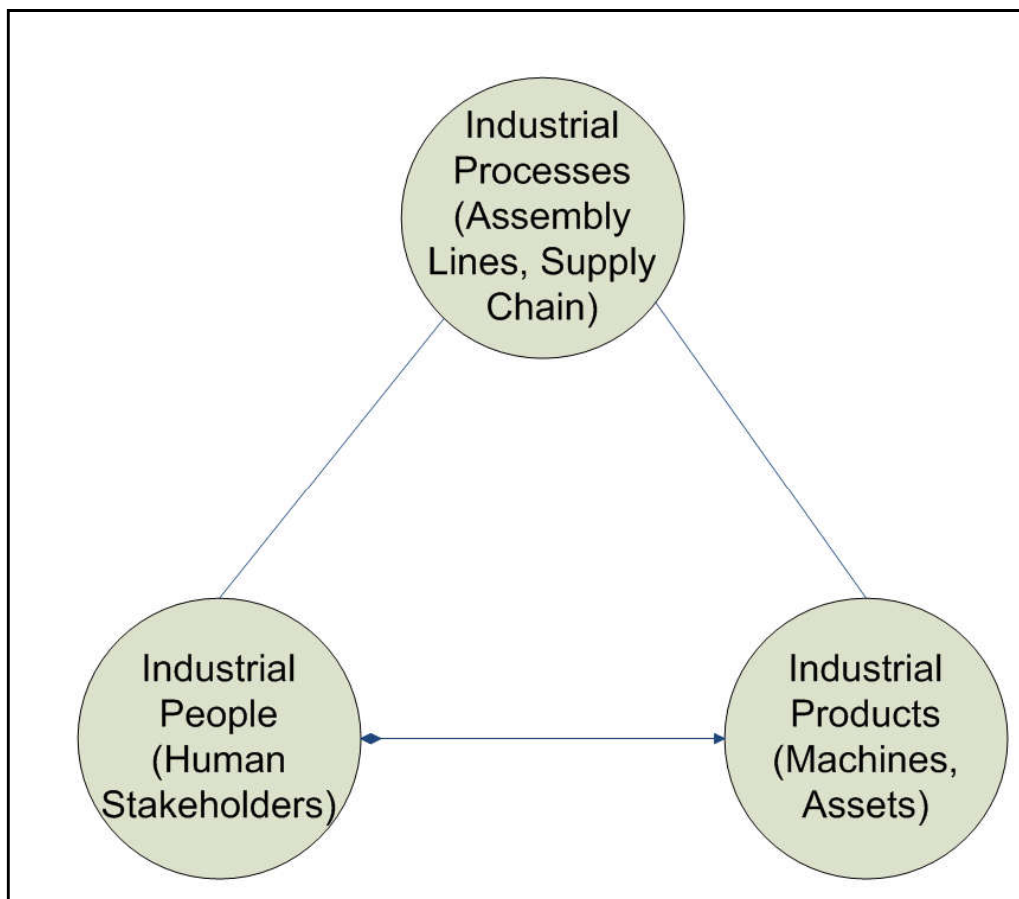
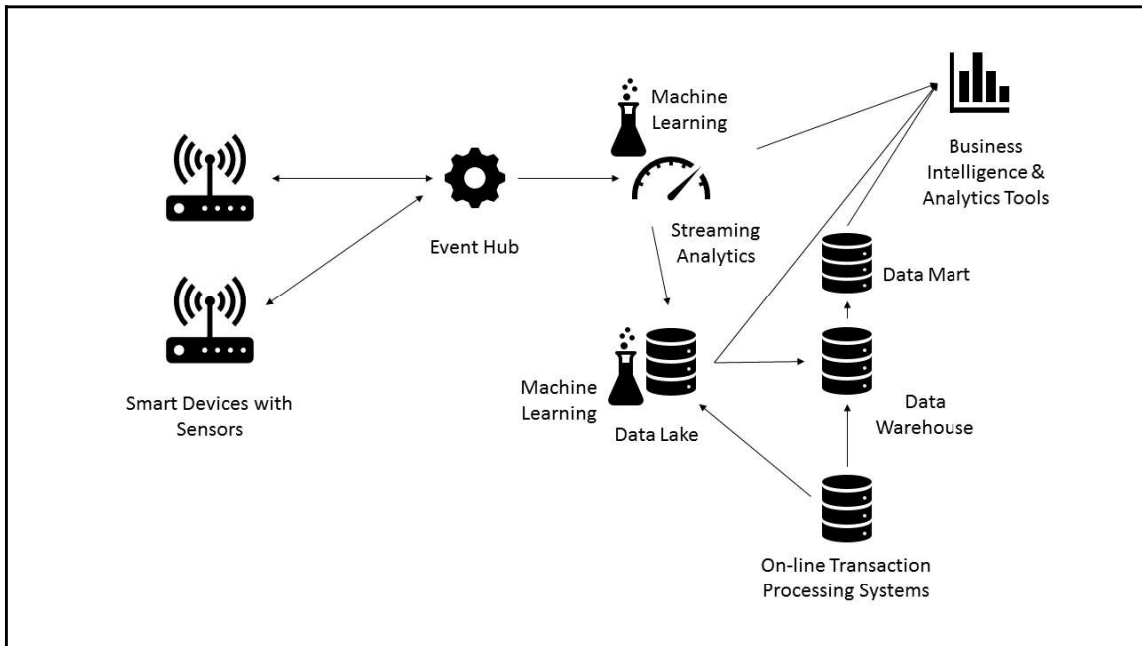
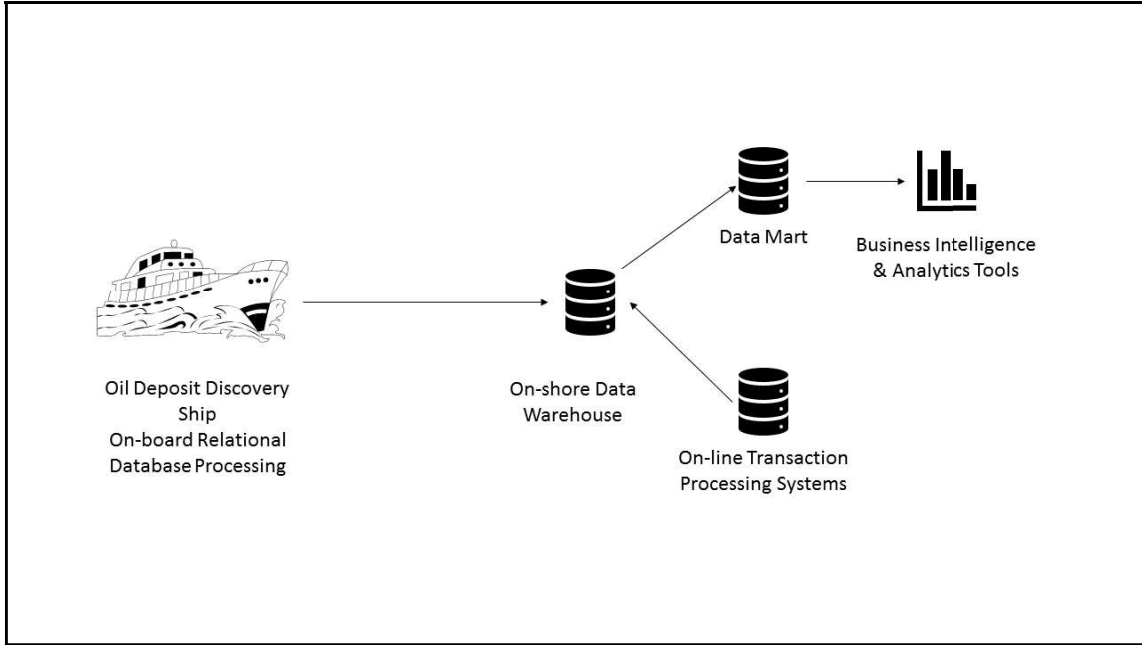
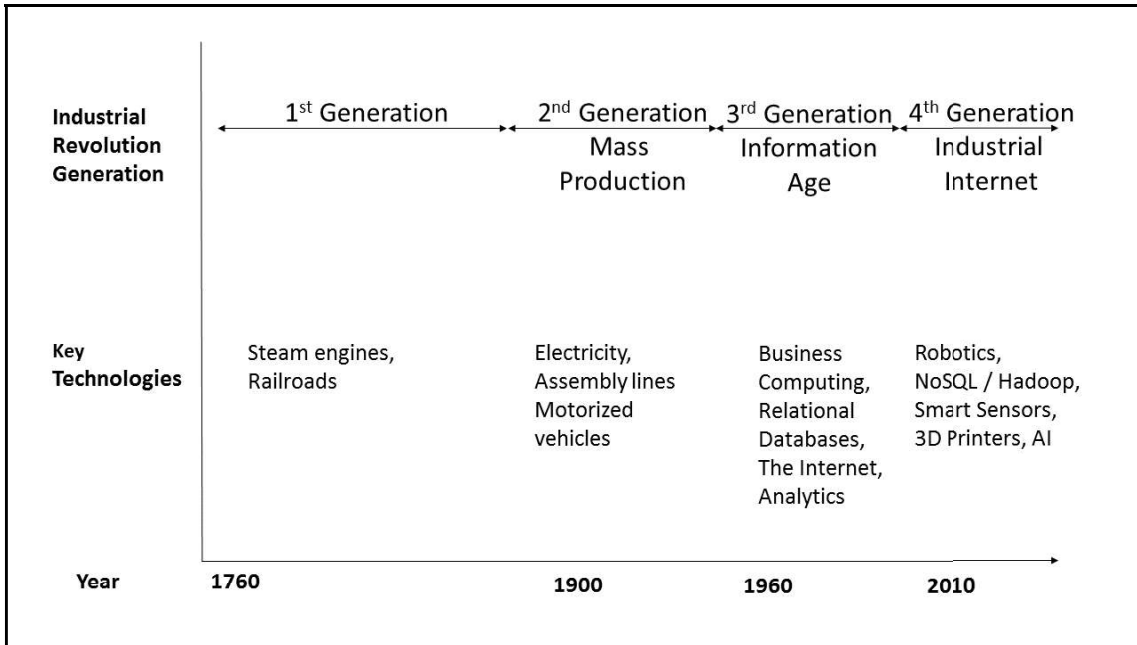
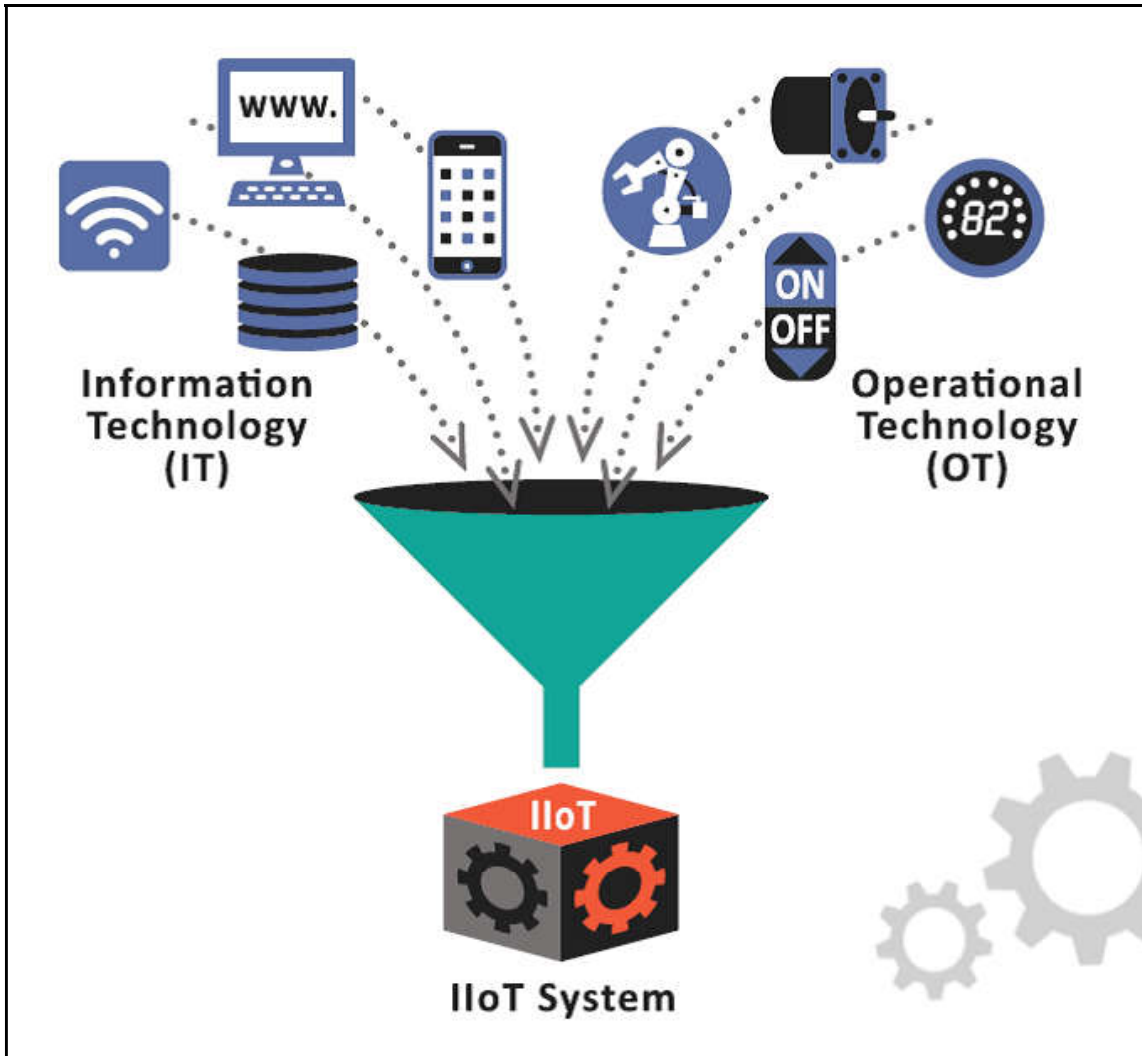


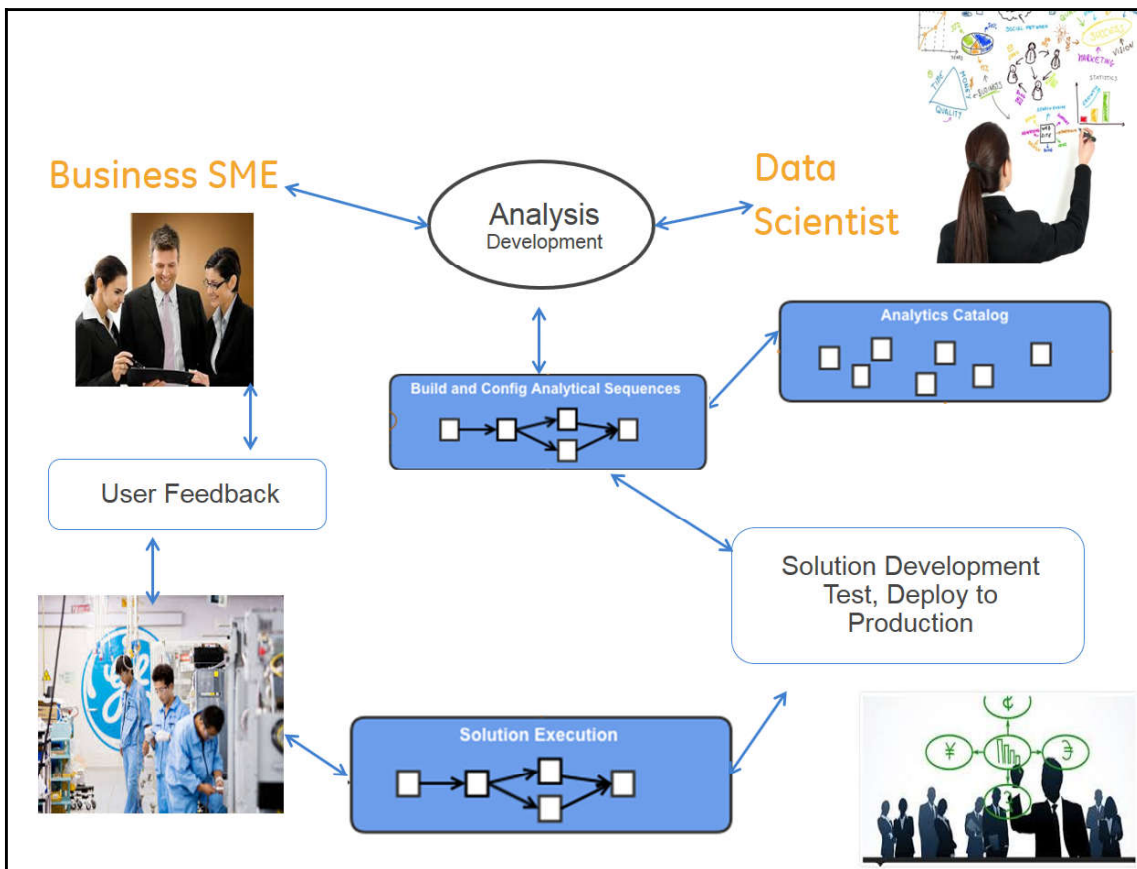
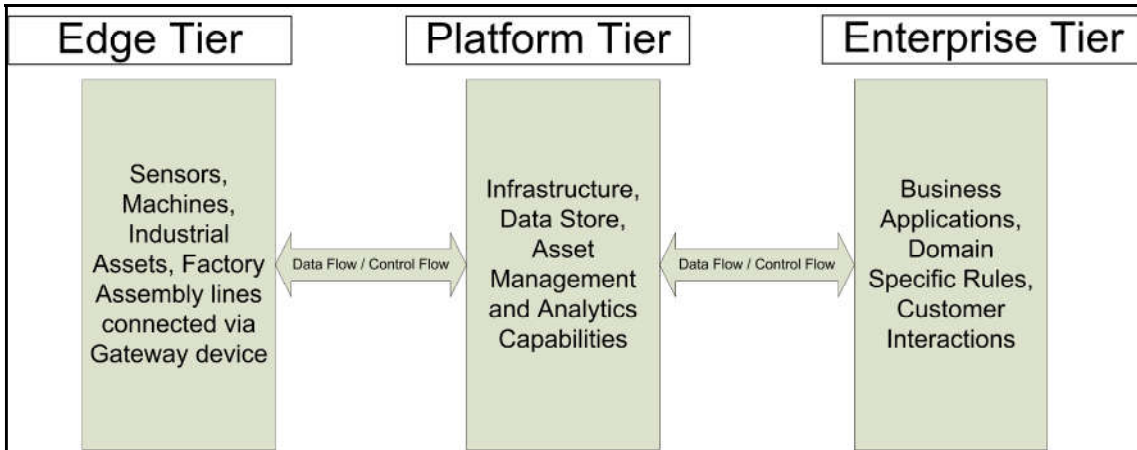
# Chapter 1: The Industrial Internet Revolution

