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The Gap Srlu Case

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Outline

1. Introduction: The Contact Center Domain
2. Gap Srlu Company
3. Development of the Data Warehouse
4. The Overall Novel Infrastructure
5. Analysis Tasks

Introduction: The Contact Center Domain

Introduction

Multi-channel contact centers are an important component of today's business world.

They serve as a primary customer-facing channel for firms in many different industries, and employ millions of agents across the globe.

During their operation, they generate vast amounts of heterogeneous data, ranging from structured automatically registered logs to semi-structured hand-written notes and unstructured raw voice recordings.

Inbound, Outbound and Backoffice Ops.

Inbound contact centers handle incoming traffic, e.g., they answer to calls received from the customers, as in the case of help-desks.

Outbound contact centers handle outgoing traffic, which is initiated from the center. For example, this is the case of calls associated with surveys or telemarketing initiatives, that typically follow a predefined script.

Backoffice operations may also be carried out, as in the case of data preparation and data analysis tasks.

All operations are carried out within the context of a *service* (e.g., an airline toll-free number), which can be composed of many different *activities* (e.g., ticket booking, or car rental).

Gap Srlu Company

The Company

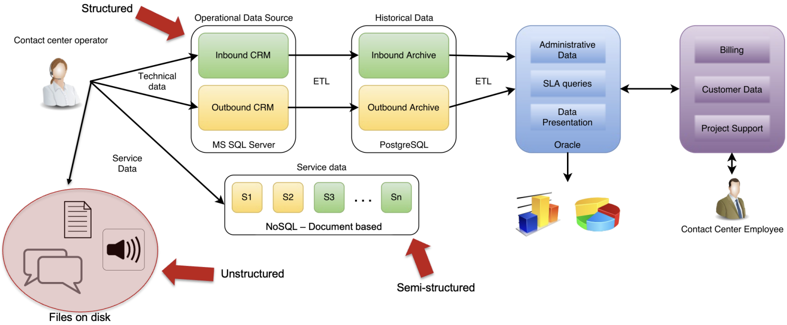
Gap Srlu is a multi-channel and multi-service Business Process Outsourcer, specialized in contact center activities.

It is active since the early 2000s and, over time, it has experienced a continuous expansion concerning both its business model and its information system infrastructure.

Nowadays, other than the traditional contact center tasks, it is capable of offering advanced services such as third-party data management and analysis, based on several machine learning technologies.

More info at: *https://www.gapitalia.com/en/*

The Initial Situation


Structured
Contact center operator
Technical data
Service Data
Operational Data Source
Inbound CRM
Outbound CRM
MS SQL Server
ETL
Historical Data
Inbound Archive
Outbound Archive
PostgreSQL
ETL
Administrative Data
SLA queries
Data Presentation
Oracle
Billing
Customer Data
Project Support
Contact Center Employee
Service data
S1
S2
S3
. . .
Sn
NoSQL – Document based
Semi-structured
Unstructured
Files on disk

What are the Issues Here?

Several problems:

- heterogeneous systems require ad-hoc solutions for reading and writing data
- different databases adopt different conventions for storing the data
- possibly (and probably) replicated and inconsistent information
- difficult to perform queries and analyses involving more than one data repository
- some of the data are not even considered for analytics purposes
- the whole architecture is complex, and hard to maintain and update

Development of the Data Warehouse

Why a Data Warehouse

All kind of monitoring and analysis tasks start from the data.

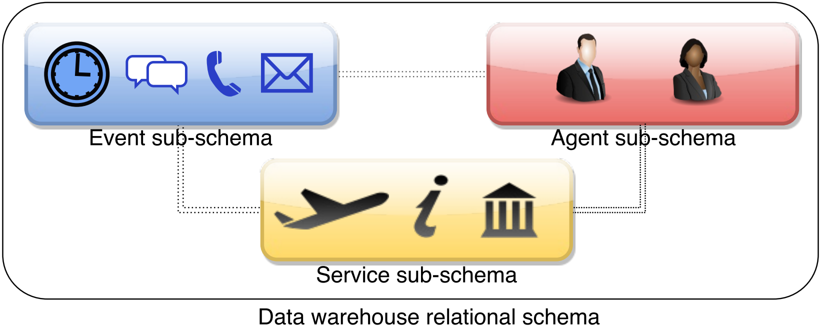
Thus, there is the necessity of having a clear and uniform view over all the company information.

