

GNG 1503
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SECTION A02 – FA24

DELIVERABLE E: PROJECT SCHEDULE AND COSTS

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Summary

After brainstorming our concepts and coming up with the solution necessary to satisfy all the needs expressed by the Shared Services of Canada organization, here are the 3 distinct principle components that the FA24 team designed:

Component 1 : Electronics casing

Component 2: Electrical layout

Component 3: Wireframe structure

Material Table :

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Introduction

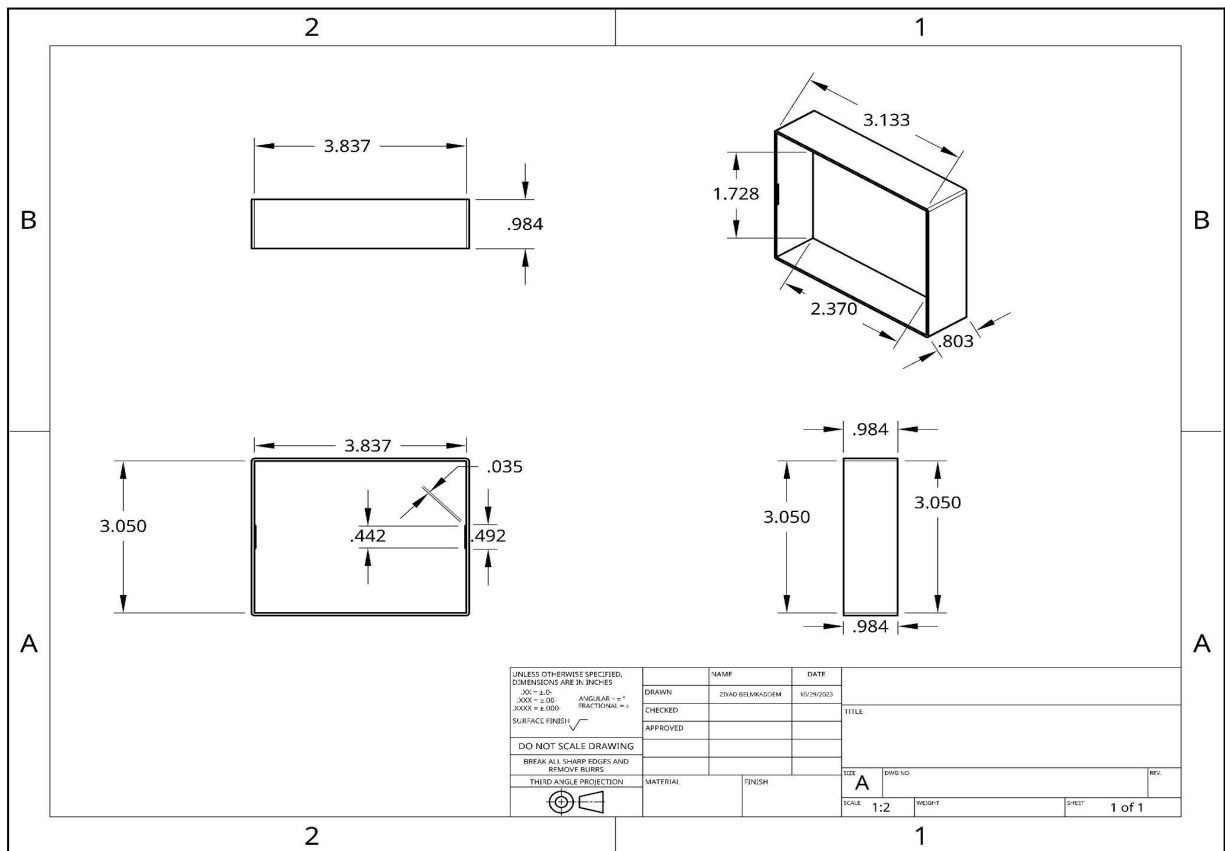
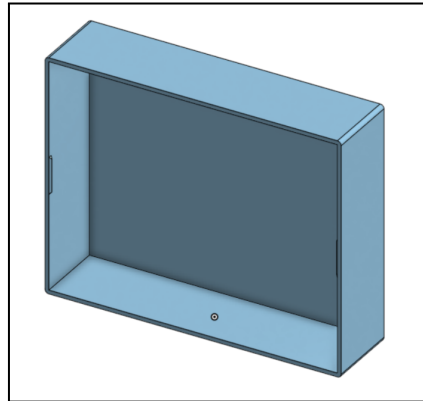
In Deliverable D, the ideation and brainstorming phase of the project, in which we had to come up with the ideal solution for our work, modify it to solve some of its drawbacks, including flexibility and cost to better satisfy the problem statement. Following Deliverable D, comes Deliverable E, which is the planning part of the project consisting of creating a project strategy, schedule, and cost estimates for the materials and components that will be used in our project to guarantee that our three prototypes are finished by the end of the school quarter. Furthermore, it ensures that we make a plan for testing our initial prototype.