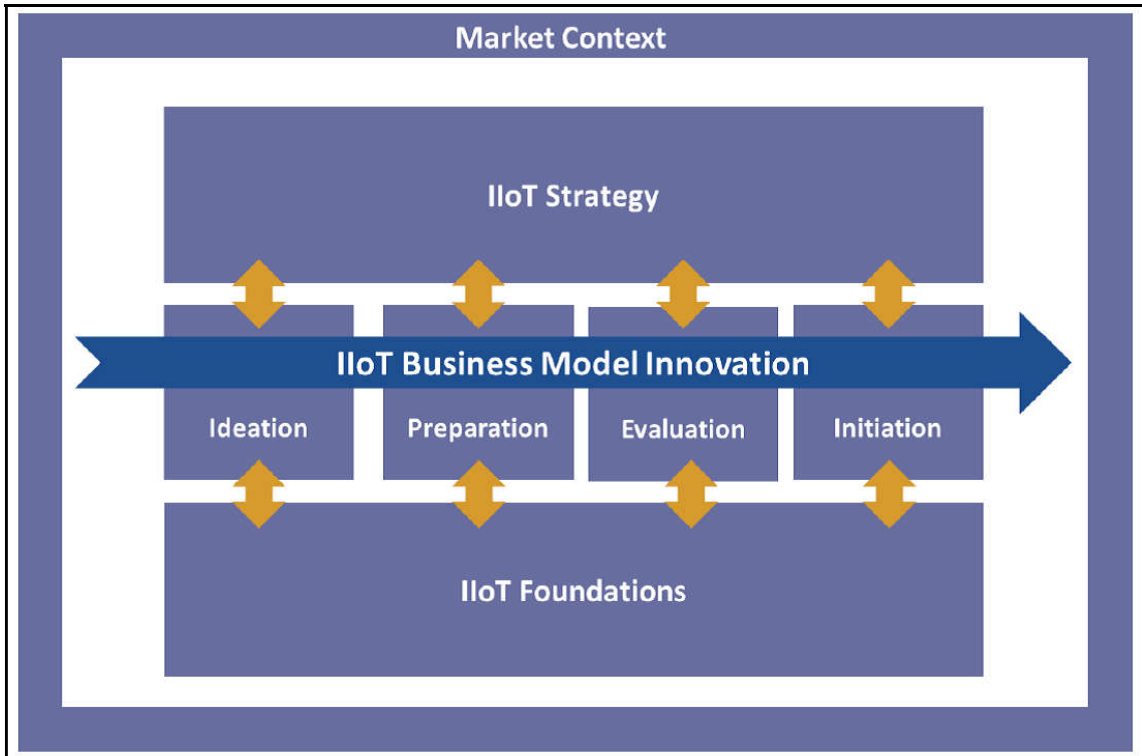




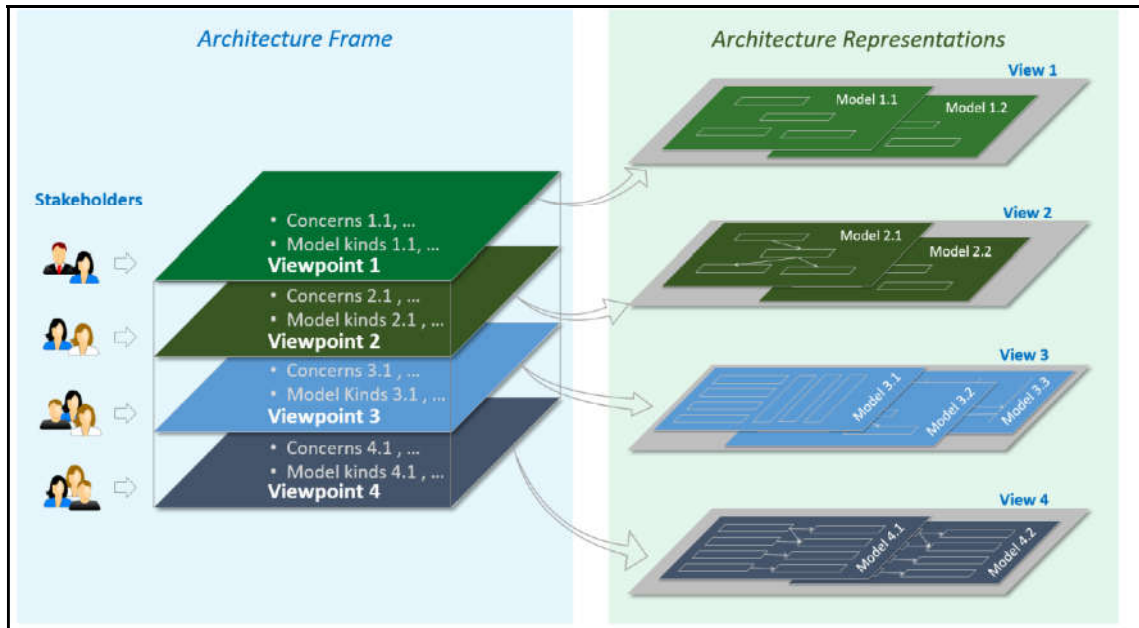


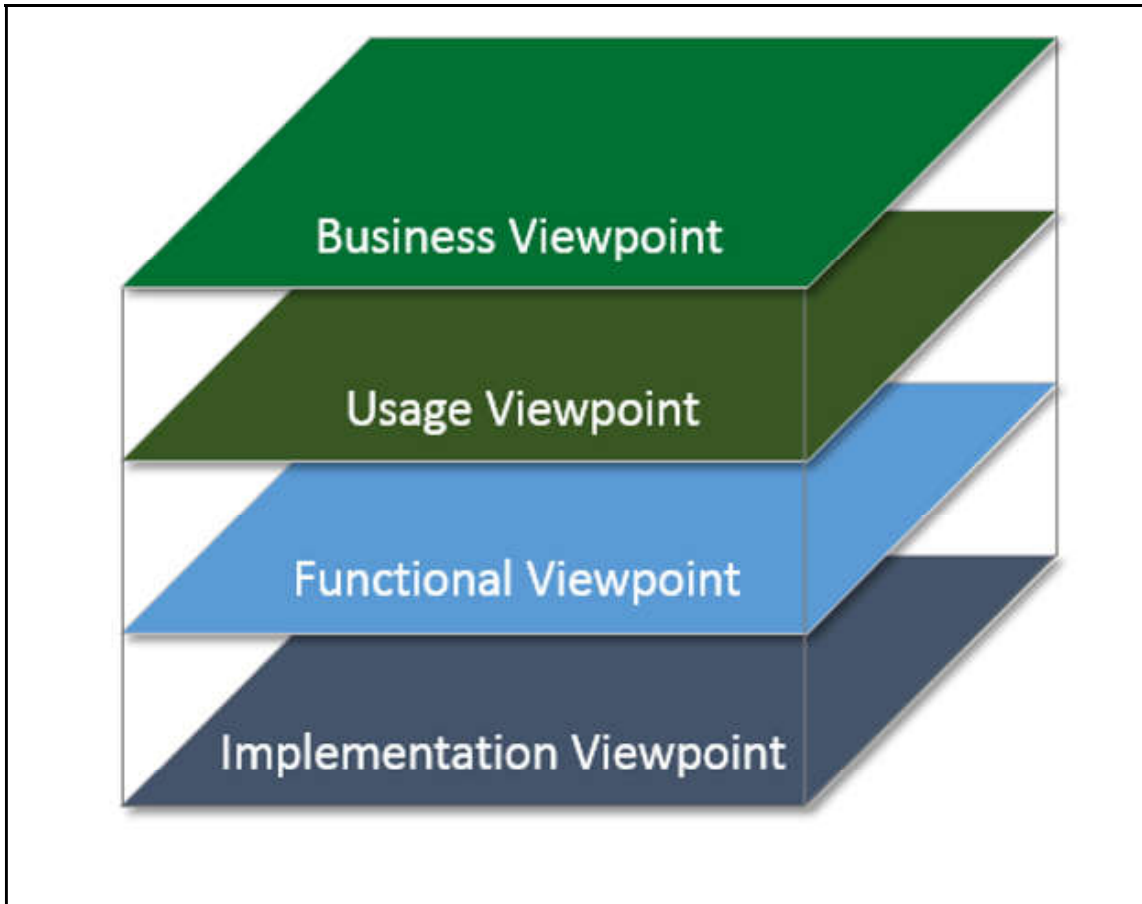




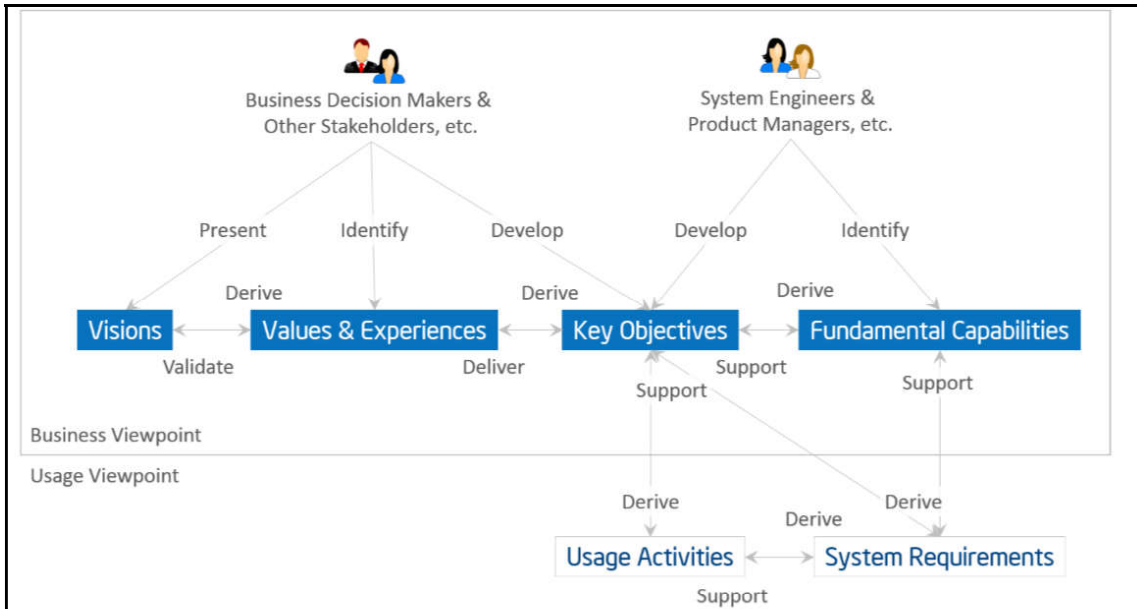


## Chapter 2: Architectural Approaches for Success

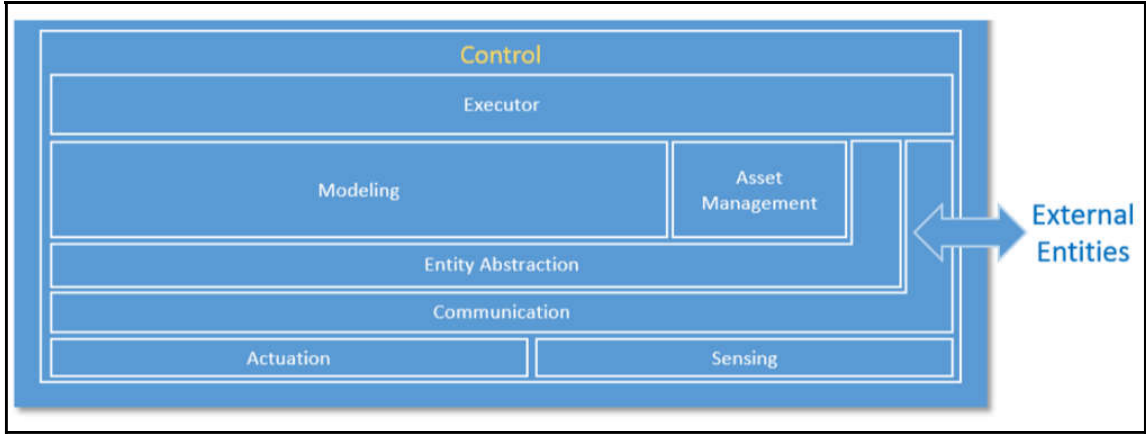


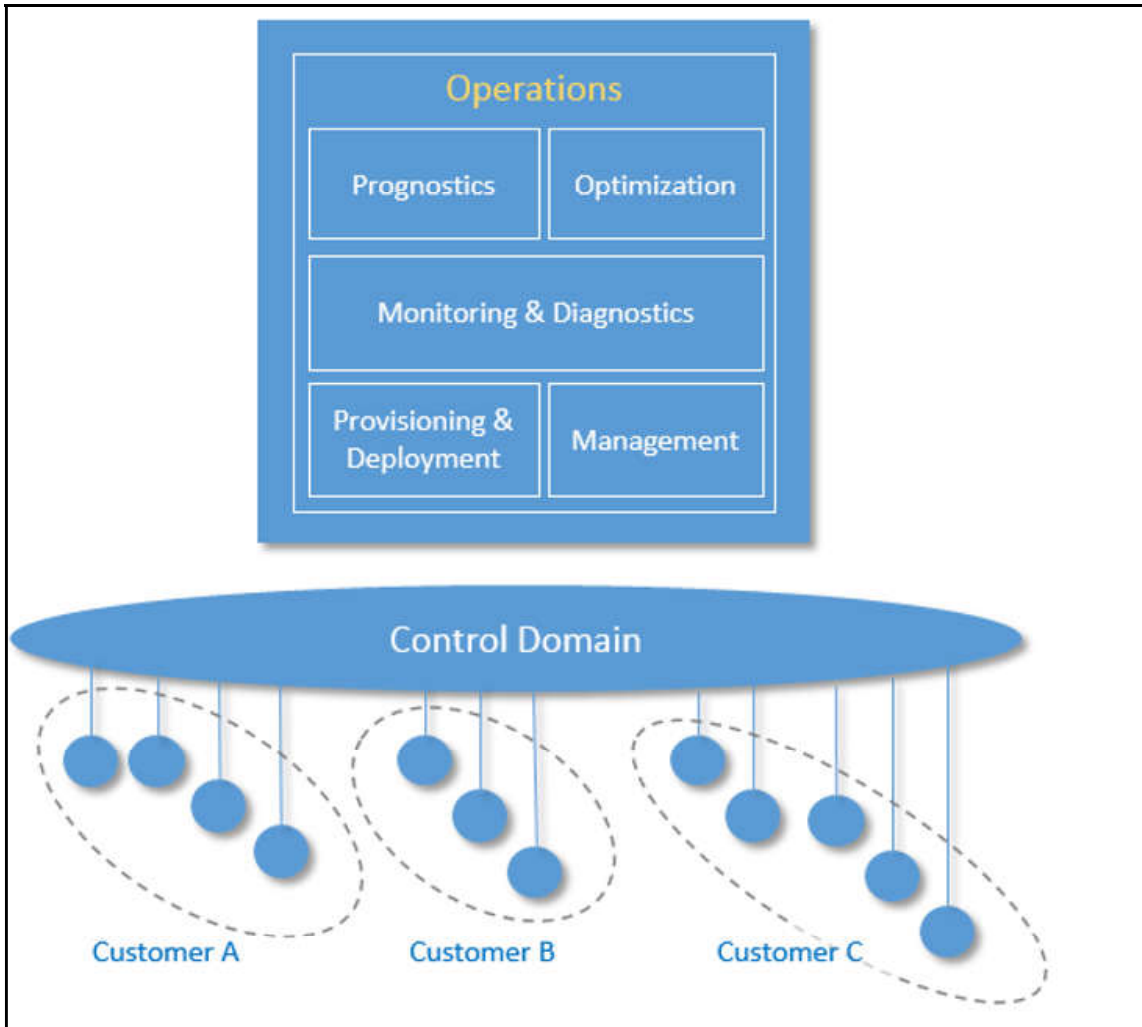


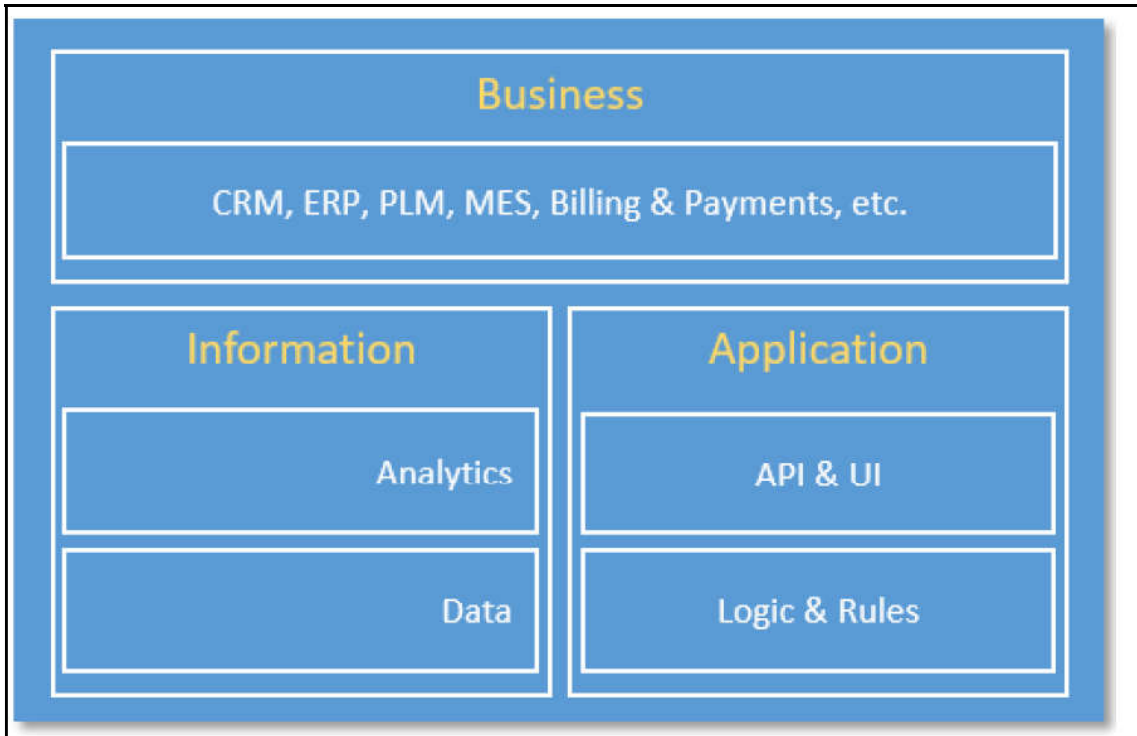


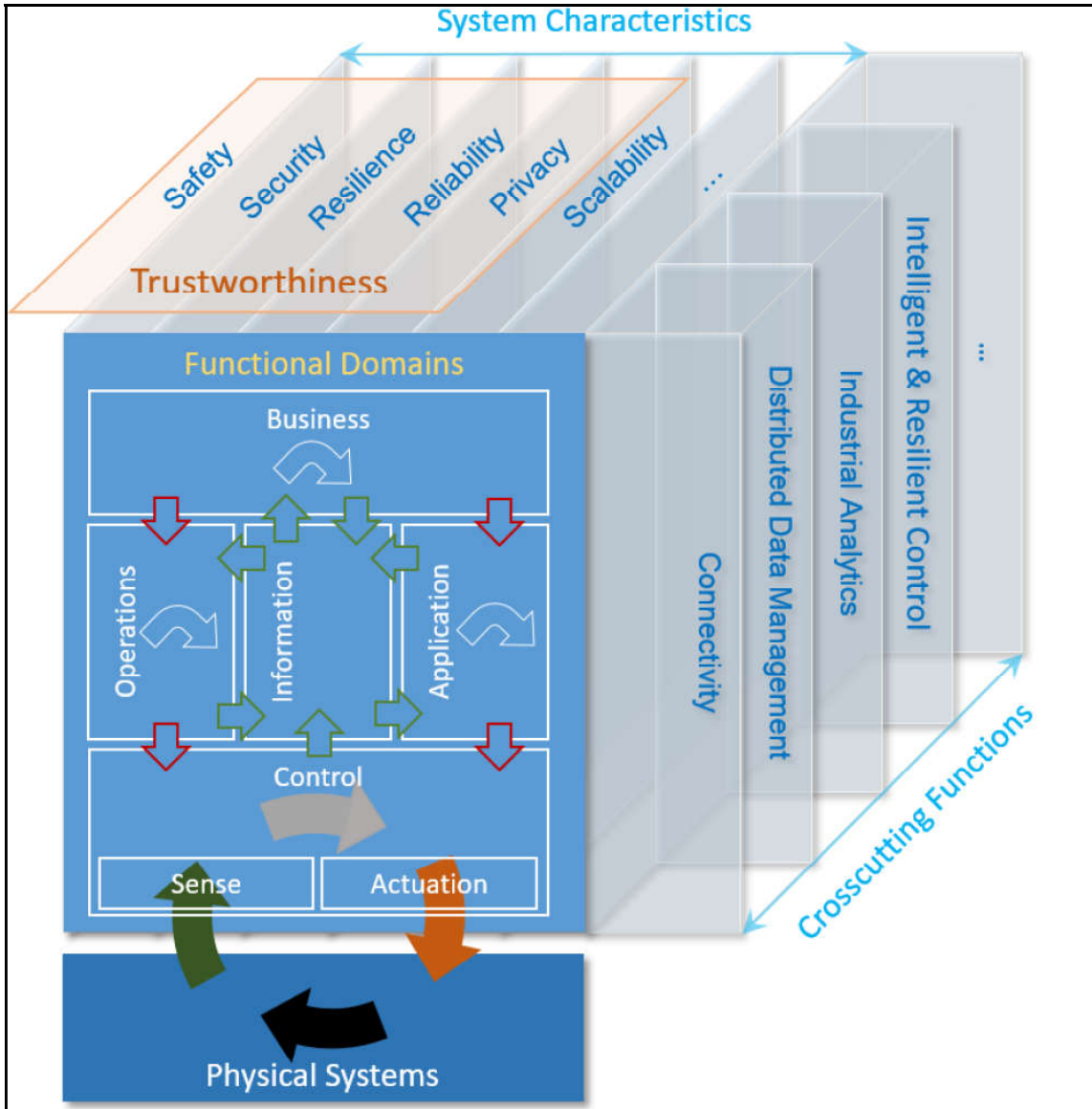


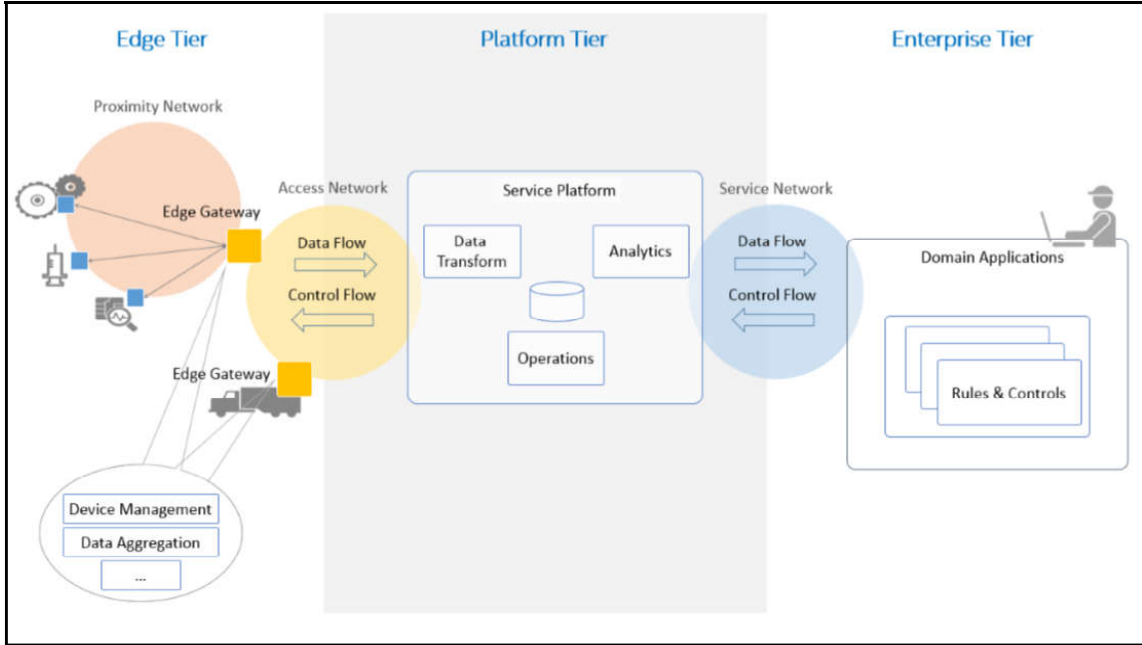
IoT Experiences	Key Usages	Potential Capabilities
1 Improving People, Culture, and Practices	<ul style="list-style-type: none"> <li>Empowering Individual and Aggregated Behavior Change</li> <li>Enabling Decentralized Decision Making</li> </ul>	Pattern identification, predictive & prescriptive analytics, data collection and visualization, data monitoring & alerting, incentive systems, crowdsourcing platforms, preference & recommendations engines
2 Growing the Business	<ul style="list-style-type: none"> <li>Uncovering New Revenue Opportunities</li> <li>Capturing Lost Revenue</li> </ul>	Legacy to open protocol transformers, smart data pipe, edge analytics, cloud analytics
3 Enhancing Oversight	<ul style="list-style-type: none"> <li>Regulatory Compliance</li> <li>Connecting Dots and Breaking Down Silos</li> </ul>	Systems for data logging, storage and verification, data integrity checking, algorithms for compliance assessment (standards/ BKM's), redundant backups, failure mode analysis, oversight mechanisms, data integrity guarantees
4 Managing All Kinds of Assets	<ul style="list-style-type: none"> <li>Asset Identification</li> <li>Asset Tracking</li> </ul>	Unique asset ID assignment, databases linking ID to asset, Method for interrogating ID (NFC, RFID, network broadcast), methods for communicating location (GPS, local positioning systems, relative proximity (RSSI)), inventory management systems
5 Optimizing System Performance	<ul style="list-style-type: none"> <li>Predictive Maintenance and Reducing Downtime</li> <li>Effective Distribution and System Stress reduction</li> </ul>	Identification of "weak links" in system performance, predictive and prescriptive maintenance algorithms, diagnostics and recommendations systems for repair, augmented reality at point of service, intelligent, interactive, situation sensitive repair instructions, remote worker communication, proprietary to open protocol translation
6 Minimizing Threats, Mitigating Risks	<ul style="list-style-type: none"> <li>Accuracy of Alerting</li> <li>Improved Trust in Systems and Processes</li> </ul>	Full security across the signal path, real time analysis and alerting, threat identification, malware detection, intrusion detection and remediation, trusted execution environments.

