MATLAB EXPO

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Revolutionizing Remote Patient Monitoring Device Development with AWS

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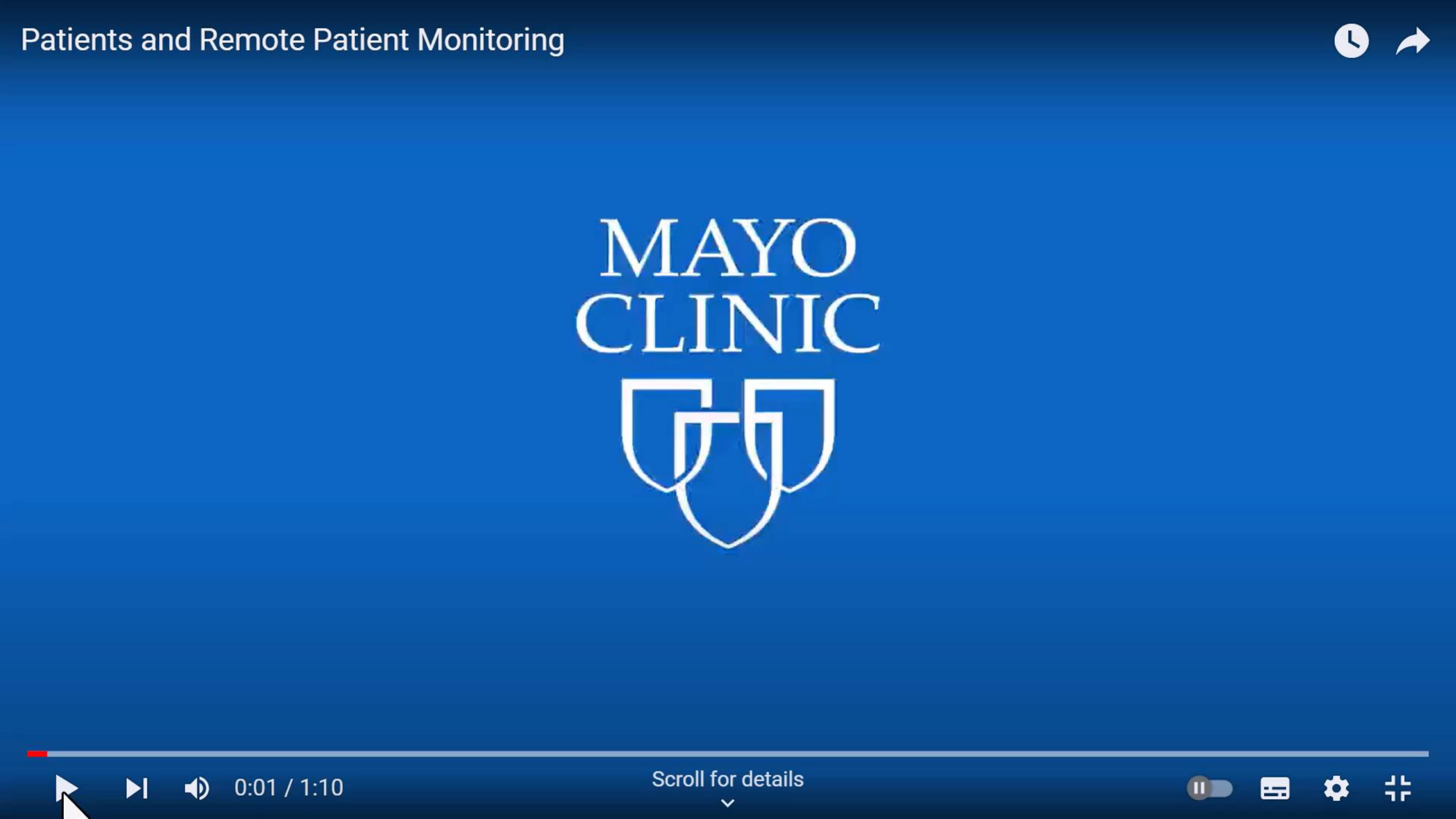
MathWorks

Agenda

- Challenges with remote patient monitoring system
- What is needed to build a robust remote patient monitoring system
- MATLAB + AWS = Revolutionizing remote patient monitoring
- Case study: GE Healthcare NICU remote patient monitoring system
- Conclusion

Patients and Remote Patient Monitoring



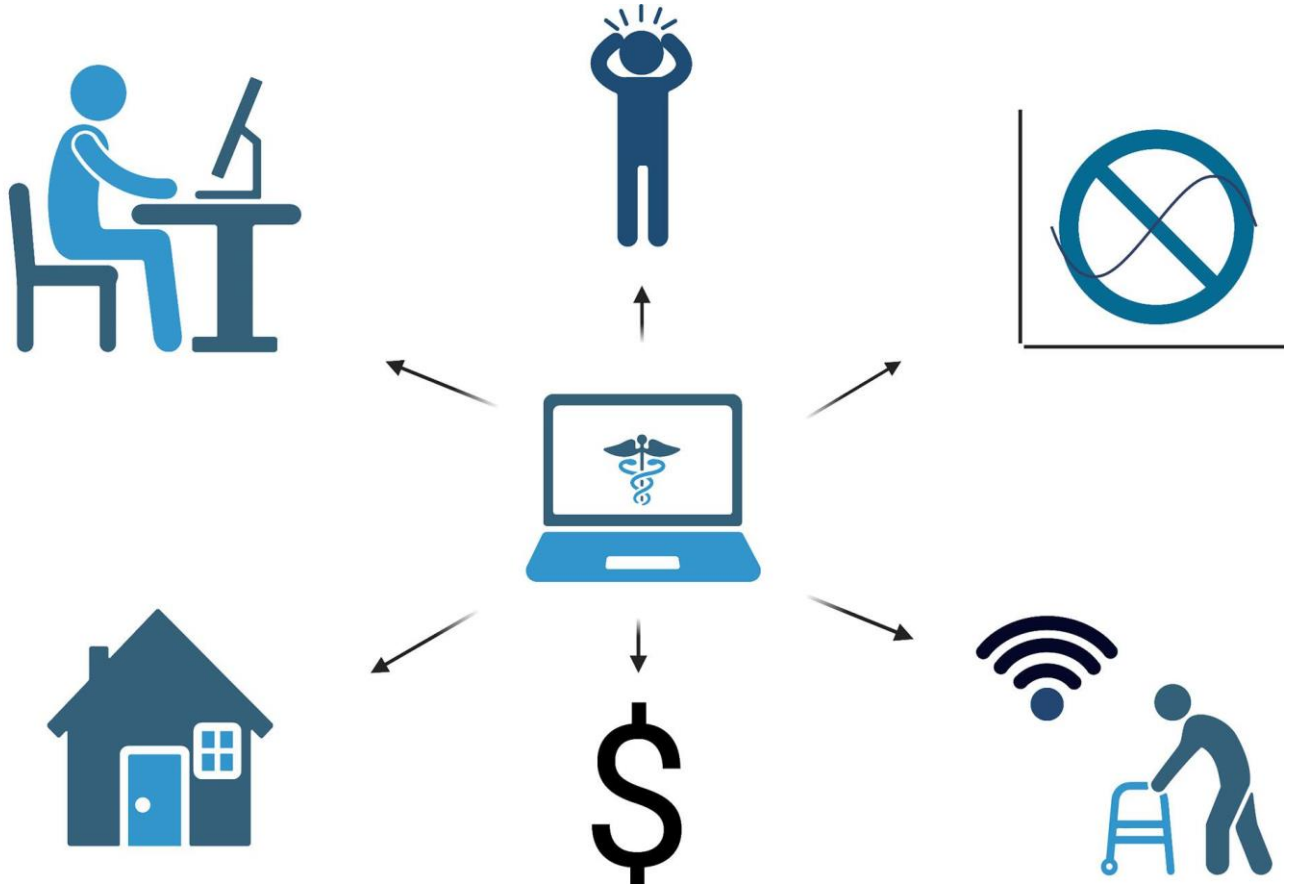
Remote patient health monitoring improves patient outcomes

