

# How Do You Feel About Storing Your Emissions Data in the Cloud?

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# Data Systems For Compliance

## Air Compliance Data Systems - Key Components :

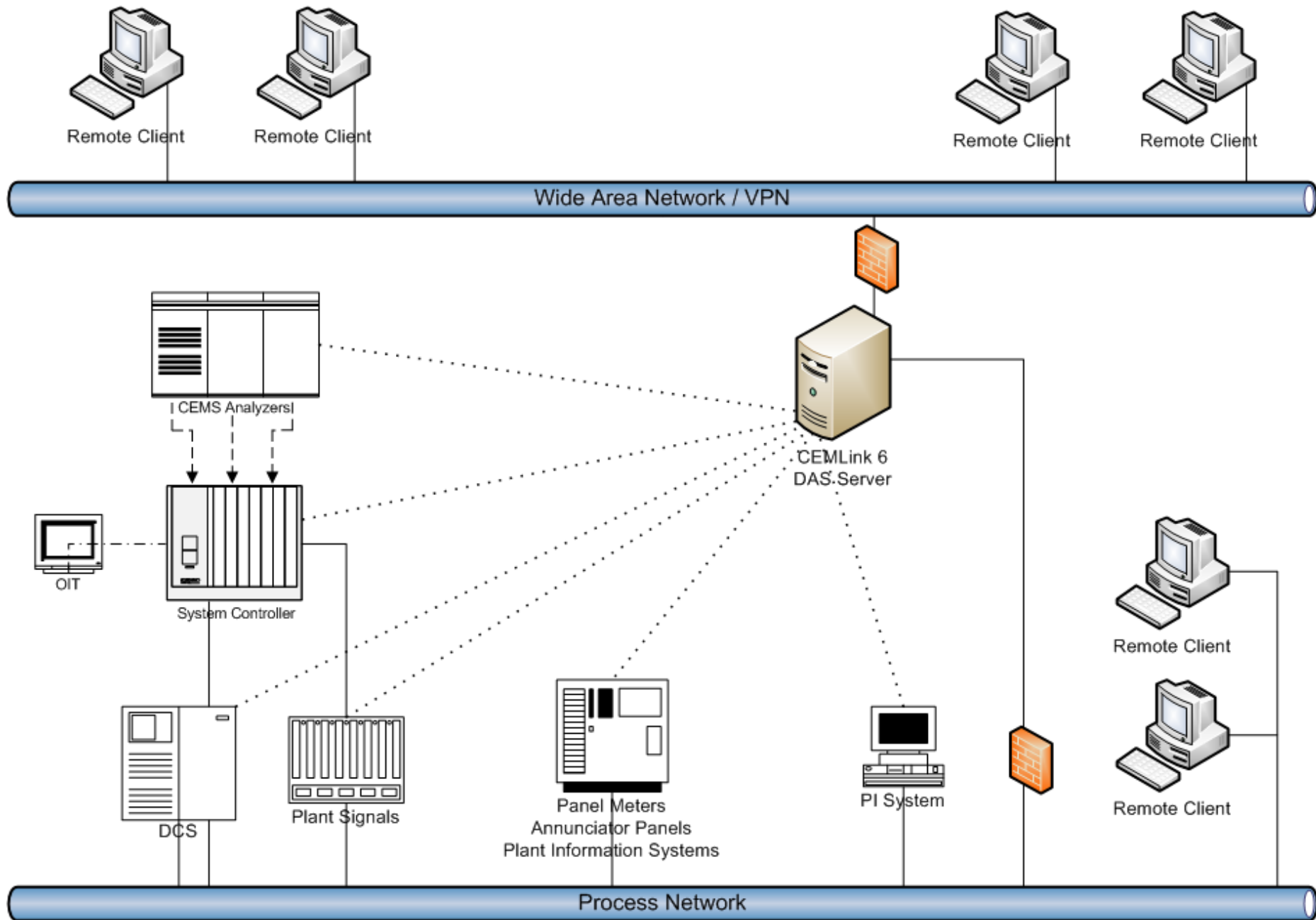
- Home Grown vs 3<sup>rd</sup> Party Solutions
- Real Time Data Collection
- Data Validity & Data Calculations Consistent with Rules
- Averages in Reportable Format(s)
- Historical Database Supporting Quarterly Reporting