Other than being cleansed, integrated and brought together into a single uniform format, data should be modelled so as to better support strategic/analytical tasks.

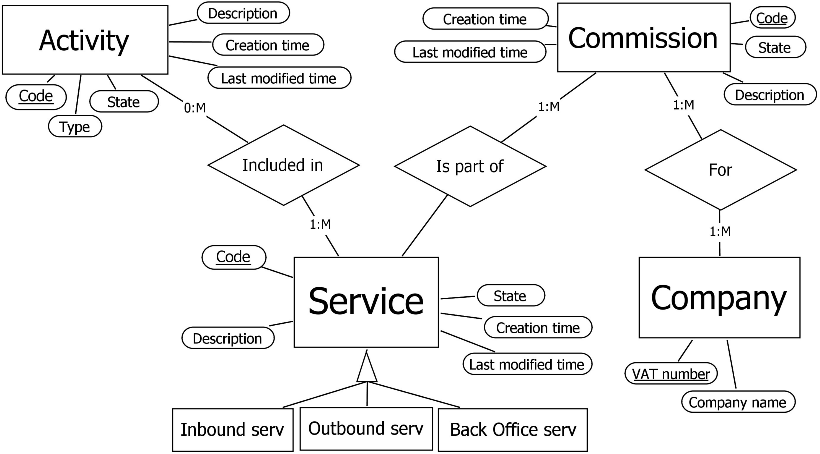
Moreover, a unique, central data repository simplifies the overall infrastructure.

Data Warehouse Overall Design

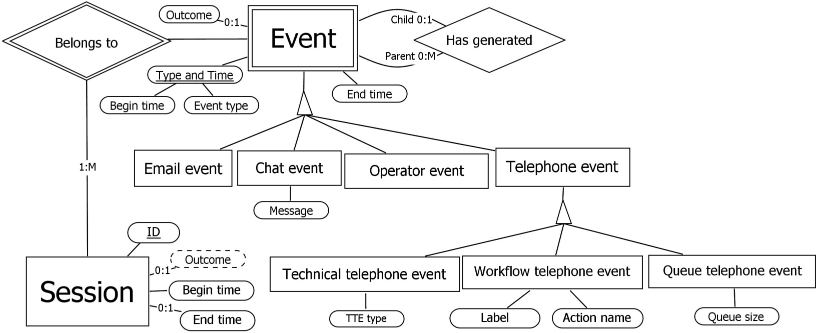
The warehouse is designed following Inmon's top-down approach; its core is composed of 3 relational "sub-schemas"


Event sub-schema
Agent sub-schema
Service sub-schema
Data warehouse relational schema

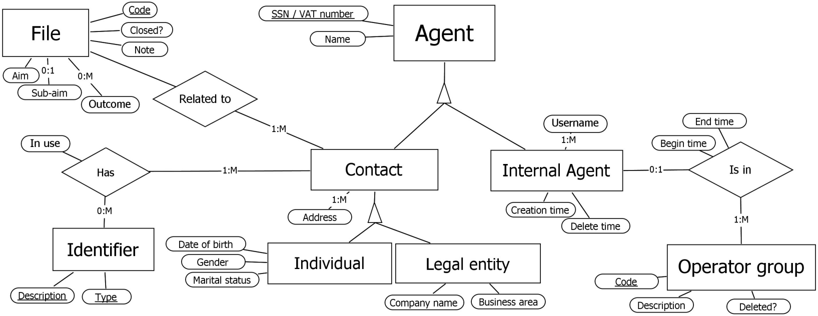
Service Sub-schema


Activity
Description
Creation time
Last modified time
Code
State
Type
0:M
Included in
1:M
Creation time
Last modified time
Commission
Code
State
Description
1:M
Is part of
1:M
For
1:M
Code
Service
State
Creation time
Description
Last modified time
Company
VAT number
Company name
Inbound serv
Outbound serv
Back Office serv