- Early detection and intervention
- Enhanced Patient Engagement
- Improved chronic disease management

Challenges with building a remote patient monitoring system

1. Technical Challenges

- Sensor and data accuracy
- Elastic data storage
- Real-time data insights
- Interoperability
- Reliability
- Scalability
- Cost optimization



Challenges with building a remote patient monitoring system

2. Regulatory Challenges

- Data security and Privacy
- Good machine learning practice
  - Model development and performance
  - Multi-disciplinary collaboration
  - Risk management
- Ethical considerations

U.S. FOOD & DRUG ADMINISTRATION

Health Canada Santé Canada

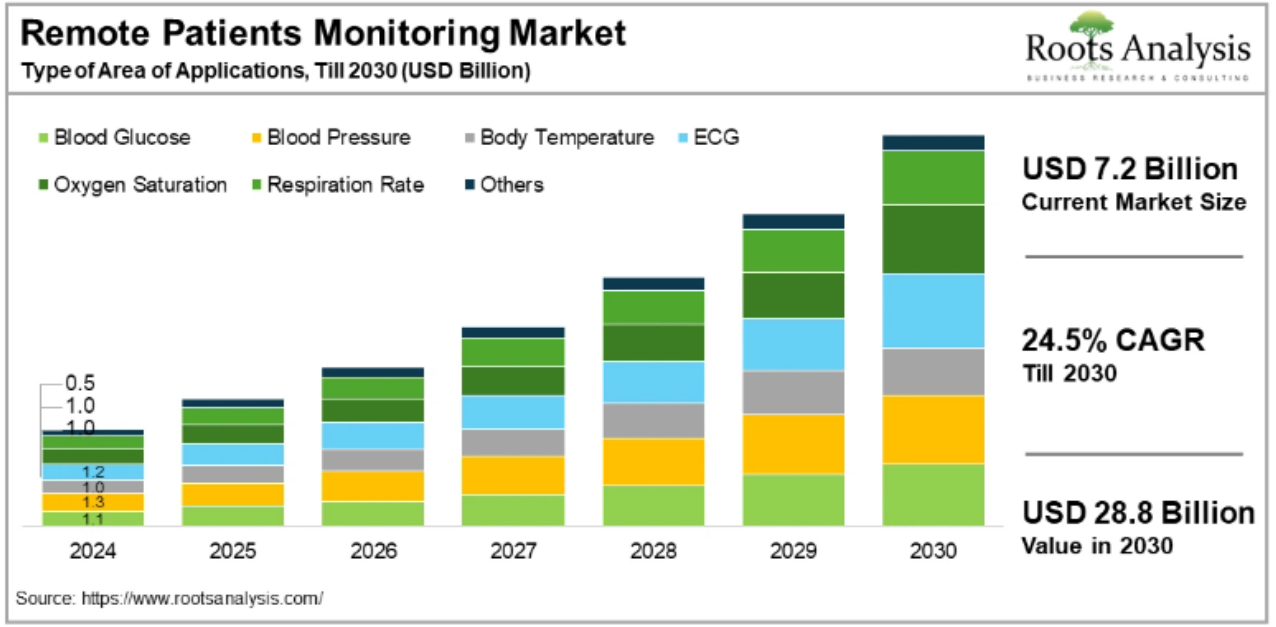
Medicines & Healthcare products Regulatory Agency

Good Machine Learning Practice for Medical Device Development: Guiding Principles

