

User guide for workshop



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For any questions or comments, you can contact us by email :

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Problem #1

Context

You just started to work for the company “Papier Sélect” and you must use Logilab to do impact analysis on the upcoming enterprise strategic decisions. Luckily, a FORAC intern already modeled the enterprise logistic chain. Your first job will be to acquire it.

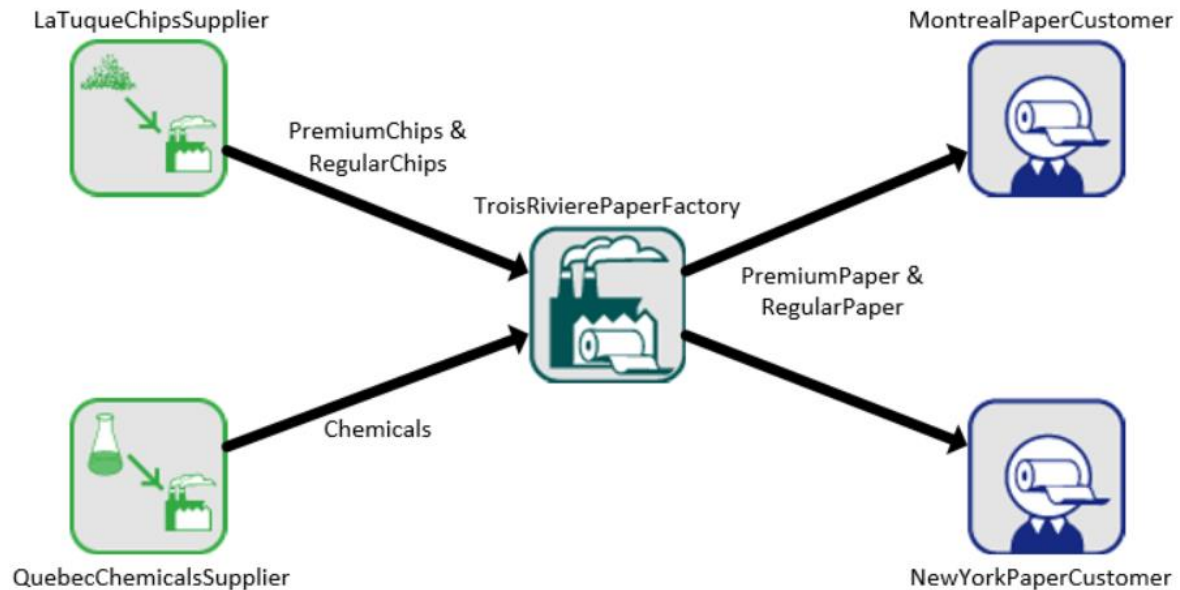
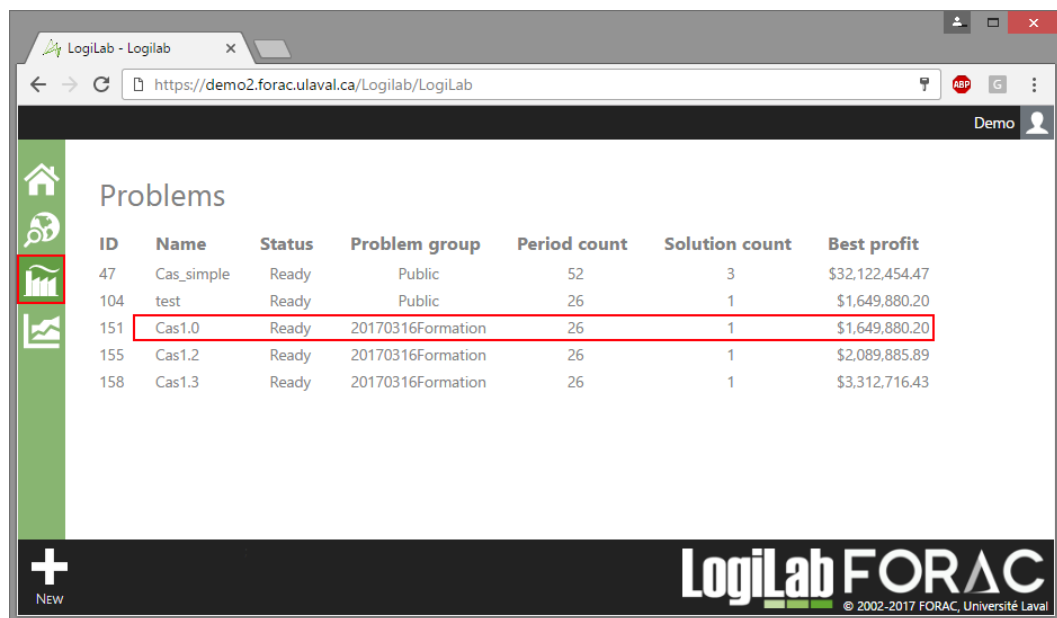


Image 1. Enterprise current logistic chain

The company “Papier Sélect” makes two paper products: *RegularPaper* and *PremiumPaper*. It has a paper mill at Trois-Rivières named *TroisRivierePaperFactory* and supplies two customers named *MontrealPaperCustomer* and *NewYorkPaperCustomer*. The client *MontrealPaperCustomer* offers a better price for the products but has a very seasonal demand. The client *NewYorkPaperCustomer* offers a lower price but has an infinite demand for the product. To make the *RegularPaper*, the mill consumes *RegularChips* and a chemical mixture called *Chemicals*. To make the *PremiumPaper*, the mill consumes *PremiumChips* and the same chemical mixture *Chemicals*. Currently, the company buys all his chips from a supplier called *LaTuqueChipsSupplier* and all his chemicals from a supplier called *QuebecChemicalSupplier*. The *LaTuqueChipsSupplier* offers a stable, but limited quantity of chips per period. The *QuebecChemicalSupplier* offers an unlimited quantity of products with included delivery.

