# EmiratesGBC Technical Workshops

## *by* DEOS Middle East

**From Building automation to AI powered building management of future**

Presented by **Mohammad Shereef,**

General Manager DEOS Middle east

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# Workshop Agenda

### Traditional Building Automation

- ❑ Why buildings matter
- ❑ Fundamentals of BAS/BMS
- ❑ Architecture, sensors and controllers
- ❑ Evolution of BMS

### Future Building Automation

- ❑ Digital commissioning
- ❑ Data-driven buildings
- ❑ AI overlay and digital twin
- ❑ AI-assisted, autonomous buildings

# 02

## Why Buildings Matter

# Why Are We Talking About Buildings?

- Buildings are among the largest consumers of energy and contributors to greenhouse gas emissions
- Climate change and rising carbon emissions
- Rapid urbanization and aging infrastructure
- Energy crisis and rising energy costs
- Increasing occupant expectations

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**KEY MESSAGE**

**Future buildings must become intelligent, connected and autonomous.**

# The Same Journey, Building by Building

01 **Mechanical system**

02 **Electrification**

03 **Automation**

04 **IOT digitalization**

05 **AI**

**Buildings are following the same journey as industry — from mechanical systems to artificial intelligence.**

# 03

## Traditional Building Automation

# What Is a Building Automation System?

DEFINITION

**An intelligent control and monitoring system used to automate a building's mechanical and electrical services.**

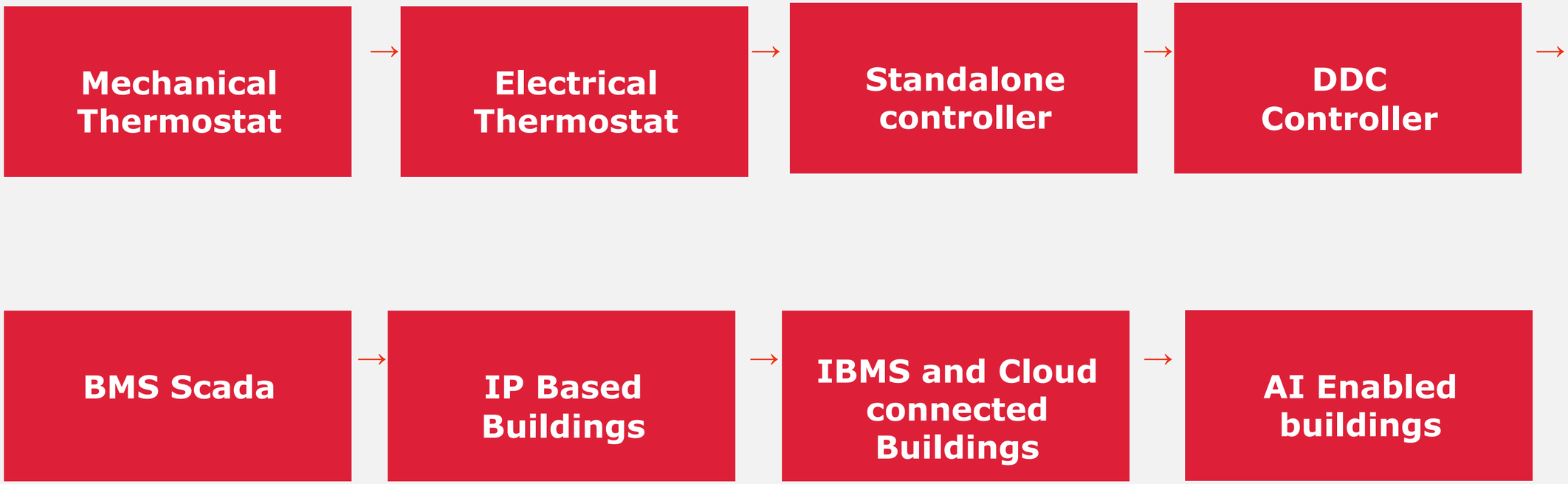
### Main objectives

Comfort · safety · energy efficiency · operational reliability · asset protection

