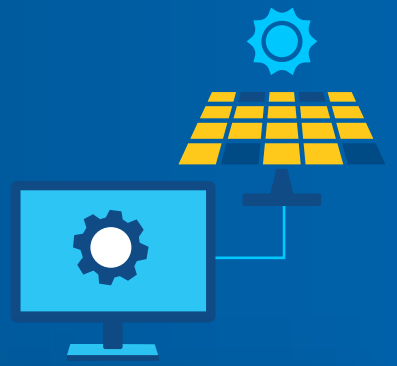
Data-driven, Interoperable, Open Edge Platform for Energy-as-a-Service (EaaS)

Integrated Energy Services (IES) Platform

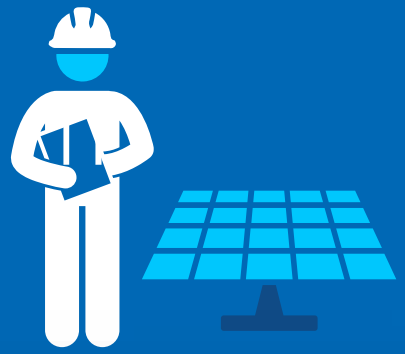
Industry Disruption and Transformation

The push for end-to-end grid transformation is accelerating



Manage Grid Resiliency

Optimize operations and assets, with integrated intelligence to improve the end-to-end performance, stability, and sustainability of the grid



Navigate Energy Transition

Create dynamic business platforms for decarbonization, allowing energy generation decentralization thanks to grid digitalization

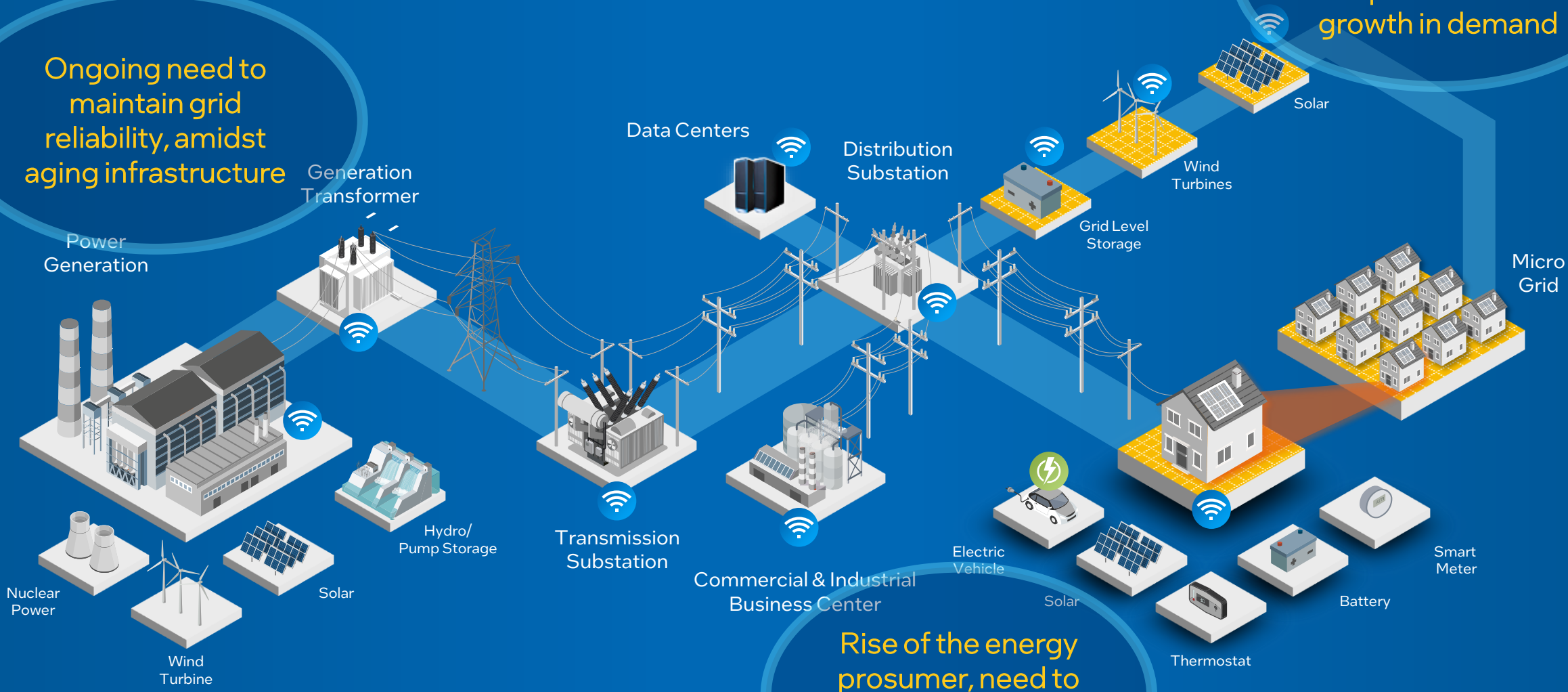
Reimagine the Customer Dynamic

Insights driven platforms for growth that expand solution footholds and bring energy partners together to unlock value across the ecosystem

Where transformation is taking place

Ongoing need to maintain grid reliability, amidst aging infrastructure

Decarbonization, decentralization, unprecedented growth in demand



Rise of the energy prosumer, need to deliver innovative products

Edge Computing and AI are both critical to enabling the grid of the future

1

Manage Grid Resiliency:
Use of real-time insights combined with textual and geophysical data to de-risk aging assets, improve grid performance, and build next generation infrastructure to manage renewable disruption.

2

Navigate Energy Transition:
Create integrated, scalable platforms – where clean energy and technology goals are inseparable – to reinvent the business, forge new alliances, and explore new relationships to transform emerging competitors into emerging partners.

3

Reimagine the Customer Dynamic:
Fuel innovation and growth of value driven solutions leveraging advanced analytics and behavioral science to create new value streams and business models that enable energy transition – all while safely preserving reliability.

Why Energy-as-a-Service (EaaS)?