Consult an existing solution:

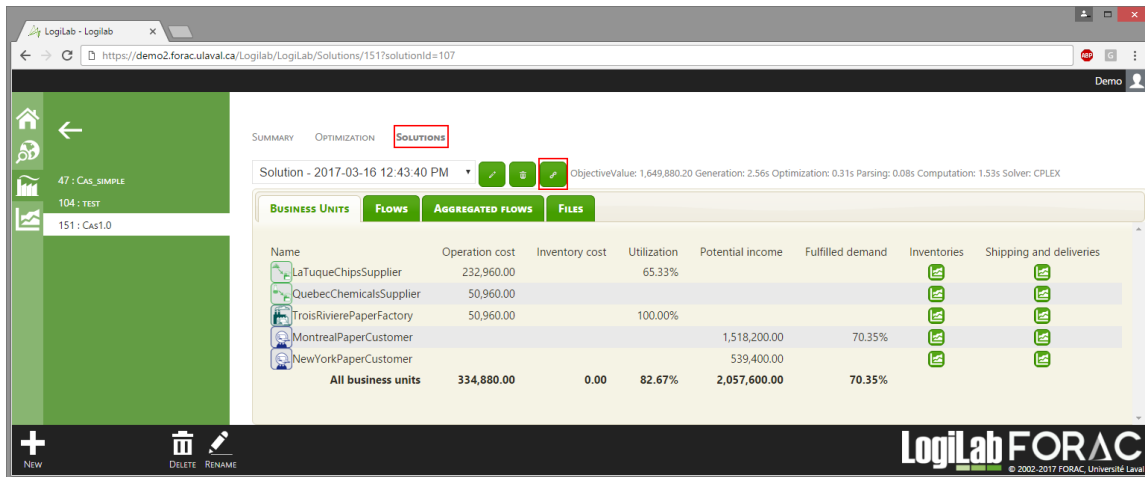
- Open Chrome at this address:
<https://demo2.forac.ulaval.ca/Logilab/>
- Create your Logilab user if it's not already done:
 - o See the user creation procedure "LogilabCreationUsager.pdf"
 - o Give your username to the presenter so he can add you to the formation group
- Click on the link « GO TO LOGILAB » on the home page to access the list of *Problems*. You can also click on the icon as shown on the next screenshot.



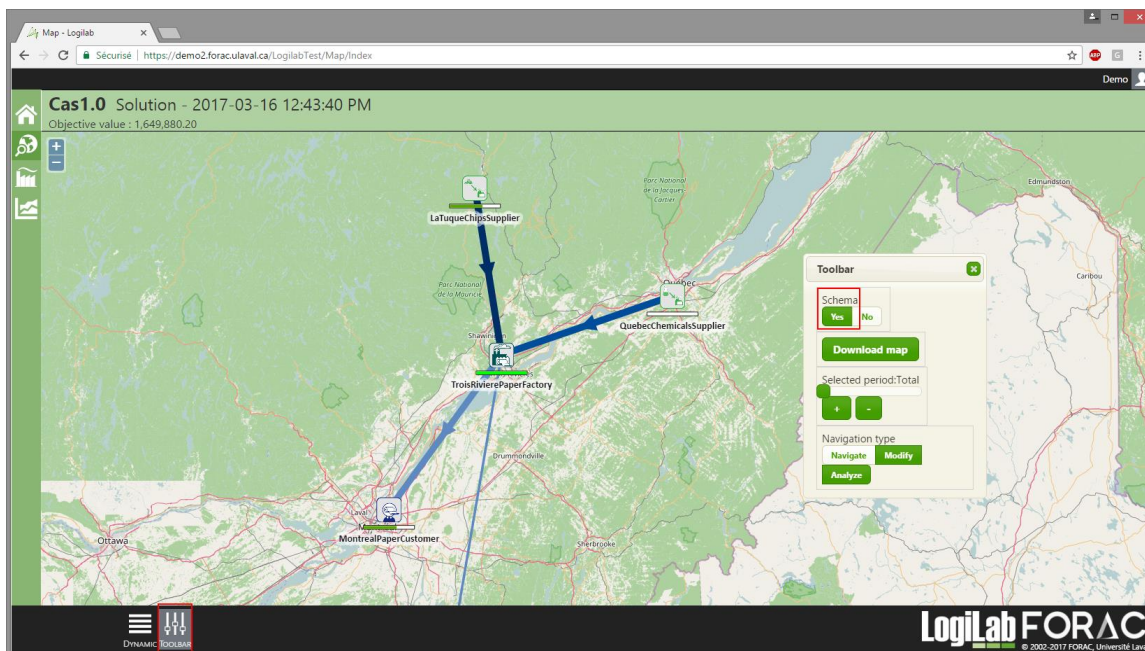
ID	Name	Status	Problem group	Period count	Solution count	Best profit
47	Cas_simple	Ready	Public	52	3	\$32,122,454.47
104	test	Ready	Public	26	1	\$1,649,880.20
151	Cas1.0	Ready	20170316Formation	26	1	\$1,649,880.20
155	Cas1.2	Ready	20170316Formation	26	1	\$2,089,885.89
158	Cas1.3	Ready	20170316Formation	26	1	\$3,312,716.43

- Locate the problem « Cas1.0 » on this list and analyse the initial solution :
 - o Visualise the *Summary* section
 - o Visualise the *Optimization* section
 - o Visualise the *Solutions* section
 - Locate the current potential profit of the model (ObjectiveValue):
1 649 880.20 \$
 - Locate the percentage of fulfilled demand for *MontrealPaperCustomer*:
70.35%

- You can also visualise the solution on a geographic map by clicking the icon as shown on the next screenshot.



- Finally, visualise the solution on a conceptual schema by clicking on the toolbar, then on Schema « Yes »



Edit an existing problem:

- Download the input file from the *Summary* section

The screenshot shows the LogiLab FORAC web interface. The browser address bar displays <https://demo2.forac.ulaval.ca/Logilab/Logilab/Summary/151>. The interface has a green sidebar on the left with a navigation menu. The main content area is titled "SUMMARY" and contains the following sections:

- INFORMATIONS:**
 - Problem name : Cas1.0
 - Problem group : 20170316Formation
 - Problem description :
- INPUT FILES:**
 - Cas1.0ACCDB (highlighted with a red box)
- BUSINESS UNITS:**
 - LaTuqueChipsSupplier
 - MontrealPaperCustomer
 - NewYorkPaperCustomer
 - QuebecChemicalsSupplier
 - TroisRivierePaperFactory
- FLows:**

Origin	Destination	Transportation mode	Distance
LaTuqueChipsSupplier	TroisRivierePaperFactory	Truck	100.76

At the bottom of the interface, there is a "LogiLab FORAC" logo and the text "© 2002-2017 FORAC, Université Laval".

