CEC Continuing Education Center

DesignNews

Real-Time System Software Architecture Design

DAY 4 : Data-Centric Architecture Design

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THE SPEAKER

Jacob Beningo

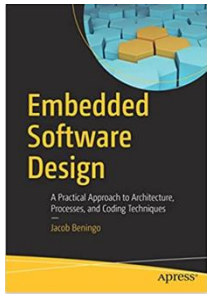
Jacob@beningo.com

jacobbeningo

Beningo Embedded Group – CEO / Founder

Focus: Software Architecture, Processes, and Dev Skills

At Beningo Embedded Group, we believe everyone deserves the skills to confidently advance their careers, meet deadlines, and deliver quality embedded systems. We provide modern strategies, insights, and hands-on training to equip developers and teams with the tools they need to succeed.



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This week's topics:

- What is Software Architecture?
- Design Philosophies and Principles
- Modeling with UML and the 4C Model
- Data-Centric Architecture Design
- Beyond UML – Data, Isolation, Security

Data Dictates Design

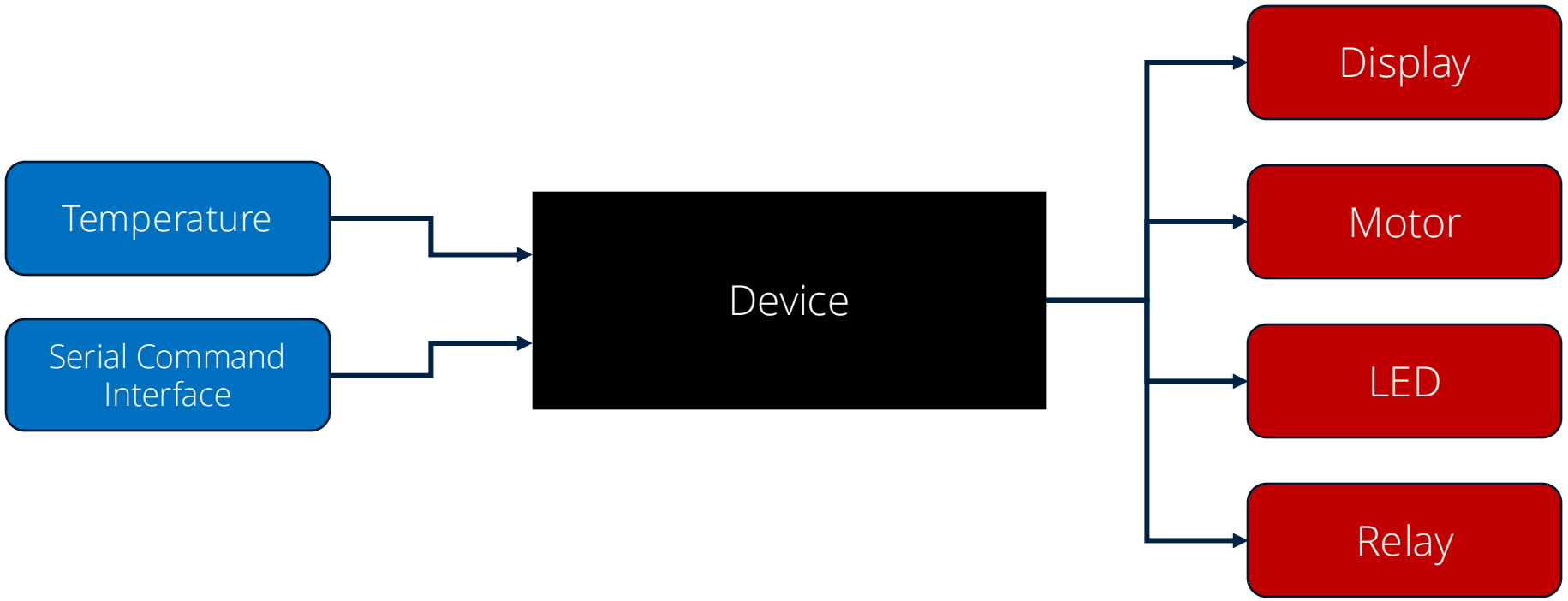
01

Data Dictates Design

Software systems today are about 5 things:

- Where is the data coming from? (Producer)
- How is the data being transferred?
- How is data being processed? (Consumed)
- What actions are being taken?
- How is data being stored?

