

# **YELLOWCOM**

## **case study**

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# Specifications

**We want to create a database of the information system of a mobile telephone operator. The specifications are provided follows.**

A new mobile operator is about to enter the market. Part of the company's information system is about managing contracts with customers. For each contract stipulated, the company records customer data and assigns it a unique telephone number. The same customer can stipulate more contracts and therefore have more telephone numbers.

Each contract specifies the tariff plan chosen by the customer. Each tariff plan includes the price for calls, for video calls, for sending text messages, for sending Video / MMS messages, for international calls and for internet connection. The plan can also define (this is not an alternative to the tariff) a limit for calls, text messages and internet traffic

with monthly payment.

The customer's contract also provides for payment through "recharge" of the phone card or by sending a monthly bill ("subscription-based" customers). If the customer uses a refillable card, the remaining amount of his credit must be known. If the customer chooses the payment by bill, one must know his bank details.

For each operation (call, text messages, etc. ..) carried out by a customer, the operator records the number called, the date and time of the operation and the cost. For (video) phone calls, the operator also records the duration in seconds; for internet connections, the operator records the amount of data transmitted (in bytes). At the end of each month, the operator sends invoices to customers with a subscription. The first page of the invoice contains the date, the customer data and the total expenditure for each category of operation (call, message, etc.). The following pages contain the details of each operation carried out: each line shows the type of operation, the date and time, the number called and the duration or amount of data transmitted, depending on the type of operation. The operator provides invoices of this type on request to subscription-based customers. It can happen that a customer finds errors in the invoice. In this case, he/she informs the company, which records the data of the claim, including the date, the reason and the invoice and, after evaluating the situation, the amount of the possible reimbursement.

The company, in order to advertise new products / technologies, provides for the possibility of defining temporary promotions that allow the use of these products / technologies at a reduced price. Each promotion can be associated with a particular contract.

To comply with current legislation, the operator needs to associate to each operation the place where it was made (eg city from which the call was made). The operator needs to associate to each operation its informative content (eg text for sms) for some users appropriately reported by the judicial authority.

## Conceptual Design

### Requirements collection and analysis

#### Structuring of requirements

Phrases of general nature
We want to create a database of the information system of a mobile telephone operator. We will hold information for managing contracts with customers.

<b>Phrases relating to the customer</b>
For each customer who signs a contract we will hold the customer data.

<b>Phrases relating to the contract</b>
For each contract stipulated, we will hold customer data and a unique telephone number. Each contract specifies the tariff plan chosen by the customer.

<b>Phrases relating to type of contracts</b>
The contract also provides for payment through "recharge" of the phone card or by sending a monthly bill. For rechargeable contract, the remaining amount of his credit must be known. For subscription based contract, must know the bank details.

<b>Phrases relating to the tariff plan</b>
For each tariff plan we will hold the price for calls, for video calls, for sending text messages, for sending Video / MMS messages, for international calls and for internet connection. The tariff plan can also define a limit for calls, text messages and internet traffic with monthly payment.

<b>Phrases relating to the operation</b>
For each operation (call, international call, video call, sms, mms and internet connection ) we will hold the number called, the date and time of the operation and the cost. For calls, video calls and international calls, we will hold the duration in seconds; for internet connections, we will hold the amount of data transmitted (in bytes). For each operation we will hold the place where it was made (eg city from which the call was made), its informative content (eg text for sms).

<b>Phrases relating to the invoice</b>
At the end of each month, the operator sends invoices to customers with a subscription. For each invoice we will hold the date, the customer data and the total

expenditure for each category of operation and the details of each operation carried out: the type of operation, the date and time, the telephone number called and the duration , if the operation is a call, video call and international call; the telephone number if the operation is an sms or is an mms; the amount of data transmitted if the operation is an internet connection.

### Phrases relating to the claim

For each claim we will hold the data of the claim, including the date, the reason and the invoice and the possible amount of the possible reimbursement.

### Phrases relating to the promotion

The company, in order to advertise new products / technologies, provides for the possibility of defining temporary promotions that allow the use of these products / technologies at a reduced price. Each promotion can be associated with a particular contract.