- Open the downloaded input file with Access, this should open the form *frmProblem*

The screenshot shows the Microsoft Access database interface. The "frmProblem" form is open, displaying the following fields and controls:

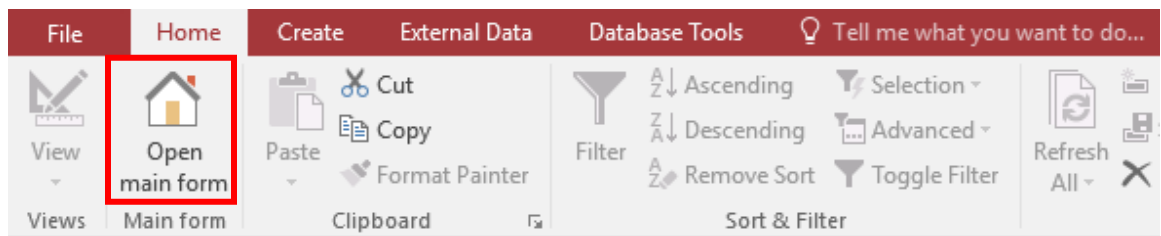
- Problem name:** Paper Enterprise
- Description:** (empty text box)
- Number of periods:** 26
- Period length (days):** 14
- Buttons:** "Change periods", "Save", "Close" (highlighted with a red box), and "Add Business Unit" (highlighted with a red box).
- Business units table:** A table with columns: BusinessUnit Name, BusinessUnit Type, Inventory Cost, Latitude, Longitude, X, and Y. The table contains five rows of data.

BusinessUnit Name	BusinessUnit Type	Inventory Cost	Latitude	Longitude	X	Y
LaTuqueChipsSupplier	ChipExternalSupplier	0	47.327717	-72.846152	-20	-10
QuebecChemicalsSupplier	ChemicalExternalSupplier	0	46.750655	-71.292451	-20	10
TroisRivierePaperFactory	PapermillProduction	0	46.433018	-72.636403	0	0
MontrealPaperCustomer	PaperCustomer	0	45.59138	-73.522012	20	-10
NewYorkPaperCustomer	PaperCustomer	0	40.800966	-73.962818	20	10

The "LogiLab FORAC" logo is visible in the bottom right corner of the form.

- Become familiar with the principal interface
 - **Navigation buttons** (top left of the form) : Allows you to navigate between the main concepts of the logistic chain model: the business units (nodes), the flows and the products
 - **Edition zone** (center of the form) : This is where you can visualize the data and double-click on a line to open an edition form
 - **Add button** (lower right of the form) : To add a new line to the data of the edition zone
 - **Close button** (lower left of the form) : To close the current form

- If you accidentally close the main form *frmProblem*, you can open it back by clicking on the “Open main form” button in the “Home” tab at the top of the screen:



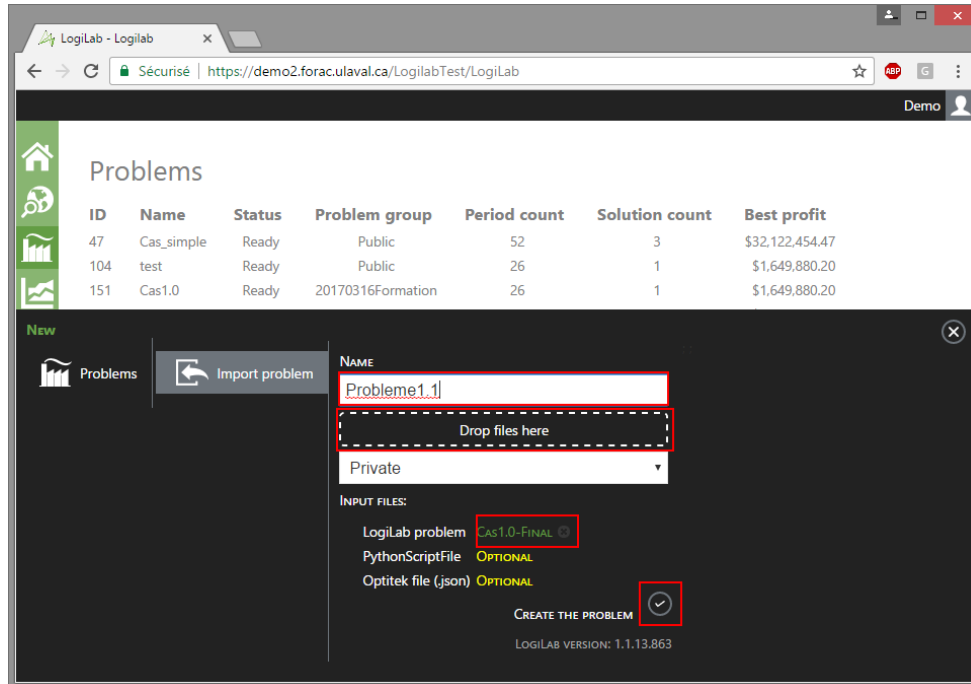
Problem #1.1:

You realise that the FORAC intern who modeled the initial logistic chain forgot to model the stocking capabilities of the *TroisRivièrePaperFactory* mill. Your team estimates that you have enough space to stock about 300 products units at an inventory cost of 15%. You must add these stocking capabilities to your model and analyse its impact on your logistic chain.