Identify the System Hardware Blocks

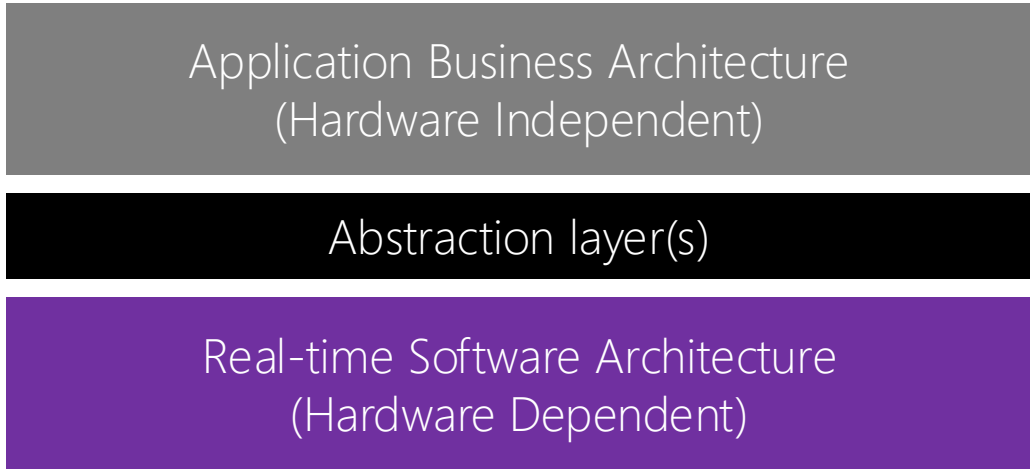


Decomposition using Data Flow

There are five steps teams can use to develop and evolve their software architecture:

1) Separate the software architecture
2) Identify and trace data assets
3) Decompose the system
4) Interface and component design
5) Simulate, iterate, and scale

Step #1 – Separate the Architecture



Audience POLL Question

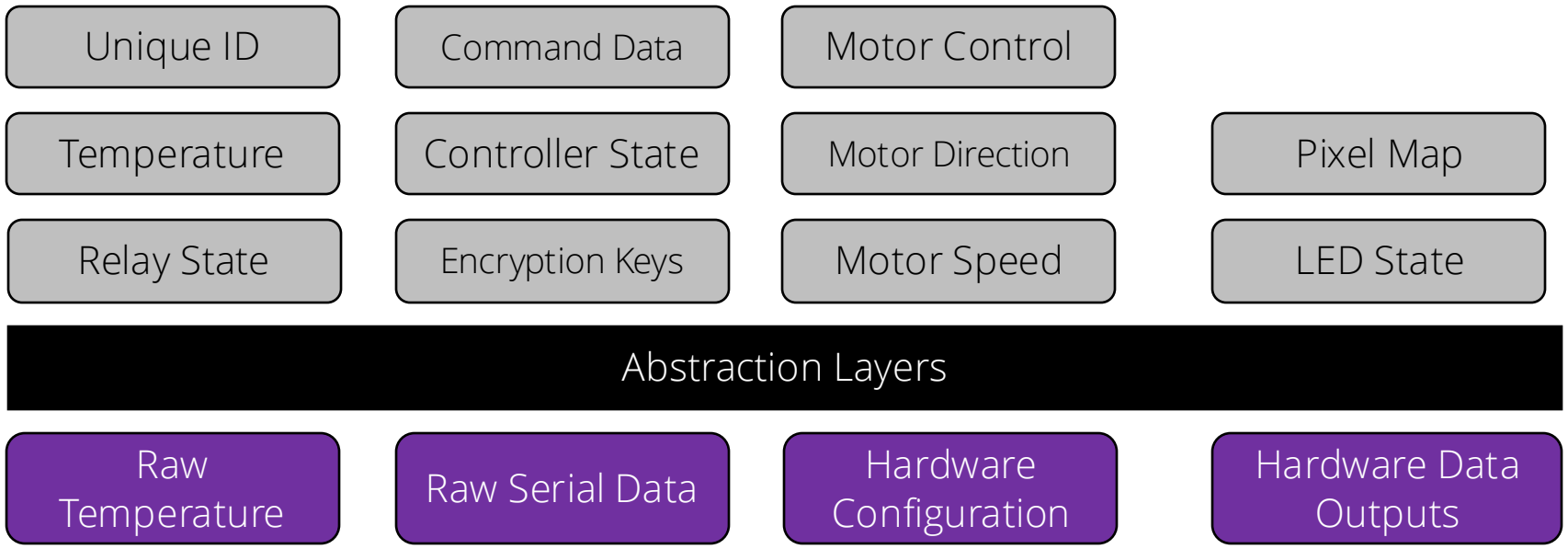
Why is it important to separate the architecture into application and real-time architectures?

