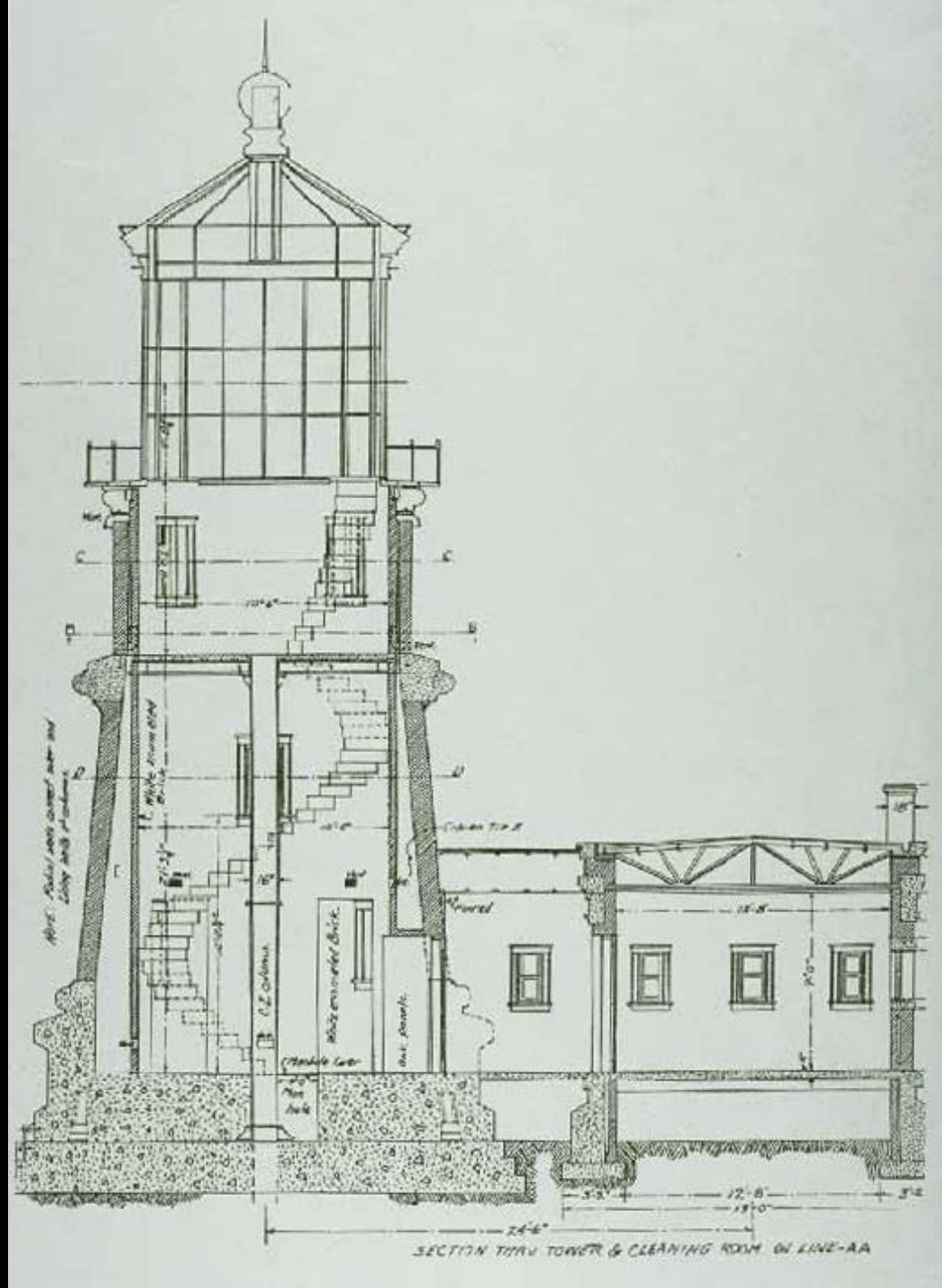