Technology and data propels industry transformation

Traditional Energy Engagement

Centralized, Predicable, Rate-Based Vertically Integrated, One-way Customer Relationship

- Energy Delivery
- Commodity Services (Power Purchase/Energy Contracts)
- Demand-side Management Programs
- Energy Performance Contracting, Energy Audits
- Limited Behind-the-Meter Services

New Revenue Streams Through EaaS Models

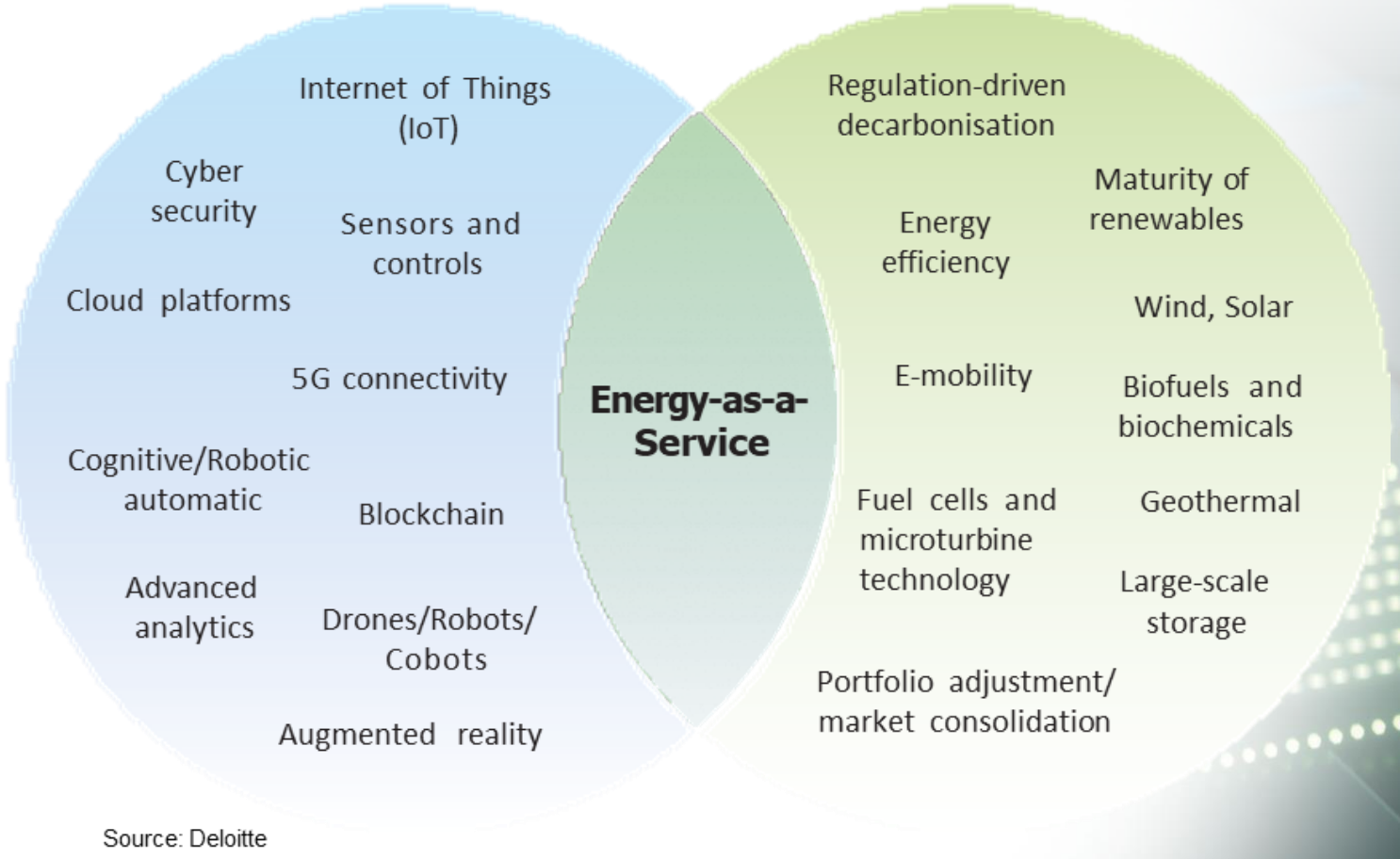
De-centralized, Intermittent, Market-Driven Pricing, Distributed Integration, Bi-Directional Customer Relationship

- Distributed Energy Resource (DER) Management (e.g., Battery/Stationary Storage, Solar, Wind)
- Generation and Microgrid Interconnect Services
- Load Leveling and Frequency Regulation Services
- Ancillary Services and Market Transaction Enablement for Aggregators, Prosumers, RECs and Peer-to-Peer Trading
- Output-based Subscription X-as-as-Service Delivery Models (e.g., DERs, EV Charging, Heat, Lighting, Mobility, etc.)

IES Platforms

Unification of real-time data across the value chain, laying the foundation for:

- new digital value streams,
- enhanced grid resiliency, and
- sustainable operations.



