Smart Pet Care Ecosystem Final Summary

Petr Novak, Julius Salas

SPEC: A Recap (Description)

The Smart Pet Care Ecosystem is a fully integrated lineup of wirelessly interconnected smart pet care products which are designed to automate and simplify pet ownership. The SPEC ecosystem is divided into three essential aspects: **User**, **Device**, and **Pet**. The user truly is the master of their ecosystem. Through interaction with the highly intuitive UI of the SPEC mobile and web applications, the user is able to control every detail of their ecosystem with ease. Users can integrate new pets and devices, set scheduled and on demand tasks to be completed by their SPEC devices, and monitor the health and status of their pets and devices, all with the click of a button. SPEC devices on the other hand, truly have no limits in terms of what can be produced. Smart collars, feeders, hydrators, cleaning bots, litter boxes, doggy doors, the list goes on and on; countless possibilities for various devices for a user to integrate into their SPEC ecosystem. All designed in a simplistic, no frills fashion, meant to be accessible for all. Lastly, and most importantly, the pets. The Smart Pet Care Ecosystem prioritizes pet health and safety. Through physically built-in fail safes, persistent monitoring, and timely alerts, SPEC ensures that pet care remains the uppermost priority. We want to build trust with our consumers, and we do so through our simple, effective, and consistent hardware/software design.

SPEC: Our Standards (Tests & Requirements)

The Smart Pet Care Ecosystem is held to the highest standards in terms of both hardware and software design. The entirety of SPEC should be put through a rigorous testing process in order to ensure that the highest quality standards are being met. Requirements pertaining to **reliability**, **fail-safe integrity**, and **timely task execution**. Reliability is tested through testing the SPEC environment in a variety of scenarios ranging from highly repetitive tasks to edge cases and extreme scenarios. Scenarios involving common hardware faults should also be tested to ensure that built in fail-safes/notification subsystems function as intended. Lastly, timely execution of both scheduled and on-demand tasks must be properly optimized to ensure user satisfaction.

The SPEC Product (Design)

Architecture

The Smart Pet Care Ecosystem will utilize a **client-server architecture**. In order to achieve this the system responsibilities are broken into three parts. The **SPEC Main Hub** acts as the l**ocal server** and **manages communication** between SPEC devices and SPEC applications. **SPEC applications** are the **clients** and are able to **send commands, view pet activity, monitor device status, and receive notifications** through the hub. **SPEC devices** act as **subordinate nodes** and **interact exclusively with the hub** to receive commands and send notifications/status updates. This three-way communication system provides modularity on a larger scale, with each aspect being further broken down into subsystems. Each of the three components will gather, process, and communicate different data to the other two allowing for a workflow distribution that is easily manageable and scalable.

Class Design

In terms of classes, the Smart Pet Care Ecosystem can be broken down into three class types, with various relationships between them, the three classes being **Pet**, **User**, and **Device**.

Pet Class:

- Data Members: Pet names', species', breeds', health metrics', and more. Pet instances should only be linked to one User, but can be linked to any number of devices as a single pet might use multiple SPEC devices in its daily life.
- Methods: The majority of the methods owned by the pet class relate purely to device pairing, and metric sharing; methods which carry out tasks such as pairing to a smart collar, and persistently communicating health statistics.

User Class:

- Data Members: User's name, their paired central hub, list of pets and devices, account credentials, and notifications. All of these data members are integral to what makes a user's account unique to them and their ecosystem, and are crucial for proper data management and communication between an ecosystem's devices.
- Methods: All of the ecosystems logistical control is conducted through the use of the User Class' methods. Methods such as adding or removing pets and devices from one's ecosystem, performing maintenance, updates, and diagnostics on devices; everything pertaining to the underlying technical functionality lies here.

Device Class:

- Data Members: Device ID, type, battery level, status, owner. Device instances should all be linked to one User, and depending on the type of Device they can be linked to either one or many Pet instances.
- Methods: Most of the Device methods involve informing the user in some way. This can either be done in the form of a ping or in the form of a status update that lets the user know what has been going on.

The primary subsystem is that of the Main Hub. The Main Hub is a subclass of the Device class. As previously mentioned the Main Hub acts as the mediary between the user and their connected devices, and essentially behaves as the server for a user's ecosystem. It receives commands from the user and relays that information to the user's devices. If any device must alert or notify the user it will first ping the main hub which then relays the notification to the user's SPEC application. Additionally, the Main Hub is also in charge of database management; with three being incorporated: user, pet, and device each with their respective databases. Each one must ensure persistent data management in the case of a system outage.

Project Issues

There are many raised issues with no conclusion as of yet. The first being whether non-SPEC manufactured smart devices will be able to pair with the ecosystem. Many users may already have a smart device they enjoy and may be reluctant to buy a newer one. If general compatibility exists, another issue arises: optimization; while they may be compatible with the main hub, outside devices may not be optimized to the extent required to function within the SPEC ecosystem, possibly leading to performance issues and questionable reliability. Another issue being the main hub breaking; will users have to wait for some form of maintenance, or replacement? Or should they be able to directly interact with the smart devices. Some users might heavily rely on their ecosystem and a lack of functionality could lead to a loss in user trust.