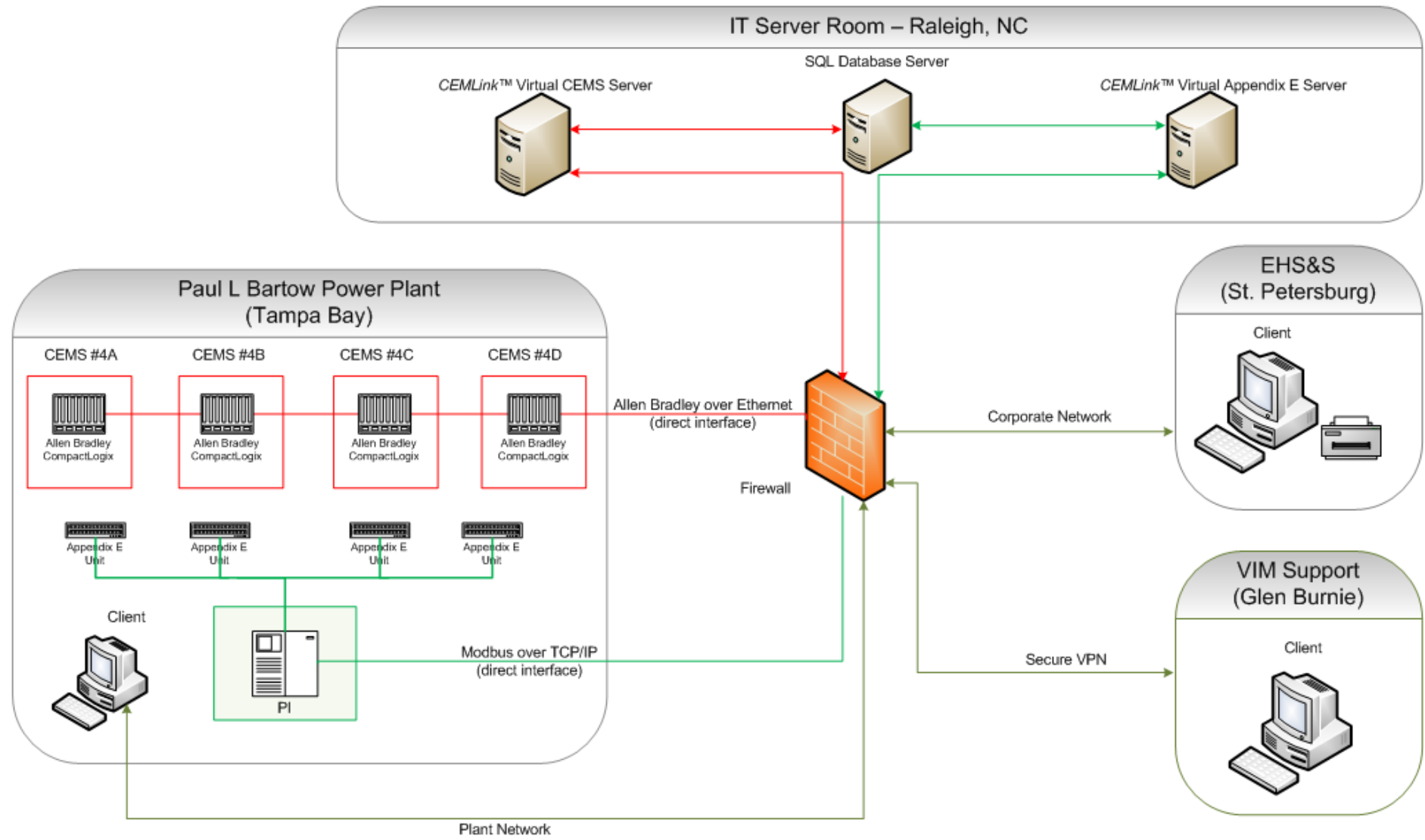


# Data Systems For Compliance

## Evolution of Compliance Data Acquisition Systems (DAS):

- Chart Recorders
- Single Source DAS on dedicated network
- Plantwide Multiple Sources on Central Server via LAN
- Fleetwide Multiple Sources on Remote VM Servers via WAN
- Cloud-Based Future? - TBD







# The Connected World



Does the cloud-based comfort level that controls our personal life translate seamlessly to our business life?