Challenges with building a remote patient monitoring system

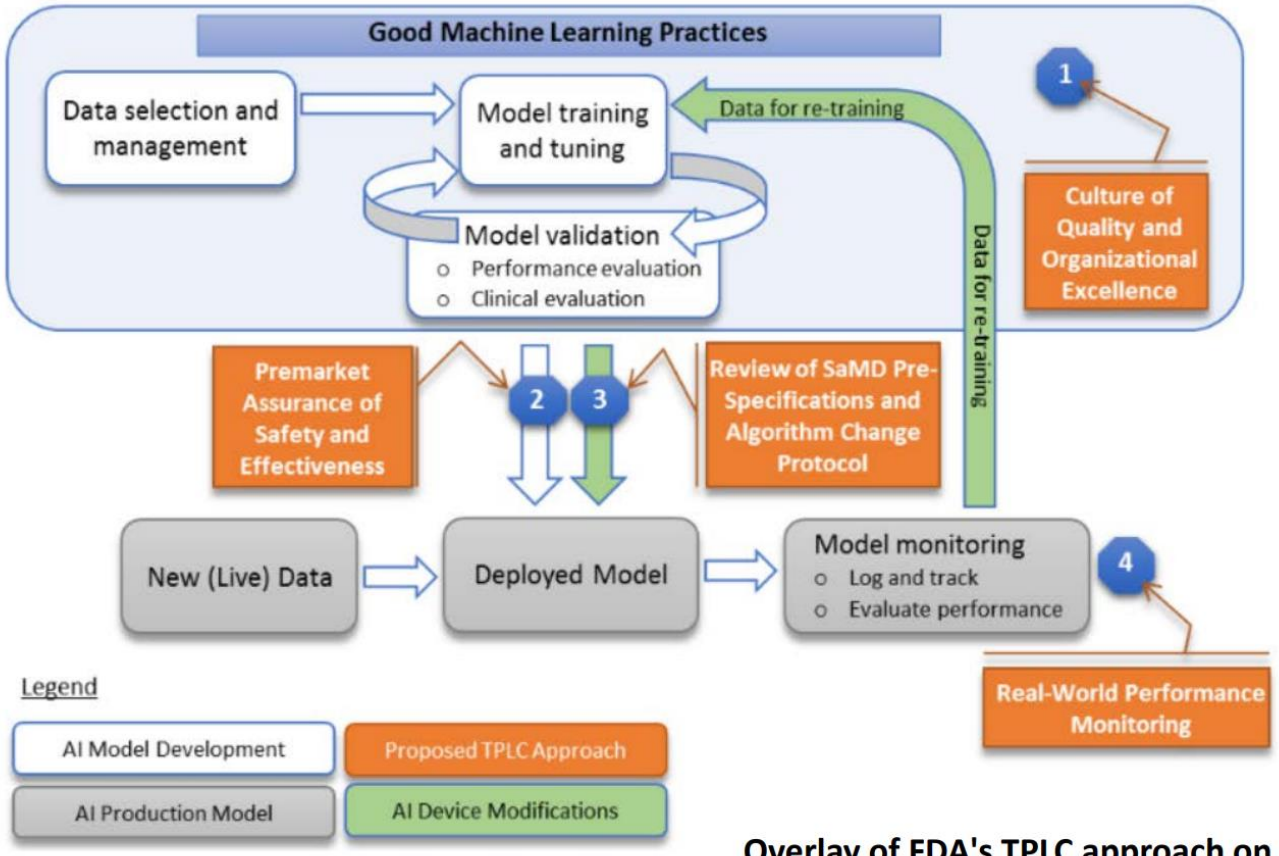
3. Business Challenges for OEMs

- Competitive space
- Siloed development, integration, and testing
- Prolonged timelines for moving the concepts to products
- Maintenance and upgrades



What does it take to build a robust remote patient monitoring system?

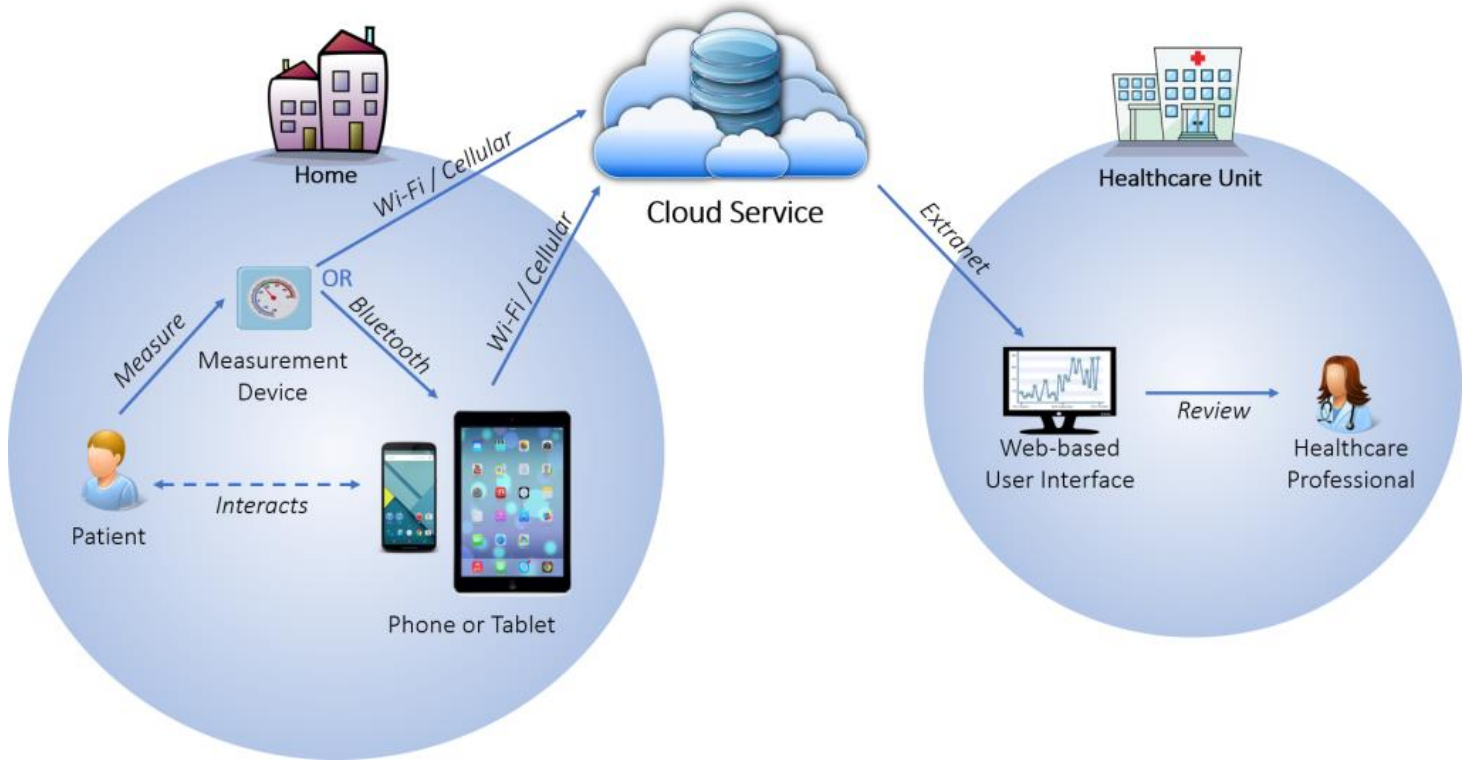
1. **Development** Platform
   - Faster process for converting concepts into product
   - Integrated V&V
   - Operationalize



