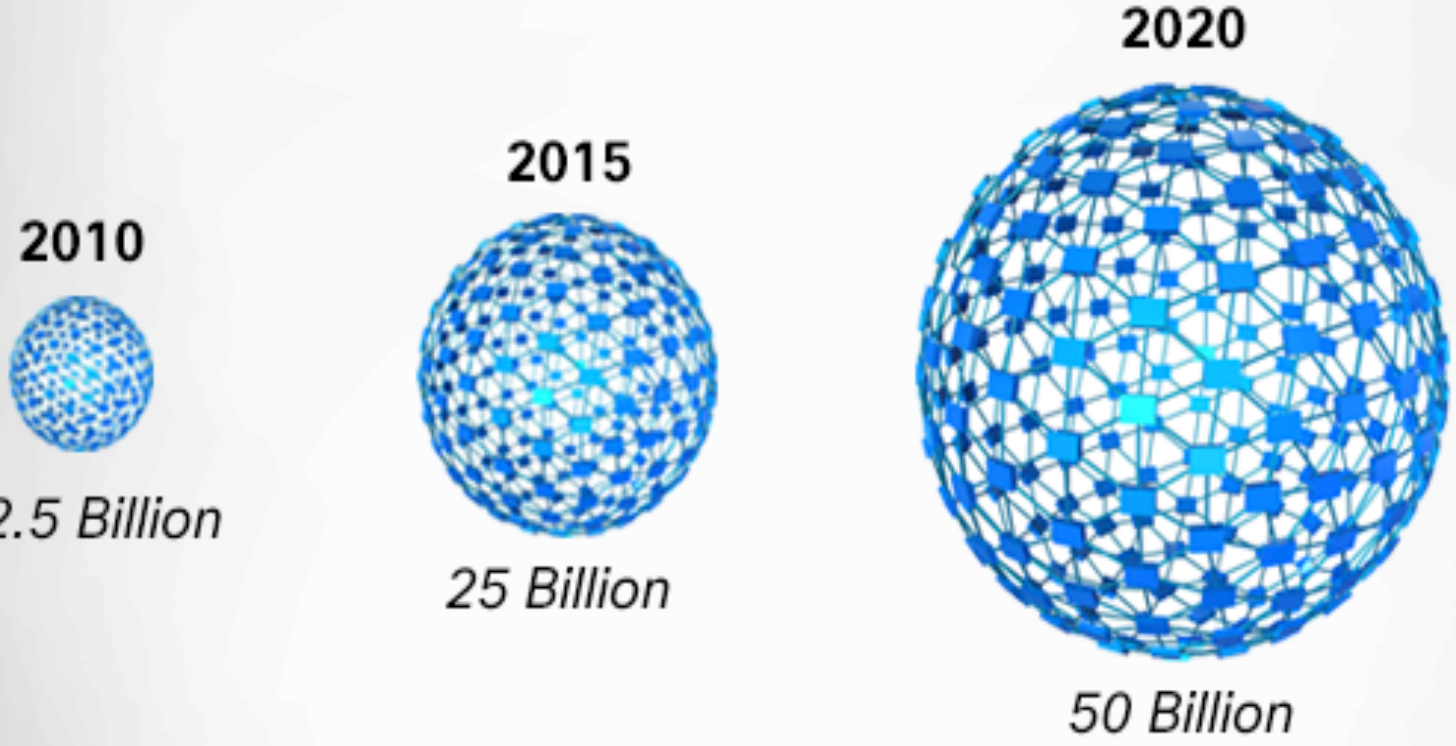
Fast Innovation requires Fast IT

Cisco Connect

Building the Internet of Things

© 2014 Cisco and/or its affiliates. All rights reserved.

It's Huge, but What Is It?



cisco

IoT World Forum Architecture Committee

© 2013 Cisco and/or its affiliates. All rights reserved.

Basic Premises

Devices

send and receive data interacting with the

Network

where the data is transmitted, normalized, and filtered using

Edge Computing

before landing in

Data storage / Databases

accessible by

Applications

which process it and provide it to people who will

Act and Collaborate

Standards based approaches are required to enable the IoT industry

Internet of Things Reference Model

Levels

7 **Collaboration & Processes**
(Involving People & Business Processes)

6 **Application**
(Reporting, Analytics, Control)

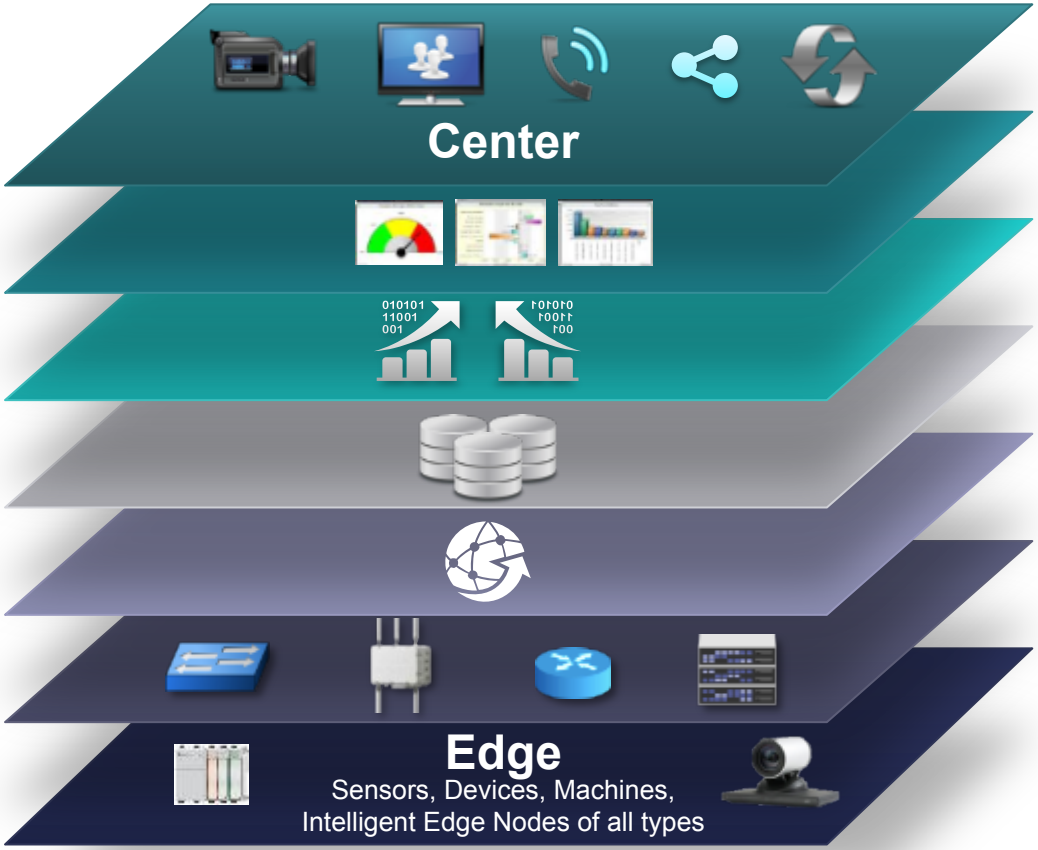
5 **Data Abstraction**
(Aggregation & Access)

4 **Data Accumulation**
(Storage)

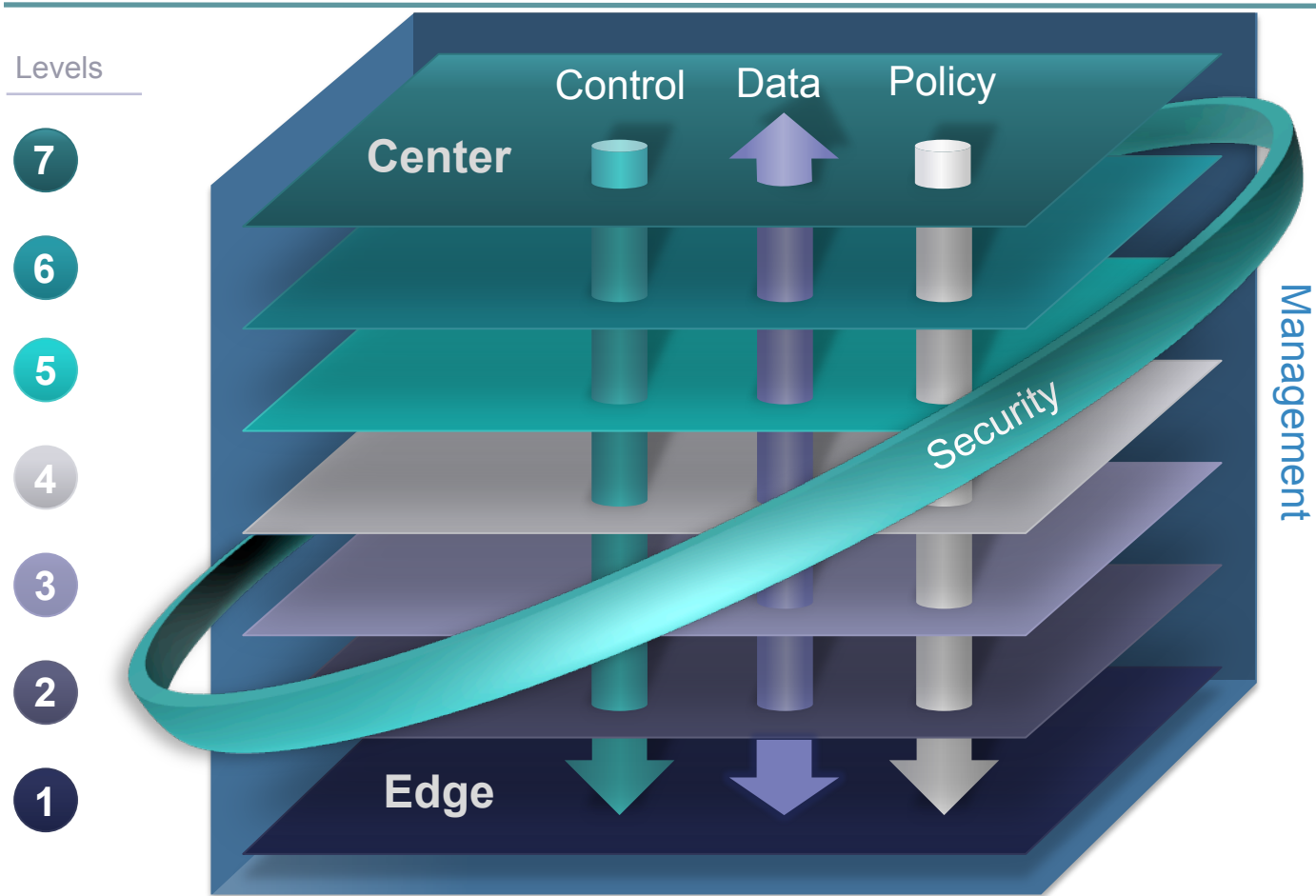
3 **Edge Computing**
(Data Element Analysis & Transformation)

