

# Internet of Things— Conceptual Frameworks and Architecture

# An IoT Conceptual Framework

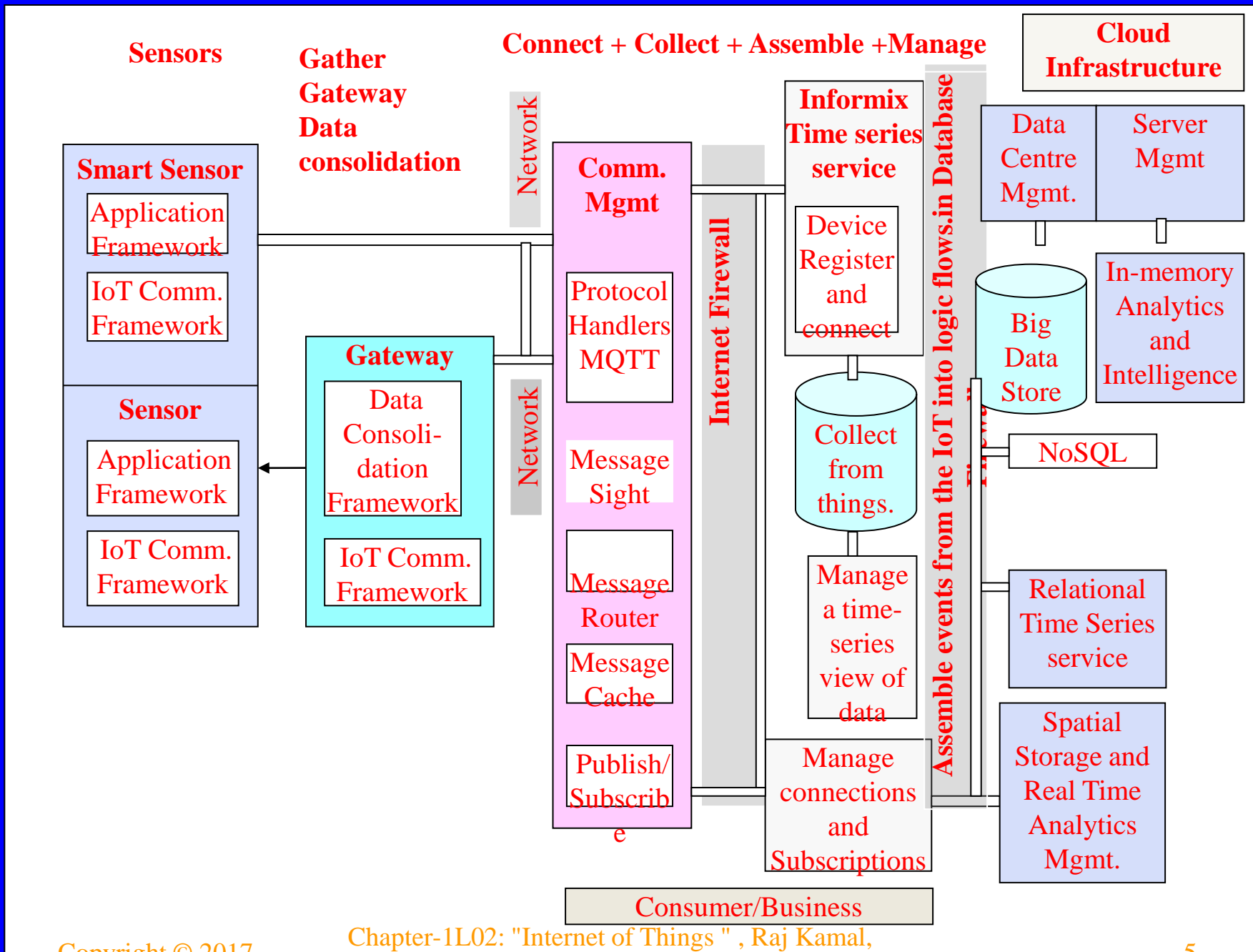
- Physical Object + Controller, Sensor and Actuators + Internet = Internet of Things ... (1.1)
- Source: An equation given by Adrian McEwen and Hakim Cassimally, 'Designing Internet of things', Wiley, 2014

# Another IoT Conceptual Architecture

- Gather + Enrich + Stream + Manage  
+ Acquire + organize and Analyse =  
Internet of Things Enterprise &  
Business Applications, Integration  
and SoA ... (1.2)  
[An Equation based on Oracle IoT  
Architecture in Fig. 1.5 of book]

## Another IoT Conceptual Framework

- Gather + Consolidate + Connect + Collect + Assemble + Manage and Analyse = Internet of Things connected to Cloud Services ...  
(1.3) [An Equation based on the IBM Framework at **Fig. 1.3 for the Framework blocks and components.**]



