Home Assistant

Ali Sina (218318428)
Arash Saffari (218791632)
David Luu (216157463)
John Donato Prabahar (219087279)
Omer Omer(218636878)
Siyan Sriganeshan (218707190)

EECS 4314

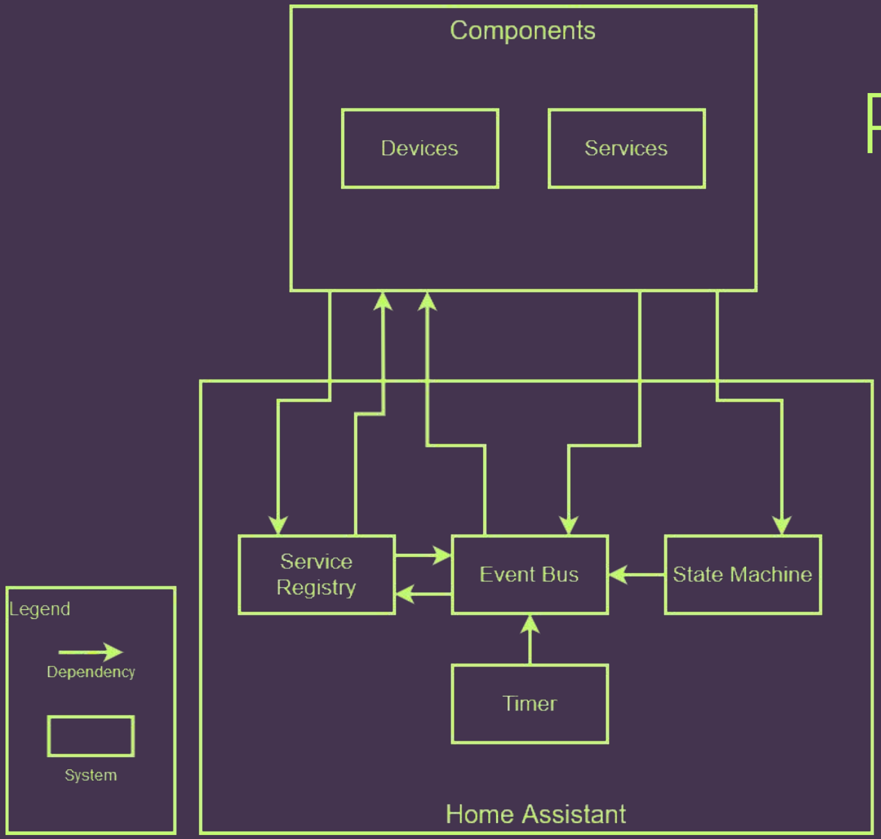
01

Conceptual Architecture

Present Architectures

Implicit-Invocation (Event Bus)