2 **Connectivity**
(Communication & Processing Units)

1 **Physical Devices & Controllers**
(The “Things” in IoT)



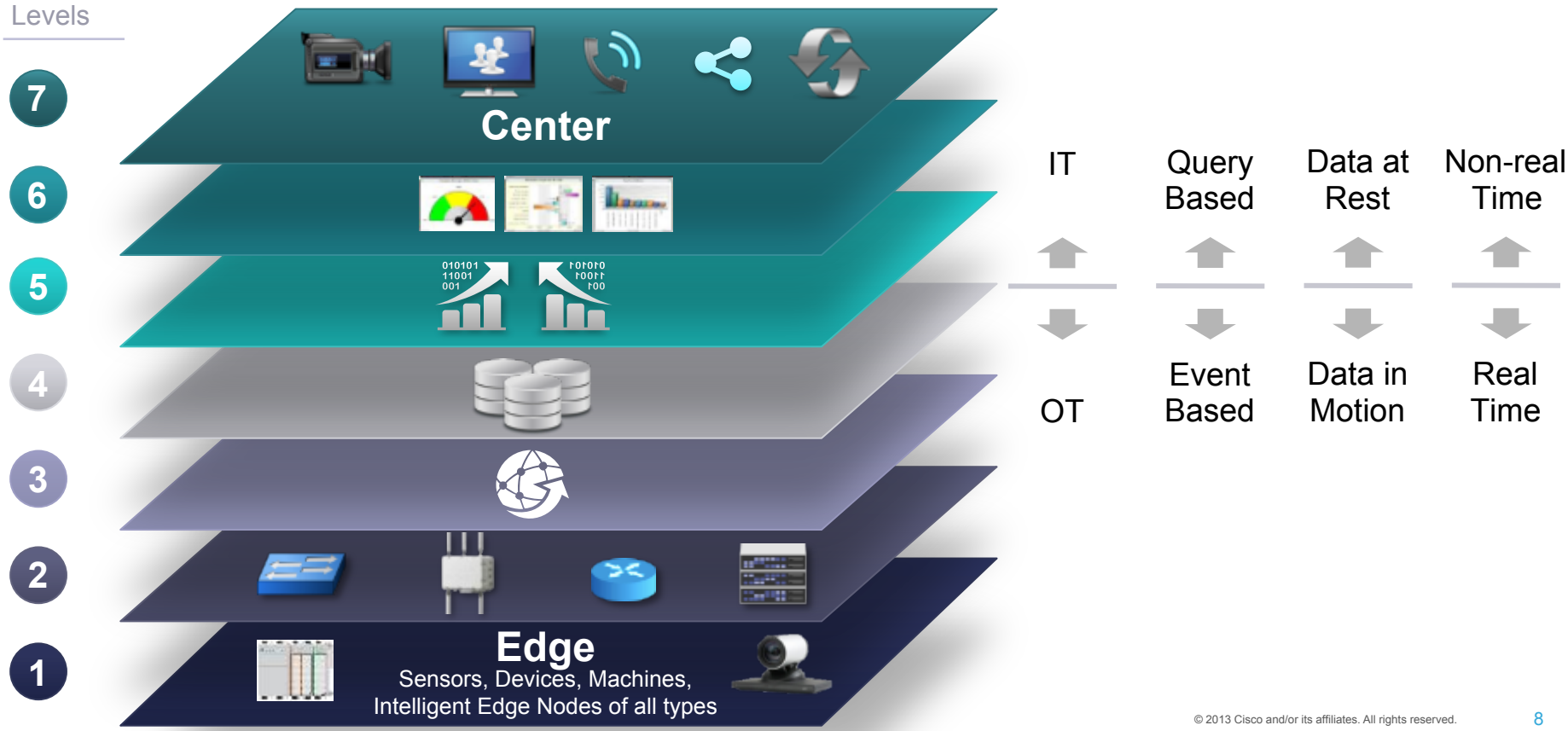
Internet of Things Reference Model



The model is based on **“Information Flow”**

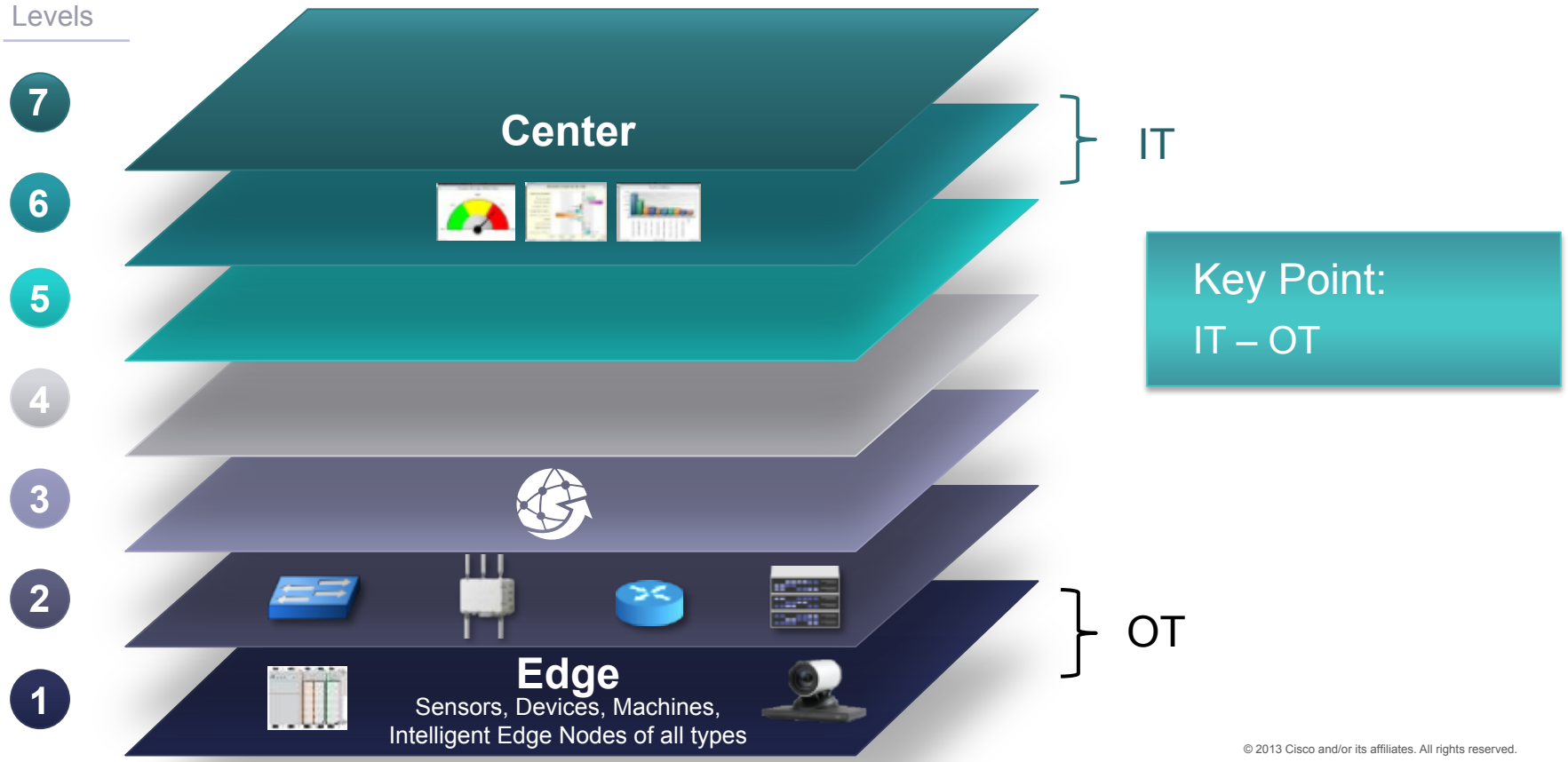
© 2013 Cisco and/or its affiliates. All rights reserved.