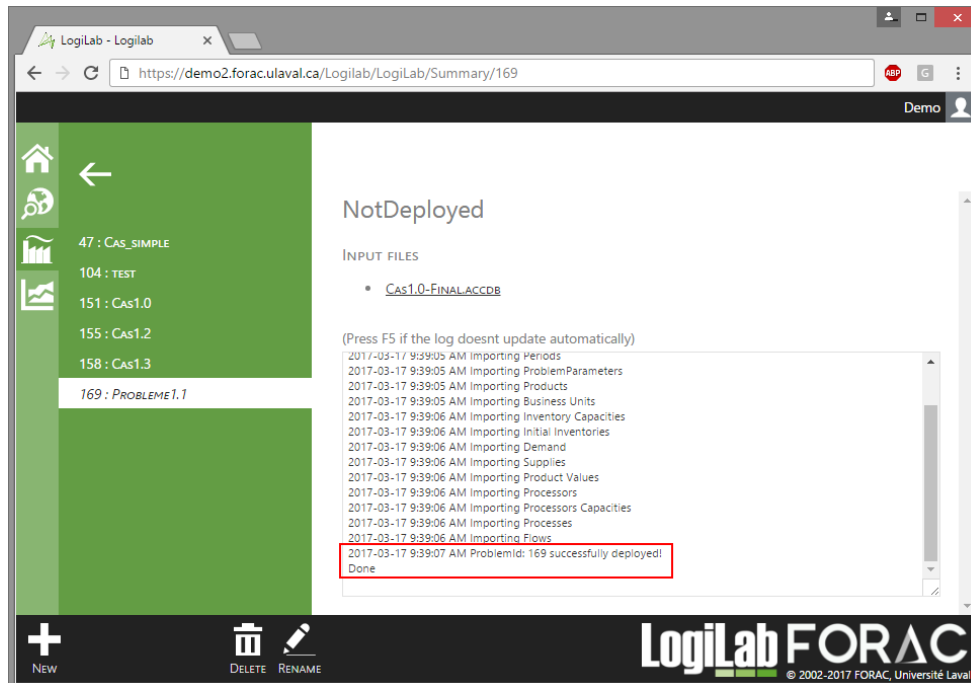
- a) In your Access main form, make sure you are in the *Business units* section
- b) Double-click on the line of the *BusinessUnit TroisRivièrePaperFactory* to open its edition form
- c) Enter the *Inventory Cost* value
- d) Enter the maximal capacity and the minimal capacity in the *Inventory Capacities* sub-form
- e) Press the *Close* button to close the *BusinessUnit TroisRivièrePaperFactory* edition form and save your file
- f) Import your file on the Logilab Web site
 - i. Make sure you are in the Logilab section of the site (factory button on left menu)
 - ii. Press the *New* button on the lower left corner

ID	Name	Status	Problem group	Period count	Solution count	Best profit
47	Cas_simple	Ready	Public	52	3	\$32,122,454.47
104	test	Ready	Public	26	1	\$1,649,880.20
151	Cas1.0	Ready	20170316Formation	26	1	\$1,649,880.20
155	Cas1.2	Ready	20170316Formation	26	1	\$2,089,885.89
158	Cas1.3	Ready	20170316Formation	26	1	\$3,312,716.43

- iii. Name your problem
- iv. Drag and drop your modified Access file on the “Drop files here” zone so the file name appears in green beside the text “Logilab problem”
- v. Press the check button on the right of the text “Create the problem”



- i. Wait for your file to be deployed. When the log shows “successfully deployed”, refresh the page (F5)



- g) Optimize your problem on Logilab Web site
 - i. Go to the *Optimization* section and click on “Start new optimization”
 - ii. Below the “Start new optimization” button, a new optimization should be added in the list
 - iii. Wait for the new optimization to reach the state “OptimizationCompletedWithSuccess”

The screenshot shows the Logilab FORAC web interface. The browser address bar displays <https://demo2.forac.ulaval.ca/Logilab/Logilab/Optimization/169>. The interface has a green sidebar on the left with a list of problems: 47 : CAS_SIMPLE, 104 : TEST, 151 : Cas1.0, 155 : Cas1.2, 158 : Cas1.3, and 169 : PROBLEME1.1. The main panel is titled "OPTIMIZATION" and shows parameters for problem 169. The parameters are listed in a table:

PARAMETERS:	Value
SolverName	CPLEX
IsMip	False
IsMipAsFixedLP	False
ModelType	ProfitMaximization
TimeLimit	7200
MipGap	0.01
RandomizeOrder	False
GetLpFile	False
GetConflifFile	False
GetSolFile	False
FlowDiscretizationDelayPercentage	0.3
ProcessDiscretizationDelayPercentage	0.3
PythonScriptFile	

Below the parameters, there is a "Start new optimization" button. Below the button, there is a table showing the optimization results:

Problem name	Username	Added on	Status	Machine	Available files
Probleme1.1	Demo	3/17/2017 9:44:35 AM	OptimizationCompletedWithSuccess	FORAC-DEV-04	log.txt

The footer of the interface shows the Logilab FORAC logo and the copyright notice: © 2002-2017 FORAC, Université Laval.

- h) Visualize the results of the optimization in LogiLab
 - i. Go into the *Solutions* section
 - ii. In the *Business Units* tab, note the *ObjectiveValue*, this value is the model profit
 - iii. Also note the fulfilled demand percentage of the client *MontrealPaperCustomer*

The screenshot shows the LogiLab FORAC interface with the 'SOLUTIONS' tab selected. The 'ObjectiveValue' is 1,661,917.30. The 'Fulfilled demand' for 'MontrealPaperCustomer' is 72.64%.

Name	Operation cost	Inventory cost	Utilization	Potential income	Fulfilled demand	Inventories	Shipping and deliveries
LaTuqueChipsSupplier	232,960.00		65.33%				
QuebecChemicalsSupplier	50,960.00						
TroisRivieresPaperFactory	51,015.80	55.80	100.00%				
MontrealPaperCustomer				1,567,800.00	72.64%		
NewYorkPaperCustomer				499,400.00			
All business units	334,935.80	55.80	82.67%	2,067,200.00	72.64%		

Solution validation

What is the model profit?

Answer: 1,661,917.30 \$

What is the fulfilled demand percentage of the *MontrealPaperCustomer*?

Answer: 72.64 %

Additional information

What does an inventory cost of 15% means?

It is the percentage of the products value if we keep it in inventory for a year (365 days). In our particular case, we have 14 days periods, giving a proportion of 14/365.

