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SYSTEMS AUTOMATION & MANAGEMENT PTY LTD.

ENERGY METERING DATA ACQUISITION SYSTEM
EMDAS
by Systems Automation & Management



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ENERGY METERING DATA ACQUISITION SYSTEM
EMDAS
by Systems Automation & Management

TECHNICAL SPECIFICATIONS

Executive Summary

A power utility company needs to accurately measure the power produced and used by their power stations on a 24/7 basis. The EMDAS (Energy Metering and Data Acquisition System) has been developed as a standard for ESKOM since 1995. The EMDAS system is continuously redeveloped using the latest technology available.

Based on our knowledge and experience in system integration of EMDAS Metering Schemes and a vast number of third party products/applications, we have the ability to seamlessly engineer and commission the control system as per the end user's specifications.

SCOPE OF SUPPLY

The control solution offered consists of the following:

- EMDAS metering scheme for the collection of the Active and Reactive Energy from the Energy Meters by pulse counting on legacy systems or reading data directly from networked Energy Meters.
- Real time storage of input signal data for projection of hourly Energy data.
- Hourly storage of input signal data for historical storage.
- User defined signal calculation (e.g. summation, subtraction, multiplication, square root extraction, etc) can be used for group totals and energy losses etc.
- Comparison between Main and Check Meters with Alarm logging
- Scheduled FTP transfer of Power Station Energy to National Control Centre.
- Web based user interface for accessing energy data reports.
- Audit logging of all signal or configuration changes made.
- User Access level control.

OVERVIEW

Standard EMDAS metering Panel consisting of dual independent EMDAS systems. Pulse counting input modules expandable to accommodate site specific energy pulses requirements. Software pulse filtering and de-bounce to count the 80ms energy pulses Digital output module used for system cross checking and Alarm generation to station DCS.

All pulse data is stored within the EMDAS PLC controller card with 24hr rollover registers for hourly energy data backup that can be reloaded in case of communication failure – operating completely independently from the PC data server.

Networked DLMS and Modbus communication directly to the Energy meters allows for the retrieval of energy data as stored by modern meters.

The Dot Net based EMDAS server software running on the PC continuously monitors energy data on the controller storing current and hourly values into the Microsoft SQL database. Automated FTP file transfer of hourly values is generated and transmitted on the ESKOM LAN to the National Control server.

Automated data verification by software and hardware hand-shaking and data comparison between the two EMDAS systems continually verifies data and System integrity between Main and Check energy meters and EMDAS 1 and 2 data generating System. Audit and Alarm data logs into the SQL server database. Hard-wired alarms are provided to the DCS / Station SCADA.

Hourly and Daily Energy reports can be viewed and printed. Data storage is only limited by hard disk space and is therefore basically unlimited.

