

Business Intelligence



Course: [Business Intelligence for Data Science \(880682-M-6\)](#)

Semester: [Spring 2024/Block 4](#)

Business Topic: [Monitoring sales within CarCompany](#)

CONTENT:

1. Describe motivation and goals for building DW into an enterprise of choice - 2 points.
2. Create and describe the OLTP schema with relationships, entities and attributes with screenshots and submit the file of the model (.mvb file) - 2 points.
3. Transfer the OLTP schema diagram into Tables in MySQL and load with the .csv files - 2 points.
4. Create and transfer DW schema into Tables in MySQL - 2 points.
5. Describe the dimensions and fact for the DW and chosen variant, i.e. star/snowflake/constellation with screenshots and submit the file of the model (.mvb file) - 2 points.
6. Describe and present (both with screenshots and by submitting the .ktr files) three ETL processes used for transformations (more details in Section 6) - 6 points.
7. Create and present one View (both with screenshot and by submitting the file) using some of the keywords (more details in Section 7) - 2 points.
8. Create and present one Report (both with screenshot and by submitting the file) - 2 points.

1. Motivation & Goals

The motivation for creating a Data Warehouse (DW) within the Car Chain Company is to centralize and streamline data from various sources, enhancing data accuracy and accessibility. The DW will integrate data from customer interactions, sales transactions, employee activities, product information, and authorized services of the product, providing a comprehensive view of business operations. This centralized repository will enable advanced analytics, uncovering critical insights for informed decision-making. By tracking sales trends and revenue through a Sales fact table, the company can optimize inventory management, ensuring popular car models are adequately stocked while also monitoring the revenue after subtracting the commission of the salesperson who made the sale. Additionally, the DW will help monitor employee performance and dealer activities, facilitating better resource allocation and operational efficiency. The integration of authorized service data will provide insights into service trends, helping improve after-sales support and customer satisfaction. Overall, the DW aims to drive business growth, enhance customer experience, and support strategic planning by leveraging accurate and timely data across the organization.