### Controlled systems

HVAC · lighting · energy · water · ventilation · fire integration · metering

# Evolution of Building Automation



# Building Management System Architecture

**Management layer**

SCADA · web server · reports · alarm management

←

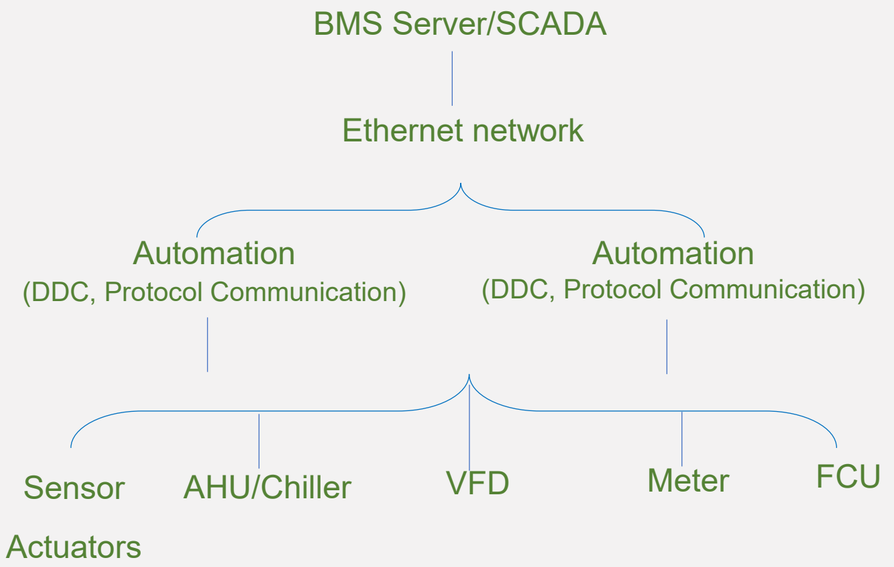
**Automation layer**

DDC controllers · control logic · schedules · PID

←

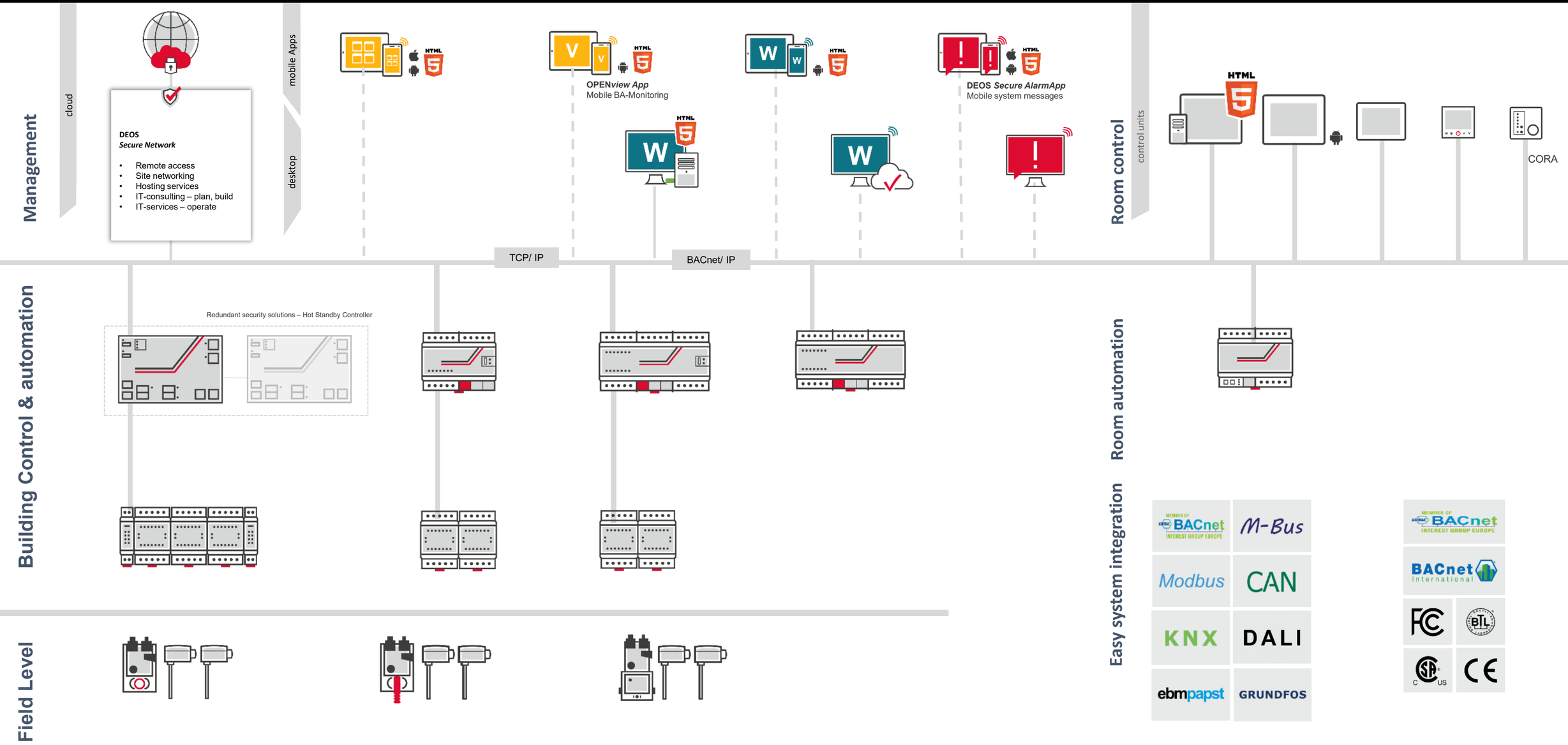
**Field layer**

Sensors · actuators · VFDs · valves · dampers



# Building Automation system (BMS/BAS/EMS)

## System topology



# Sensors — Eyes of Building Automation

**Sensor types**

Temperature · humidity · pressure · $CO_2$ · CO · flow · differential pressure · occupancy · lux

