What is Building informatics?

leveraging information technology, computer science, and related data science technologies → to improve building operation efficiency & user comfort in buildings.
dealing with collecting, managing, and analysing building data → improve building efficiency & user comfort.

What is the target of Smart Building?

user experience, increase productivity, reduce costs, mitigate physical & cybersecurity risks

What most Smart Building system contain?

HVAC, lighting, electrical, drainage & plumbing, alarm, fire safety, security & access control

What is the core of Smart Building?

Adaptability, not reactivity

What are the divers for building progression?

1. Energy & efficiency
2. Longevity
3. Comfort & satisfaction

What is similar and difference between Smart Building and Intelligent Building?

- Similar:
  - Use information technology and data generated by building [Data]
  - Focus on creating **integrated system** interrelates various subsystems → single control frame work [Frame]
- Difference:
  - Smart Building also **includes wider integration** with utilities and city infrastructure to realize smart city （Smart Building 有公共设施和城市基建，实现 Smart city）
  - Smart Building includes use of emerging **machine learning and AI** for advanced control and diagnostics （Smart Building 有 AI 和 ML）
  - Smart Building encompasses the use of emerging IoT, wireless communication, and other related technologies (technologies were not developed when Intelligent building concept was proposed) （Smart Building 会用一些 Intelligent Building 时期未开发的技术）
  - Smart Building considers interaction of users with building and surrounding environment → improve comfort of users apart from building operations.

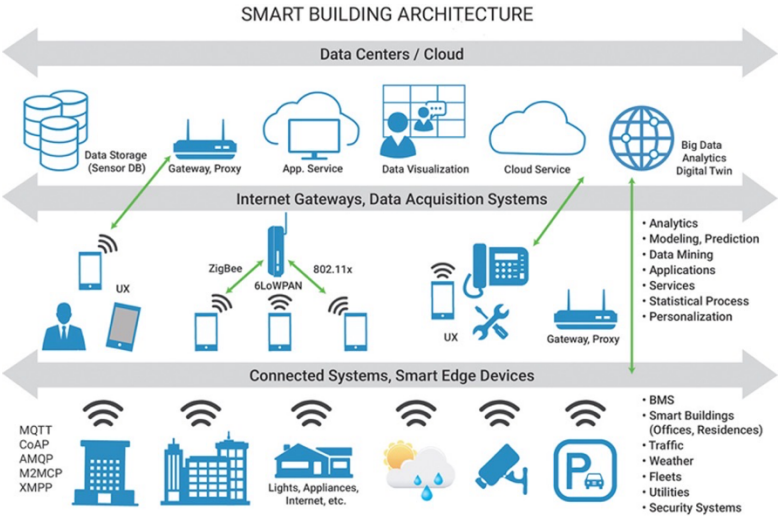
What is characteristic/feature of Smart Building?

Climate Response: buildings to adapt to external climate conditions
Grid Response: buildings to adapt the information coming from grid （电网） → maximize the energy/economic efficiency at district/city scale
User Response: enable a real-time interaction between users and technologies → optimized performance & user comfort
Monitoring and Supervision: enable real-time monitoring of building operations and users' behaviour.

Benefit for using Smart Building?

Lower operation cost
Lower energy cost
More flexibility
Improve user comfort, efficiency, wellbeing

Smart Building Framework? And explain the layers.



What aspect to analyse Smart building framework?

Different systems/devices within the smart buildings
Different technologies used within the smart buildings
Different use cases/features supported within the smart building

What is Smart Building underlying system?

Building automation system

What technology does BAS use?

AI, IT, IoT, Big Data, modern control…

What is the major component of BAS?

Sensor, controller, actuator, computer & server, software, network

What are BAS typical functions?

HVAC control, lighting control, Fire detection & alarm, Security & access control, Lift control, Utility management interface

What is popular Smart Building popular certification? And what is important to consider in this certification?

Smart Building collective
Consider how the building data is utilized

How many certifications in Smart Building collective? And what are they?

4, Platinum; Gold; Silver; Bronze

What themes in Smart Building collective?

1) Building usage
2) Building performance
3) Building environment
4) Health, Safety, Security
5) User Behavior & collaboration
6) Interactive design & Connectivity

What certification HK apply? And describe what characteristic of building?