2. Source OLTP schema

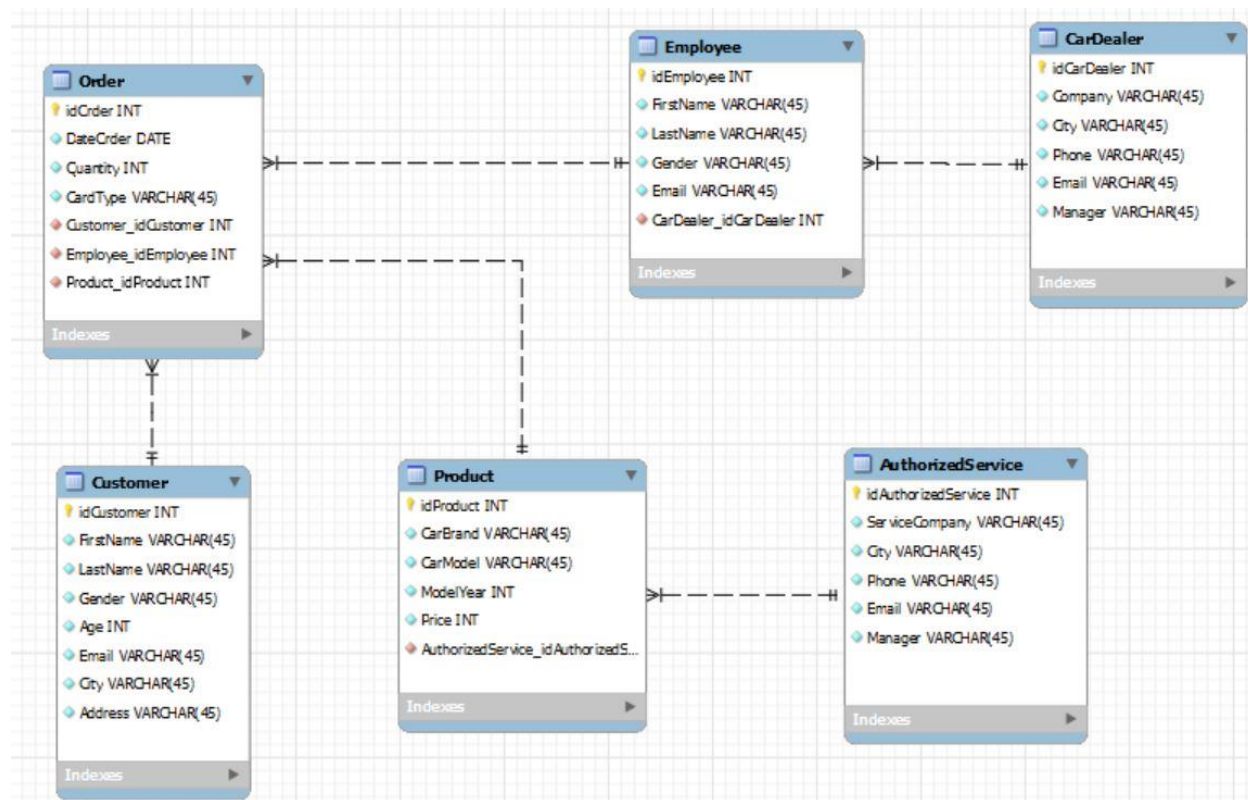


Figure 1. OLTP schema CarCompany.

The OLTP schema for the Car Chain Company includes several interconnected tables. The Order table stores order details and references the Customer, Employee, and Product tables via foreign keys. The Customer table contains customer information. The Product table holds car details (like brand, model,

price etc.) and references the AuthorizedService table, which lists authorized service companies. The Employee table records employee details and references the CarDealer table, which contains information about the car dealer company. Each order is linked to a customer, an employee, and a product. Each product is associated with an authorized service, and each employee works for a specific car dealer. This schema ensures efficient data management and traceability across orders, customers, products, employees, and dealerships.

3. Transferring OLTP schema to Tables in MySQL

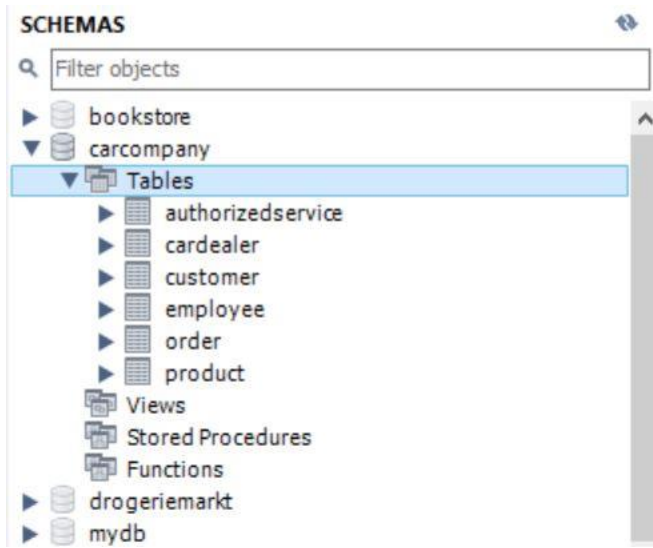


Figure 2. Transferring the OLTP into Tables.

	idProduct	CarBrand	CarModel	ModelYear	Price	AuthorizedService_idAuthorizedSer
▶	1	Chevrolet	Corvette	2010	57862	39
	2	Mercury	Capri	1984	26670	135
	3	Toyota	Avalon	2004	52625	277
	4	Ford	Mustang	1994	60217	82
	5	BMW	Equinox	2002	66843	67
	6	Nissan	Sentra	2006	50159	202
	7	Pontiac	Torrent	2007	27409	151

Figure 3. Imported data for Product table

	idEmployee	FirstName	LastName	Gender	Email	CarDealer_idCar
▶	1	Jehu	Bewshire	Male	lbewshire0@list-manage.com	236
	2	Ekaterina	Marchenko	Male	bmarchenko1@walmart.com	39
	3	Jackson	Petrozzi	Male	spetrozzi2@tmall.com	70
	4	Janine	Doran	Male	mdoran3@clickbank.net	267
	5	Woodman	Cordelet	Female	ccordelet4@sciencedaily.com	252
	6	Drucill	Auger	Female	pauger5@apache.org	240
	7	Thibaut	Craster	Female	rcraster6@google.nl	121

