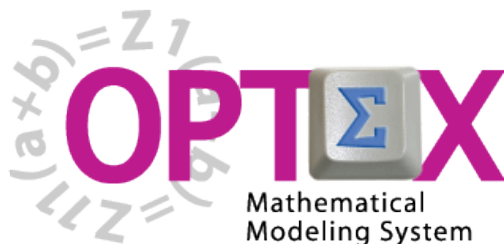


TUTORIAL – SESSION 3

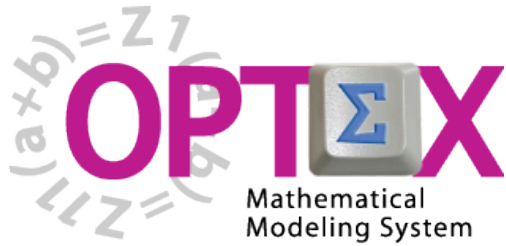
IMPLEMENTATION OF THE VRP PROBLEM (VEHICLE ROUTING PROBLEM)





BASIC TUTORIAL

1. **SESSION 1: INTRODUCTION**
 - Introduction to OPTEX (Section 1)
 - OPTEX-EXCEL-MMS (Section 2)
2. **SESSION 2: VRP MODELING IN EXCEL**
 - VRP: Vehicle Routing Problem (Section 3)
 - Implementing VRP Model using EXCEL (Section 4)
3. **SESSION 3: USING EXCEL TO LOAD DATA**
 - Industrial Data Information Systems –IDIS- (Section 5)
4. **SESSION 4: OPTEX-GUI – LOADING MODELS**
 - Loading the Model in OPTEX-MMIS (Section 6)
 - Verification of the Model in OPTEX-MMIS (Section 7)
5. **SESSION 5: Loading and Checking Industrial Data**
 - Implementation and Validation of IDIS- (Section 8)
6. **SESSION 6: Solving Mathematical Models**
 - Scenarios and Families of Scenarios (Section 9)
 - Solution of Mathematical Problems (Section 10)
 - Results Information System (Section 11)
7. **SESSION 7: SQL Servers**
 - Using SQL Servers for IDIS (Section 12)
8. **SESSION 8: Optimization Technologies**
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 - Solving Problems using GAMS (Section 13.2)
 - Solving Problems using IBM OPL (Section 13.3)



TUTORIAL IMPLEMENTATION OF THE VRP PROBLEM (VEHICLE ROUTING PROBLEM)

BASIC TUTORIAL

3. SESSION 3: USING EXCEL TO LOAD DATA

- **Industrial Data Information Systems IDIS
(Section 5)**

INDUSTRIAL DATA INFORMATION SYSTEM

Subsequent to the completion of the formulation of the mathematical model should be defined the data model of the information system of industrial data (IDIS). Three tables must be defined for this purpose:

- Tables of the IDIS (**CDBAS**)
- Fields of the Tables of IDIS (**DDBAS**)
- Relational fields (**CAMRE**)

These tables are included in the **OPTEX-EXCEL-MMS** template.

This process involves collecting all the information of the data model that is storage in all tables used in the mathematical formulation. Because the data model is fully defined in tables presented previously, in the near future OPTEX will "generate automatically" the tables that are required.

The data corresponding to the technical information of urban routing VRP model are classified into two types:

- **Permanent Data:** pertaining to technical information of the system that is independent of any scenario; and
- **No Permanent Data:** associated to the existence or not of a scenario and representing its variability.

In the information system of industrial data are stored as "input values" the parameters and the elements of the sets, and as "output values" the solutions for variables and for constraints (primal variables and dual variables), and, when the user specifies, tables for sets and the parameters used in the model.

RELATIONAL KEYS

To make easy the services that may be provided by OPTEX for organizing information, in different forms, the table **CAMRE** that defines the relational keys must be filled; information that can be extracted from the table **INDICE** related to the indexes used in the mathematical model.