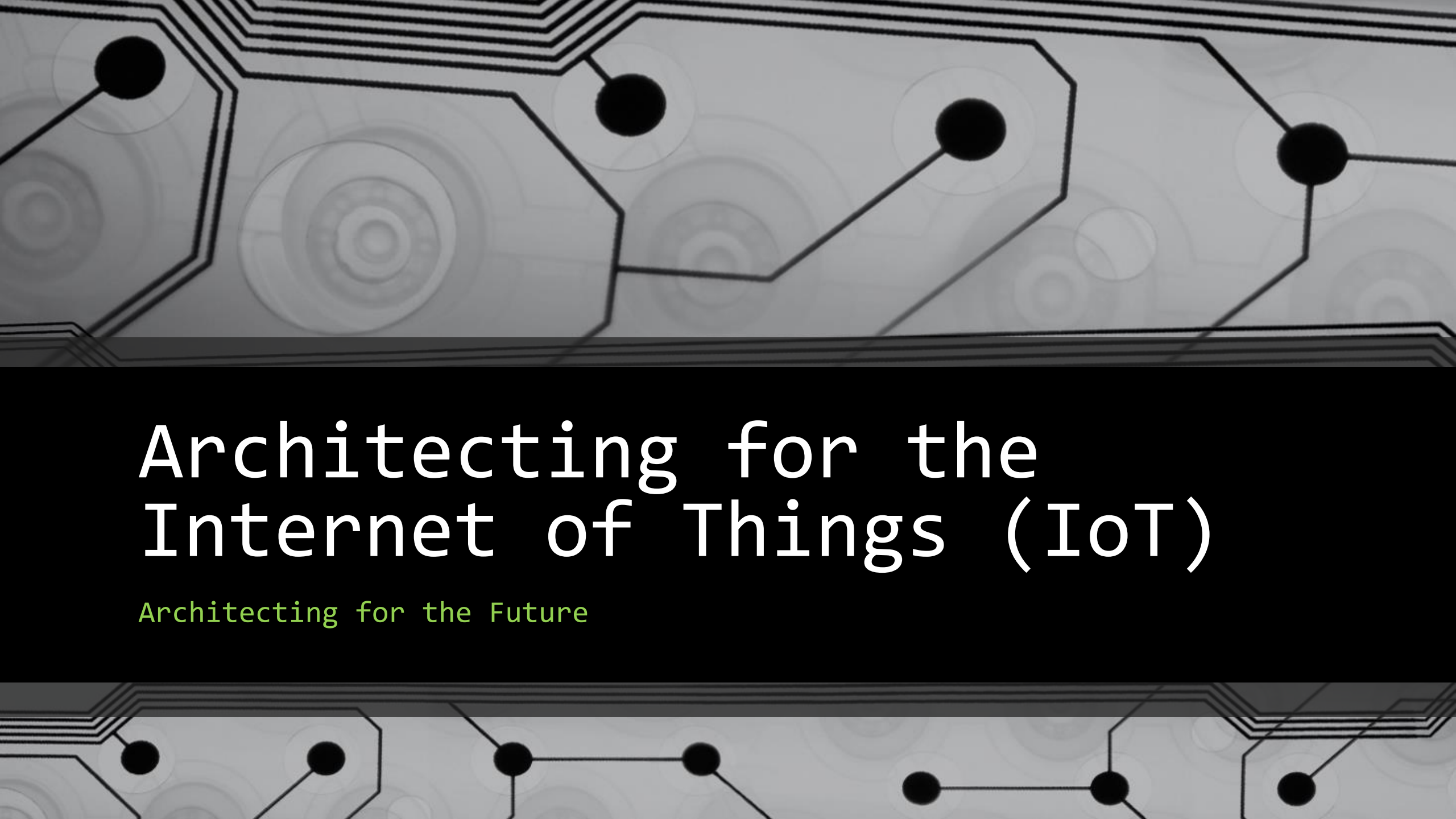
Software Architecture & Design