As an example, if we have a product with an estimated value of 100\$, with an inventory cost of 15%, we would have:

$(100\$ * 14 \text{ days} / 365 \text{ days} * 15\%) = 0.5753\$$ per period (of 2 weeks) per unit kept in stock.

Problem #1.2:

A **new potential customer** just opened his business in your local market. Here is the information we gathered about him:

OttawaPaperCustomer (PaperCustomer)	
Location: Latitude: 45.392329, Longitude: -75.608394 (X=20, Y=0)	
Buys PremiumPaper at 750\$/tma and RegularPaper at 550\$/tma.	

Here is his paper demand forecast per period per product:

Period(s)	PremiumPaper	RegularPaper
1-9	80	98
10-20	40	55
21-26	180	200

Your current transport company could take care of the deliveries of both types of papers by truck at the same cost than the other customers (0.05\$ per tma per km).

Your job is to model this new customer in your Access file and to evaluate its potential impact on your logistic chain.

The first step is to create the new business unit and to input its demand data:

- In your main Access form *frmProblem*, in the *Business Unit* section, click on the *Add Business Units* button
- Input the values of these fields: *BusinessUnit Name*, *BusinessUnit Type*, *Latitude*, *Longitude*, *X* et *Y* then press the *Confirm* button
- You can now press on the "*See customer's demand*" button to open the *frmBusinessUnitDemands* form
- In the *frmBusinessUnitDemands* form, you can now open the demand input form by pressing the "*Add Demand*" button
- Input the demand per product for each period interval, then press on the *Save and Close* button

For the second step, you must create a flow to link your *TroisRivièrePaperFactory* mill with your *OttawaPaperCustomer* client.

- a) Go back to the main form *frmProblem* by closing all other opened forms with the *Close* button
- b) Go to the *Flows* section by pressing the *Flows* button
- c) Open a flow creation form by pressing the *Add Flow* button
- d) Input values for these fields: *Origin*, *Destination*, *Transportation Mode*, *Unit of measure*, *Cost*
- e) Leave the field *Distance (Km)* empty to let Logilab calculate it automatically (as the crow flies)
- f) Leave the field *Delay (hours)* at 0
- g) Press the *Save* button
- h) Press the *Add Capacity* button to open the *frmFlowCapacities* form. This form allows you to define what products can be transported on this flow.
- i) Delete the value from the *Max* field, to define an unlimited capacity for *PremiumPaper* for all problem's periods, then press on the *Save and Close* button
- j) Repeat the last step with the *RegularPaper* product

Now that your new customer is created and linked into your logistic chain, you must use Logilab to optimize it and analyse the results.

- k) Import your Access file in Logilab
(see problem 1.1.g)
- l) Optimize your problem in Logilab
(see problem 1.1.h)
- m) Visualize your results in Logilab
(see problem 1.1.i)

Now, what is the model's profit?

2,063,411.43 \$

What are the fulfilled demand percentage of the clients?

MontrealPaperCustomer: 16.26 %

OttawaPaperCustomer: 67.04 %

Problem #1.3:

With this new customer in the market, your production is not big enough. Your company now consider buying a competitor's mill. Here is the information gathered about this new mill:

WestPaperFactory (PapermillProduction)

Located at Latitude: 46.439131, Longitude: -73.094169 (X=0, Y=-5)

Can stock 600 product units with an inventory cost of 15%.

In a single period (of 2 weeks), the mill can produce for 336 hours.

One batch of RegularPaper requires 24 hours to produce and cost 103.50\$. Its fabrication process requires 28 m3 of RegularChips and 14 kg of Chemicals to produce 22 tma of RegularPaper.

One batch of PremiumPaper requires 24 hours to produce and cost 135\$. Its fabrication process requires 28 m3 of PremiumChips and 14 kg of Chemicals to produce 22 tma of PremiumPaper.

Your current transport company offers the same rates to connect this new mill to your suppliers and to your customers by truck.

Your FORAC intern already has modeled the new mill and all the flows required to connect it to the clients and to the suppliers. However, he did not have enough time to model the production processes of the mill. Your job is to fetch his incomplete input file into Logilab, to complete it by adding the missing production processes to the factory *WestPaperFactory* with the Access forms and to optimize the modified file in Logilab to finally analyze it.

The first step is to fetch the file to complete.

- a) Fetch the file « Cas1.3 » in Logilab

The second step is to add the two paper making processes in the *WestPaperFactory* mill.

- b) Open the fetched Access file and make sure you are in the main form *frmProblem*, in the *Business units* section
- c) Double-click on the line of the *business unit WestPaperFactory* to open its edition form *frmBusinessUnits*
- d) In the *frmBusinessUnits* form, click on the *See factory's processes* button to open the *frmBusinessUnitProcesses* form
- e) You can see there is already a default global capacity set based on the number of hour contained in one period of the problem
- f) You can now open the process creation form *frmProcesses* by clicking on the *Add Process* button in the lower right corner
- g) In the *frmProcesses* form, input the fields: *Name*, *Duration*, *Cost* for the *RegularPaper* process

- h) Press the *Save* button to activate the *Consumptions/Productions* input section
- i) Input the *Consumptions* of the process at the left of the orange arrow
- j) Input the *Productions* of the process at the right of the orange arrow
- k) Repeat steps f to k for the *PremiumPaper* process

The last step is to optimize your new logistic chain with Logilab and to analyse the results.

- l) Import your Access file in Logilab
(see problem 1.1.g)
- m) Optimize your problem in Logilab
(see problem 1.1.h)
- n) Visualize your results in Logilab
(see problem 1.1.i)

Now, what is the model's profit?

3,266,683.22 \$

What are the fulfilled demand percentage of the clients?

MontrealPaperCustomer: 30.25 %

OttawaPaperCustomer: 100 %

What are the utilization percentages of the factories and of the suppliers?

TroisRivierePaperFactory: 7.3%

WestPaperFactory: 72.88%

LaTuqueChipsSupplier: 100 %

Problem #1.4:

Seeing that you currently don't have enough chips supplies to feed your two mills, you start looking for a **new supplier** and find an interesting one. Model the new supplier from the gathered information and then use Logilab to see its impact on the logistic chain.