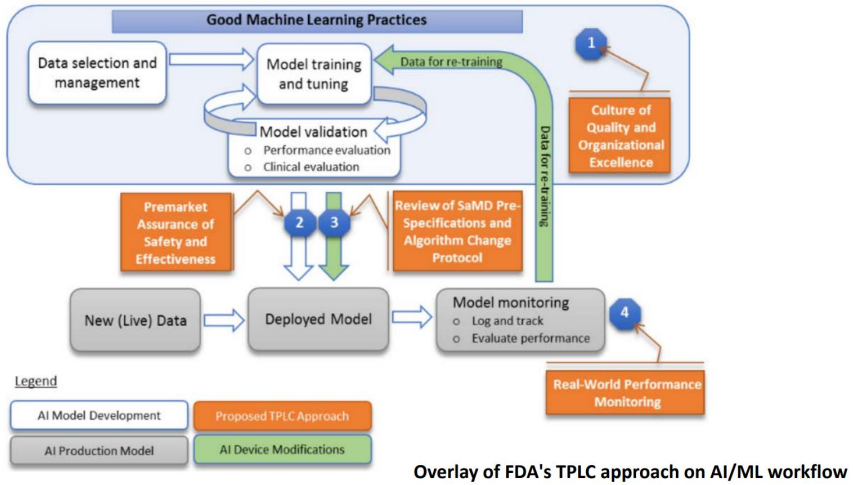
Overlay of FDA's TPLC approach on AI/ML workflow

What does it take to build a robust remote patient monitoring system?

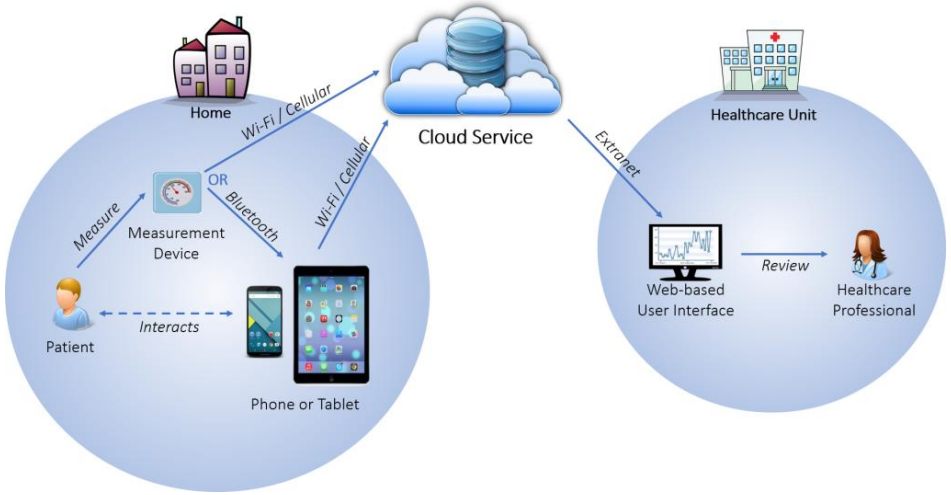
2. Infrastructure to **Operationalize**
   - Reliable
   - Scalable
   - Cost effective
   - Allows integration with other hardware/software platforms



Revolutionizing remote patient monitoring



Overlay of FDA's TPLC approach on AI/ML workflow



Development platform

Operationalize

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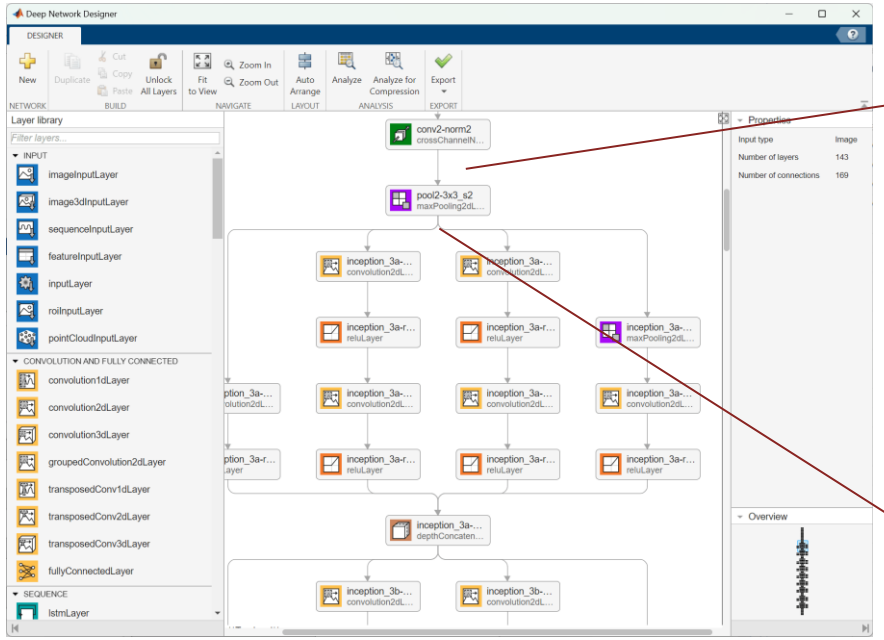
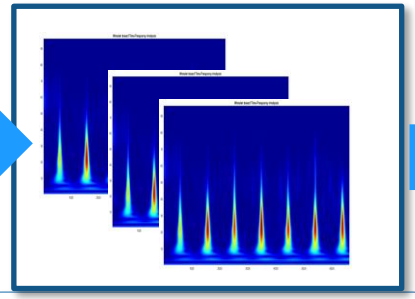
MATLAB integrates with AWS to accelerate prototype and research

Development Platform

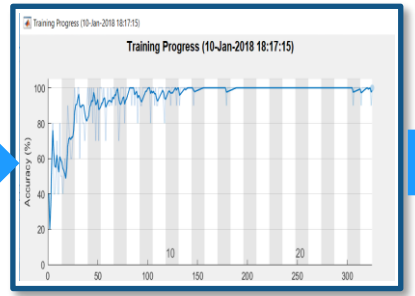


- `stftLayer` (Signal Processing Toolbox)
- `istftLayer` (Signal Processing Toolbox)
- `cwtLayer` (Wavelet Toolbox)
- `icwtLayer` (Wavelet Toolbox)
- `modwtLayer` (Wavelet Toolbox)