Internet of Things Reference Model Objectives



© 2013 Cisco and/or its affiliates. All rights reserved.

Bridging IT and OT



© 2013 Cisco and/or its affiliates. All rights reserved.

Bridging IT and OT: Introducing IoT “Edgeware”

Device Control
- Configure (from the device provider)
- Status (from the device provider)

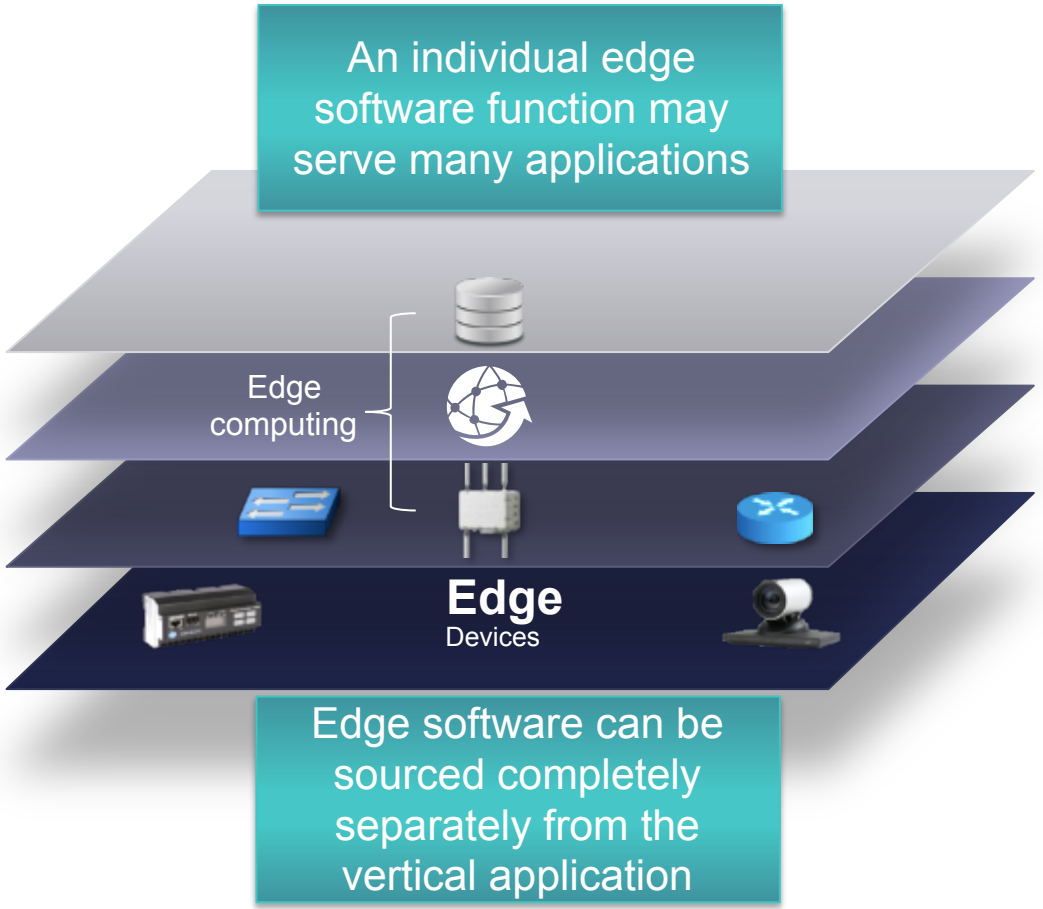
Device Interactions
- Discovery
- Addressing
- Protocol conversion

Middleware
- Listeners (Zigbee), brokers (MQTT)
- Event grouping / batch interactions

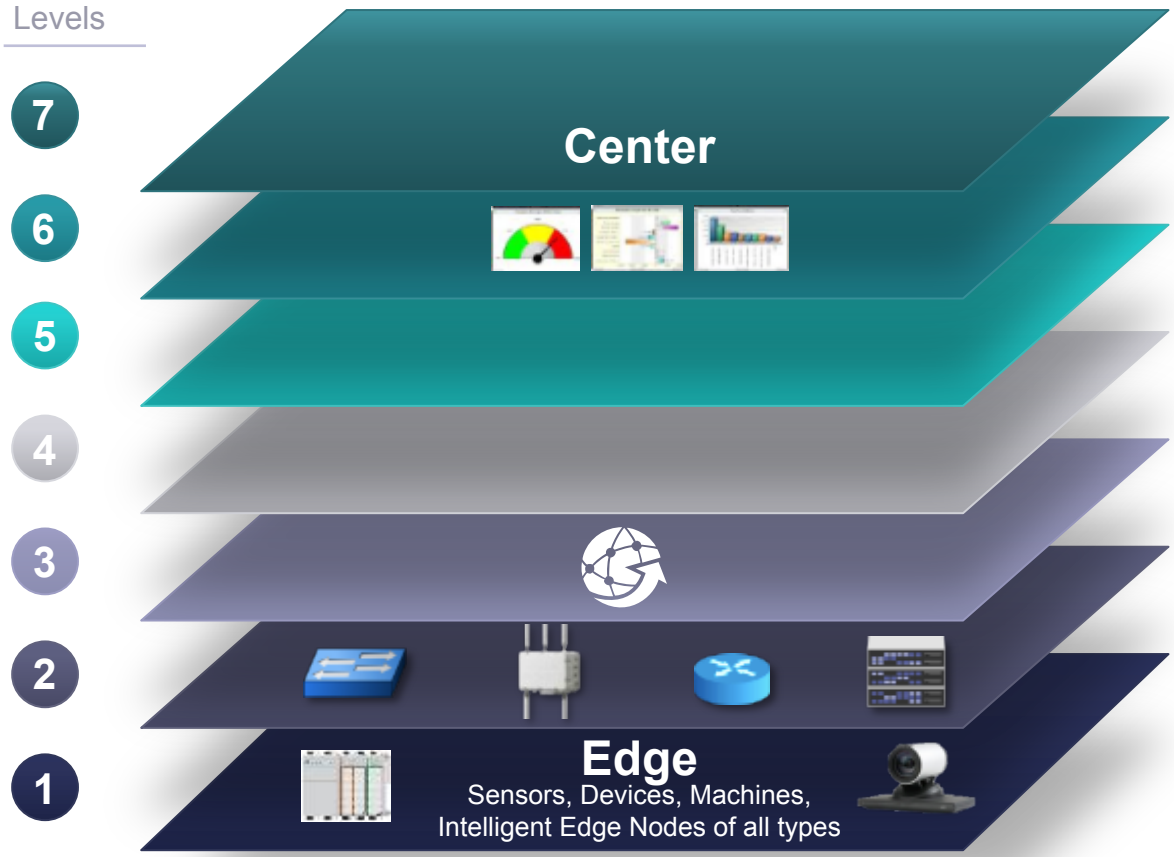
Data
- Normalize (standardize codes for the app)
- Filter (against pre-set criteria from the app)
- Expand (decode/expand cryptic codes)
- Aggregate (generate statistics)
- Notify/alert (to the app)

Combine the functions above
- Schedule (when to comm with the device)
- BPM (when multiple steps are needed)