# The Connected World

What is the Cloud<sup>1</sup>?

- The term "**cloud** computing" is everywhere. In the simplest terms, **cloud** computing means storing and accessing data and programs over the Internet instead of your computer's hard drive. The **cloud** is just a metaphor for the Internet.
- **Cloud** computing, in turn, refers to sharing resources, software, and information via a network, in this case the Internet. The information is stored on physical servers maintained and controlled by a **cloud** computing provider.
- **Cloud** computing is the practice of making use of the network of servers/hardware/computers that are hosted by provider and available through web/Internet for multiple purposes such as storage and computing i.e. instead of on-premise servers or hardware we leverage infrastructure from some other provider.

<sup>1</sup>. Definitions compliments of pcmag.com, moneycrashers.com & quora.com







# The Connected World

## The Cloud Advantage:

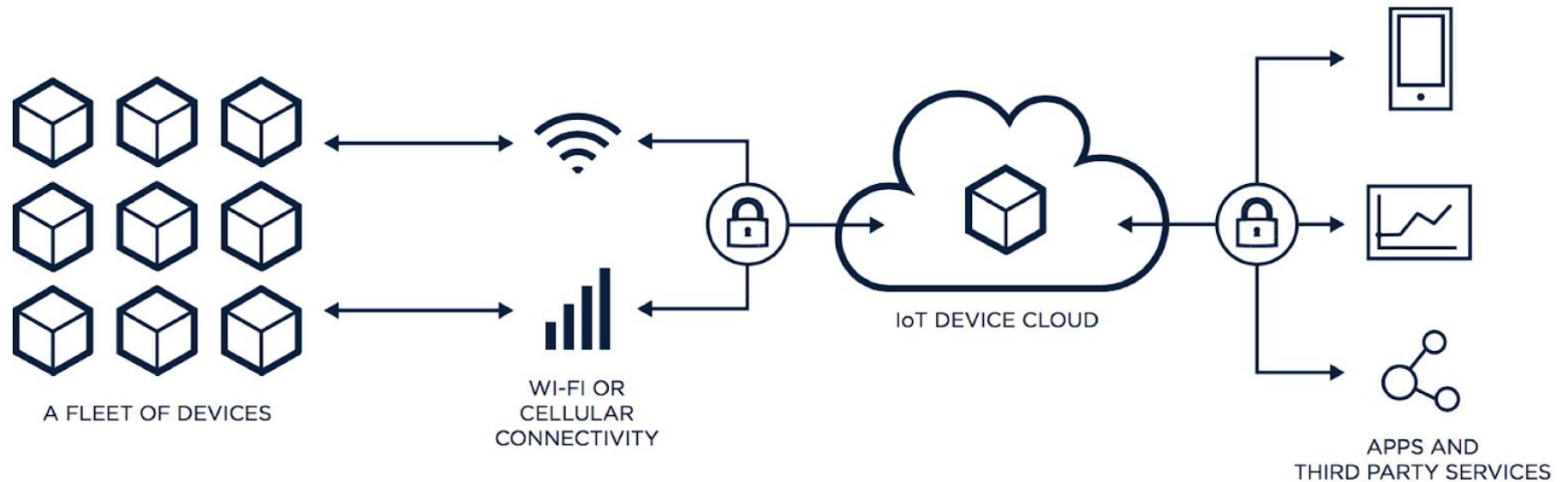
- Eliminates onsite hardware & support
- Private Server Guarantee
- 99.99% Uptime Guarantee
- Security Assurance
  - HTTPS/TLS – TCP Port 443
  - Dynamic Packet Filtering
  - Web Proxy (including NTLM)
  - NIST 800-53 compliant
  - SOC certified