RELATIONAL FIELDS (KEYS)				
RELATIONAL KEY	OBJECT ENTITY	MASTER TABLE	TYPE	LENGTH
COD_CAJ	Boxes ID	CAJAS	C	15
COD_NOD	Node ID	NODOS	C	15
COD_NOD1	Node ID (Alias)	NODOS	C	15
COD_VEH	Vehicle ID	VEHICULOS	C	13
COD_PED	Order ID	PEDIDOS	C	7

TABLE INDICE - INDEXES						
INDEX	ENTITY OBJECT	DESCRIPTION	ALIAS	MASTER TABLE	SCENARIO TABLE	RELATIONAL KEY
b	Boxes	Container in which it is protected, stored and transported merchandise		CAJAS	ESC_CAJ	COD_CAJ
c	Node	Spatial point that must be visited by a vehicle to provide a service of loading and/or unloading of goods	k	NODOS	ESC_NOD	COD_NOD
k	Node (Alias)	Spatial point that must be visited by a vehicle to provide a service of loading and/or unloading of goods	c	NODOS	ESC_NOD1	COD_NOD1
v	Vehicle	Transport equipment to be used to provide transportation services		VEHICULOS	ESC_VEH	COD_VEH
w	Orders	Custom merchandise that customers make and must be shipped and transported		PEDIDOS	ESC_PED	COD_PED

RELATIONAL KEYS

The table/sheet **CAMRE** that defines the relational keys must be filled.

The screenshot shows the OPTΣX software interface with a spreadsheet. The spreadsheet has columns labeled A through O. The data in the spreadsheet is as follows:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	COD_CAMPO	DESC_CAMPO	TIPO_CAMPO	COD_UNI	COD_DB	COD_CAMPOS	TIPO	LONGITUD	DECIMAL	PICTURE	CAPTION	CLAVE_HELP	HELP_MSG		
2	Prototype Field	Description	Class Prototype	Measuring Unit	Associated Mas	Field Code Time	Type	Longitude	Decimal	Format	Help text in Stati	Connection Topi	Help Message		
3	COD_CAJ	Código Cajas	C		CAJAS		C	15		@!					
4	COD_NOD	Código Nodo	C		NODOS		C	15		@!					
5	COD_NOD1	Código Nodo (Alias)	C		NODOS		C	15		@!					
6	COD_VEH	Código Vehículo	C		VEHICULOS		C	13		@!					
7	COD_PED	Código Pedido	C		PEDIDOS		C	7		@!					

Below the spreadsheet, there is a detailed table titled "CAMPOS RELACIONALES":

CLAVE RELACIONAL	ENTIDAD OBJETO	TABLA MAESTRA	TIPO	LONGITUD
COD_CAJ	Código Cajas	CAJAS	C	15
COD_NOD	Código Nodo	NODOS	C	15
COD_NOD1	Código Nodo (Alias)	NODOS	C	15
COD_VEH	Código Vehículo	VEHICULOS	C	13
COD_PED	Código Pedido	PEDIDOS	C	7

The bottom of the screenshot shows the software's navigation bar with the following tabs: CAMRE | Relational Field Contro, CDBAS | Data Tables, CONJUNTO | Sets, CUNID | Units, DD ...

IDIS DATA TABLES

The data model is implemented from the definition of the **master tables** for each of the entities included in the VRP, and **secondary tables** that allow detailed characteristics of each entity, and make it possible to establish the necessary relationship between the entities to represent the topology of the system. The **scenario tables** store the physical entities that will be incorporate in the model.