## Glossary of terms

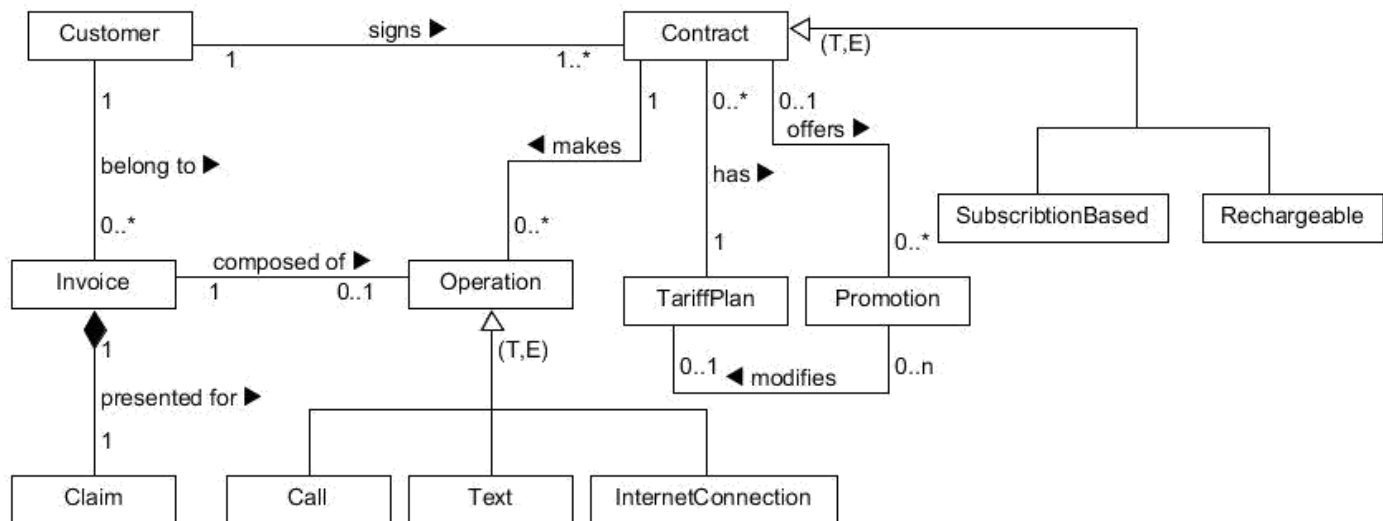
The table below describes the glossary of terms extrapolated from the specifications.

Name	Description	Synonymous	Connections
<i>Customer</i>	Who stipulates the contract	Client, User	Contract, Invoice
<i>Contract</i>	Agreement between Customer and YellowMobile	Stipulation	Customer, TariffPlan, Promotion
<i>TariffPlan</i>	The set of prices and limits of the services provided by a contract	Plan	Contract, Promotion
<i>Operation</i>	The operation performed by a Customer	Service	Customer, Contract, Invoice

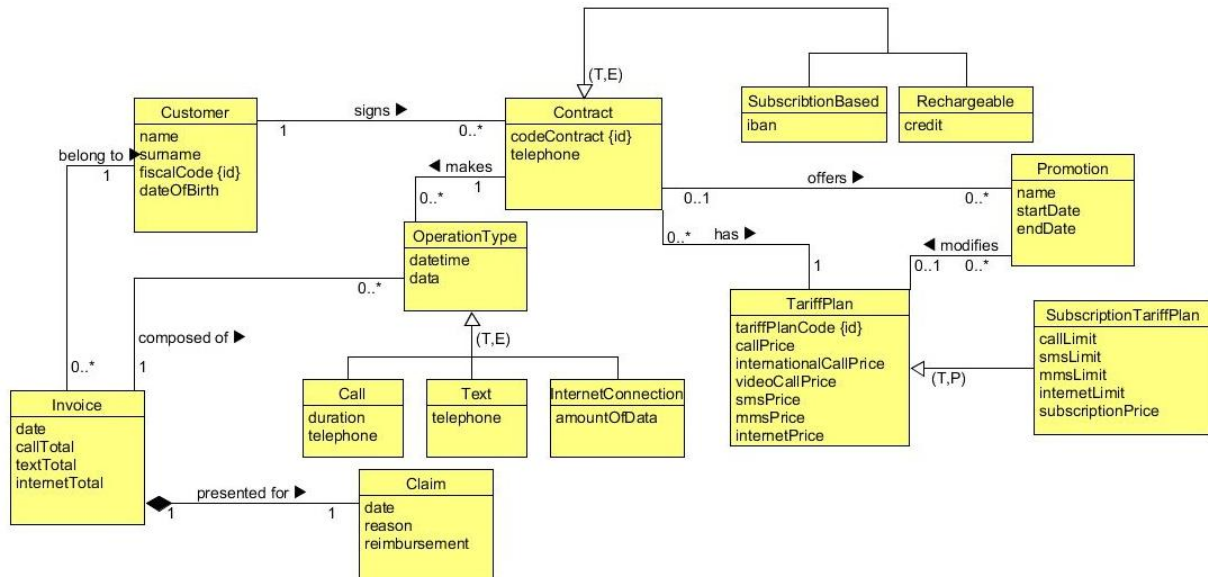
<i>Invoice</i>	A bill which contains information about used services.	Bill	Operation, Claim, Customer
<i>Claim</i>	A request of reimbursement from a Customer because of an error reported on the bill.	/	Invoice
<i>Promotion</i>	Advertise about a Yellowcom services.	Advertise	Contract, Tariff Plan