<p style="text-align: center;">SaguenayChipsSupplier (ChipExternalSupplier)</p> <p>Located at Latitude: 48.768322, Longitude: -70.90281 (X=-20, Y=0)</p> <p>It can supply 168 m3 of PremiumChips at 40\$/m3 and 192 m3 of RegularChips at 20\$/m3 at each period.</p> <p>Your transport company offers the same truck rates (0.05\$ per m3 per km) than for your other chip supplier LaTuqueChipsSupplier to assure chip deliveries to your mills.</p>
--

The first step is to add a new supplier to the model created at problem 1.3 and to input its supply offer.

- a) In your main Access form *frmProblem*, in the *Business Unit* section, click on the *Add Business Units* button
- b) Input the values of these fields: *BusinessUnit Name*, *BusinessUnit Type*, *Latitude*, *Longitude*, *X* and *Y* then push the *Confirm* button
- c) You can now press the *See suppliers's supply* button to open the *frmBusinessUnitExternalSupply* form
- d) In the *frmBusinessUnitExternalSupply* form, you can now open the supply input form by pressing the *Add Supply* button
- e) Input the quantity and the price for each supplied product, for each period interval then press on the *Save and Close* button

The second step is to create the needed flows to connect your supplier to your two mills.

- f) Go back to the main form and open the flows section by pressing the *Flows* navigation button
- g) Press the *Add Flow* button to open the flow creation form
- h) In the *Flows* form, input the values of a new flow between *SaguenayChipsSupplier* and *TroisRivierePaperFactory* then press the *Save* button
- i) Press the *Add Capacity* button to open the *frmFlowCapacities* form used to input the allowed product quantity transported on the flow then press the *Save and Close* button
- j) Do step i for each of the two products transported on the flow
- k) Repeat steps f to j for the flow between *SaguenayChipsSupplier* and *WestPaperFactory*

Finally, import, optimize and analyze the solution in Logilab.

Now, what is the model's profit?

5,611,733.89 \$

What are the fulfilled demand percentage of the clients?

MontrealPaperCustomer: 100 %

OttawaPaperCustomer: 100 %

What are the utilization percentages of the factories and of the suppliers?

TroisRivierePaperFactory: 100 %

WestPaperFactory: 100 %

LaTuqueChipsSupplier: 76 %

SaguenayChipsSupplier: 100 %

Problem #1.5:

Your company is thinking about buying an intermodal warehouse to stock your paper. This could allow mitigating the problems related to some client's very seasonal demand. In addition, using trains instead of trucks to deliver remote clients could reduce transport costs. Here is the information gathered on the **new warehouse**.

DrummondvilleMultiModalStorage (Storage)

Located at Latitude: 45.825836, Longitude: -72.478547 (X=15, Y=0)

This warehouse can stock 1800 products at an inventory cost of 3%.

Your transport company offers the same truck rates between your mills and the new warehouse. However, by using trains between the warehouse and the clients, the transport cost would go down from 0.05\$/tma*km to 0.01\$/tma*km.

Your FORAC intern already has modeled the new warehouse, but has made two mistakes. The first one is that he forgot to model the new flow between the *DrummondvilleMultiModalStorage* warehouse and the *NewYorkPaperCustomer* client. The second is that he forgot to use the train as a transportation mode between the warehouse and the customers. You must fetch your intern's model, correct it, and analyse the results in Logilab.

The first step is to fetch the file to complete.

- a) Fetch the file « Cas1.5 » in Logilab

The second step is to create a new flow between the *DrummondvilleMultiModalStorage* warehouse and your *NewYorkPaperCustomer* client.

- b) Open the Access main form *frmProblem* and go to the *Flows* section by pressing the *Flows* button
- c) Open a flow creation form by pressing on the *Add Flow* button
- d) To add a new transport mode, press the « + » button on the right of the field *Transportation Mode*, write “Train” then press the OK button
- e) Input field values: *Origin*, *Destination*, *Transportation Mode*, *Unit of measure* and *Cost*.
- f) Leave the field *Distance (Km)* empty to let Logilab calculate it automatically (as the crow flies)
- g) Leave the field *Delay (hours)* at 0
- h) Press the *Save* button
- i) Press the *Add Capacity* button to open the *frmFlowCapacities* form. This form allows to define what products can be transported on this flow.
- j) Delete the value from the *Max* field to define an unlimited capacity for *PremiumPaper* for all problem’s periods then press on the *Save and Close* button
- k) Repeat the last step with the *RegularPaper* product

The third step is to modify the *Transportation Mode* and the *Cost* of each flow linking the *DrummondvilleMultiModalStorage* warehouse to a *PaperCustomer*.

- l) Close the *Flows* form to return to the main form, in the *Flows* section
- m) In the flow list, at the center of the screen, make sure flows have “Train” as *Transportation Mode* value and 0.01 as *Cost* value for each of these flows:
 - a. *DrummondvilleMultiModalStorage* to *MontrealPaperCustomer*
 - b. *DrummondvilleMultiModalStorage* to *OttawaPaperCustomer*
 - c. *DrummondvilleMultiModalStorage* to *NewYorkPaperCustomer*

Finally, import, optimize and analyze the solution in Logilab.

Now, what is the model’s profit?

- 5,700,532.22 \$

What is the utilization percentage of the new warehouse?

- 15.75 %

Problème #1.6 :

Your company is thinking about setting up an exclusive partnership with *MontrealPaperCustomer*. This customer would buy exclusively his paper from us if we promise to fulfill 100% of its demand at a more competitive price.

Here is the demand that should be mandatory to fulfill:

Period(s)	PremiumPaper	RegularPaper
1-2	21	84
3-4	63	28
5-6	105	84
7-8	126	140
9-10	105	168
11-12	63	140
13-14	21	84
15-16	21	28
17-18	63	84
19-20	105	140
21-22	126	168
23-24	105	140
25-26	63	84

Here are the new prices:

PremiumPaper: 625\$/tma

RegularPaper: 415\$/tma

Your job is to edit your model to evaluate the viability of this partnership.