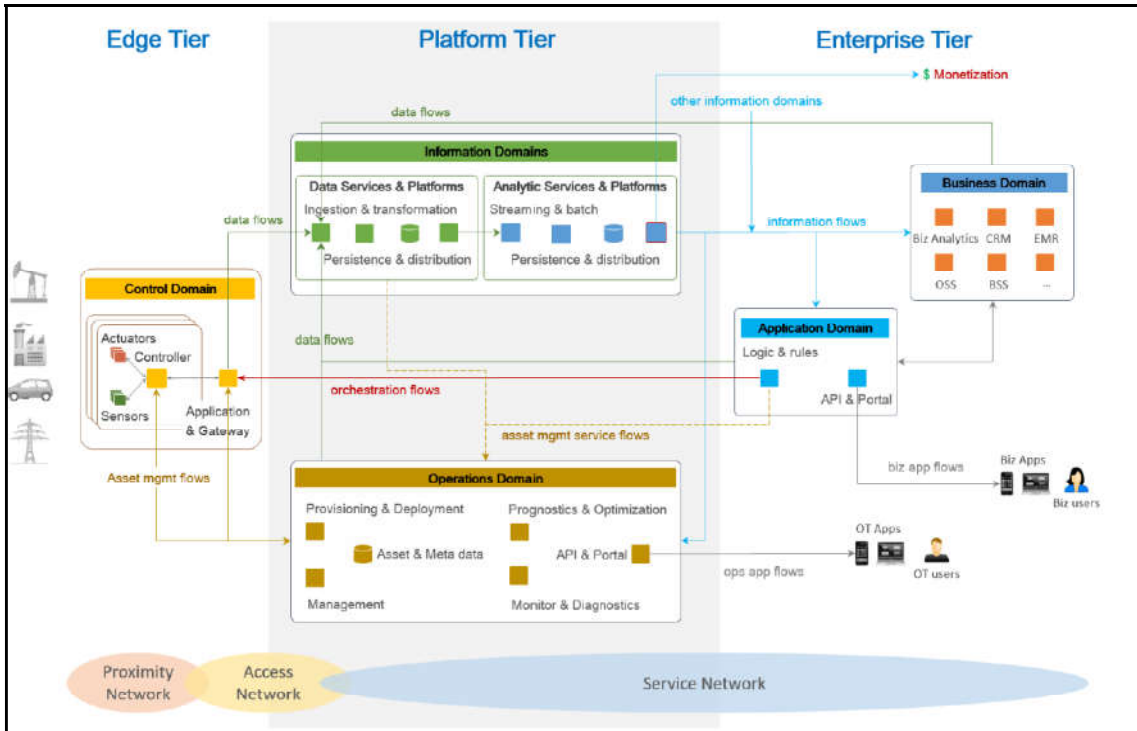


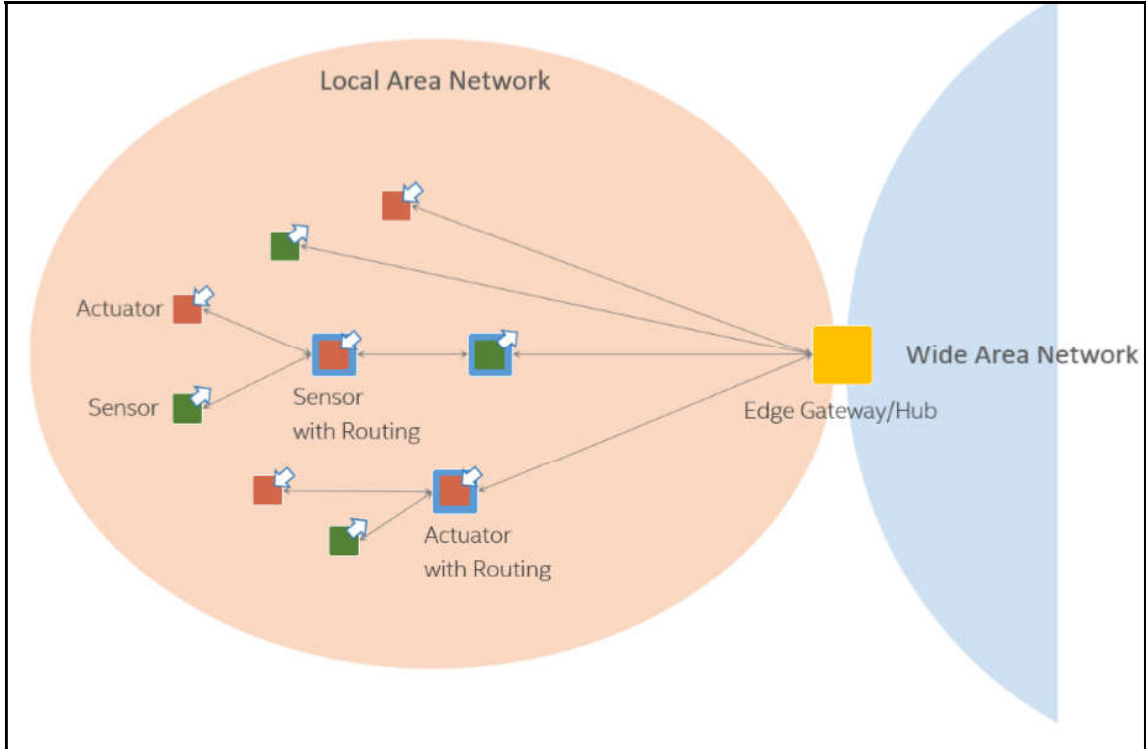




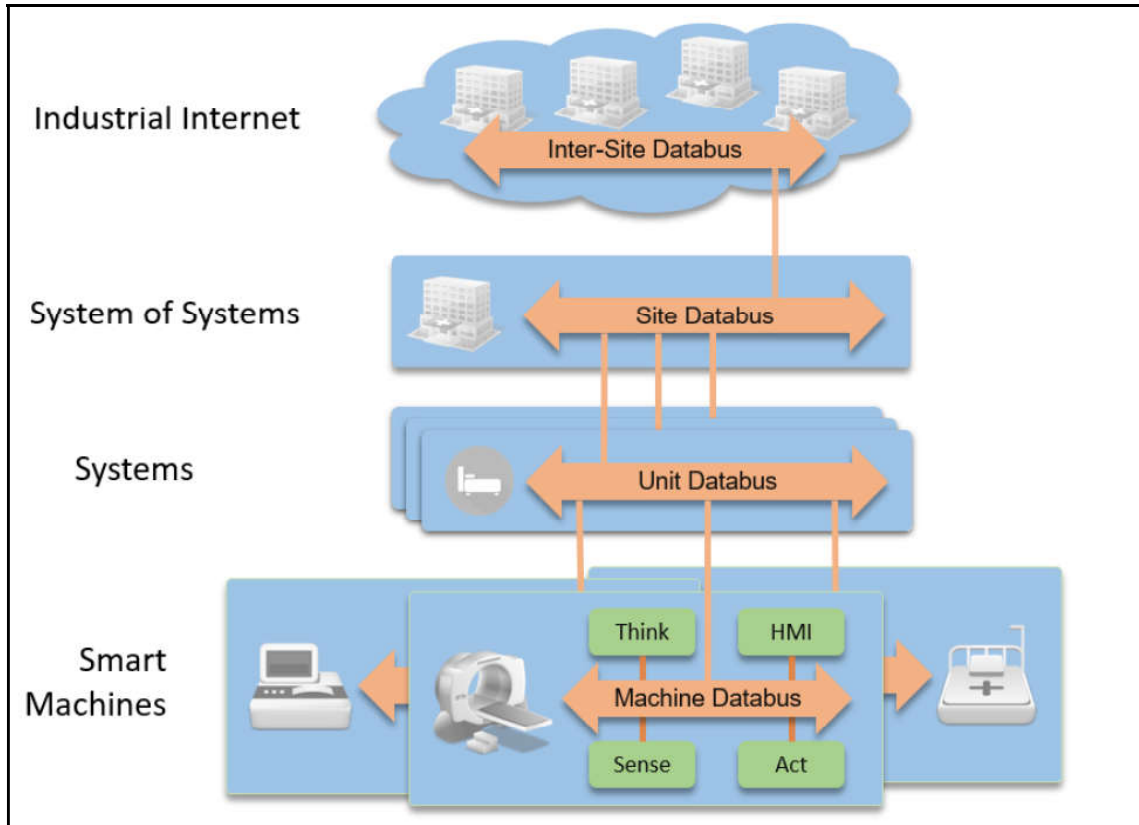


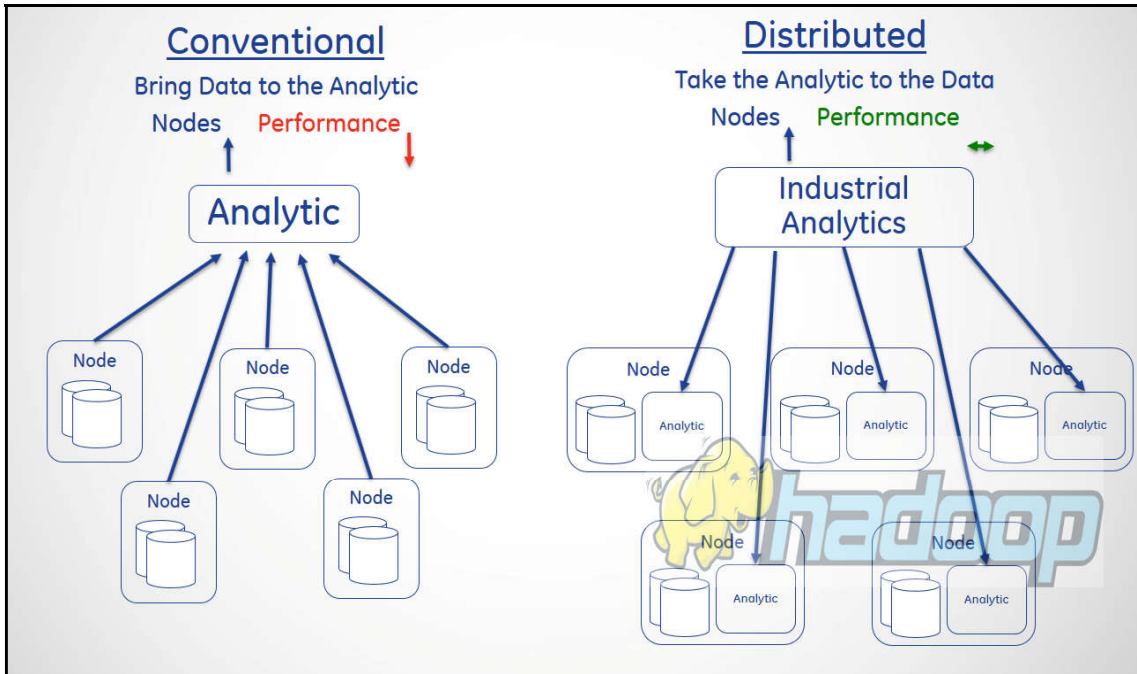








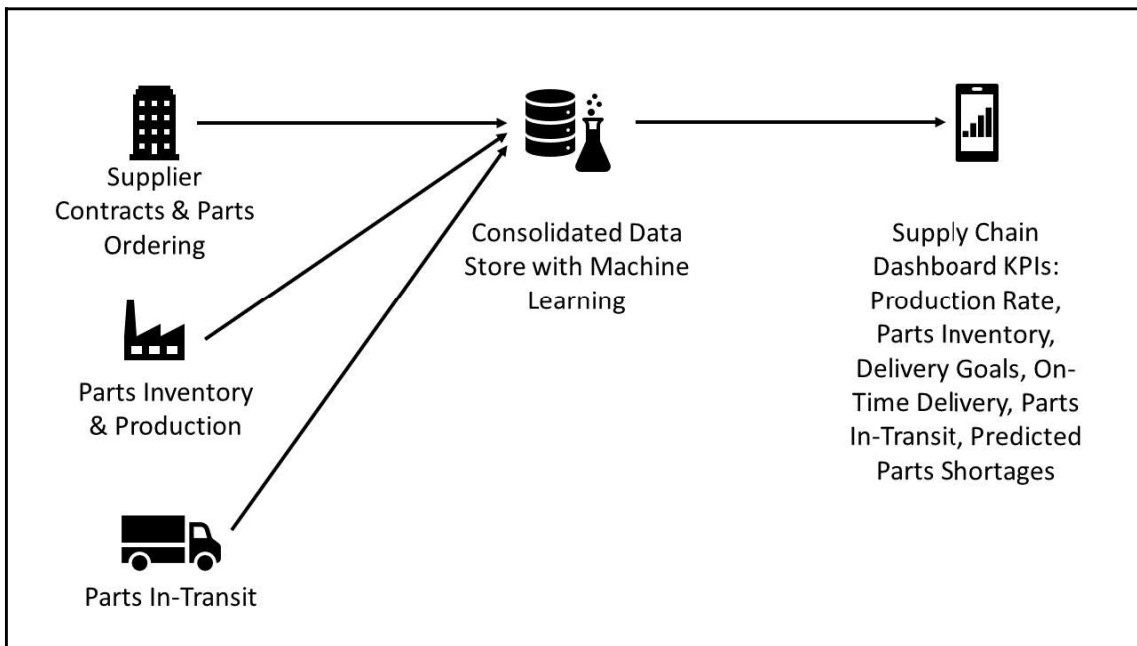




## Chapter 3: Gathering Business Requirements

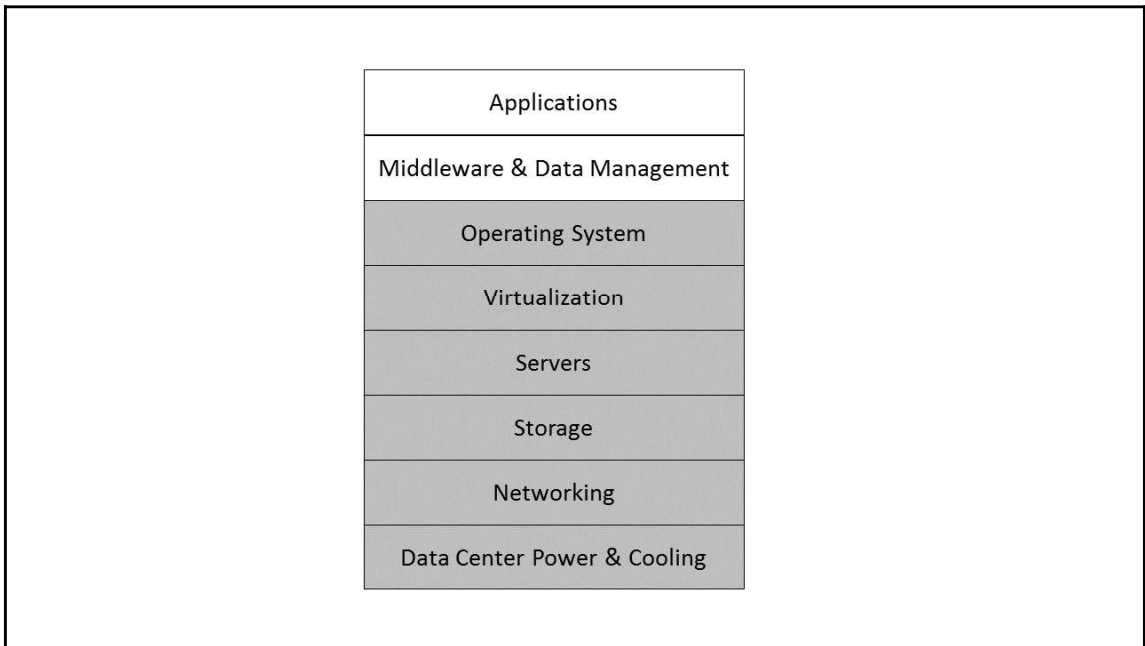
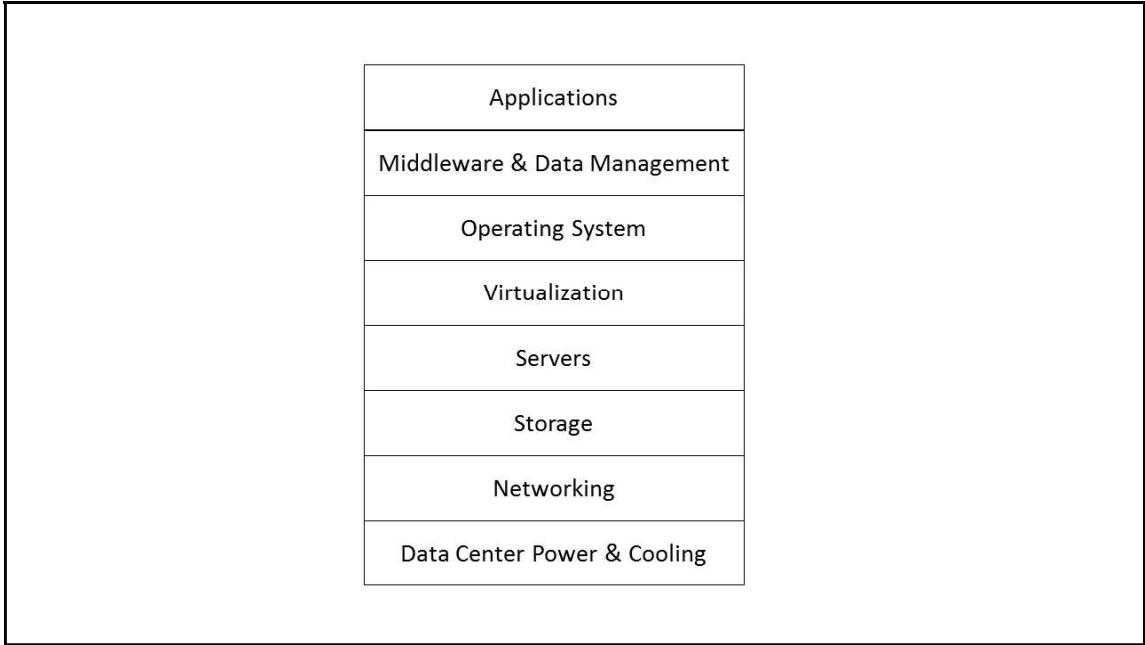
Key Stakeholder (LOB)	Critical Success Factor	Key Performance Indicators	Revenue / Savings Impact	Ranked Priority

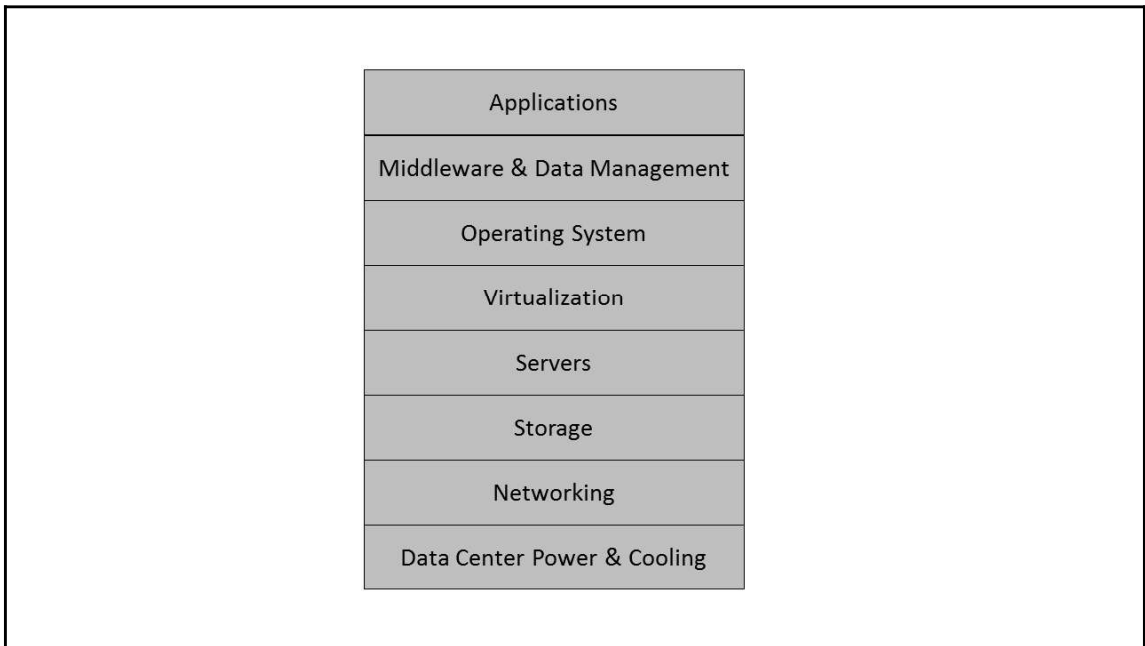
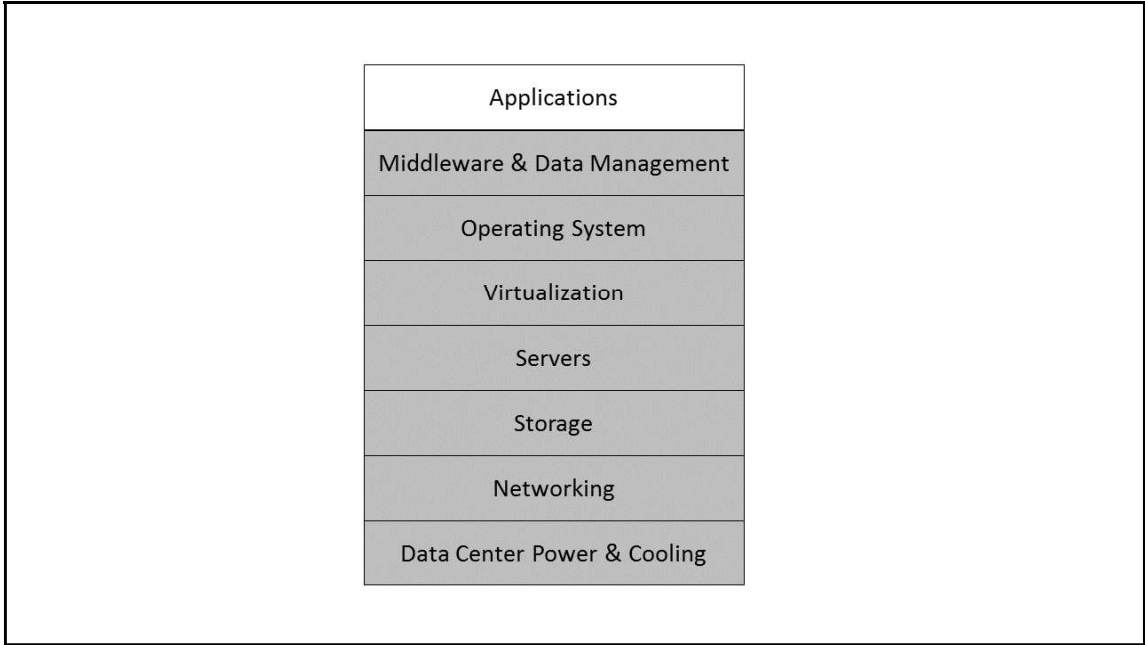
Key Stakeholder (LOB)	Critical Success Factor	Key Performance Indicators	Revenue / Savings Impact	Ranked Priority
VP of Product Manufacturing	Factory operating at maximum capacity 24X7	Production up-time, unit goals, units produced, parts backlog	\$10 m in additional product produced, \$5 m saved in factory down-time	
VP of Supply Chain Management	All needed components delivered JIT	Parts delivery goals vs. on-time, parts inventory, parts in-transit	\$5 m saved in storage of excess parts, rush order cost for parts supply	
Chief Financial Officer	Maximized revenue from production meeting demand	Unit demand forecast, units produced, unit production rate, parts inventory, revenue gained vs. predicted	\$15 m in additional product produced, \$2 m saved in misspent promotions, \$2 m saved in secondary suppliers	



Key Stakeholder (LOB)	Product Manufacturing	Supply Chain	Finance
Project Benefits	2	3	1
Project Costs	1	3	2
Time to Complete	1	3	2
Total:	4	9	5

Key Stakeholder (LOB)	Critical Success Factor	Key Performance Indicators	Revenue / Savings Impact	Ranked Priority
VP of Product Manufacturing	Factory operating at maximum capacity 24X7	Production up-time, unit goals, units produced, parts backlog	\$10 m in additional product produced, \$5 m saved in factory down-time	1
VP of Supply Chain Management	All needed components delivered JIT	Parts delivery goals vs. on-time, parts inventory, parts in-transit	\$5 m saved in storage of excess parts, rush order cost for parts supply	3
Chief Financial Officer	Maximized revenue from production meeting demand	Unit demand forecast, units produced, unit production rate, parts inventory, revenue gained vs. predicted	\$15 m in additional product produced, \$2 m saved in misspent promotions, \$2 m saved in secondary suppliers	2

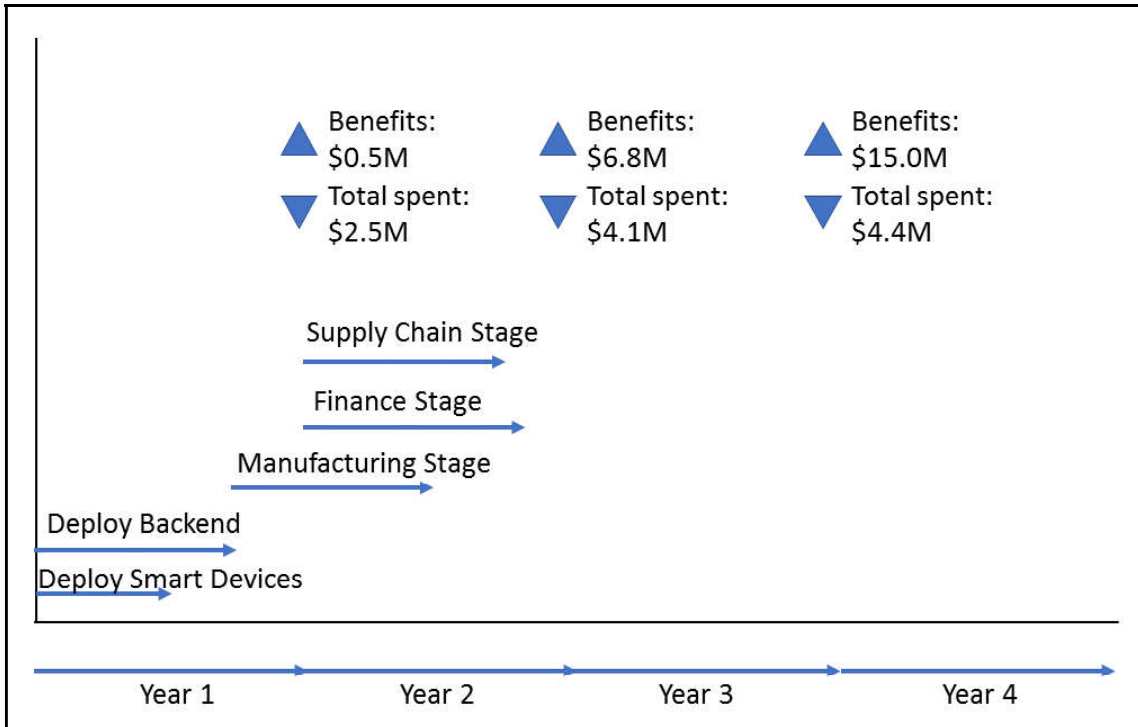


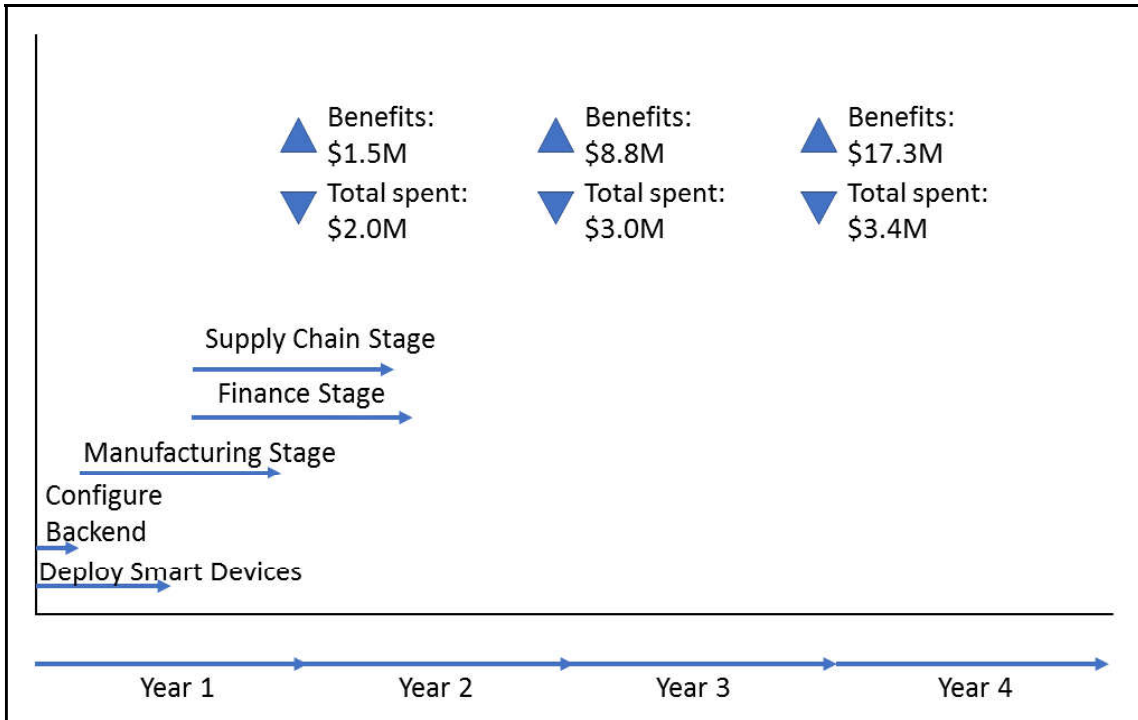


	On-Premises Data Center	Platform as a Service in a Public Cloud
Compute (Hardware, Software, Electricity)	\$849,366	\$282,744
Storage	\$399,360	\$221,184
Data Center Networking	\$162,730	\$180
Data Center Build Out	\$76,405	\$0
IT Labor	\$103,411	\$52,252
<b>Total Backend Infrastructure</b>	<b>\$1,591,272</b>	<b>\$556,360</b>

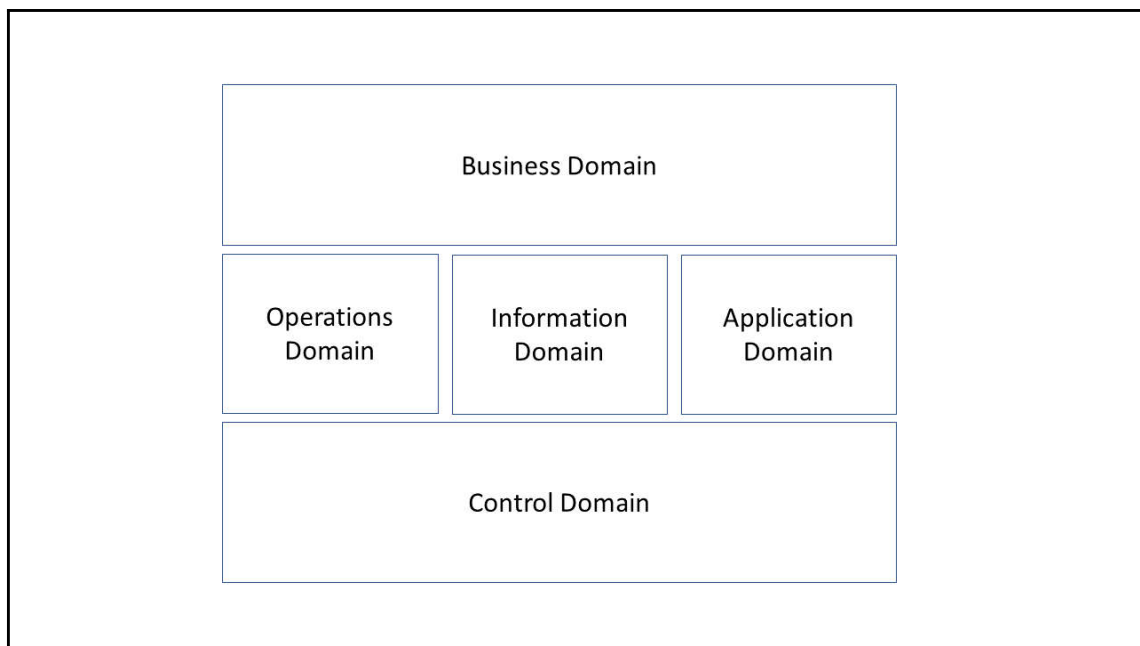
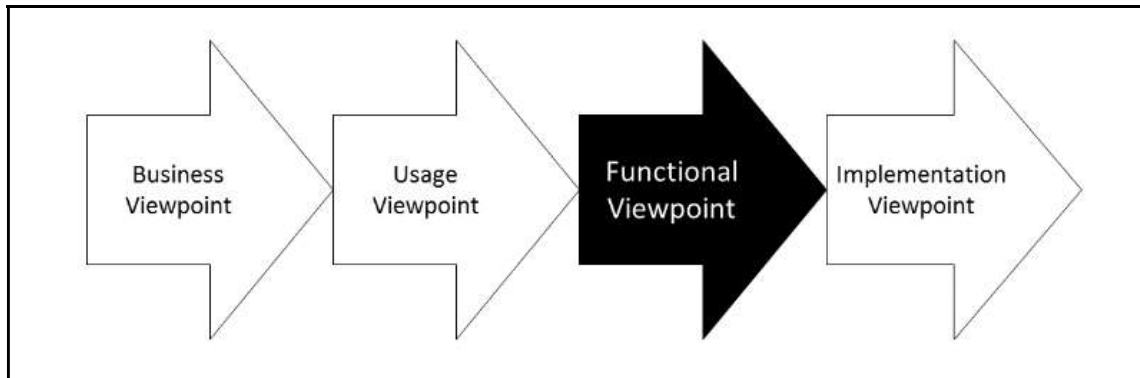