Security
- Roles
- Privileges



Bridging IT and OT: Handling the Volume of Data



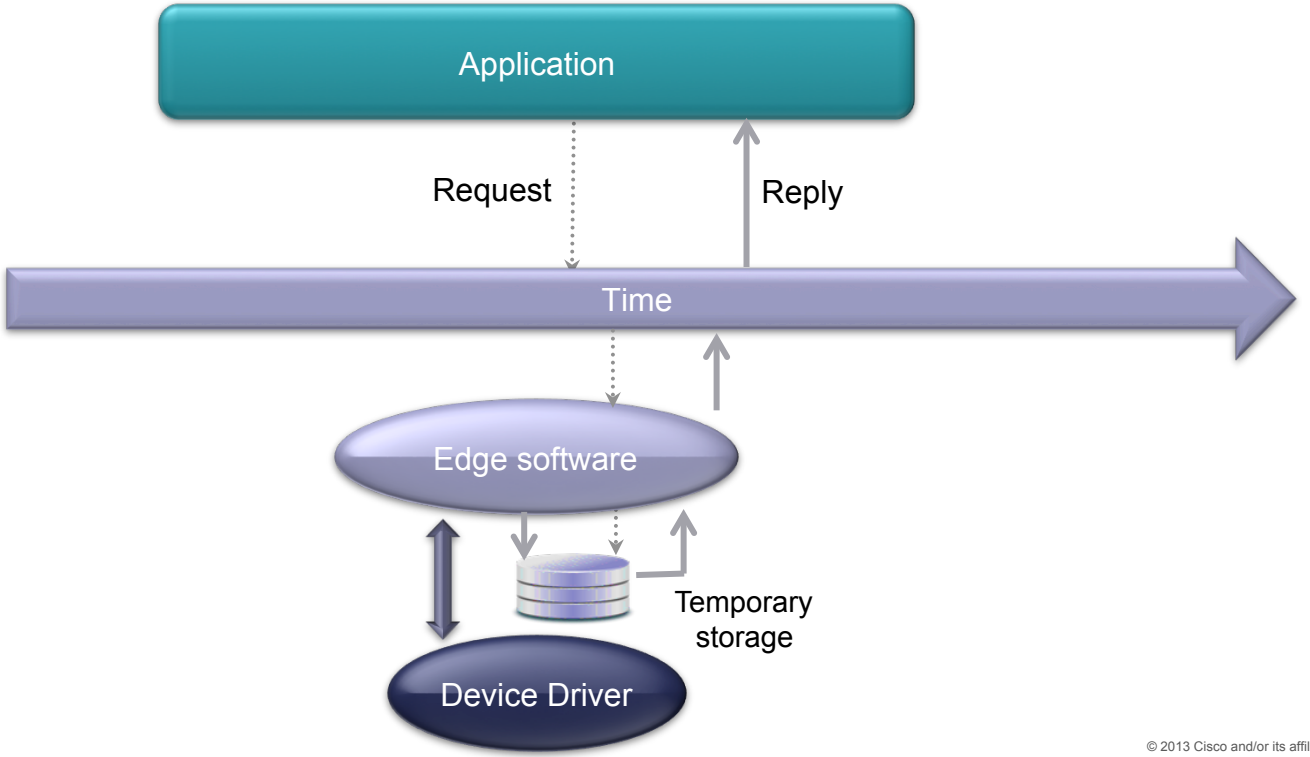
Issue: Devices may generate data faster than apps can ingest it

Apps

Devices

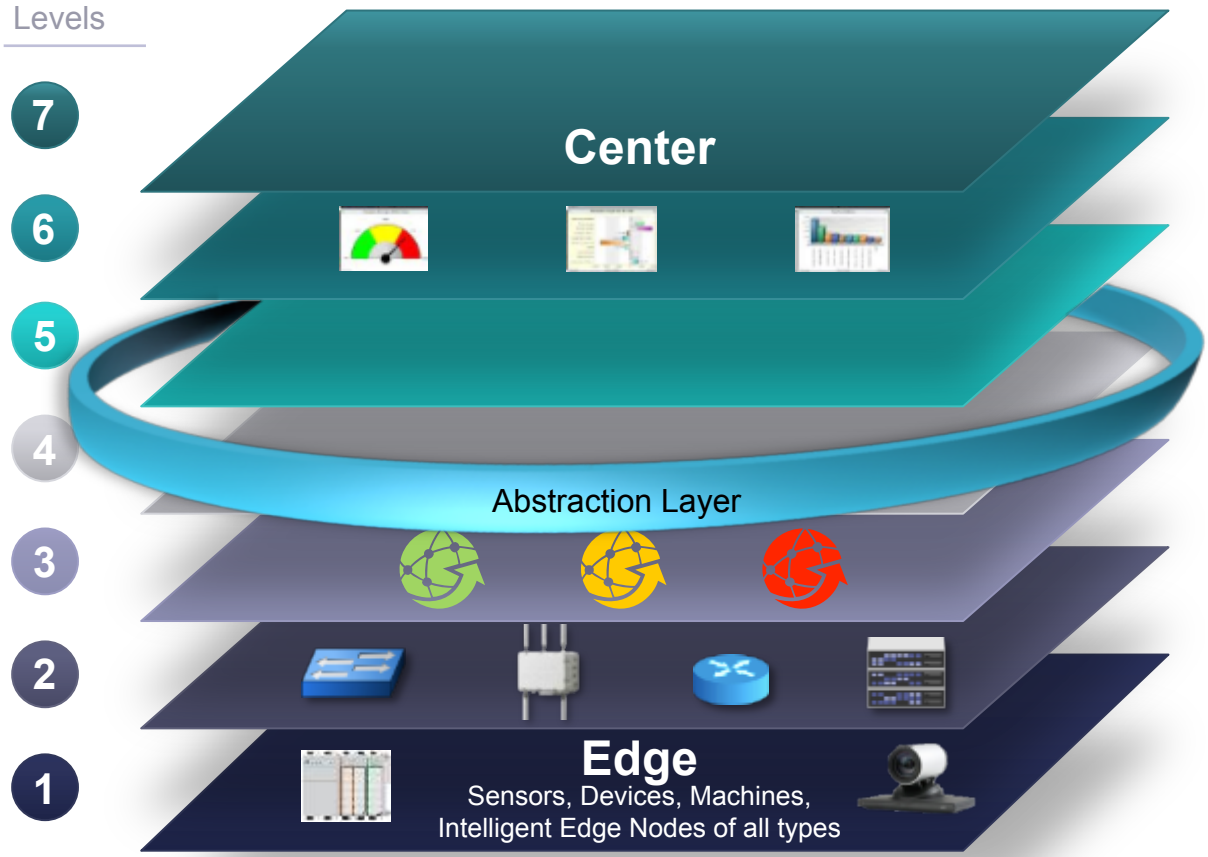
© 2013 Cisco and/or its affiliates. All rights reserved.

The “Cache and Batch” Sequence Pattern (decouple the application from the data capture)



© 2013 Cisco and/or its affiliates. All rights reserved.

Interoperability: Enable Edgeware and Applications from Different Vendors



Key Points:

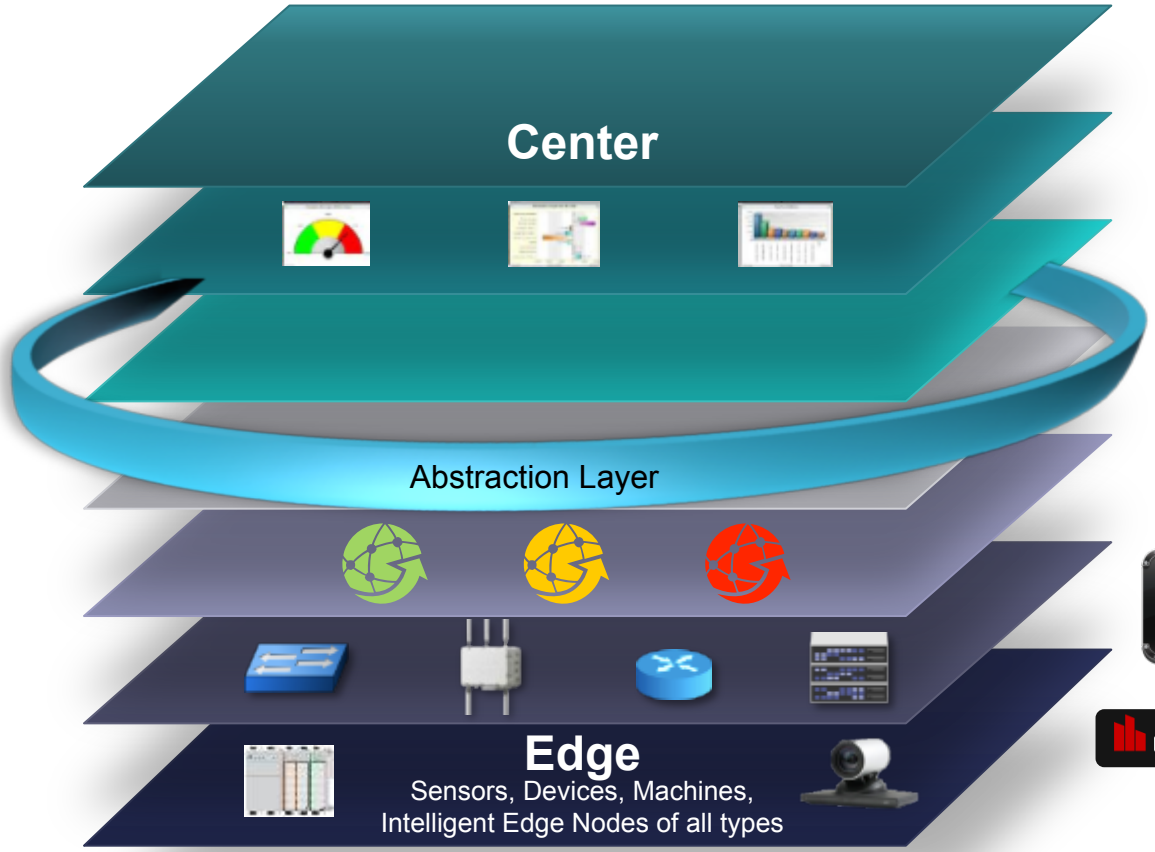
- IT – OT
- Decoupling
  - Scalability
  - Agility
- Interoperability

© 2013 Cisco and/or its affiliates. All rights reserved.

