TEAM 30

# Adaptive Ventricular Assist Device (AVAD)

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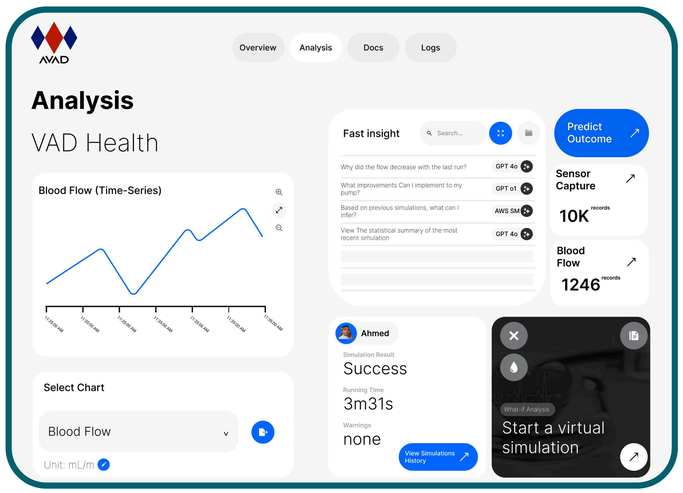
EE ICS 4 COE ME

## Objective

**Current VADs operate at a constant flow rate, which will limit the patients' ability to engage in physical activities and reduces their quality of life. The Adaptive VAD system offers a smarter solution. By providing a research field with more than 26 million patients with a more flexible and smart mock loop, which enables them to enhance patients' lifestyles.**

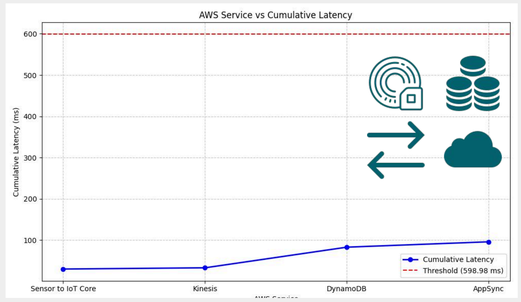



## Specifications

- Sensor Latency
- Data Throughput
- Power Efficiency
- Flow Rate
- Cloud Processing Latency
- Controller Operating Temperature
- Weight of the System

## Validation

**83.97% lower than the 598.98 ms maximum latency threshold**




```
Current Heart Rate from the simulator: 70 BPM
Current Orientation from the simulator: Horizontal
Current Orientation from Accelerometer Sensor: Horizontal
Activity Level: Resting
Desired Voltage: 1V
Pump is working, running at 1V (Duty Cycle: 8.333333333333332%)
Flow Rate from Sensor 1 (after pump): 1.4666666666666666 L/min
Total Flow Rate from Sensor 2: 2.4266666666666667 L/min
Current Heart Rate from the simulator: 70 BPM
```

**Terminal output while running a test scenario**

**Calculation:**

- Gripper current consumption: 1 A
- Raspberry Pi current consumption: 1.25 A
- Two stepper motors current consumption: 4 A
- Battery capacity: 12 Ah

**To calculate battery life:**

- t = C / I
- t = 12 Ah / (1 + 1.25 + 4) A
- t = 12 / 6.25
- t = 1.92 hours, which is around 1 hour and 55 minutes

**Estimated battery life approx. 1 hr and 55 minutes**

```
Mass properties of A-VAD Assembly
    Configuration: Default
    Coordinate system: -- default --

Mass = 14.95 kilograms
```

**50% less than Expected Weight (30 kg)**

## Constraints

- **Real-Time Sensor Data Stream**
- **Battery Capacity**
- **Offline/No Internet Functionality**
- **Pump Type**

## Conclusion

**The A-VAD prototype demonstrates the potential of adaptive control and real-time monitoring to enhance current VAD systems. Through interdisciplinary collaboration, we developed a responsive and reliable solution aimed at improving patient mobility and quality of life. This work lays the foundation for future clinical development and broader application.**