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VUW-Acme Vending Machine - System Description (2020)

This assignment will allow you to apply what you have learnt about

1.0 System Description of the VUW-Acme Vending Machine

The vending machine dispenses products such as snacks.

1.1 Vocabulary

This vocabulary is sourced from <https://vendinghow.com/article/filling-vending-machines-a-step-by-step-guide>

Cart: The handcart you use to transport product to and from the truck.

Cases: These are the form in which the product is originally bought or delivered. A case of chips is usually a cardboard box of 64 chips. A case of soda is in a cardboard flat or box and is in a count of either 12, 24, or 36.

Coil: The metal spiral in a column that holds snacks and rotates to vend snacks (see Figure 1).



Figure 1: A coil from a vending machine

Coin box/Cash box: This removable box is where the coins that customers insert into the machine fall, so you can collect them later.

Coin slot: The slot where the customer puts coins into the machine in order to buy product.

Column: The entire line of snacks of one selection. The coil winds through the column to hold the snacks.

Collection: The money that you collect from a vending machine.

Collection bag: The bag you use to store your collections when you service a machine.

Selection: One specific product location. An example of a selection is 'A1', or, "The first selection on the top shelf."

Shelves: Horizontal sections in a vending machine. For a snack machine, you can usually pull out the whole shelf, like you can with a dresser.

Trays: Trays hold products and support a number of individual spaces. Each space has an auger that pushes outward the selected product. (see Figure 2)

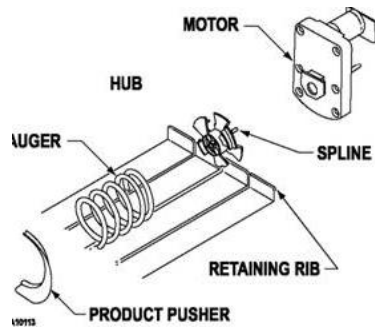


Figure 2: Motor & Auger

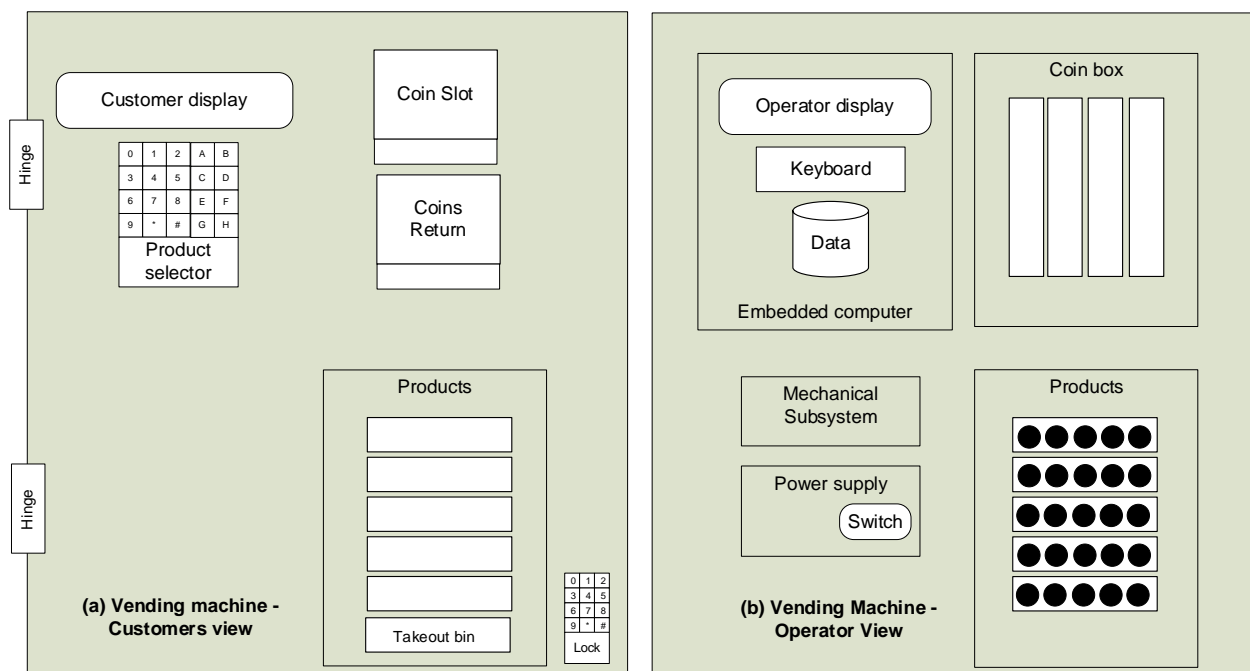


Figure 3- Two views of the physical vending machine

1.2 Physical system

Figure 2 shows two views of the physical vending machine – customer and operator.