Source: Deloitte

Eliminating siloed operating models

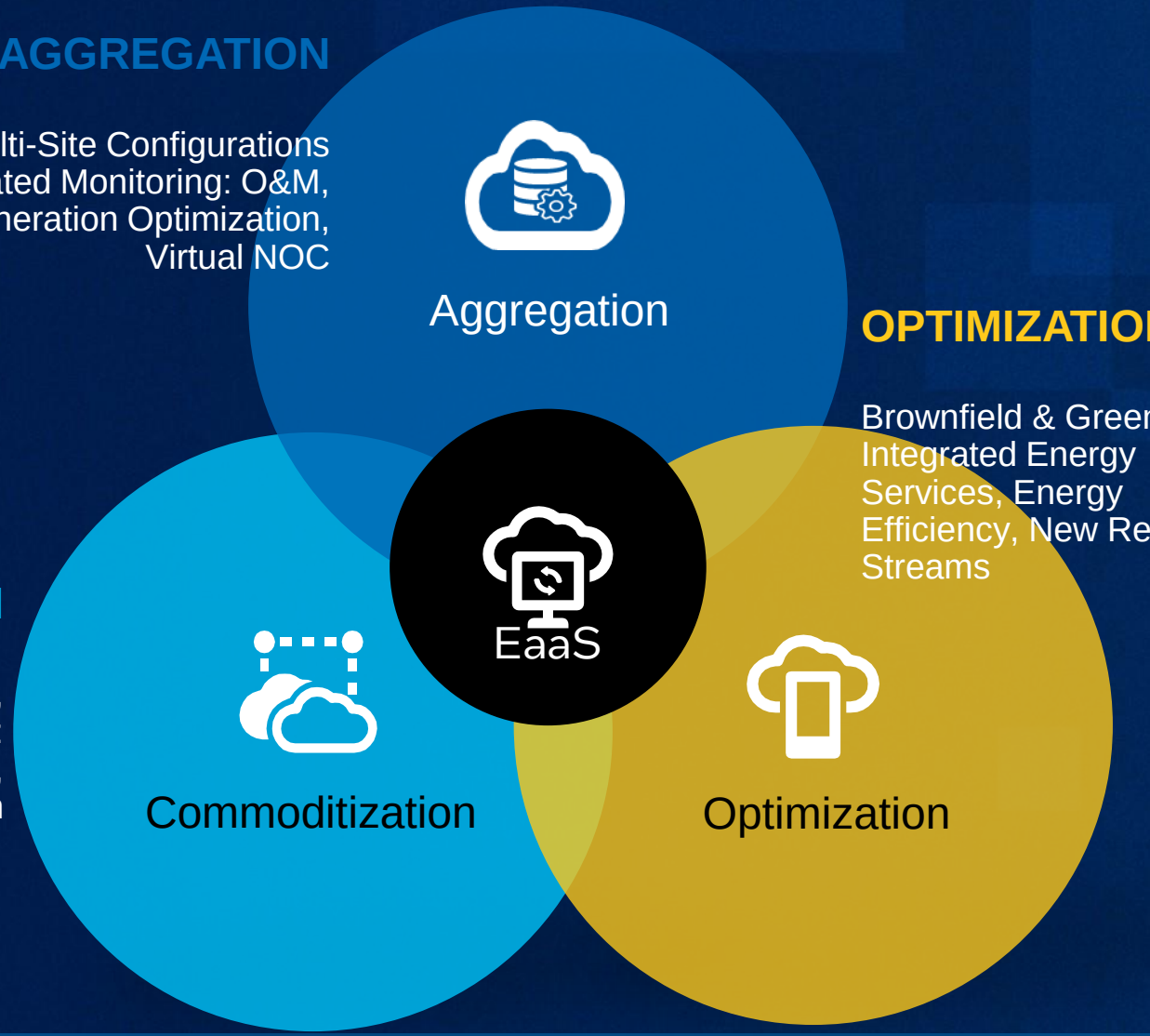
- Enabling energy transition by eliminating siloed operating models that create a lack of business agility and stifles innovation, limiting their ability to capitalize on decarbonization opportunities and sustainable development.

AGGREGATION

Multi-Site Configurations
Consolidated Monitoring: O&M, Generation Optimization, Virtual NOC

COMMODITIZATION

Auto Provisioning of Services, Large Scale Deployment: Commercial Segment, Automated Distribution



OPTIMIZATION

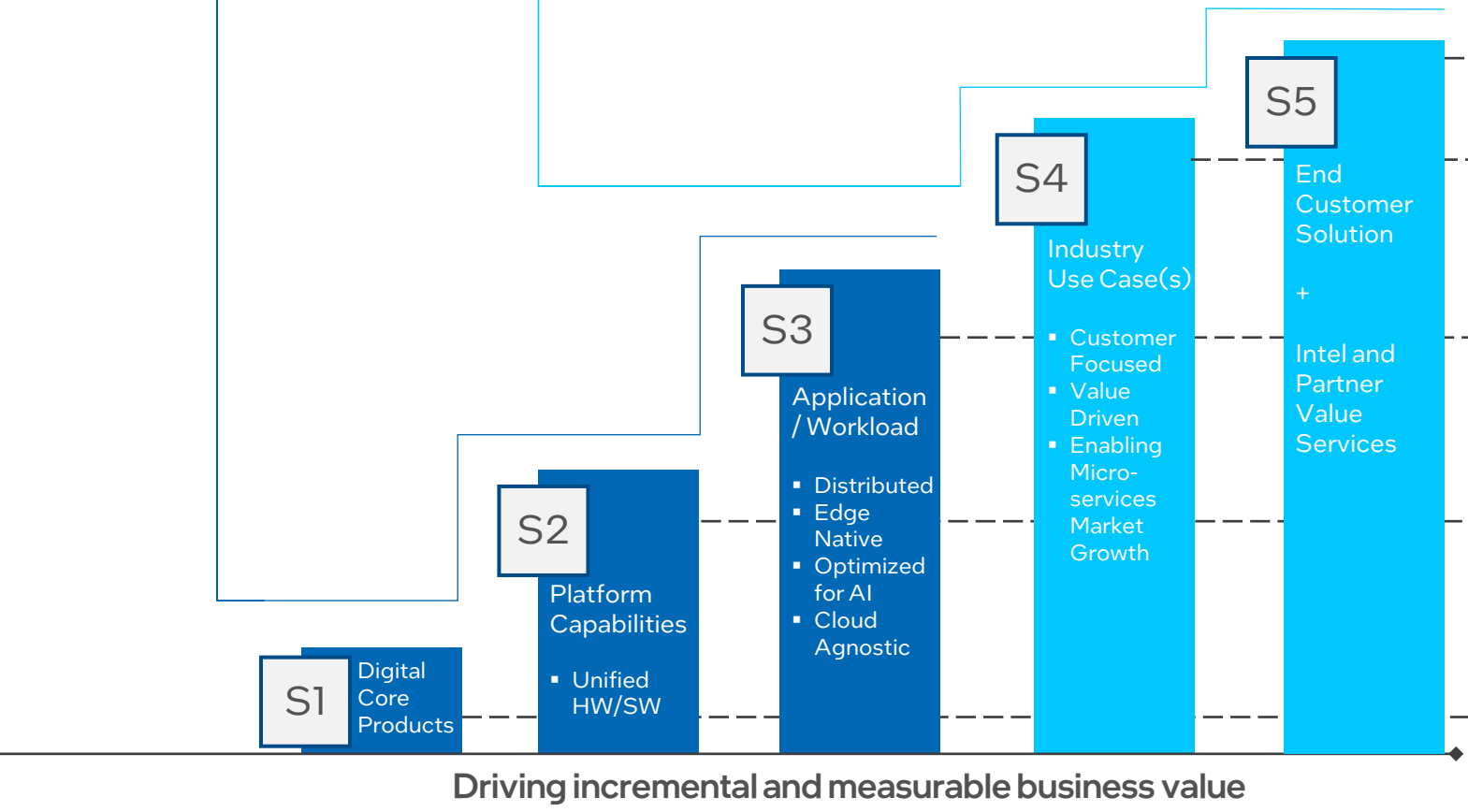
Brownfield & Greenfield Integrated Energy Services, Energy Efficiency, New Rev Streams