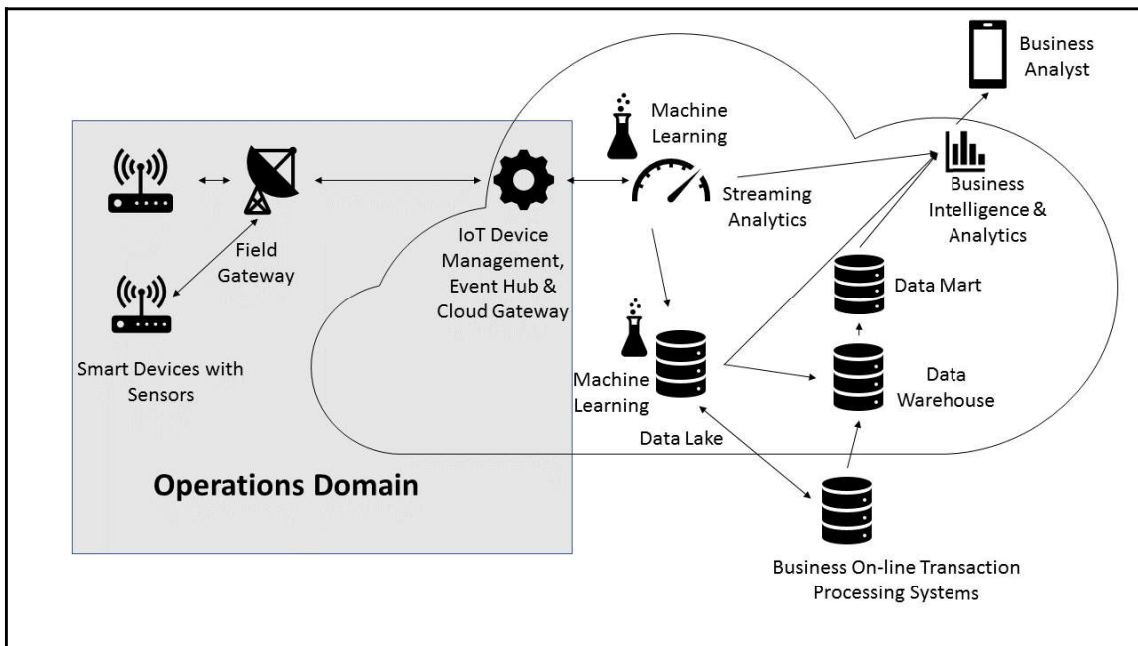
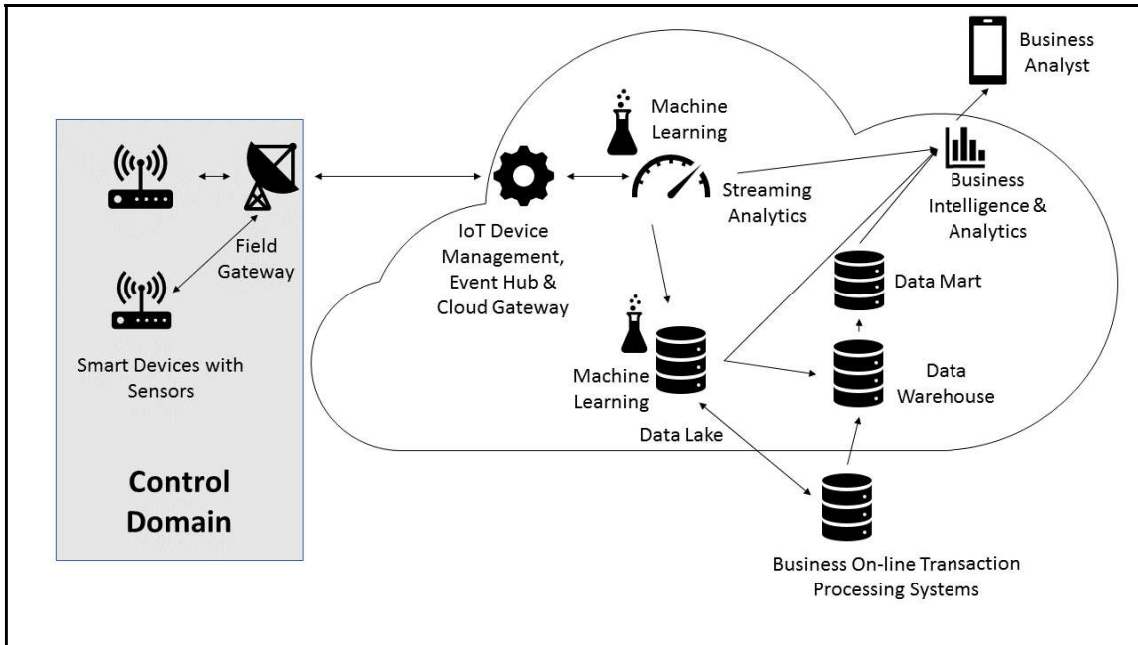
	On-Premises Backend & Devices	Platform as a Service Backend & Devices
Devices (500 smart devices deployed)	\$500,000	\$500,000
Device data transmission costs	\$90,000	\$90,000
<b>Total Frontend costs</b>	<b>\$590,000</b>	<b>\$590,000</b>
<b>Total Backend Infrastructure costs</b>	<b>\$1,591,271</b>	<b>\$556,360</b>
<b>Custom Development costs</b>	<b>\$2,300,000</b>	<b>\$2,300,000</b>
<b>Total Costs over 3 years</b>	<b>\$4,481,271</b>	<b>\$3,446,360</b>

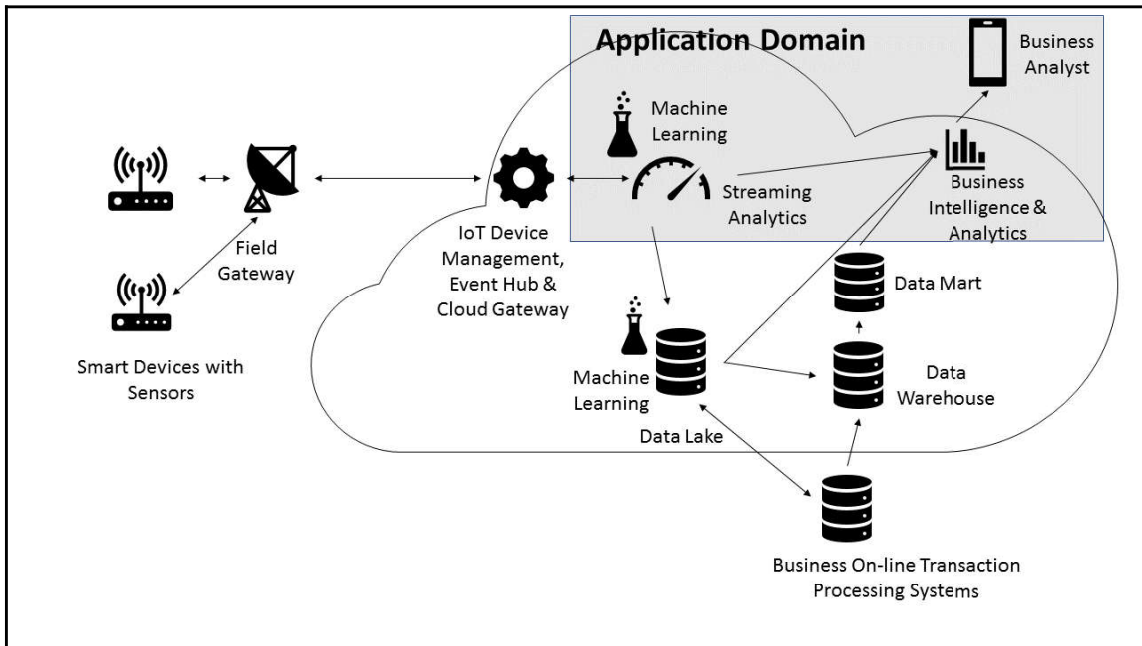
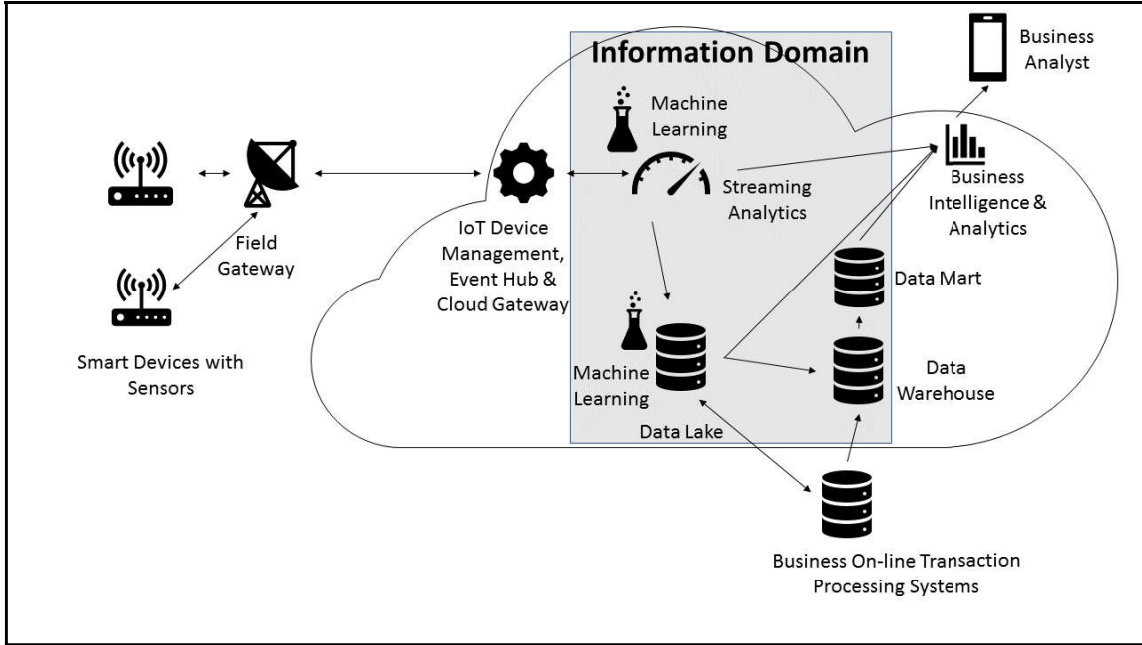


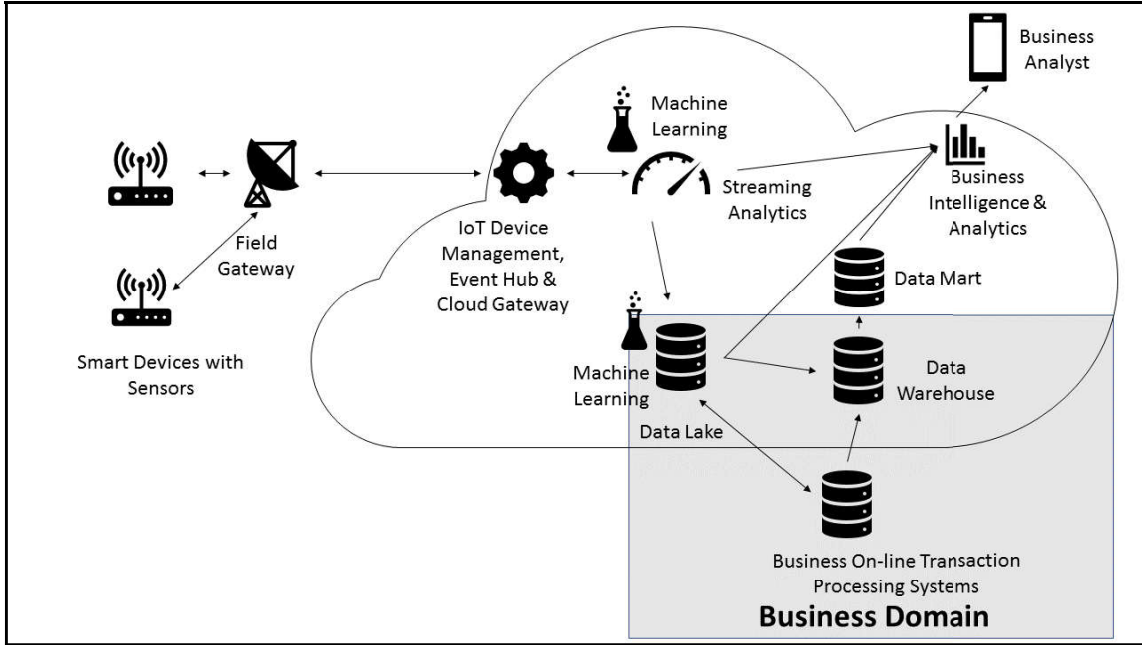


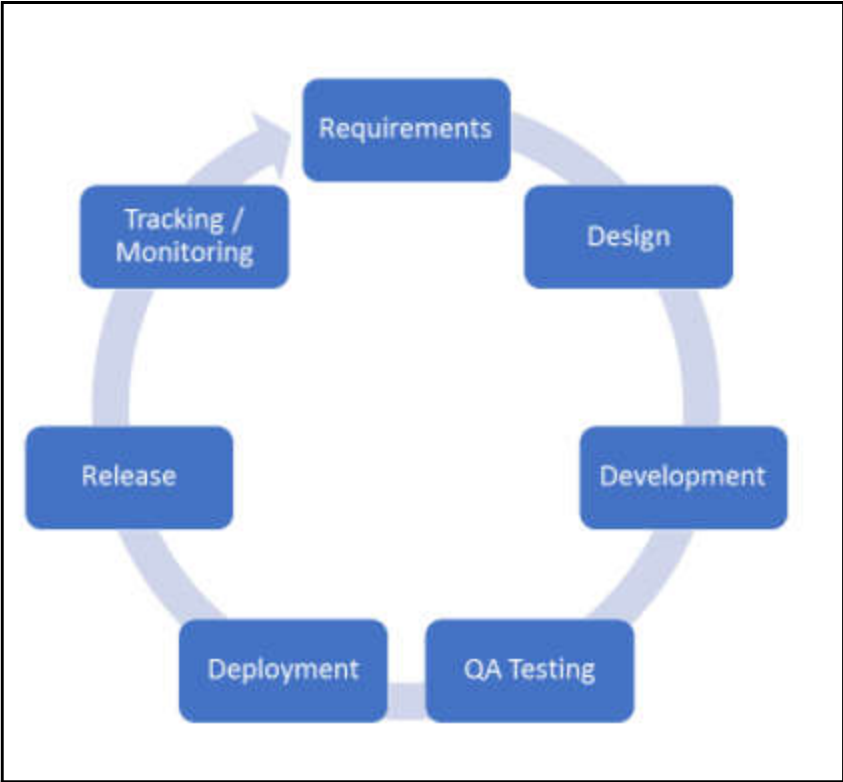
## Chapter 4: Mapping Requirements to a Functional Viewpoint





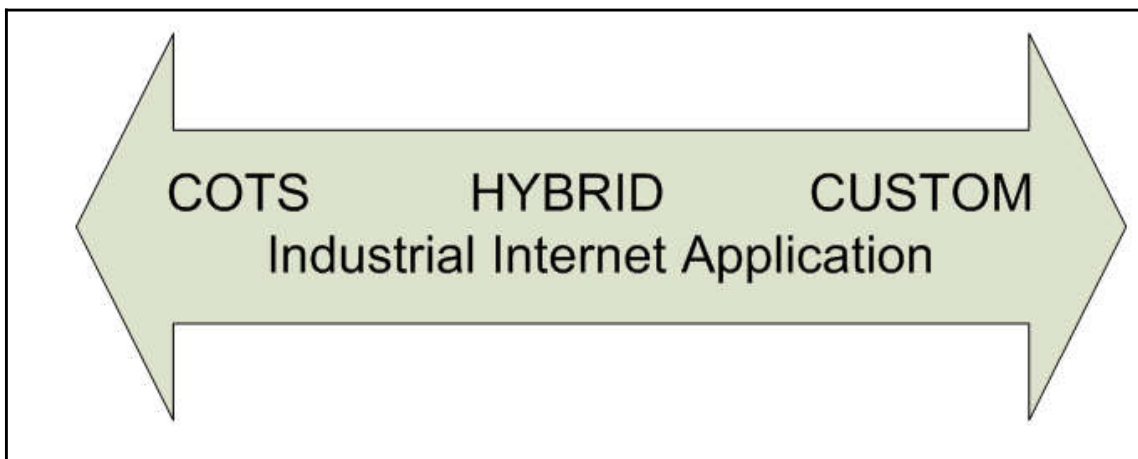
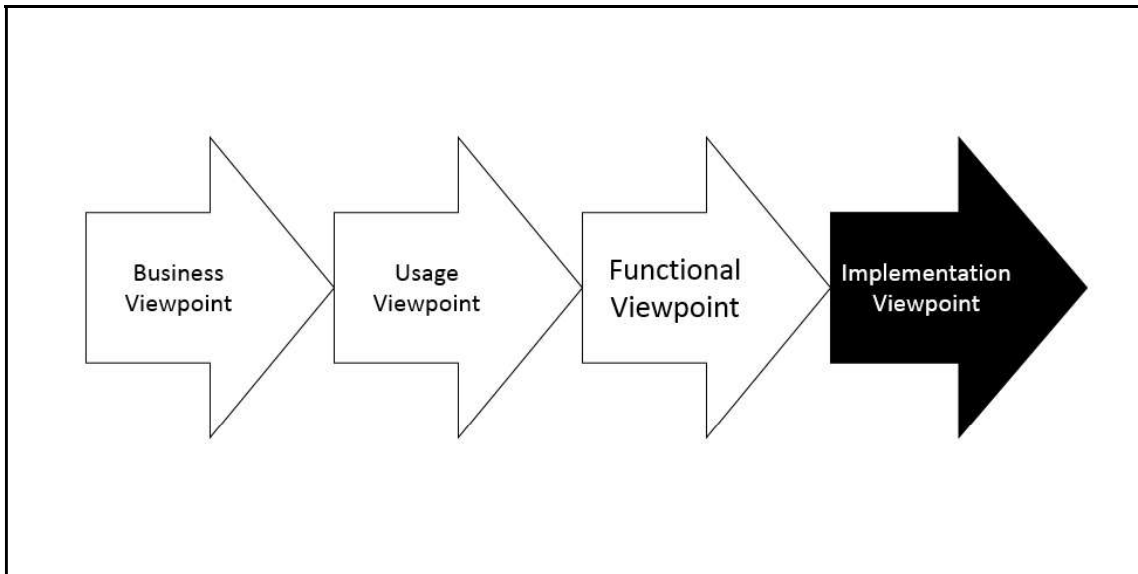


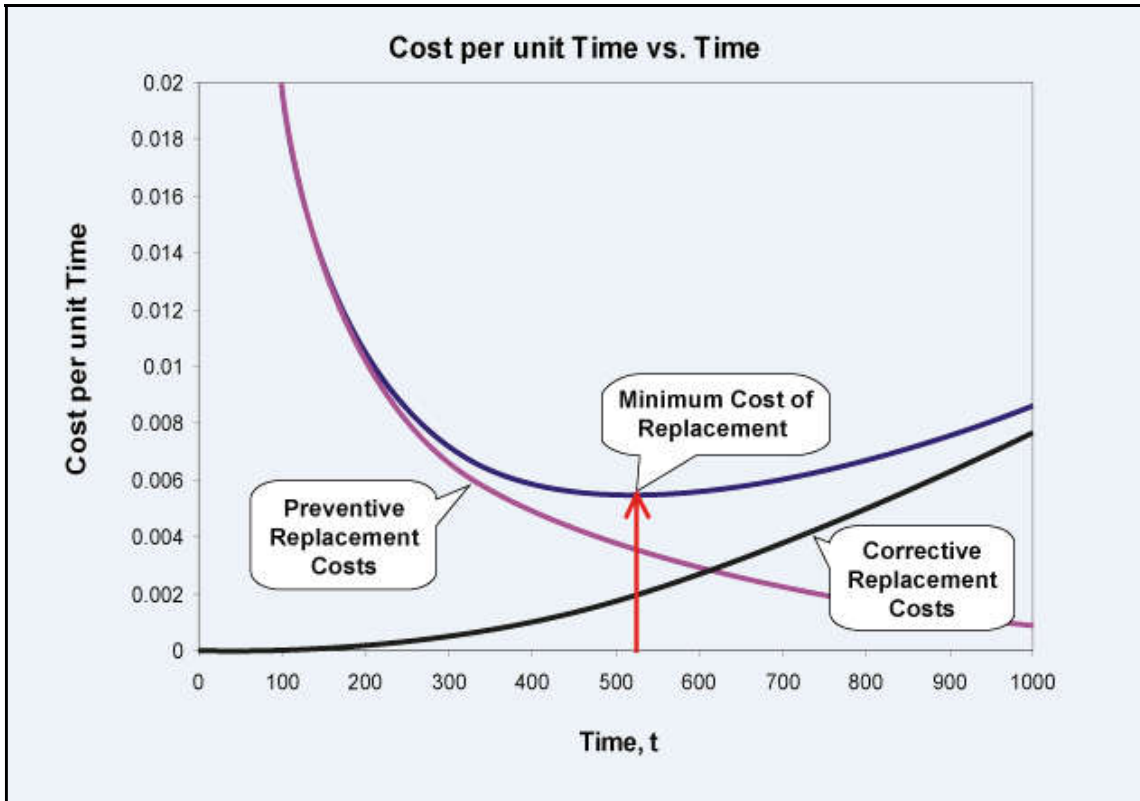


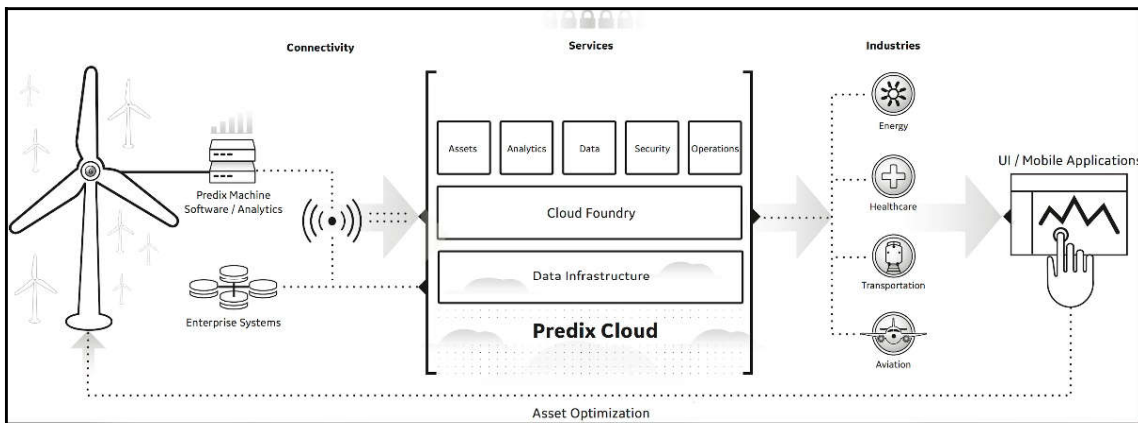


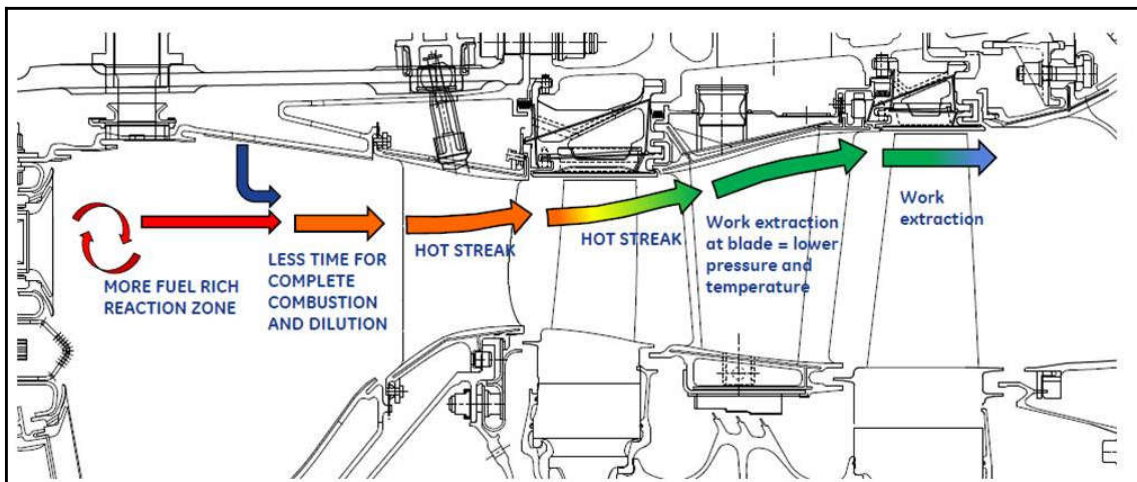
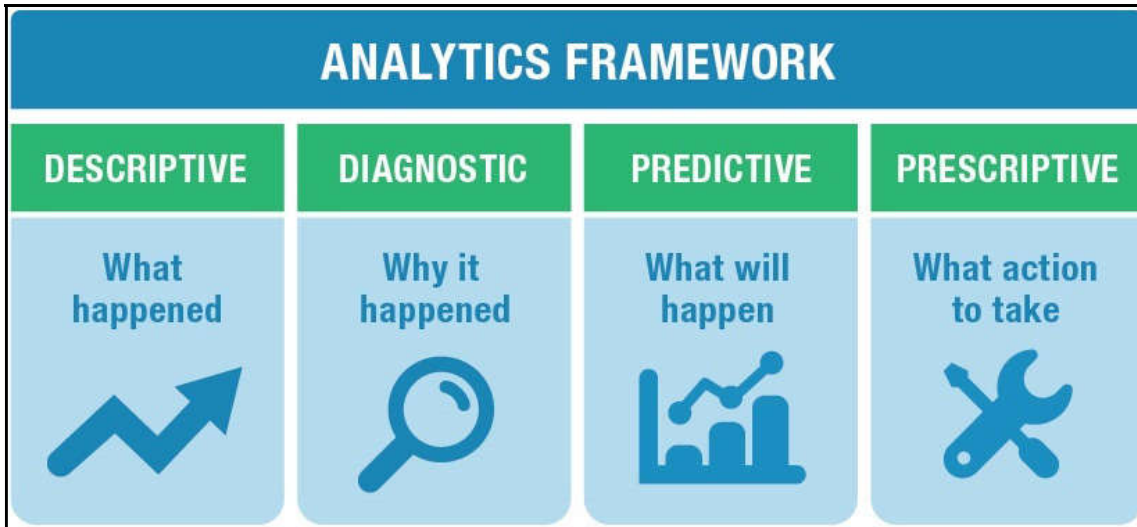


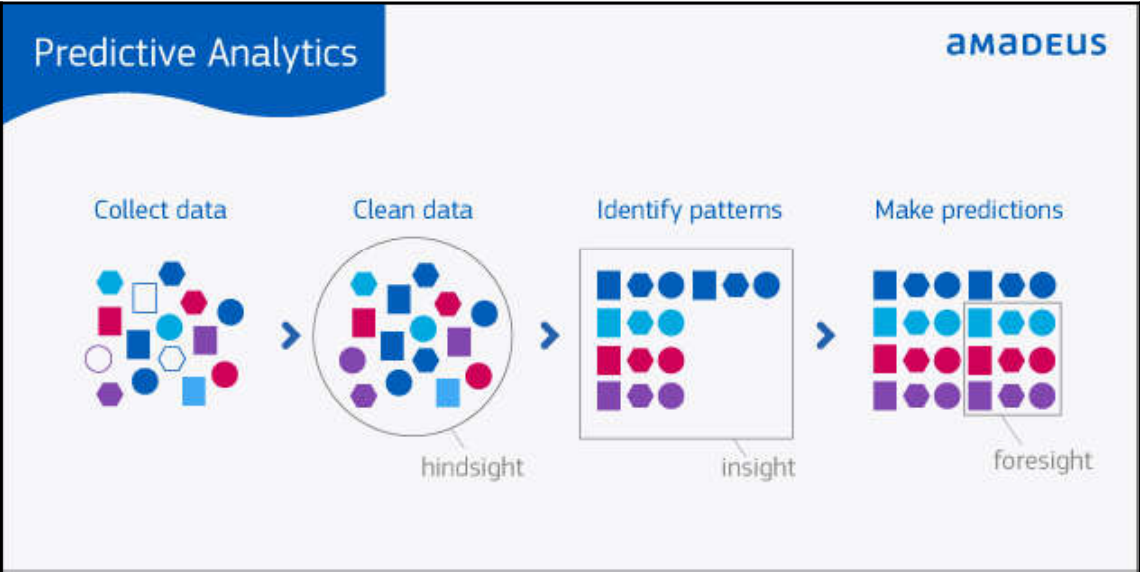
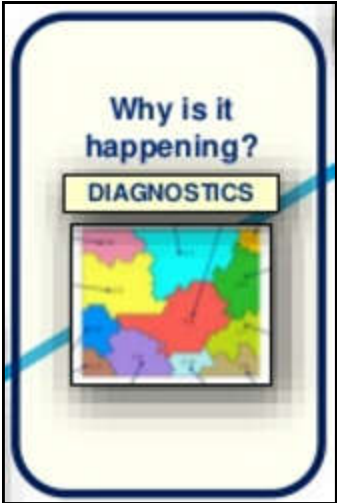
## Chapter 5: Assessing Industrial Internet Applications











## Did you know?

10,000 tonnes of CO<sub>2</sub> and £2m in fuel costs will be saved by increasing Continuous Descent Approaches in the UK by just 5%.

