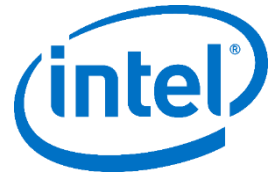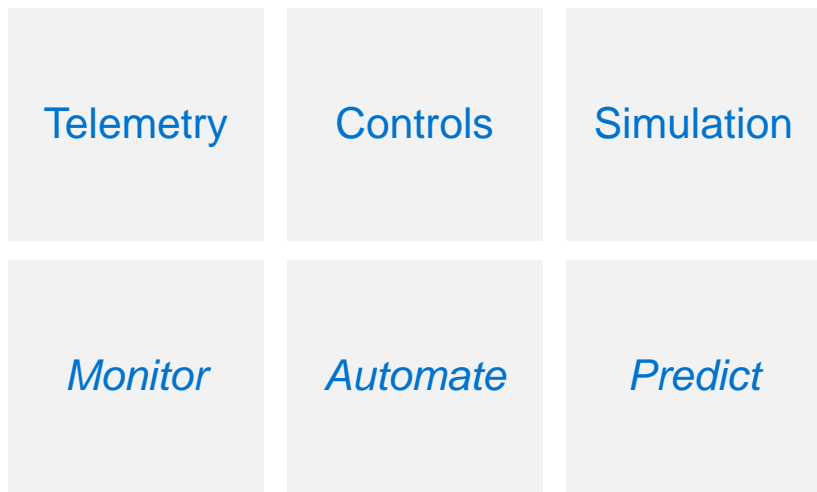# Technology Trends at the Grid Edge

Thierry Godart, Ph.D.
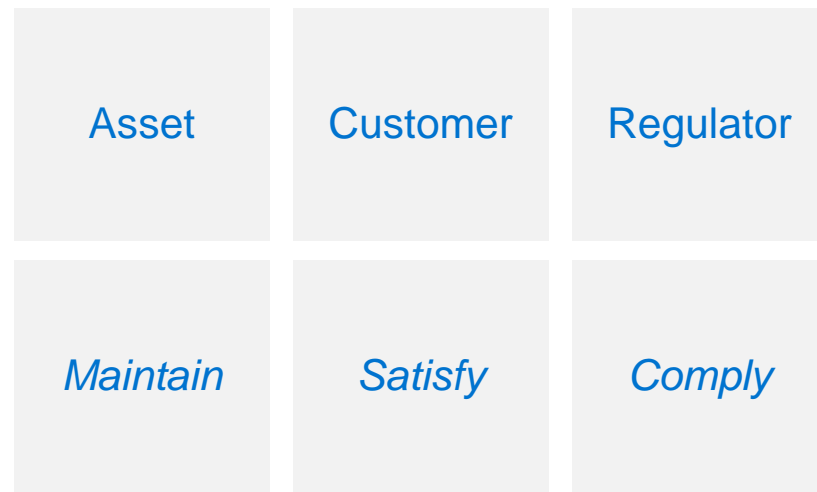
Technology does not change the Utility Fundamentals
.. but it will make sure they can scale to 21st century problems

