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Dashboard To View Petroleum Import Comparison

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ABSTRACT
Petroleum is a strategic commodity with an important role in the economy, widely used in the transportation, industrial, and household sectors. In Indonesia, although there are petroleum reserves, domestic production is often insufficient to meet needs. Therefore, importing petroleum products is the main solution. Petroleum product import data covering the volume and value of various types of products is important for strategic decision making in the energy sector. This study aims to design a dashboard that can visualize import data for each petroleum product in real-time, interactively, and easily understood, thus facilitating analysis and supporting better strategic decisions. This dashboard helps users monitor import trends, compare data, and understand national energy needs. As a result, the dashboard is able to display import trends and comparisons interactively based on volume, value, product type, and specific time periods.

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INTRODUCTION

Petroleum is a strategic commodity that plays an important role in the global economy. Petroleum products, such as gasoline, diesel, kerosene, and LPG, are used in various sectors, including transportation, industry, and households. In Indonesia, although the country has petroleum reserves, the need for petroleum products often cannot be met solely through domestic production. Therefore, petroleum imports become one of the solutions to meet national energy needs.

The high volume of petroleum product imports requires the government and industry players to have a comprehensive understanding of import dynamics, including a comparison of the volume, value, and import trends of various types of petroleum products. This import data is important in the strategic decision-making process, both in determining energy policies and business strategies of companies engaged in the energy sector. However, the resulting data is often scattered across multiple sources, unstructured, and difficult to analyze quickly and efficiently.

Along with the development of information technology, the use of dashboards as a data visualization tool has become an effective solution to present complex information in an easy-to-understand format. Dashboards allow users to monitor trends, make comparisons, and evaluate performance in real-time based on available data. Therefore, designing a dashboard that is able to visualize import data for each petroleum product will be very useful for the government, industry players, and other stakeholders in

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understanding the market situation and making more informed and data-driven decisions.

Based on these needs, this research aims to design a dashboard that can display import comparisons of each petroleum product visually and interactively, making it easier for users to analyze and make better strategic decisions. In today's digital era, the utilization of accurate and real-time data is the key to effective decision-making. With increasingly large and complex data volumes, manual analysis is often inadequate to provide a comprehensive overview of market trends and import movements of petroleum products. The use of business intelligence (BI) through interactive dashboards can improve the efficiency of analysis and the accuracy of the information produced (Daniel J. Power, 2017). In addition, data visualization technology is proven to simplify the decision-making process and help stakeholders to be more responsive to dynamic market changes (Seddon et al., 2017). Therefore, the implementation of dashboards not only serves as a monitoring tool, but also as a strategic instrument in energy policy planning and evaluation.

This research was conducted by Setiawan R., 2020. Which was conducted in 2020. This research discusses the development of a dashboard using business intelligence tools to analyze and visualize crude oil import data, with the aim of making it easier for users to understand trends and patterns in crude oil imports and can see comparisons between periods. Research conducted by Miftah Hidayat, 2019. Which was conducted in 2019. This research discusses the development of an interactive dashboard that can be used to monitor and compare oil import data.

Relevant Research

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METHODS

This research will use descriptive methodology with qualitative and quantitative approaches to design and develop a dashboard that displays import comparisons of each petroleum product. Descriptive methodology is a research approach that aims to describe or explain a phenomenon or situation systematically, factually, and accurately. This research focuses on collecting information about current conditions to provide a deeper understanding of the current state. Descriptive methodology describes the nature of phenomena rather than seeking causal relationships or predictions. Both quantitative and qualitative approaches can be used to apply descriptive methodology; quantitative approaches have different features for data collection and analysis

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Qualification Method

a. Definition: A qualitative approach focuses on the meanings, experiences, and understandings of individuals or groups related to a particular phenomenon through non-numerical data collection such as observations, interviews, and literature studies. This approach aims to gain a deeper understanding of the phenomenon.
b. Characteristics: The data generated is usually descriptive in nature and is further investigated to discover.

Quantitative Approach

a. Definition: A quantitative approach refers to the collection and analysis of data in the form of numbers or statistics. This research uses methods such as surveys, questionnaires, or secondary data analysis that produce numerical data that can be measured and analyzed using statistical techniques.
b. Characteristics: The resulting data can be generalized to a wider population if the sample is representative. The results of quantitative analysis are usually presented in the form of tables, graphs, or other descriptive statistics.

Here are the steps of the methodology that will be applied.