Micro-Services



Subsystems

Home Assistant

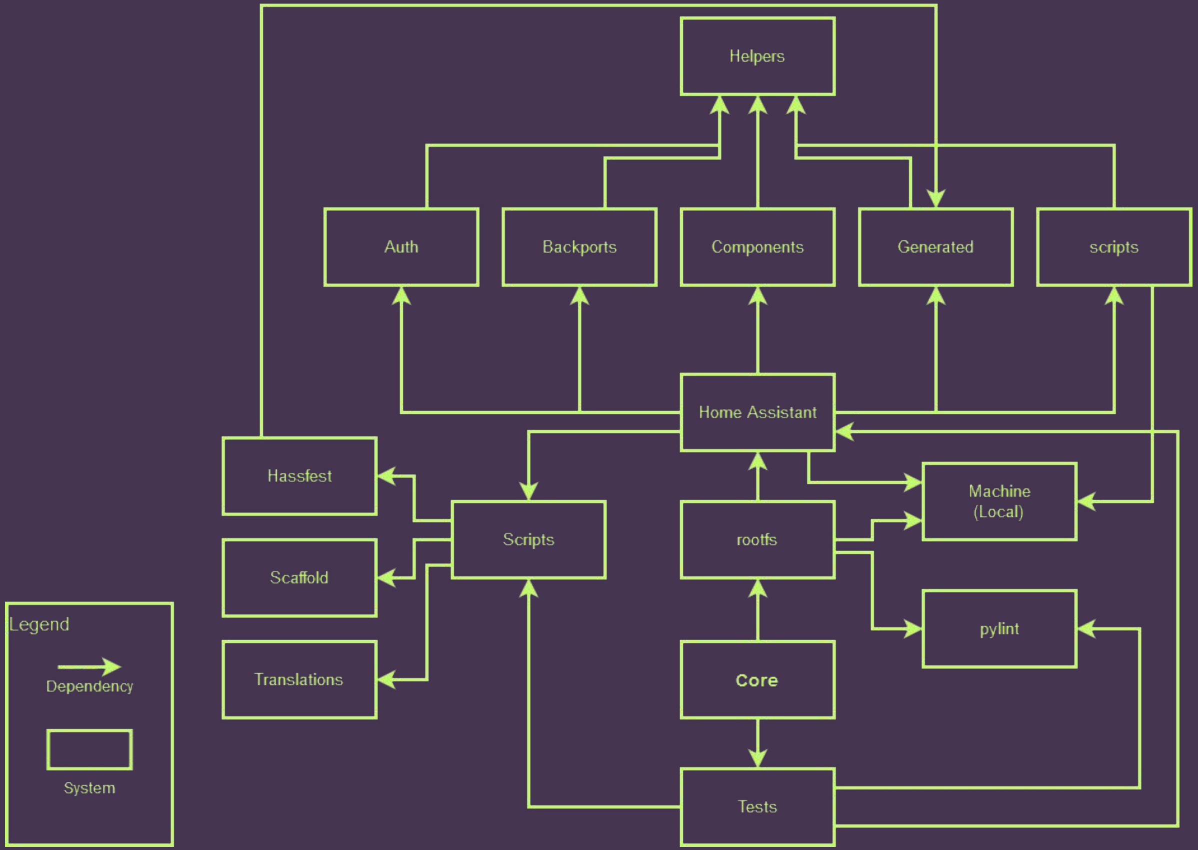
Components

Authorization

Hassfest

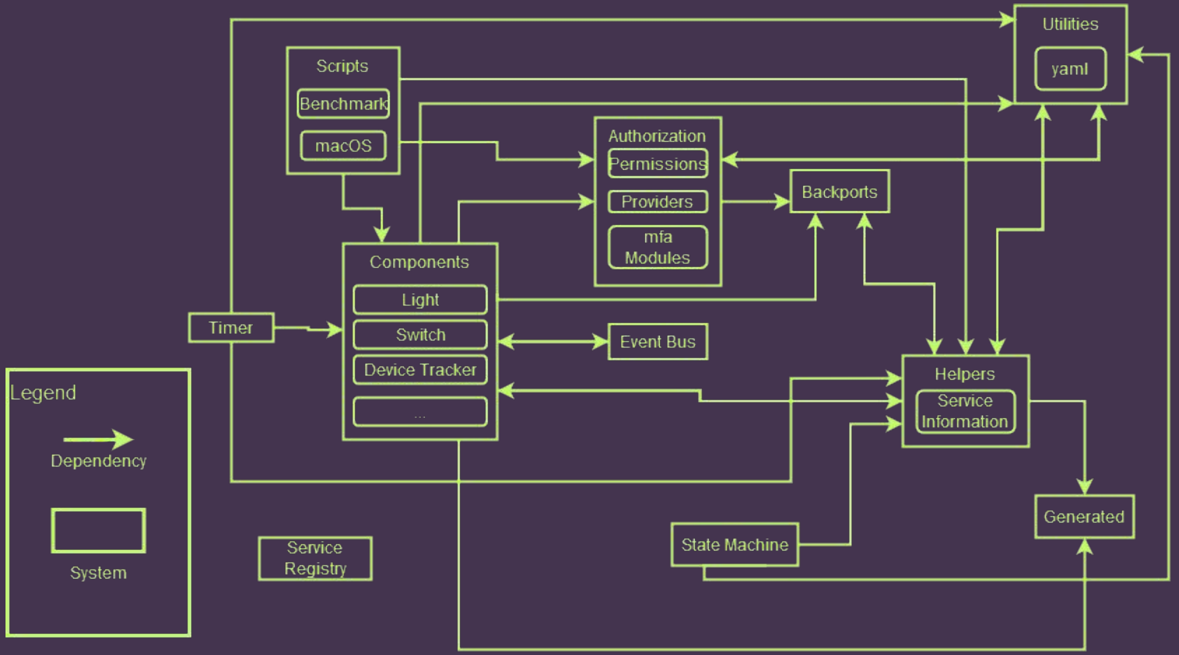
Helpers

scripts



02 Concrete Architecture

Concrete Architecture



Implicit Invocation and Microservices

Concrete - Description of Subsystems

Authorization

Ensures secure access with permissions, providers, and MFA.