As a pioneer in the technique, **over 85%** of Heathrow arrivals achieve the feat.



! CDA also helps to reduce noise by keeping aircraft higher for longer and using their engines less, before the final stages of landing.

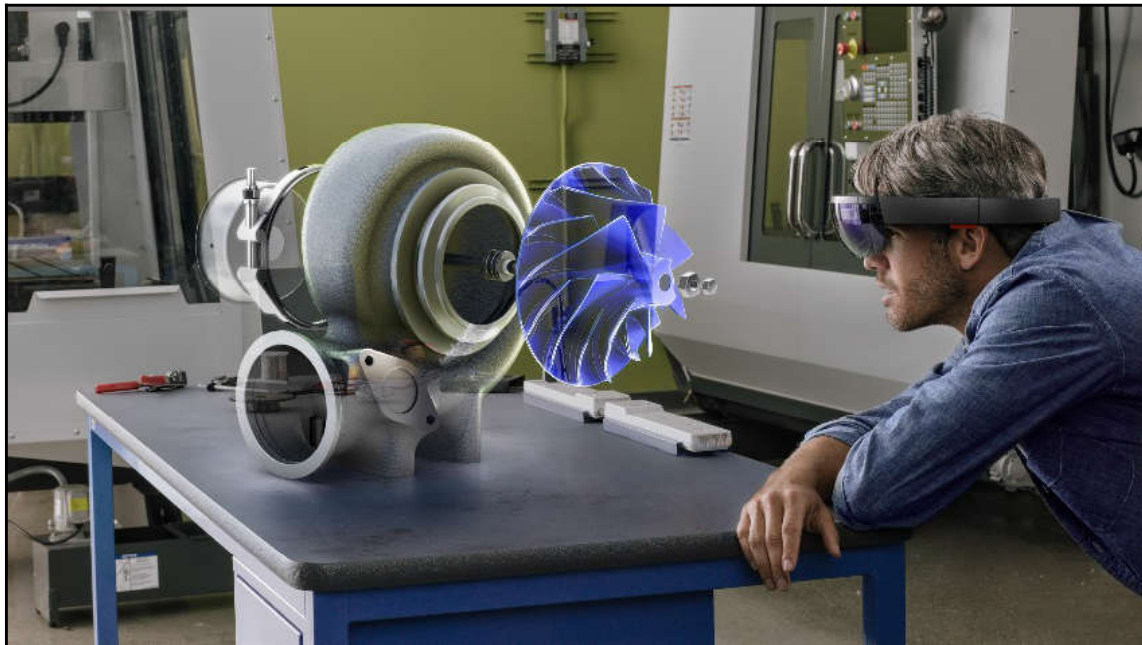
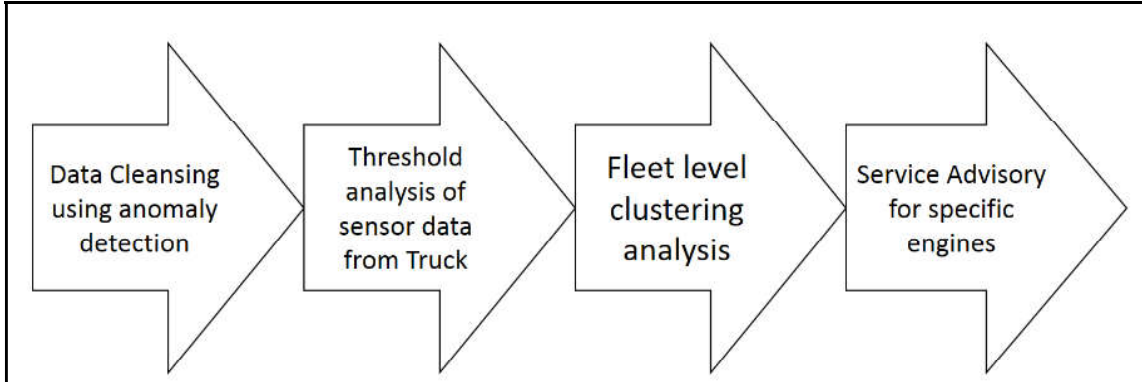
This is just one of the many initiatives Heathrow is using to reduce noise and improve environmental performance.

Heathrow

Source: Sustainable Aviation, Flight Performance Annual Report 2014 (Heathrow).



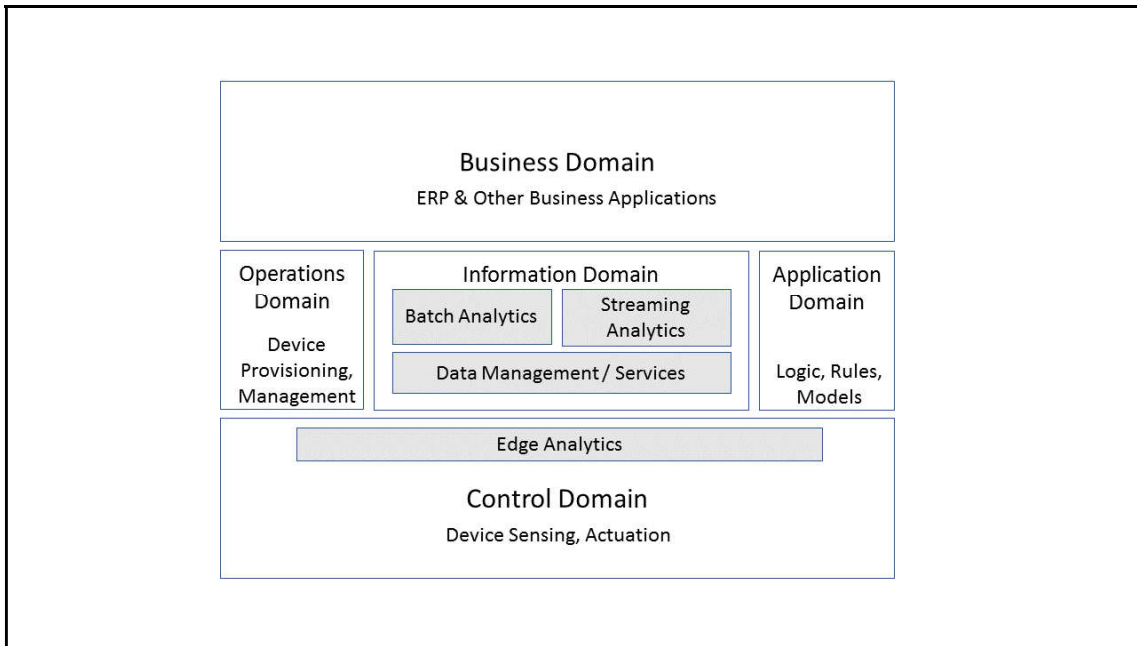


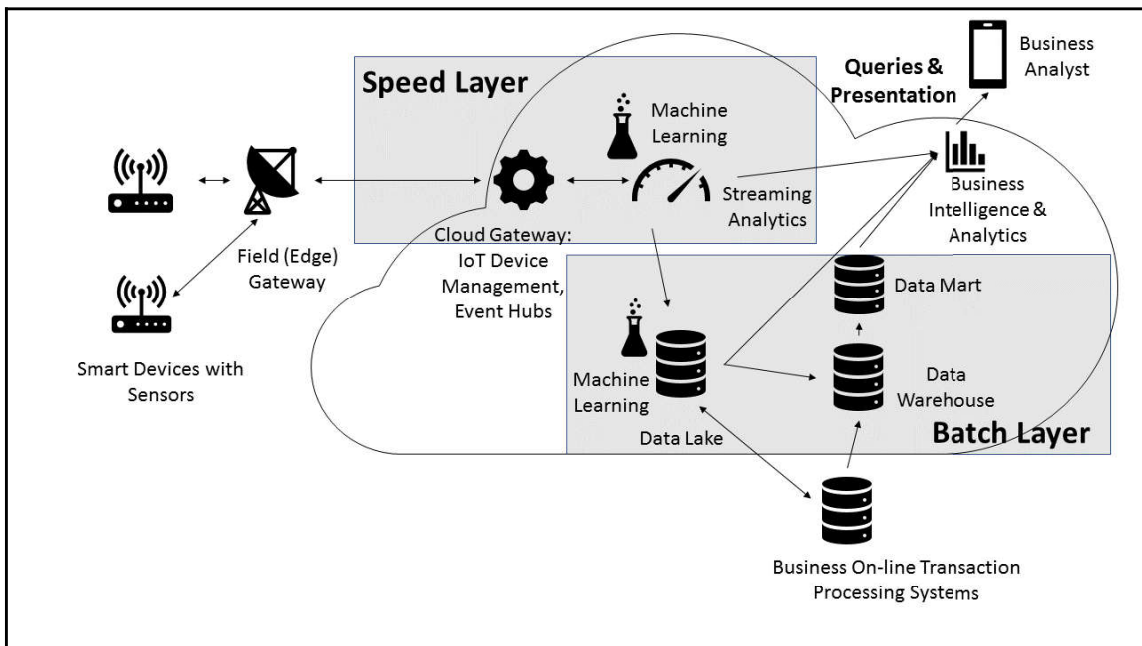
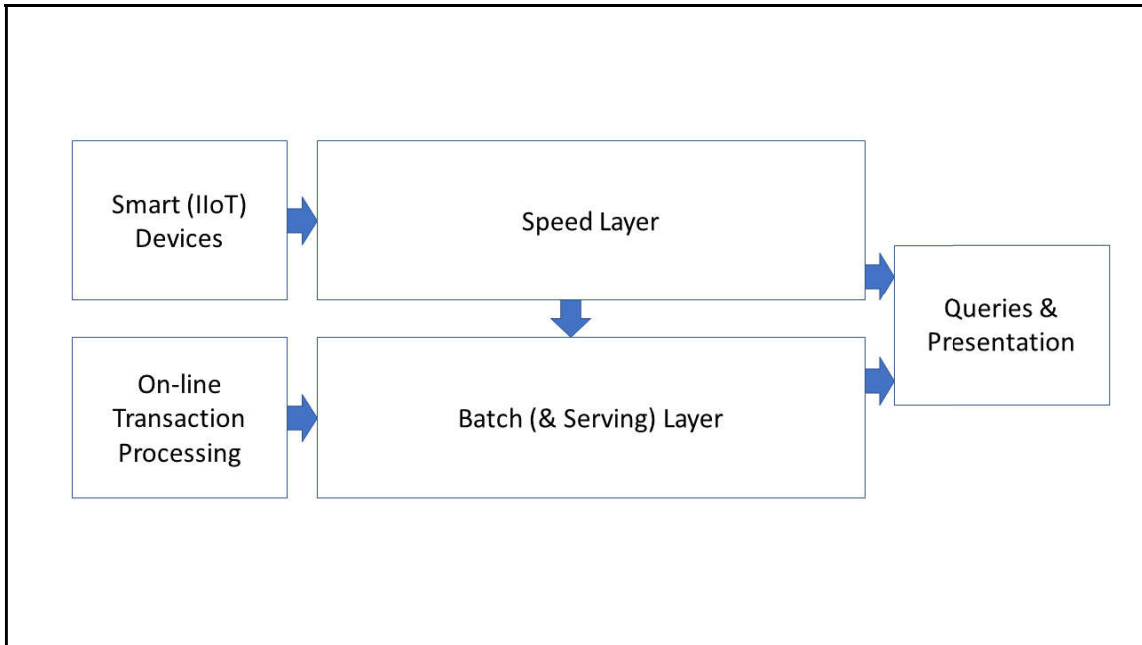


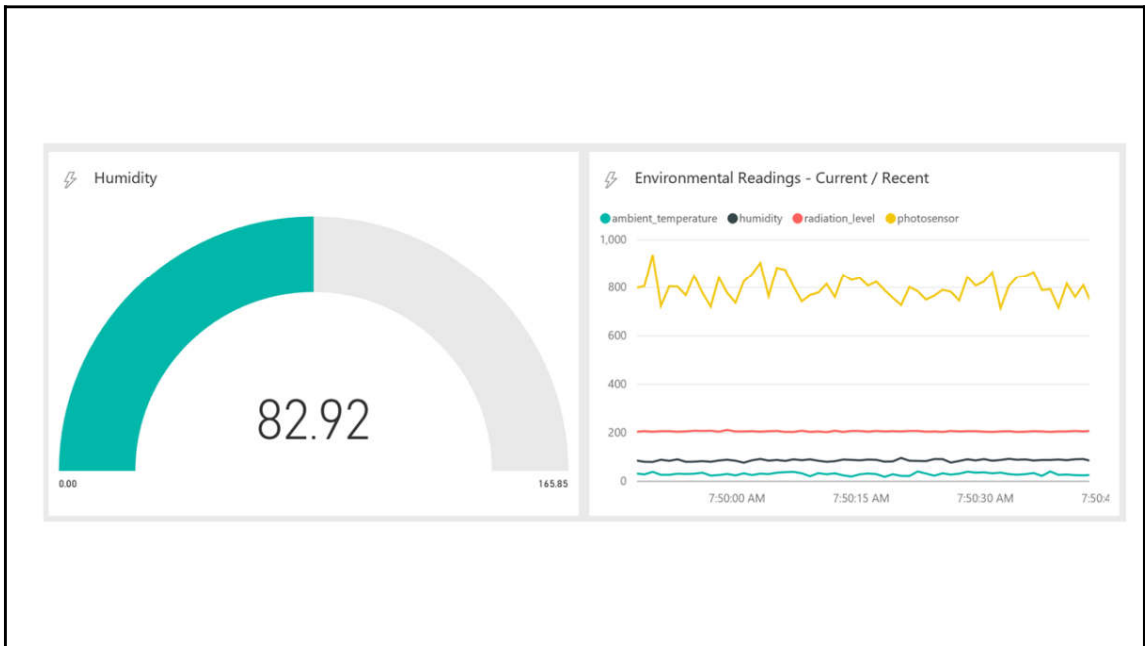
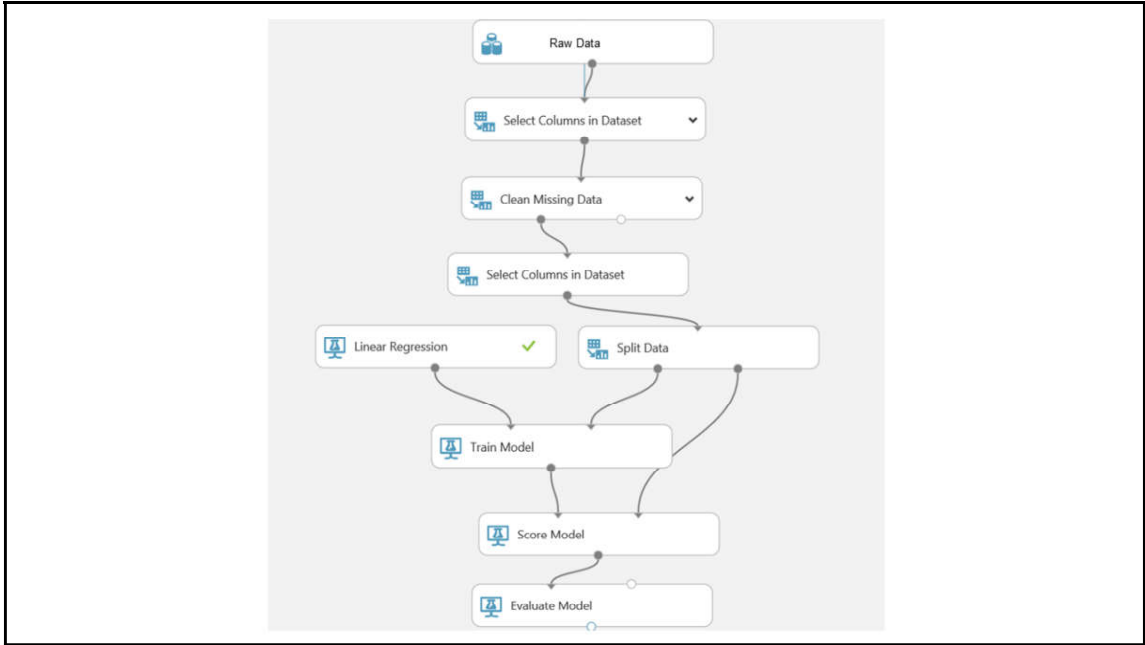




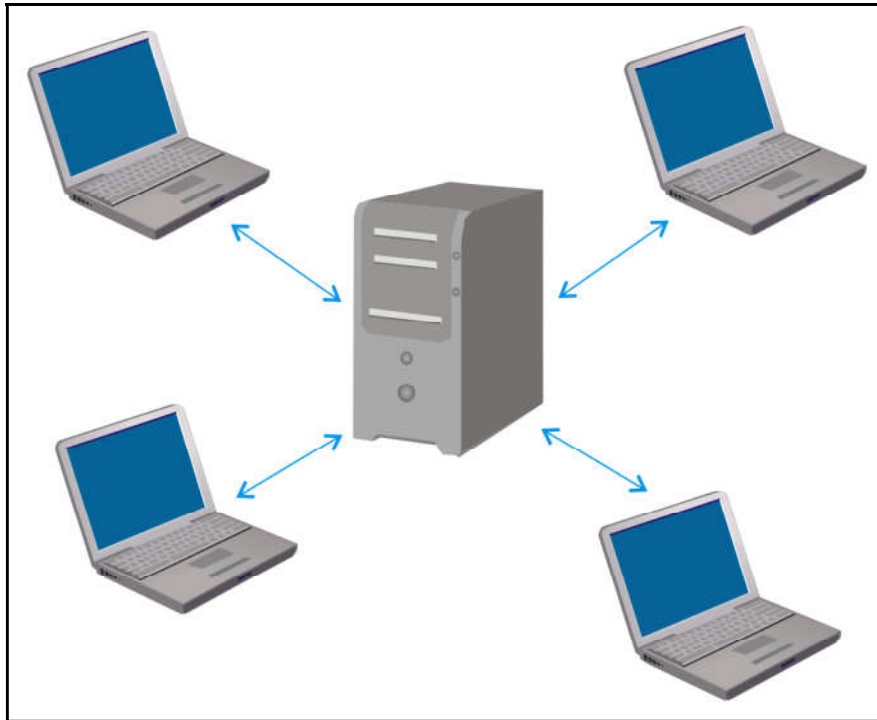
# Chapter 6: Defining the Data and Analytics Architecture

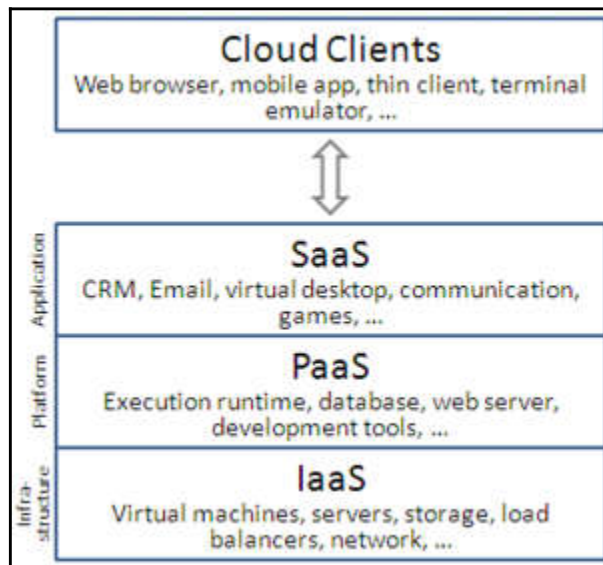
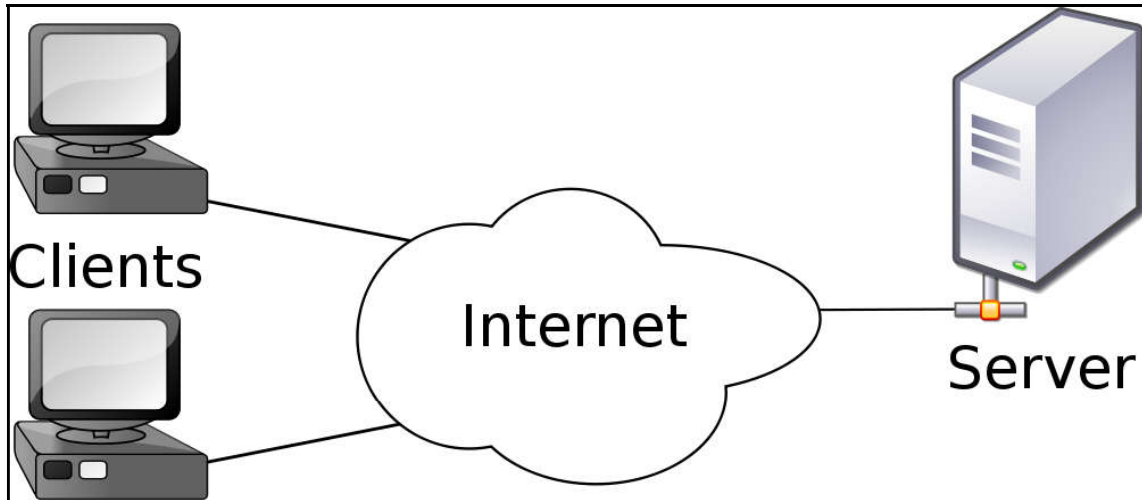


