

## Multi-Agent Solution for Autonomous Home Automation

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Home automation involves integrating technology within residential spaces to control and automate various household functions, such as lighting, heating, and security systems, to achieve better and more effective power management. Traditional home automation systems often rely on cloud-based platforms, which, while effective, can experience latency, dependence on internet connectivity, and potential security vulnerabilities. These challenges highlight the need for more robust, efficient, and secure communication frameworks within smart home environments beyond the limitations of cloud-based systems. In this research study, we propose a multi-agent-based solution that emphasizes agent-to-agent communication as a more resilient alternative to cloud-based systems. Agent-based systems operate on the principle of multi-agent communication, where each device, or "agent," communicates directly with others within the network. These communications were further tested using the multi-agent development framework MASMT, which enables seamless and efficient communication between devices. By adopting this multi-agent approach, the communication within the home automation system becomes more robust, secure, and less dependent on external factors, ensuring a more reliable and autonomous operation of smart homes. In summary, this system comprises a hardware unit and a multi-agent-based backend system. The hardware unit consists of 16 power outlets that can be fully controlled bidirectionally by the multi-agent system. The multi-agent system communicates with all devices, referred to as agents, to effectively manage power requirements within the home automation system. This system has been successfully tested in a laboratory environment, yielding positive results compared to traditional cloud-based approaches. Notably, this system proves to be more effective in complex and dynamic environments.

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