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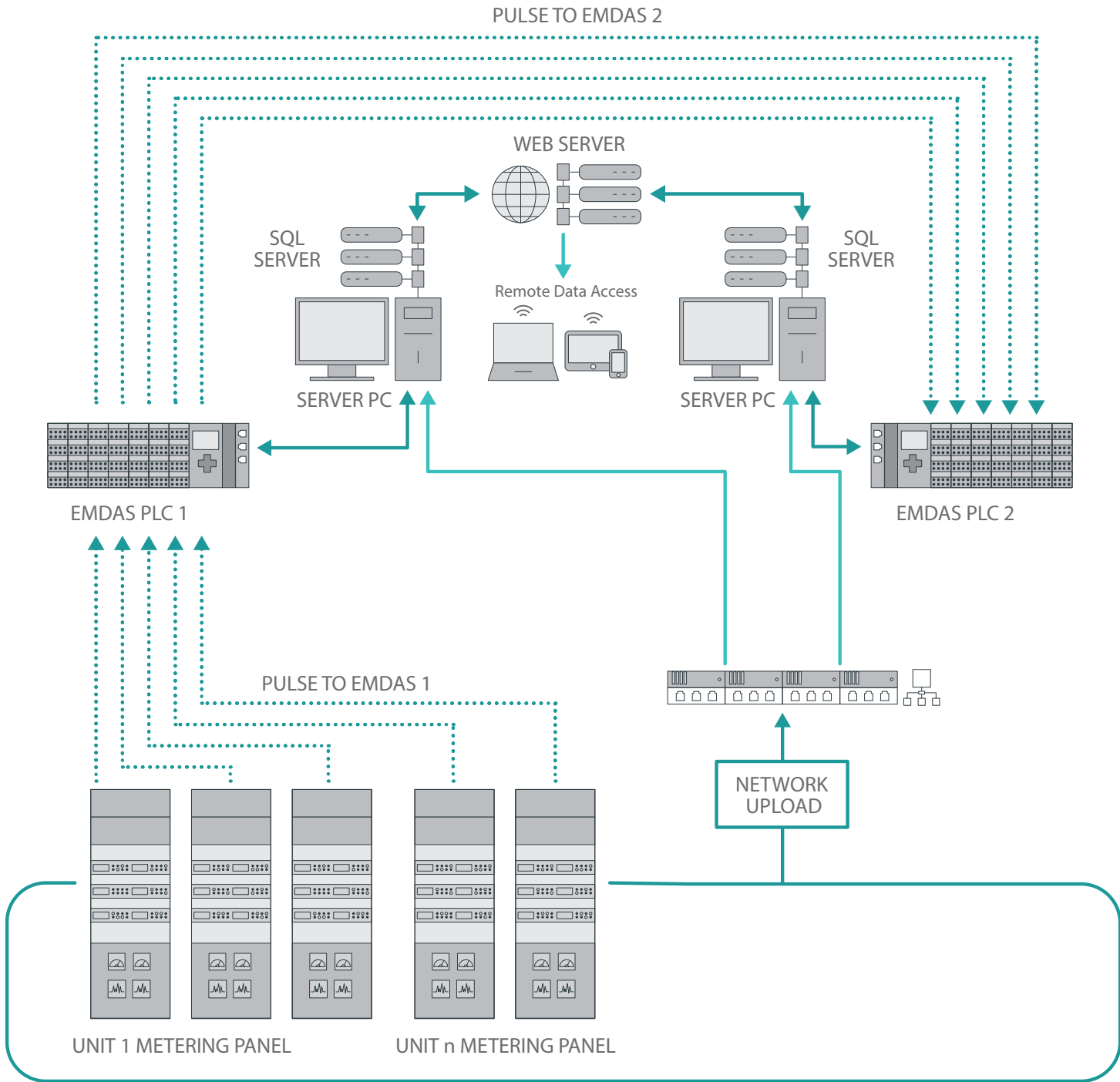
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