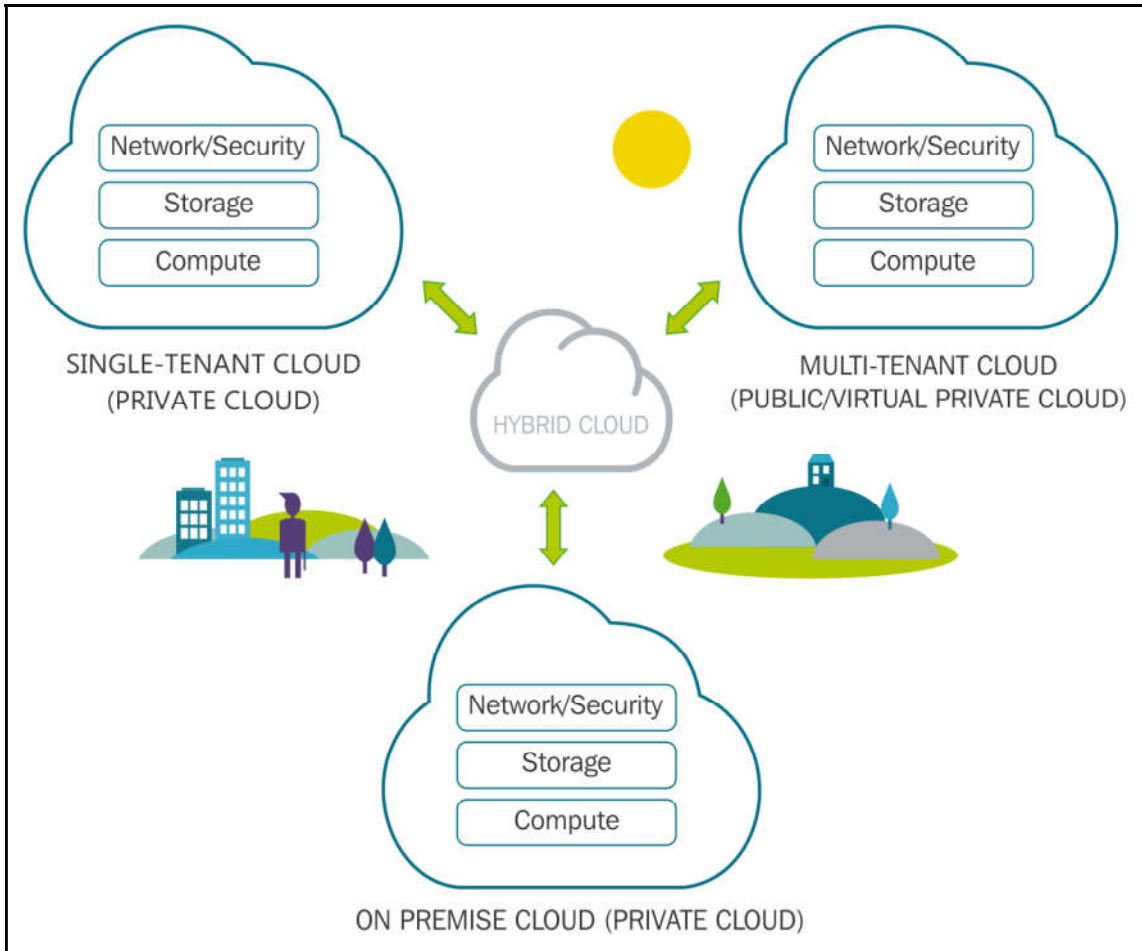


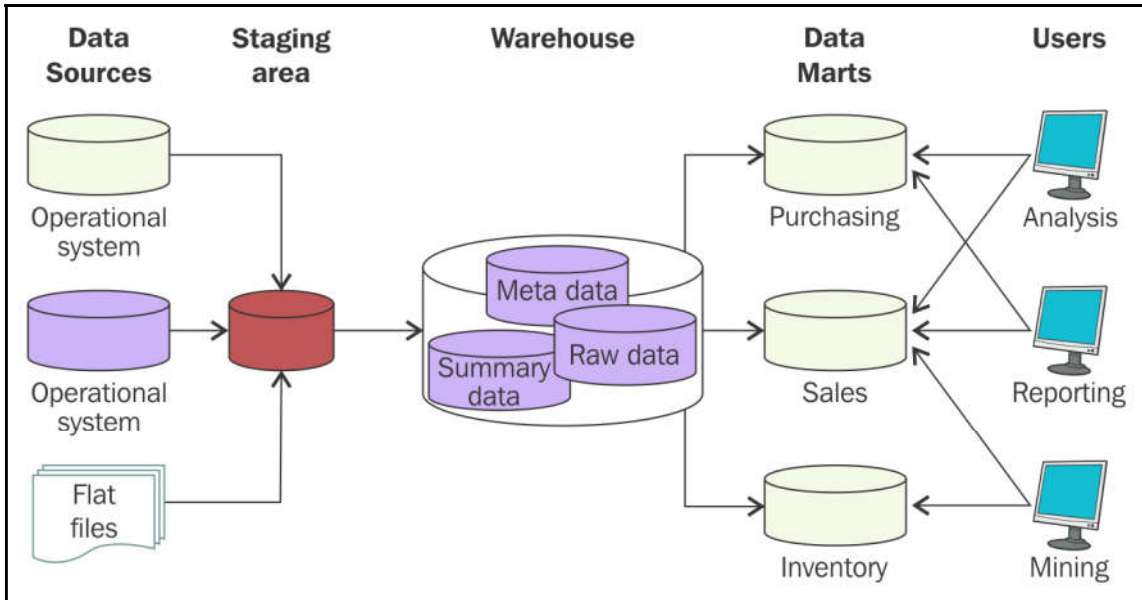


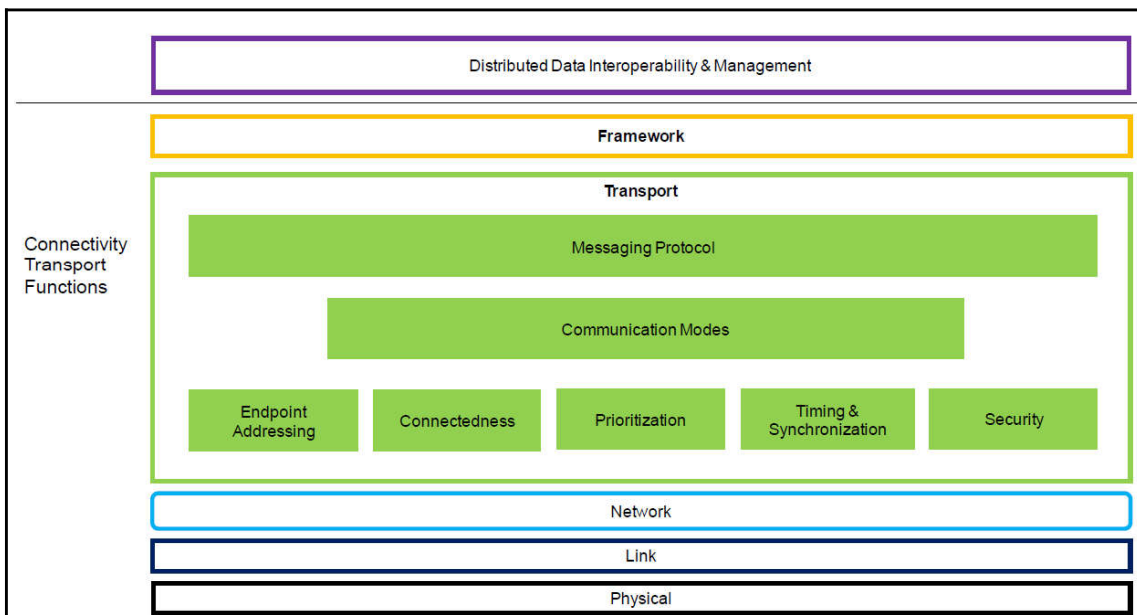
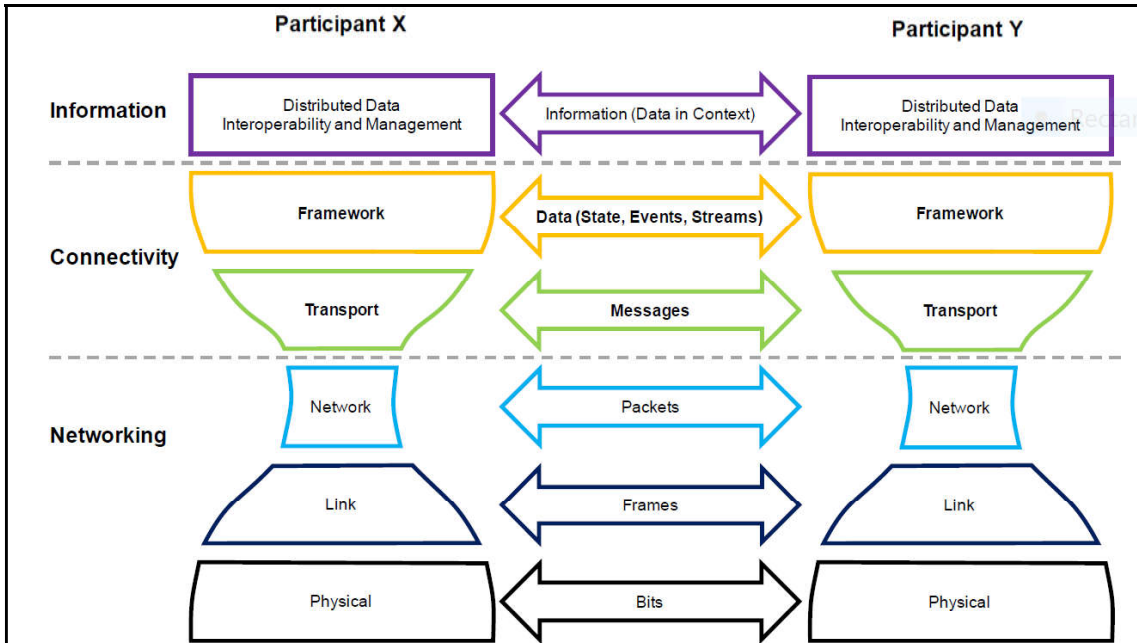
## Chapter 7: Defining a Deployment Architecture







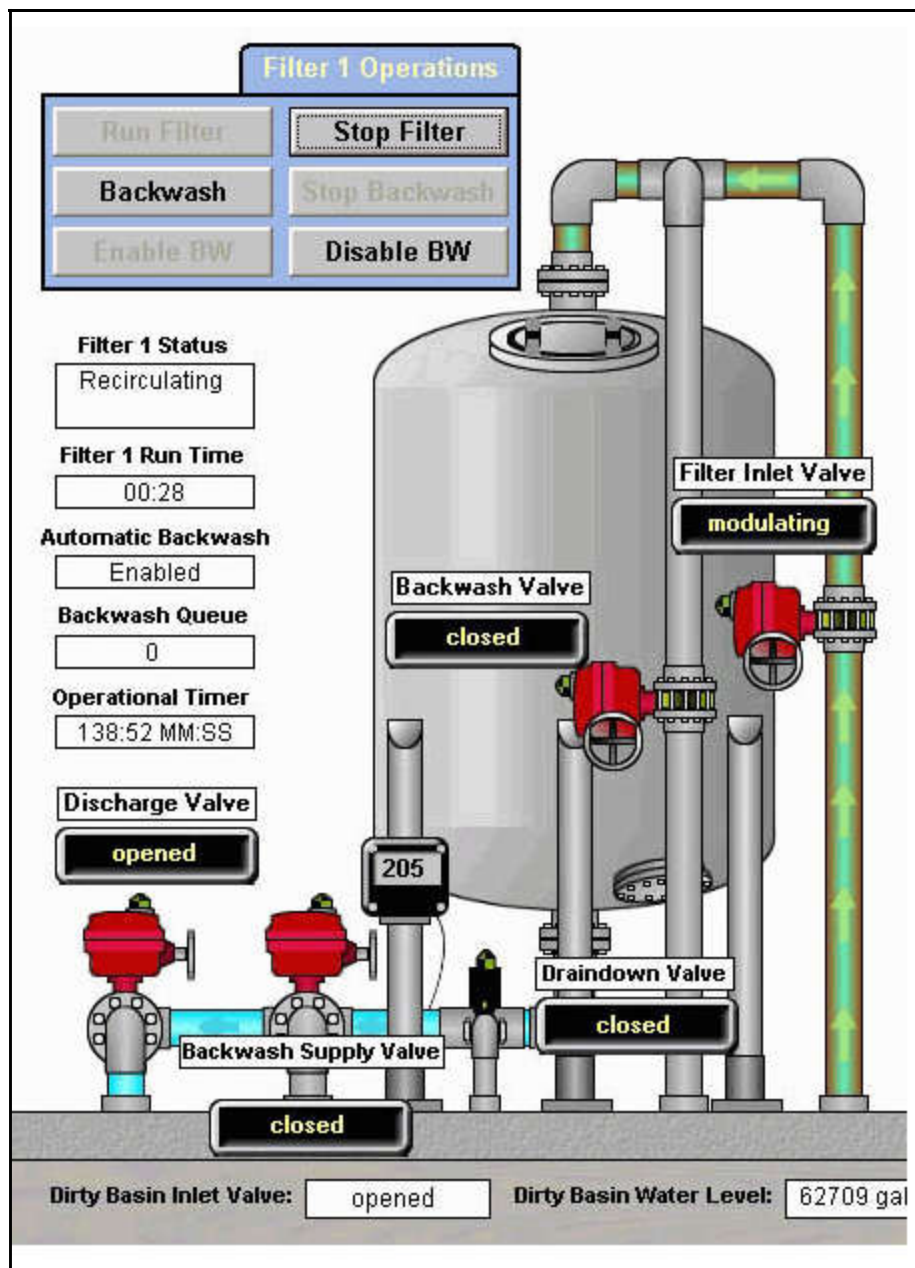


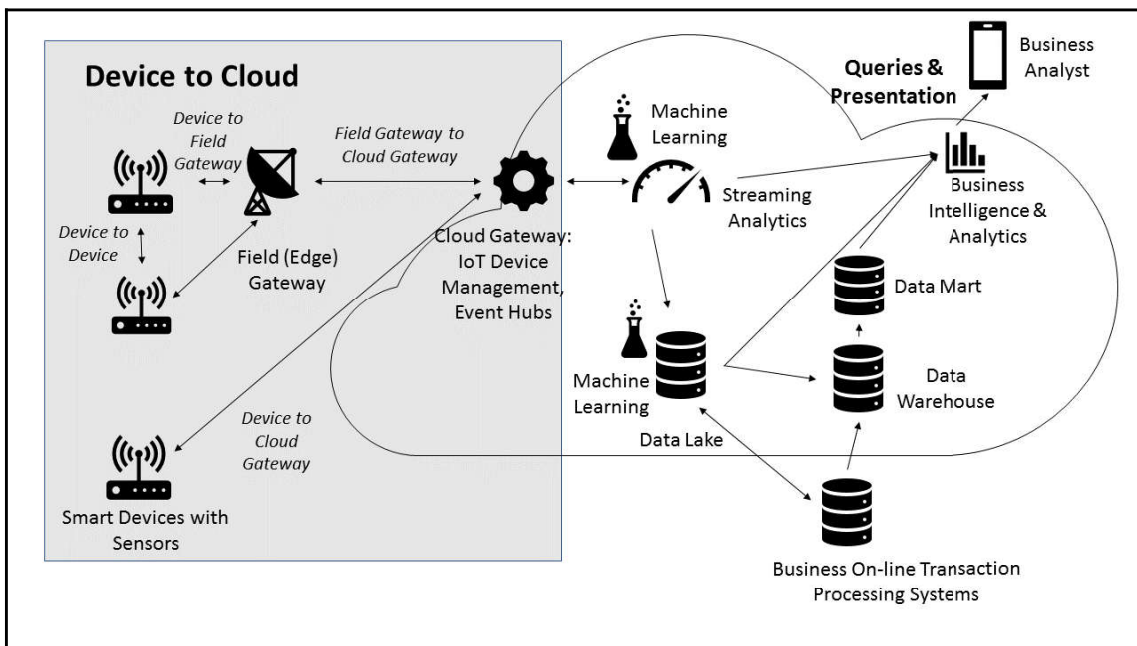
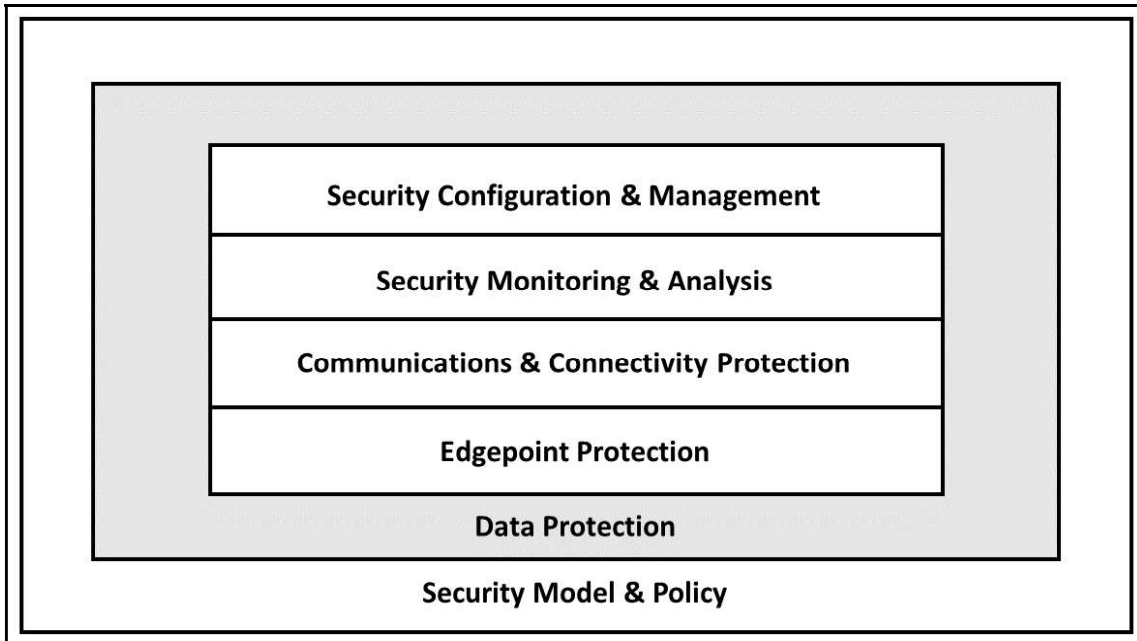




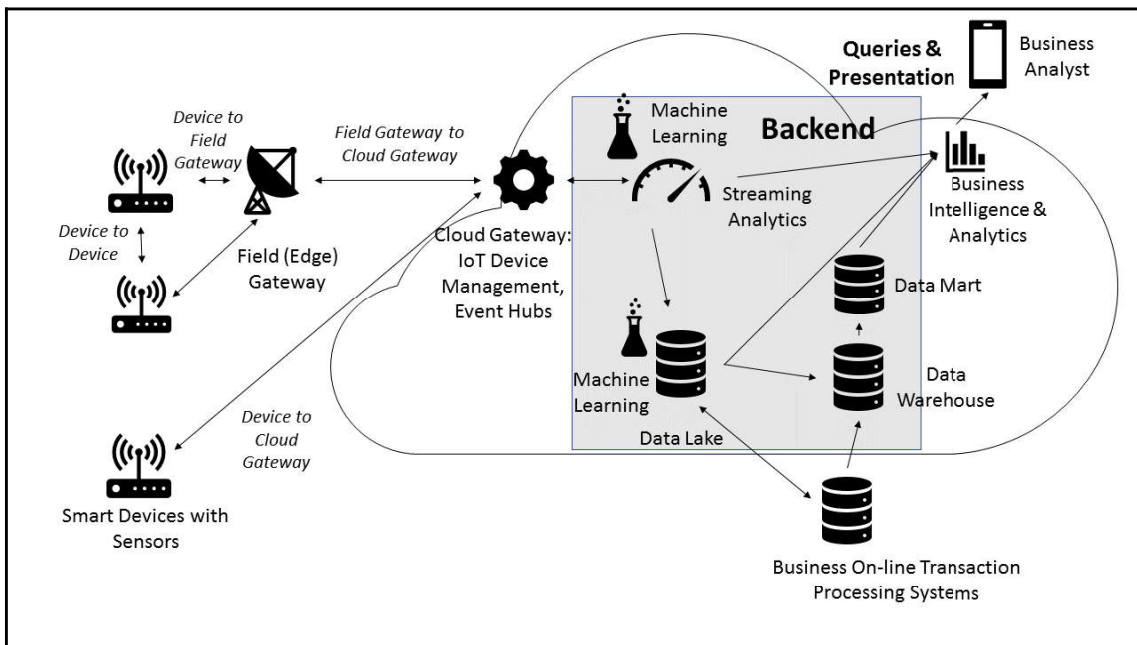
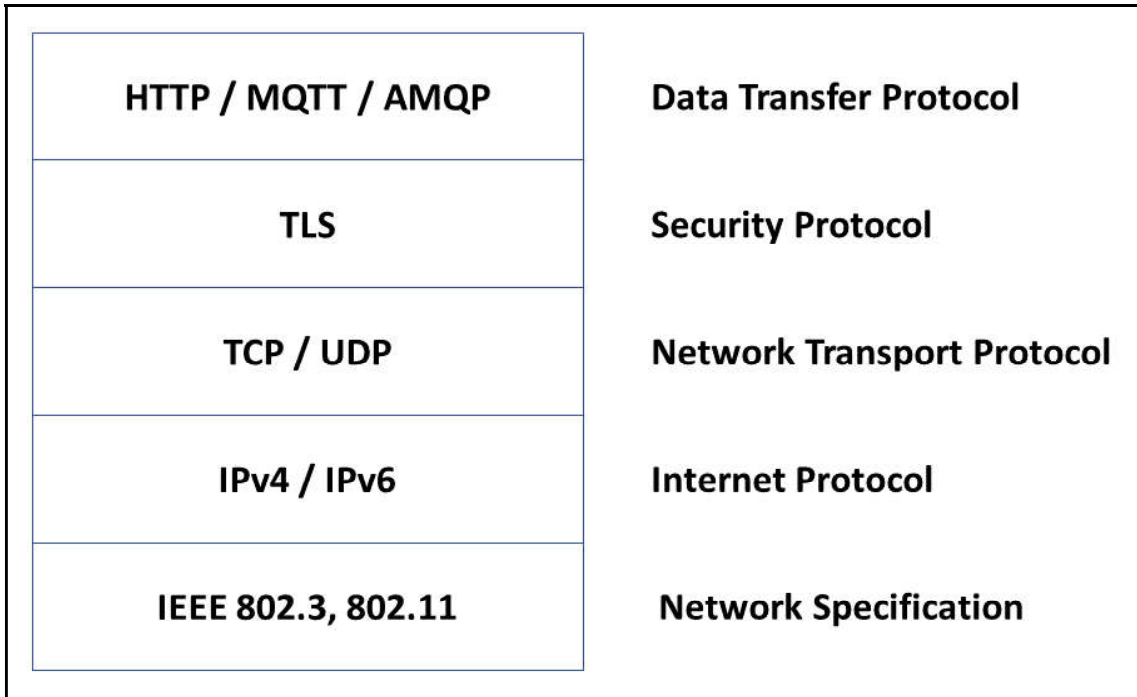


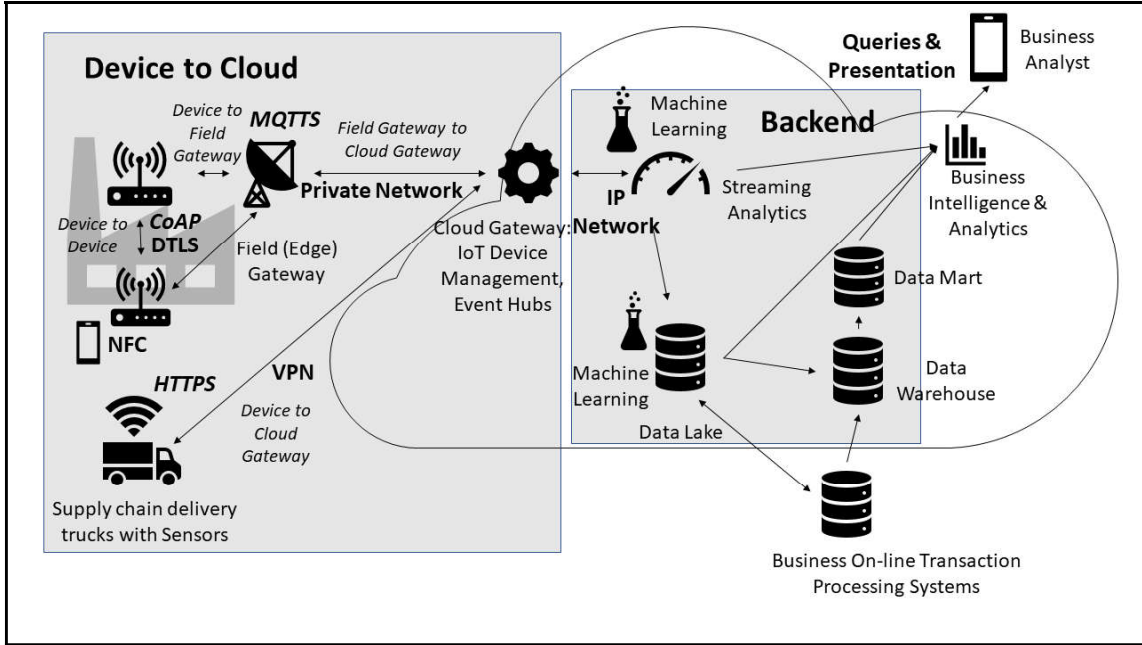
## Chapter 8: Securing the Industrial Internet



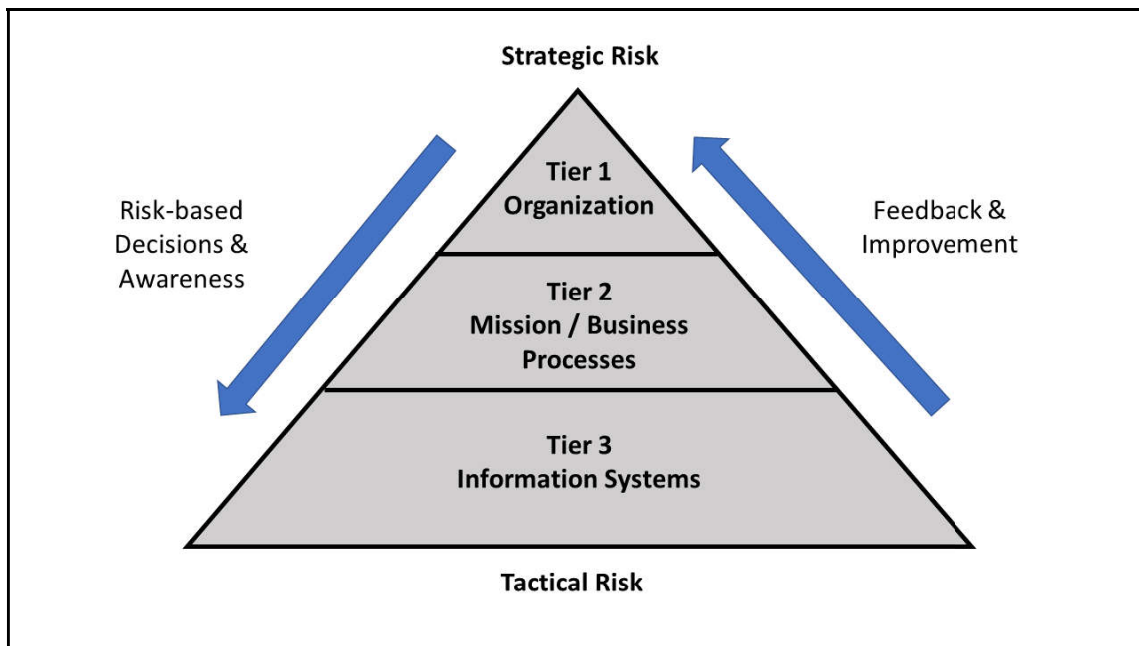


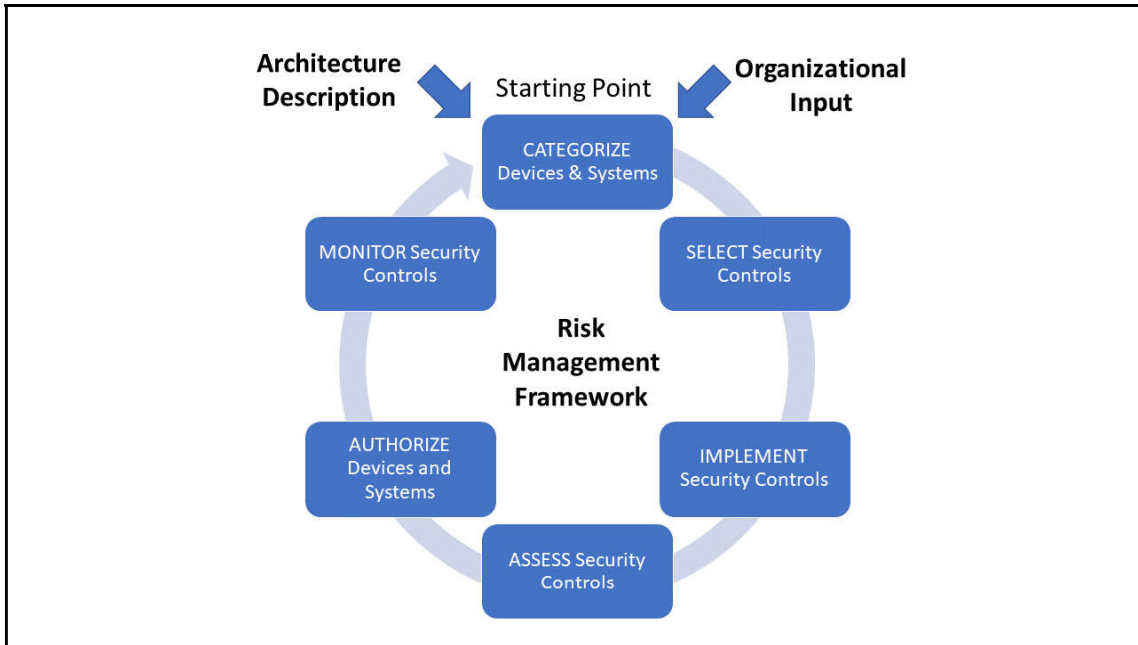
<b>CoAP</b>	<b>Data Transfer Protocol</b>
<b>DTLS</b>	<b>Security Protocol</b>
<b>UDP</b>	<b>Network Transport Protocol</b>
<b>6LoWPAN</b>	<b>Internet Protocol</b>
<b>IEEE 802.15.4e</b>	<b>Network Specification</b>