**Level 7- Collaboration and processes (involving peoples and business processes)**

**Level 6- Application (Reporting, Analysis, control)**

**Level 5- Data Abstraction (Aggregation and Access)**

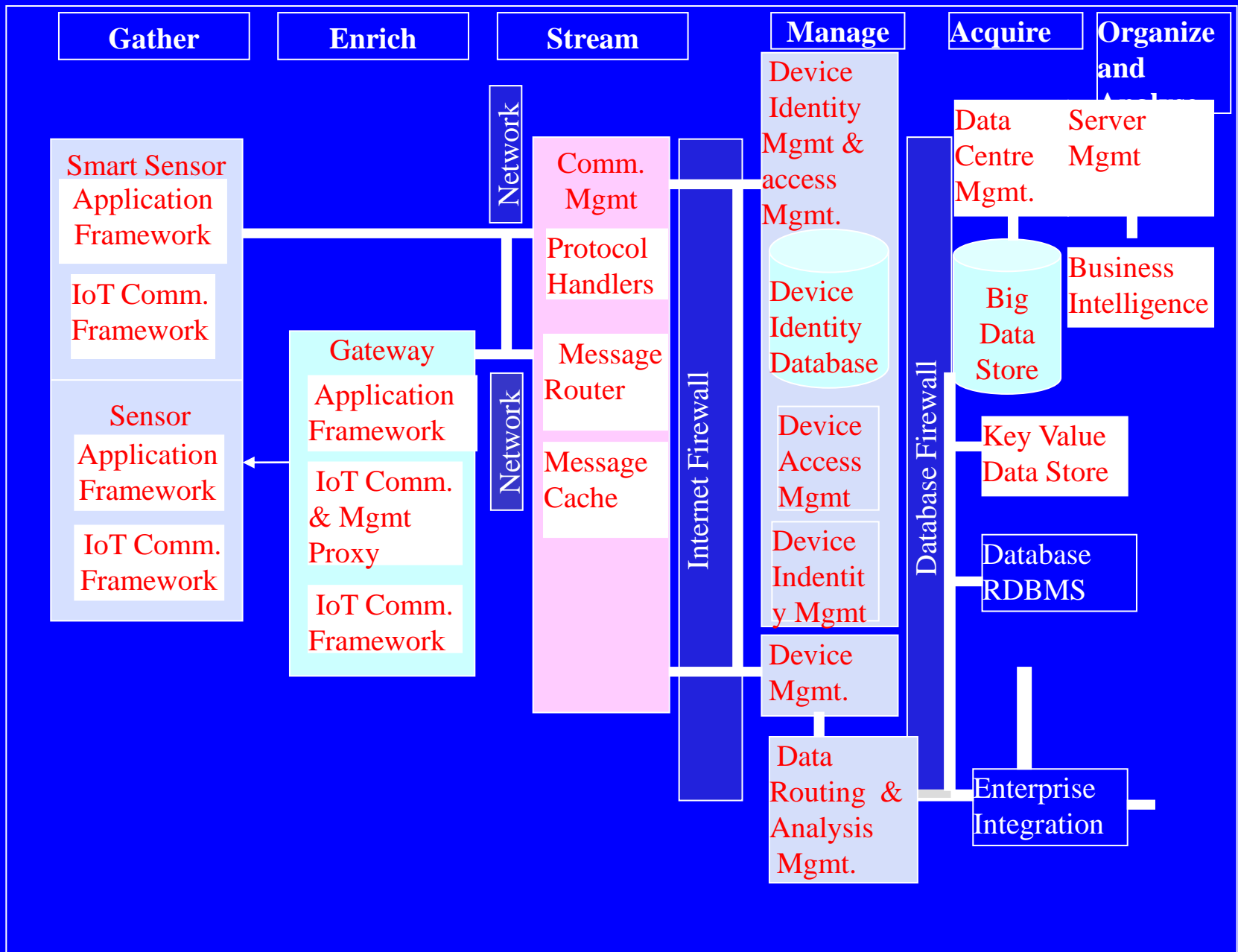
**Level 4- Data Accumulation (storage)**

**Level 3- Edge Computing (data element analysis and transformation)**

**Level 2- Connectivity (Communication and Processing Units)**

**Level 1- Physical devices and Controllers (the things in IoT) [Sensors, machines, devices, Intelligent Edge nodes of Different Types]**

**Ch01Fig. 1.4 An IOT reference model CISCO conceptual framework**



# 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)



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## CISCO Reference Model for Internet of Things (Refer Ch01 Fig. 1.4 of the Book)



# IEEE suggested P2413 standard

- A reference architecture of IoT
- Built upon the reference model(s)
- Covers the definition of basic architectural building blocks and their integration capability into multi-tiered systems.

# P2413 architectural framework

- A reference model defining relationships among various IoT verticals, for example, transportation and healthcare
- Follows top-down approach (means consider top layer design first and then move to the lowest)

# P2413

- Defines no new architecture and no reinvent but existing architectures congruent with it
- Gives a blueprint for data abstraction
- Specifies abstract IoT domain for various IoT domains

# P2413

- Recommends quality ‘quadruple’ trust
- “Protection, Security, Privacy, and Safety”
- Strives for mitigating architecture divergence (s)
- Addresses how to document

# Summary

We learnt

- (i) Physical Object + Controller, Sensor and Actuators + Internet = Internet of Things
- (ii) Gather + Enrich + Stream + Manage + Acquire + organize and Analyse = Oracle IoT Architecture

# Summary

We learnt

- (iii) Gather + Consolidate + Connect + Collect + Assemble + Manage and Analyse = IBM Architecture reference model/Conceptual framework
- (iv) CISCO Reference model layers
- (v) IEEE Suggested P2413 standard for architecture of IoT

End of Lesson 2 on  
Internet of Things—  
Conceptual frameworks and  
Architecture