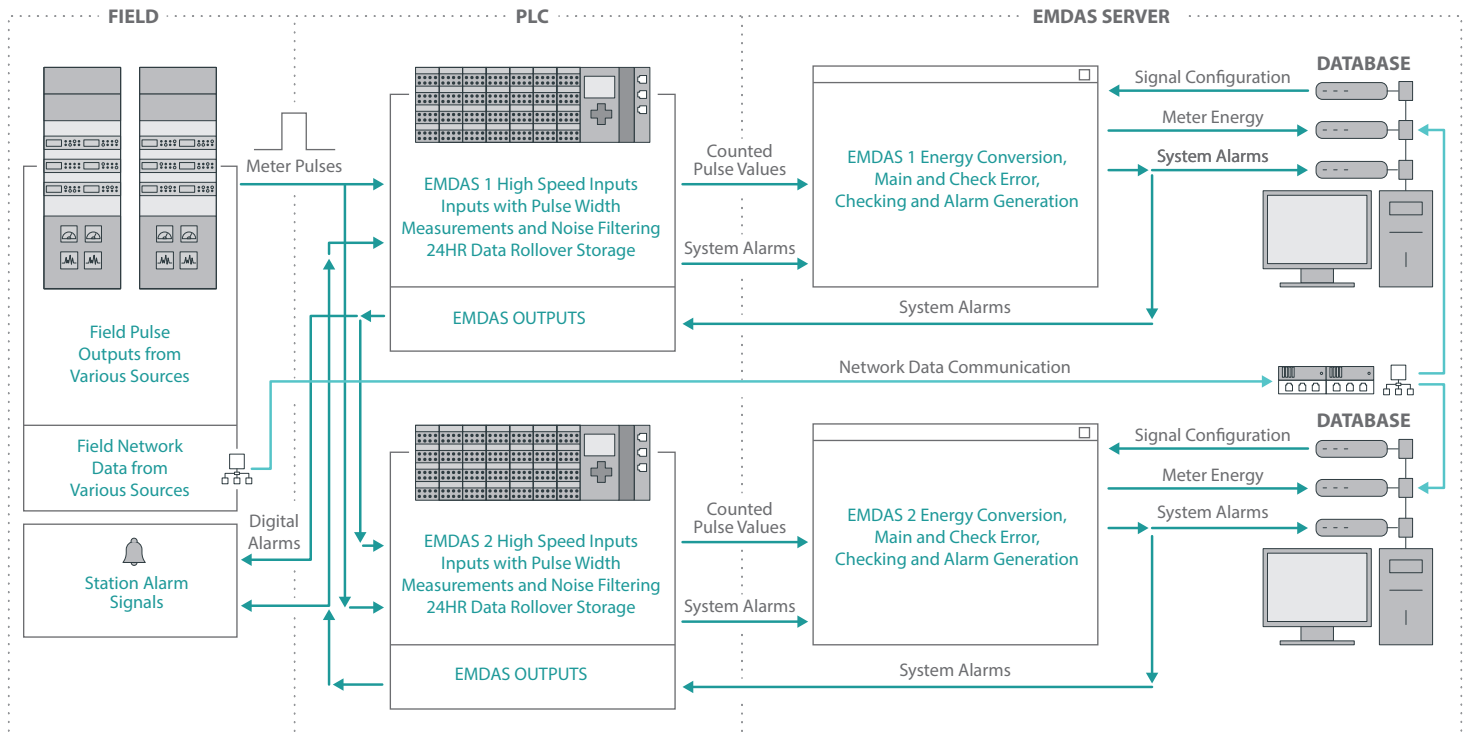
Hard wiring of the input Energy pulses is based on a centralized EMDAS connection to metering panels by UVG cables.