Figure 4. Imported data for Employee table

4. DW schema

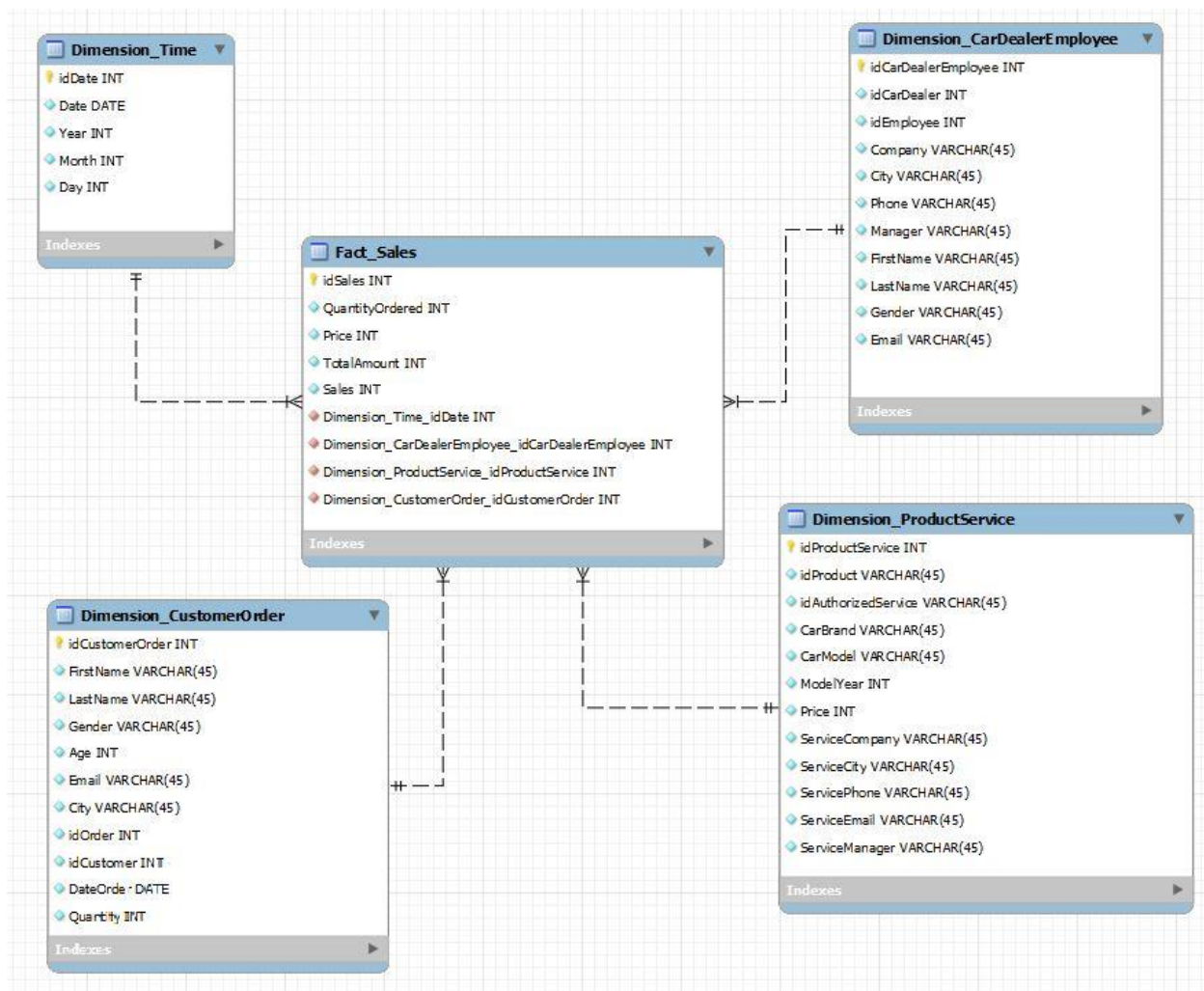


Figure 5. DW schema for CarCompany.