## Conceptual Schema

### Skeleton schema



## Restructured schema



## Business rules

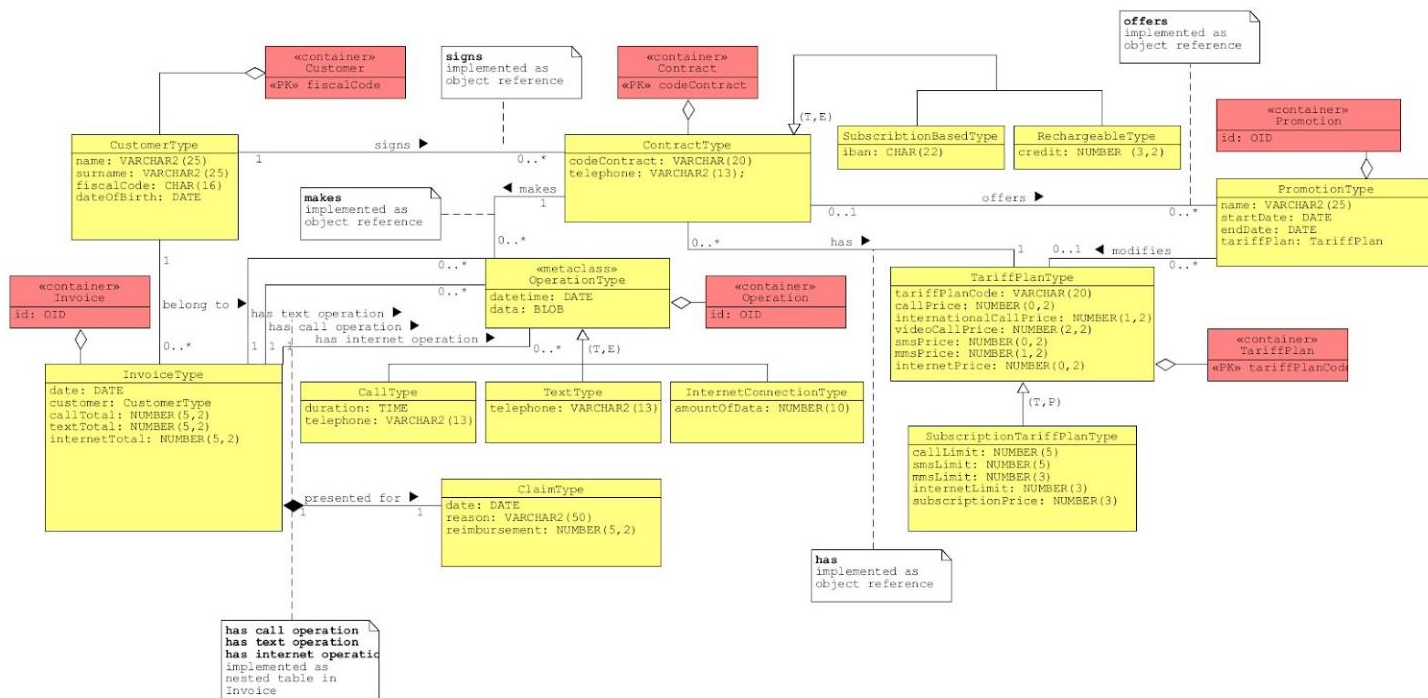
### Constraints:

1. The unit of measurement of the call price is euro per minute.
2. The unit of measurement of the call price is megabyte.
3. An invoice is associated to a contract of subscription based type.

### Derivations:

1. The total call cost of an invoice is calculated by adding up all the duration call and then multiplying for the call price of the contract's tariff plan.
2. The total text cost of an invoice is calculated by multiplying the number of messages sent for the sms price of the contract's tariff plan.
3. The total internet cost of an invoice is calculated by adding up all the amount of data and then multiplying for the internet connection price of the contract's tariff plan.
4. For rechargeable contracts, when an operation is inserted the credit has to be updated with the new value (old credit minus the cost of the operation).

