Data Analytics Module (DAM)

- Web-based Query & Reporting System
- Measurement Reports (Measurement graphs for selected installation and time period, Table with measurements and system status for selected installation and time period, Export to Microsoft Excel file with acquired measurements)
- Event Reports for selected installation and time period
- Operations and Maintenance Reports (Daily report for selected installations, Monthly report for selected installations, Yearly report for selected installations, Current alarms report, Communication problems report, Maintenance report for OLTC positions, Maintenance report for Capacitor Transitions)
- Snapshot of history status of all iReact installations and overall calculations
- Business Analytics Report (Overall system performance for selected time period, Overall system performance per geographical region for selected time period)
- Software agents to automatically generate desired reports and send by email to relevant users
- Fast response of the reporting mechanism even for large periods of selection

Simulations Analytics Module (SAM)

- **Several real-time simulation tools for distribution grid management are supported:**
- Load Allocation (High-accuracy allocation of the measured load quantity at the HV/MV substation to individual distribution transformers and loads, Reliable and realistic load data for the rest of the simulation tools)
- Load Forecasting (Modern load forecasting techniques using auto-regression models and artificial neural networks, Combination of real-time and historical load data for minimum-error predictions, Improved accuracy with integration of past and current weather conditions, Available 1, 3, 6, 9, 12-hour and day ahead forecasted load curves for predictive grid control)
- Power Flow Analysis (Excellent estimation of the current operating state of the grid, i.e. bus voltages, power flows through lines, etc., Visual, real-time result demonstration on interactive distribution network map) Static System Stability Analysis (Real-time calculation of the grid's available loading capability, Constant monitoring of voltage levels, Detailed stability assessment in a simulated, single-component loss environment, Stability violation alerting and proposed countermeasures
- **Installed iReact units in HV/MV substations are utilized for scheduled control actions on local regulating equipment (OLTC, capacitor banks, etc.) for improved, optimized performance**
- Short-term load forecasting for prompt and more efficient equipment management
- Mitigation of redundant regulating actions through careful, automated planning
- Life cycle prolongation of high-stressed equipment (transformers, OLTC mechanisms, etc.)
- **"Smart" inverter capabilities of distributed power sources are exploited in full scale with precise, scheduled setpoint adjustment for optimized grid support and operation:**
- Short-term generation profile prediction for distributed power sources
- Minimum daily distribution power losses for increased power quality
- Custom voltage profile fitting for maximum voltage level control
- Estimation of potential, future voltage stability issues and proposed countermeasures
- Full coordination with scheduled HV/MV substation regulating actions for optimal, global performance
- Intelligent integration of energy storage systems, supporting various optimization profiles (load peak shaving, handling of renewable energy intermittency, etc.)
- Day-ahead load demand report of the distribution grid, available for main utility generation planning

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EMTECH
EXCEL MICRO TECHNOLOGIES