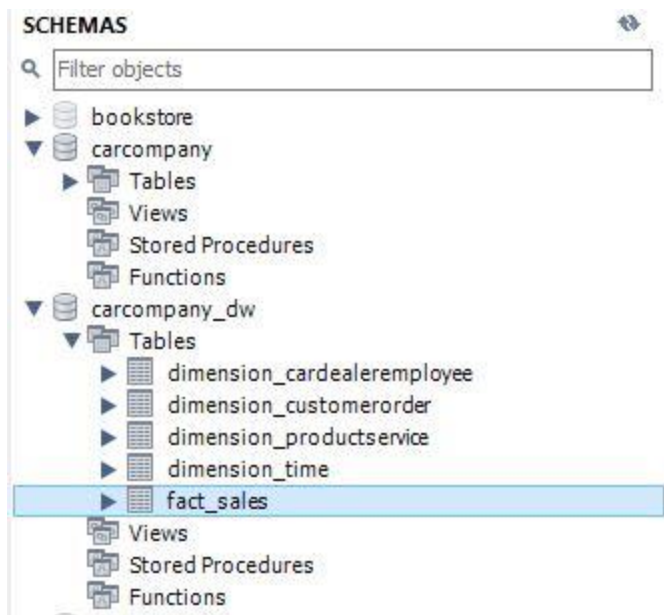


Figure 6. Transferring the DW into Tables.

5. Dimensions & Facts of DW

In our Data Warehouse (DW), we have chosen a star schema due to its simplicity and ease of understanding. The star schema is characterized by a central fact table surrounded by dimension tables, without any hierarchy between the tables, distinguishing it from a snowflake schema. Our DW schema includes dimensions for CarDealerEmployee, ProductService, CustomerOrder, and Time. The Dimension_CarDealerEmployee contains information about the employees who made the sales and the CarDealer companies they work for. The Dimension_ProductService holds details about the cars and the authorized service companies. The Dimension_CustomerOrder combines customer information and order details, while the Dimension_Time keeps track of historical data.

The Fact_Sales table is the core of our DW schema and is designed to track sales transactions, compiling information from all the dimensions to provide a comprehensive view of sales. Key metrics calculated in the fact table include QuantityOrdered, Price, and TotalAmount, which is calculated as Price multiplied by QuantityOrdered, representing the total revenue from each sale. Additionally, Sales represent the sales of the car company after subtracting the sales commission, and is calculated as TotalAmount (Revenue) minus 20% of the TotalAmount, representing the commission expense of the salesperson. Specifically, the formula for calculating the sales of the car company is $[TotalAmount] - [TotalAmount] * 0.20$, where $[TotalAmount] * 0.20$ is the commission of the salesperson. The fact table includes foreign keys linking to the dimensions, allowing for detailed analysis across various aspects of the business, such as employee performance, product details, customer demographics, and service companies. This structure facilitates better decision-making and strategic planning by providing comprehensive insights into sales performance.

6. ETL transformations in Pentaho Data Integration

Dimension CarDealerEmployee

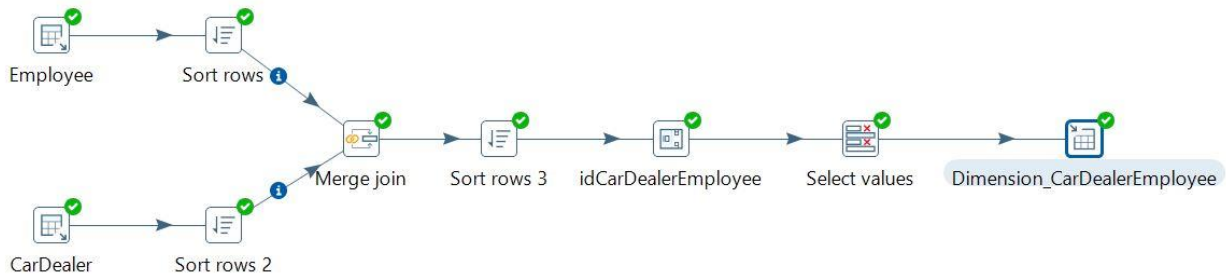


Figure 7. Dimension_CarDealerEmployee transformation.