# Logical Design



```
CREATE OR REPLACE TYPE ContractType;
```

```
CREATE OR REPLACE TYPE TariffPlanType;
```

```
CREATE OR REPLACE TYPE CustomerType AS OBJECT
(
    name VARCHAR2(25),
    surname VARCHAR2(25),
    fiscalCode VARCHAR2(16),
    dateOfBirth DATE)

```

```
CREATE OR REPLACE TYPE ContractType AS OBJECT
(
    codeContract VARCHAR2(20),
    customer ref CustomerType,
    telephone VARCHAR2(13),
    tariffPlan ref TariffPlanType) NOT FINAL;

```



```
CREATE OR REPLACE TYPE SubscriptionBasedType UNDER ContractType
( IBAN CHAR(22) );
```

```
CREATE OR REPLACE TYPE RechargeableType UNDER ContractType
( credit NUMBER );
```

```
CREATE OR REPLACE TYPE TariffPlanType AS OBJECT
( tariffPlanCode varchar(20),
  callPrice NUMBER,
  internationalCallPrice NUMBER(9,2),
  videoCallPrice NUMBER(9,2),
  smsPrice NUMBER(9,2),
  mmsPrice NUMBER(9,2),
  internetPrice NUMBER(9,2)) NOT FINAL;
```

```
CREATE OR REPLACE TYPE SubscriptionTariffPlanType UNDER
TariffPlanType
( callLimit NUMBER(5),
  smsLimit NUMBER(5),
  mmsLimit NUMBER(5),
  internetLimit NUMBER(3),
  subscriptionPrice NUMBER(3) );
```

```
CREATE OR REPLACE TYPE PromotionType AS OBJECT
( name VARCHAR2(25),
  startDate DATE,
  endDate DATE,
  tariffPlan TariffPlanType );
```

```
CREATE OR REPLACE TYPE OperationDetailType AS OBJECT
( name VARCHAR2(20) ) NOT FINAL;
```

```
CREATE OR REPLACE TYPE OperationType AS OBJECT
( datetime DATE,
  contract ref ContractType,
  details OperationDetailType,
  data BLOB ) NOT FINAL;
```

```

CREATE OR REPLACE TYPE CallType UNDER OperationDetailType
(
    durationCall NUMBER,
    telephone VARCHAR2(13) );

CREATE OR REPLACE TYPE TextType UNDER OperationDetailType
(
    telephone VARCHAR2(13) );

CREATE OR REPLACE TYPE InternetConnectionType UNDER
OperationDetailType
(
    amountOfData NUMBER(10) );

CREATE OR REPLACE TYPE CallTypeNT AS TABLE OF REF OperationType;
CREATE OR REPLACE TYPE TextTypeNT AS TABLE OF REF OperationType;
CREATE OR REPLACE TYPE InternetConnectionTypeNT AS TABLE OF REF
OperationType;

CREATE OR REPLACE TYPE InvoiceType AS OBJECT
(
    dateInvoice DATE,
    customer CustomerType,
    callTotal NUMBER,
    textTotal NUMBER,
    internetTotal NUMBER,
    calls CallTypeNT,
    texts TextTypeNT,
    claim ref ClaimType,
    internet InternetConnectionTypeNT );

CREATE OR REPLACE TYPE ClaimType AS OBJECT
(
    dateClaim DATE,
    reason VARCHAR(50),
    reimbursement NUMBER(5,2) );

--CREATE OF TABLES--
CREATE TABLE Customer of CustomerType
(
    fiscalCode PRIMARY KEY,
    name NOT NULL,
    surname NOT NULL);

```

```
CREATE TABLE Contract of ContractType
( customer NOT NULL,
  telephone NOT NULL,
  codeContract PRIMARY KEY);

CREATE TABLE TariffPlan of TariffPlanType
( tariffPlanCode PRIMARY KEY );

CREATE TABLE Promotion of PromotionType
( name NOT NULL,
  startDate NOT NULL );

CREATE TABLE Operation of OperationType
( datetime NOT NULL );

CREATE TABLE Invoice of InvoiceType(
  dateInvoice NOT NULL,
  customer NOT NULL )
NESTED TABLE calls STORE AS CallOperationNT_TAB,
NESTED TABLE texts STORE AS TextOperationNT_TAB,
NESTED TABLE internet STORE AS InternetConnectionNT_TAB;
```