- Open the Access main form *frmProblem* and make sure you are in the *Business units* section
- In the *Business units* list, double-click on the *MontrealPaperCustomer* to open its edition form
- Click on the *See customer's demand* button to open a demand edition form
- For each of the two products, and for each defined periods, update the value of the *Quantity per period* and *Price* fields and check the *Mandatory* check-box

Finally, import, optimize and analyze the solution in Logilab.

Now, what is the model's profit?

- 5,612,116.45 \$

We take a break!

Problem #2

Context

A lumber Company has hired you. This company owns two Factory (*SmallFactory* and *BigFactory*).

The first one (*SmallFactory*) is specialised in small wood processing. It products lumbers of small dimensions, but high quality (*RegularQualityALumber*). These lumbers are sold at a price of 340\$/Mppm.

The other factory (*BigFactory*) can take advantage of larger logs. It can produce specialized lumber of bigger dimensions that are sold at a price of 400\$/Mppm (*SpecializedLumber*). It can also process small logs, but it will be cut into small lumber of lesser quality than what the first factory can do (*RegularQualityBLumber*). Lumbers are sold at a price of 285\$/Mppm. Here is a schema of the actual situation:

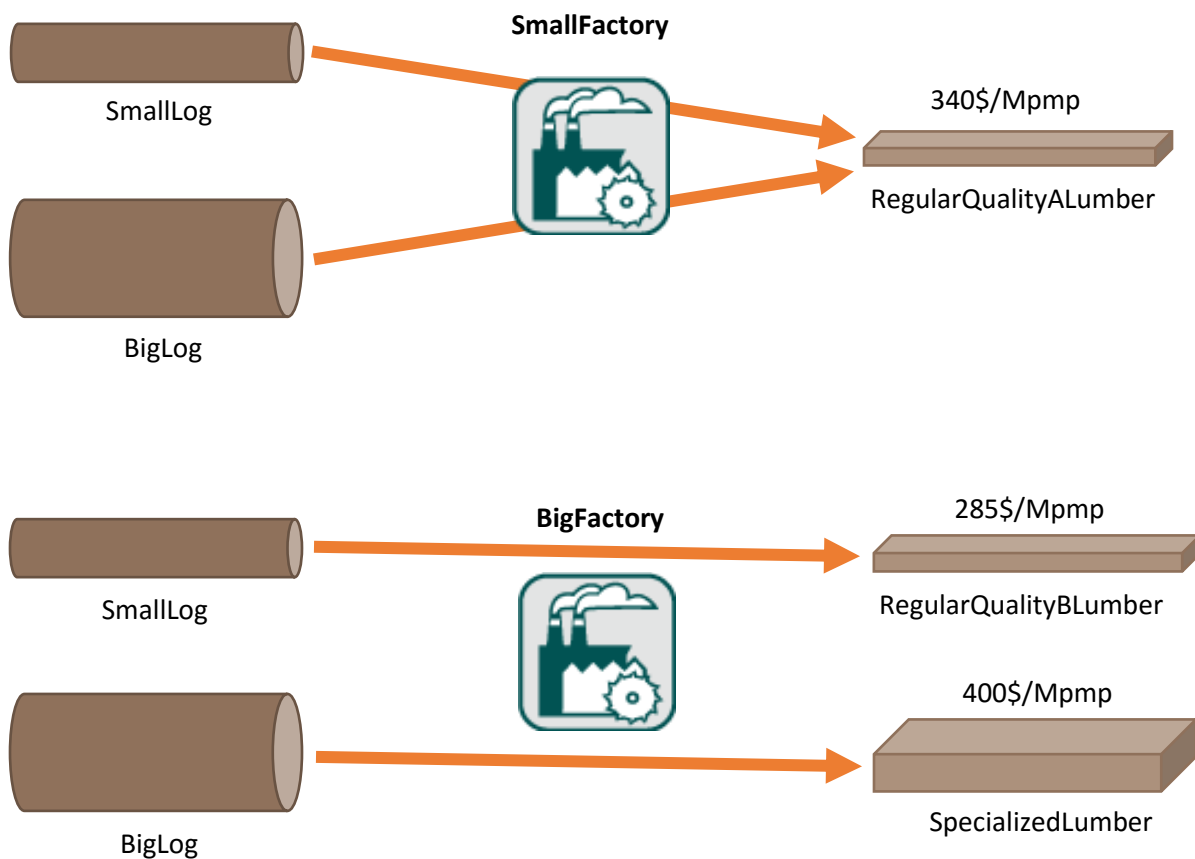


Image 2. Enterprise current logistic chain

Problem #2.1:

The enterprise acquired four forests blocs from the BMMB auction. You want to know to which factory does the wood from these blocs has to go to make the most profit. Your co-worker already created the actual logistic chain of your enterprise, but he forgot to model the content of the *Forest_Bloc_4* and the processes of its harvester. Your first job will be to download his model and complete it. According to the BMMB estimations, the *Forest_Bloc_4* has **15 000 m³** of wood. We also know that it takes an average of **0,055 hours** to harvest **1 m³** of wood (about 18,2 m³/hour) and that it costs an average of **28,62\$**.

Download the file named “Cas2.0.accdb” of the problem “Cas2” in LogiLab, and then complete the missing information. Then, optimize it with LogiLab and analyse the solution.

Solution validation

What is the profit of this model?

Answer: 2,011,658.67 \$

Problem #2.2 :

You want to know if there would be an advantage of sorting the wood in the forest (SmallLogs, BigLogs), while harvesting it, to be able to send each pile in its specialized factory. Harvesting and sorting 1m³ of wood takes **0.06 hours** (about 16.7 m³/hour) and costs **29.12\$**. Here is a table that shows the content of each forest bloc according to the data of the BMMB:

Bloc	Product	Proportion
	PetitBois	55%
	GrosBois	45%
	PetitBois	35%
	GrosBois	65%
	PetitBois	52%
	GrosBois	48%
	PetitBois	68%
	GrosBois	32%

Your co-worker modelled the harvesting processes that include the sorting for the first three forest blocs. You must download his file and model what is missing for the fourth.