a) To ensure the application remains independent from the underlying hardware and can be reused across different platforms.
b) To make the system run faster by combining all timing logic directly into the application code.
c) To simplify debugging by merging hardware drivers and business logic into a single layer.
d) To allow developers to hard-code timing and device dependencies into the application for maximum control.

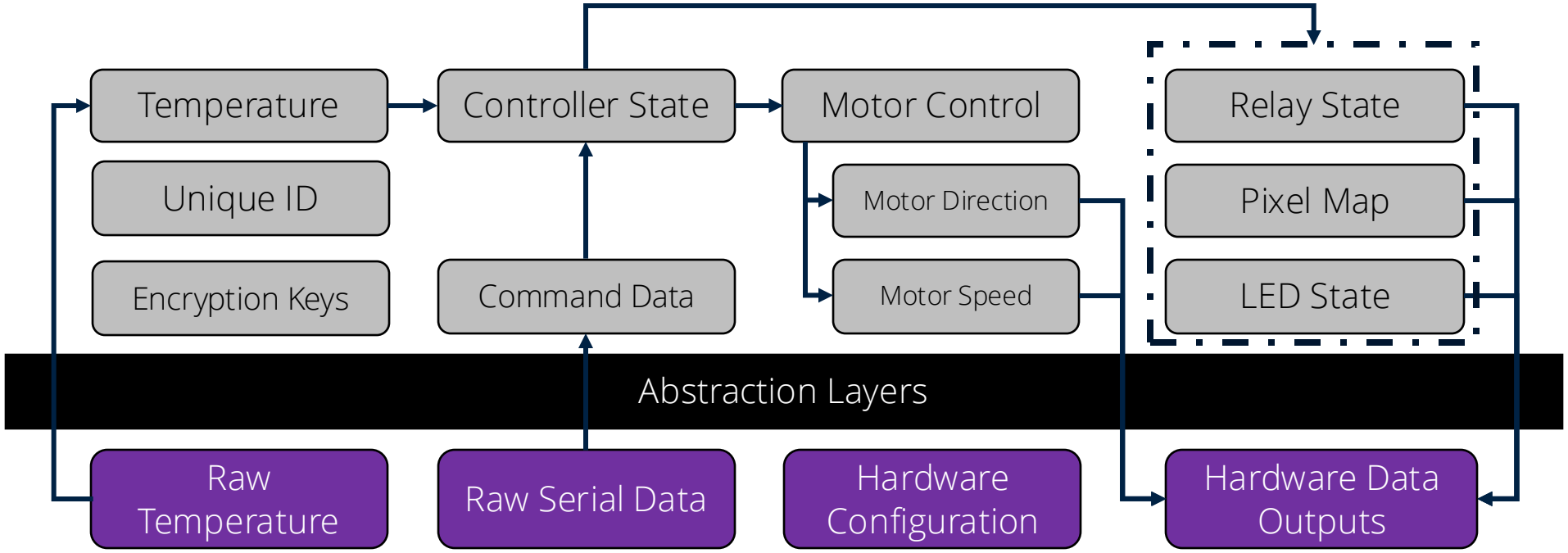
Follow the Data

01

Step #2 – Identify and trace data assets



Step #2 – Identify and trace data assets



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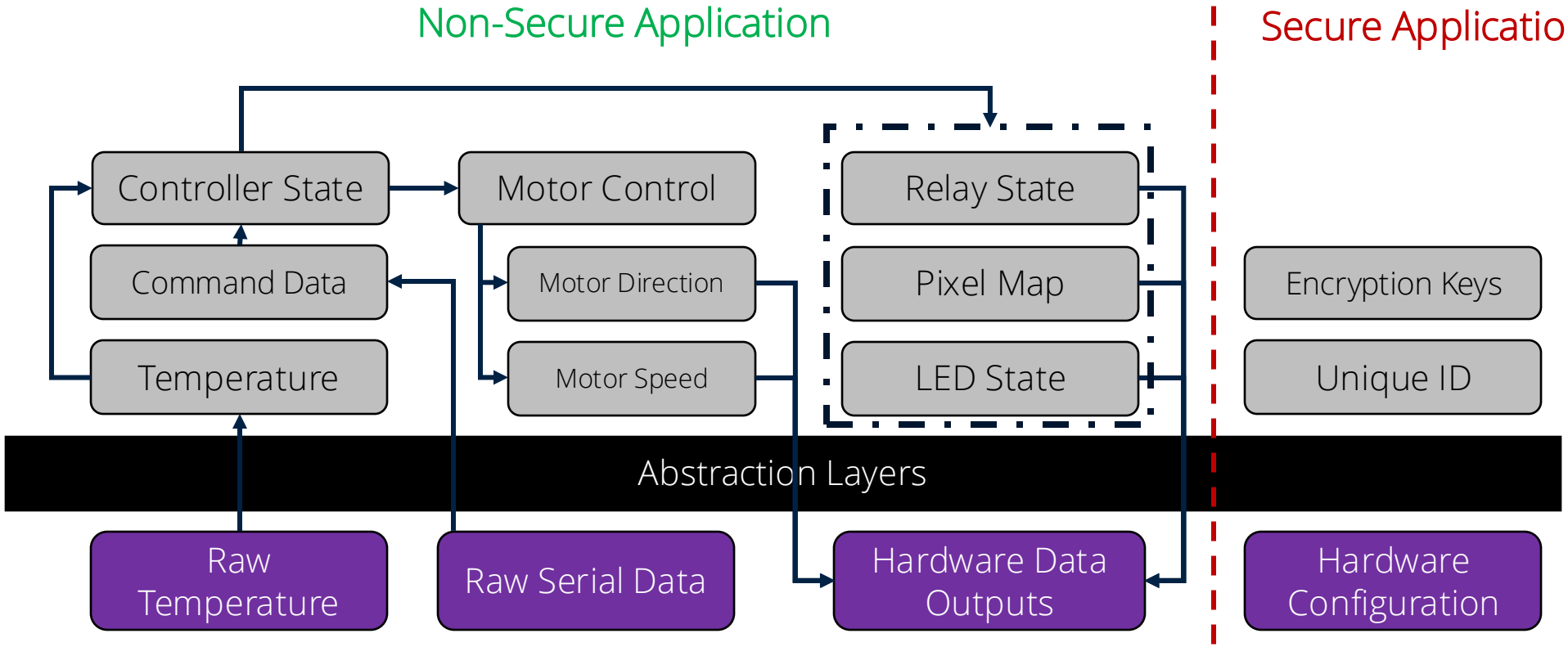