**Why accuracy matters**

Energy optimization · occupant comfort · reliable control

**POOR SENSORS RESULT IN**

**Hunting, comfort complaints, high energy consumption and equipment wear.**

# DDC Controllers — Brain of Building Automation

- PID control and scheduling
- Interlocking and safety logic
- Alarm management and sequencing
- Optimization and BACnet communication

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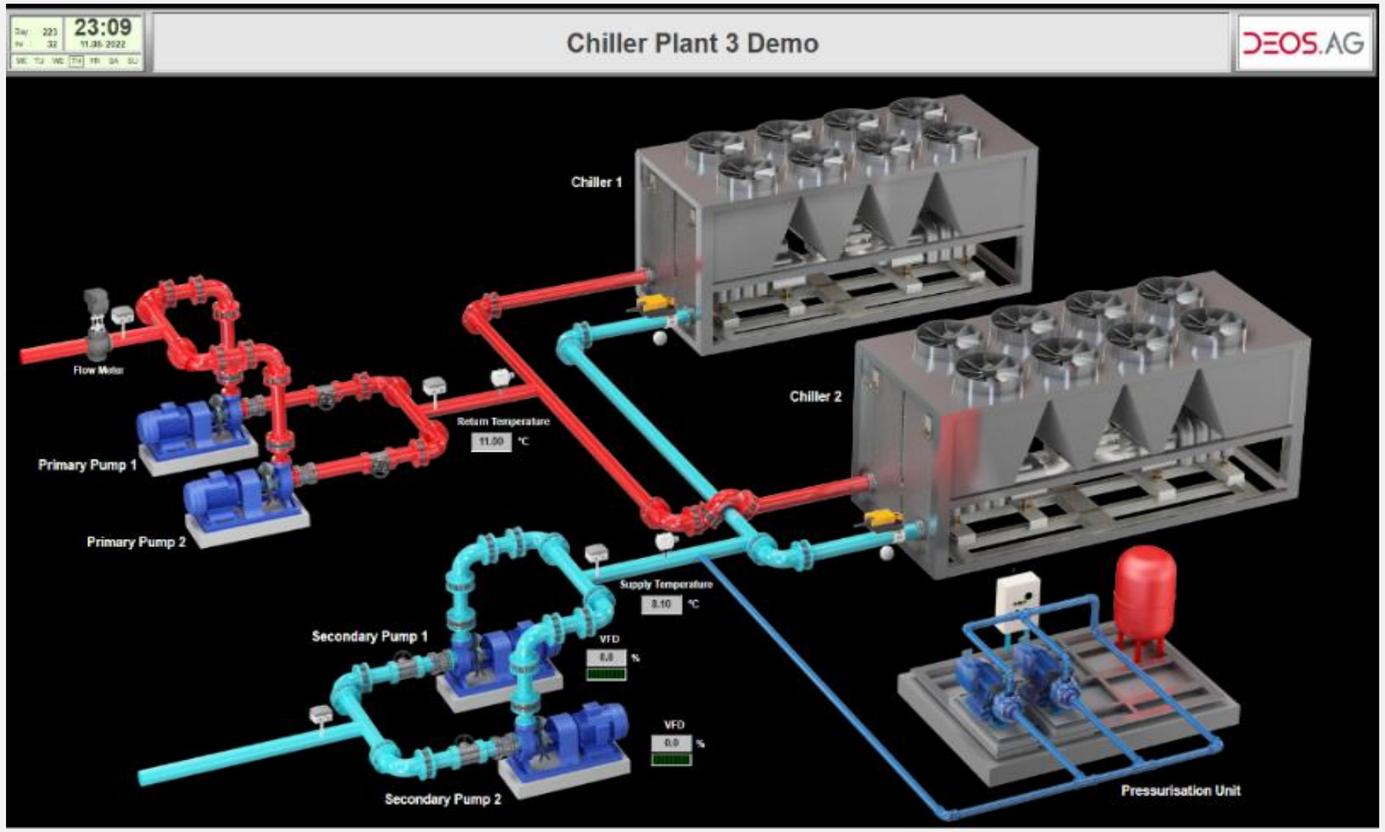
**Without proper programming, even the best hardware cannot deliver energy savings.**