Components

Core modules that implement features and integrations, such as Light, Switch, and Device Tracker.

Event Bus

Central communication hub for propagating events between components.

Helpers

Utility modules providing reusable functions and service-related support.

State Machine

Manages the system's current state and transitions between states.

Utilities

Handles configuration management, including parsing and validation.

Backports

Ensures backward compatibility with older Python versions to maintain system stability.

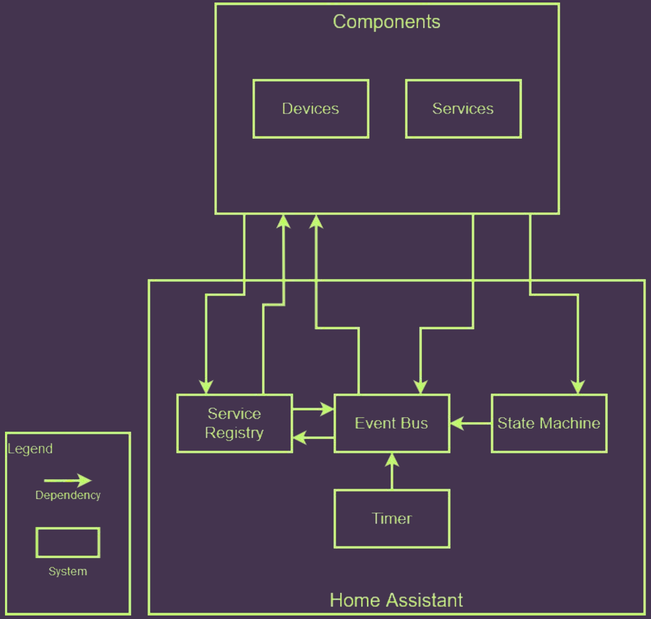
Timer

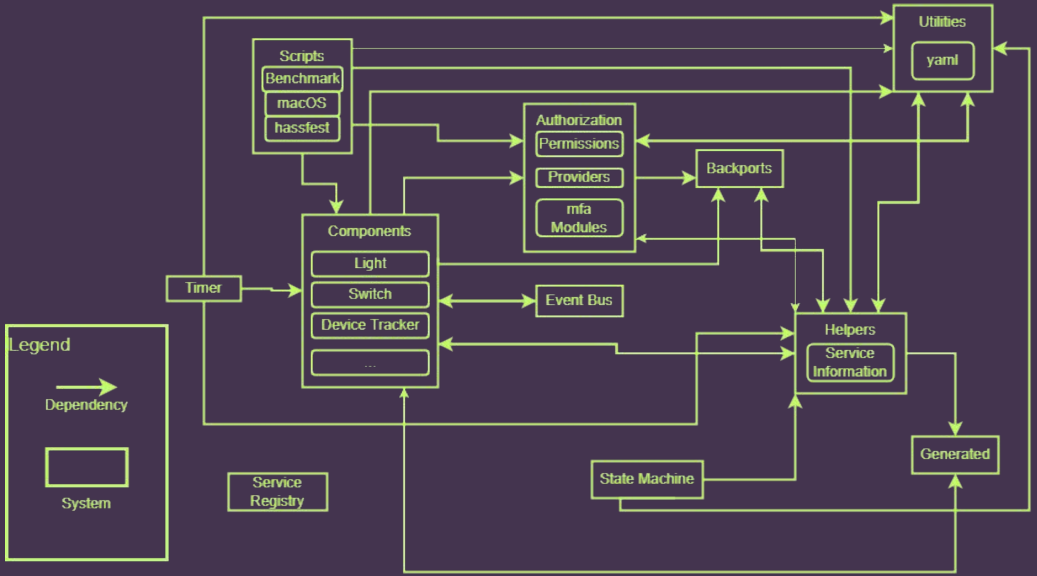
Handles all timing and scheduling tasks critical for automation and time-based operations.

Generated

Stores dynamically created runtime files or configurations essential for the system's operation.

