MICHIGAN STATE UNIVERSITY

Project Plan Presentation

Setup Assistant for Mac MLX Cluster

The Capstone Experience

Team Apple

Amelia Marine
Anika Balakrishnan
Constance Chen
Madhur Varshney
Marco Antonio de Oliveira Batista
Paul Lin

Department of Computer Science and Engineering
Michigan State University

Spring 2026



From Students…
…to Professionals

Project Sponsor Overview

- Apple is a global technology company that develops both hardware and software
- Products focus on integrating both components seamlessly
- 2.35 billion active users across all products, $416.6 billion in revenue in 2025
- In recent years, they have released custom Mac silicon

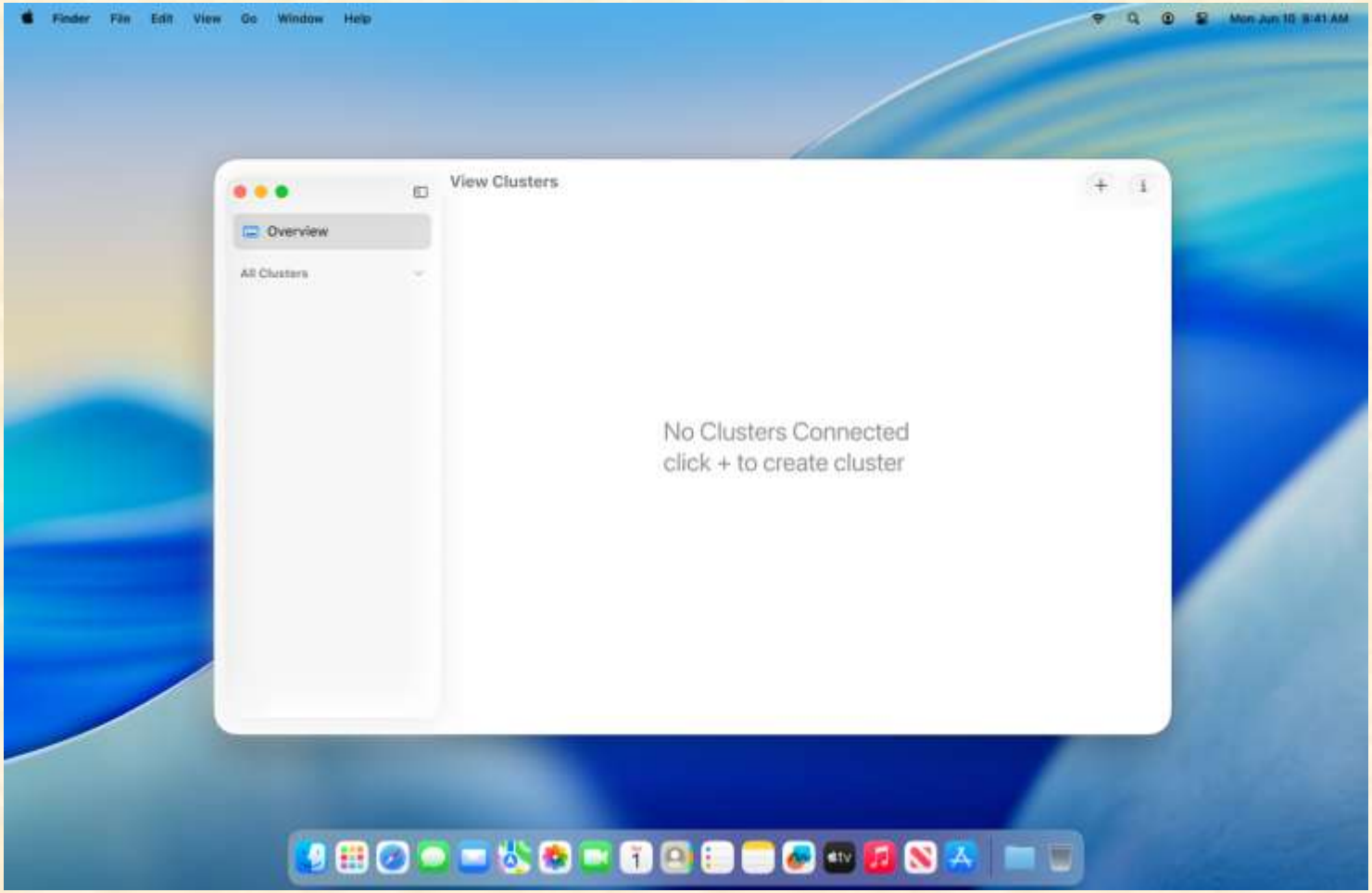
Project Functional Specifications