Acknowledgement to the IoT “Edge” Software Vendors

© 2013 Cisco and/or its affiliates. All rights reserved.

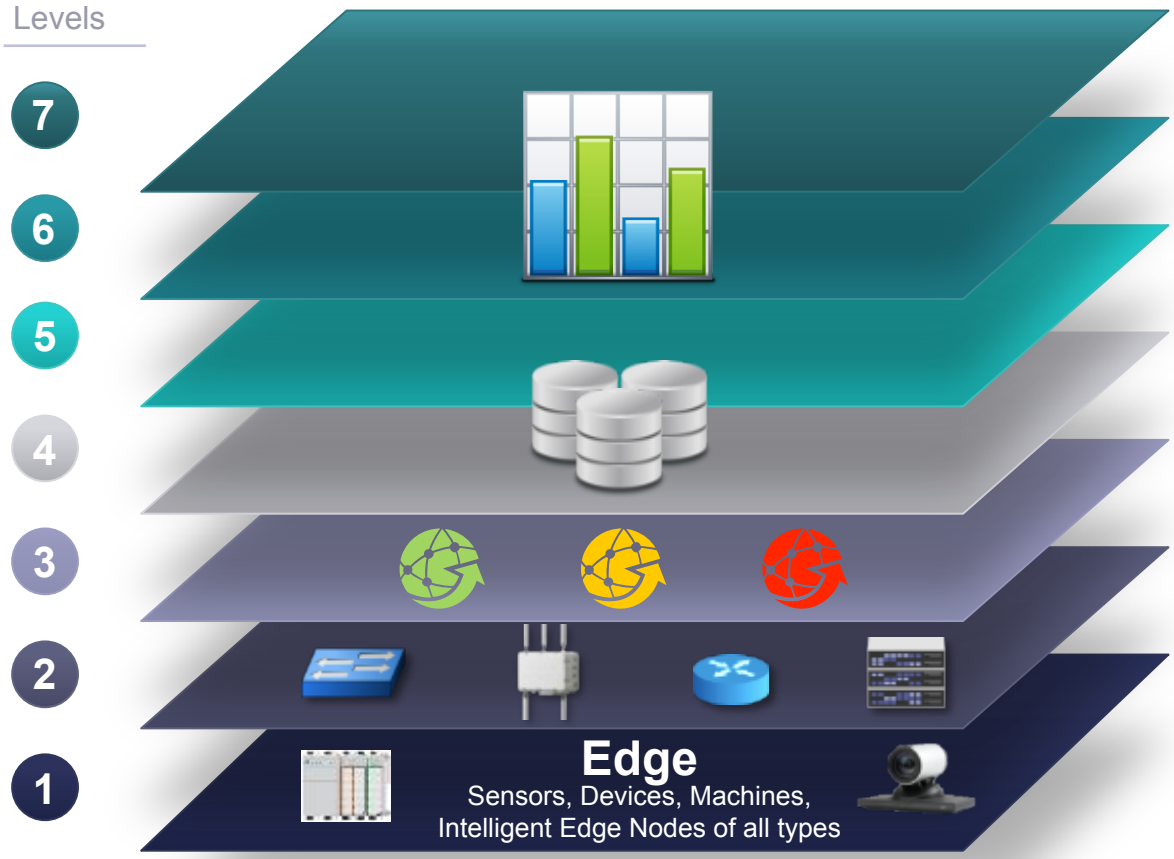
Interoperability: The Next Step is Defining Interfaces, Prototyping, and Testing



CISCO
intel
IBM
PLAT-ONE
synapse
DG LOGIK
machineshop
The Internet of Service
OMNI TROL NETWORKS
IOT TECHNOLOGY SOLUTIONS
Ayla

© 2013 Cisco and/or its affiliates. All rights reserved.

Embracing Legacy Applications

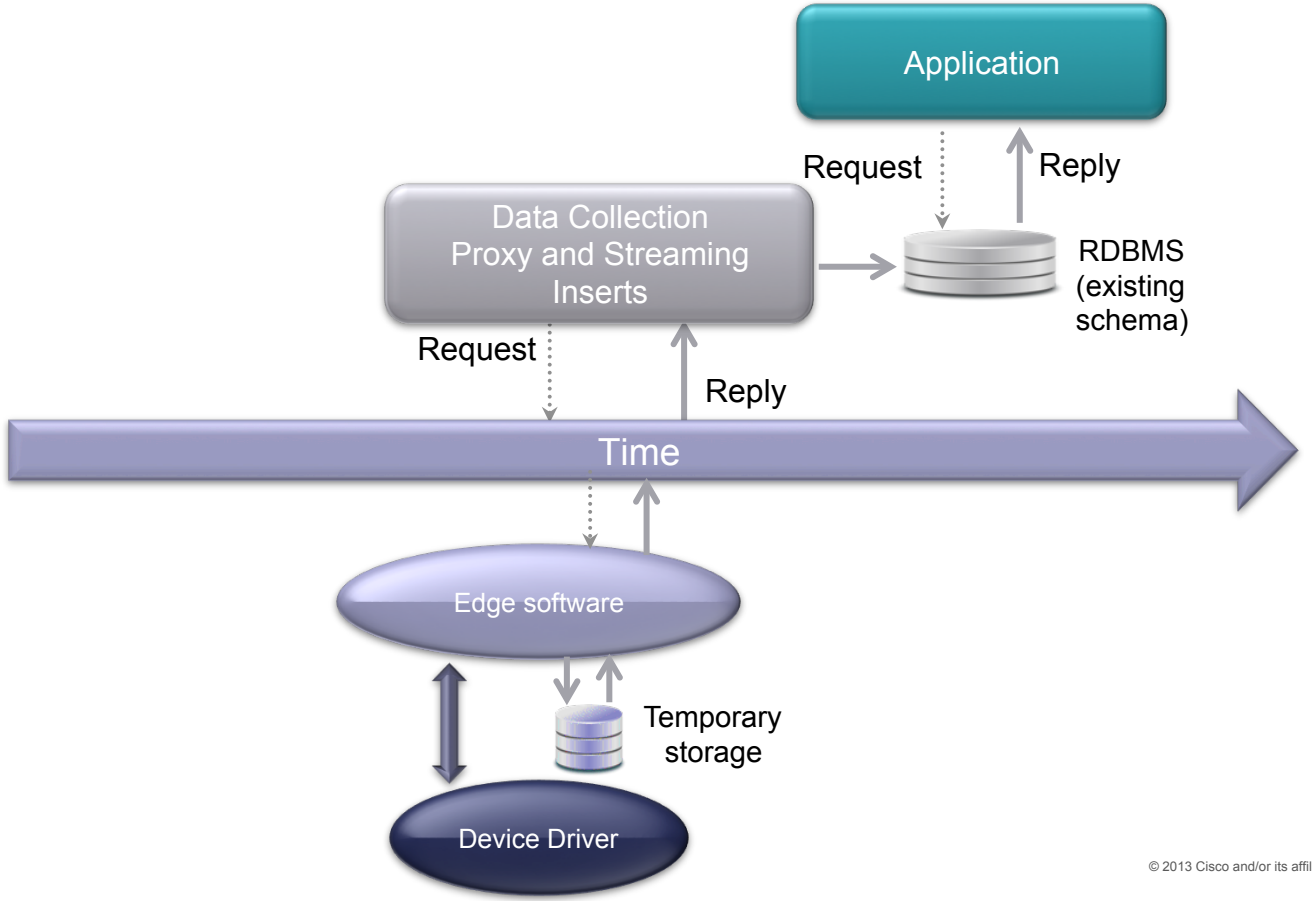


Key Point:

- IoT Enablement of Legacy Applications

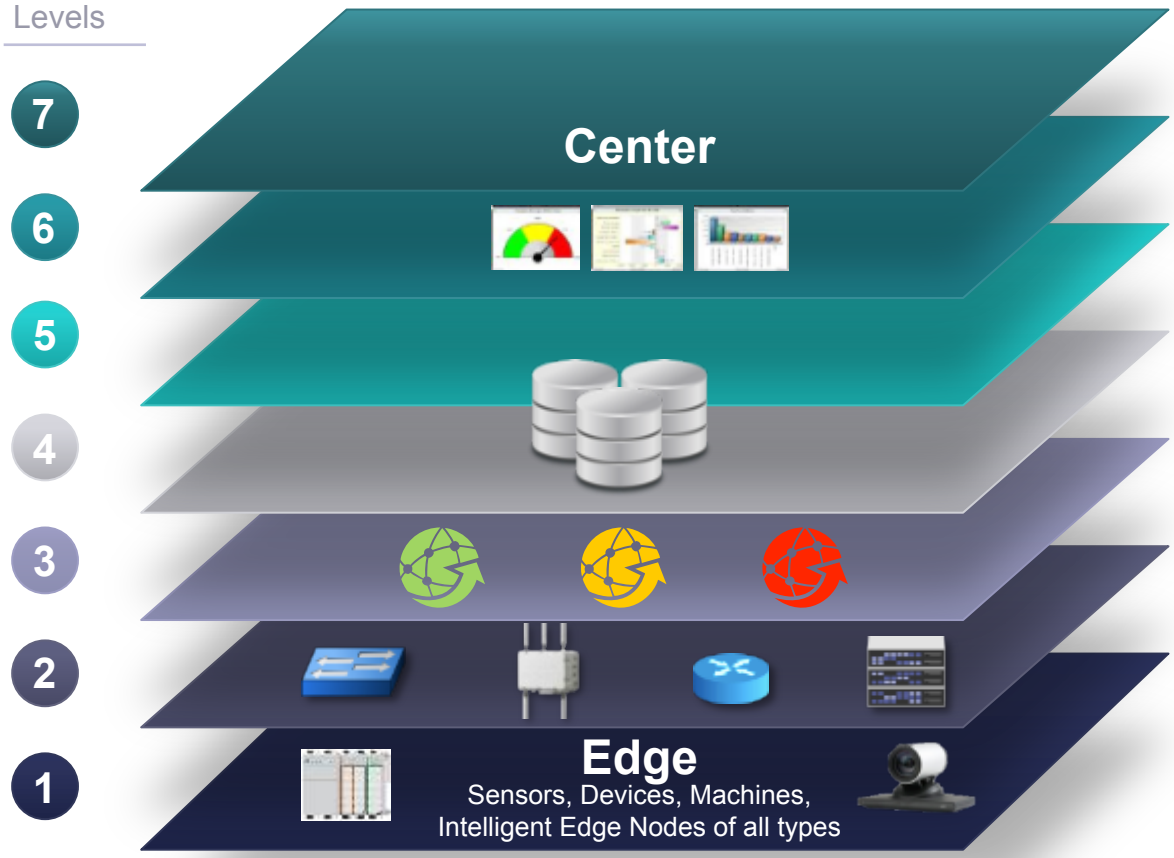
© 2013 Cisco and/or its affiliates. All rights reserved.

The Legacy Application Compatibility Sequence Pattern (use the existing DB and schema)



© 2013 Cisco and/or its affiliates. All rights reserved.

Internet of Things Reference Model

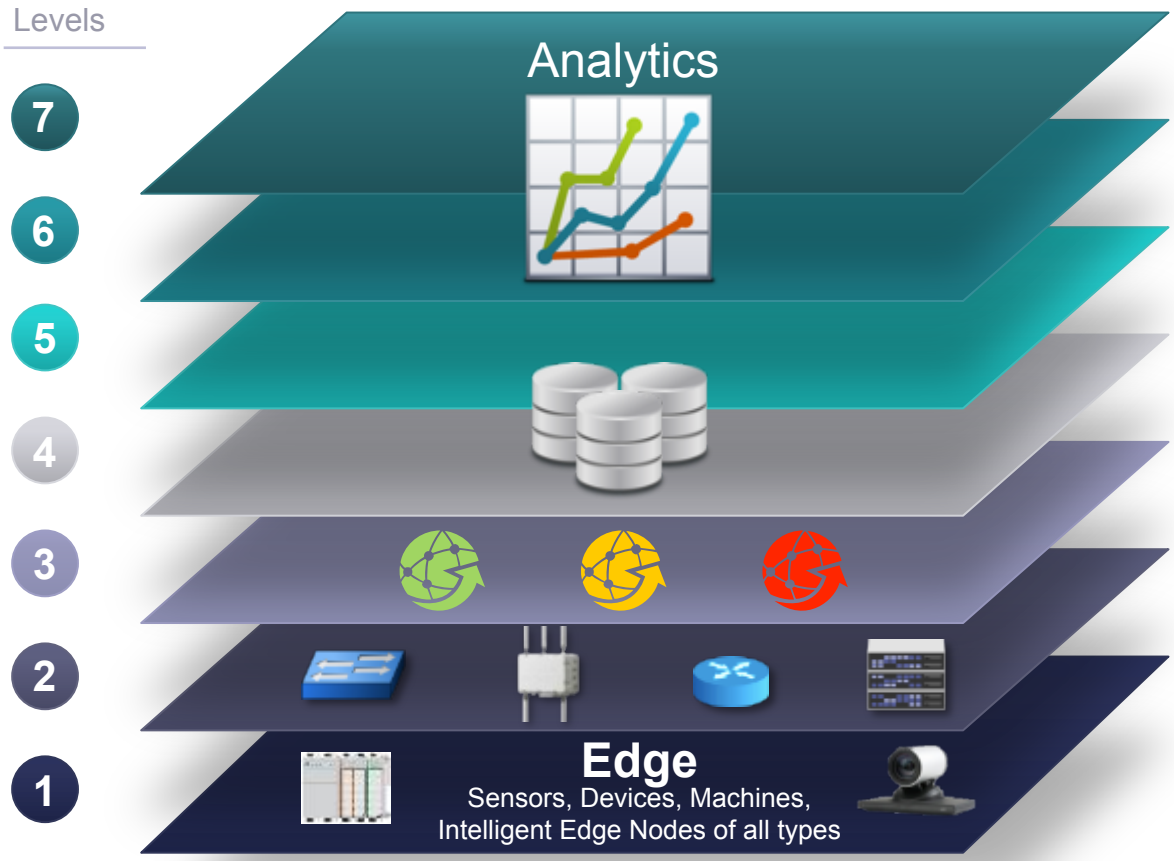


Key Points:

- IT – OT
- Decoupling
  - Scalability
  - Agility
- Interoperability
- Legacy Compatibility

© 2013 Cisco and/or its affiliates. All rights reserved.

The Internet of Things and Analytics

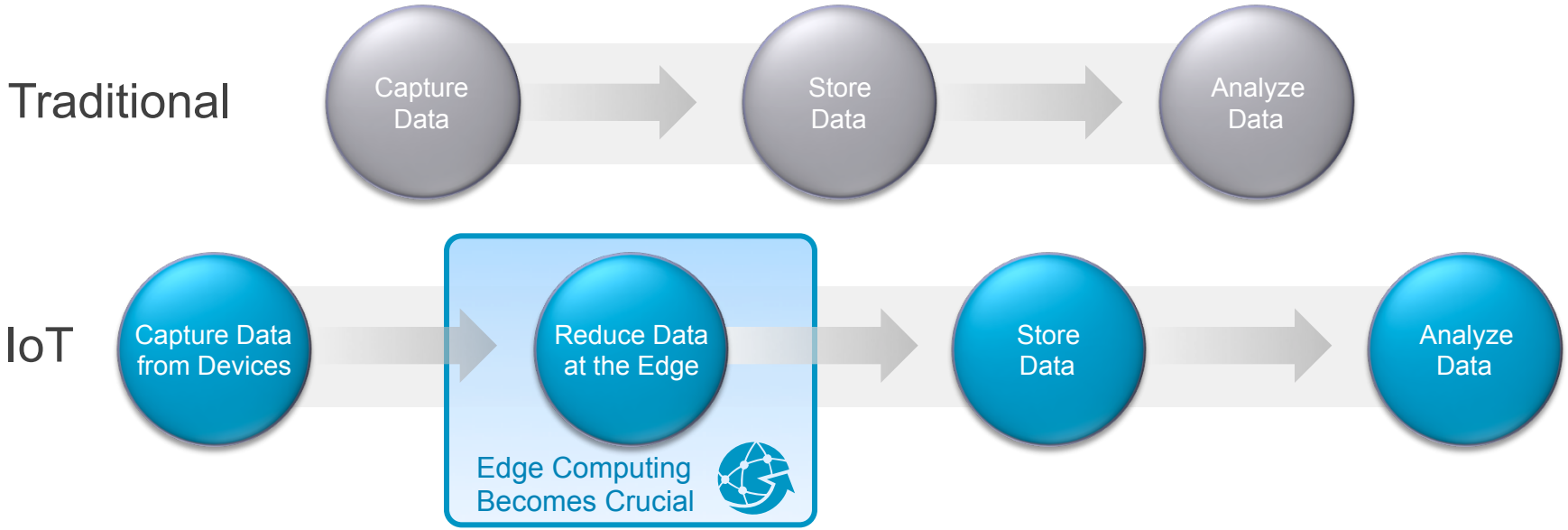


Key Point:

- Enabling IoT Analytics

© 2013 Cisco and/or its affiliates. All rights reserved.