Divergent





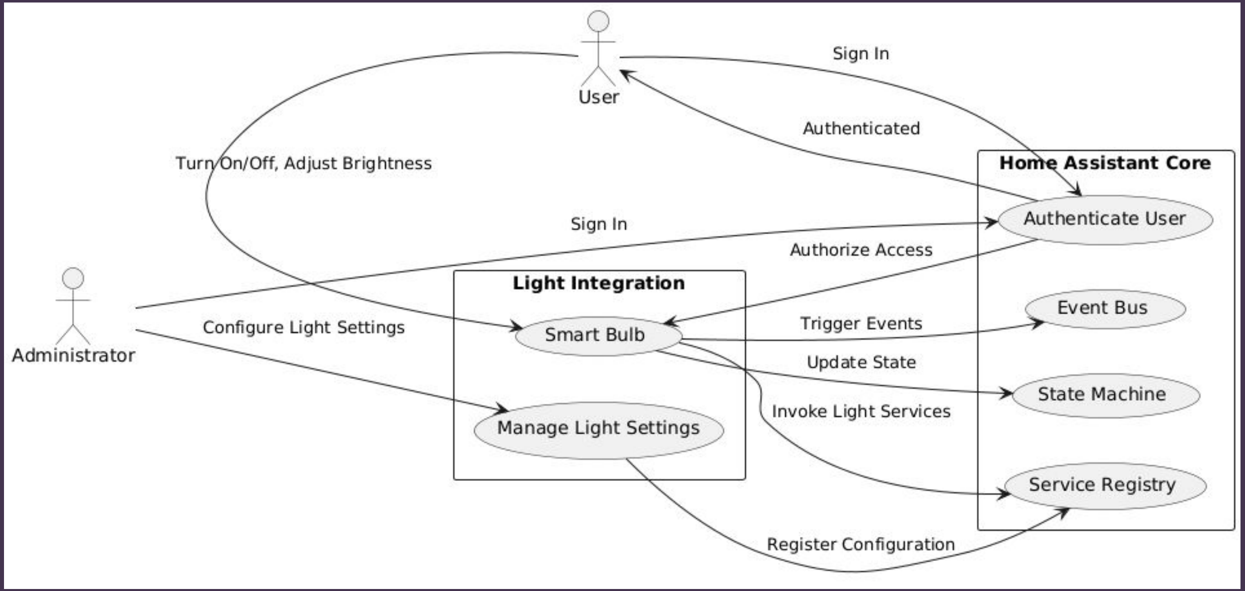
Timer, Event Bus, Service Registry

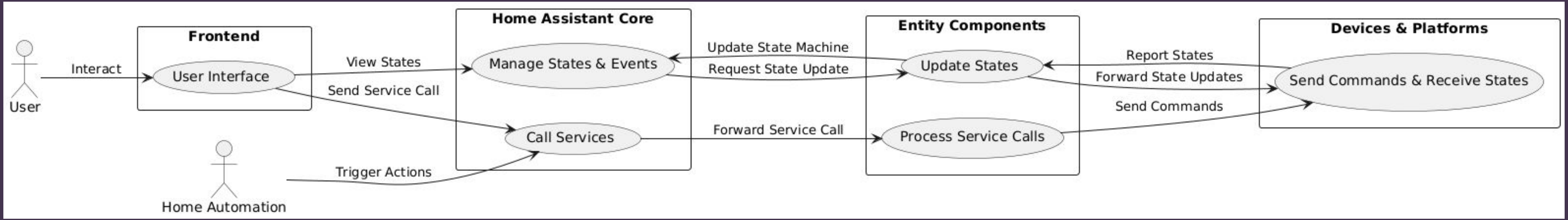
Rationale of Interactions

- Event Generation: Components Create Data and Events
  - Components trigger events by generating data or signalling a change in state
- Event Bus: Central Communication Hub
  - Receives, manages, and routes events to the appropriate listeners or services within the system.
- State Updates via State Machine:
  - Updates the states of entities based on incoming events
- Service Execution via Service Registry:
  - Maps Events to the appropriate services and executes actions
- Feedback Loop to Components:
  - After processing events, the system communicates results back to the originating components

Demo (Arash)

Use Cases


User
Sign In
Authenticated
Turn On/Off, Adjust Brightness
Home Assistant Core
Authenticate User
Sign In
Authorize Access
Administrator
Light Integration
Event Bus
Configure Light Settings
Smart Bulb
Trigger Events
Update State
State Machine
Invoke Light Services
Manage Light Settings
Service Registry
Register Configuration