	idCarDealerEmployee	idCarDealer	idEmployee	Company	City	Phone	Manager	FirstName	LastName	Gender	Email
1	1	1	1	Carroll Inc	Gibraltar	219-501-4526	Karlie Erangy	Jehu	Bewshire	Male	lbewshire0@list-manage.com
2	2	2	2	Sipes-Kuphal	Dusseldorf	308-544-6036	Lurette Mote	Ekaterina	Marchenko	Male	bmarchenko1@walmart.com
3	3	3	3	Stracke, Kilback and Koch	Irun	894-718-1863	Bee Wickham	Jackson	Petrozzi	Male	spetrozzi2@tmail.com
4	4	4	4	Kerluke LLC	Swansea	358-419-3645	Walt Darrow	Janine	Doran	Male	mdoran3@clickbank.net
5	5	5	5	Sawayn Inc	Cambridge	794-825-5711	Bronson Birk	Woodman	Cordelet	Female	ccordelet4@sciencedaily.com
6	6	6	6	Aufderhar-Huels	Castellon	643-909-8562	Raynard Van der Mark	Drucil	Auger	Female	pauger5@apache.org
7	7	7	7	Armstrong Inc	Dundee	310-961-2940	Lionel Pettecrew	Thibaut	Craster	Female	rcraster6@google.nl
8	8	8	8	Sanford, Tillman and Johnston	Algeciras	736-367-2810	Paxon Ginley	Othelia	Dodd	Female	mdodd7@symantec.com
9	9	9	9	Howe-Corwin	Leipzig	718-448-9335	Kipp Willson	Anson	Sizze	Female	gsizze8@youtu.be
10	10	10	10	Boyer Inc	Coventry	442-971-1519	Theresa Bouette	Selig	Gregor	Male	bgregor9@dot.gov

Figure 8. Dimension_ CarDealerEmployee in MySQL.

Dimension ProductService

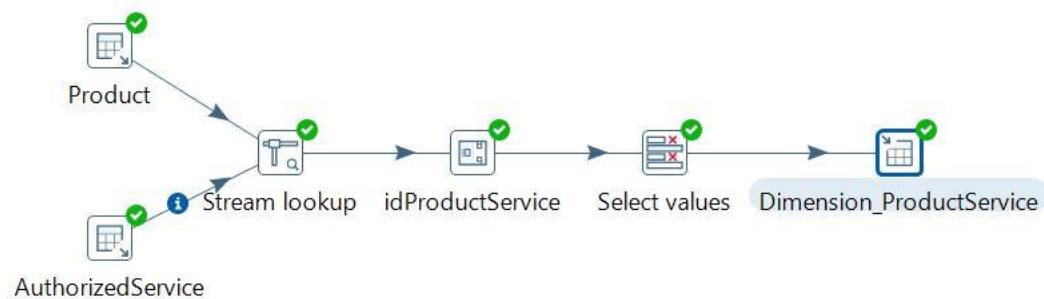


Figure 9. Dimension_ProductService transformation.

	idProductService	idProduct	idAuthorizedService	CarBrand	CarModel	ModelYear	Price	ServiceCompany	ServiceCity	ServicePhone	ServiceEmail	ServiceManager
1	1	39		Chevrolet	Corvette	2010	57862	Thiel Inc	Valencia	875-207-9232	alaight12@bluehost.com	Aleen Laight
2	2	135		Mercury	Capri	1984	26670	Koelpin-Williamson	Halle	989-497-2498	lhoodspeth3q@blinklist.com	Lucretia Hoodspeth
3	3	277		Toyota	Avalon	2004	52625	Daugherty, Nitzsche and Kris	Duisburg	200-872-9706	akitchingman7o@bloglines.com	Auroora Kitchingman
4	4	82		Ford	Mustang	1994	60217	Becker Group	Sheffield	439-770-0818	rwais29@constantcontact.com	Roma Wais
5	5	67		BMW	Equinox	2002	66843	Muller LLC	Nice	326-428-2692	ijaggi1u@boston.com	Inesita Jaggli
6	6	202		Nissan	Sentra	2006	50159	Kuhlman, Davis and Roob	Genoa	396-250-8418	ecranstone5l@yolasite.com	Edee Cranstone
7	7	151		Pontiac	Torrent	2007	27409	Pfeffer and Sons	Heidelberg	930-841-3397	resley46@ebay.com	Rosella Esley
8	8	69		Dodge	Ram Van B250	1992	55146	Runolfsdottir, Schuster and Boyer	Hull	912-413-6517	ahowdsen1w@geocities.com	Angli Howdsen
9	9	68		Chevrolet	Equinox	2011	32094	Hessel-Renner	Bratislava	210-670-2198	ebeebee1v@rakuten.co.jp	Edie Beebee
10	10	264		Maserati	Coupe	2005	34182	Padberg-Fritsch	Dublin	206-629-3899	cbechley7b@usgs.gov	Candy Bechley