IoT Analytics Introduces New Complexities to Analytics

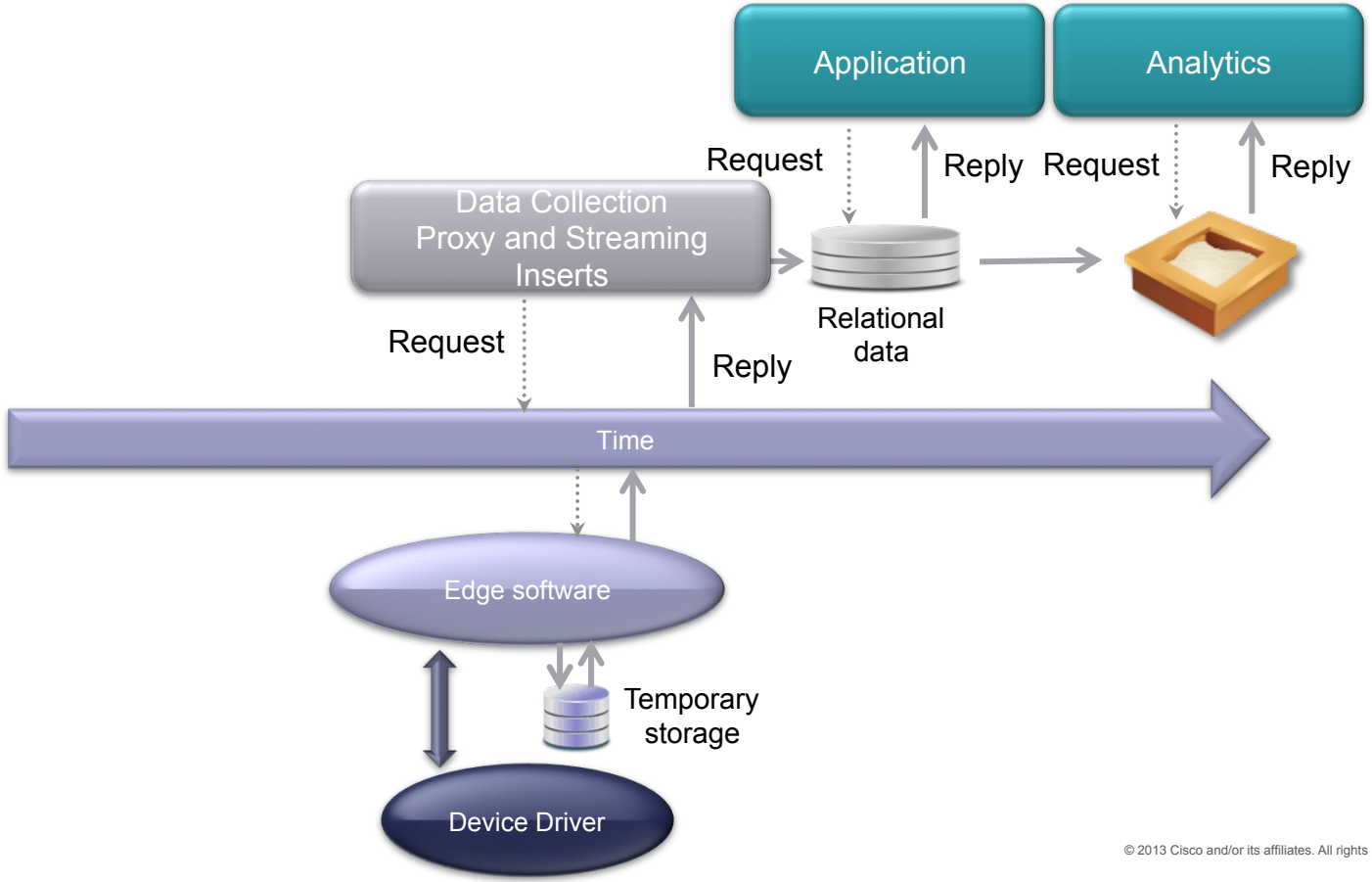


Key Issues:

- The velocity and volume of data may be huge
- In some cases, most of the data is unimportant

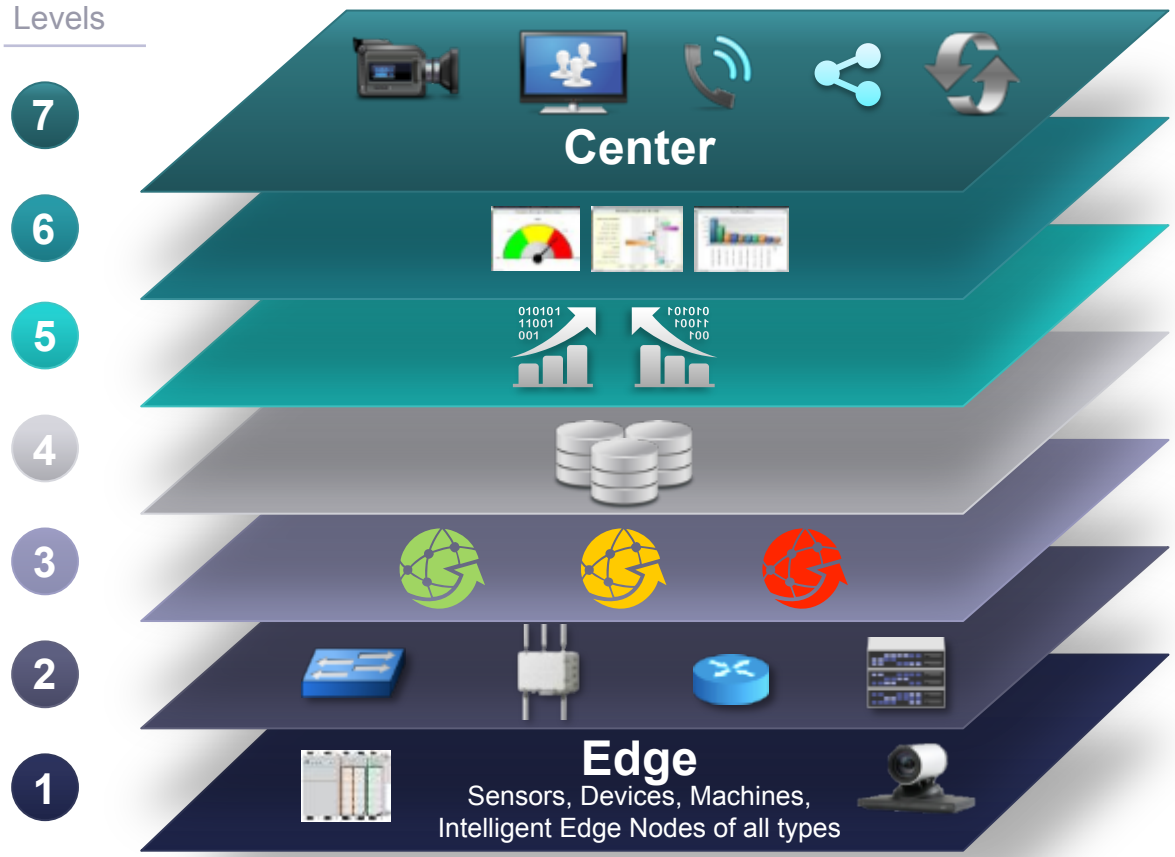
© 2013 Cisco and/or its affiliates. All rights reserved.

Sampling and Analytics Sequence Pattern



© 2013 Cisco and/or its affiliates. All rights reserved.

Analytics Using Both OT and IT Data

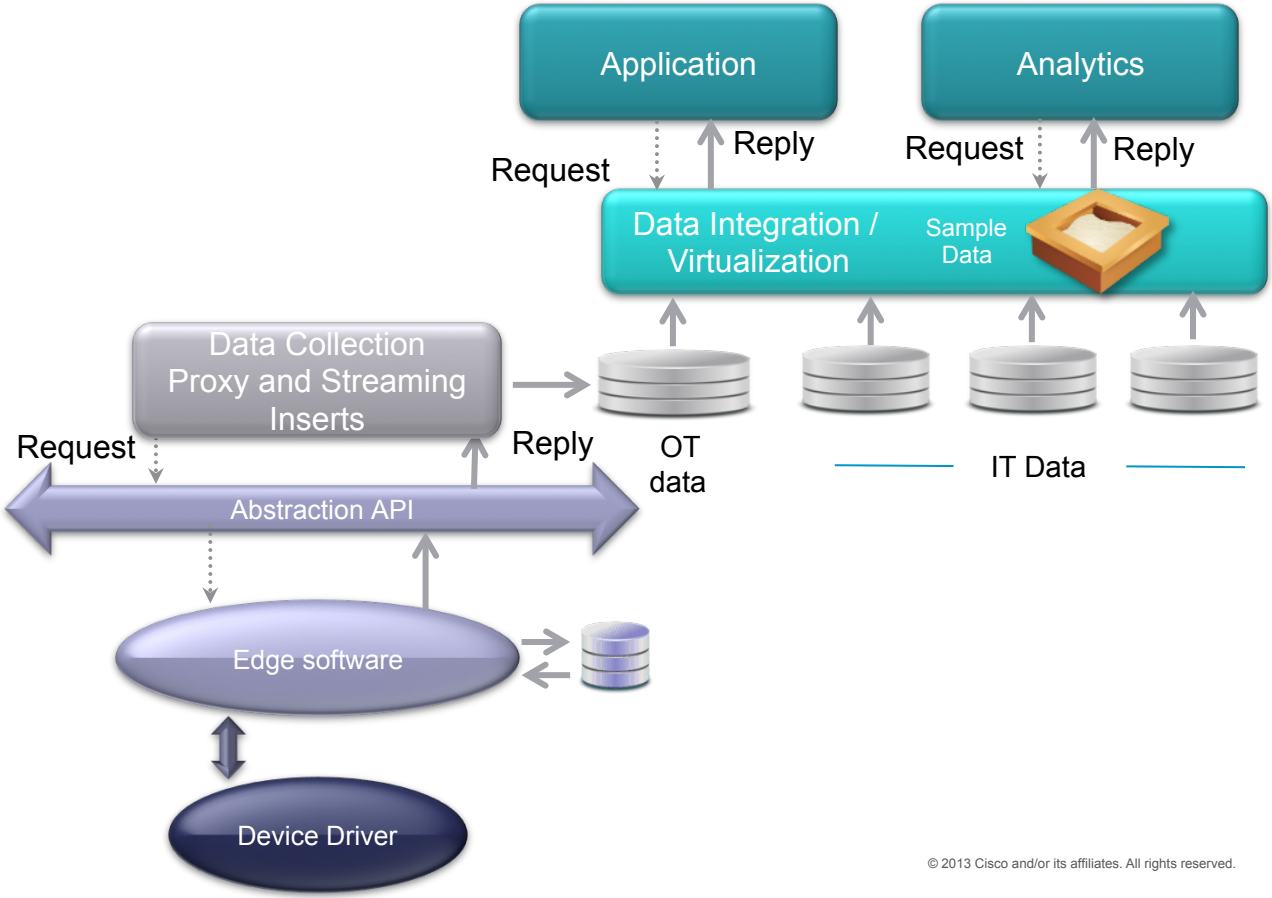


Key Point:

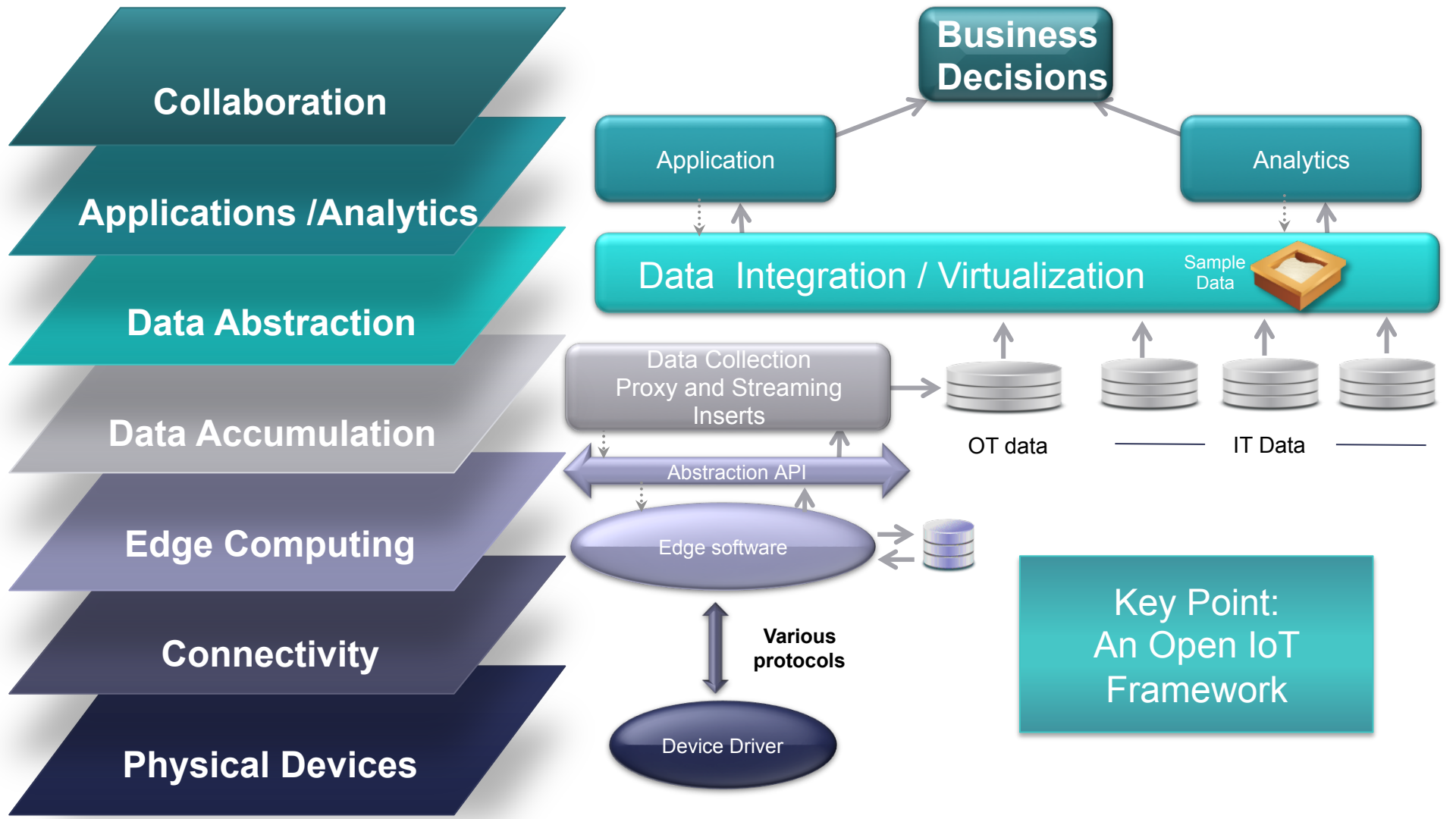
- Integration with the Enterprise

© 2013 Cisco and/or its affiliates. All rights reserved.

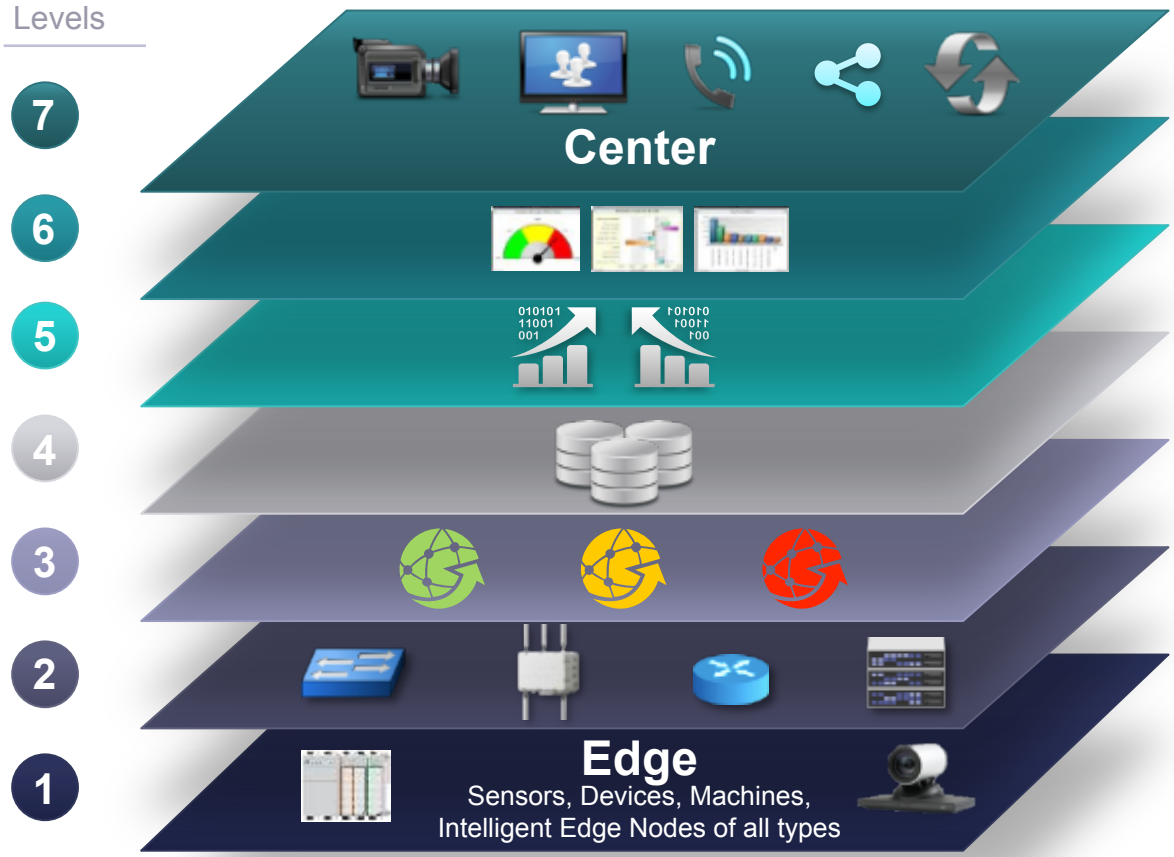
These “Sequence Patterns” Help Us Define the “Abstraction API”



© 2013 Cisco and/or its affiliates. All rights reserved.


Collaboration
Applications /Analytics
Data Abstraction
Data Accumulation
Edge Computing
Connectivity
Physical Devices
Business Decisions
Application
Analytics
Data Integration / Virtualization
Sample Data
Data Collection Proxy and Streaming Inserts
OT data
IT Data
Abstraction API
Edge software
Various protocols
Device Driver
Key Point: An Open IoT Framework

The Complete IoT System



Key Points:

- IT – OT
- Decoupling
  - Scalability
  - Agility
- Interoperability
- Legacy Compatibility
- Analytics
- Integrated with the Enterprise

© 2013 Cisco and/or its affiliates. All rights reserved.

Thank you.

© 2014 Cisco and/or its affiliates. All rights reserved.