Additional information

Attention: To keep the processes that doesn't include sorting and be sure that LogiLab doesn't use them, your co-worker changed the max capacity of not sorted products for the flows to the factories to 0. The same manipulation should be done for the fourth forest blocs.

The file to download is named « Cas2.2.accdb » in the problem named « Cas2.2_Initial »

Solution validation

What is the profit of this model?

Answer: 2,412,300.46\$

Problem #2.3:

A competitor's factory is for sale. It contains newer equipment and has a better production capacity than what your enterprise has. This factory can cut any size of wood, but only products quality A lumbers. Your boss considers selling both of your current factories to buy this one. He asks you which one of these possibilities would be the best one:

1. To keep your current factories and sort the wood while harvesting.
2. To sell your current factories to buy the new one and stop sorting the wood.

To be able to make a choice, it is important to consider the fixed costs. It cost an average of 345,300\$ for a factory to work for six periods (2,992,600\$/year). If the best choice is to use the new one, the fixed cost would be **345,300\$**. If the best choice is to keep your current factory, the fixed cost would be **690 600\$** (345,300\$ x 2).

Your co-worker already modeled the new factory with its flows. You now have to model the system that will forced LogiLab to make a choice.

Here's how to do it:

You will have to set up a ticket system. A **VirtualTicketSupplier** (virtual supplier) will have to create **only one GenericTicket at the first period only** and will send it to a **VirtualTicketFactory** (virtual factory). This factory will have to choose between :

1. To consume the GenericTicket to create **SortTickets**. This would cost **690 600\$** (fixed cost).
2. To consume the GenericTicket to create **NoSortTickets**. This would cost **345 300\$** (fixed cost).

The specialized factories (*SmallFactory and BigFactory*) will have to consume a **SortTicket** in their cutting processes **and the general factory (GeneralFactory)** will have to consume one **NoSortTicket** in its cutting processes. **100 000 tickets** will be created in the system, this will be enough to provide the cutting processes for every period. Only one of both ticket will exist in the network, LogiLab will make the most profitable choice.

A schema of the situation is shown on the next page.

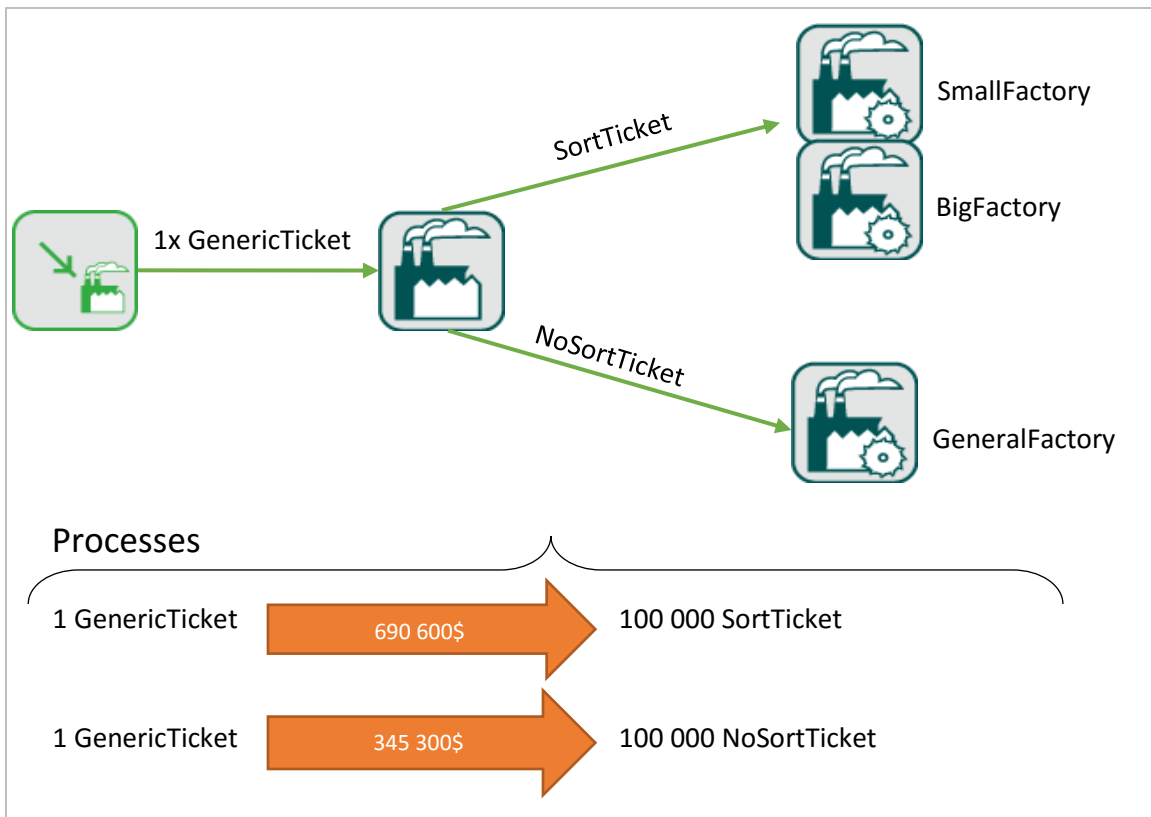


Figure 3. Réseau logistique avec le système de tickets pour le cas 2.3

Additional information

Warning: The processes of the virtual factory *VirtualTicketFactory* must be **discrete**. This will force the processes to run completely. For exemple, it will be impossible for one process to consume 0.5 *GenericTicket* to product 50,000 *SortTickets/NoSortTickets*. Furthermore, since we will use discrete processes, you will have to change the *IsMip* parameter for **True** when you will optimize the problem in *LogiLab*

SUMMARY
OPTIMIZATION
SOLUTIONS

PARAMETERS:

SolverName	CPLEX
IsMip	True
IsMipAsFixedLP	False

Solution validation

What is the most profitable choice?

Answer: Sell your current factories to buy the new one and stop sorting the wood.

What is the profit of this model?

Answer: 1,721,994.44\$

Commentaires / Feedback

Points forts / positive comments:

Points à améliorer / points to improve:

Merci de votre participation !