Figure 10. Dimension_ ProductService in MySQL.

Dimension Time



Figure 11. Dimension_Time transformation.

	idDate	Date	Year	Month	Day
▶	1	2022-07-11	2022	7	11
	2	2022-07-12	2022	7	12
	3	2022-07-13	2022	7	13
	4	2022-07-14	2022	7	14
	5	2022-07-15	2022	7	15
	6	2022-07-16	2022	7	16
	7	2022-07-17	2022	7	17
	8	2022-07-18	2022	7	18
	9	2022-07-19	2022	7	19
	10	2022-07-20	2022	7	20

Figure 12. Dimension_Time in MySQL.

Dimension CustomerOrder

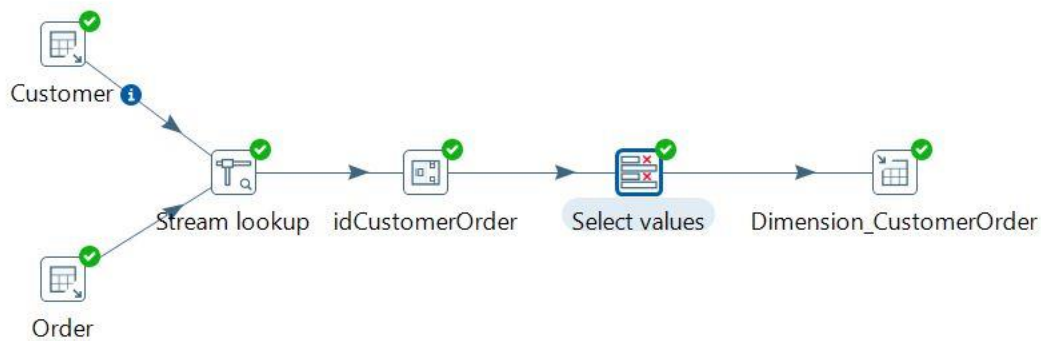


Figure 13. Dimension_CustomerOrder transformation.

	idCustomerOrder	FirstName	LastName	Gender	Age	Email	City	idOrder	idCustomer	DateOrder	Quantity
▶	1	Ryan	Sheara	Female	32	gsheara6j@plala.or.jp	Hasselt	1	236	2022-05-23	3
	2	Gibbie	Guidetti	Male	70	lguidetti12@vimeo.com	Bastia	2	39	2022-03-02	2
	3	Yvonne	Lindwasser	Female	70	alindwasser1x@cyberchimps.com	Cork	3	70	2021-05-02	2
	4	Elli	Martugin	Male	48	nmartugin7e@time.com	Lisbon	4	267	2022-01-22	3
	5	Irena	McNellis	Male	47	fmcnellis6z@vkontakte.ru	Corfu	5	252	2023-09-19	1
	6	Pembroke	Janowicz	Male	53	ijanowicz6n@photobucket.com	Zagreb	6	240	2024-02-15	2
	7	Vida	Dummett	Male	31	rdummett3c@artisteer.com	Amsterdam	7	121	2022-05-13	1
	8	Ruggiero	Veeler	Male	44	kveelert@mac.com	Hannover	8	30	2022-04-21	1
	9	Niki	Clarae	Female	68	wclarae76@mayoclinic.com	Hamburg	9	259	2021-02-23	2
	10	Idette	Simioli	Male	28	asimioli4d@daily motion.com	Benidorm	10	158	2021-04-10	3

Figure 14. Dimension_ CustomerOrder in MySQL.