Remote users gain access to the EMDAS Web server via the ESKOM LAN.

EMDAS OVERVIEW DIAGRAM



EMDAS DATA CAPTURING DIAGRAM



DATA CAPTURING OVERVIEW

Energy measurement is done in the field by off the shelf Energy Meters providing field indication and storage of values. Pulse outputs are used to provide real time data for the EMDAS PLC. The width of the pulses in the pulse train, are continuously monitored filtering out unwanted noise. Data is stored in the current hour data block and rolled over on a hourly basis into the 24 hour data blocks. Time syncing is achieved through a NTP time server setup on the EMDAS server PC.

Data is also collected directly from the Energy meters using DLMS and Modbus networked communication. EMDAS server time sync is done to the station NTP server. There is a continuous upload of the current hour data from the PLC into the database. Hourly data is uploaded and stored for historical purposes. User defined calculations are done and results stored with the hourly data.

System errors (e.g. Power failure, program failure etc) and main check comparison errors are logged into the database. Audit log is kept of scheduled tasks run successfully and alarm's logged when necessary.

DATABASE TABLE OVERVIEW

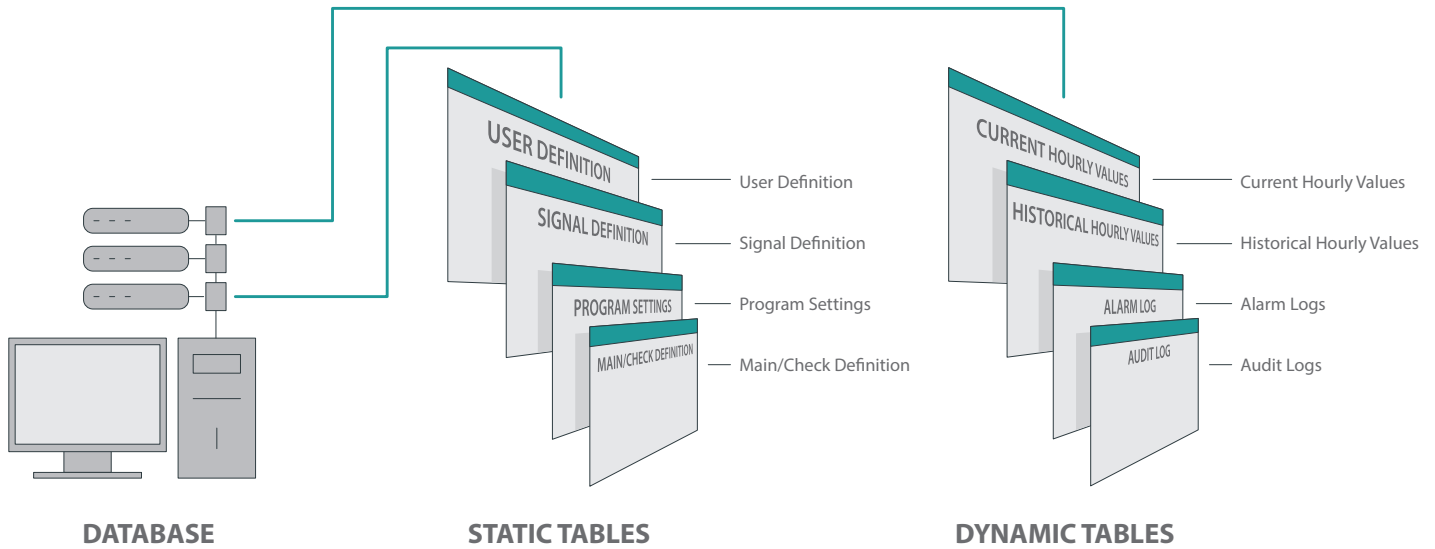
The data base can be broken up into two subsections namely Static and Dynamic tables. Table relations are setup linking signal configuration to the stored data and users to signal or configuration edits done during operation.

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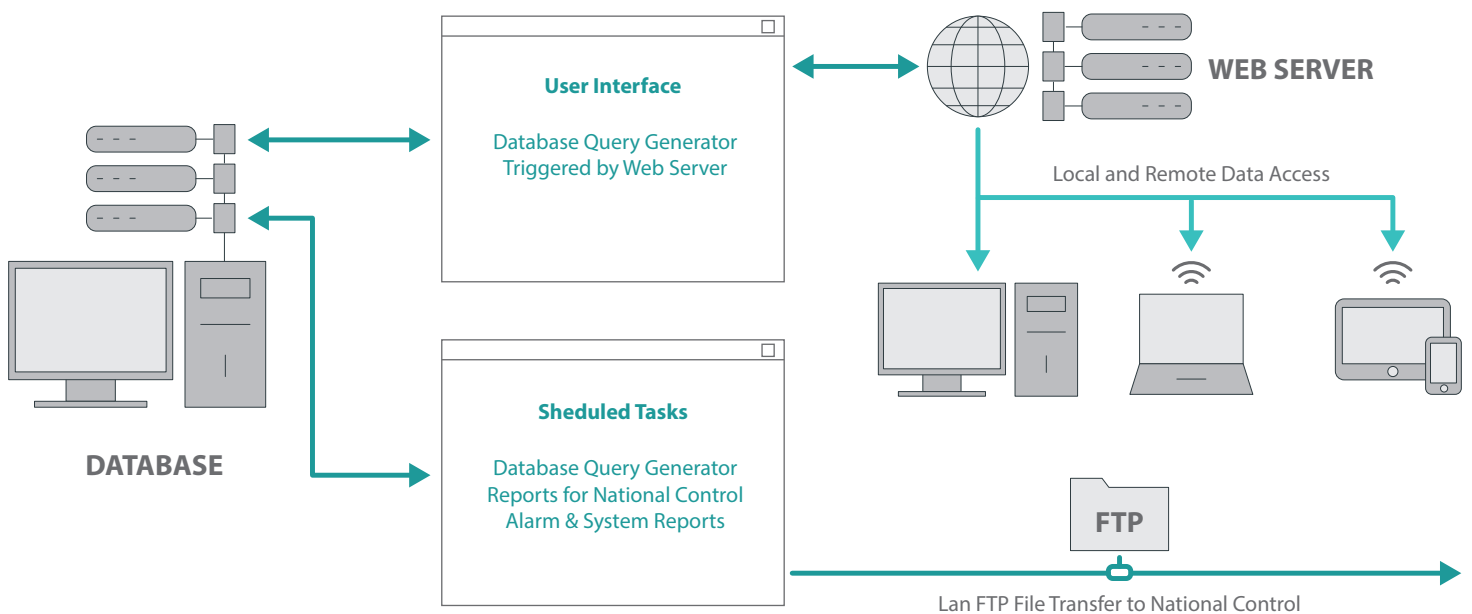
EMDAS DATABASE TABLES DIAGRAM