Operations

Telemetry	Controls	Simulation
Monitor	*Automate*	*Predict*

Safety + Reliability + Efficiency + Security

Business

Asset	Customer	Regulator
Maintain	*Satisfy*	*Comply*

Cost + Risk + Social

Digital Grid starts with secure and scalable data collection

Communities

Field Worker

Drones

Data Center

Solar Farm Controller

Wind Farm Controller

Distribution Automation

Smart Substation

HV Systems

Hydro Plant Controller

Smart Meters Smart Homes

Smart Buildings

Smart Factories

Fossil Plant Controller
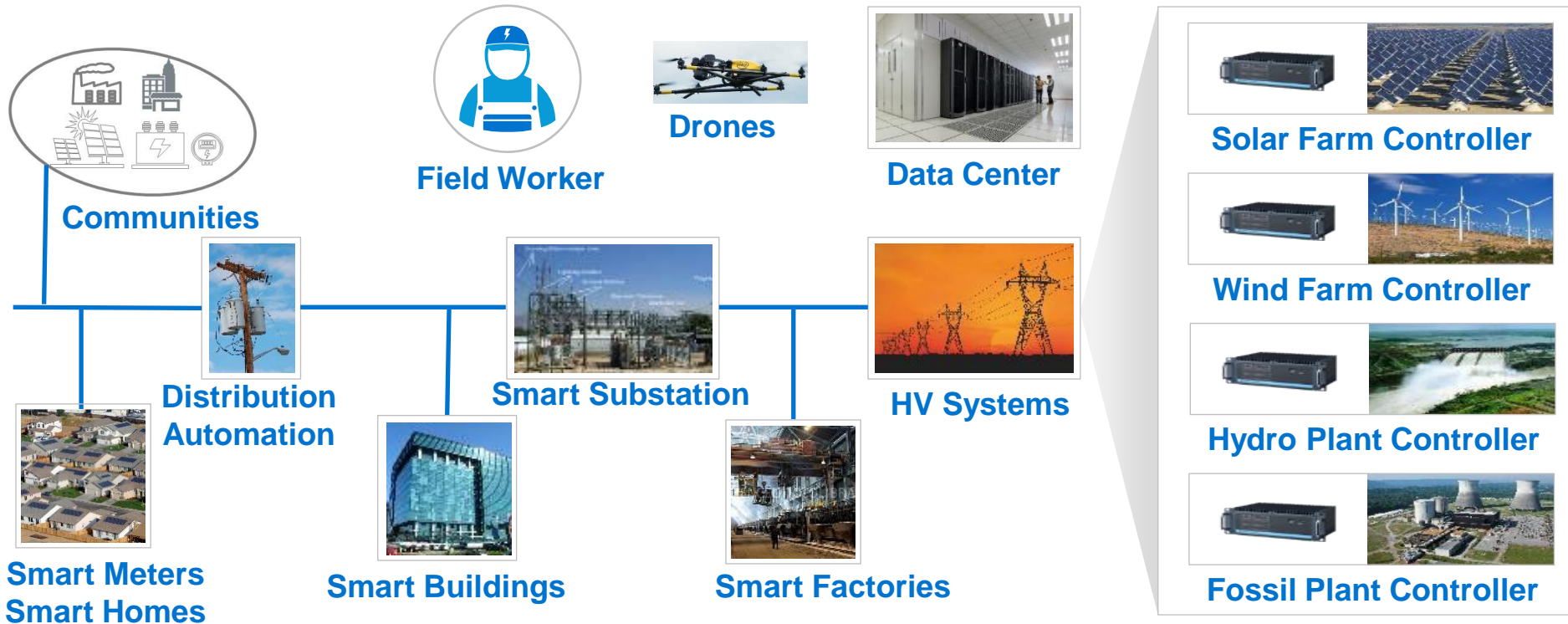
Connect Grid Assets: From Technology to Solution