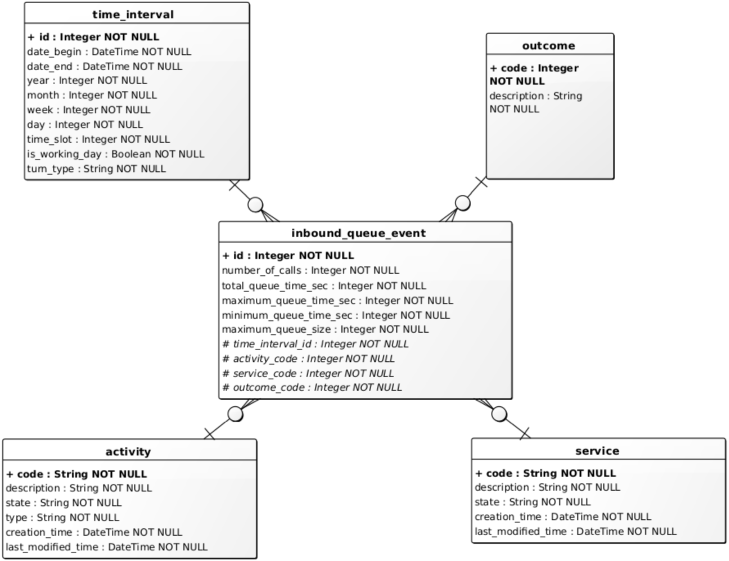
Event Sub-schema


Outcome
0:1
Event
Child 0:1
Has generated
Parent 0:M
Belongs to
Type and Time
Begin time
Event type
End time
1:M
Email event
Chat event
Operator event
Telephone event
Message
ID
Outcome
0:1
Session
Begin time
0:1
End time
Technical telephone event
Workflow telephone event
Queue telephone event
TTE type
Label
Action name
Queue size

Agent Sub-schema


File
Code
Closed?
Note
Aim
0:1
Sub-aim
0:M
Outcome
Related to
1:M
SSN / VAT number
Name
Agent
In use
Has
1:M
Contact
1:M
Address
0:M
Identifier
Description
Type
Date of birth
Gender
Marital status
Individual
Legal entity
Company name
Business area
Username
1:M
Internal Agent
Creation time
Delete time
0:1
End time
Begin time
Is in
1:M
Operator group
Code
Description
Deleted?

The Analysis Layer / OLAP Tier



time_interval

+ id : Integer NOT NULL
date_begin : DateTime NOT NULL
date_end : DateTime NOT NULL
year : Integer NOT NULL
month : Integer NOT NULL
week : Integer NOT NULL
day : Integer NOT NULL
time_slot : Integer NOT NULL
is_working_day : Boolean NOT NULL
tum_type : String NOT NULL

outcome

+ code : Integer NOT NULL
description : String NOT NULL

inbound_queue_event

+ id : Integer NOT NULL
number_of_calls : Integer NOT NULL
total_queue_time_sec : Integer NOT NULL
maximum_queue_time_sec : Integer NOT NULL
minimum_queue_time_sec : Integer NOT NULL
maximum_queue_size : Integer NOT NULL
# time_interval_id : Integer NOT NULL
# activity_code : Integer NOT NULL
# service_code : Integer NOT NULL
# outcome_code : Integer NOT NULL

activity

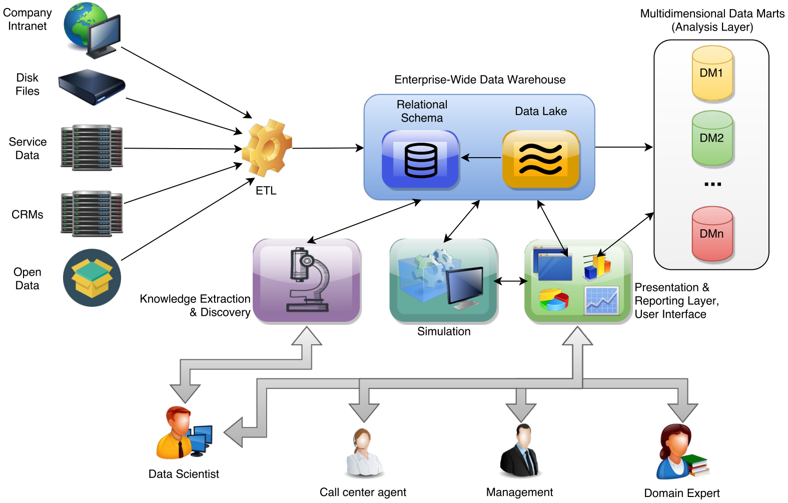
+ code : String NOT NULL
description : String NOT NULL
state : String NOT NULL
type : String NOT NULL
creation_time : DateTime NOT NULL
last_modified_time : DateTime NOT NULL