Detailed design of the final solution

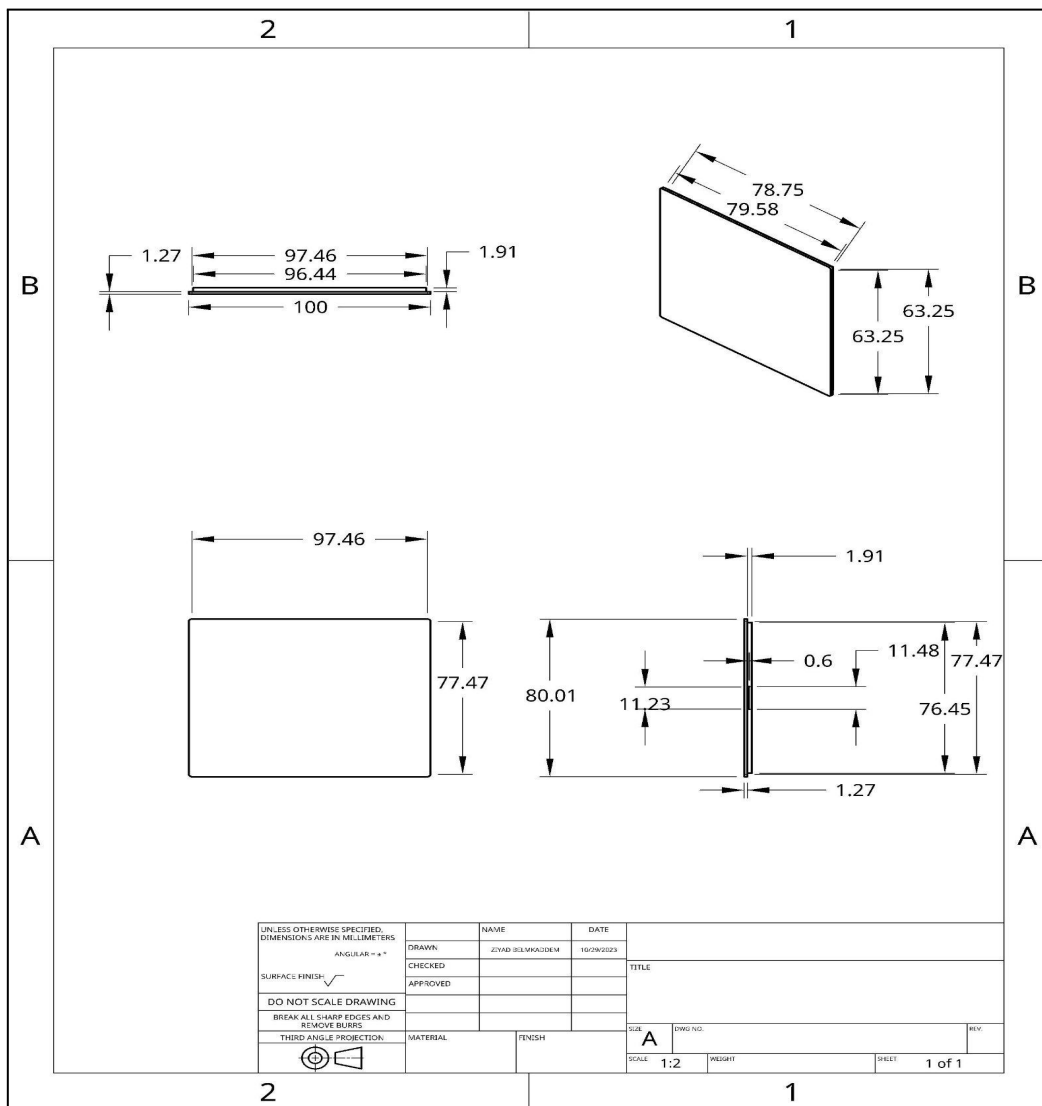
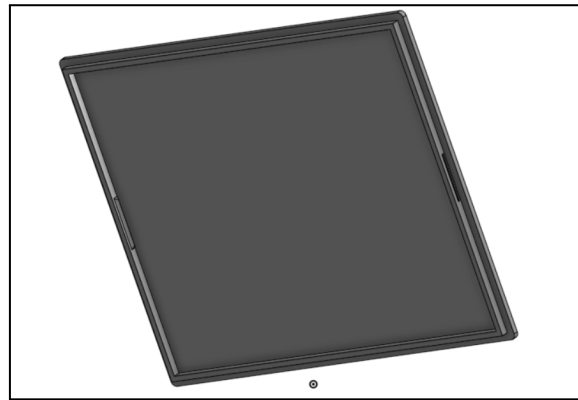
As required, team FA24 came up with this detailed design drawing that summarizes the concept that we have chosen in Deliverable D, which is the following:

- Electronics casing:

Electronics compartment



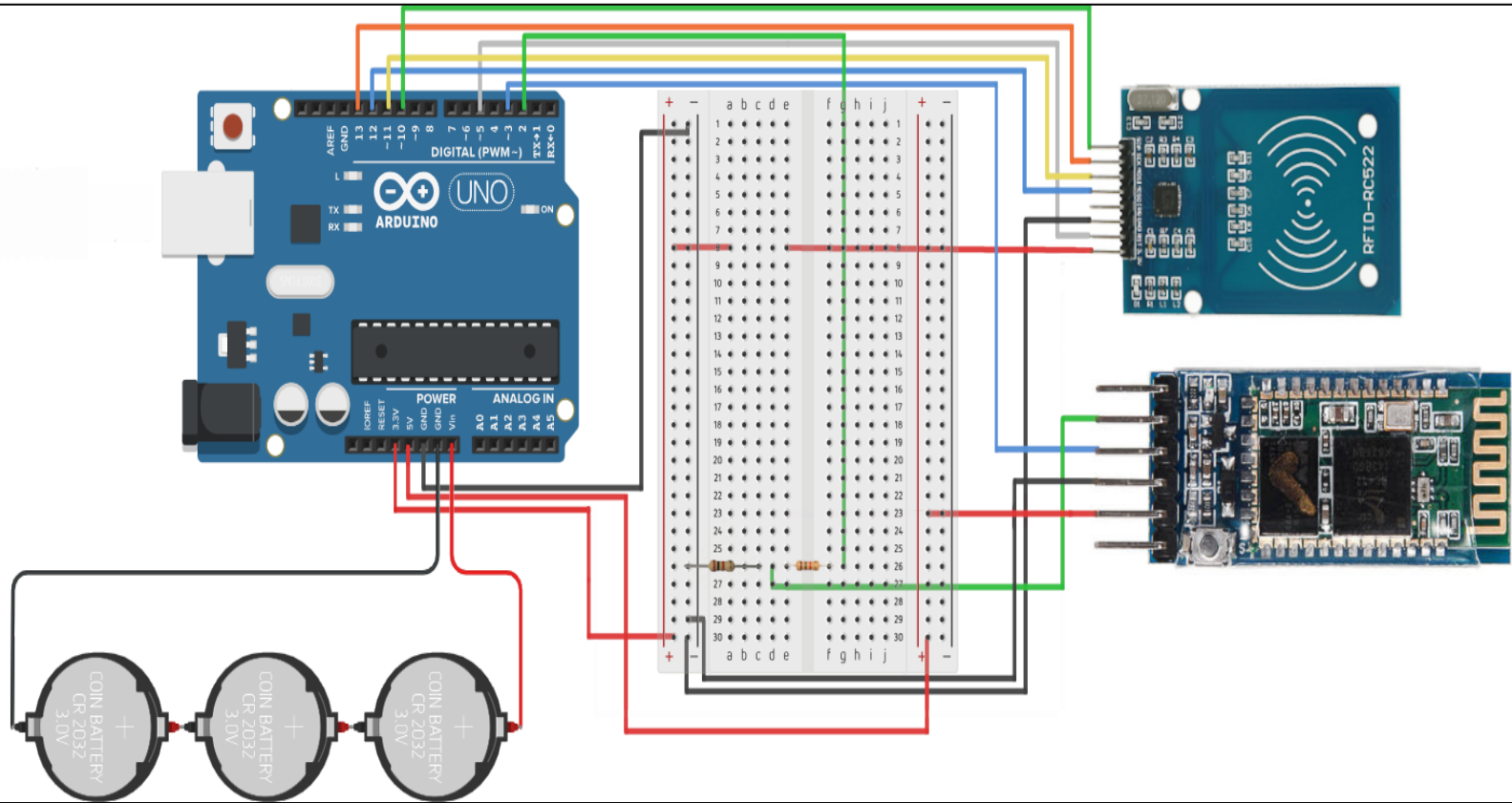
Compartment cover



The electronics casing is the box we will use to enclose the entire electrical layout and its respective components. This, combined with the complete electrical setup, forms a comprehensive representation of the physical aspect of the product.

- Electrical layout:

Circuit composition and cable/pin layouts



Description

The Arduino circuit above, serves as a processing and execution unit for the base code. The board is responsible for directing orders and decision-making algorithms, as well as detection loops to the RFID reader, as well as the Bluetooth module.

The RFID reader repeatedly seeks out RFID tags in the proximity, once it detects one that is within range (by receiving a response in the form of a reflected radio wave), it sends out an electrical signal to the Arduino, indicating that an RFID tag has been detected, and sending a serial print containing the RFID identifier for that particular tag, which in-turn contains critical identifying information such as: Name of the item, date/time of last addition, date/time of last deletion,etc.