# The Connected World

## Basic Components of a Cloud Based Solution:

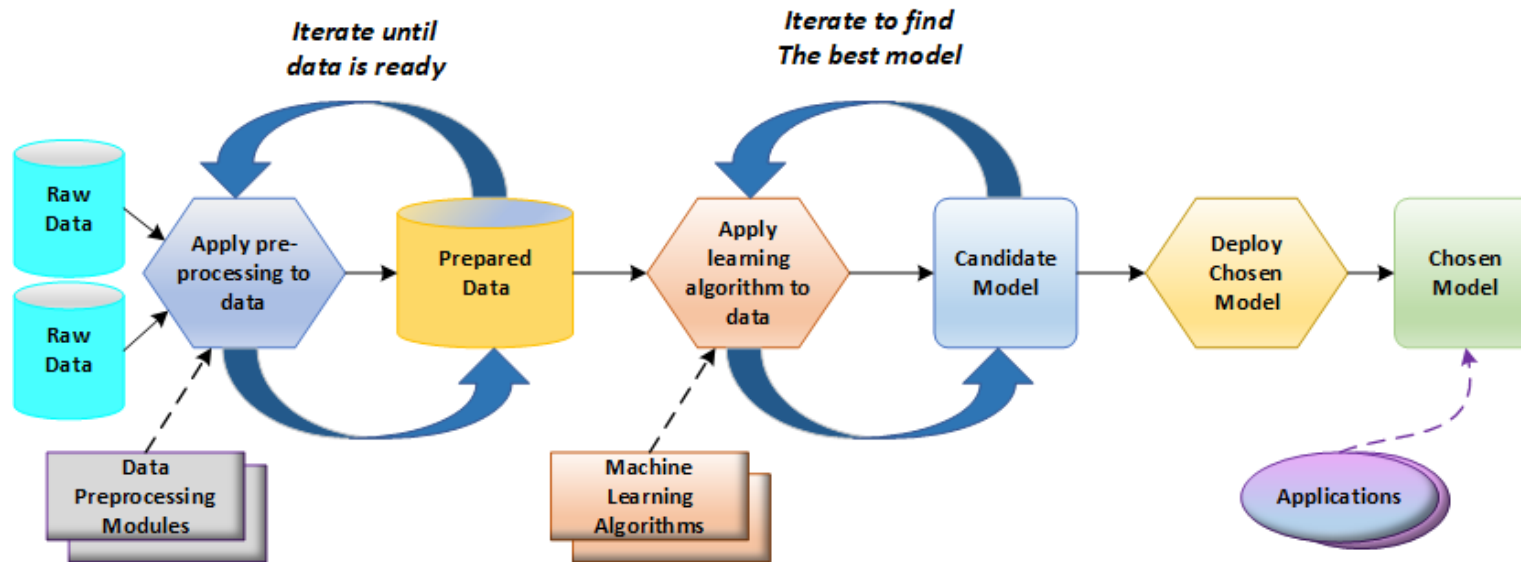
- Device(s)
- Gateway
- Cloud Server
- User Interface(s)





# The Connected World

## Machine Learning Process



From "Introduction to Microsoft Azure" Compliments of David Chappell

## The Internet of Things (IoT):

- Smart Devices
- Artificial Intelligence (AI)
- Outcome Based Analytics
- Machine Learning
- Process Improvement Applications