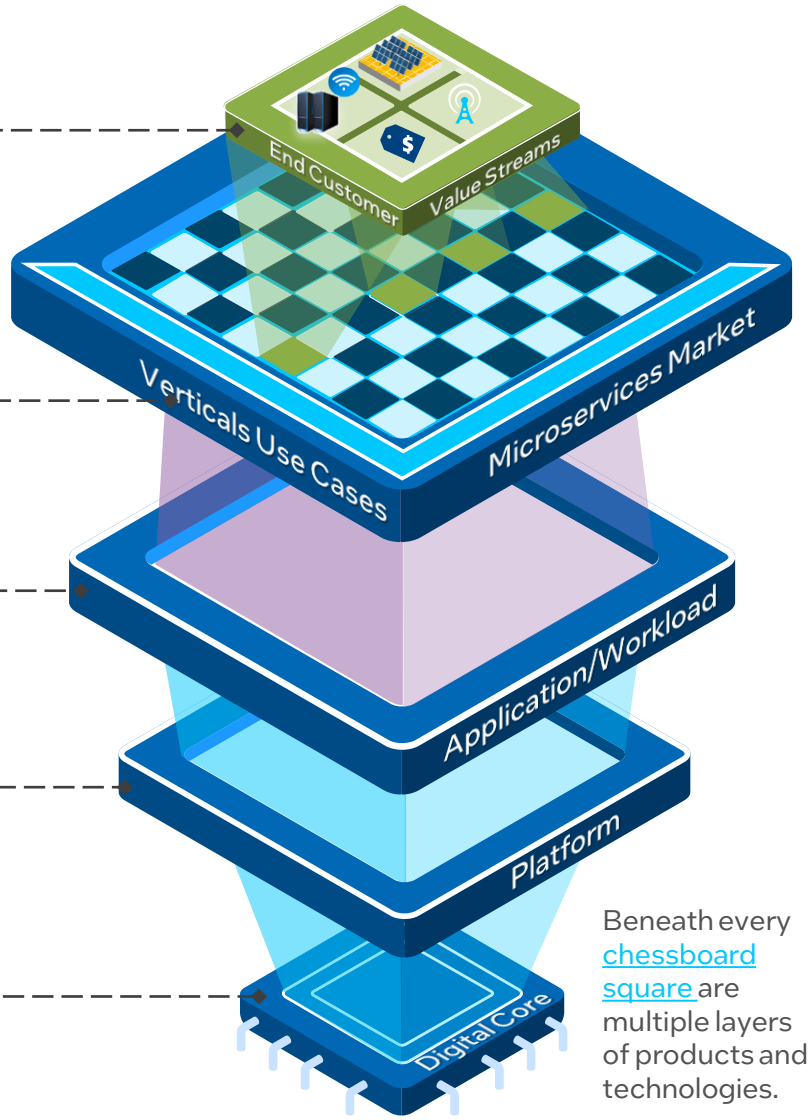
Integrated Energy Services (IES) Platform and Marketecture

The Anatomy of an Integrated Solution

Unified HW/SW platform - partner ecosystem solutions - extract complexity from deployments

Industry Solution + Value-add Services





Beneath every chessboard square are multiple layers of products and technologies.

Intel Integrated Energy Services – Solution Overview

Integrated

intel EaaS Platform – Enabling Capabilities

Front-of-the-Meter Value Streams

Cloud Optimization	Decentralized Edge Services	Real-time Insights	Application Marketplace	Intelligent Network
Federated Cloud Services	Insights, Control, Deploy, Manage	AI & Autonomous Decision Services	SW and Data Services (XaaS)	Bi-directional Data Orchestration

Behind-the-Meter Value Streams

Trusted and Secure

Grid/Network Services

- DER Fleet Insights
- Grid Level Aggregation
- Network Reinforcement and Congestion Management
- Capacity and Carbon Trading
- Autonomous DER Dispatch
- Economic Based DER Allocation and System Optimization
- Decarbonization Portfolio Investment and Planning

Intel® EaaS Digital Core

Intel® Cloud Optimization Modules
Cloud-like Experience at the Edge, Performance and Power Efficiency to Speed Time to Business Insights

Intel® Processors Enhanced for IoT
Better Manageability, Deeper Insights, and Faster Time to Value - Moving Storage, Processing, and Analysis to the Edge

habana An Intel Company / intel GETi
Gaudi: Dedicated Deep Learning Training and Inference, Edge and Network AI Inference, AI-as-a-Service

GRANULATE An Intel Company
Real-Time, Autonomous Application Aware Optimization to Improve Performance and Cuts Costs

OpenVINO / oneAPI
Open-source Toolkit to Build AI Applications That Deploy and Run Anywhere, Multiarchitecture Software Development

Synchronized & Sustainable

Energy Services

- Plug and Play Integration
- EV Charging Solutions
- DER Ancillary Services
- Predictions and Behavioral Analytics
- New Transactive X-as-a-Service Models
- Community Level Aggregation
- Grid Interconnection and Synchronization
- Standardized Communication Protocols
- Carbon Strategy

Intel Edge Platform – Enabling EaaS

Integrated

intel EaaS Platform – Enabling Capabilities

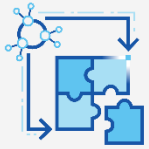
Front-of-the-Meter Value Streams

Cloud Optimization

Federated Cloud Services

Decentralized Edge Services

Insights, Control, Automation



Real-time Insights

Autonomous Decision Services

Application Marketplace

Software and Integrated Data Services

Intelligent Network

Bi-directional Data Orchestration

Behind-the-Meter Value Streams

Trusted and Secure

Grid/Network Services

- DER Fleet Insights
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- Autonomous DER Dispatch
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Intel® EaaS Digital Core

Zero Touch Provisioning	Application Life Cycle Management	Zero Trust Security	Communications Protocol Adapters	Cloud Functionality @ Edge

Synchronized & Sustainable

Energy Services

- Plug and Play Integration
- EV Charging Solutions
- DER Ancillary Services
- Predictions and Behavioral Analytics
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Shell Integrated Energy Services (IES) Platform

Why would Shell want an integrated services offering?

