

Autonomous Multiple Cycle Farming in Space

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MOTIVATION

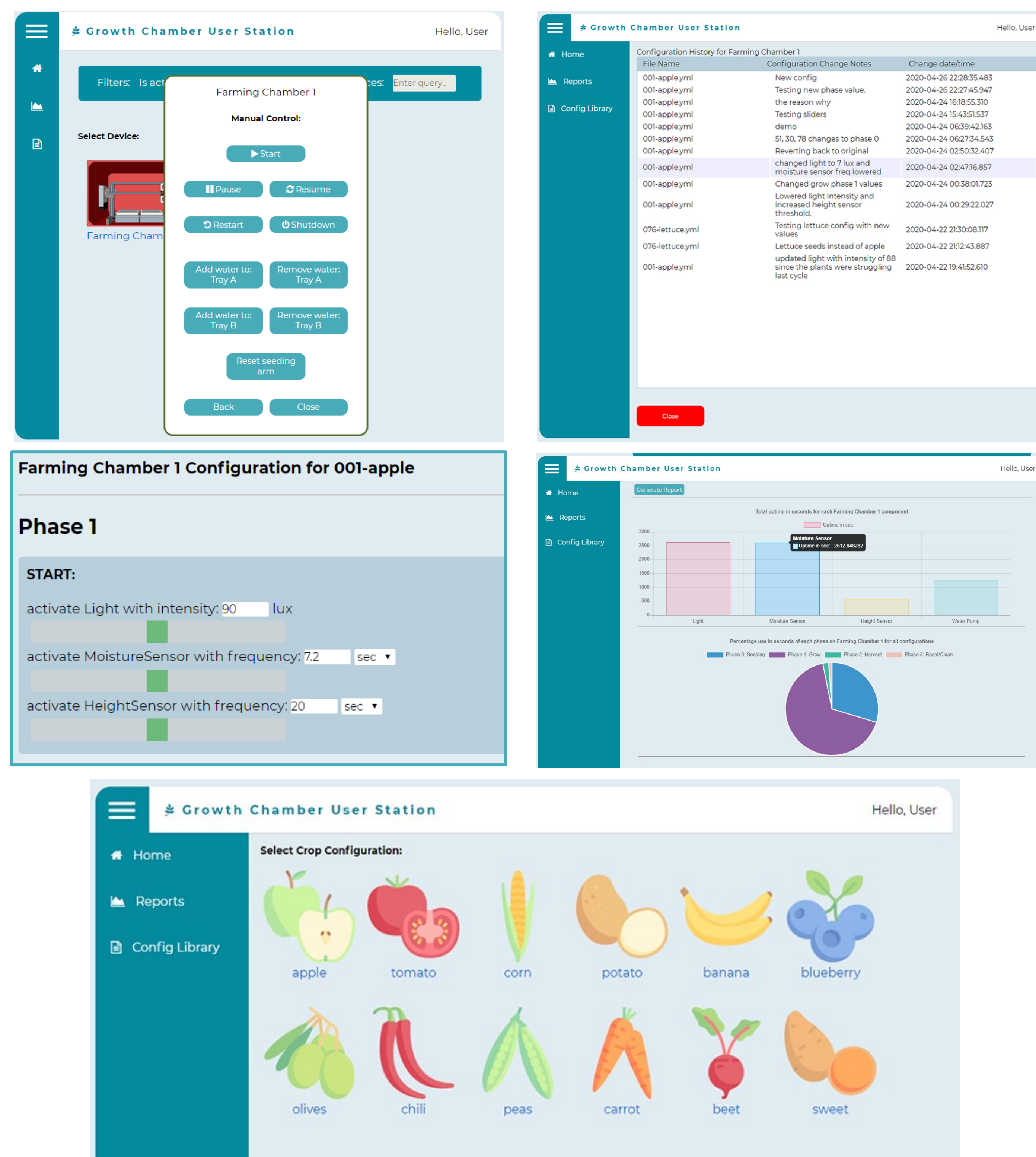
- Space exploration expanding rapidly and the need to accommodate life beyond Earth.
- To grow food autonomously in space that can support humans reliably, without compromising valuable time, or energy, from other missions.