Data source

a. The data used in this study will be secondary data derived from official sources such as the Central Statistics Agency (BPS), the Ministry of Energy and Mineral Resources (ESDM), and other publications related to petroleum imports.
b. The data taken includes the volume and value of imports from various countries for several petroleum products (gasoline, diesel, kerosene, and LPG) within the last 5 years.
c.

Data collection technique

a. Documentation: Data was collected through documents and reports related to petroleum import statistics from government agencies, online publication reports, and international energy databases.
b. Literature Study: Reviewing literature and journals related to the use of business intelligence and dashboards in import data analysis, as well as the role of data visualization in decision-making.

Needs Analysis

Identify User Needs

a. Conduct interviews or discussions with stakeholders (e.g., energy sector decision-makers or industry analysts) to understand their needs related to petroleum product import data and how they will use the dashboard.
b. Identify metrics and key performance indicators (KPIs) to be displayed in the dashboard, such as trends in import volumes and values per product and per country.

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Dashboard Functional Specifications

a. Determine the main features and functions of the dashboard, including the type of visualization (line chart, bar, pie chart, etc.), filters by product, country of origin, and time period.
b. Deciding on the platform to use for dashboard development, e.g., Tab-leau or Mi crosoft Power Bl.

Dashboard Design

Conceptual Design

a. Design wireframes and dashboard mockups to show the visual layout, types of graphics used, and how users can interact with the data.
b. Conduct design trials with users to ensure ease of use (user experience) and clarity of information.

Dashboard Development

a. Import petroleum import data into the selected business intelligence platform.
b. Develop interactive dashboards that can display visualizations of import comparisons by volume, value, product type, and country of origin.

Dashboard Trial

Data Validation

a. Ensure that the data displayed on the dashboard matches the original data source and that no errors occur in the data processing process.
b. Verify with relevant experts or users to ensure the dashboard meets the needs of the analysis.

Function Testing

a. Testing interactive features on the dashboard, such as filters, drill-downs, and the ability for users to view detailed data based on analysis needs.
b. Measuring the efficiency and effectiveness of the dashboard in presenting information that can be used for strategic decision-making.

Analysis and Evaluation

Analyze the visualization results displayed on the dashboard, including trends in petroleum imports of various products, countries of origin, and year-on-year comparisons of volume and value.

Dashboard Evaluation

a. Collect feedback from end-users regarding the usability and effectiveness of the
b. dashboard in assisting them to conduct petroleum product import analysis.
c. If necessary, make improvements or design enhancements based on the feedback re- ceived.

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Results Reporting

Summarize the results of the entire dashboard design, development, and evaluation process in the form of a comprehensive report. This report will also include recommendations for further development or utilization of the dashboard by relevant stakeholders.

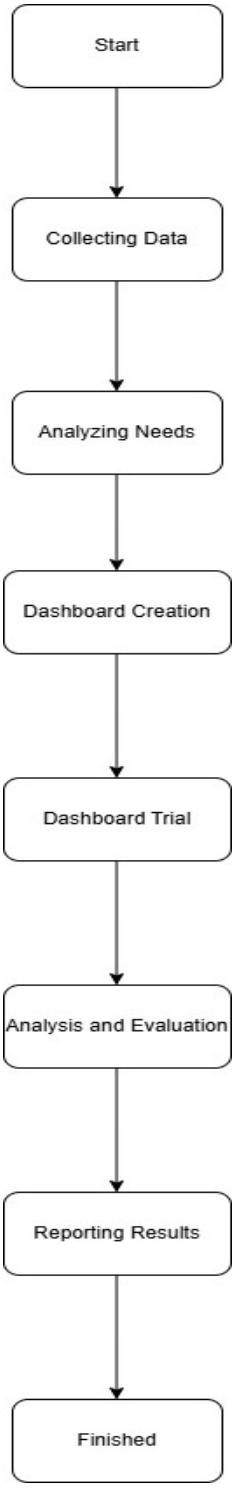

Figure 1. Research Methodology

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RESULTS AND DISCUSSION

The design results that have been implemented in the stages of forming a petroleum comparison dashboard are as follows:

Designing Use Case Diagrams

The Use case diagram image below explains the steps in creating a dashboard, namely, researchers must collect petroleum import data, after the data has been collected, researchers must input the data into Power Bi or Tableau, after the data is input, researchers create the desired graph, after that the dashboard is tested, after testing the user can see the comparison of petroleum imports each year.