Brief

Capability Name: Shell Integrated Energy Services (IES) Platform

Description: Shell IES will provide seamless integration to all OT systems and ingestion, processing, enrichment and analytics of data at the edge to provide real time operational insights at the edge or far edge to enable business run efficiently.

Vision: Run Optimized & **Lights-out industrial operations**, site autonomously orchestrated by edge intelligence.

Marketing Intelligence

Latest Trends: Edge and fog computing, edge analytics

Competitors and Partnerships: ?

Basic Features

i. **Auto-detection of assets and asset model; Auto-Detection of Asset Model change at the edge and Model Sync with the cloud**
   - Auto detection of available tags
   - Ability to create, update asset model
   - Ability to onboard any asset easily using available asset models

ii. **Edge KPIs (Key Performance Indicators) and Derived tags**
   - Ability to compute the KPI locally and share only critical information / insight on the cloud

iii. **Data Quality and consistency check**
   - Reduce any anomalies, reduce data holes

iv. **High Resolution data gathering for model training**
   - Ability to temporarily configure, capture, store and share high frequency data as per the requirement required

v. **Edge Computing and Analytics**
   - Ability to deploy analytics model on the edge to compute the data locally and share the insight locally thus ensuring robust connectivity and reduced latency

vi. **Run Custom or third-party modules at edge**
   - Ability to integrate 3rd party app data to the cloud directly

vii. **Data Visualization**
   - Empowering the site with customizable dashboard creation locally to analyze a asset performance

User(s): Renewable Energy Team, SCADA Team, Energy Trading Team

What value does Intel offer at the edge?

Goal

1. Intelligent Edge Services capable of centralized deployment & orchestration
2. Capability to run 'Lights-out' operations at the site (with AI inferencing & Data visualization)
3. Demonstrating scalability to run operations across ports, airports, solar plants, wind farms, etc.

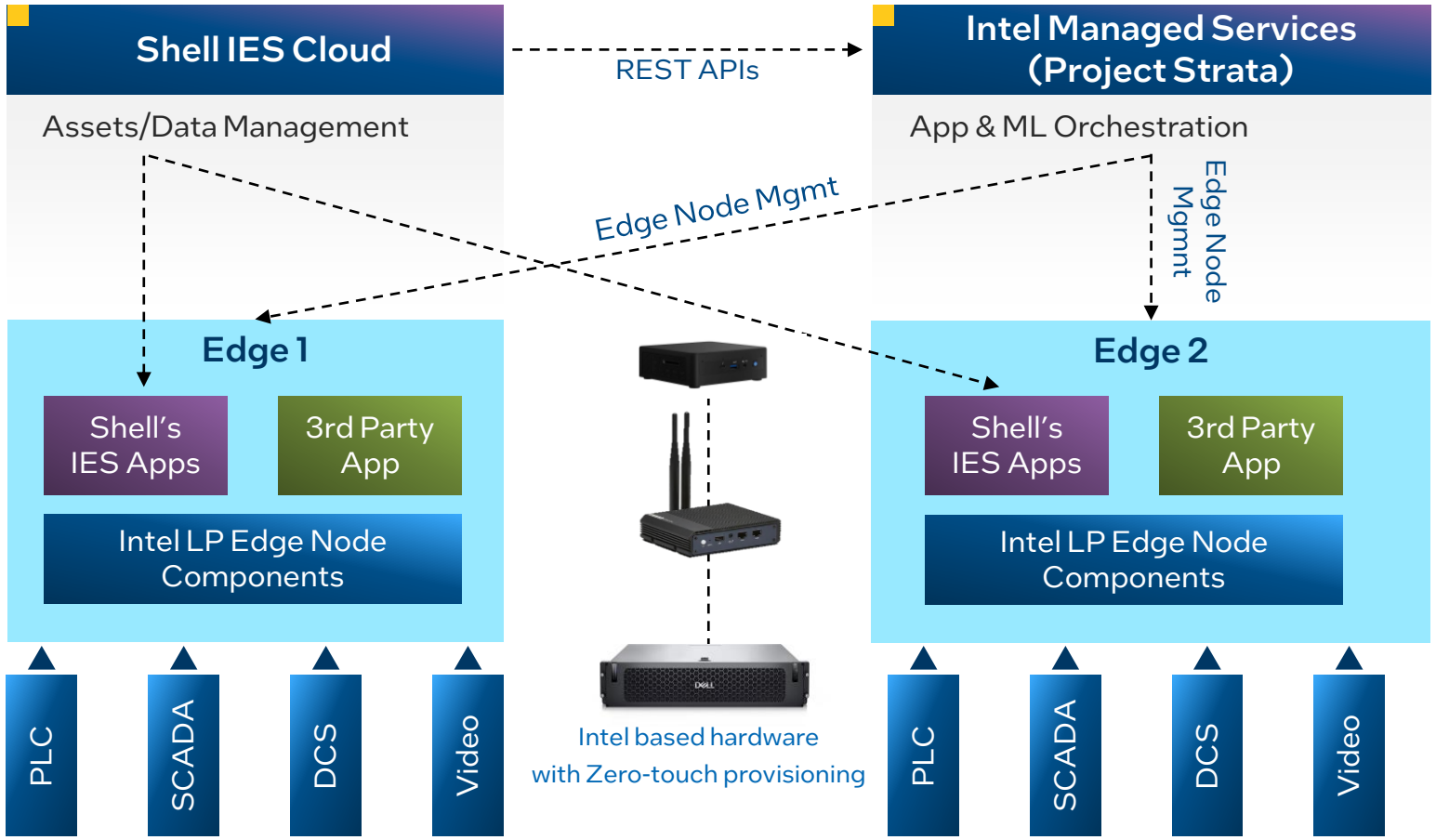
Edge Services components

- Hardware options- Intel® Core™ to Intel® Xeon®
- Asset discovery, Data Collection, Analytics, Local visualization and Data Integration
- Secure enclave* for model protection
- Secure license management