# Feasibility & Practicality

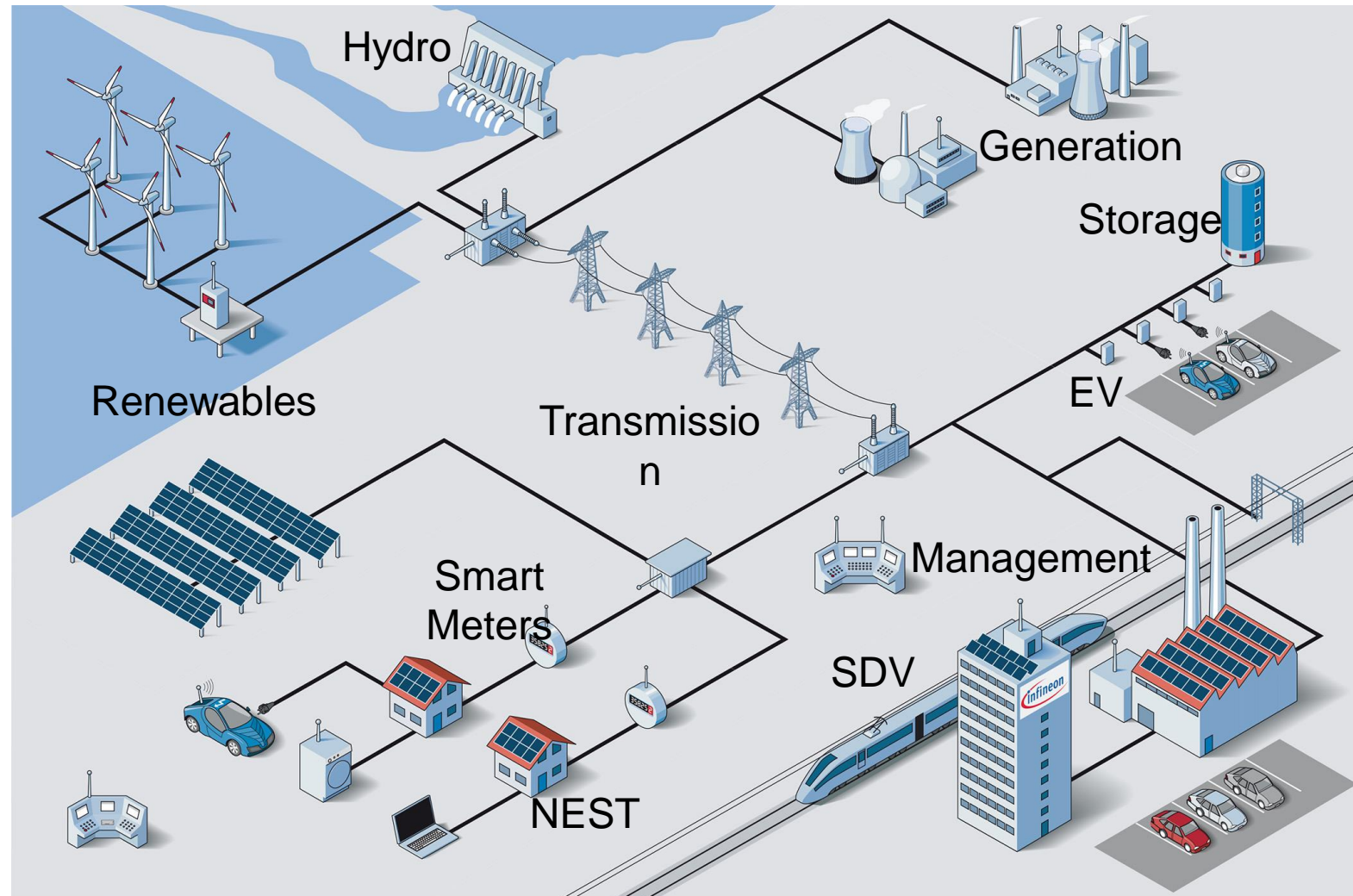
Practical Applications in the Industrial World:

- Utilities & Power Generation
- Energy Management
- Oil & Gas Industry
- Automation & Controls
- Transportation