Wind Farms

Power Plant

Solar Plants

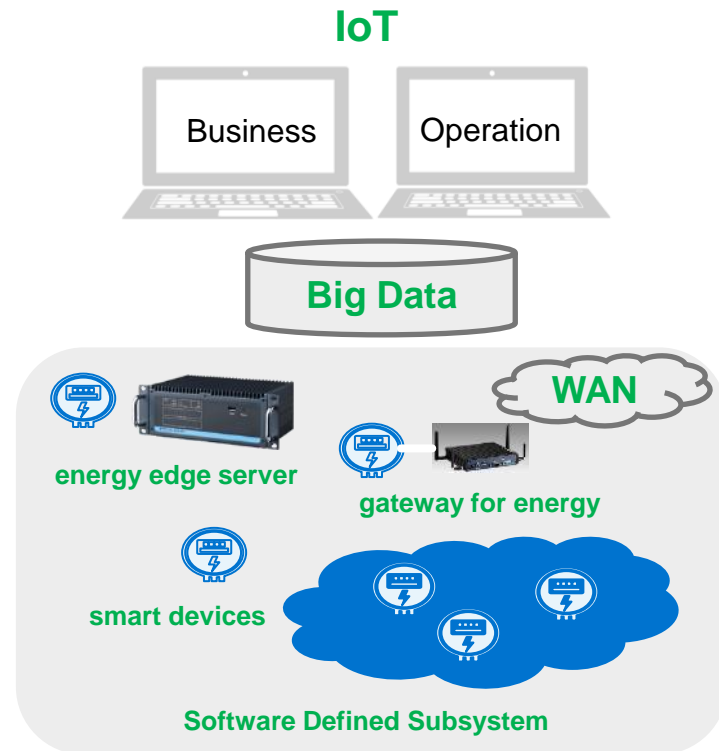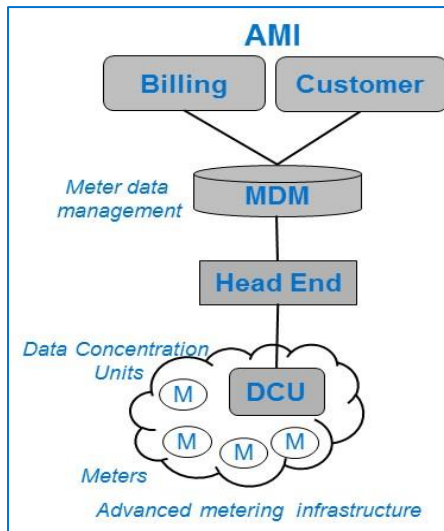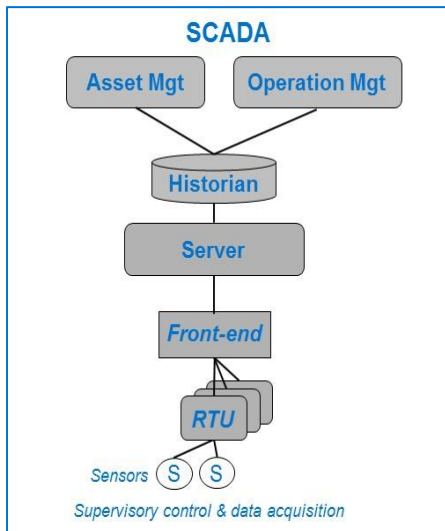Microgrid Controller

Substation Controller

Smart Buildings
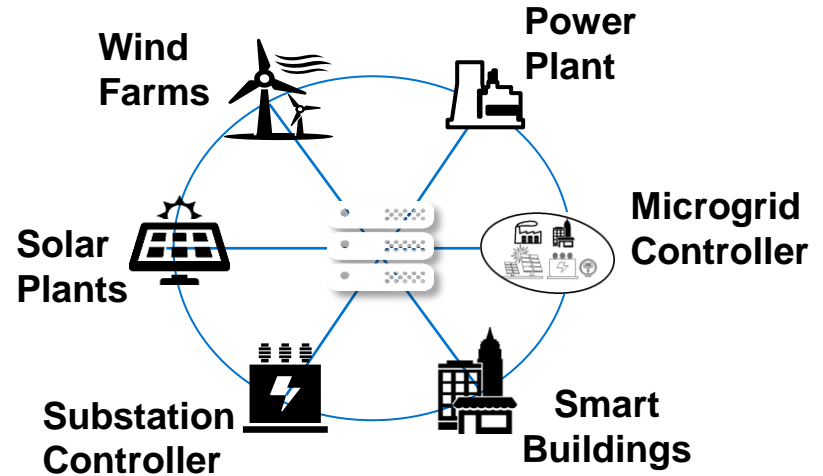
OSIsoft.

✓ Telemetry data
✓ Condition data
✓ Alarm & Events data

SCADA / AMI / IoT architectures
technology driven evolution of utility systems

What IoT brings?