Architecting for the Internet of Things (IoT)

Architecting for the Future

Contents

- Introduction
- The Internet of Things
- Discussion & Q&A

Internet of Things

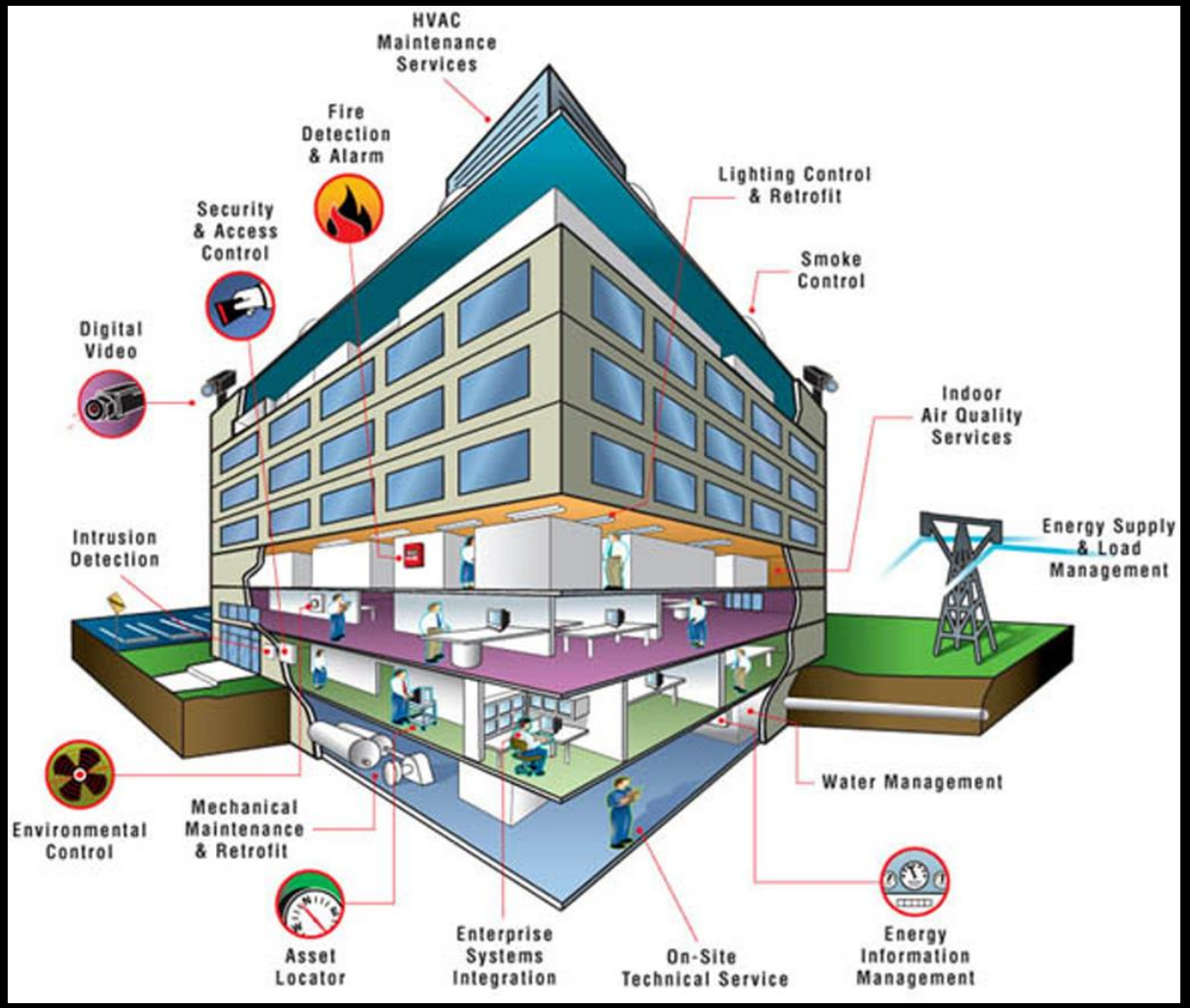
Architecting for the Internet of Things

IoT Characteristics

- Large number of simple, inexpensive devices
  - Network connected
  - Edge-Connect enabled
- Produce low-level statistical data
  - E.g. Temperature, Humidity, Windspeed, Direction
- Sufficient data volume delivers statistical relevance
  - Pattern Determination
  - Identify anomalies
- Intelligence at the Edge (Smart Devices)
  - e.g. Gait Analysis by Video Cameras
  - e.g. License plate recognition
- Metering
  - Remotely Controlled

Smart Buildings

- Discrete event sources correlated & command-control
  - Provides ‘richer’ information
  - e.g.
    - Lighting motion sensors & HVAC
    - Lighting motion sensors & Intrusion systems
    - Fire Alarm systems & access-control systems



Source: https://www.researchgate.net/figure/Typical-application-for-BMS-SBMS_fig1_283545366

Managing IoT

- Systems Management
  - Management of devices on your IoT platform (e.g. provisioning, configuration)
  - Security (Authentication & Authorization)
- Messaging
  - Handling events at scale
  - Event routing
- Input streams
  - Correlation with external systems (e.g. weather)
  - Sentiment Analysis (e.g. Twitter)
  - Trend Analysis (e.g. Google Flu Trends)

IoT Challenges

- Interoperability
  - Competing Vendors
  - Exchange of data between vendors
- Connectivity
  - Older (non-smart) devices
  - Network Data Charges (3G/4G)

How to build an IoT platform

IoT Architecture Framework

- Different ‘levels’ of an IoT Architecture
- Different types of users/actors
  - Operators/Technicians
  - Network Administrators
  - Application Users
  - Data Scientists
- Multiple Applications to support
- Address scale

IoT Architecture Framework - Tiers

- Level 0 – Network Management
  - Administer & Monitor the Sensor Fabric/Network
  - e.g. Gateway & Edge-Connected devices
- Level 1 – Data & Event Integration (Domain & Event Models)
  - Administer & Monitor the Managed Domain
    - i.e. Sensor Devices
    - Low-tech devices → High-tech devices
  - Assimilation, Routing & Persisting Event Data Points
  - Integration of data points → Data Analytics
- Level 2 – Systems Management
  - Common/Shared model versus Domain-Specific
    - e.g. Authentication, Alerts
  - UI, Server & Mobile Infrastructure
  - Systems Management Services (non-functional)
- Level 3 – Platform
  - Scalability & Performance
  - Multi-tenancy
    - Separate/Individual Systems utilizing shared services
  - Global Analytics
    - Holistic + Historic

Summary

- Internet of Things
  - Large-scale distributed systems
  - Natural fit for Big Data
  - Analytics feeding into systems management

Q&A

Discussion Time

Thank You