Dimension Fact_Sales

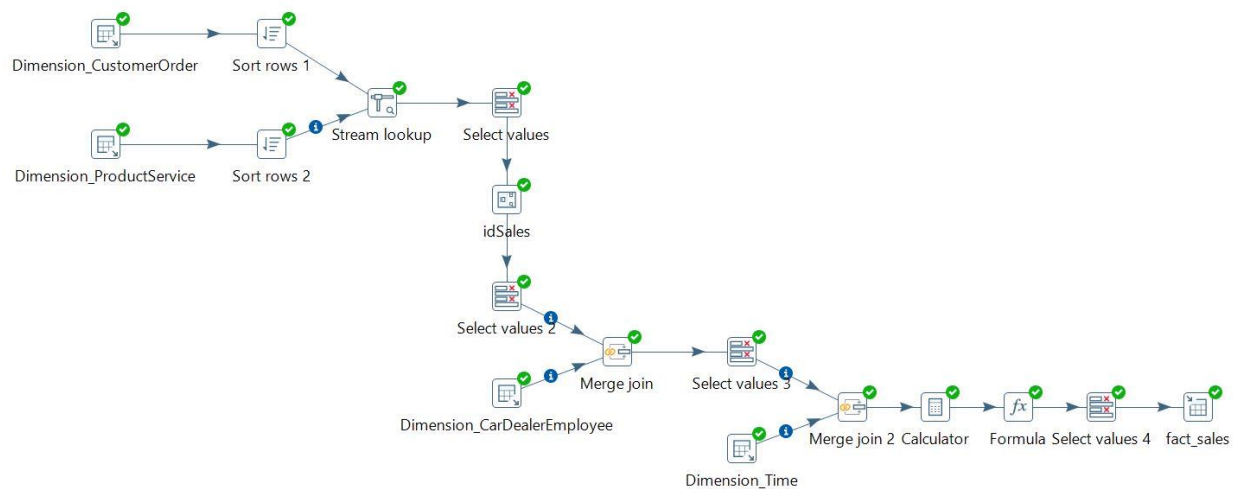


Figure 15. Dimension_fact_sales transformation.

	idSales	QuantityOrdered	Price	TotalAmount	Sales	Dimension_Time_idDate	Dimension_CarDealerEmployee_idCarDealerEmplo	Dimension_ProductService_idProductService	Dimension_CustomerOrder_idCustomerOrder
▶	1	3	57862	173586	138869	1	1	1	1
	2	2	26670	53340	42672	2	2	2	2
	3	2	52625	105250	84200	3	3	3	3
	4	3	60217	180651	144521	4	4	4	4
	5	1	66843	66843	53474	5	5	5	5
	6	2	50159	100318	80254	6	6	6	6
	7	1	27409	27409	21927	7	7	7	7
	8	1	55146	55146	44117	8	8	8	8
	9	2	32094	64188	51350	9	9	9	9
	10	3	34182	102546	82037	10	10	10	10

Figure 16. Dimension_ fact_sales in MySQL.