- ✓ Secure connectivity
- ✓ Scalable data management
- ✓ Distributed data processing
- ✓ Data driven machine learning

Designing Secure IoT systems
from hardware embedded to enterprise management

| Device Lifecycle Security Services	**Trusted Broker Services** Device onboarding and attestation	→ Manage security at scale
Built-In Security Architecture	**Security Integrated from Edge to Cloud** Secure Communications Security Management	→ Enable Security Policy
Designed-in Security Hardware	**Consistent Security for the Edge** Trusted Execution Environment Hardware and Software Identities Protected Boot Protected Storage	→ Build the Foundation for Security

(intel)

Edge Data Management – For all your telemetry needs
IoT data mapped to the common information model (IEC 61970, 61968, 61850, 62056)

1. Scan sensors through the Protocol interface
2. Populate the time series data store with UID, value, quality, timestamp
   - UID refers to the ID in the metadata store
3. Any authorized systems (enterprise system / peer edge device / local mobile device) can subscribe as a Data Consumer
4. Data Consumers discover the data using OPC-UA protocol commands from the metadata store
5. Data Consumers query the Edge Device for the data it subscribes to from the data store using OPC-UA
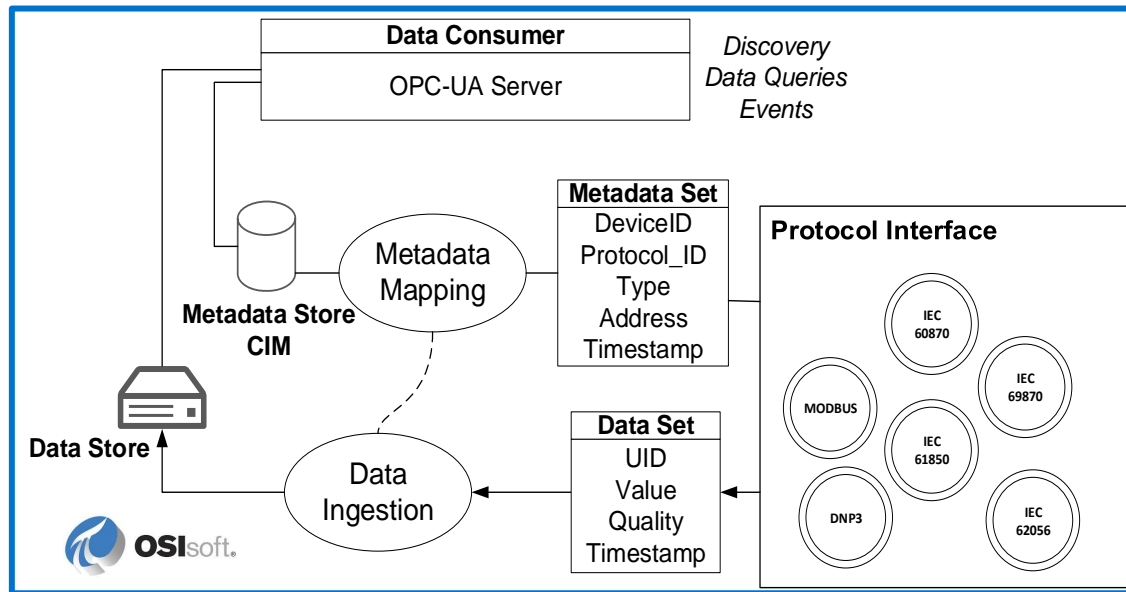

IoT Edge Data Processing

Consolidate your applications in one virtual system
trusted and managed microservice platform

Trends towards more granular service-oriented architecture at the edge:
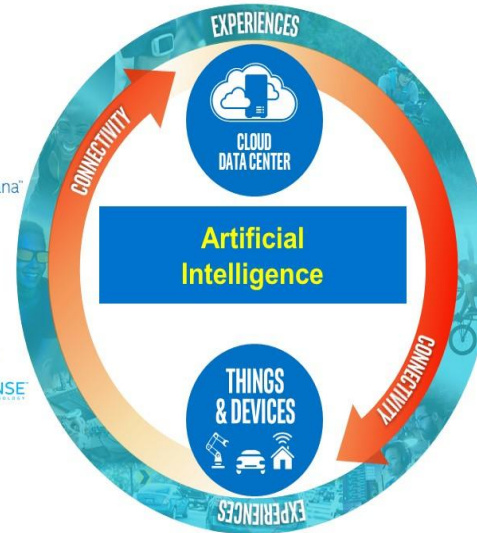- ❑ Virtual Machines
- ❑ Containers