TABLES OF VRP - INDUSTRIAL DATA INFORMATION SYSTEM						
TABLE	DESCRIPTION	AREA PATH	RELATIONAL CODES	SECONDARY CODES	SETS	PARAMETERS
MASTER TABLES						
CAJAS	Boxes Master	I	COD_CAJ			PECA_b, VOCA_b
DIAS	Days Master	I	COD_DIA			
NODOS	Nodes Master	I	COD_NOD		DEC, NOD, DEK	TSER_c
PEDIDOS	Orders Master	F	COD_PED	COD_NOD	PEC(c)	
VEHICULOS	Vehicle Master	I	COD_VEH		VEH	CAPP_v, CAPV_v, COVA_v, CUVE_v
SECONDARY TABLES						
NOD_NOD	Nodes <-> Nodes	I		COD_NOD, COD_NOD1	NOK(c), NOC(k)	DIST_{c,k}
NOR_VEH	Node Origin <-> Vehicles	I		COD_NOD, COD_VEH	NOV(v)	
PED_CAJ	Order <-> Boxes	F		COD_PED, COD_CAJ	CAP(w)	NUCA_{w,b}
VEH_NOD	Vehicles <-> Nodes	I		COD_VEH, COD_NOD	NCV(v), VEC(c), NKV(v), VEK(k)	
VEHICULOS	Vehicle Master	I		COD_VEH	VEH	
SCENARIO TABLES						
ESC_CAJ	Scenarios Boxes	F		COD_CAJ		
ESC_DIA	Scenarios Days	F		COD_DIA		
ESC_NOD	Scenarios Nodes	F		COD_NOD, COD_NOD1		
ESC_PED	Scenarios Orders	F		COD_PED		
ESC_VEH	Scenarios Vehicles	F		COD_VEH		

IDIS DATA TABLES

The above information is the basis for filling the **CDBAS** table whose image is presented below, in that table the following fields have been filled:

- **TIPO_FILE:** **M**, master or **S** secondary
- **PATH_DB:** **I**, permanent data area (Industrial), **F**, Family of Scenarios or **E** Scenarios.

The screenshot shows the Microsoft Excel interface with the 'CDBAS | Data Tables' spreadsheet open. The spreadsheet has columns labeled A through N. Column C is circled in blue. The spreadsheet contains the following data:

A	B	C	D	E	F	G	H	I	J	K	L	M	N
COD_DB	DESC_DB	PATH_DB	TIPO_FILE	ON_SCR	DIR_FILE	CLAVE_HLP	COMENTARIO						
Code Data Table	Description	Data Area	Type Table	Quick Screen Generation	File Directory	Windows Help Topic	Comments						
CAJAS	Maestra Cajas	I	M										
DIAS	Maestra Días	I	M										
NODOS	Maestra Nodos	I	M										
PEDIDOS	Maestra Pedidos	F	M										
VEHICULOS	Maestra Vehículos	I	M										
ESC_CAJ	Escenarios Cajas	F	S										
ESC_DIA	Escenarios Días	F	S										
ESC_NOD	Escenarios Nodo	F	S										
ESC_PED	Escenarios Pedido	F	S										
ESC_VEH	Escenarios Vehículos	F	S										
HORARIO	Horario de Atención	I	S										
NOD_NOD	Nodos <-> Nodos	I	S										
NOR_VEH	Nodo Origen <-> Vehículos	I	S										
PED_CAJ	Pedidos <-> Cajas	F	S										
VEH_NOD	Vehículos <-> Nodos	I	S										

TABLA	DESCRIPCIÓN	ÁREA	CÓDIGOS RELACIONAL	CÓDIGOS SECUNDARIOS	CONJUNTOS	PARÁMETROS
CAJAS	Maestra Cajas	I	COD_CAJ			PECA _w , VOCA _w
DIAS	Maestra Días	I	COD_DIA			
NODOS	Maestra Nodos	I	COD_NOD		DEC_NOD, DEK	TSER _w
PEDIDOS	Maestra Pedidos	F	COD_PED	COD_NOD	PEC(c)	
VEHICULOS	Maestra Vehículos	I	COD_VEH		VEH	CAPP _w , CAPV _w , COVA _w , CUVE _w

TABLA	DESCRIPCIÓN	ÁREA	CÓDIGOS SECUNDARIOS	CONJUNTOS	PARÁMETROS
ESC_CAJ	Escenarios Cajas	F	COD_CAJ		
ESC_DIA	Escenarios Días	F	COD_DIA		
ESC_NOD	Escenarios Nodo	F	COD_NOD, COD_NOD1		
ESC_PED	Escenarios Pedido	F	COD_PED		
ESC_VEH	Escenarios Vehículos	F	COD_VEH		
HORARIO	Horario de Atención	I	COD_NOD, COD_DIA	DIQ(c)	HAPE _{w,d} , HCIE _{w,d}
NOD_NOD	Nodos <-> Nodos	I	COD_NOD, COD_NOD1	NOK(c), NOQ(k)	DIST _{w,k}
NOR_VEH	Nodo Origen <-> Vehículos	I	COD_NOD, COD_VEH	NOV(v)	
PED_CAJ	Pedidos <-> Cajas	F	COD_PED, COD_CAJ	CAP(w)	NUCA _{w,b}
VEH_NOD	Vehículos <-> Nodos	I	COD_VEH, COD_NOD	NOV(v), VEG(c), IIKV(v), VEK(k)	

STRUCTURE OF THE TABLES

Below, the structure of the data tables that are part of the information system is presented; previously it is presented the description of the columns in the table.