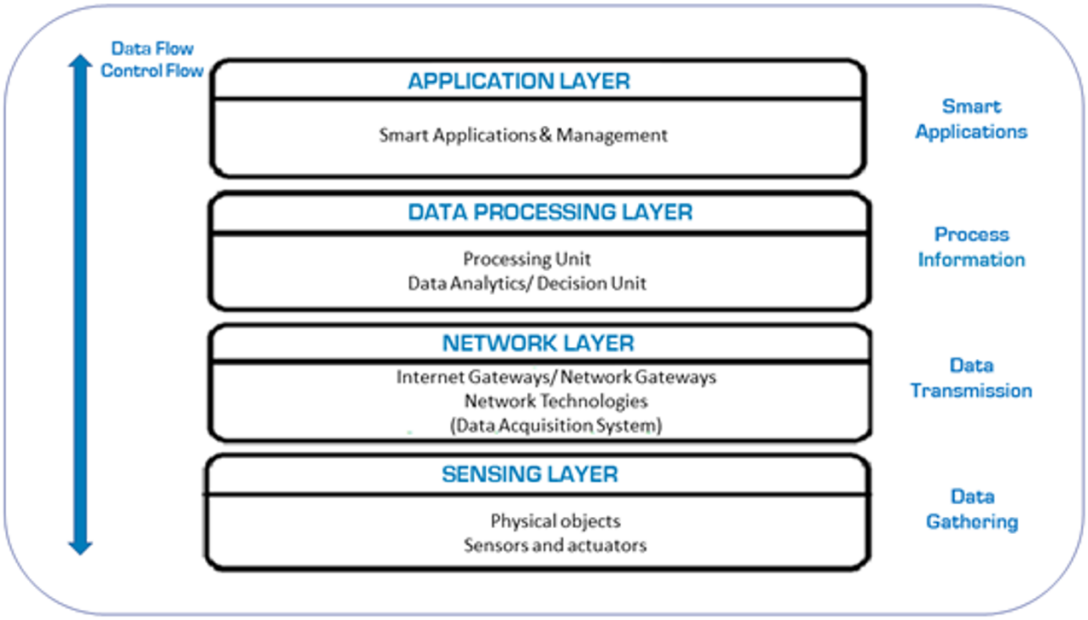
Beam Plus, characteristic: New building, existing building, neighbourhood, interior, data centre, existing school

What are the challenges of Smart Building?

Limited interoperability – due to heterogeneity
Limited integration across system and technology
Complex dependency of different systems
Lack standard
Large scale of devices and data

Security & Privacy

What is IoT structure?



What benefit IoT have?

Save time & energy
Efficient utilisation & monitoring
Enhance real-time data use
Reduce human effort
Security & Efficiency
Get new analytic insights
Create new business opportunities

Challenges for IoT?

Heterogeneity
Integration of device
Lack of standardised protocols
Scalability
Remote device management & diagnostic
Network concern
Energy concern
Reliability concern
Privacy and Security

Solve IoT challenges?

Interoperability of devices and system
Low-cost and low-power sensing
Low-cost and high-rate networking
Cloud/edge computing
New security and privacy solution
AI ML to get new business insight

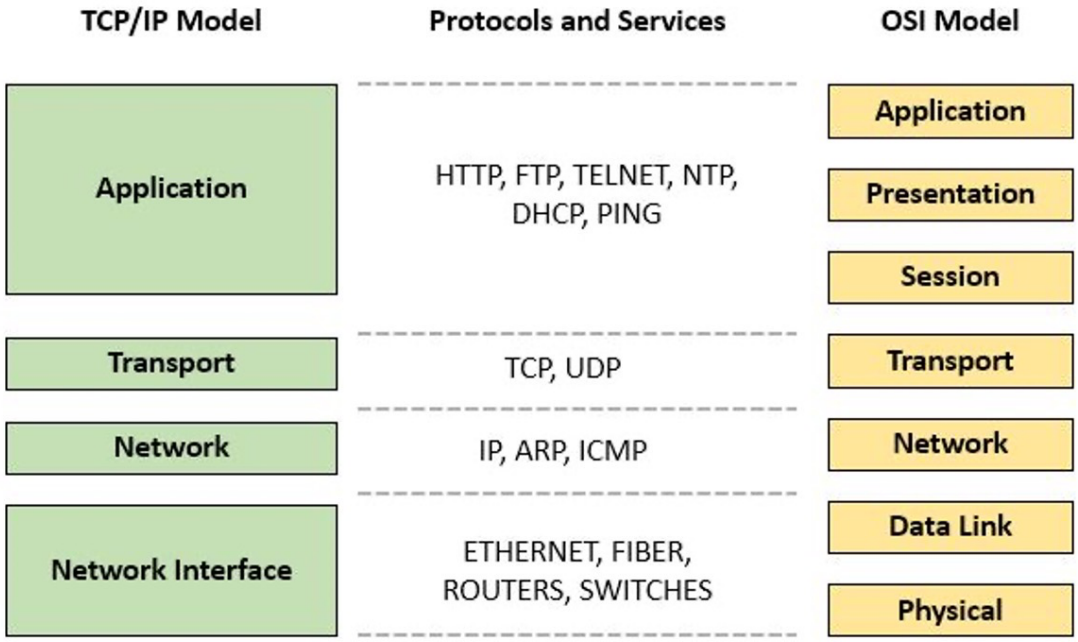
What standard does OSI model coordinate?