iReact-Prognosis

Your Virtual Assistant for substation & distribution grid operations

Όνομα	Ημερομηνία	Mode	C1	C2	C3	TAP	V (kV)	P (MW)	Q (MVAr)	Qc (MVAr)	Qc1 (MVAr)	Qc2 (MVAr)	Qc3 (MVAr)	Ic1 (A)	Ic2 (A)	Ic3 (A)	Sx (MVA)	A (%)	Cos (-)	Cos_w (-)	Alarm	Com Status	Con. Type
ΑΓΙΟΣ ΔΗΜΗΤΡΙΟΣ 1	07/12/2016 - 15:25	AUTO-1	OFF	ON	OFF	3	20,69	18,90	-1,83	4,56	0,00	4,51	...	-0,02	2,82	...	0,11	1,11	1,00	0,99	OFF	OK	Corporate
ΑΓΙΟΣ ΔΗΜΗΤΡΙΟΣ 2	07/12/2016 - 15:25	AUTO-1	OFF	OFF	ON	3	20,66	15,20	-1,22	4,64	...	0,00	4,66	...	0,00	0,27	0,34	4,18	1,00	0,98	OFF	OK	Corporate
ΑΓΙΟΣ ΔΗΜΗΤΡΙΟΣ 3	07/12/2016 - 15:25	AUTO-1	ON	OFF	OFF	3	20,84	20,53	-0,43	4,58	4,33	0,00	...	2,77	0,07	...	0,42	3,89	1,00	0,98	OFF	OK	Corporate
ΑΓΙΟ 1	28/11/2016 - 08:47	AUTO-1	OFF	OFF	OFF	5	0,29	11,59	2,12	0,00	...	...	...	0,04	0,00	0,03	0,00	0,00	0,98	0,98	OFF	LINE	Corporate
ΑΙΤΩΛΙΚΟ 1	07/12/2016 - 15:26	AUTO-1	OFF	OFF	OFF	3	20,63	6,05	2,14	0,00	0,00	...	0,00	-0,05	0,01	-0,03	0,00	0,00	0,94	0,94	OFF	OK	Corporate
ΑΙΤΩΛΙΚΟ 2	07/12/2016 - 15:26	AUTO-1	OFF	OFF	ON	2	20,52	11,95	-0,26	4,15	...	0,00	0,00	-0,01	-0,00	0,14	0,65	9,57	1,00	0,95	OFF	OK	Corporate
ΑΛΕΞΠΟΛΗ 1	07/12/2016 - 15:27	AUTO-1	OFF	OFF	OFF	1	20,80	19,36	-0,31	0,00	0,00	0,00	0,00	-0,01	0,01	-0,04	0,00	0,00	1,00	1,00	OFF	OK	Corporate
ΑΛΕΞΠΟΛΗ 2	07/12/2016 - 15:27	AUTO-1	OFF	OFF	ON	5	21,16	19,79	0,64	3,38	0,00	0,00	0,00	0,01	-0,12	0,03	0,40	3,88	1,00	0,98	OFF	OK	Corporate
ΑΛΕΞΑΝΔΡΕΙΑ 1	07/12/2016 - 15:26	AUTO-1	ON	OFF	OFF	3	20,75	5,50	-0,56	4,63	...	...	...	0,09	0,03	-0,02	1,65	34,67	0,99	0,80	OFF	OK	Internet
ΑΛΕΞΑΝΔΡΕΙΑ 2	07/12/2016 - 15:25	AUTO-1	OFF	OFF	ON	3	20,79	6,66	-0,57	4,33	0,00	0,00	4,31	-0,05	-0,02	-0,05	1,13	23,55	1,00	0,87	OFF	OK	Internet
ΑΜΑΛΙΑΔΑ 1	07/12/2016 - 15:25	T/X	OFF	OFF	ON	2	7,63	12,08	-1,51	1,92	...	...	4,62	...	...	3,33	-0,09	-1,45	0,99	1,00	OFF	OK	Corporate
ΑΜΦΙΠΟΛΗ 1	07/12/2016 - 15:25	AUTO-1	OFF	OFF	OFF	4	21,24	2,99	0,67	0,00	0,00	0,00	...	-0,02	-0,03	0,04	0,00	0,00	0,98	0,98	OFF	OK	Internet
ΑΜΦΙΠΟΛΗ 2	07/12/2016 - 15:26	AUTO-1	OFF	ON	ON	2	20,28	8,14	0,01	4,54	0,00	6,29	3,96	0,41	0,22	0,37	1,33	23,78	1,00	0,87	OFF	OK	Internet
ΑΜΦΙΣΣΑ 1	07/12/2016 - 15:24	AUTO	ON	OFF	OFF	-	20,38	8,48	-0,87	4,46	...	...	...	0,21	0,01	0,01	0,77	14,34	0,99	0,92	OFF	OK	Internet
ΑΞΙΟΥΠΟΛΗ	04/12/2016 - 00:34	AUTO-1	OFF	OFF	OFF	-	20,54	2,75	-0,00	0,00	0,00	0,00	0,00	0,01	0,16	0,19	0,00	0,00	1,00	1,00	OFF	LINE	Internet
ΑΡΓΟΣ-Ι 2	07/12/2016 - 15:26	AUTO-1	OFF	ON	OFF	3	20,59	16,56	-0,62	4,32	0,00	4,34	0,00	-0,03	3,17	-0,02	0,41	4,63	1,00	0,98	OFF	OK	Corporate
ΑΡΓΟΣ-Ι 3	07/12/2016 - 15:25	AUTO-1	OFF	OFF	ON	3	20,44	19,19	0,48	4,29	0,00	0,00	4,28	0,12	0,01	0,25	0,59	5,76	1,00	0,97	OFF	OK	Corporate
ΑΡΓΟΣ-Ι 1	07/12/2016 - 15:26	AUTO-1	OFF	OFF	OFF	3	20,45	5,72	2,36	0,00	0,00	0,00	0,00	0,00	-0,05	0,03	0,00	0,00	0,92	0,92	OFF	OK	Corporate
ΑΡΓΟΣ-Ι 2	07/12/2016 - 15:27	LOG	OFF	OFF	OFF	3	20,62	12,95	1,30	0,00	0,00	0,00	0,00	-0,01	0,01	0,01	0,00	0,00	0,99	0,99	OFF	OK	Corporate
ΒΕΛΟ 1	07/12/2016 - 15:26	AUTO-1	OFF	OFF	OFF	3	20,57	11,58	1,28	0,00	0,00	0,00	0,00	0,02	0,03	0,08	0,00	0,00	0,99	0,99	OFF	OK	Corporate
ΒΕΛΟ 2	17/11/2016 - 09:55	AUTO-1	OFF	OFF	OFF	-	20,66	3,93	1,24	0,00	0,00	0,00	0,00	0,01	0,05	0,00	0,00	0,00	0,95	0,95	OFF	LINE	Corporate
ΒΕΡΟΙΑ 1	07/12/2016 - 15:25	AUTO-1	OFF	OFF	ON	4	20,84	11,40	0,51	2,36	0,00	0,00	2,29	-0,00	-0,00	0,67	0,35	5,75	1,00	0,97	OFF	OK	Corporate
ΒΕΡΟΙΑ 2	07/12/2016 - 15:26	AUTO-1	OFF	OFF	ON	4	21,00	17,88	-0,80	3,57	0,00	0,00	3,51	-0,04	-0,01	0,59	0,20	2,15	1,00	0,99	OFF	OK	Corporate
ΒΙ.Π. ΘΕΣΣΑΛΟΝΙΚΗΣ 1	07/12/2016 - 15:25	AUTO-1	ON	ON	OFF	5	21,09	30,41	-0,29	9,09	4,56	4,55	...	0,10	0,44	0,04	1,30	7,72	1,00	0,96	OFF	OK	Corporate
ΒΙ.Π. ΘΕΣΣΑΛΟΝΙΚΗΣ 2	07/12/2016 - 15:26	AUTO-1	OFF	OFF	ON	4	20,91	20,82	-0,28	4,68	0,00	...	4,69	-0,01	-0,00	0,31	0,47	4,26	1,00	0,98	OFF	OK	Corporate
ΒΙΠΕ ΘΕΣΣΑΛΟΝΙΚΗΣ 9	07/12/2016 - 15:25	AUTO-1	ON	OFF	OFF	-	20,53	23,82	-1,21	4,55	4,56	0,00	0,00	3,00	0,01	-0,03	0,21	1,67	1,00	0,99	OFF	OK	Corporate
ΒΙΠΕ ΒΟΛΟΥ 2	07/12/2016 - 15:26	AUTO-1	OFF	OFF	OFF	3	20,65	59,54	0,42	0,00	0,00	0,00	0,00	0,33	1,06	0,38	0,00	0,00	1,00	1,00	OFF	OK	Corporate
ΒΟΛΟΣ-Ι 1	07/12/2016 - 15:25	AUTO-1	OFF	OFF	OFF	4	20,79	15,33	2,14	0,00	0,00	0,00	0,00	0,03	-0,04	0,02	0,00	0,00	0,99	0,99	OFF	OK	Corporate
ΒΟΛΟΣ-Ι 2	07/12/2016 - 15:26	AUTO-1	OFF	ON	OFF	2	20,72	15,13	-1,31	4,56	...	4,55	0,00	-0,04	6,24	-0,05	0,30	3,68	1,00	0,98	OFF	OK	Corporate