service

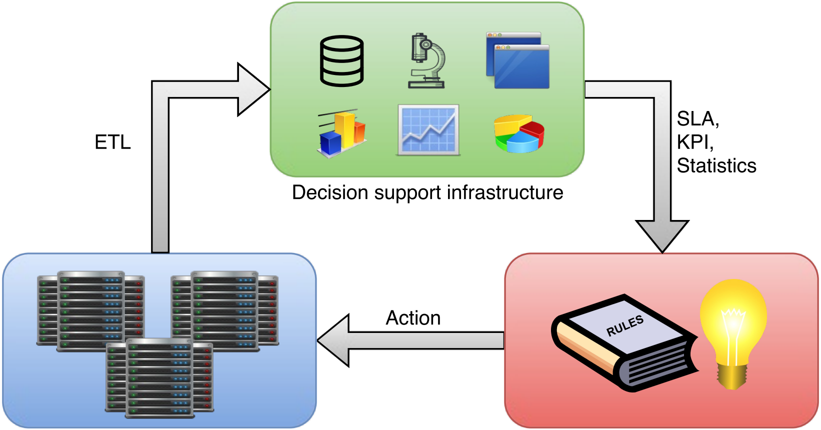
+ code : String NOT NULL
description : String NOT NULL
state : String NOT NULL
creation_time : DateTime NOT NULL
last_modified_time : DateTime NOT NULL

The Overall Novel Infrastructure

Decision Support System


Company Intranet
Disk Files
Service Data
CRMs
Open Data
ETL
Enterprise-Wide Data Warehouse
Relational Schema
Data Lake
Multidimensional Data Marts (Analysis Layer)
DM1
DM2
...
DMn
Knowledge Extraction & Discovery
Simulation
Presentation & Reporting Layer, User Interface
Data Scientist
Call center agent
Management
Domain Expert

Decision Management System



ETL

Decision support infrastructure

SLA,
KPI,
Statistics

Action

Production systems

Decision layer

Analysis Tasks

Operator Performance Assessment

Tracking the performance of agents is a primary issue in contact centers, as it allows, for example:

- the best match to be taken between a service and an agent
- the recognition of unsatisfactory agent behaviours, due for example to a lack of proper training
- the prediction of future trends, based on the history of observations

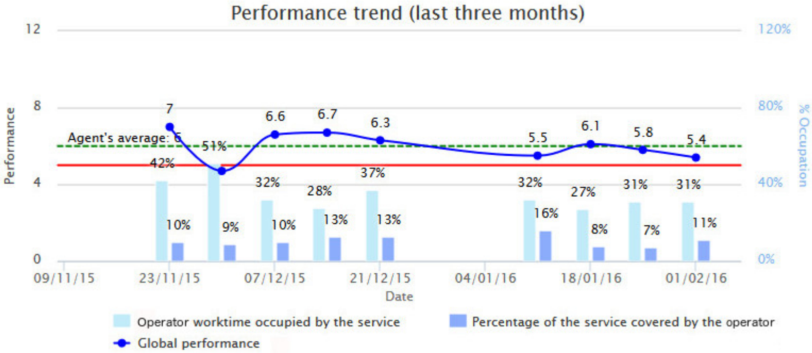
A function has been designed, which is capable of assigning a score to each operator-service couple.

Operator Performance Assessment
Some of the Considered Information

Inbound	Average conversation time Average postcall time Generic call notes compiled per session Percentage of correctly filled script fields Purpose of the call Outcome of the call
Outbound	Average conversation time Average postcall time Amount of surveys over calls Number of answered calls per hour
General	Number of different kinds of services managed by an operator Degree of interleaving between services Respect of work schedule Turn flexibility

Operator Performance Assessment

Detail of the User Interface



References

A. Brunello, P. Gallo, E. Marzano, A. Montanari, N. Vitacolonna, *An event-based data warehouse to support decisions in multi-channel, multi-service contact centers*, 2019.

A. Brunello, E. Marzano, A. Montanari, G. Sciavicco, *A combined approach to the analysis of speech conversations in a contact center domain*.