# Building Management Software (SCADA)

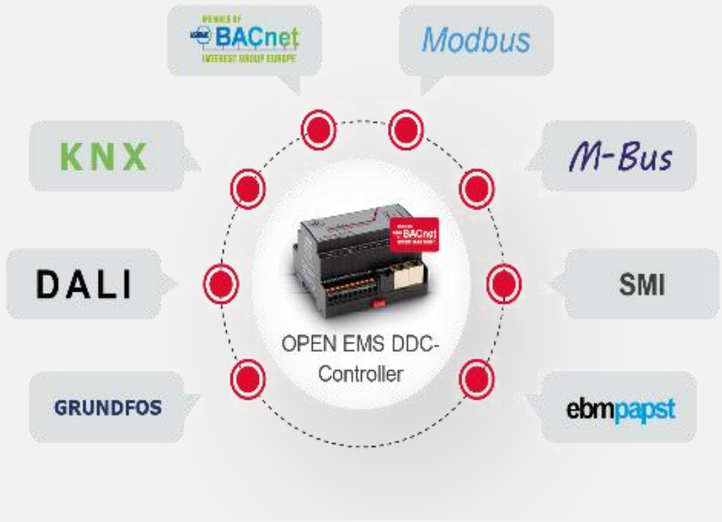
- Monitoring and graphics
- Alarm management
- Historical trends and reports
- User management
- Energy dashboards



# Communication Protocols

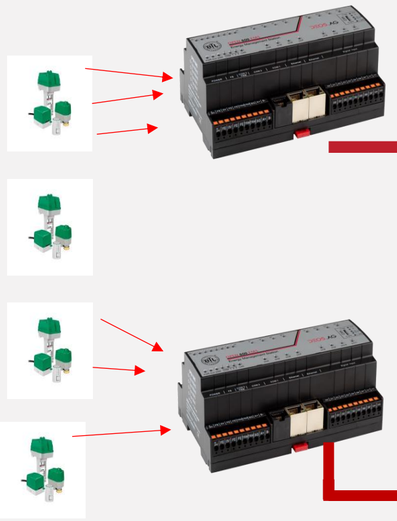
| Category | Protocols |
|---|---|
| Open protocols | BACnet, Modbus, KNX, M-Bus |
| Emerging protocols | MQTT, OPC-UA, REST API |

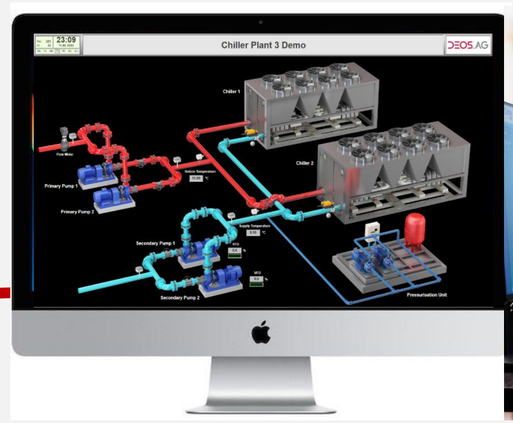
Open communication ensures interoperability across systems and vendors.