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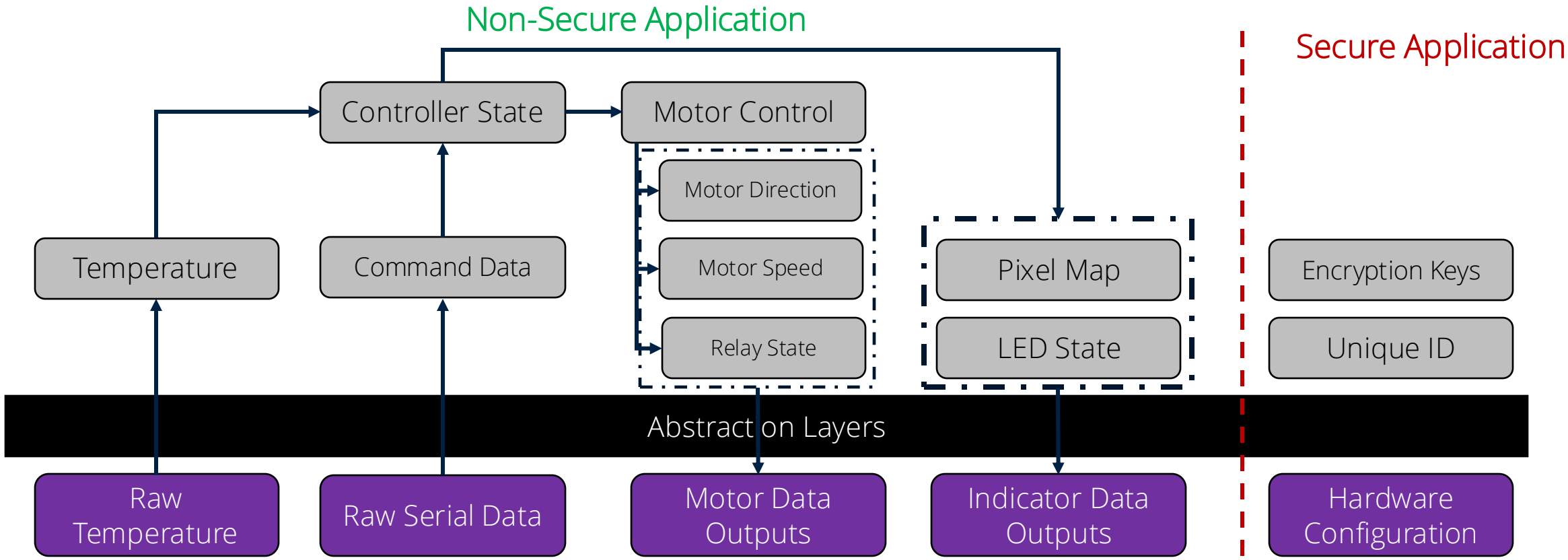