- Continuous and dynamic update of software services
- Sharing of common resources (security, compute, network)
- Multi-vendor systems co-existing but not interdependent
- Granular failover/redundancy schemes
- Maximize service availability (partial shutdown during update)
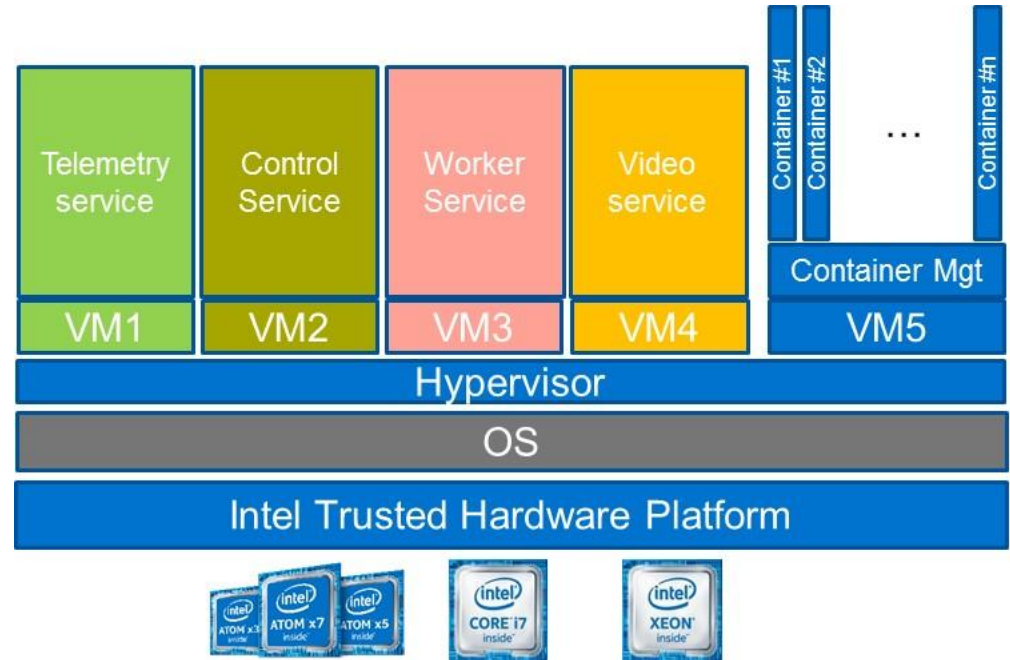
Getting Smarter with Analytics
your AI strategy starts with data

- **Breakthrough in Machine Learning**
- **Applications**
  - **Consumer marketing**
  - **Energy Forecasting**
  - **Energy Trading**
  - **Maintenance Strategies**
  - **Worker Assistance**
- **Cloud Based**
  - **Model generation**
  - **Planning & simulation**
- **Edge**
  - **Real-time inference**
  - **Autonomous decision**

Capabilities

- intel XEON inside
- intel XEON PHI inside
- n

- ✓ **MACHINE/DEEP LEARNING** — intel Nervana™
- ✓ **REASONING SYSTEMS** — saffron
- ✓ **FPGA** — intel ARRIA 10 inside
- ✓ **COMPUTER VISION** — Movidius, intel REALSENSE TECHNOLOGY
- ✓ **TOOLS & STANDARDS**