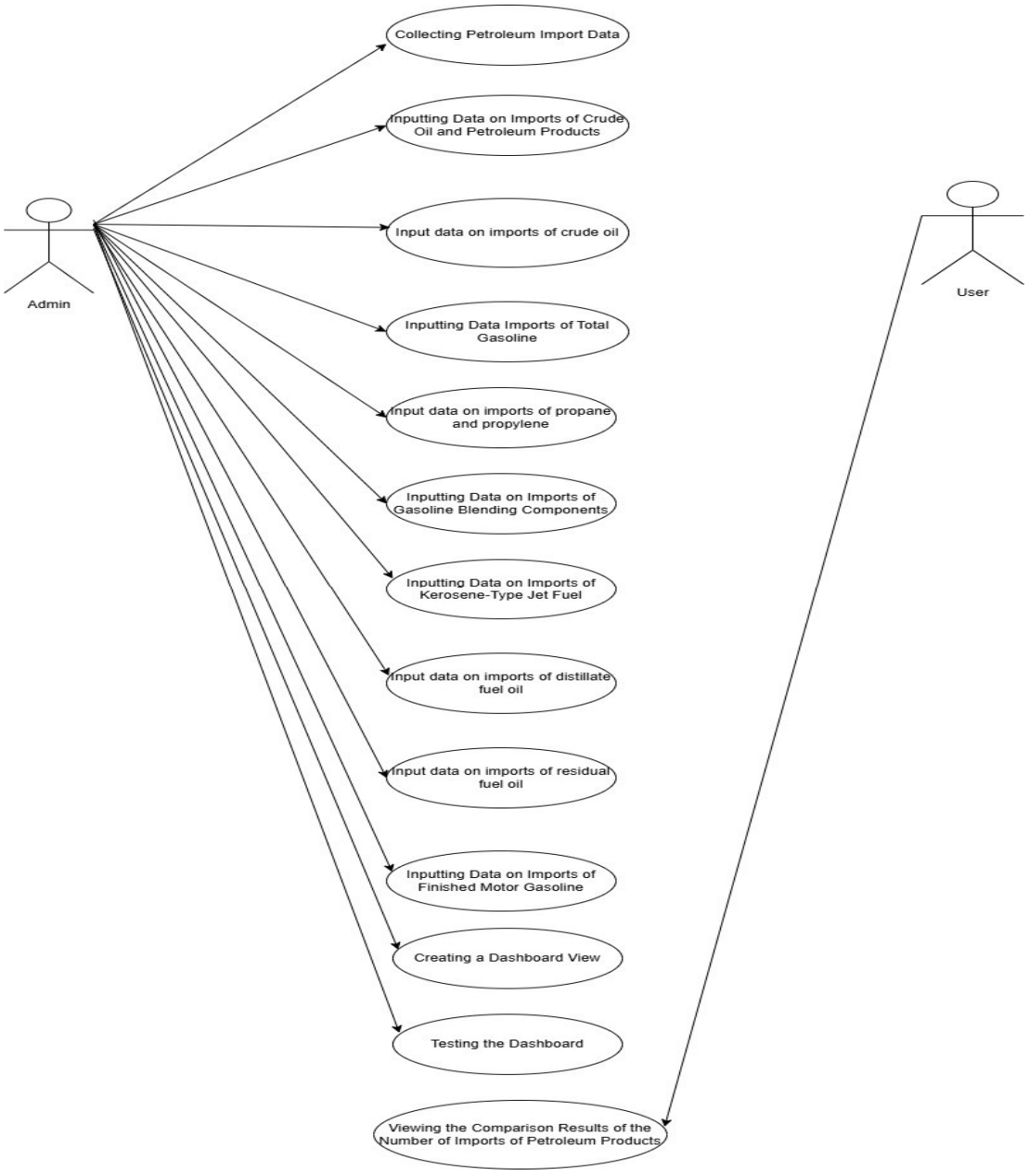

Figure 2. Use case Diagram

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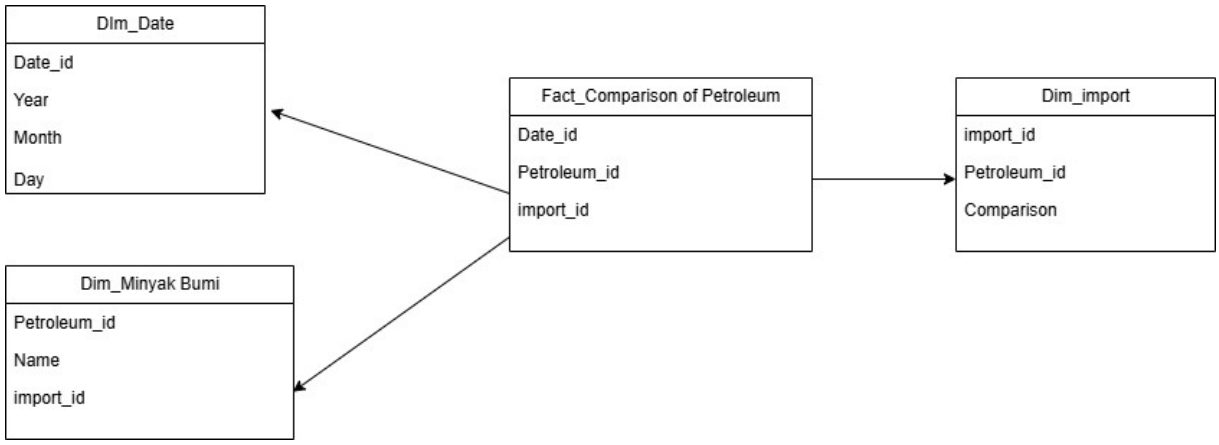
Database Design

Database design in this study uses a star schema diagram with fact and dimension tables, fact tables or facts have a connection to the dimension tables of time, employees, desk time and average time. As in Figure 3. Star Schema.