Customer view:

- Front of the machine is hinged to allow operator to access internal components after unlocking it using the keyless lock located in the lower right hand corner of the front of the machine.
- Operator enters a four digit code into the keyless lock in order to open the machine. The keypad has physical buttons. The * key is used to clear any digits entered so far while the # key is used to submit the four digit code.
- Product selector is a keypad with physical buttons. The customer enters a two character code corresponding to codes that appear at the front facing end of a column, for example "A5".
- Customer display is a LCD screen used to display the price of the selected product.
- Coin slot allows the customer to insert \$1, 50 cent, 20 cent and 10 cent coins.
- Coins return has a small recessed shelf to hold change or refunds.
- Products are displayed through a clear Perspex front wall and arranged on trays.
- Products are pushed to the front of the tray and will fall down a drop shaft created by the space between the end of the tray and the front wall into a takeout tray. The takeout tray is covered by a flap that is pushed in to access to the item. While the flap is pressed in it is impossible to reach around to access products in the trays.

Operator view:

- Embedded computer with a LCD operator display, physical keyboard and internal flash drive. The front of the embedded computer has four screws holding its cover on that holds the display and keyboard in place. The embedded computer cannot be reprogrammed.
- Coin box can be removed from the machine to allow the operator to gain access and fill the columns holding the coins used for change and also to receive payment from the user.
- Product holder allows access to the columns holding the snacks that are sold using the vending machine. The operator will fill the column from back to front with new snacks.
- Mechanical subsystem refers to the machinery used to validate coins and any systems responsible for driving the motor used to dispense snacks or motor used to cause coins to drop into the coins return tray.
- Coins are validated to determine if they are valid by measuring their weight and size.
- Power supply converts external power to correct voltage, current and frequency to drive the internal components of the vending machine. There is an off/on switch used so that the electronics are isolated from power when any maintenance such as on the mechanical subsystem or embedded computer take place. The power supply is a sealed unit.

1.3 Location of Vending Machine

The vending machine is located next to two other vending machines owned by competitors. The machines are located in the Cotton building in a corridor that is heavily trafficked between 9am and 5pm Monday to Friday.

The building is open from 8am-midnight seven days a week to allow students after hour access to laboratories and the library.

The vending machine is plugged into a wall socket that is behind the machine.

University security guards patrol the area twice a night between 5pm and midnight. They return at closing time to make sure that no students are remaining in the area and lock the main doors to the area. They will phone the operator if there is any visible damage to the machines.