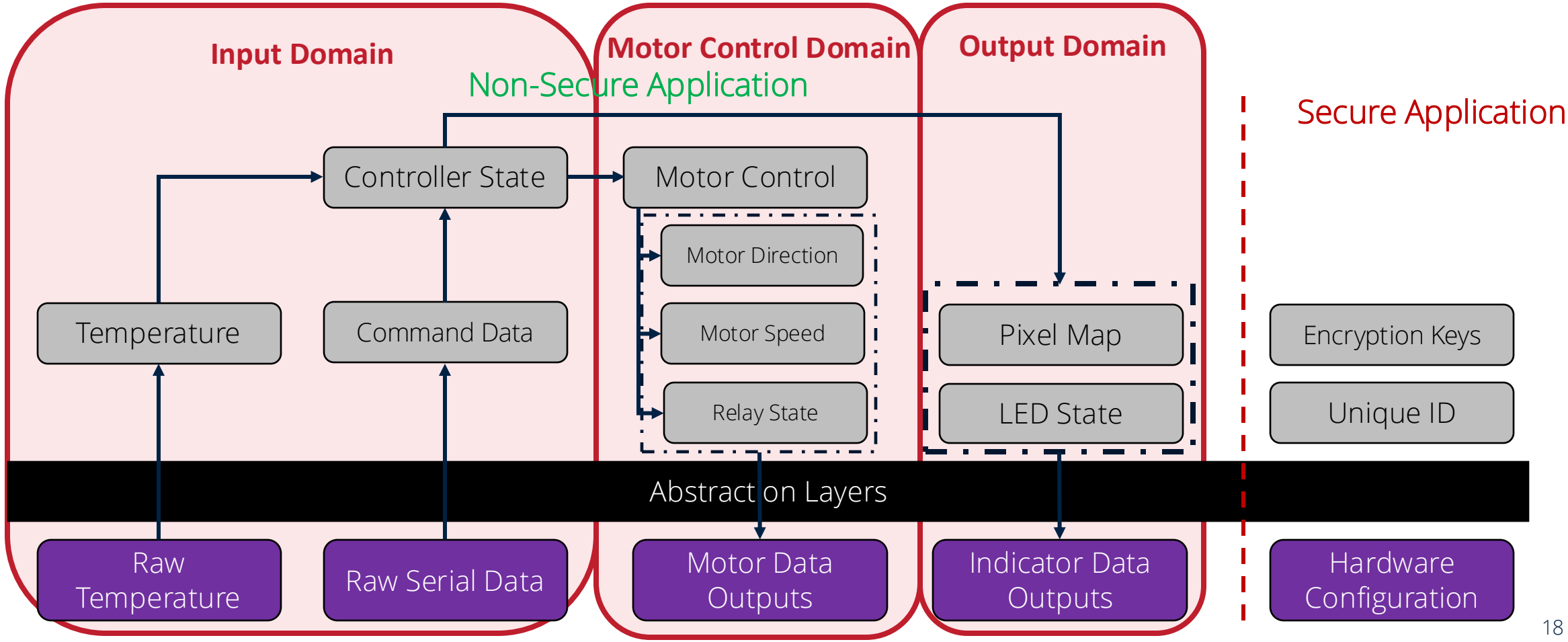
Audience POLL Question

Why is tracing data assets important?

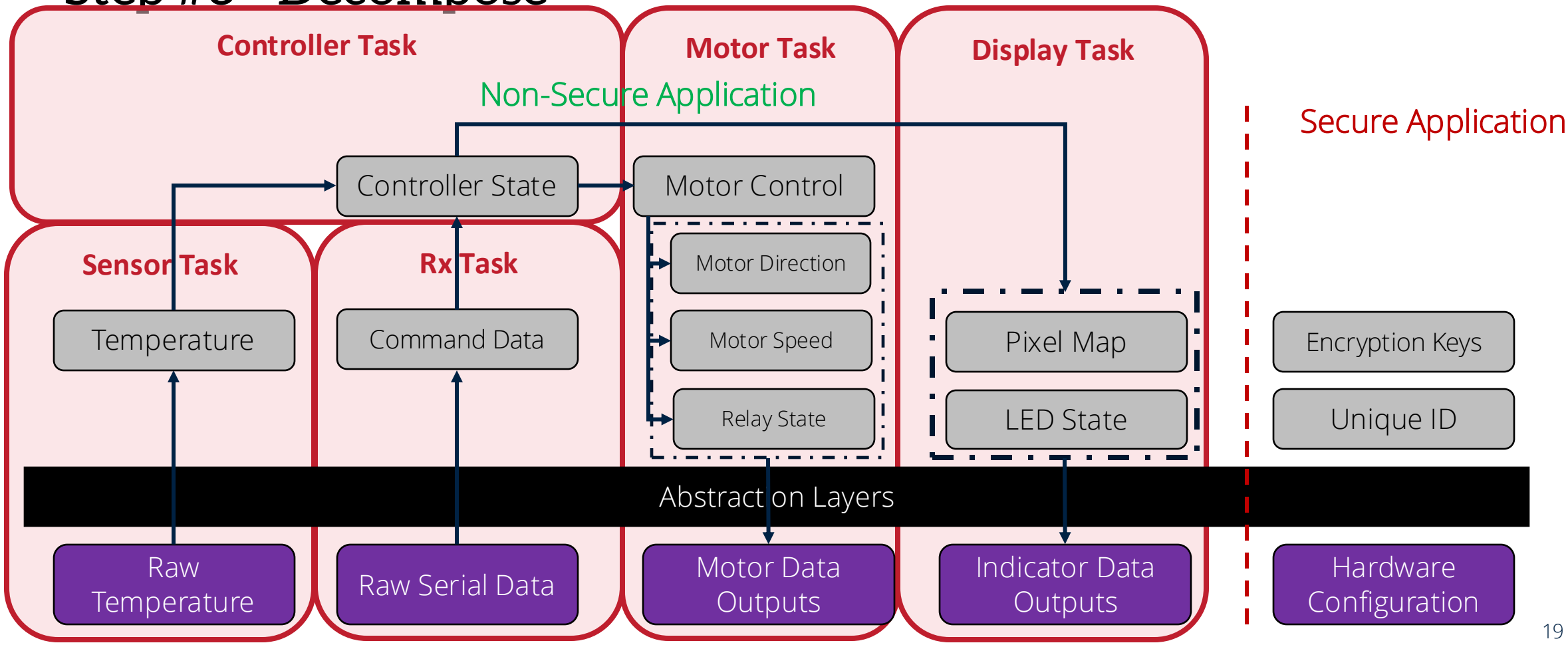
a) It shows you how data flows through the system.
b) It guides how the system should be broken up into different domains
c) It hints at where additional communication mechanisms are needed.
d) All the above
e) None of the above