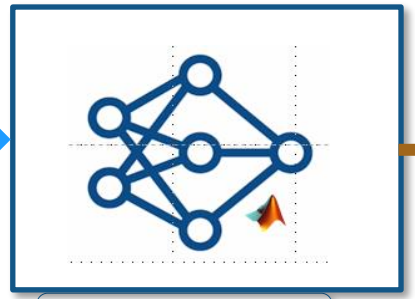
Signals



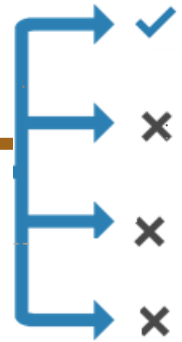
Wavelet Time-Frequency Representation



Train Deep Networks

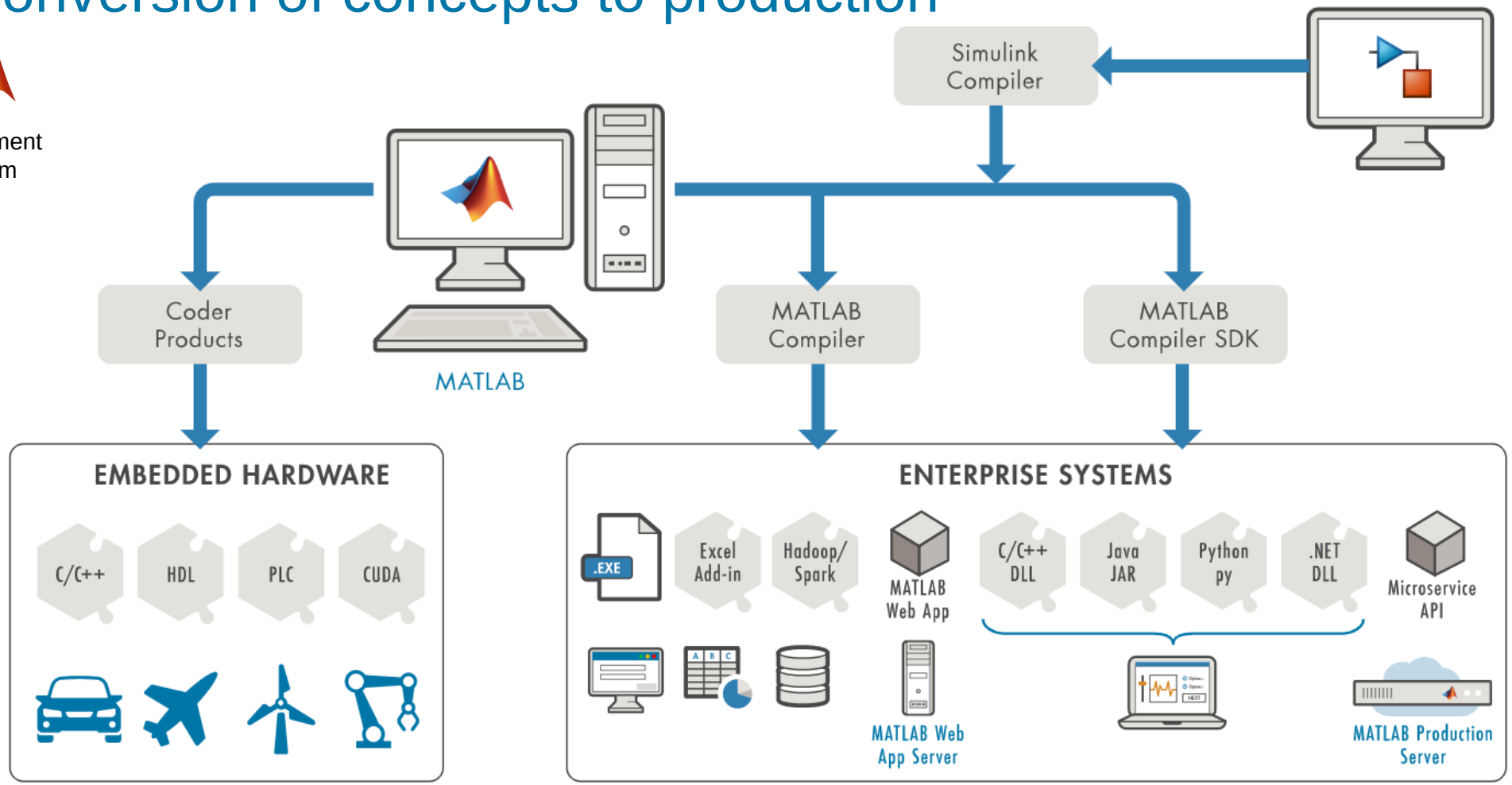


Trained Model



MATLAB integrates with AWS to accelerate the conversion of concepts to production