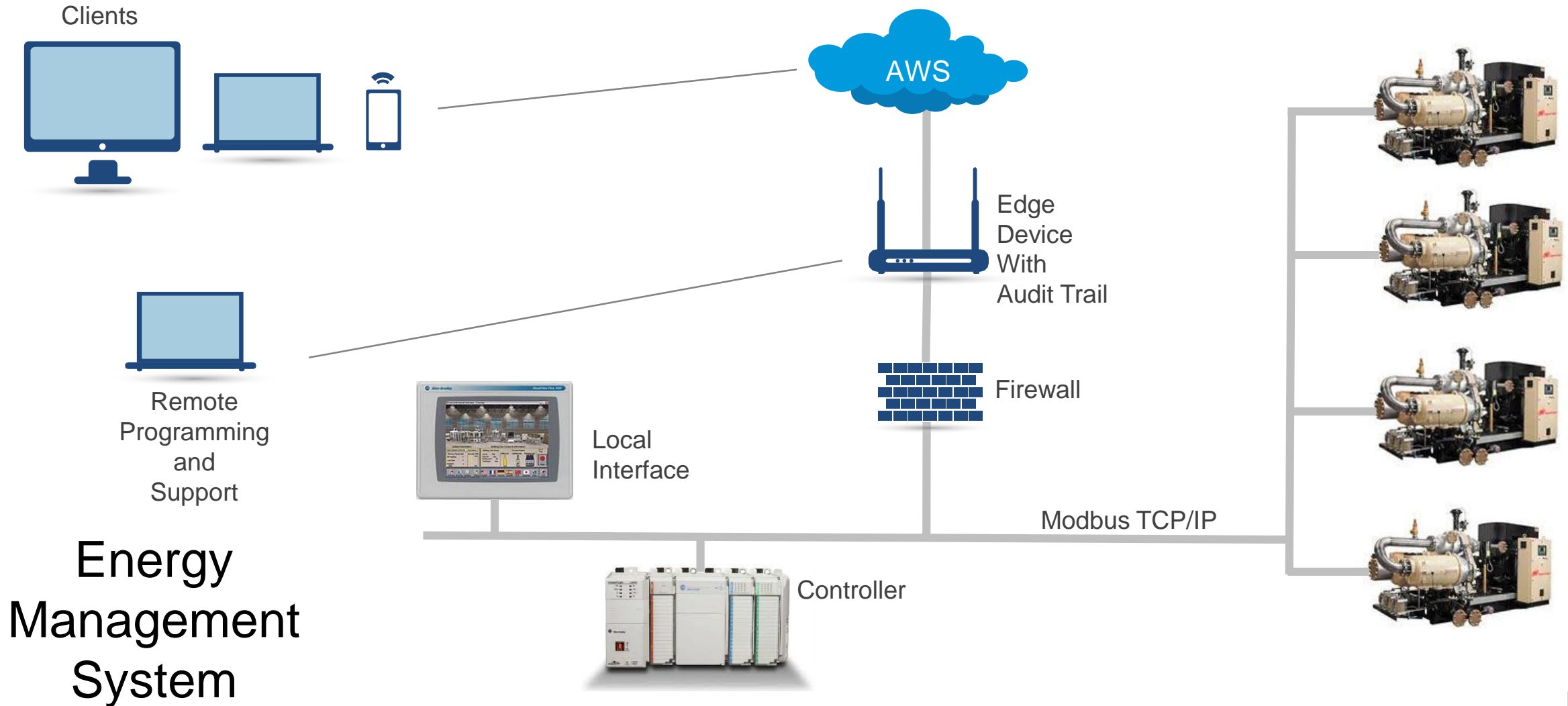
# Feasibility & Practicality

Utilities  
Smart Grid





# Feasibility & Practicality

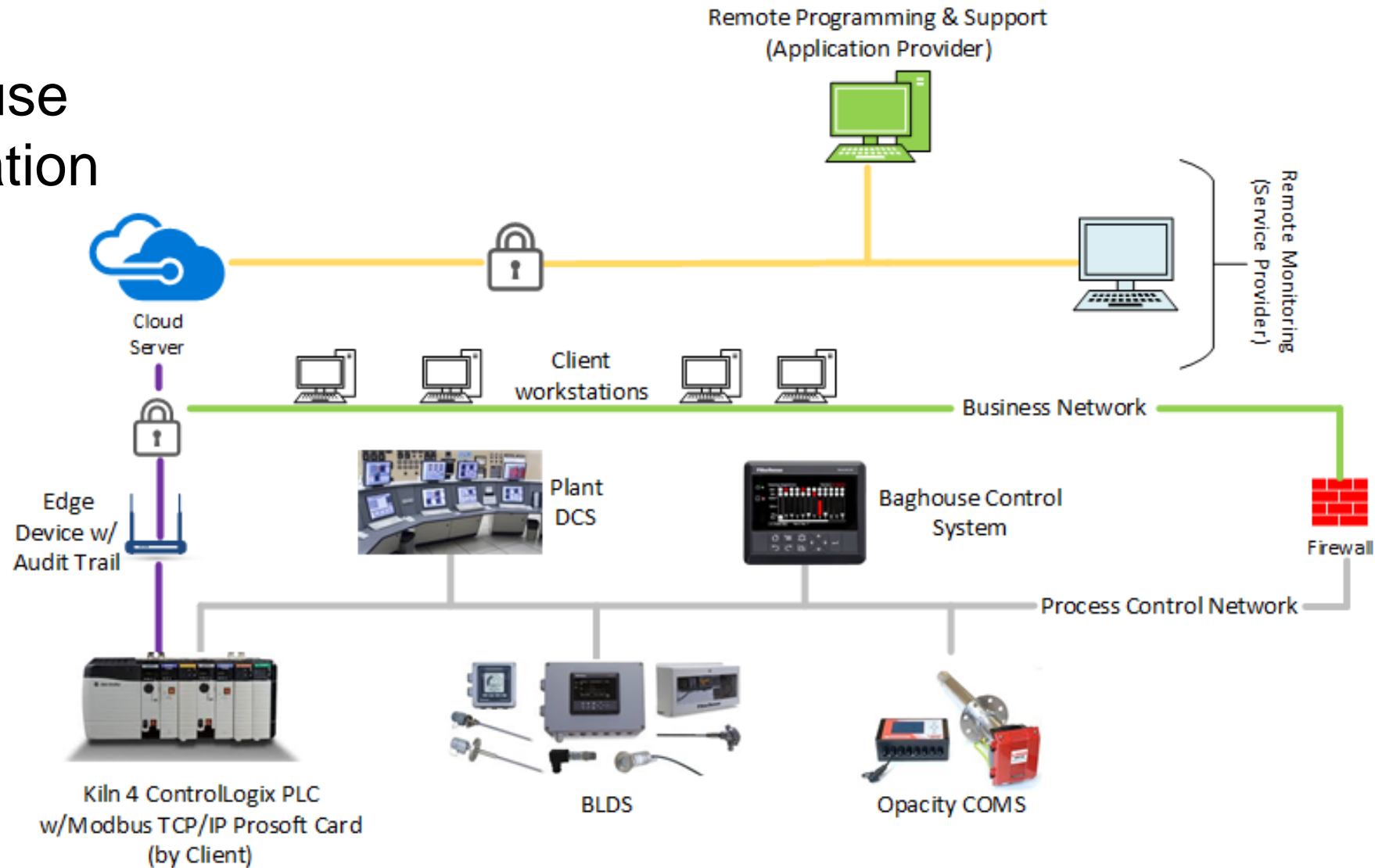


Energy  
Management  
System



# Feasibility & Practicality

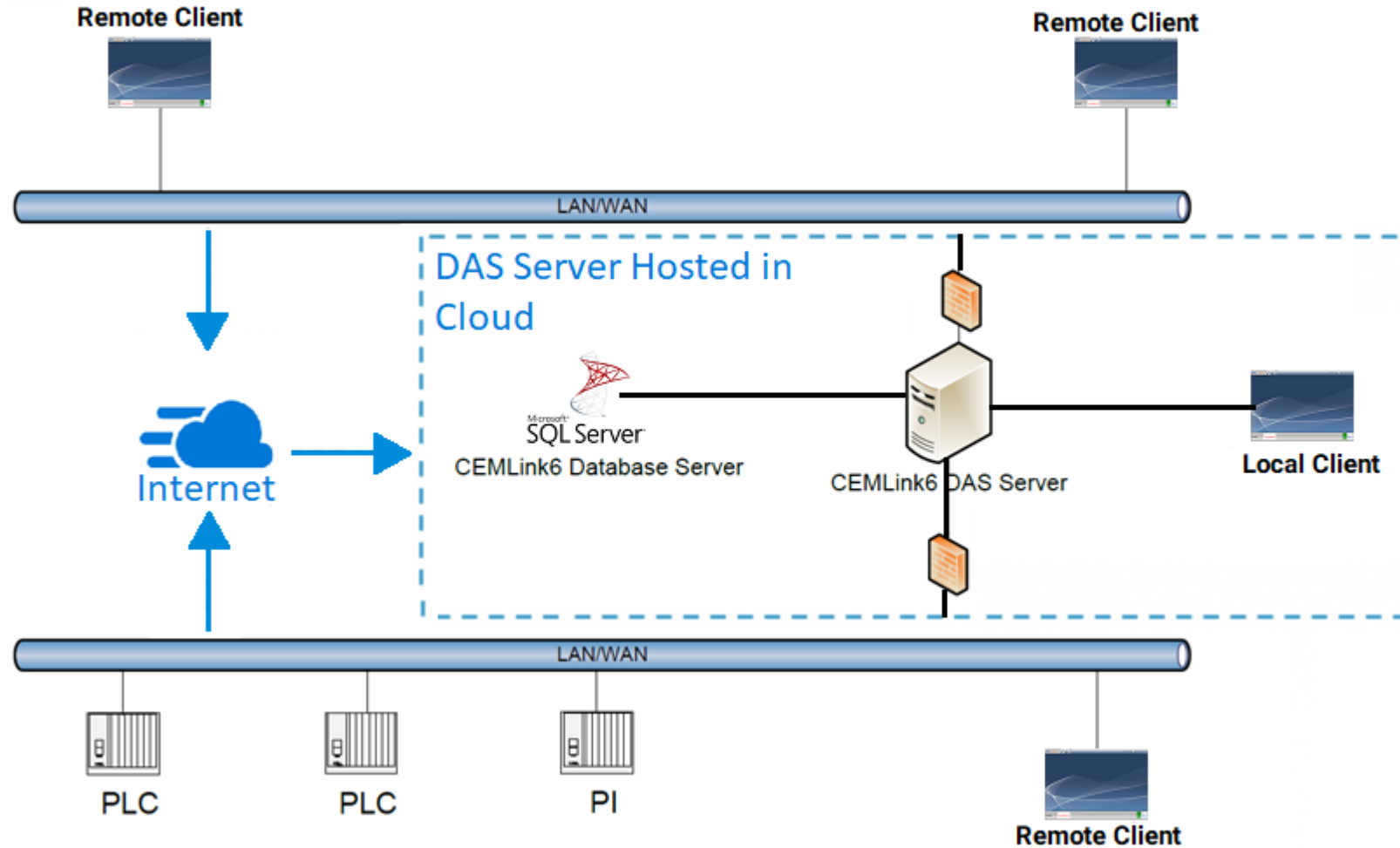
## Baghouse Optimization





# Feasibility & Practicality

CEMS/DAS  
S







# Barriers of Entry

- Evolving Technology
- Required Infrastructure Changes
- Overcoming Follow the Herd Mentality
- Data in Public Domain
- Data Availability & On-Demand Recovery
- Risk Assessment - Security



# Summary & Conclusions

- Cloud computing for emissions monitoring data is available & feasible
- Implementation challenges are minimal compared to other industries
- IoT in emissions monitoring is developing but not critical at this time
- Barriers of entry are real but not insurmountable
- Real world evidence supports data security is good and risks are minimal



# Questions?





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