EXPERIENCES

CONNECTIVITY

CLOUD DATA CENTER

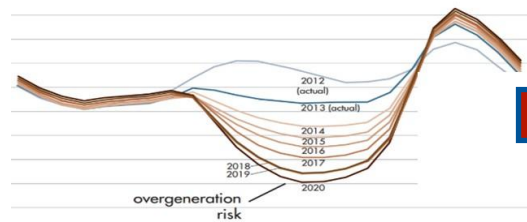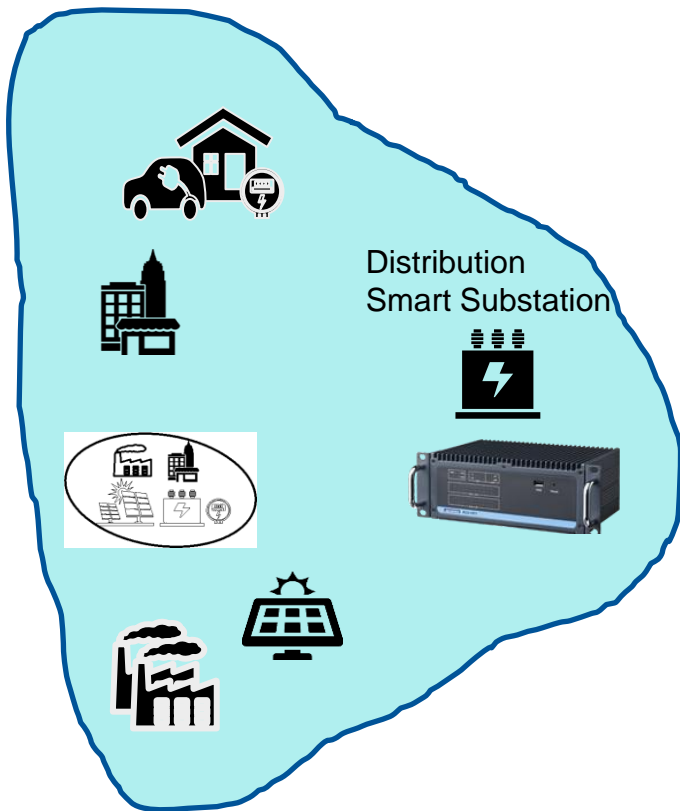**Artificial Intelligence**

THINGS & DEVICES

EXPERIENCES

Power Industry Applications

To learn more: www.intel.com/ai

Digital Platform to Optimize the Distribution Grid

How Utilities and Society can take advantage of DERs in a shared economy

Distribution
Smart Substation

Duck Curve

Flat Aggregated Load Factor
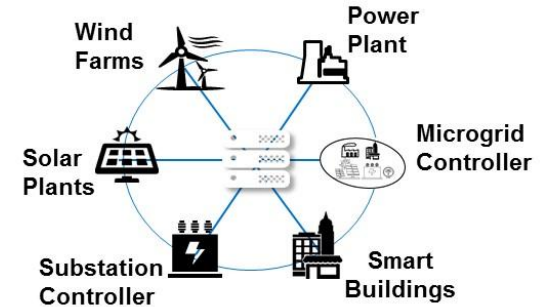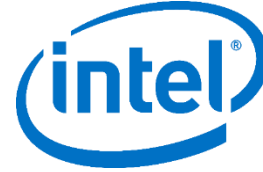
**Distribution Grid
Digital Platform**

$$ Shared Economy

✓ LV Grid Monitoring
✓ Integrated Resource Planning with DER
✓ Energy Flexibility Programs

Technology Trends at the Grid Edge

Intel – Technology Partner for Smart Grids

Intel brings technology innovations to its partners who design and deploy IoT solutions to modernize the Power Industry

CHALLENGE

Bring secure and reliable technology to adapt power systems to 21st century challenges

- Security
- Manageability
- Legacy Interoperability
- Reliability at Cost

SOLUTION

Intel's Energy solutions delivered by hardware and software ecosystem for power industry applications

- Trusted platform for grid edge
- Hardware embedded security
- Enable advanced analytics
- Enable distributed controls

RESULTS

Lower cost of maintenance

More insights from the field

New businesses enabled

- Planning for DER / EV
- Improve reliability (SAIDI)
- Defer capital investment
- Build an AI strategy to transform

Thierry Godart

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General Manager, Energy & Building Solutions
Internet of Things Group
Intel Corporation

Questions

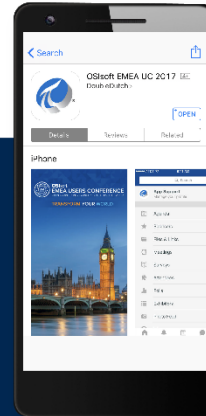Please wait for the **microphone** before asking your questions

State your **name & company**

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감사합니다

Danke

谢谢

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado

Technology Adoption and Change Management need your Leadership