PROJECT GOAL

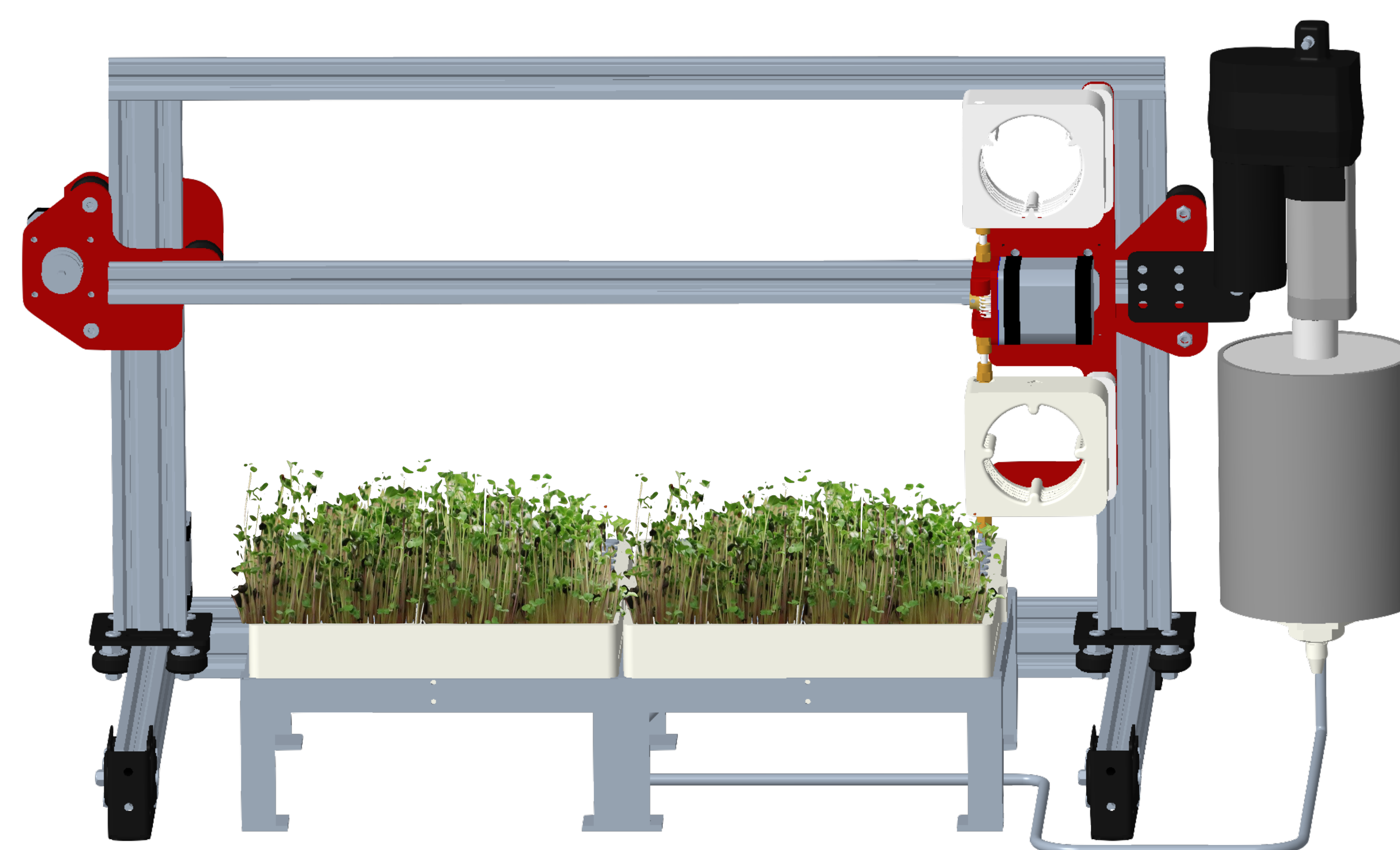
- To build an Autonomous Multiple Cycle Farming Chamber that seeds, grows, and notifies crew that crop is ready for harvest.
- Streamline the Growth Chamber configuration for multiple farming cycles by creating a web application user station.

USER STATION FEATURES

- User Station allows users to **manually control**, **update configurations**, and **view reports**