03 Decomposing the Architecture

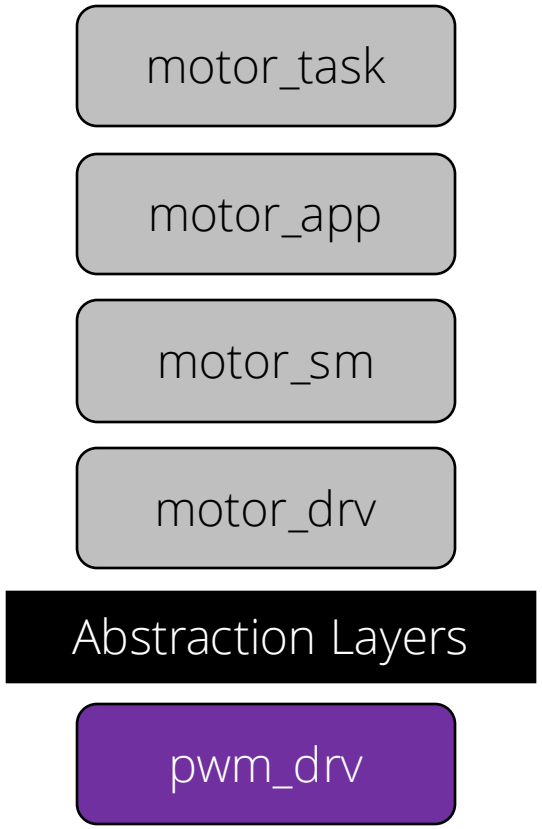
Step #3 - Decompose

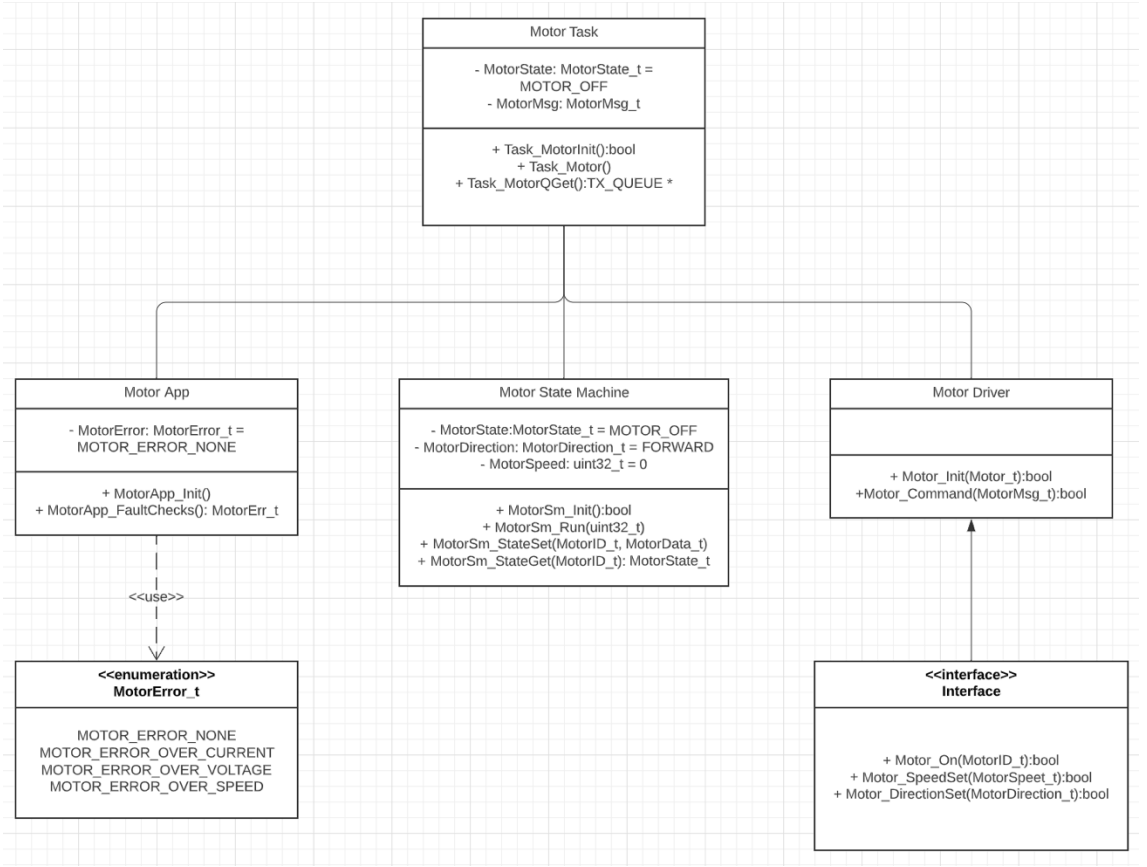


Step #3 - Decompose

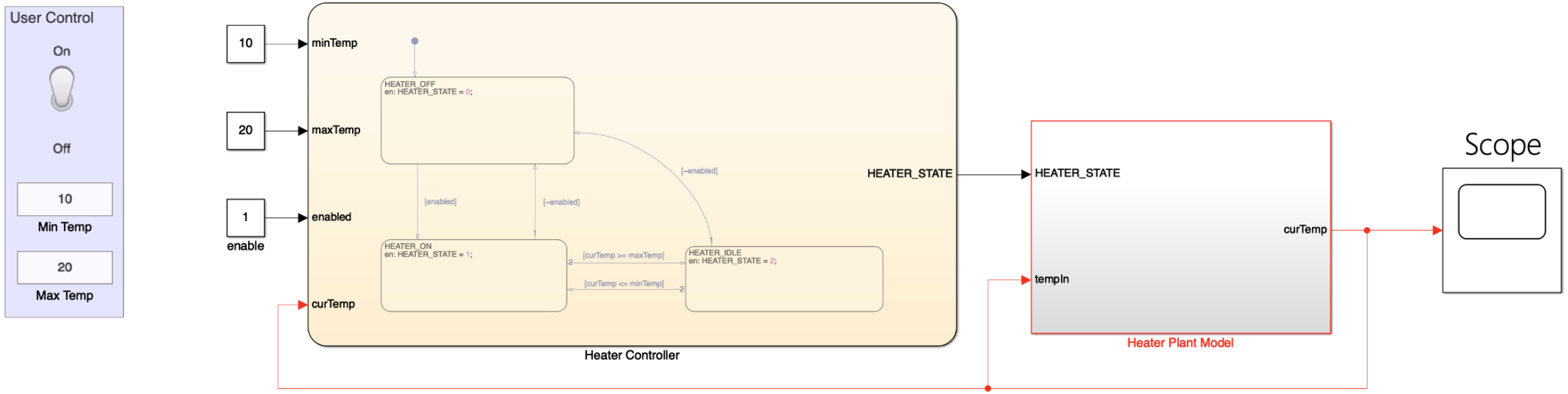


Step #4 – Interface and Component Design





Step #5 – Simulate, Iterate, and Scale



Audience POLL Question

Once an architecture is created, is it set in stone?

a) Yes
b) No, as new information is learned, the architecture evolves
c) Other

Next Steps

04

Going Further

Download the extra resources:

- https://beningo.short.gy/25DNCEC-10-Architecture-Resources

Get Hands-On:

- Analyze an existing projects software architecture
- Draw a new software architecture
- Invest a widget to practice your architecture skills
- Join an Embedded Software Architecture Kata

Downloadable Resources:

- Characteristics Worksheet
- Modern Principles
- Architecture Book List
- ADR Template

Save $100:
https://beningo.short.gy/DNCEC2510

Additional Resources

Please consider the resources below:

- Jacob's Blogs
- Jacob's CEC courses
- Embedded Software Academy

- Embedded Bytes Newsletter
  - http://bit.ly/1BAHYXm

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Next Steps

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