the added value for system integration and efficient smart-grid operation

iReact-Prognosis transforms acquired raw data from iReact units to valuable information in order for any Manager to focus on performance evaluation and decision making towards his grid sustainability.

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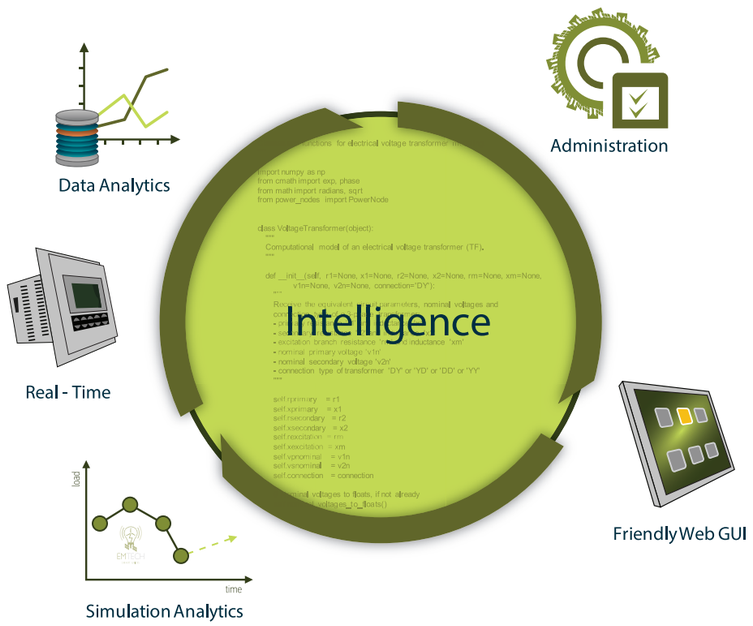
The **iReact-Prognosis** is an Intelligent System for remote supervision and control of iReact automation controllers and smart-sensors installed in power distribution and renewable plant substations. Its' modular architecture comprises of:

The **Administration Module**, which supports all system administration matters, such as installation sites and installed iReact units, users' account settings and access rights and licenses management. The module uses a compact database to store relevant information, as well as the history of all users' actions, events and settings.
The Real-Time Module, which facilitates interfacing & networking of remote iReact units, downloading of stored measurements and current system status (e.g. analog quantities, control inputs, etc.), performing controls and operations, remotely configuring & calibrating units' parameters, as well as integrating real-time weather conditions. Several software agents supervise all acquired information and promptly inform substation's supervisors for fault conditions and alarms, using SMS, emails, or via a smart-phone application. In certain cases automated fault diagnosis is also available. A friendly, web based, Graphical User Interface (GUI) provides real-time graphs, charts, and icons to visualize operation conditions, and allow users to easily manage controllable assets. The module uses a compact database to store all acquired measurements and units' parameters.

The **Data Analytics Module**, which is a useful tool for assets' maintenance and business reporting. It delivers reports for daily, monthly and yearly statistics for any iReact installation to optimize maintenance, prevent damages of critical assets, and support short-term engineering decisions. Regarding business perspective, the module aggregates results, according to desirable time periods and geographical regions, provides overall calculations of system's performance, thus supporting long-term decisions on system expansion and optimization. All functionalities are delivered via a friendly web GUI and contemporary reporting and visualization schemes.

The **Simulation Analytics Module**, which provides a set of added value services to help users achieve maximum optimization level for operations. Real-time and short-term load prediction, power flow analysis, N-point contingency analysis, grid stability analysis and several other utilities, offer a multi-disciplinary approach to support operations in real-time, and help users to take the right decisions. In addition, the module may be used for power resources allocation and scheduling, as well as to analyze operation profiles, and optimize parameter settings according to desirable operational objectives (e.g. minimum power losses, voltage leveling, stability enhancement, etc.). All utilities are furnished via the friendly web GUI.

All aforementioned modules, are supported by an agent based framework, providing efficient integration and abstraction of information, facilitating easy tailoring, according to customer's requirements.



Operations & Features *

Real-Time Module (RTM)

- Interfacing with iReact automation units and smart sensors (Several interfacing means: ADSL, Satellite Internet, GSM 4G/3G/GPRS, Analog Modem; Security: VPN, AES 256-bit; Several networking protocols: TCP/IP, Telnet, Modbus, Fiware, DNP3, IEC60870, proprietary; Clock synchronization; Acquirement of measurements, system status and events; Secure remote control transactions
- Web-based Graphical User Interface (GUI)
  - Synoptic view of installations with geographical region select (Table with calculations of the total load handled by the installations, View of all iReact installations containing measurements of critical operation quantities for each substation, View with overall double-axis graphs, Integration of real-time monitoring information on a Geographical Information System (GIS) based on Google Maps
  - View of selected installation (Table with all current iReact measurements and system's status, 24h statistics, Real-Time Measurements Graphs, 24h Graphs, Current Weather Information, One line diagram of installation with live measurements and status icons, Live Phasor diagram
  - Interactive view of alarms and events (Red color for measurements exceeding selected thresholds, Red icon blinking for extreme conditions, User clickable red icons to indicate faults
  - Interactive real-time graphs for signal measurements (select/deselect quantities to display, zoom in/out, tooltip with measurements)
- Alerting System
  - Agent based alerting on acquired measurements (min/max, inactivity, number of changes/time, loss of sensor, etc)
  - Immediate alerting messages to field engineers (smart-phone application, GSM SMS, email)
- Integration with real-time weather conditions
- Configuration of iReact units' Parameters
- Database (Real-Time measurements storage, Unit parameters storage, Automatic data downloading and synchronization with the database)