Development Platform



MATLAB integrates with AWS to implement V&V throughout development cycle

Development Platform

Production code System Testing

Requirements Traceability

Unit->Architecture Traceability

Unit & Integration Testing

Static & Dynamic Code Testing

Software Requirements

Software Architecture

AI Software Development

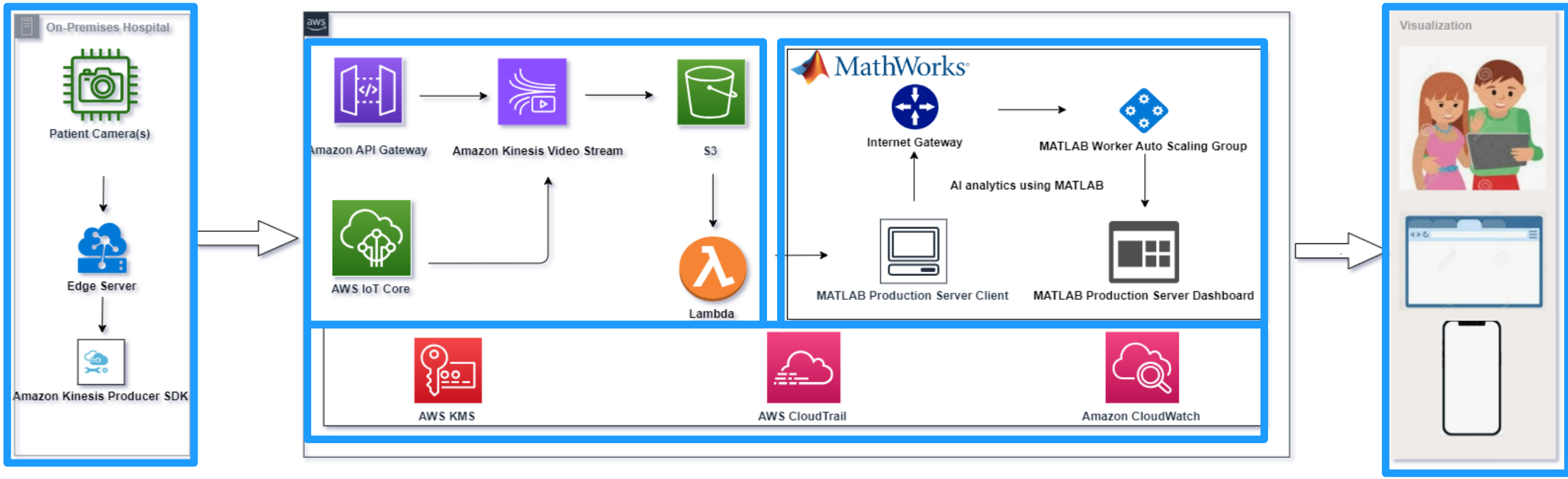
Compiled patient monitoring application

Production code

Integrated V&V with Development

Remote Patient Monitoring system – System Architecture

Operationalize



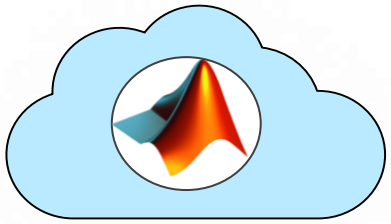
Security and compliance with AWS

Operationalize

Simplify Development on AWS with MathWorks Cloud Integrations

Least — IT Flexibility — Most

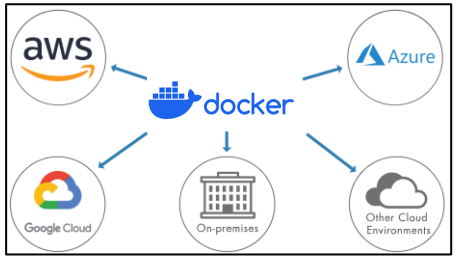
MATLAB Online
Hosted on MathWorks.com



Cloud Center

Virtual Desktop Infrastructure (VDI)

Reference Architecture



Containers & Dockerfiles

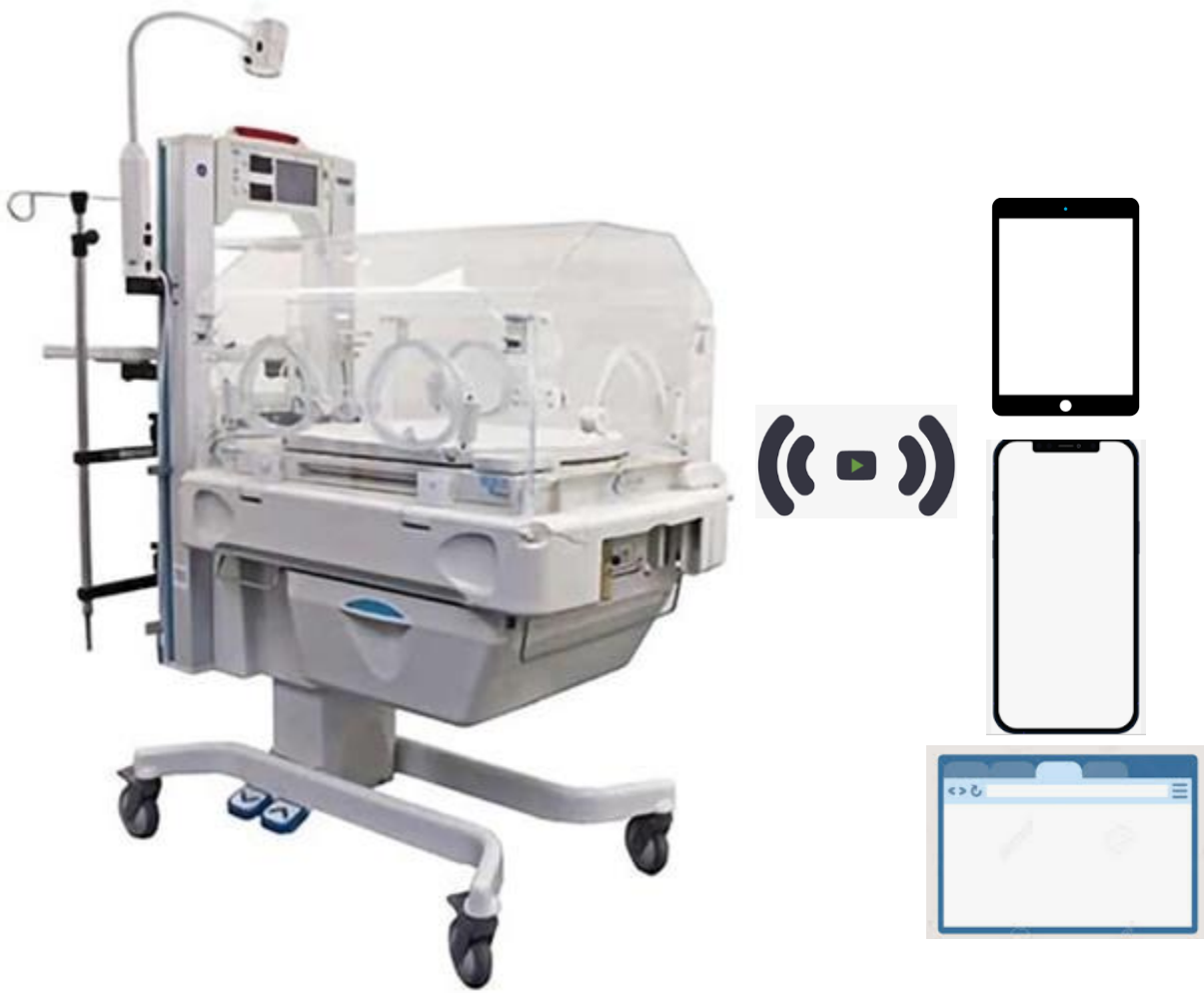
Most — Ease Of Use — Least

Scan QR code to learn more

Case study: GE Healthcare NICU monitoring system

NICU remote patient monitoring system

- Aiding diagnosis and prognosis
- Non-contact monitoring systems
- Parental bonding aspect
- Improving patient outcomes