# Typical Building Automation Workflow

| 01 | 02 | 03 | 04 | 05 | 06 |
|---|---|---|---|---|---|
| **Equipment** | **Sensor/Actuator** | **controller** | **Control Logic** | **SCADA** | **Operator** |





**BMS SCADA**

# How BMS Saves Energy

### Demand and occupancy

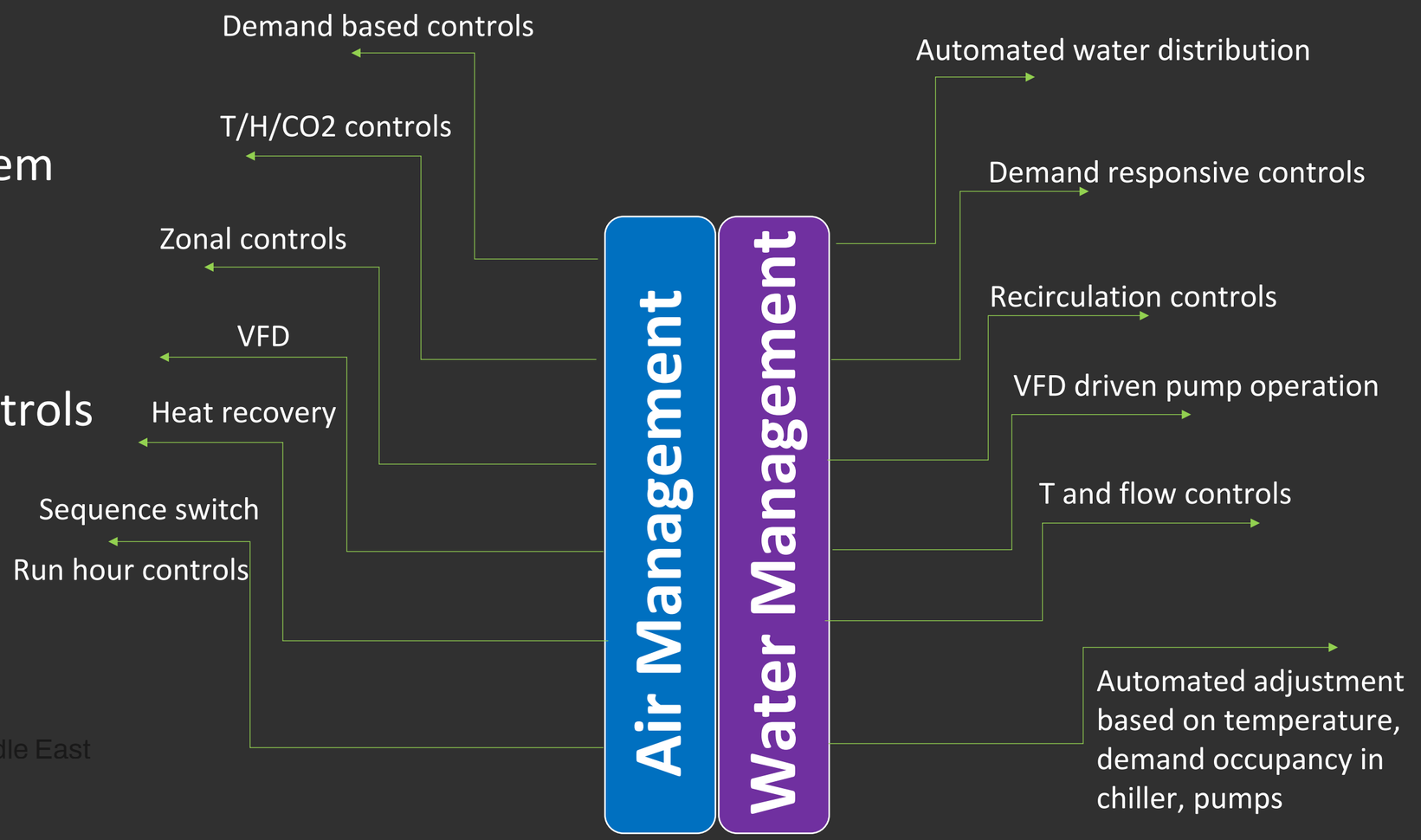
- ❑ Demand-based ventilation
- ❑ Occupancy-based control
- ❑ Optimum start/stop
- ❑ scheduling

### Optimization and reset

- ❑ Chilled water optimization
- ❑ Variable speed drives
- ❑ Static pressure reset
- ❑ Temperature reset