The Bluetooth module receives this information through the medium of the Arduino, where it relays it to a mobile phone in the proximity, to which it is connected by bluetooth. The information relayed is then uploaded to the shared storage cloud (which serves as a database) through the mobile app. Any request to access information through the mobile app will be directed to the cloud.

Circuit components

Microcontroller: 1x Arduino UNO Rev3

Power supply: 3x CR2032 3.0V lithium batteries (in series)

Connections: 16x standard jumper cables

Breadboard: 1x half-breadboard

RFID reader: 1x RC522

Bluetooth module: 1x HC05

Resistors: 1x 1 k Ω & 1x 2 k Ω

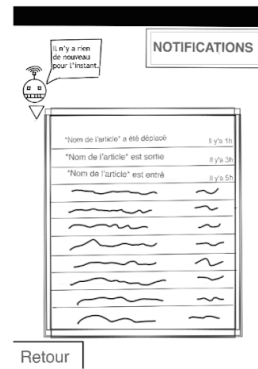
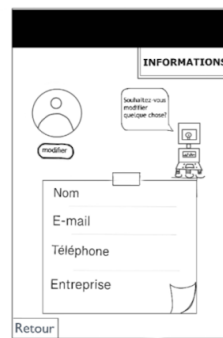
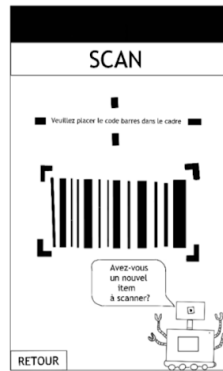
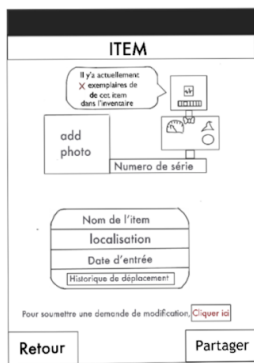
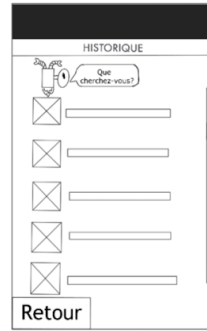
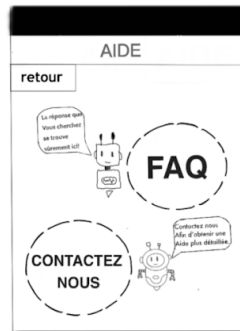
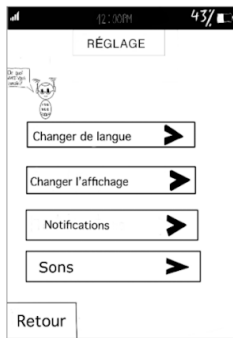
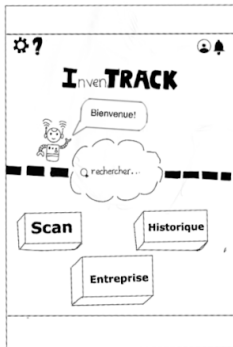
Arduino IDE material