7. View in MySQL

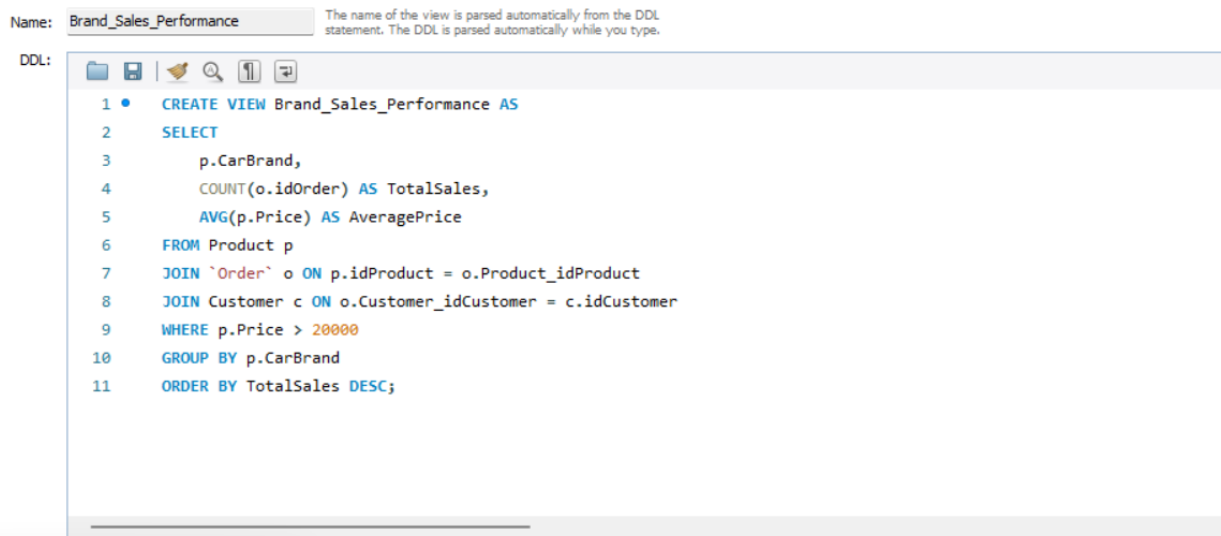


Figure 17: View that contains sales performance across different car brands.

The screenshot shows the MySQL Result Grid displaying the results of the 'Brand_Sales_Performance' view. The grid has four columns: 'CarBrand', 'TotalSales', and 'AveragePrice'. The data is sorted by 'TotalSales' in descending order. The first row is 'Chevrolet' with 31 total sales and an average price of 45412.7097. The last row is 'Mercedes-Benz' with 9 total sales and an average price of 39834.8889. The grid also includes a 'Filter Rows' button and a 'performance 1' tab.

CarBrand	TotalSales	AveragePrice
Chevrolet	31	45412.7097
Ford	23	50595.8261
Mitsubishi	16	43184.7500
Toyota	15	46552.0667
Pontiac	15	49251.4000
Dodge	14	43501.3571
GMC	12	44965.0000
Honda	11	45809.6364
Nissan	11	41927.9091
Mercury	10	44769.5000
Volkswagen	10	39612.8000
Mercede...	9	39834.8889

Figure 18: View result

8. Report in Pentaho Report Designer

June 01, 2024 @ 06:33

Toyota Service Location Report

Toyota

CarBrand	ServiceCompany	PriceServiceCity	ServiceEmail	CarModel
Toyota	Daugherty, Nitzsche and Kris	52,625Duisburg	akitchingman7a@btoglines.com	Avalon
Toyota	Wunsch LLC	39,663Perth	jodgaard76@jalbum.net	Tacoma Xtra
Toyota	Jacobson, Mertz and Ferry	65,572Coventry	blemprel8@telegraph.co.uk	Sequoia
Toyota	Predovic-Heidenreich	57,540Madrid	vwoodruff5e@dyndns.org	Camry
Toyota	Wuckert-Walsh	33,238Amsterdam	gvasilyevski7e@nbcnews.com	Supra
Toyota	Schumm, Towne and Shanahan	58,131Evora	ase@wood4c@sfgate.com	Celica
Toyota	Braun and Sons	39,417Hague	ccastledine4k@hhs.gov	Highlander
Toyota	Streich-Schiller	64,357Crela	lconnnew77@flickr.com	Previa
Toyota	O'Reilly-Von	46,543Albufeira	aalday6i@gnu.org	Paseo
Toyota	Jakubowski LLC	28,839Cork	dwaplinton6d@springer.com	Corolla
Toyota	Moen Group	62,964Riga	ccarden69@jathis.com	Tacoma Xtra
Toyota	Larkin-Schusler	35,722Harrogate	gpoat15@bigcartel.com	Prius
Toyota	Carter Inc	26,938Ciudadella	mruggier4g@list-manage.com	Land Cruiser
Toyota	Kutch and Sons	64,596Toulouse	ccollingworth2t@mlb.com	MR2
Toyota	Tillman Inc	22,136Eskisehir	rmcheesley5r@rambler.ru	4Runner

CarCompany - Toyota Service Locations

Service Location Report

Sat Jun 01 18:33:33 CEST 2024

Figure 19: Report about the Service Locations of a specific Brand