# How BMS Saves Energy

- ❑ Demand Based controls system
- ❑ Optimal start
- ❑ Optimized scheduling
- ❑ Energy efficient programs
- ❑ Outside condition-based controls
- ❑ Automated setback
- ❑ Integrated lighting

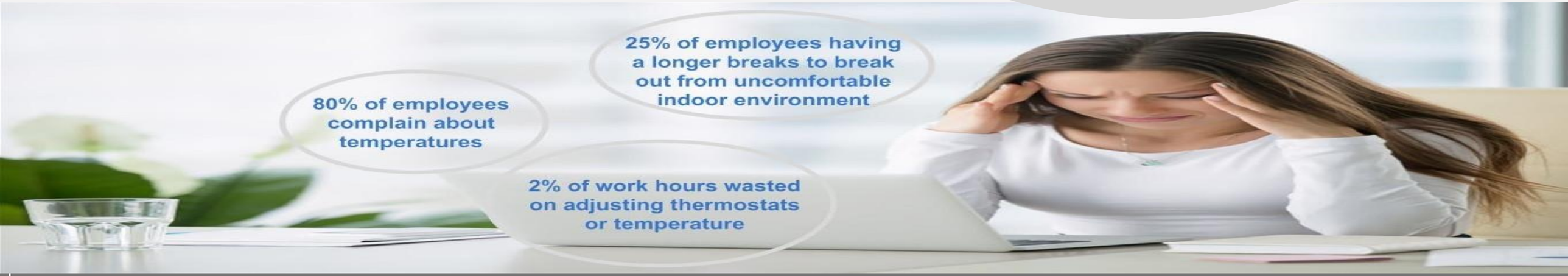


# Optimized/Energy efficient building scenario

Better lighting environment gives you up to 20% higher concentration

Optimized ventilation system can increase employee productivity by 8 to 10% and sick free life

Imagine if your employee generating revenue of 10,000 Euro per month, he/she can generate additional revenue of 12000 euro per year. If you have office building of 100 people ?




# Occupant productivity and BMS ?

If your office is too cold then employee output is down by 50%, If your office space is too warm then employees attendance drops down and if your lighting isn't managed well, then employee's concentration level goes down

# Benefits of Traditional BMS

- ❑ Energy saving and reduced manpower
- ❑ Better comfort and central monitoring
- ❑ Alarm management
- ❑ Longer equipment life
- ❑ Better operations

# Challenges of Today's Building Automation

- ❑ Commissioning starts too late in the project lifecycle
- ❑ Predefined logic instead of learning from data
- ❑ Reactive maintenance instead of predictive maintenance
- ❑ Limited visibility into asset health and lifecycle
- ❑ Manual alarm analysis, difficult digital integration

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**These challenges are driving the next evolution — from automation to intelligence.**

# 04

## The Future of Building Automation

# The Shift Towards Intelligent Buildings

## Traditional building

## Future building

# Digital Commissioning (or Integrated digital delivery)

DEFINITION

**Digital technologies integrated across the full project lifecycle — from design through operation — to create a connected, traceable, continuously optimized building.**

- ❑ Early design validation and BIM integration
- ❑ Standardized asset data
- ❑ Real-time progress tracking
- ❑ Automated testing and digital handover