End-to-End Managed Services

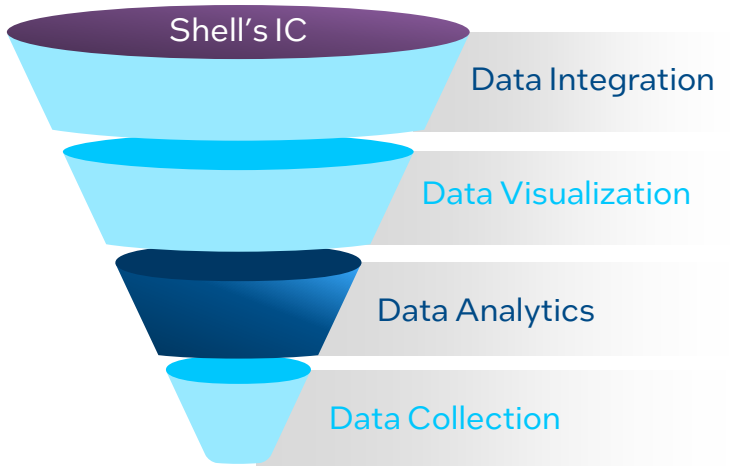
- Zero-touch provisioning
- Cloud like experience @ the Edge
- Automated & intuitive Lifecycle management
- Central Observability & Monitoring
- Application catalog (VM, Container)
- Zero-trust architecture

How do we create a joint Shell/Intel edge offering?



Key Takeaways

- Data from the assets remains either at edge or within Shell's IES Cloud
- Edge site can contain commercial to ruggedized systems which can be mounted on outdoor



Shell team Intel SI Partner

Freedom to choose the hardware. Can be from Dell/ HPE or other 3rd party OEM servers.

- Ruggedized box for outdoor, remote settings
- Intel based NUC (computing unit)

Edge Services Orchestration & Zero-touch Provisioning

Intel Managed service

Publicly accessible Intel managed service: Project Strata

Intel's modular platform to deliver the Distributed Edge with As-a-Service offerings

Zero Touch Provisioning of Edge Serviceses/ Nodes

Edge Services allocation and Zero Touch Installation of Platform Components and applications

Observability and Health Monitoring

Observe Deployment status through Dashboards

Application Catalog & Deployment Configuration

Upload, Configure and Package applications, Create Deployment Configuration for Edge Node

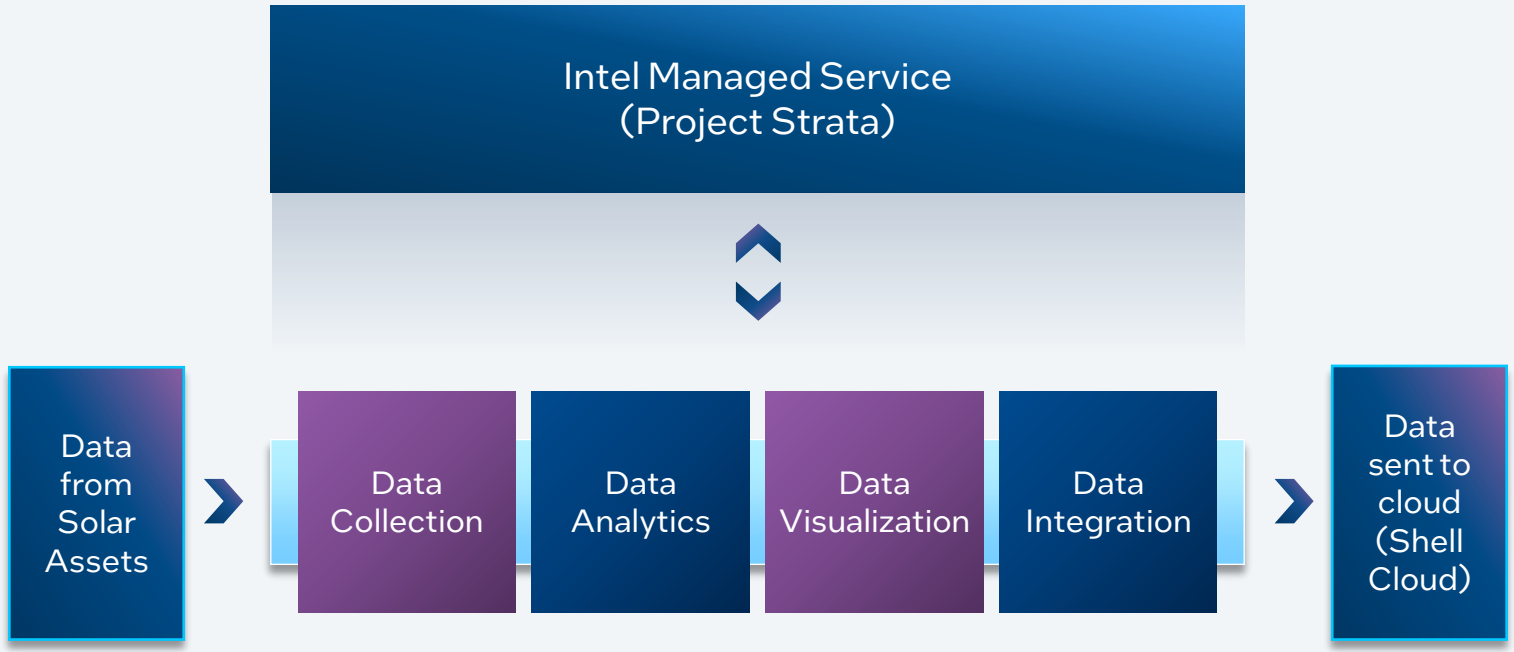
Edge Node OS Provisioning and Onboarding to Project Strata Edge IAAS

Automated PXE Based OS provisioning on edge Node and onboarding by Maestro

VM Operations and Application Update

VM Console Access and Operations, Apps Update

EaaS Application #1:
Consolidated Monitoring of Multiple Sites for O&M, Generation Optimization, Energy Services Participation



Intel value proposition is an end-to-end solution having 3 components :