[ISO] standards

What Layer in OSI model use protocols and what these protocols are?

Transport layer [transmit data]
TCP & UCP

What the differences between TCP/IP and OSI model? Sketch it.



What communication medium use in IoT, is it same as protocols in IoT?

Yes, communication medium is same as protocols
Wire: BACnet, KNX, Ethernet, DALI, LonWork
Wireless: WiFi, 3G/4G/5G, Bluetooth, NBIoT, ZigBee, 6LoWPAN

What differences between wire and wireless protocols?

PARAMETER	WIRED	WIRELESS
Communication Medium	Copper, Fiber etc.	Air
Standard	IEEE 802.3	802.11 family
Mobility and Roaming	Limited	Higher
Security	High	Lower than Wired. Also easy to hack
Speed / Bandwidth	High Speed upto 1 Gbps	Lower speed than Wired Network.
Access to Network	Physical Access Required	Proximity Required
Delay	Low	High
Reliability	High	Lower than Wired
Flexibility to change	Less flexible to changes	More flexible configuration
Working principle	CSMA/CD, operates by detecting the occurrence of a collision.	CSMA/CA , hence reduces possibility of collision be avoiding collision from happening
Interference and Fluctuations vulnerability	Very Less	High
Installation activity	Cumbersome and manpower intensive	Less labor intensive and easy
Installation Time	Takes longer time to perform	Very less deployment time
Dedicated / Shared Connection	Dedicated	Shared
Installation Cost	High	Low
Maintenance (Upgrade) cost	High	Low
Related equipment	Router, Switch , Hub	Wireless Router, Access Point
Benefits	• Greater Speed • Higher noise immunity • Highly reliable • Greater Security	• No Hassles of Cable • Best for mobile devices • Greater mobility • Easy installation and management
		https://ipwithease.com

IoT solution for Smart Building?

Localization for occupants and resource tracking
Occupants' safety and health security
Building health control
Resource management
Energy management
Facility management
Indoor comfort enhancement

What are Big Data Features?

5V's
Velocity
Veracity
Variety
Volume
Value (Not all big data have it)

Big Data Challenges?

Data processing: Data mining & cleansing; Data acquiring & warehousing; Data aggregation

& integration; Data analysis and modelling; Data interpretation
Data management: Cost & Operation cost; Data governess; Data and information sharing; Data ownership; Privacy & security

Great Cloud Bottleneck? And drawbacks

Bottleneck: cannot apply in IoT
Drawbacks: High cost; High response time (delay); Bandwidth congestion; Limited scalability; Privacy leakage

What does Edge computing do?

Push computation, storage, and other services close to the data sources

What is the component of Edge computing?

Local devices
Localize data centre
Regional data centre

What is Edge computing function?

Caching
Storage
Processing
Decision making
Security

What is benefit to edge computing?

Low cost
Interoperability of old and new systems
Fast response
Reliable system (intermittent Connectivity)
Security & Compliance

What is Edge network platform features?

On-demand services
Wide access to the network
Pooling resources
Rapid elastically
Measured services

What challenges of Edge network?

Heterogenetic
Resource-constraint
Dynamic network & intermittent connection failure
Sharing & management distributed network
Large scale of divices
Security