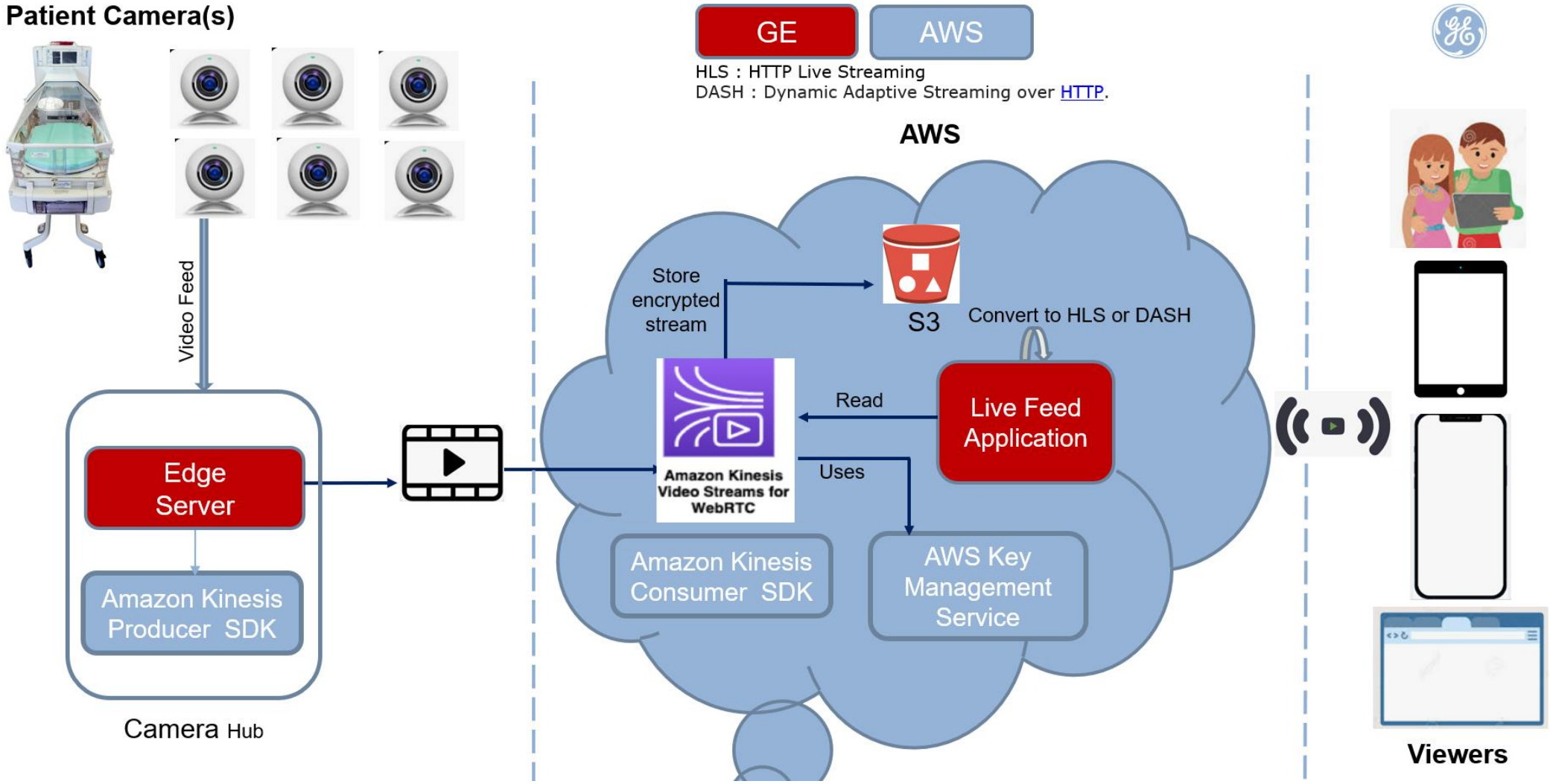
MATLAB Based DevOps Workflow in AWS for Hospital Patient Monitoring Applications

GE Healthcare, Inc.

Mohammad Khair, Principal Engineer

Link to presentation and video

NICU Patient Monitoring system – System Architecture



Execution of the NICU monitoring system

Data Acquisition

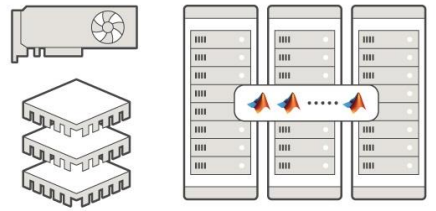
Camera as the upstream data source.

Kinesis Streaming

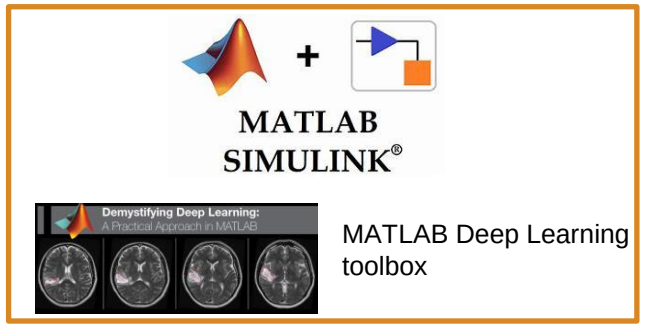
Amazon Kinesis Data Streams

MATLAB Production Server Cluster

IEC 62304 compliant algorithm from MATLAB/Simulink



MATLAB Parallel Server



MATLAB Deep Learning toolbox

MATLAB/Simulink with Deep Learning, Parallel Server to develop and train AI models,