1. Edge Services, with site to cloud connectivity
2. Capable of running AI inference models at the individual Shell sites
3. Zero-touch provisioning and orchestration of Edge nodes

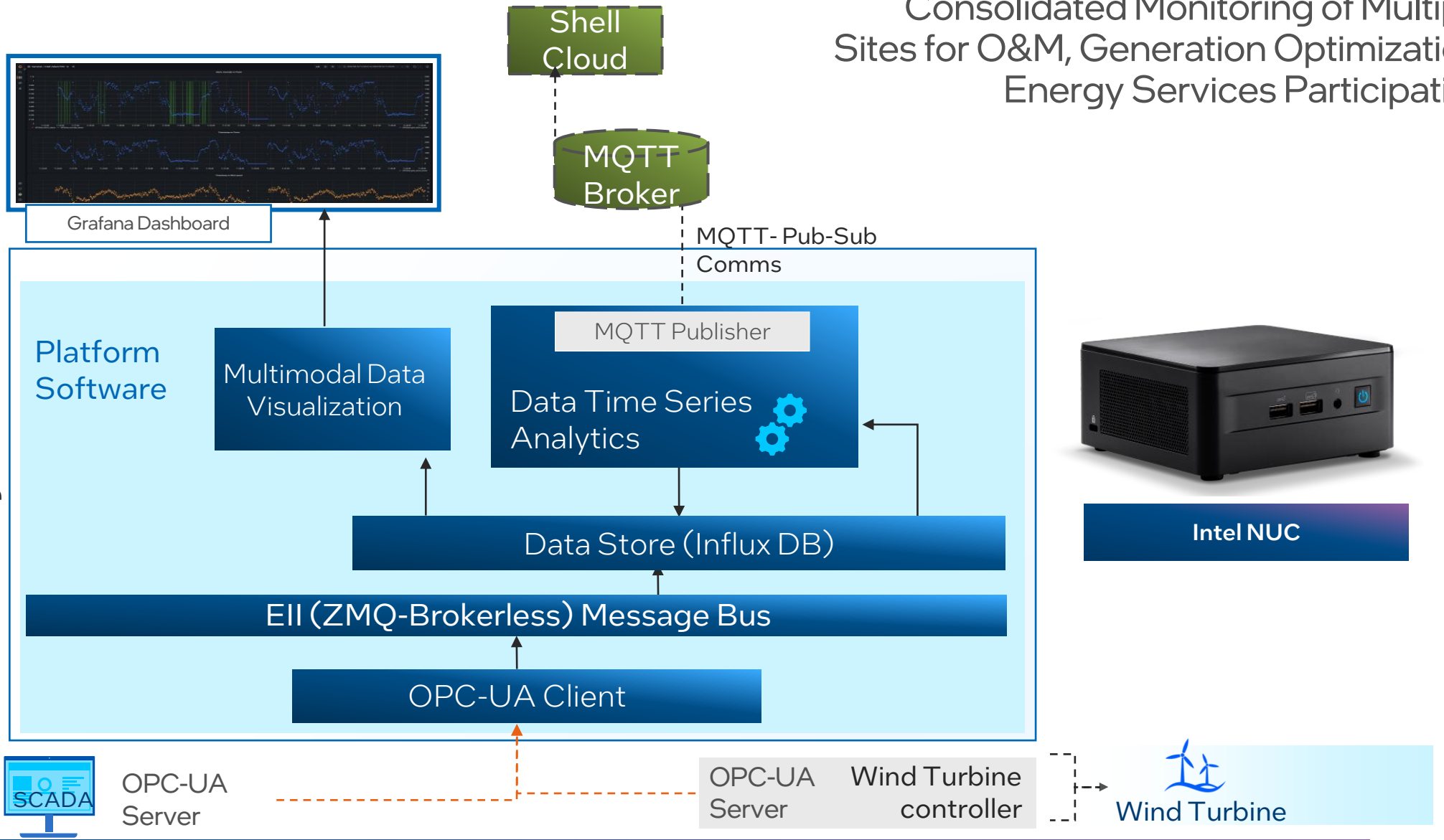
- This box brings in the **modularity** as well as the **scalability** that Shell group requires

Note:

MVP Phase 1 – Intel as the partner to fulfil all the requirements to get to Shell an end-to-end box

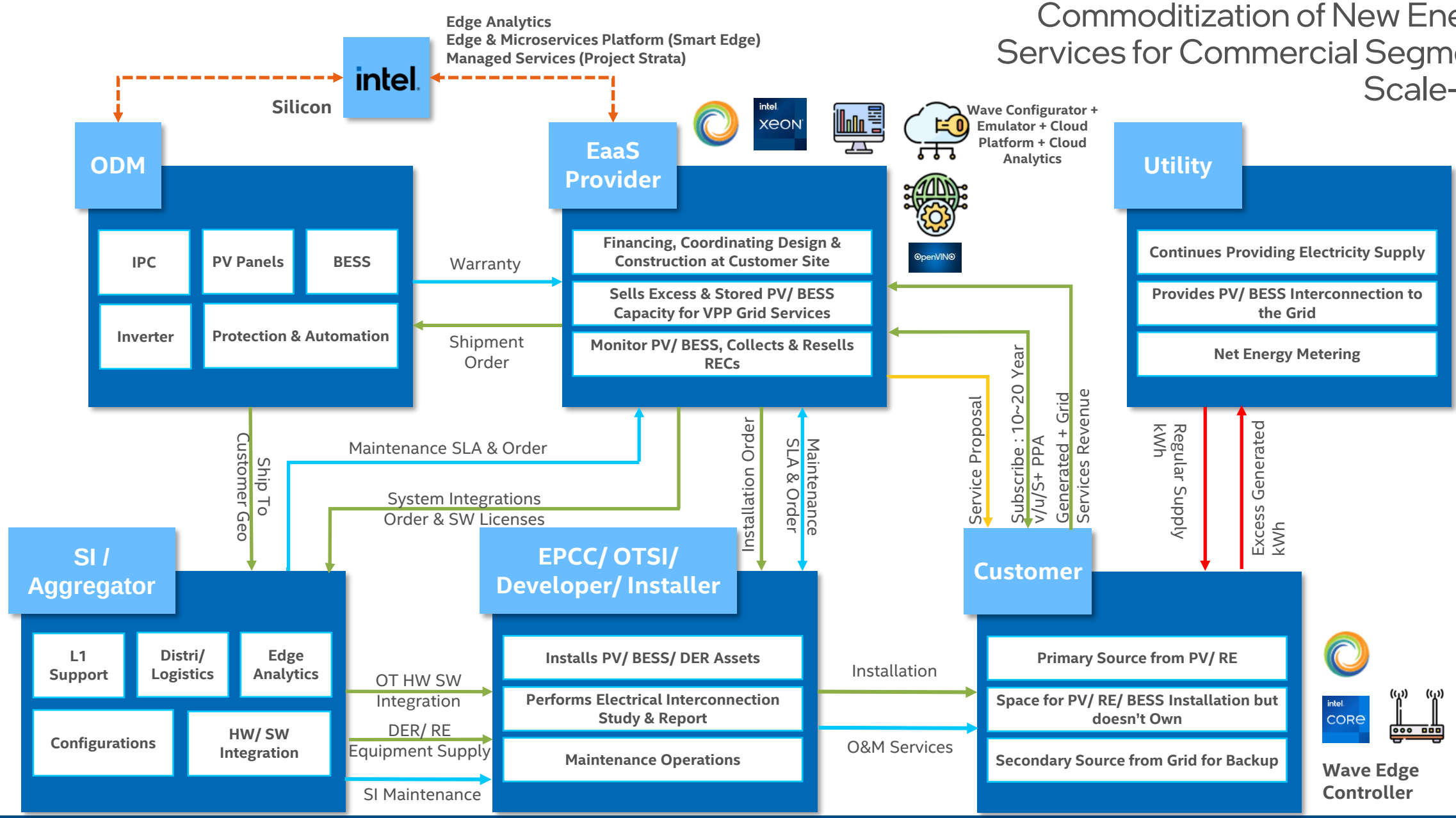
EaaS Application #1:

Consolidated Monitoring of Multiple Sites for O&M, Generation Optimization, Energy Services Participation



Showcase of Data collection, Analytics, Visualization and Integration through modified EII

EaaS Application #2:
Commoditization of New Energy Services for Commercial Segment/ Scale-Out



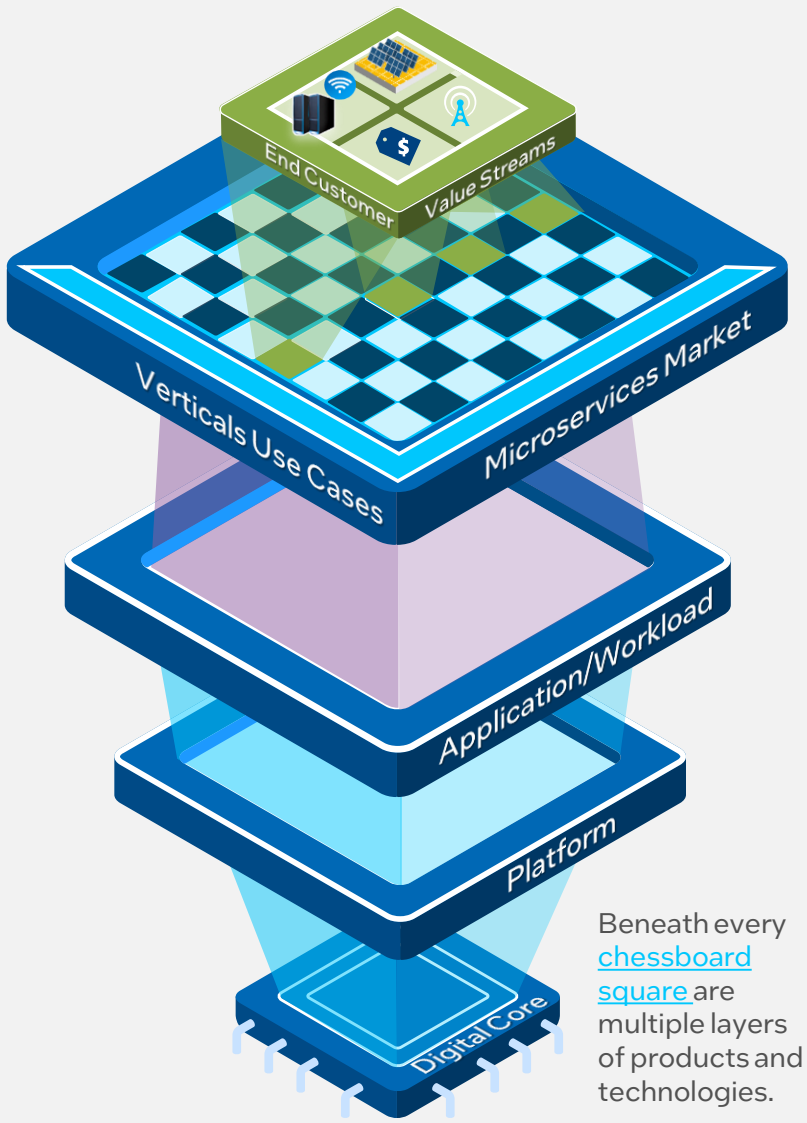
Service Proposal Subscription & Deployment SLA Maintenance

Close and Call to Action

Use as a summary recap for presentation.

Update TBD

Change Title



Beneath every chessboard square are multiple layers of products and technologies.

1

Identify manufacturing end customers, their personas, desired business outcomes, and how they measure success.

2

Connect your end customers' manufacturing business outcomes with use cases that solve for those outcomes.

3

Show how a given solution's business outcomes, technologies, use cases, etc. provide opportunities for one-to-many scale.

Principles of Intel's Chessboard Solution Selling Approach:

Lead with language that is relevant and easily understood by end customers.

Position yourself as a trusted advisor, rather than just a transactional seller.

Show, rather than tell, how ingredients and technologies as key enablers of scale.

Update TBD

Next Steps

Pathways for building this relationship

Alignment on Market Need

What do we need to focus on?

- ☐ 1
- ☐ 2
- ☐ 3

Creating a Compelling Value Proposition

What do we need to focus on?

- ☐ 1
- ☐ 2
- ☐ 3

Driving Market Awareness Through Scale Programs

What do we need to focus on?

- ☐ 1
- ☐ 2
- ☐ 3

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