Gambar 3. Star Schema

ETL process (Extract, Transform, Load)

The ETL stage uses the Google Colab application, uses excel and performs the process of extract, transform, load.

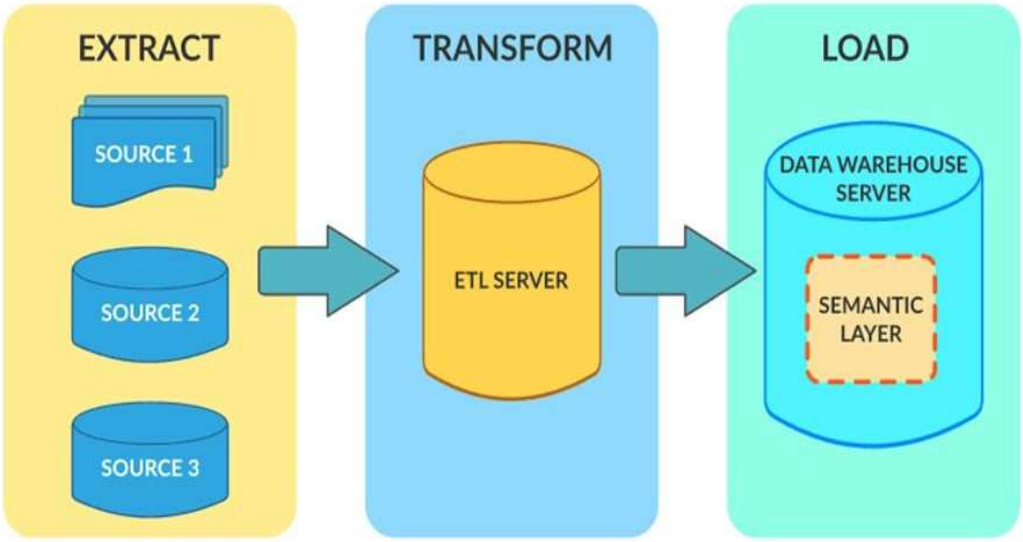


Figure 4. ETL process

Dashboard View

Figure 5 explains that this dashboard display is used to see the import comparison of each petroleum product from 2018 - 2023.