- **Problem:** Current MLX setup requires manual SSH configuration and offers minimal debugging feedback which makes MLX inaccessible to non-experts
- **Our solution – MLX Setup Assistant:**
  - Automated Device Discovery – Users click a button to add nearby Macs to the cluster instead of manual SSH setup
  - Real-Time Status Monitoring – Clear visibility of all devices and progress throughout setup
  - Intelligent Error Handling – Detects issues, walks users through issue resolution, and returns to workflow seamlessly

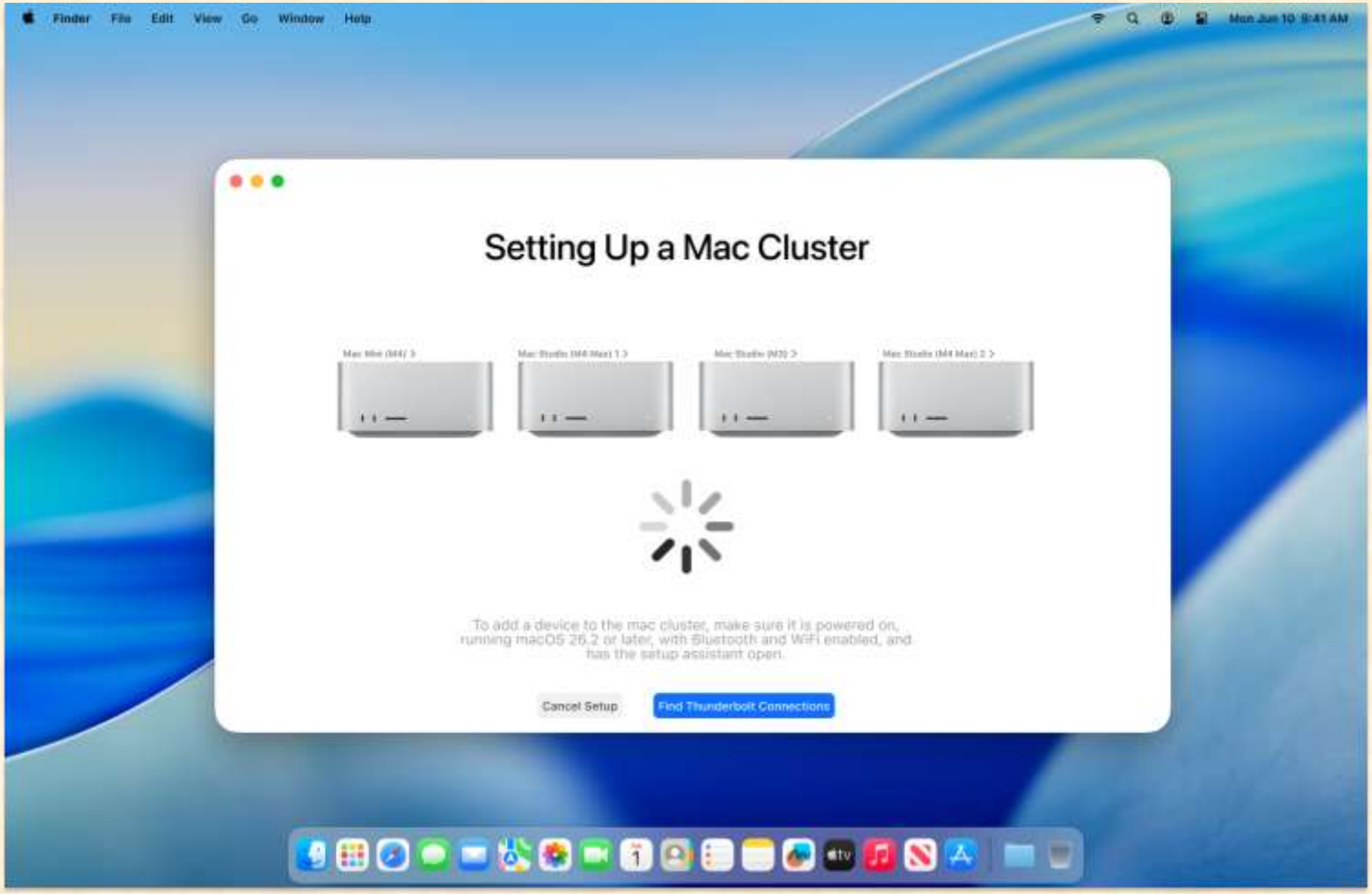
Project Design Specifications

- Device Discovery page clearly shows the devices that will be added to the cluster
- Error page aids the user is debugging any missing Thunderbolt Connections
- Topology graph displays Mac cluster configuration