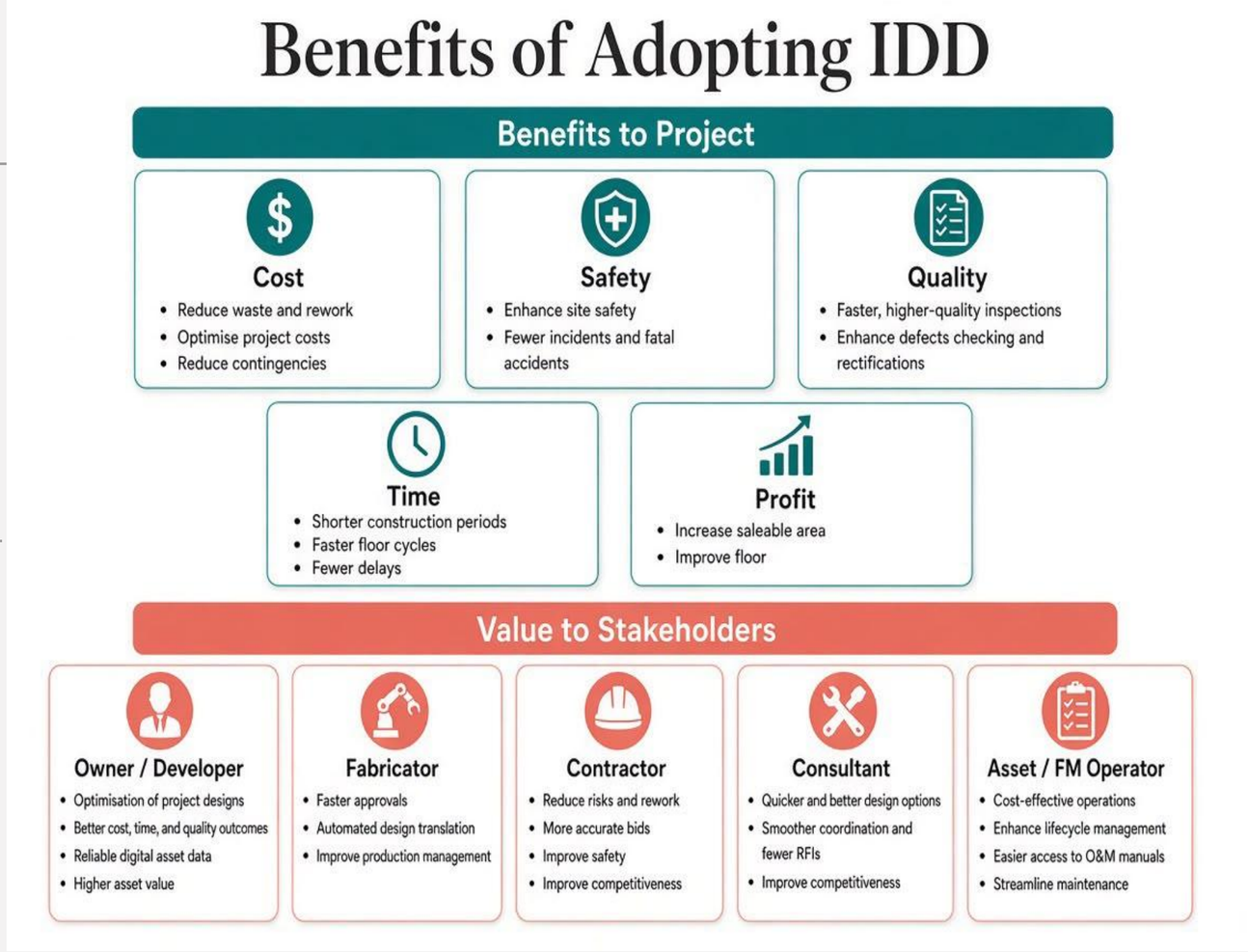
# Why Digital Commissioning?

### Traditional commissioning

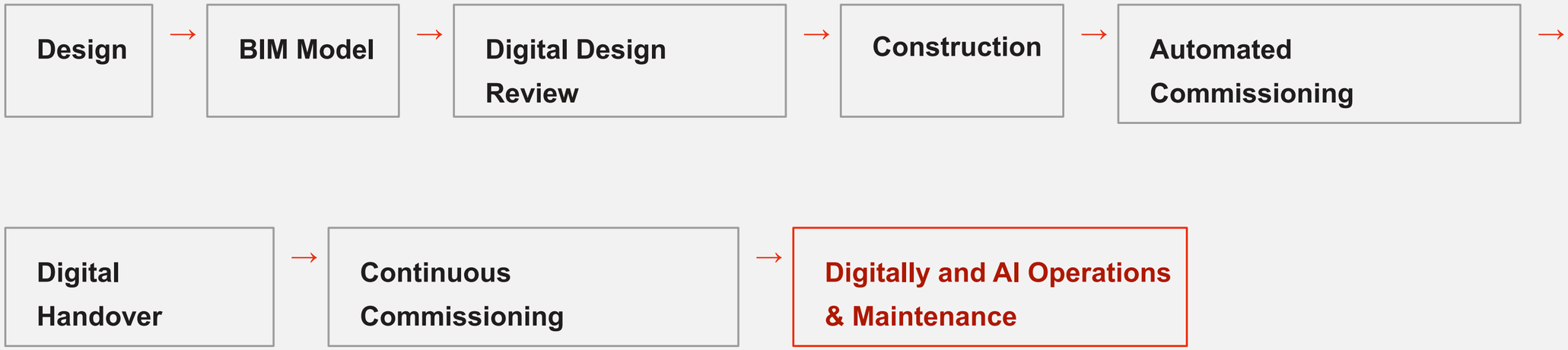
Begins after installation — design errors are expensive and slow to correct.