COLUMNS FIELDS OF TABLES	
COLUMN	DESCRIPTION
TABLE	Code (name) Table
FIELD	Field code; by default, assumes codes up to ten (10) characters
DESCRIPTION	Description of the contents of the field, which is used in the automatic generation of prototypes and in the titles of windows when you access the data in form mode.
TYPE	Type of field, may be one of the following: C Alphanumeric character N Numeric D Date M Memo
UNIT	Unit measure code
LENGTH	Length of field
DECIMAL	Number of decimals of the field (for numeric fields)
VALIDATION	Validation function. The following are types of validations: A Referential integrity. D Validation for duplicity of content of a key in a tables
VALID 1	Parameter 1 of a validation function
VALID 2	Parameter 2 of a validation function

STRUCTURE OF THE TABLES

FIELDS OF DATA TABLES										
TABLES	FIELD	DESCRIPTION	TYPE	LENGTH	DE CIMAL	UNIT	VALID ATE	VALID 1	VALID 2	DSS
CAJAS	COD_CAJ	Code boxes	C	15	0		D			
	DES_CAJ	Box description	C	10	0		D			
	PECA	Weigth of boxes	N	8	3	kg				Si
	VOCA	Volumen of boxes	N	7	4	m3				Si
ESC_CAJ	COD_CAJ	Code boxes	C	15	0		A	CAJAS	COD_CAJ	
ESC_DIA	COD_DIA	Day Code	C	4	0		A	DIAS	COD_DIA	
ESC_NOD	COD_NOD	Node code	C	15	0		A	NODOS	COD_NOD	
	COD_NOD1	Node code (Alias)	C	15	0		A	NODOS	COD_NOD	
ESC_PED	COD_PED	Order code	C	13	0		A	PEDIDOS	COD_PED	
ESC_VEH	COD_VEH	Vehicles code	C	7	0		A	VEHICULOS	COD_VEH	
HORARIO	COD_NOD	Node Code	C	15	0		A	NODOS	COD_NOD	Si
	COD_DIA	Day code	C	4	0		A	DIAS	COD_DIA	Si
	HAPE	Open hour	N	10	3	hr				Si
	HCIE	Closed hour	N	10	3	hr				Si
NOD_NOD	COD_NOD	Node code	C	15	0		A	NODOS	COD_NOD	Si
	COD_NOD1	Node code (Alias)	C	15	0		A	NODOS	COD_NOD	Si
	DIST	Distance between nodes	N	6	2	Km				Si
NODOS	COD_NOD	Code node	C	15	0		D			Si
	DES_NOD	Description node	C	30	0		D			
	TIPO	Type of node	C	3	0					Si
NOR_VEH	COD_NOD	Origin node code	C	15	0		A	NODOS	COD_NOD	Si
	COD_VEH	Vehicle code	C	7	0		A	VEHICULOS	COD_VEH	Si
PED_CAJ	COD_PED	Order code	C	13	0		A	PEDIDOS	COD_PED	Si
	COD_CAJ	Boxes code	C	15	0		A	CAJAS	COD_CAJ	Si
	NUCA	Number of boxes of order	N	3	0	Und				Si
PEDIDOS	COD_PED	Order code	C	13	0		D			Si
	DES_PED	Order description	C	30	0		D			
	COD_NOD	Code node	C	15	0		A	NODOS	COD_NOD	Si
VEH_NOD	COD_VEH	Vehicle code	C	7	0		A	VEHICULOS	COD_VEH	Si
	COD_NOD	Node code	C	15	0		A	NODOS	COD_NOD	Si
VEHICULOS	COD_VEH	Vehicle code	C	7	0		D			Si
	DES_VEH	Vehicle description	C	30	0		D			
	CAPP	Load capacity	N	7	2	kg				Si
	CAPV	Volume capacity	N	8	2	m3				Si
	CUVE	Use cost of vehicle	N	10	2	\$/día				Si
	COVA	Variable cost	N	10	3	\$/km				Si