1.4 Data flow diagram

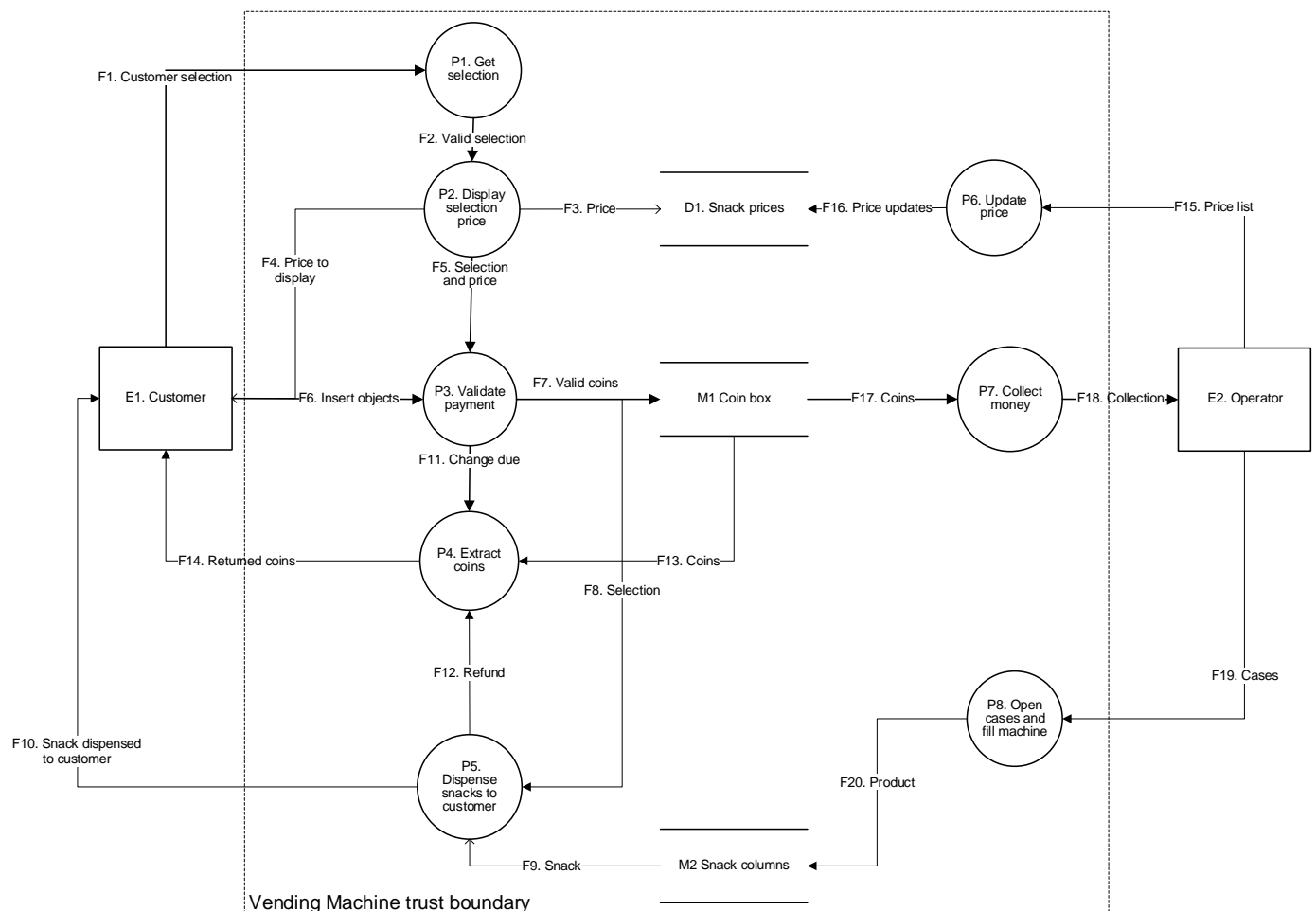


Figure 4 - Data flow diagram

3.5 Analysis

You must perform a security analysis by answering the following

questions:

1. Identify the assets.
2. Identify possible harms that could affect the assets.
3. Identify the security goals based upon the harms.
4. Use STRIDE to analyse the DFD and identify threats. Note that the table below indicates what parts of STRIDE apply to different elements.

DFD Element Type	S	T	R	I	D	E
	---	---	---	---	---	---
External entity	X		X			
Data flow		X		X	X	
Data store		X		X	X	
Process	X	X	X	X	X	X

Document your analysis by listing *for type of threat* the details of potential threats. Identify the affected element and make sure you say how the threat might be realised (i.e. turned into an attack).

These threats should be feasible for the attacker as described earlier.

5. For each of the identified threats, document how you could mitigate

it (in a real system you would also consider how you are going to eliminate, transfer or accept).

6. Document the security requirements in light of the possible mitigations.

4. Submission and grading

Submit your answers as a PDF document.

Use the provided template as a basis of this document.

You should make sure you address all of the questions under the section **Analysis**.

Make sure you include your name and student ID.

4.1 Criteria

The criteria for grading are:

Completeness Did you answer all of the questions and how comprehensively? For example, did the analysis consider all elements.

Accuracy How well did you answer the questions? Were your answers reasonable and did you explain your answers?

Scope How narrowly did you consider the problem? You are

encouraged to include the whole system.

****Presentation**** Did you use the right format and terminology? Please check for readability, we mark a lot of these and generally we look more favourably on well structured and well written ones.

4.2 Letter grades

What the letter grades mean:

****A-range:****

Excellent performance. Complete, accurate, scope includes all of the external entities and well presented. Shows good knowledge and good understanding of the methods. Well-argued. Where required, contains good original input from the student.

****B-range:****

Good performance. Mostly complete, mostly accurate, scope includes most of the external entities and well presented. Shows a good knowledge and fairly good understanding of the methods but either fails to answer some parts of the question or is unclear or is poorly argued.

****C-range:****

Satisfactory performance although some errors in accuracy, scope is limited to only one of the external entities and/or problems with presentation. Shows only some basic knowledge of the material or fails to understand some important parts of it, or does not answer a significant portion of the questions.

****D-range:****

Poor performance overall, some evidence of learning but very problematic in all aspects mentioned above. [If you receive this grade, come and see us to discuss what went wrong and how we can avoid it happening again.]

****E-range:****

Well below the required standard. Fail.