## Chapter 9: Governance and Assuring Compliance

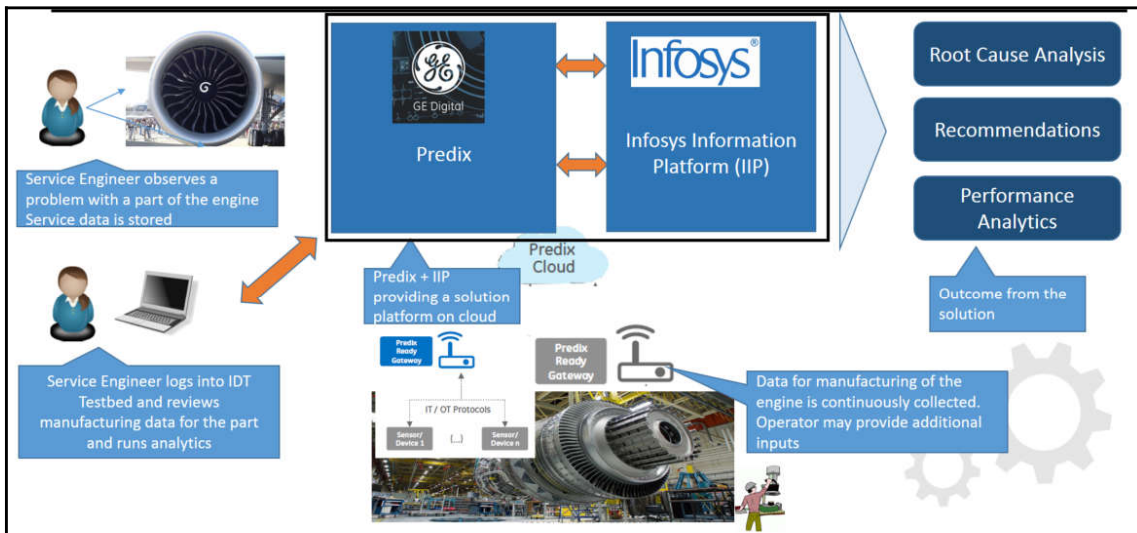
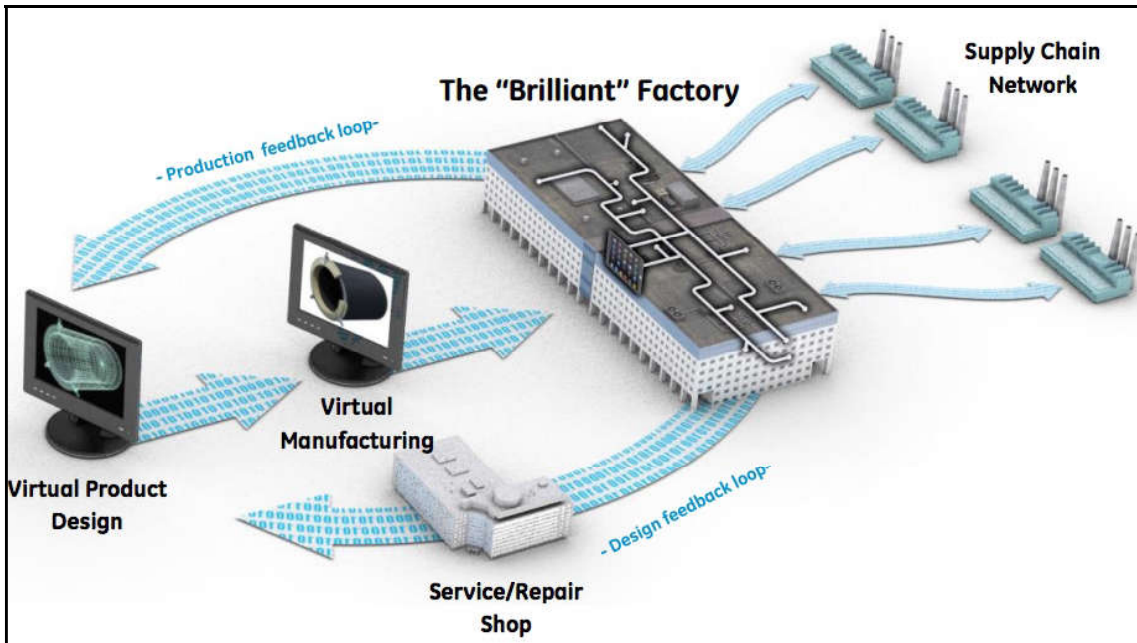


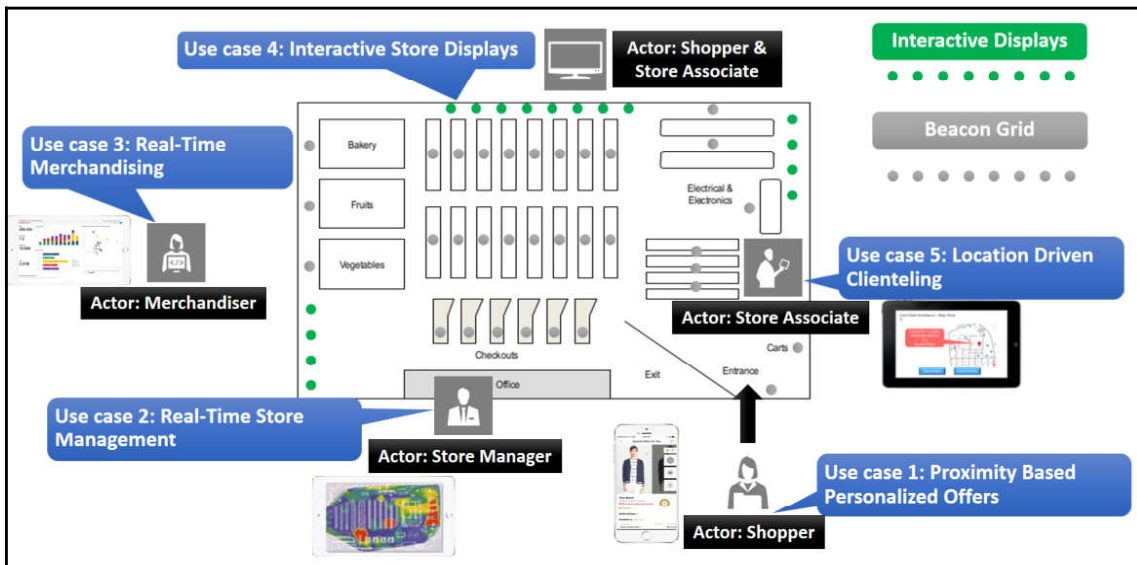
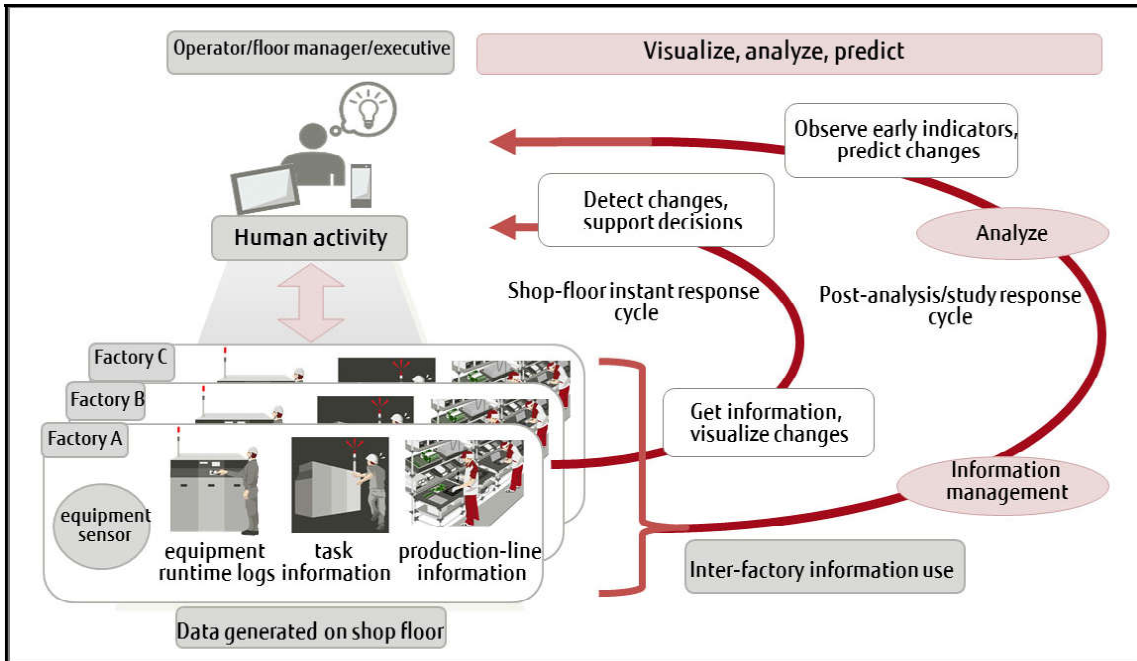




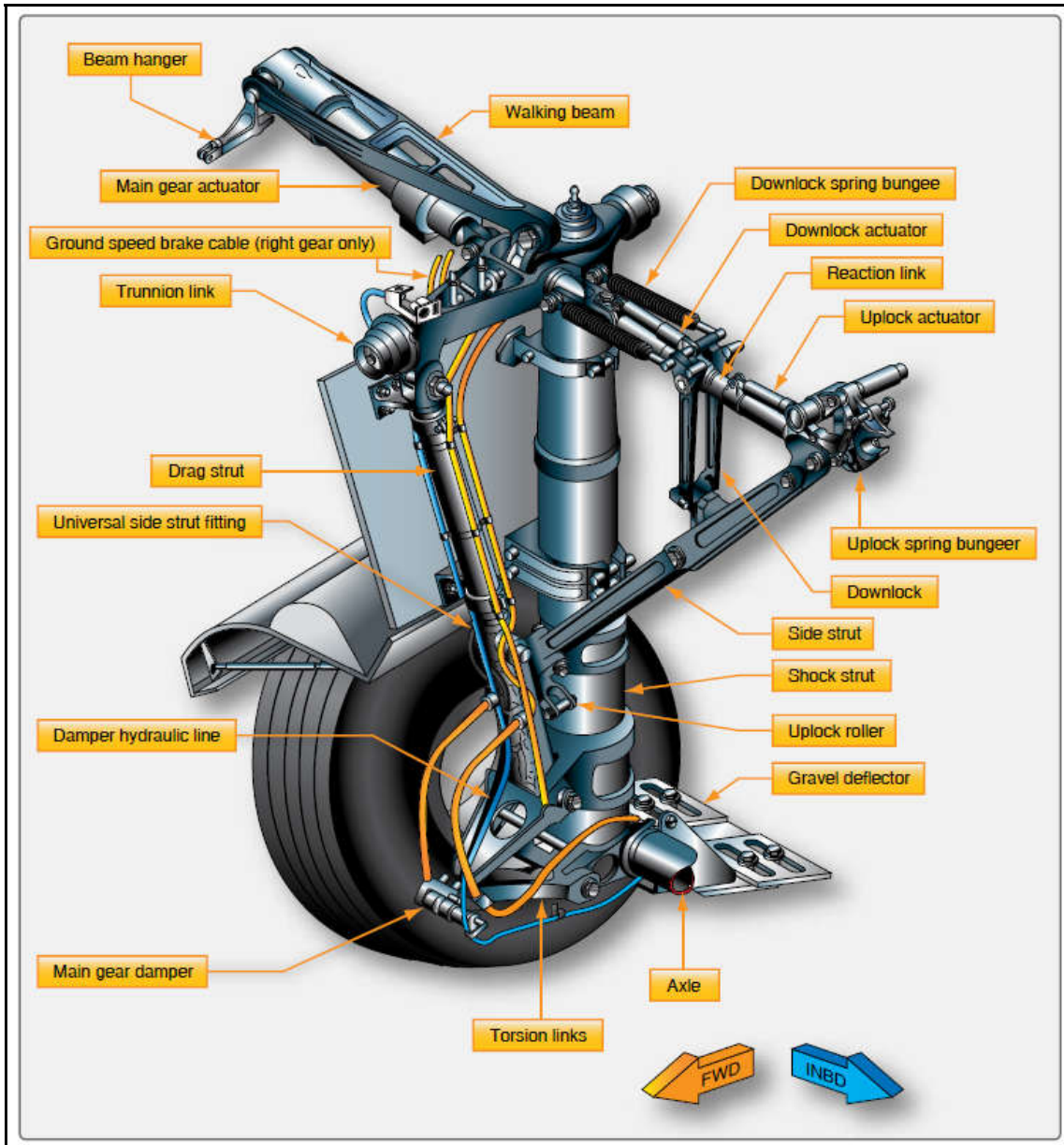


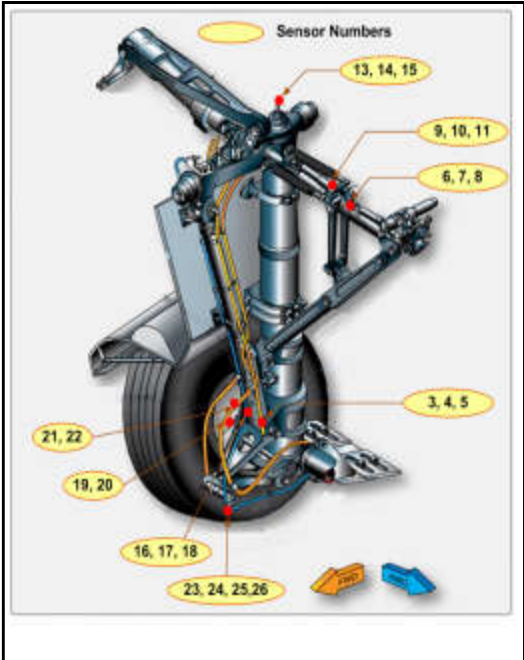
# Chapter 10: Industrial Internet Use Cases in Various Industries



