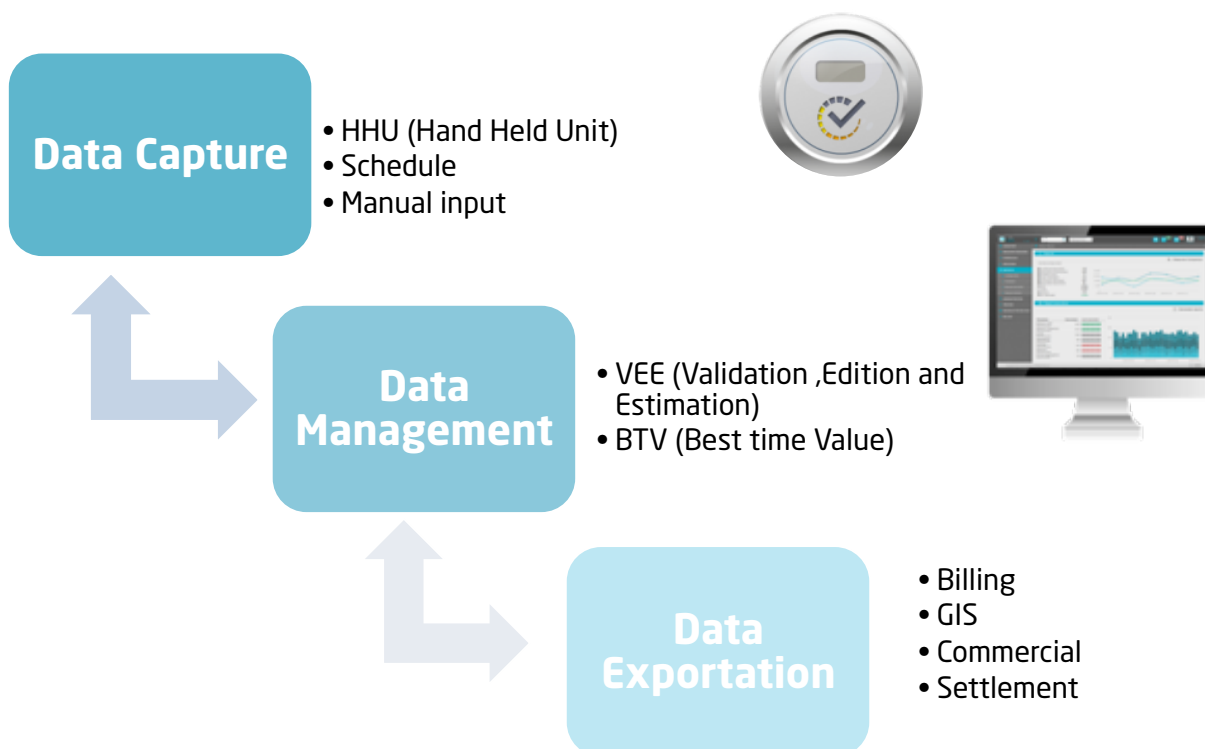
ARCHITECTURE

SOFTWARE IMPLEMENTATION

Indra´s platform is an advanced system based on a **100% Web** front-end architecture based in a platform created with **HTML5**. The back-end is an **Open Source** product, implemented with J2EE and integrated with the most recent standards and security frameworks. The system uses **Big Data** technology from **Cloudera** for data storage and processing, Open Source technologies like PostgreSQL and HBase, and proprietary relational database systems such as **Oracle**.

MULTI-LAYER ARCHITECTURE

Customer		
Presentation	HTML5 · ANGULARJS · Bootstrap · jQuery
Integration Services	JAVA J2EE · Apache CXF · Apache Camel · spring
Business Logic Model	JAVA J2EE · BIRT · spring · cloudera · Spark · hadoop
Data Model	JAVA J2EE · JPA · HIBERNATE
Persistence	cloudera APACHE HBASE · ORACLE · PostgreSQL

OPERATIONAL FLOW

LOGICAL EXECUTION

Data Capture
- HHU (Hand Held Unit)
- Schedule
- Manual input

Data Management
- VEE (Validation ,Edition and Estimation)
- BTV (Best time Value)

Data Exportation
- Billing
- GIS
- Commercial
- Settlement

1. Data Collection

Data acquisition through various methods: HES (Head End System, e.g. InGRID MDC), HHU, manually, or directly from the different equipment deployed in the grid such as Data Concentrators using PRIME technology.

2. Data Management

Data management involves all the VEE (Validation, Estimation and Edition) process in order to complete and certify the measurements.

3. Third Systems

All information can be exchange, either input/output with other corporate systems in the appropriate format.

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Over **140 Utilities** use Indra's technology solutions.