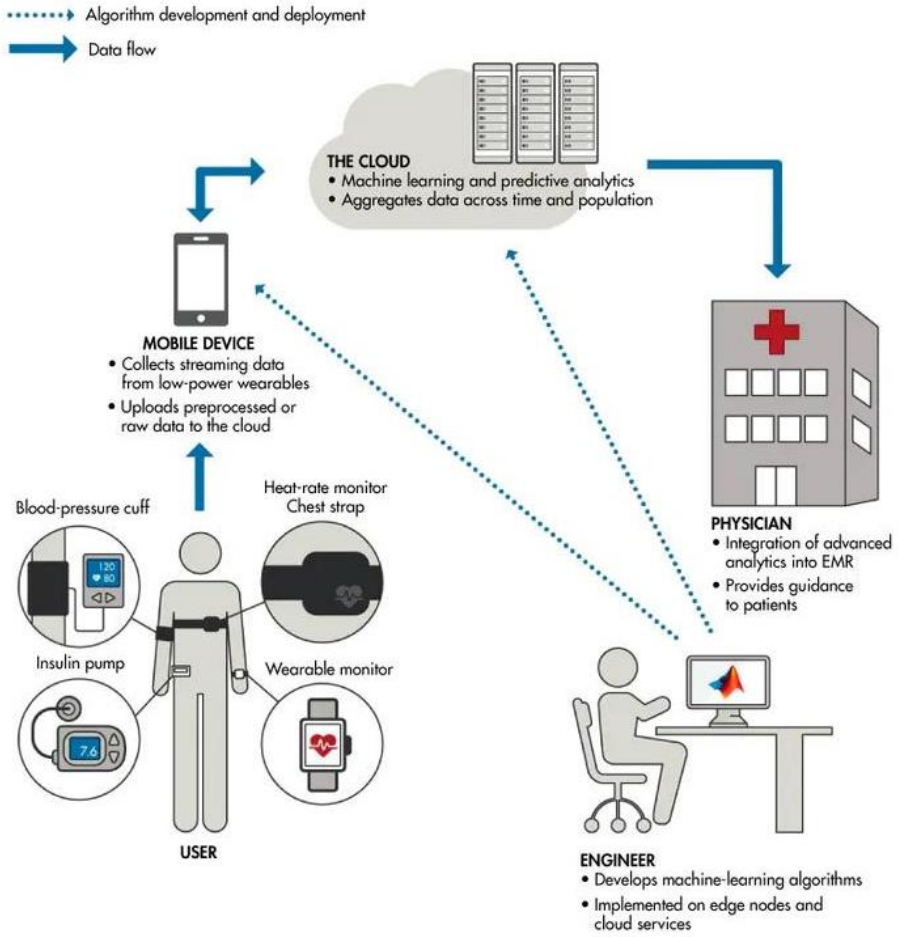
Data Visualization

Reporting Dashboard on a Web App or Phone App

Conclusion

MATLAB + AWS = Revolutionizing the remote patient monitoring system development

- ✓ **Technical Excellence**
- ✓ **Regulatory Compliance**
- ✓ **Business Innovation**



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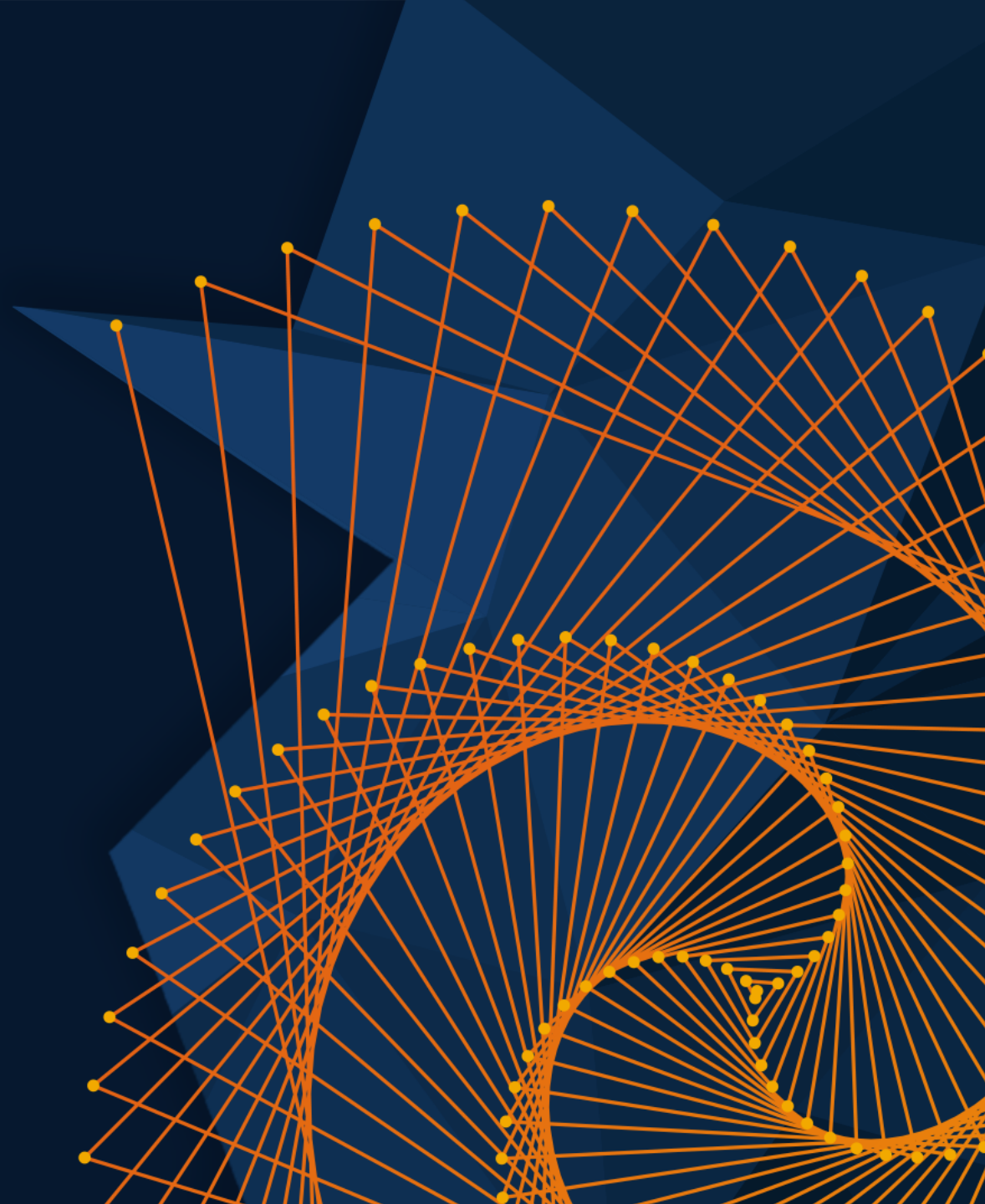

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