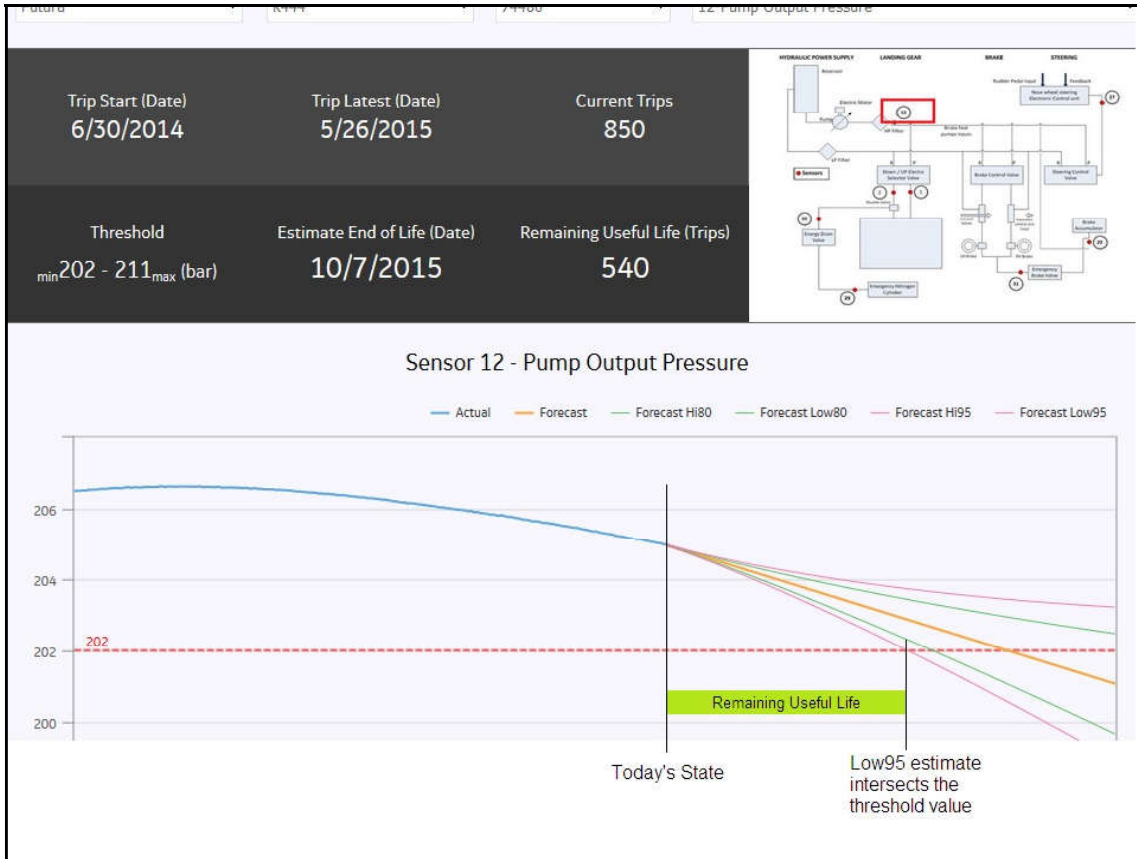


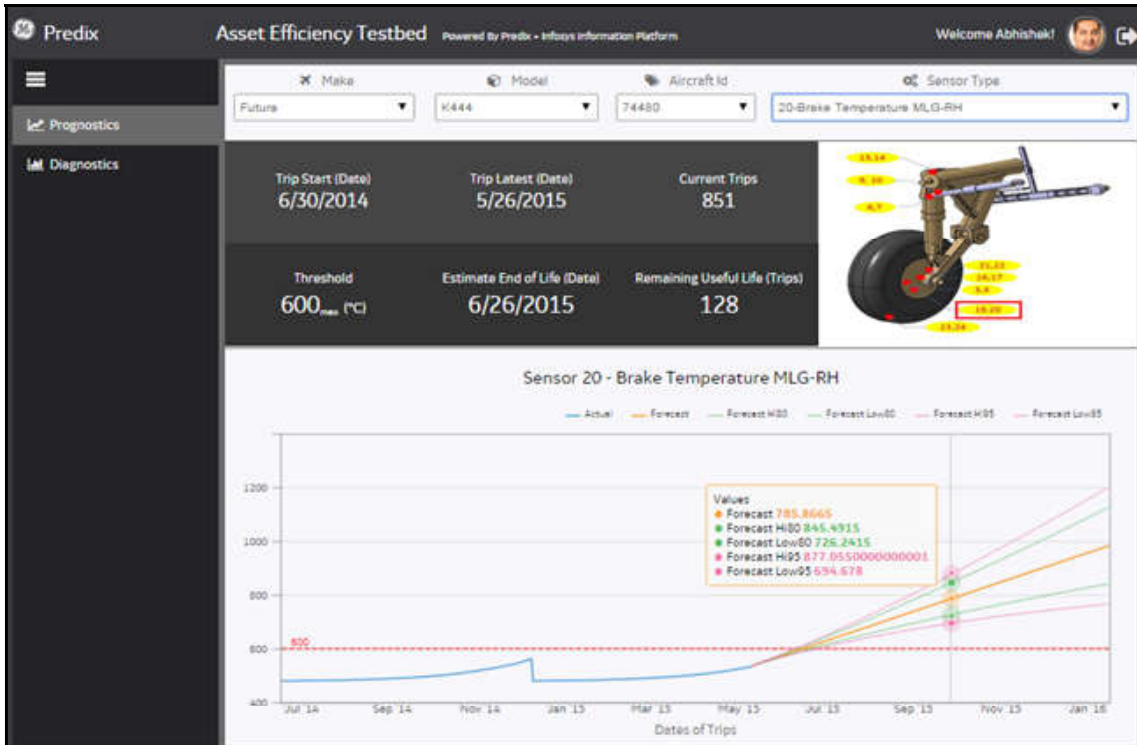




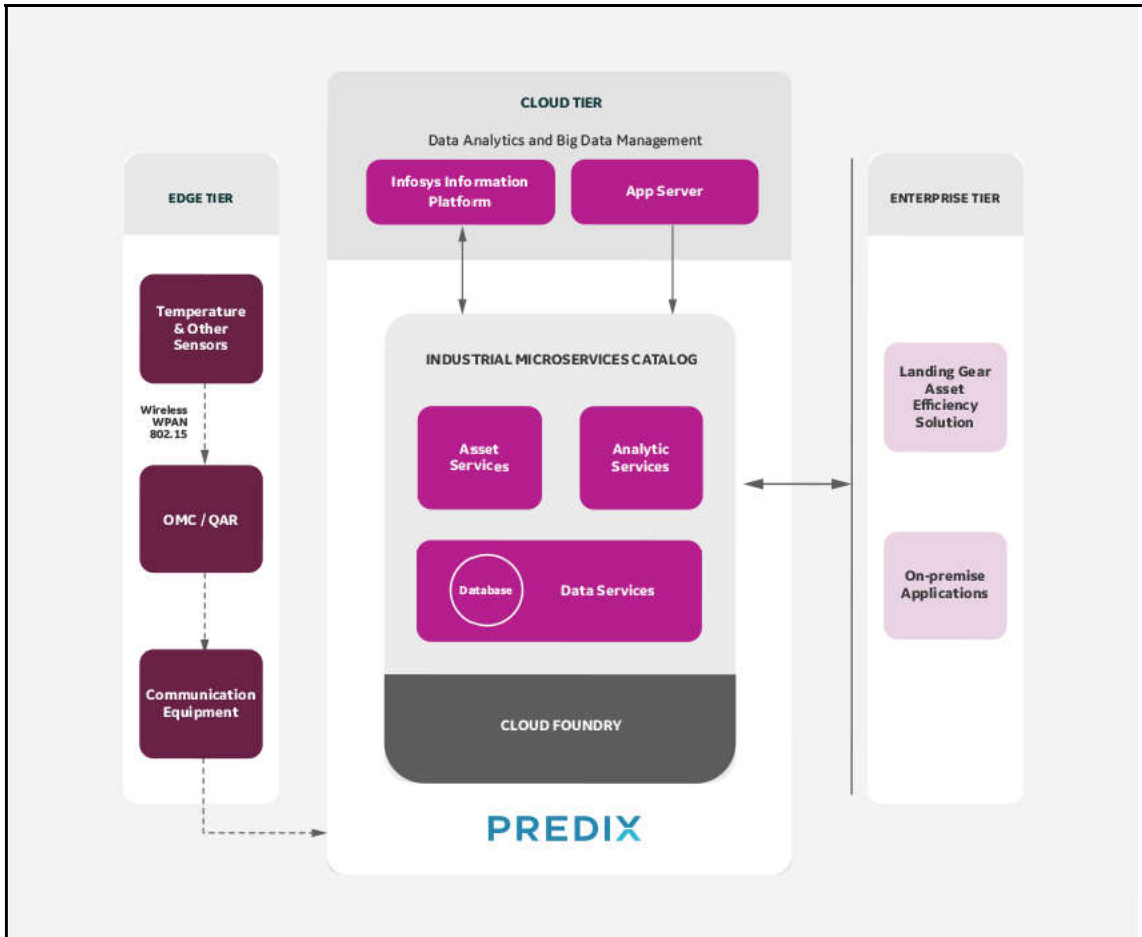


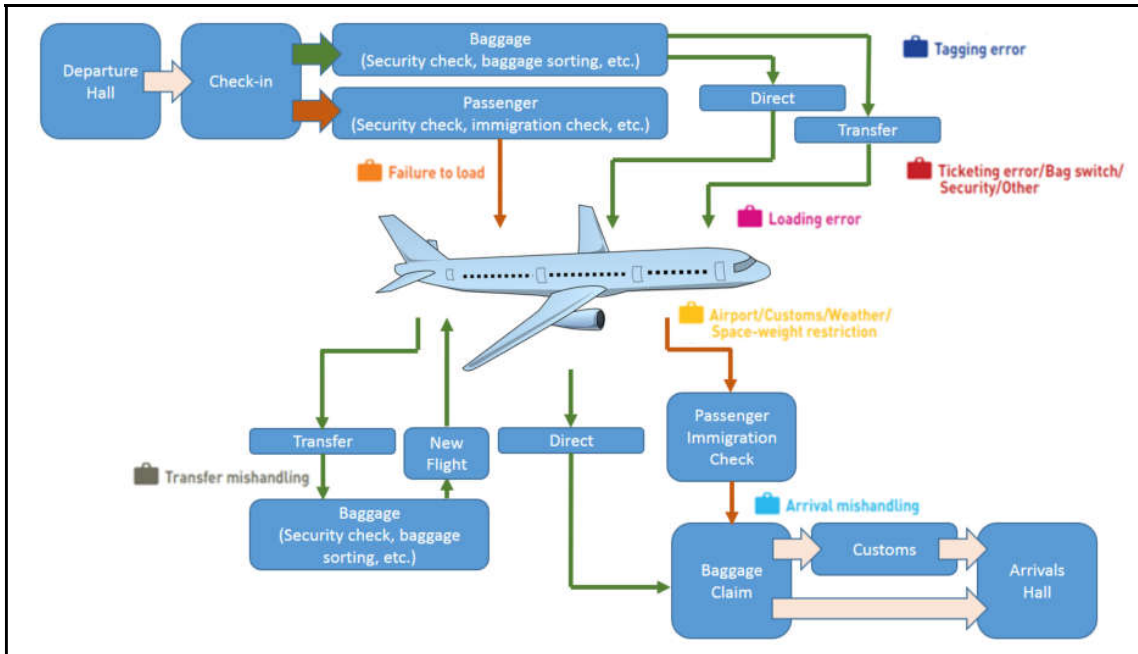




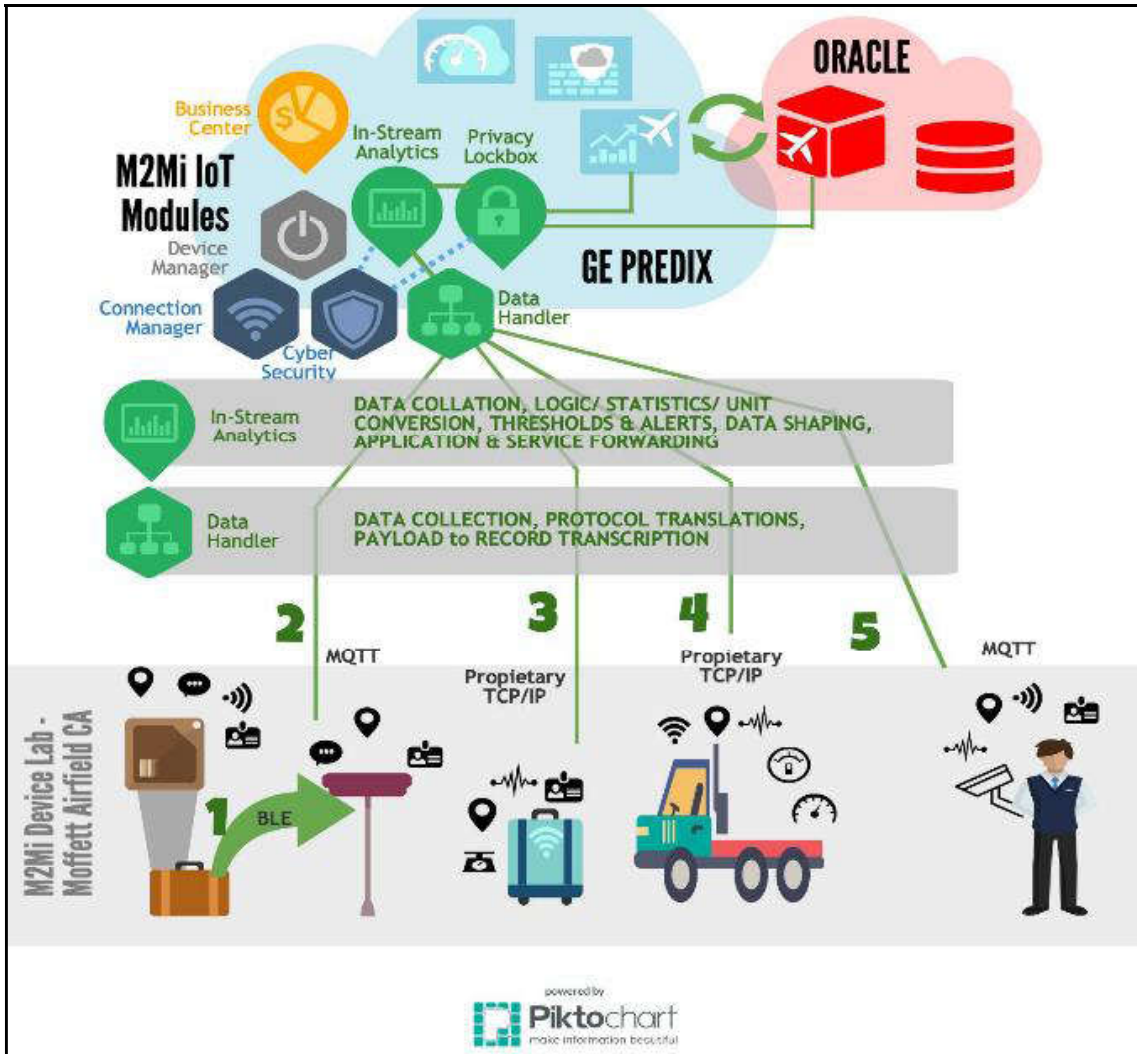


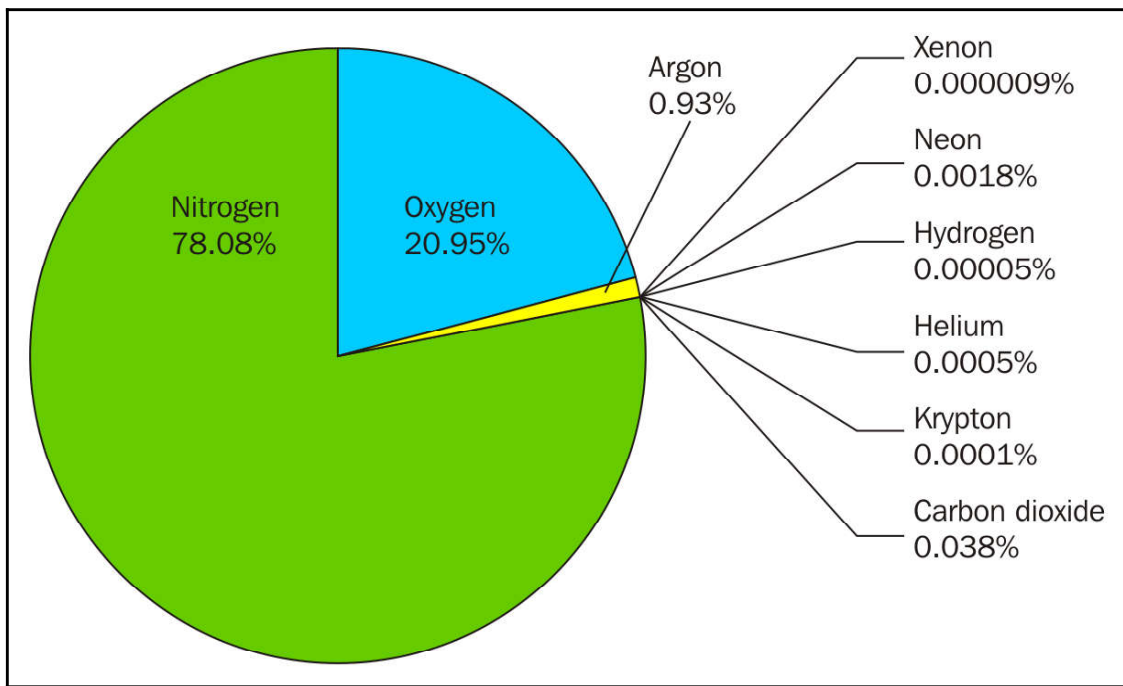
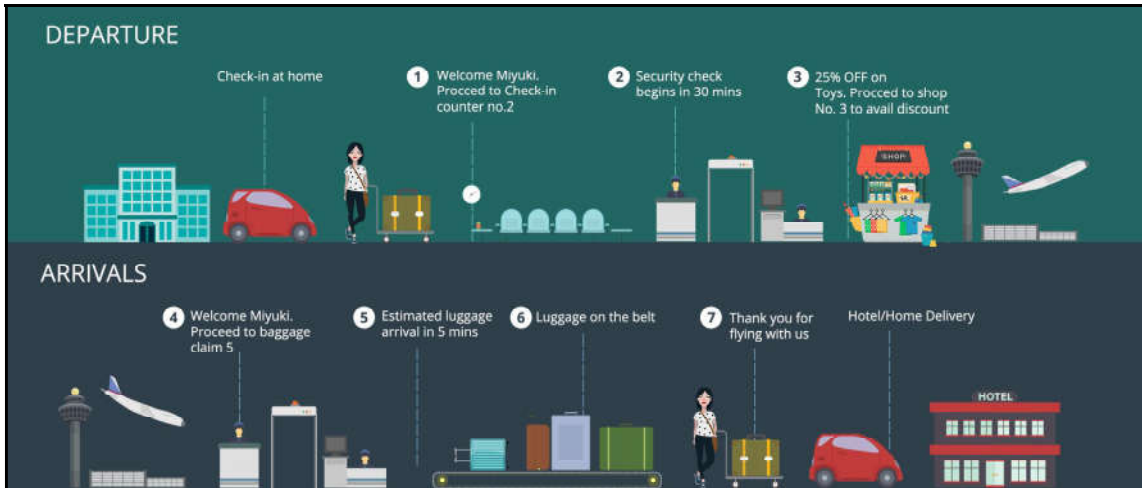


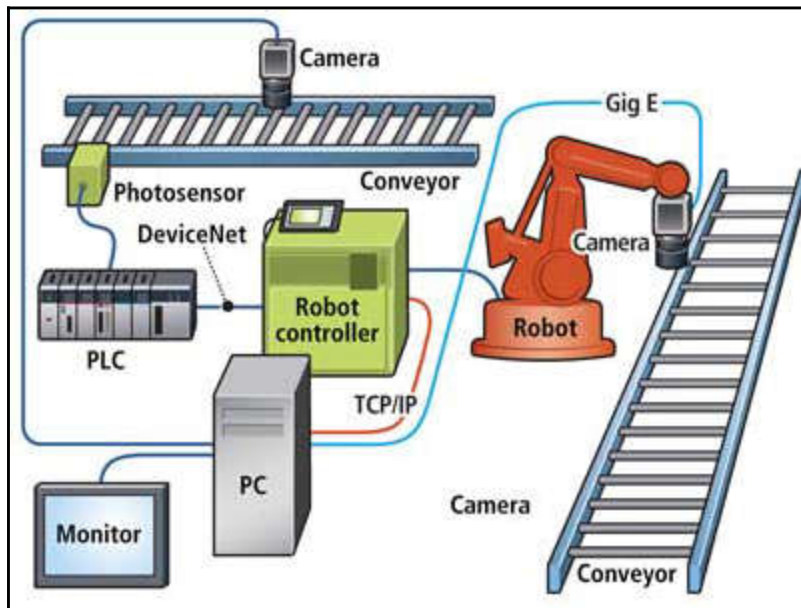
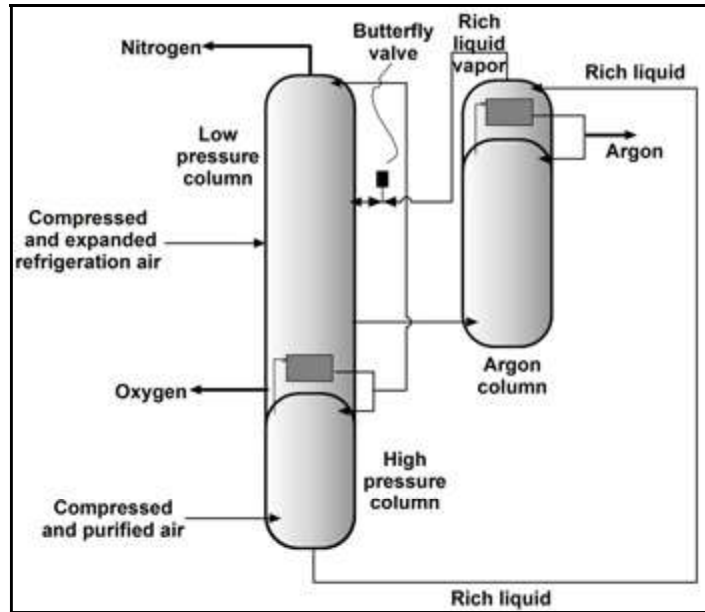




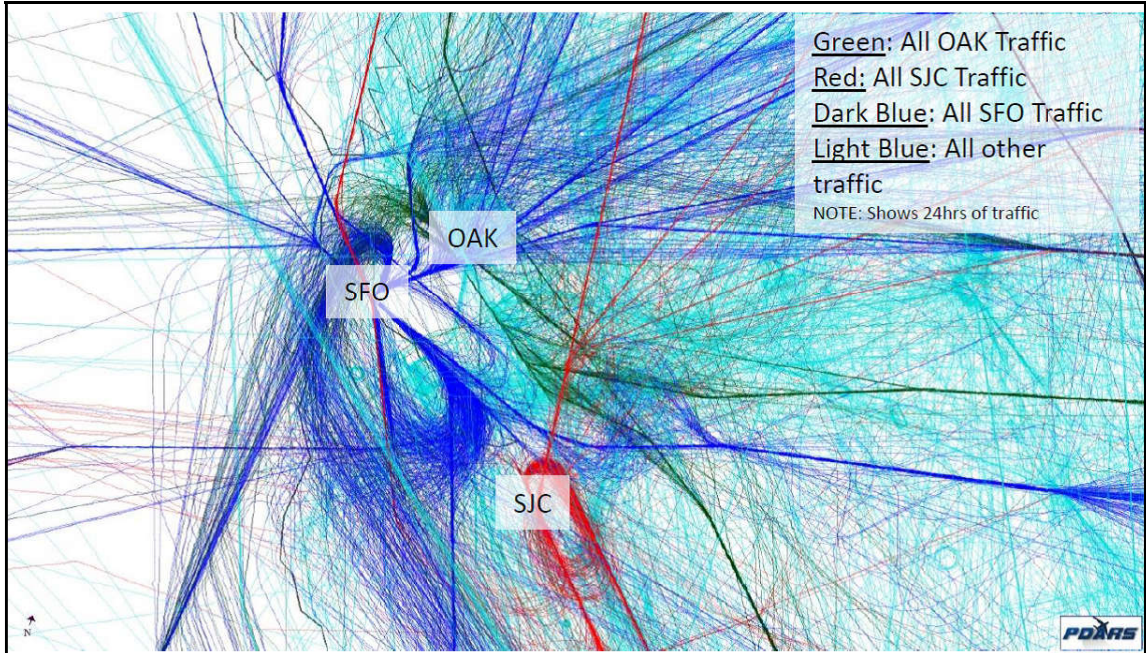


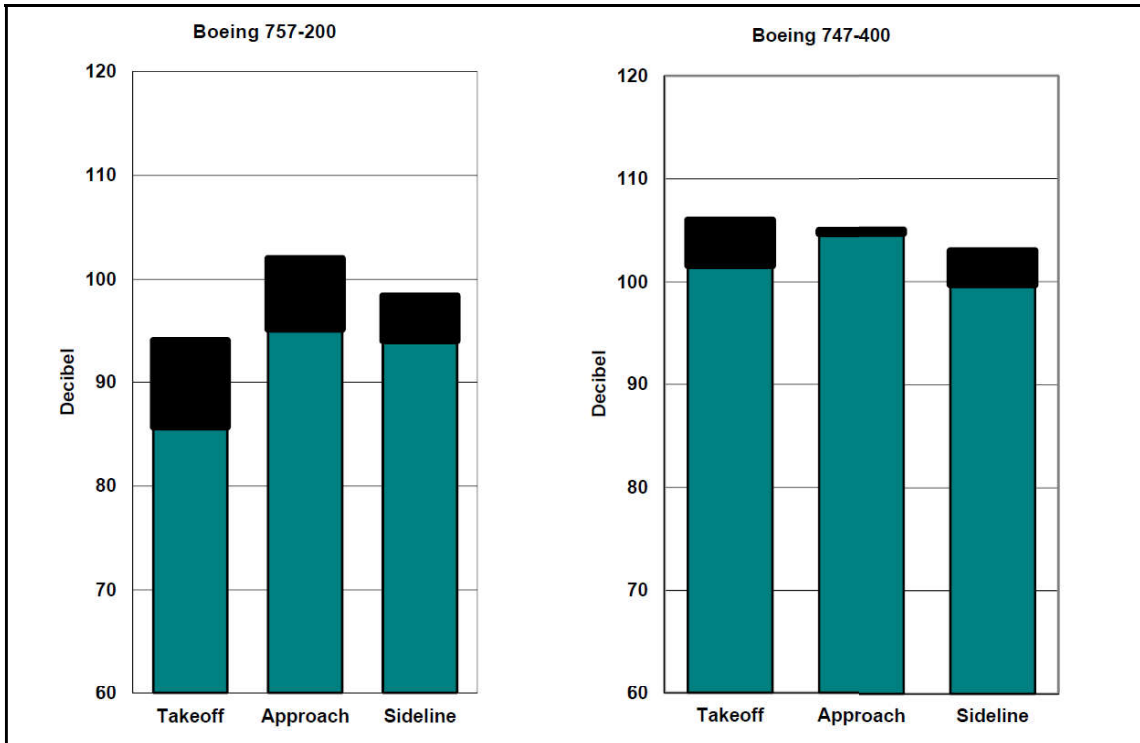






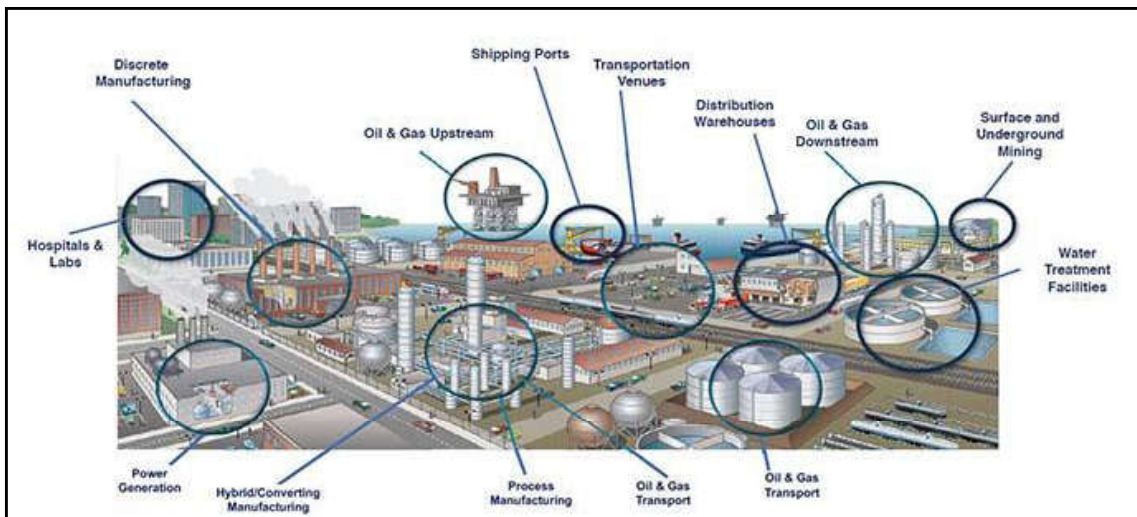
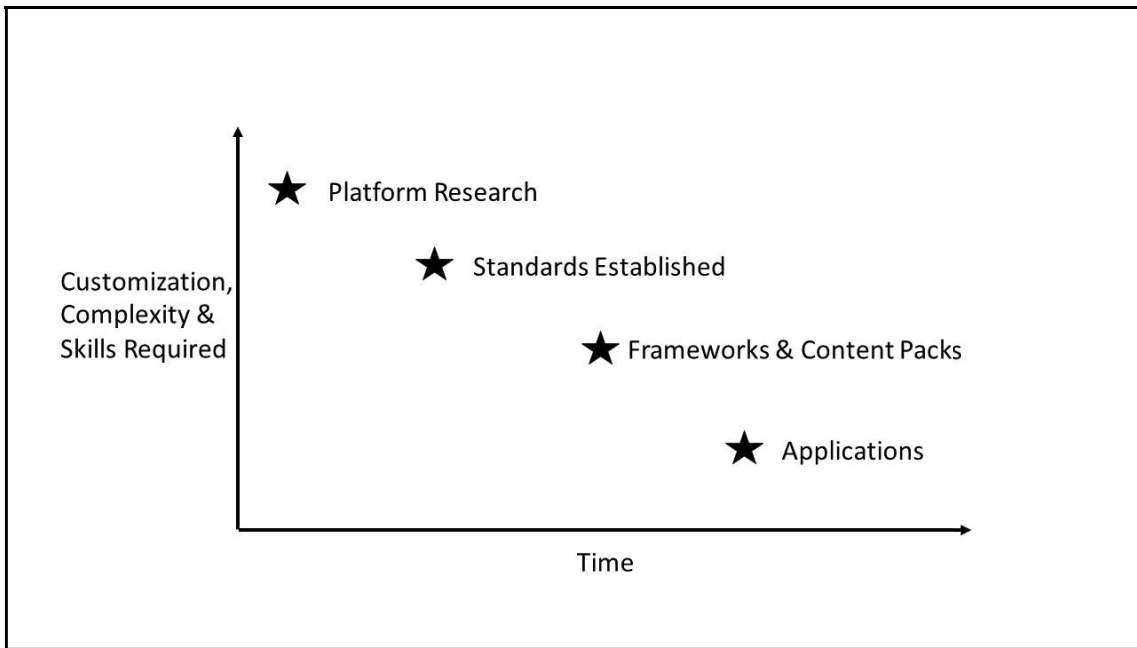


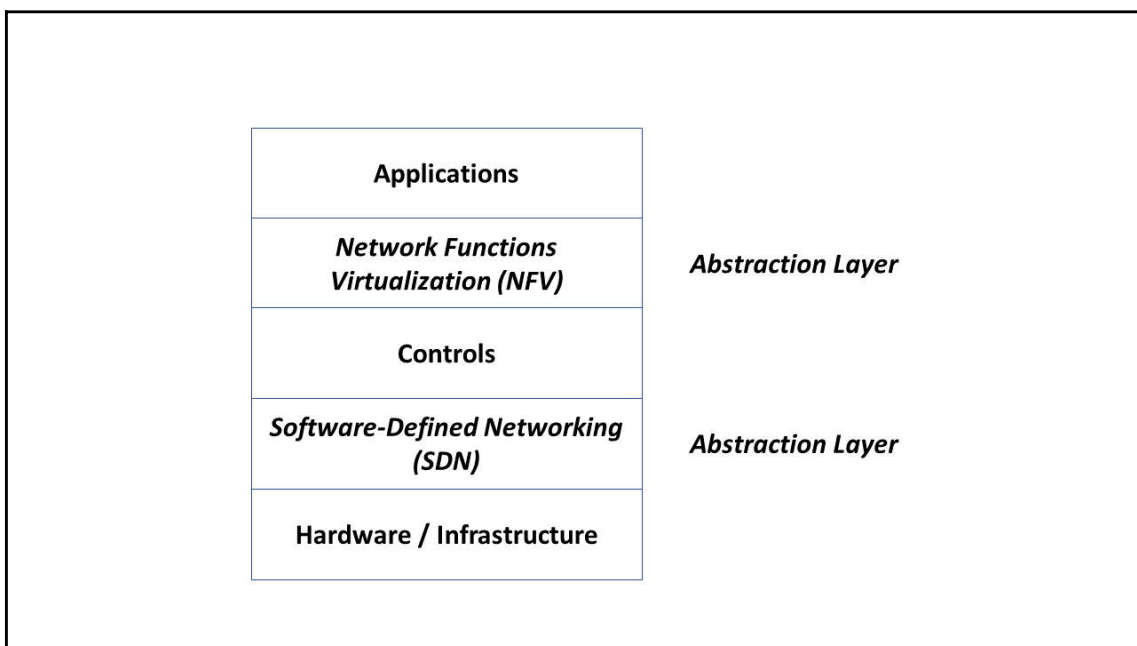
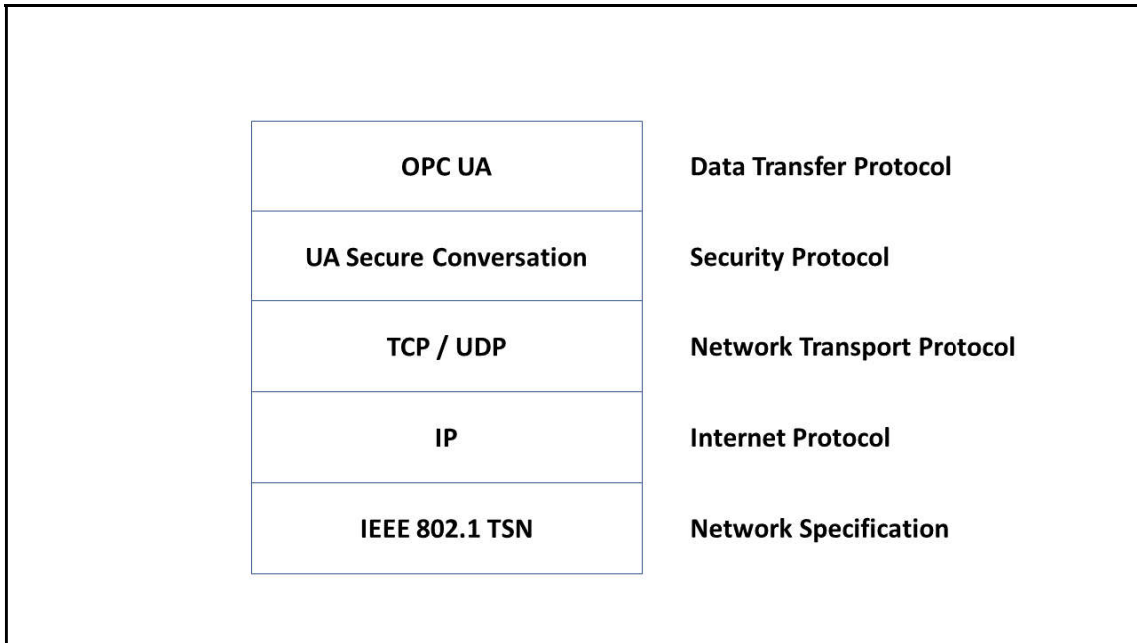


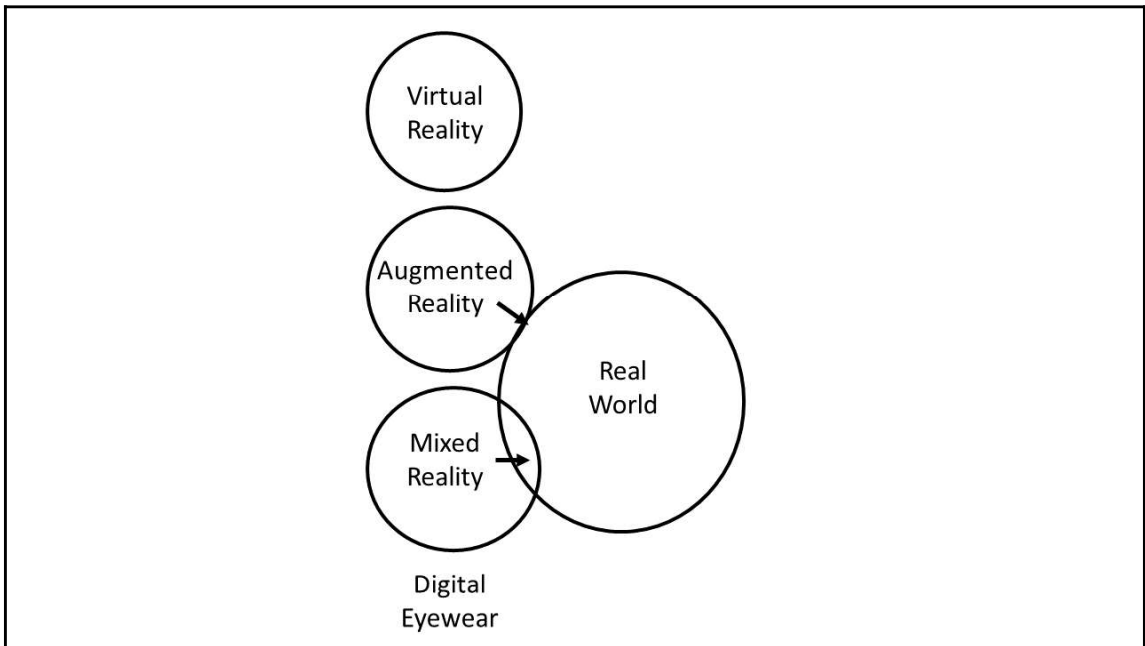
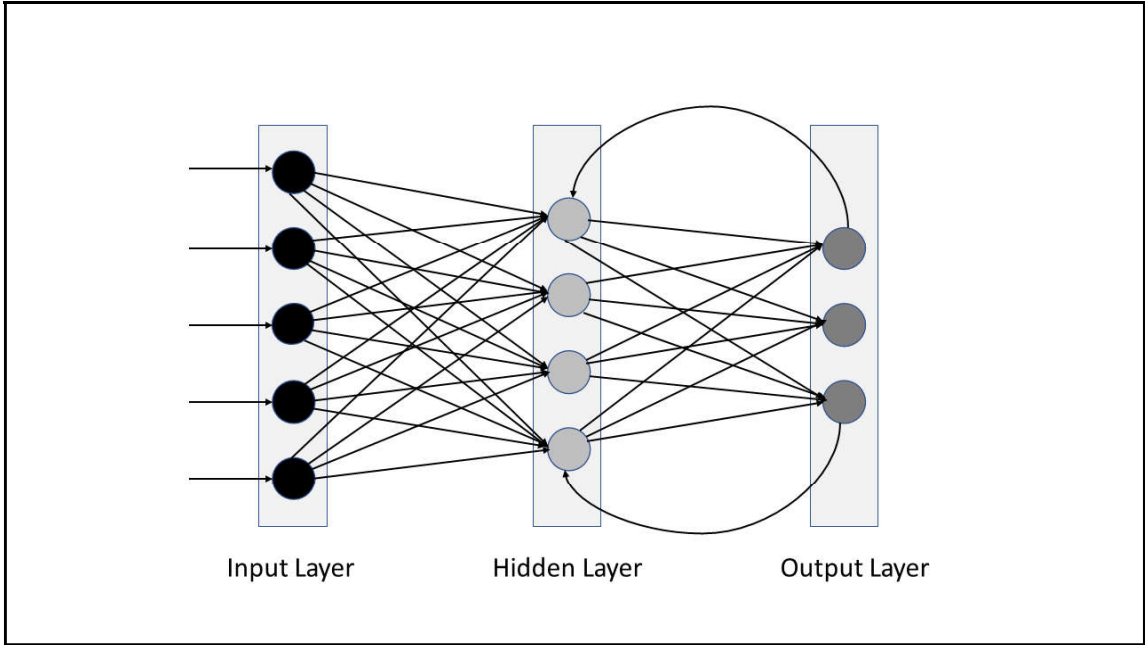




# Chapter 11: A Vision of the Future







### **Challenges**

- Security
- Privacy
- Legacy job loss
- Accountability
- Liability



### **Opportunities**

- New efficiencies
- Cost reduction
- Productivity improvement
- Improved environment
- Improved safety
- New business models
- New jobs and job skills