USER INTERFACE OVERVIEW

A Web Server provides the User interface to the EMDAS data. Access control is done on all Users. Standard Reports consist of 6 pages that can be configured and grouped.

EMDAS USER INTERFACE DIAGRAM



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Reports available from EMDAS web interface are as follows:

HOURLY REPORTS

- Current Hour – The EMDAS values for the current hour
- Last Hour – The EMDAS values for the last hour
- Historical – The EMDAS historical values for the historical hour and date selected.

DAILY REPORTS

- Current Day – The EMDAS values for the current day for all completed hourly periods
- Last Day – The EMDAS values for the previous day
- Historical – The EMDAS historical values for the day selected by the date controls

For administrative purposes, the Web Interface also allows an administrative user to control access to the EMDAS Web interface through user account management.

An administrator user may also view a detailed report of all SQL queries and data transactions carried out on the SQL database including user name, date and time and client machine name.

In the case of problems with the EMDAS values or the EMDAS system faults there is an alarm indication on the screen. Hard wired alarm is also sent to the DCS. The alarm may be acknowledged but can only be cleared when the fault is corrected and a action taken has been logged.

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SAM EMDAS 1

HOURLY REPORT (LAST HOUR)

Date 2020-04-07 : Hour 09-10

Administrator

Logout

Configure

User Admin

Audit Log

Alarms

Current Hour

Last Hour

Date

2010

Apr

7

Hour

09-10

Historical

Daily Rep

Hourly Rep

2010-04-07 10:47:22

Page 1

Page 2

Page 3

Page 4

Page 5

Page 6

GENERATORS

Gen 1

Gen 2

Gen 3

Gen 4

Gen 5

Gen 6

22kV

Gross Gen MWh (Main Exp)

656.00

653.40

660.80

700.40

688.00

695.40

Gross Gen Mvarh (Main Exp) Lag

143.61

167.69

155.71

068.81

000.00

086.90

Gross Gen Mvarh (Main Imp) Lead

000.00

000.00

000.00

000.00

000.00

000.00

Gross Gen MWh (Check Exp)

656.00

653.80

660.80

700.80

688.20

695.00

Gross Gen Mvarh (Check Exp) Lag

000.00

000.00

000.00

000.00

000.00

000.00

Gross Gen Mvarh (Check Imp) Lead

000.00

000.00

000.00

000.00

000.00

000.00

Gross Nett Generated MWh (Sendout)

600.74

590.08

606.94

649.04

639.96

646.12

Gross Nett Generated Mvarh (Sendout)

143.61

122.67

120.29

033.13

-34.02

054.36

Unit Average Loading

598.20

550.90

548.19

680.24

574.83

591.92

UNIT TRANSFORMER 1

Unit 1 Trfr 1

Unit 2 Trfr 1

Unit 3 Trfr 1

Unit 4 Trfr 1

Unit 5 Trfr 1

Unit 6 Trfr 1

22kV

Gross Trfr 1 MWh (Main Exp)

032.02

026.02

029.38

014.02

023.64

024.32

Gross Trfr 1 Mvarh (Main Exp)

023.96

020.18

019.96

009.68

017.28

016.16

Gross Trfr 1 MWh (Check Exp)

032.00

026.02

029.38

014.02

023.64

024.34

Gross Trfr 1 Mvarh (Check Exp)

023.96

020.18

019.96

000.00

000.00

000.00

UNIT TRANSFORMER 2

Unit 1 Trfr 2

Unit 2 Trfr 2

Unit 3 Trfr 2

Unit 4 Trfr 2

Unit 5 Trfr 2

Unit 6 Trfr 2

22kV

Gross Trfr 2 MWh (Main Exp)