STRUCTURE OF THE TABLES

The image of the table **DDBAS** in EXCEL.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	COD_DB	COD_CAMPO	DESC_CAMPO	DESCORT_01	TIPO	LONGITUD	DECIMAL	COD_UNI	VALIDACION	VALIDO_1	VALIDO_2	SEQ_GET	DEFAULT_EX	PICTURE	CAPTION	CLAVE_HLP
2	Code Data Table	Field Code	Long Description	Short Description	Field Type	Longtude	Decimal	Unit Code	Type Validati	Parameter # 1	Parameter # 2	Browse Sequence	Initialization Expression	Format	Help Text in Status Bar	Connection Topi
3	CAJAS	COD_CAJ	Código Cajas	Código	C	15	0		D			1				
4	CAJAS	DES_CAJ	Descripción Caja	Descripcion	C	10	0		D			2				
5	CAJAS	PECA	Peso de la Caja	Peso	N	8	3	kg				3				
6	CAJAS	VOCA	Volumen de Caja	Volumen	N	7	4	m3				4				
7	ESC_CAJ	COD_CAJ	Código Cajas	Codigo Caja	C	15	0		A	CAJAS	COD_CAJ	1				
8	ESC_NOD	COD_NOD	Código Nodo	Codigo Nodo	C	15	0		A	NODOS	COD_NOD	1				
9	ESC_NOD	COD_NOD1	Código Nodo (Alias)	Codigo Nodo	C	15	0		A	NODOS	COD_NOD	2				
10	ESC_PED	COD_PED	Código Pedido	Código Pedido	C	13	0		A	PEDIDOS	COD_PED	1				
11	ESC_VEH	COD_VEH	Código Vehículo	Código Vehículo	C	7	0		A	VEHICULOS	COD_VEH	1				
12	NOD_NOD	COD_NOD	Código Nodo	Nodo Origen	C	15	0		A	NODOS	COD_NOD	1				
13	NOD_NOD	COD_NOD1	Código Nodo (Alias)	Nodo Destino	C	15	0		A	NODOS	COD_NOD	2				
14	NOD_NOD	DIST	Distancia entre Nodos	Distancia	N	6	2	Km				3				
15	NODOS	COD_NOD	Código Nodo	Código	C	15	0		D			1				
16	NODOS	DES_NOD	Descripción del Nodo	Descripcion	C	30	0		D			2				
17	NODOS	TIPO	Tipo de Nodo	Tipo	C	3	0					3				
18	NOR_VEH	COD_VEH	Código Nodo Origen	Codigo Nodo	C	15	0		A	NODOS	COD_NOD	1				
19	NOR_VEH	COD_VEH	Código Vehículo	Código Vehículo	C	7	0		A	VEHICULOS	COD_VEH	2				
20	PED_CAJ	COD_PED	Código Pedido	Código Pedido	C	13	0		A	PEDIDOS	COD_PED	1				
21	PED_CAJ	COD_CAJ	Código Cajas	Codigo Caja	C	15	0		A	CAJAS	COD_CAJ	2				
22	PED_CAJ	NUCA	Número de Cajas del Pedido	Cantidad	N	3	0	Und				3				
23	PEDIDOS	COD_PED	Código Pedido	Código	C	13	0		D			1				
24	PEDIDOS	DES_PED	Descripción del Pedido	Descripcion	C	30	0		D			2				
25	PEDIDOS	COD_NOD	Código Nodo	Código Nodo	C	15	0		A	NODOS	COD_NOD	3				
26	VEH_NOD	COD_VEH	Código Vehículo	Código Vehículo	C	7	0		A	VEHICULOS	COD_VEH	1				
27	VEH_NOD	COD_NOD	Código Nodo	Codigo Nodo	C	15	0		A	NODOS	COD_NOD	2				
28	VEHICULOS	COD_VEH	Código Vehículo	Código	C	7	0		D			1				
29	VEHICULOS	DES_VEH	Descripción del Vehículo	Descripcion	C	30	0		D			2				
30	VEHICULOS	CAPP	Capacidad de Carga	Capacidad Peso	N	7	2	kg				3				
31	VEHICULOS	CAPV	Capacidad Volumétrica	Capacidad Volume	N	8	2	m3				4				
32	VEHICULOS	CIUVE	Costo de Utilizar el Vehículo	Costo Fin	N	10	2	\$/día				5				