GROWTH CHAMBER DESIGN



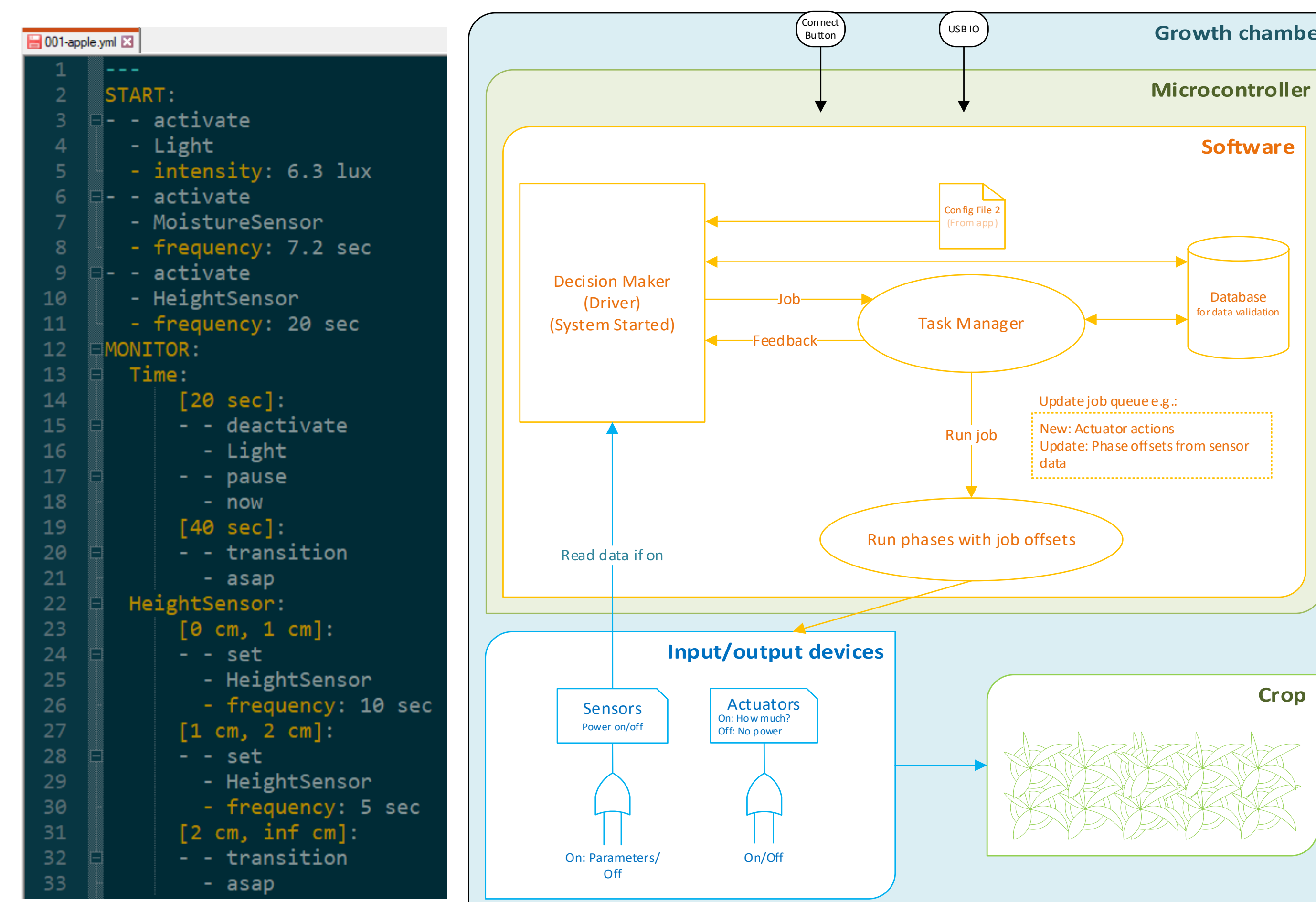
GROWTH CHAMBER FEATURES

- An aluminum tank, that controls the intake and outflow of water nutrient solution with a plunger. Solenoid valves control the direction of the water utilizing capillary action.
- The End Effector is capable of planting seeds in microgravity by forcing seeds out with filament driven by a stepper motor.



GROWTH CHAMBER SCHEDULER

- Growth Chamber **runs autonomously** based on botanist and astronaut configuration files



TESTING & VALIDATION

- Multiple iterations of the tray were tested through growth cycles, in order to achieve the requirement of 70% harvest.
- Circuitry and software was also successfully tested over several weeks, proving the autonomous capabilities of the system.



COST ANALYSIS

Component	Cost
Planting System & End Effector	\$560.21
Water Delivery & Tray	\$329.16
Lighting & Electrical	\$83.95
Miscellaneous & Case	\$341.74
Total	\$1315.06

FUTURE PLANS

It is with great pleasure to announce that we have already submitted the Autonomous Multiple Cycle Farming System concept to two different NASA programs: "Technology Advancement Utilizing Suborbital Flight Opportunities 'Tech Flights'," as well as "Student Payload Opportunity with Citizen Science (SPOCS)" at Johnson Space Center.

ACKNOWLEDGEMENTS

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