Open-source code libraries:

-RFID reader program: MFRC522 (<https://github.com/miguelbalboa/rfid>) [1]

-Bluetooth module program: SoftwareSerial (...) [2]

● Wireframe:



This is the Wired Structure for the application. This is the low fidelity version, which means it only shows the main pages of the application.

The interface : It's the main menu. From there, you have access to every options that the app provides

Reglages(Settings) : From there, we can change the language, the display, the notification you receive and the sound

Aide (Help) this page gives you access to the FAQ(for more general questions about how the application works) and to a phone number and an Email to contact when you have a more specific problem.

ITEM : This page shows the information about the item that you are searching for : the serial number, the location, the date of entry(=When did the item enter the inventory), the history of this item(= every move in the inventory). With the option « partager »(share) you can share the information you found with other members of your team.

Historique (History): shows the user every item that they searched previously .

Enterprise: From there, the user can chat with all their colleagues who use the application.

Scan: from there, the owner of the app can use their phone as a scanner for the item.

Informations : this page shows the information about the person that logs in; their name, their email, their phone number and the name of their company. They can edit the information whenever they want.

Notifications : From there, we can see the moves of every item register in the inventory

Every page has a “retour” (back) button. When the person using the application clicks on it, it redirects them to the main menu.

Material Naming

	Item Name	Description	Unit of measurement	Quantity	Cost	Expected cost	Link
1	RFID reader (RC 522)	Scanner + tag	Unit	1	5\$	5\$	https://www.amazon.ca/CANADUINO-RFID-Starter-13-56MHz-Keyfob/dp/B07B2CV31T/ref=sr_1_2?crid=YZTDLLULKJU5&keywords=RFID+reader+Arduino+UNO&qid=1698606710&sprefix=rfid+reader+arduino+uno%2Caps%2C89&sr=8-2
2	Arduino Uno	Arduino UNO microcontroller (processing unit)	Unit	1	17\$	17\$	https://makerstore.ca/shop/ols/products/arduino-uno-r3/v/A001-WTH-USB
3	Breadboard	Half-size	Unit	1	5\$	5\$	https://makerstore.ca/shop/ols/products/breadboard/v/B15-HLF
4	Bluetooth module (HC 05)	Bluetooth transceiver replacing the serial cable	Unit	1	9\$	9\$	https://makerstore.ca/shop/ols/products/hc-05-wireless

							-bluetooth-module-with-at-button
5	Jumper cables	Pack of 10 -male-male - 20cm	Unit	2	1\$	2\$	https://makerstore.ca/shop/ols/products/jumper-cables-per-10/v/JMP-CBL-20C-M_L
6	Batterie	CR 2032 - 3V	Unit	3	1\$	3\$	https://makerstore.ca/shop/ols/products/cr2032-lithium-coin-cell-battery/v/ELC003-CR2
7	Resistance	-1K Ω -2K Ω	Unit	2	1\$	2\$	N/A
8	Data base	Flutter flow	N/A	N/A	0\$	0\$	https://flutterflow.io/
9	RFID case	A plastic case that contains the Arduino, the RFID and the batteries (3D-printed)	Unit	1	0\$	0\$	https://cad.onshape.com/documents/8f4b0cc50aac21c20323d64b/w/f1718eea2c8e68708ef56824/e/fe41029a669a977626162548?renderMode=0&uiState=653ea72120e66a34a1bbd021