LOADING OF TABLES OF THE IDIS

The industrial data base (IDIS) required to solve the problem of VRP has organized a book/template EXCEL that contains all the tables defined, this template is located at:

http://www.doanalytics.net/Documents/OPTeX_Plantilla_Data_VRP.xlsx.

The following image shows the template generated by OPTeX for loading the data.

The image shows a Microsoft Excel spreadsheet with a table of vehicle data. The table has columns for vehicle code, description, capacity, cost, and variable costs. An 'Activar' dialog box is open, listing various tables to be activated, with 'VEHICULOS | Maestra Vehiculos' selected.

COD_VEH	DES_VEH	CAPP	CAPV	CUVE	COVA
Codigo Vehiculo	Descripcion del	Capacidad del V	Capacidad Volu	Costo de Utilizar	Costo Variable (\$-km)
SWK053	NHR	6000	10.51	125921.6	268.612
SWK054	NHR	6000	10.51	118875.03	268.612
SWK055	NHR	6000	10.51	114172.28	268.612
SWK056	NHR	6000	10.51	114172.28	268.612
SWK057	NKR III	8400	15.34	121070.44	357.36
SWK058	NKR III	8400	15.34	125980.45	357.36
SWK059	NKR III	8400	15.34	130385.36	357.36
SWK060	NPR	9999	50	127652.89	415.189
SWK061	NPR	9999	50.23	125906.06	415.189
SWK062	NPR	9999	20.23	131012.17	415.189
SWK925	NHR	6000	10.51	115870.5	268.612
SWK926	NKR II	9999	14.61	124575.98	357.36
SWK927	NHR	6000	10.51	119165.27	268.612
SWK928	CARRY	2400	3.25	107005.49	239.4
SWK929	NHR	6000	10.51	114172.28	268.612
SWK930	NKR II	9999	14.61	128118.3	357.36
SWK931	NKR II	9999	14.61	128118.3	357.36
SWK932	NKR II	9999	14.61	131148.88	357.36
SWL583	NHR	6000	10.51	108163.22	268.612
CON001	NHR	6000	10.51	999999	0
CON002	NHR	6000	10.51	999999	0
CON003	NHR	6000	10.51	999999	0
CON004	NHR	6000	10.51	999999	0
CON005	NKR III	8400	15.34	999999	0
CON006	NKR III	8400	15.34	999999	0
CON007	NKR III	8400	15.34	999999	0
CON008	NPR	9999	19.23	999999	0
CON009	NPR	9999	19.23	999999	0
CON010	NPR	9999	19.23	999999	0
CON011	NHR	6000	10.51	999999	0

Activar

- CAJAS | Maestra de Cajas
- ESC_CAJ | Escenarios Cajas
- ESC_NOD | Escenarios Nodo
- ESC_PED | Escenarios Pedido
- ESC_VEH | Escenarios Vehiculos
- HORARIO | Horario de Atencion
- MAE_ROL | Maestra de Roles
- NOD_NOD | Nodos (-) Nodos
- NODOS | Maestra Nodos
- NOR_VEH | Nodo Origen (-) Vehic
- PED_CAJ | Pedidos (-) Cajas
- PEDIDOS | Maestra Pedidos
- VEH_NOD | Vehiculos (-) nodos
- VEHICULOS | Maestra Vehiculos**

Activar: ? X

Aceptar Cancelar

VEHICULOS | Maestra Vehiculos

EXPORT/IMPORT OF TEMPLATES EXCEL

As part of the files that integrated **OPTeX-EXCEL-MMS** are the oriented to conversion of templates to CSV files and otherwise, build templates from CSV files. This incorporates two EXCEL macros that users install on their PC to link them to icons in EXCEL. These components, **OPTeX_Exportar_Plantilla_a_CSV.xla** and **OPTeX_Importar_Plantilla_de_CSV.xla**, are located in the directory **/BIN/**. To install the components as permanent parts of EXCEL the user must perform the procedure indicated in the Tutorial Manual.