- More than **100 million Customers** managed throught Indra's commercial systems.
- More than **700 generation Plants** are managed with Indra solutions.
- Successful implementations in **most of the European and Latin-American** companies.
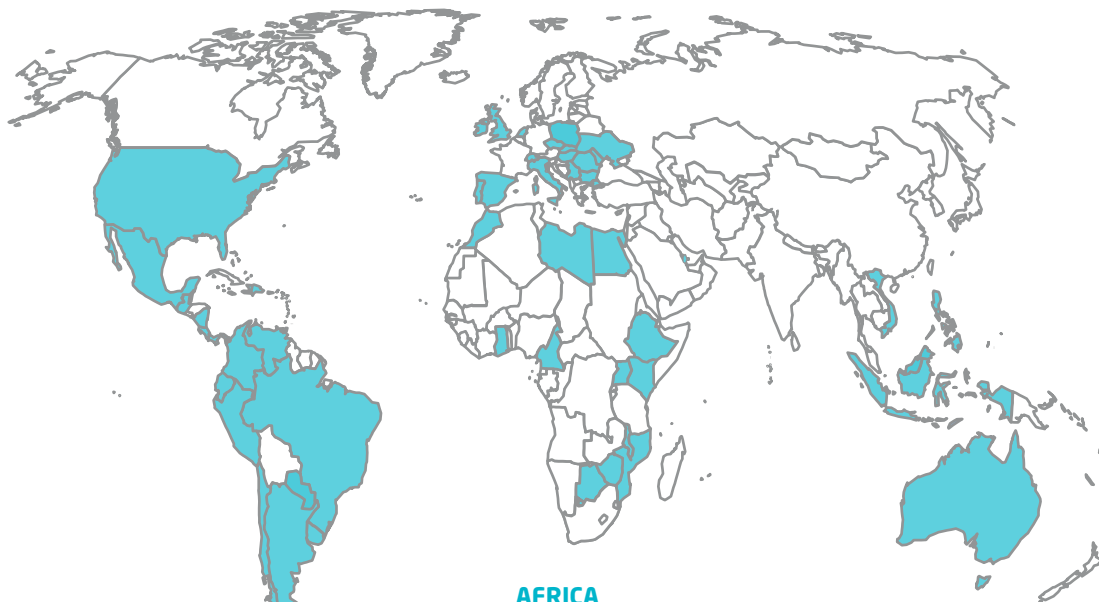
AMERICA

Energuate (Guatemala)
Ecopetrol (Colombia)
Cemig (Brazil)
Elektro (Brazil)
OSE (Uruguay)
UTE (Uruguay)
AES SUL (Brazil)
CPFL (Brazil)
Aguas de Hermosillo (Mexico)
Aguas de Monterrey (Mexico)
Cadafe (Venezuela)
Hidrocapital (Venezuela)
Seneca (Venezuela)
Disnorte-Dissur (Nicaragua)
Electricaribe (Colombia)
Eleval (Venezuela)
Eletrobas (Brazil)
CEEE (Brazil)
Energisa (Brazil)
Emdersa (Argentina)
EEC (Colombia)
Epsa (Colombia)
Grupo EMEL (Chile)

Petrobras (Brazil)
RGE (Brazil)
Chevron (USA)
AyA (Costa Rica)
Aysa (Argentina)
Edelap (Argentina)
Sedapal (Peru)
Sedalib (Peru)
Electrodunas (Peru)
Osinergmin (Peru)
Sempra (USA)
AES (Brazil)
Ligth (Brazil)
Petroperú (Peru)
EP Petroecuador (Ecuador)
CDEEE (Dominicana)
Edesur (Dominicana)
Edenorte (Dominicana)
Edeeste (Dominicana)
DelSur (El Salvador)
EDEN/EDES (Argentina)
UTE (Uruguay)

AFRICA

ONEE (Morocco)
KPLC (Kenya)
ENEO (Cameroon)
EEPCO (Ethiopia)
NCWSC (Kenya)
KENGEN (Kenya)
UMEME (Uganda)
ZESCO (Zambia)
ZETDC (Zimbabwe)
GECOL (Libya)
ESCOM(Malawi)
EDM (Mozambique)
ECG (Ghana)
KETRACO (Kenya)

MIDDLE EAST - ASIA - PACIFIC

Meralco (Philippines)
Mayniland (Philippines)
Manila Water (Philippines)
E&W Authority (Bahrain)
Cepalco (Philippines)
Caltex (Australia)
Origin (Australia)
PLN (Indonesia)
RAWEC (Saudi Arabia)

EUROPE

GNF (Spain / LATAM)
Enel / Endesa (Italy / Spain/LATAM)
Enel Green Power (Spain)
Viesgo (Spain)
Iberdrola (Spain / Portugal)
REE (Spain)
ACEA (Italy)
ENI (Italy)
EDP (Portugal)
BP (Portugal)
Canal Isabel II (Spain)
Agbar (Spain)
FCC Aqualia (Spain)
SSE Grupo EDF (Slovakia)
Grupo PP&L CEZ (Czech Republic, Romania)
RWE (Czech Republic)
Red Chisinau, Centru, Sud (Moldova)
Electrica (Romania)
EDA (Portugal)
EDM (Portugal)
GALP (Portugal)
REPSOL (Spain / Portugal)
Lafarge Energy (Switzerland)
ENEA (Poland)
NEK EAD (Bulgaria)
Trafigura (Global)
SEPS (Slovakia)