User
Interact
Frontend
User Interface
View States
Send Service Call
Home Assistant Core
Manage States & Events
Call Services
Update State Machine
Request State Update
Forward Service Call
Entity Components
Update States
Process Service Calls
Report States
Forward State Updates
Send Commands
Devices & Platforms
Send Commands & Receive States
Home Automation
Trigger Actions

Concurrency

Event-Driven Architecture

- Core Event Loop
- Event Bus

Threading & Thread Pools

- Threaded Operations
- Integration Offloading

Asynchronous Programming

- Async I/O
- Coroutines
- Task Scheduling

Rate-Limiting & Throttling

- Non-Overwhelming Systems and Services

Team Issues

Coordination and Communication

- Distributed Team
- Lack of Centralized Control
- Issue Prioritization

Code Quality & Consistency

- Varying Expertise Levels
- Technical Debt
- Review Bottlenecks

Sustainability

- Funding & Resources
- Burnout Risk

Scalability & Performance

- Asynchronous Complexity
- Legacy Integrations
- Load Testing

Integration Ecosystem

- Fragmentation
- Backward Compatibility
- Synchronous Dependencies

User & Contributor Support

- Community Expectations
- Support Load
- Contributor Onboarding

Testing & Quality Assurance

- Comprehensive Testing
- Regression Issues
- Limited Real-World Testing

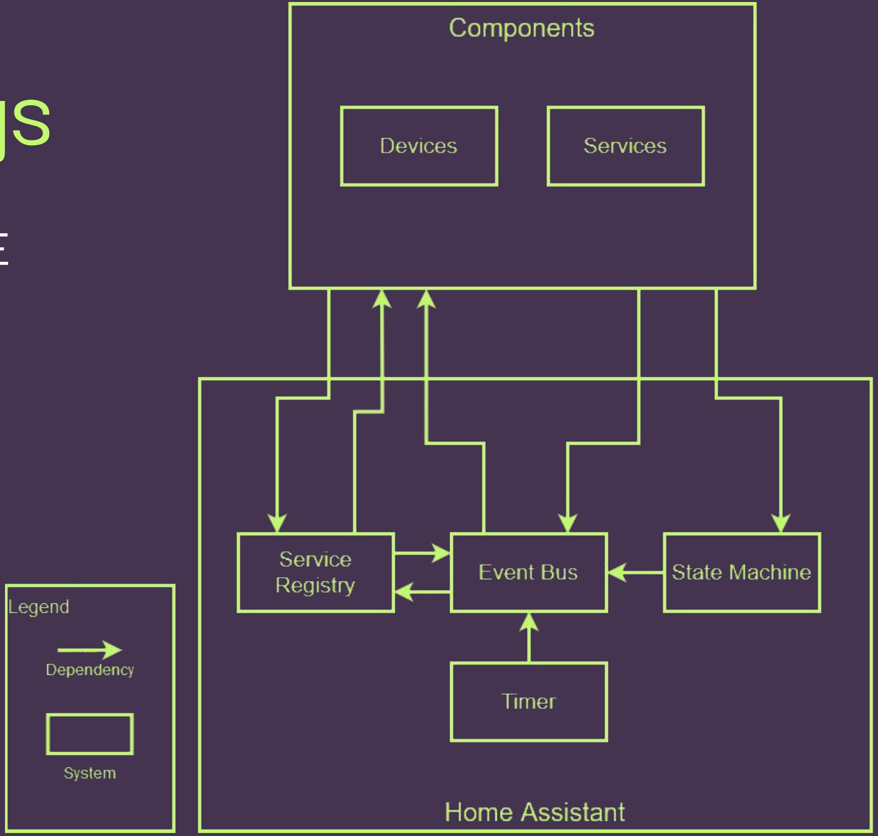
03

Lessons Learnt

Limitations of findings

Graphing Conceptual Without README

Hass object too big to be mapped



Lessons Learnt

- The concrete architecture differs greatly from both the developer's and our team's conceptual architecture.
- This change is due to issues and factors that arise during the implementation stage
- The Home Assistant architecture clearly shows how the Event Bus is a central part of the application and how it allows for a seamless flow between the many functions of the component system

THANK YOU