At the end of the process on the Quick Access toolbar should appear the **icons associated with macros**.

The screenshot shows the Microsoft Excel interface with the following content:

A	B	C	D	E	F	G	H	I	J	K	
1	COD_VAR	DES_VAR	DIN_VAR	COD_UNI	COD_TVTR	COD_VARC	COD_IND	UP_BOUND	LO_BOUND	COD_UOPSS	DLES_VAR
2	Variable Code	Spanish Description	English Descript	Variable Unit	Variable Type	Logic Variable	Expansion Index	Upper Bound	Lower Bound	UOPS Entity	Long Description
3	AVL	Uso del vehículo v		B				1	0		Variable binaria que determina si se utiliza el vehículo v para atender los pedidos
4	VCL	Vehículo v viaja del nodo c al nodo k		B				1	0		Variable binaria que determina si el vehículo va desde el nodo origen c hasta no

VARIABLES				
VARIABLE	DESCRIPCIÓN	UNIDAD	TIPO	CONDICIONES EXISTENCIA
AVL _v	<p>Determina el Uso de un Vehículo Variable binaria que determina si se utiliza el vehículo v para atender los pedidos del cliente.</p> <p>Existe para todo vehículo v considerado en el problema, lo que se representa por el conjunto veVEH.</p>		B	veVEH
VCL _{v,c,k}	<p>Determina si un Vehículo va de un Destino a Otro Variable binaria que determina si el vehículo va desde el nodo origen c hasta nodo destino k</p> <p>Existe para todo vehículo v considerado en el problema, todo cliente c que pueda ser atendido por el vehículo v (c ∈ NCV(v)) y por todo nodo k que pueda ser visitado desde el nodo c en el vehículo v (k ∈ TRK(c,v))</p>		B	vveVEH ∨ c ∈ NCV(v) ∨ k ∈ TRK(c,v)

EXPORT/IMPORT OF TEMPLATES EXCEL

To convert the template into CSV files is necessary to define the following parameters:


1. Define the field delimiter in the CSV file
2. Indicate if the template contains descriptions in the second row of each sheet
3. Select the directory where the CSVs files should be located

The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	COD_PRO	DES_PRO	DIN_PRO	INDICES	COD_TPR	COORDINADO	COD_CPR	COD_ADE	COD_INC	COD_SEC	COD_TEM	COMENTARIO			
2	Code Problem	Spanish Description	English Descript	Indexes	Role Problem Co	Model Coordinat	Format Problem	Decision Area C	Uncertainty Cod	Area - Sector C	Temporality Code	Comments			
3	VRP	Ruteo Vehículos (VRP)			IN		PM								
4	VRP2C	Ruteo Vehículos (VRP) - Peso + Volumen			IN		PM								

The three dialog boxes shown are:

- OPTEX-EXCEL Export To CSV File**: "Introduzca el carácter delimitador (por ejemplo, coma o punto y coma)" with a text input field and "Aceptar" and "Cancelar" buttons. A red circle with the number "1" is around the dialog.
- OPTEX-EXCEL Export To CSV File**: "The template includes a second file with fields Description (YES/NO)?" with a text input field containing "YES" and "Aceptar" and "Cancelar" buttons. A red circle with the number "2" is around the dialog.
- Buscar carpeta**: "Select the Directory to export CSV files" showing a file explorer view of "Este equipo" with folders like Descargas, Escritorio, Documentos, etc. A red circle with the number "3" is around the dialog.



Analytics

"the computer-based mathematical modeling is the greatest invention of all times"

**Herbert Simon
First Winner of Nobel Prize in Economics (1978)**

"for his pioneering research into the decision-making process within economic organizations"