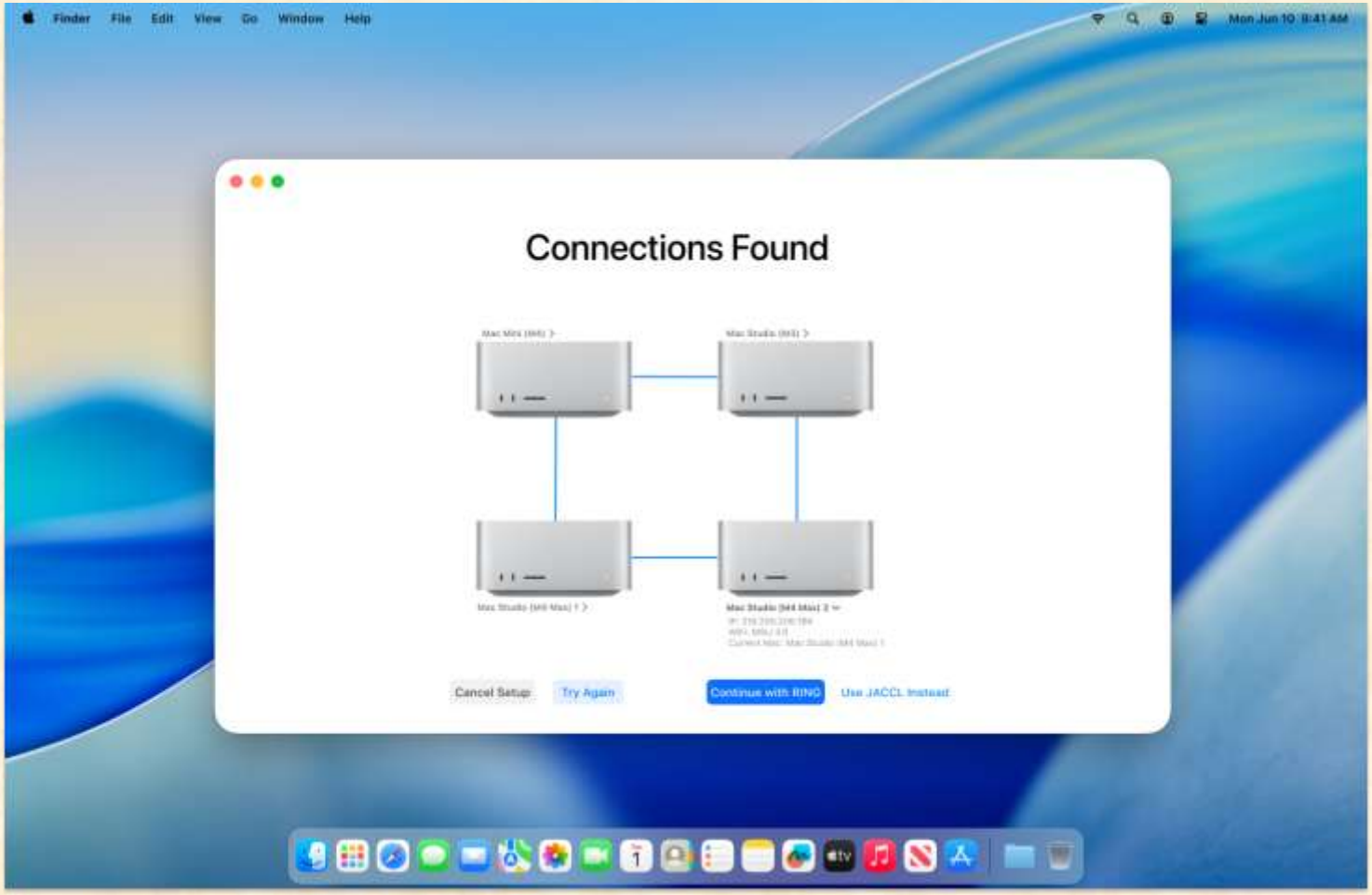
Screen Mockup: Initial View



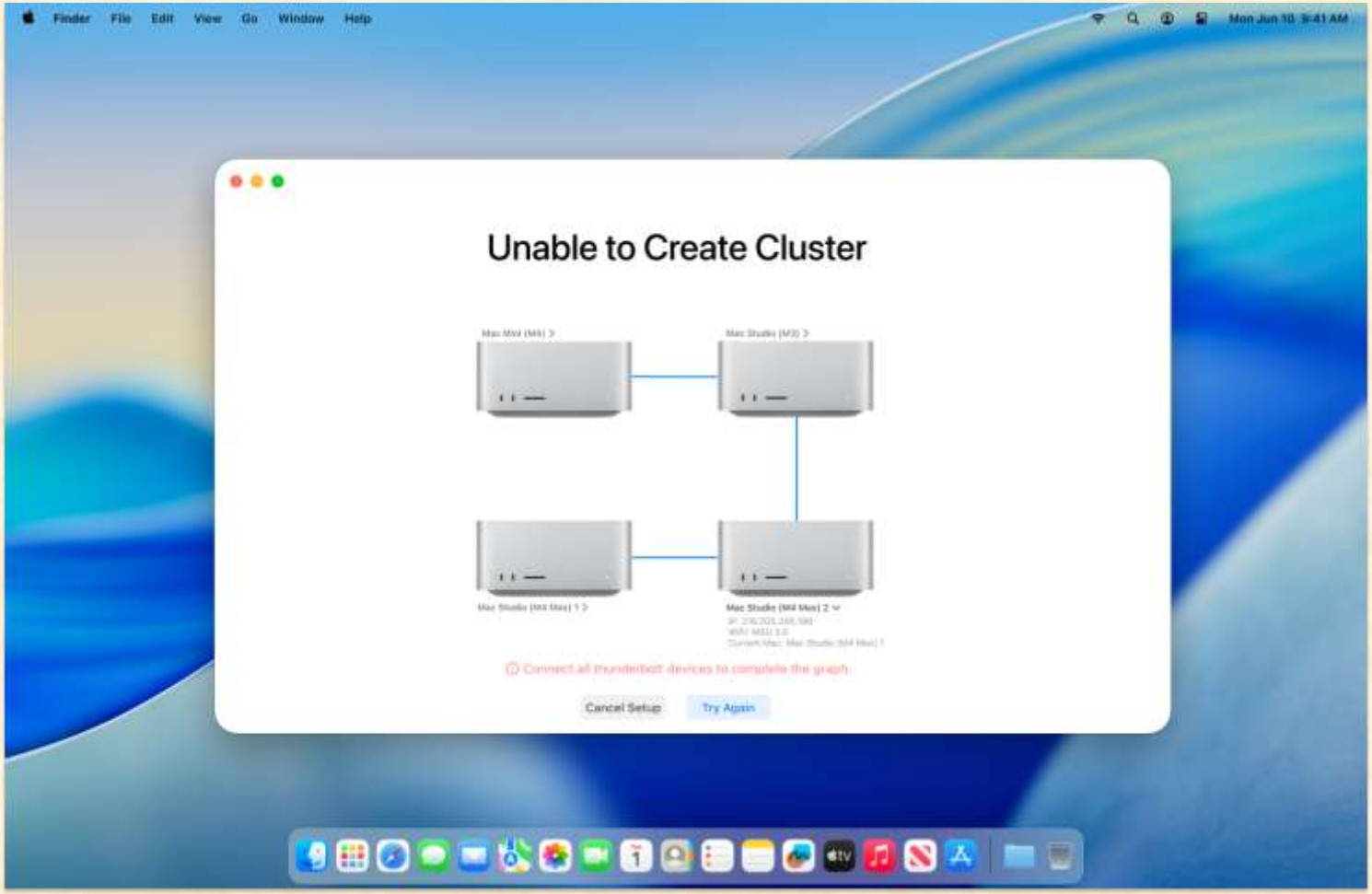
Screen Mockup: Discovering Devices



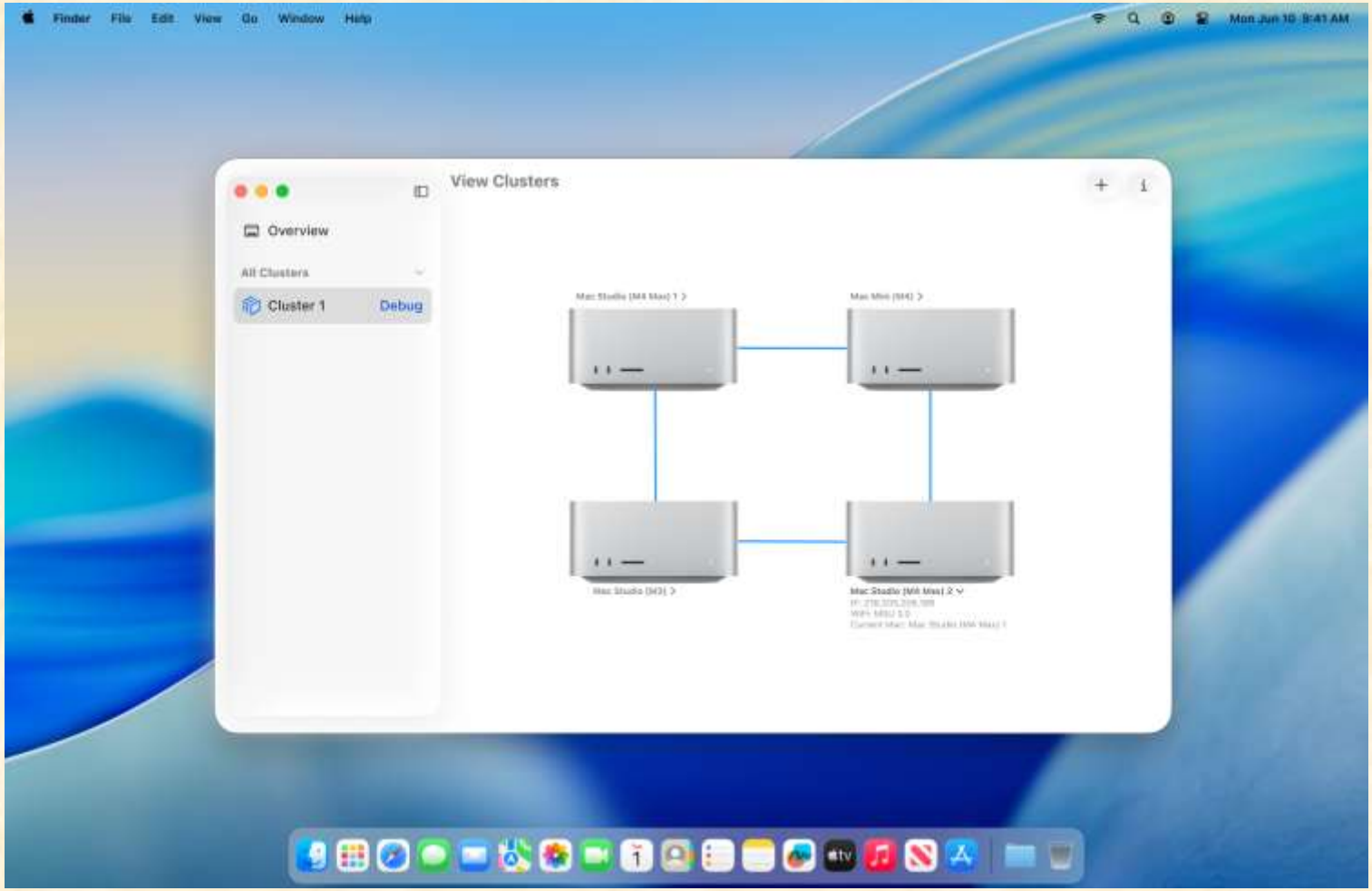
Screen Mockup: Connection Successful



Screen Mockup: Connection Unsuccessful



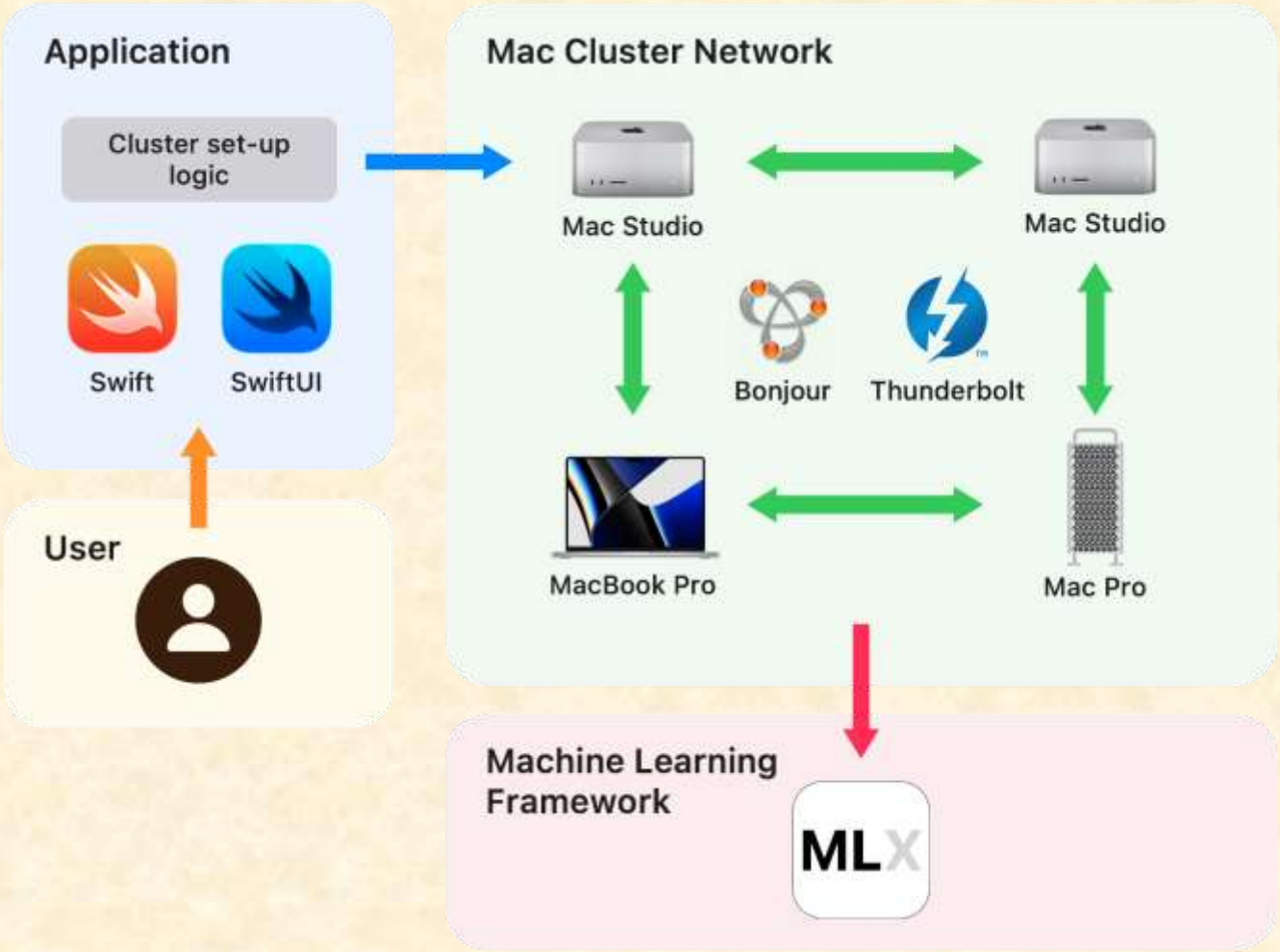
Screen Mockup: Cluster Running



Project Technical Specifications

- Device discovery
  - Devices discovered over Wi-Fi and Ethernet via Bonjour
  - Sends device name, IP address, and other info when discovered
- Connections
  - Thunderbolt topology created once all Macs have been discovered
- TCP used for device communication over Thunderbolt

Project System Architecture



Project System Components

- Hardware Platforms
  - Thunderbolt
- Software Platforms / Technologies
  - Bonjour
  - MLX
  - Swift
  - SwiftUI

Project Risks

- Risk 1: Testing w/ Non-Technical Users
  - Complex automated checks produce overly technical error messages, could overwhelm first-time users
  - Mitigation: Self-testing from a “first-time user” POV, write concise error messages w/o heavy reliance on external testing
- Risk 2: Inconsistent Thunderbolt Device Detection
  - Detection may behave differently across different devices
  - Mitigation: Test TB connections across different hardware and OS environments, document findings
- Risk 3: Automated RDMA Verification
  - macOS permissions may restrict automated RDMA support
  - Mitigation: Validation checks testing if two or more Macs can establish a direct connection and exchange data
- Risk 4: macOS System Information Collection
  - Privacy + security protections block access to system information needed for setup + cluster validation
  - Mitigation: Explicitly define required system information, with manual verification guidance as a fallback solution



Questions?