### Digital commissioning

Starts at design — early issue detection, less rework, accurate asset data, seamless handover to operations.



# Digital Commissioning Lifecycle



# Traditional vs Digital Commissioning

| Aspect | Traditional | Digital |
|---|---|---|
| Starts | After installation | During design |
| Issue detection | Late, costly | Early, low-cost |
| Asset data | Manual, inconsistent | Standardized, structured |
| Handover | Paper-based | Digital, continuous |

# Data-Driven Building Management

**Data sources**

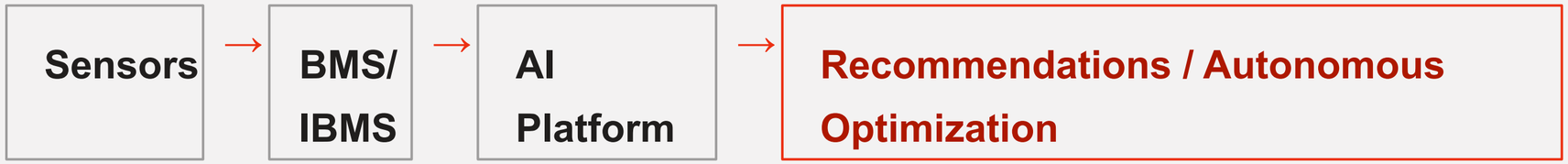
BMS · energy meters · IoT devices · occupancy systems · weather data · maintenance records

**Benefits**

Better decisions · energy optimization · predictive insight · ESG reporting

# AI Overlay on BMS

AI complements the existing BMS — it does not replace it.




- ❑ No replacement of existing controllers
- ❑ Faster deployment, higher ROI
- ❑ Continuous learning

# Predictive Analytics

- Equipment failure prediction
- Energy forecasting
- Chiller/Major equipment operational optimization
- Fault detection
- Maintenance planning

# Behavioural Analytics

### How AI learns

Occupancy patterns · HVAC usage · lighting behaviour · seasonal change · operator actions

### Outcome

Smarter control strategies — improved comfort with reduced energy use.

# Asset Lifecycle Prediction

**AI continuously evaluates**

Runtime · equipment efficiency · maintenance history · operating conditions, Historical patterns of all data.

**Benefits**

Reduced downtime · extended asset life · optimized maintenance costs

# Digital Twin – Visual Twin

DEFINITION

**A virtual representation of a physical building that continuously receives real-time operational data.**

- ❑ Simulation and performance analysis
- ❑ Fault diagnosis
- ❑ Optimization
- ❑ Operator training

# AI-Assisted Operations

- ❑ Intelligent alarm prioritization
- ❑ Natural language queries
- ❑ Automated reporting
- ❑ AI scheduling
- ❑ Optimization recommendations and decision support

# AI Agents in Building Management

| Agent | Focus |
|---|---|
| HVAC Agent | Comfort and energy performance |
| Energy Agent | Consumption and efficiency |
| Lighting Agent | Occupancy-driven lighting control |
| Maintenance Agent | Predictive maintenance planning |
| Occupancy Agent | Space utilization patterns |
| ESG Agent | Sustainability and reporting |

Each agent focuses on one domain while collaborating to optimize overall building performance.

# Towards Autonomous Buildings

| 01 | 02 | 03 | 04 | 05 |
|---|---|---|---|---|
| **Manual operation** | **Automated controls** | **AI assisted optimization** | **Semi autonomous** | **Fully autonomous** |

# Key Benefits of AI-Powered Buildings

- ❑ Lower energy consumption
- ❑ Predictive maintenance
- ❑ Better occupant comfort
- ❑ Reduced carbon footprint
- ❑ Faster issue resolution
- ❑ Improved ESG performance
- ❑ Lower operational costs

# Future Vision

Buildings that:

# Key Takeaways

- ❑ Traditional BMS delivers automation and control
- ❑ Digital commissioning brings intelligence into the project lifecycle
- ❑ Data is the foundation for smarter decisions
- ❑ AI enhances BMS with predictive and adaptive capability
- ❑ Autonomous buildings are the future of building management

# Questions & Discussion

Thank you — Mohammad Shereef Ibrahim, General Manager, DEOS Middle East