10	Code libraries	-MFRC522 -Software serial	Unit	2	0\$	0\$	https://github.com/miguelbalboa/rfid
11	Total without Tax or delivery fee					≈43\$	N/A
12	Total with tax and delivery					≈48.59\$+0\$	N/A

[3]

List of Equipment Used

The equipment we chose in this deliverable and that will be used for the production of the first prototype, as well as the upcoming prototypes and design configurations, are:

Material	Software
3D printer	Microsoft visual studio express
Onshape	Sketchbook
GIMP	Arduino IDE + Library

Risks Related To Our Project

- Loss of data :

Risk : Inventory data could be lost due to hardware or software failures.

Contingency Plan: Make sure there are data back-ups servers on a secure separate server.

- Data Security:

Risk : Project data may be in risk in case of piracy / hacking

Contingency Plan: Implement trust-worthy security bases such as encryption of data, antiviruses that will solidify the database and diminish the risk concerning data security.

- Expected Cost :

Risk : The project's cost may exceed the calculated/expected cost

Contingency Plan: In order to stay within budget, we will carefully calculate the sum of costs and carefully use our items so that we won't need to repair them.

- The Electronics Casing closing mechanism:

Risk : The closing mechanism of the Electronic Clasing could break due to its material properties (PLA Polylactic Acid).

Contingency Plan : In order to address the issue of the closing mechanism failing, we will either secure the two parts of the Electronic Casing by applying Gorilla Glue or by fastening the enclosure with screws.

- The radio waves :

Risk : The building material (PLA Polylactic Acid) of the Electronic Casing may not allow the radio waves from the RFID reader pass through to the RFID Tag.

Contingency Plan : Modification of electronics casing building material and parameters (MDF, thinner PLA blocks, ...)

Test and Prototyping Plan

N° de Test	Objectif du Test	Description du Prototype utilisé et de la méthode de Test de Base	Description des résultats à documenter et Comment ces résultats seront utilisés	Durée estimée du Test et date prévue du début du Test
1	Verify longevity of power supply chosen	Physical and comprehensive. Prototype will be placed in a reading and writing loop until batteries run out.	Observe period of operation and compare to expected results (~10 hours of continuous operation)	10 hours
2	Verify Bluetooth connectivity and range	Physical and comprehensive. Prototype will be placed at varying and pre-determined distances from a mobile phone.	Observe signal strength and connectivity at each distance. Note down ideal connection distance.	30 minutes
3	Verify functionality of casing closing mechanism	Physical and comprehensive. Prototype will have the electrical components arranged adequately inside of the casing, and the casing will be closed.	Observe sealing strength and whether re-opening is as easy or harder than what is convenient to your average user.	5 minutes
4	Verify electronics compartment's permeability of radio signals from the RFID	Physical and comprehensive. Prototype will be fully closed, with the electrical components	Observe reading distances and compare them with expected results. (5cm ideally)	5 minutes

	reader	charged, engaged and contained in the compartment. RFID tags will be placed at different distances from the compartment.		
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[4]

Conclusion

In this Deliverable, we developed a precise and comprehensive design drawing that captured our selected ideas and served as a strong basis for the project's further stages that meet the clients' needs and requirements. Furthermore, our material approvals and cost estimates simplified the procurement process and ensured effective budget allocation, in order to not exceed the 50\$ budget limit. In addition, our ability to recognize and handle possible risks regarding our project was another benefit that improved project management and the thought process for the individuals within the team.

References

- [1] <https://lastminuteengineers.com/how-rfid-works-rc522-arduino-tutorial/>
- [2] <https://lastminuteengineers.com/hc05-bluetooth-arduino-tutorial/>
- [3] https://fr.wiki.makerepo.com/wiki/D%C3%A9veloppement_professionnel/Gestion_de_projet/Guide_d%27achat.
- [4] <https://uottawa.brightspace.com/d2l/le/content/382673/viewContent/5596392/View>