023.24

037.30

024.48

037.34

024.40

024.96

Gross Trfr 2 Mvarh (Main Exp)

015.48

024.84

015.46

026.00

016.74

016.38

Gross Trfr 2 MWh (Check Exp)

023.24

037.32

024.48

037.32

024.38

024.98

Gross Trfr 2 Mvarh (Check Exp)

015.48

024.84

015.46

000.00

000.00

000.00

UNIT TO STATION

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5

Unit 6

11kV

Gross Unit to Station MWh Exp

393.00

572.00

001.00

000.00

000.00

000.00

Gross Unit to Station MWh Imp

000.00

000.00

000.00

000.00

000.00

000.00

Gross Unit to Station Mvarh Exp

000.00

000.00

000.00

000.00

000.00

000.00

Gross Nett Auxiliaries MWh

448.26

635.32

054.86

051.36

048.04

049.28

Gross Nett Auxiliaries Mvarh

039.44

045.02

035.42

035.68

034.02

032.54

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TECHNOLOGY

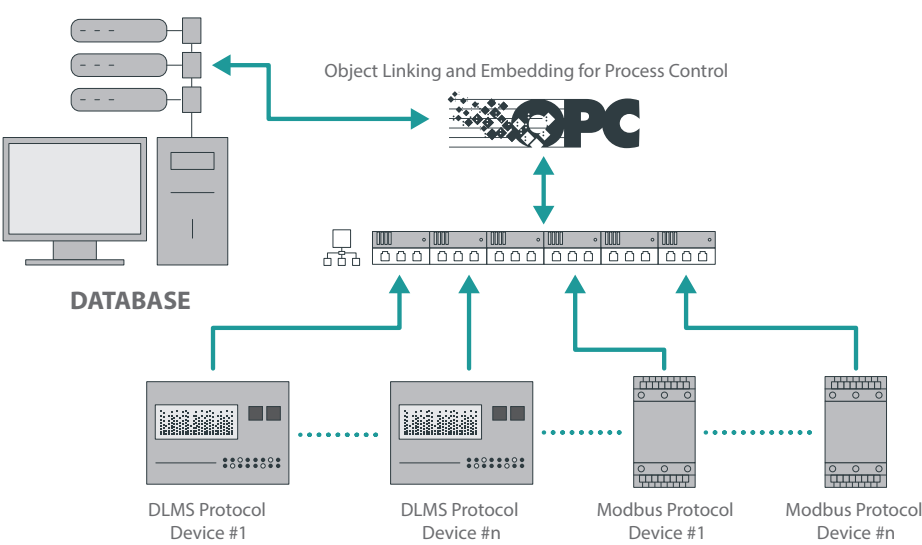
Technology advances over the past years has now provided energy metering equipment with Ethernet communications. The EMDAS can now be provided at a reduced cost with the same reliability.

Advantages:

Reduced Cabling: Single Ethernet communication cable replaces multiple pulse signals.

Reduced Hardware: No high speed pulse capturing modules are required. Dual EMDAS server can be replaced with a single server as data is already duplicated in the field by the main and check meter configuration. Meters also have the built in capability of storing more than 100 days of data arranged into hourly load profile data blocks.

EMDAS NETWORK TECHNOLOGY OPTIONS



ADVANTAGES	
Reduced cabling	All data transmitted via standard ethernet.
Reduced hardware	No requirement for additional input modules to recieve data.
Reduced hardware	EMDAS redundancy could be in the field equipment as apposed to dual EMDAS system.

DIS-ADVANTAGES
Ethernet network is a single point of faluire (however a ring network topology can be applied and energy values are historically logged onto meters and critical signals can be hardwired where required.





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SYSTEMS AUTOMATION & MANAGEMENT PTY LTD.



HEAD OFFICE | GAUTENG | SOUTH AFRICA

13 -17 Rembrandt Str. | Petervale | Bryanston

P O Box 97757 | Petervale | 2151 | Z.A.

Tel. +27 (0)11 803 0570 | +27 (0)11 231 8900

Email. info@sam.co.za | Web: www.sam.co.za

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