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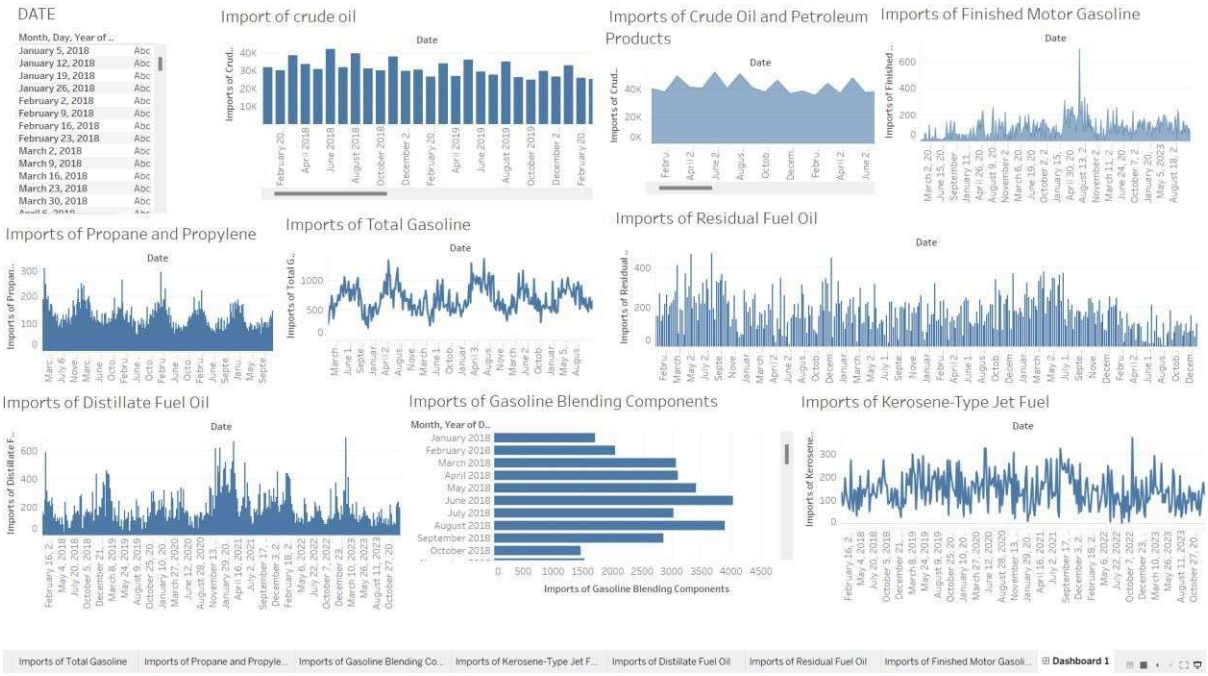

Figure 5. Dashboard Visualization Display

Table 1. Key Performance Indicator

NO	KPI	Description	Objectives
1,	Total Crude Oil Import Volume:	Measures the total amount of crude oil imported during a certain period (daily, weekly, monthly, or annually). This KPI helps in evaluating basic supply needs for oil production and their relationship to local energy production.	Identify import growth trends and measure dependence on foreign supplies.
2	Total Import Volume of Processed Petroleum Products:	Covers imports of various types of processed fuels such as gasoline, diesel, kerosene, propane, etc. This KPI shows the level of need for processed products for direct consumption, such as transportation and industry.	Analyze the role of processed products in meeting energy needs and assess the availability of supply in the domestic market.
3	Import Proportion per Product:	Measuring the contribution of each type of product to the total import volume. This data helps understand which products are predominantly imported.	Provide insight into import priorities and assist in planning logistics and distribution needs.
4	Annual/Monthly Import Growth:	Track changes in import volume from ear to year or month to month. This KPI is important for understanding historical trends and seasonal patterns in oil imports.	Assist decision makers in planning long-term energy strategies and preparing budgets.

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5	Ratio of Imported Products to Crude Oil	Measuring the comparison between imports of refined products and imports of crude oil. This ratio can indicate the level of dependence on ready-to-use products versus raw materials processed domestically.	efficiency of the domestic oil processing industry and the need to increase local processing capacity.
6	Import Value (Monetary)	This KPI tracks the total value of imported petroleum products in currency form. This data is useful for understanding the financial impact of import dependence.	Assist in economic analysis regarding energy budgets and trade policies.
7	Fuel Use Efficiency (Imports vs. Consumption	Measuring whether petroleum imports are in line with domestic consumption. This KPI shows whether there is an imbalance between the amount of imports and actual needs.	Provides insight into whether imports are optimal or need to be adjusted to avoid overstock or supply shortages.

Table 2. Test Results

NO	Tested Aspects	Test Description	Testing Steps	Expected results	Status
1.	Data Load	Ensure imported data can be loaded correctly into the dashboard.	Reload the dashboard and check if the imported data is displayed.	Data displayed is complete and accurate.	Passed
2	Time Filter	Ensure time filters work to display monthly and yearly data.	Select a time filter (for example, 2023 or a specific month).	The data changes according to the selected time period.	Passed
3	Product Type Filter	Ensure that the product type filter displays data according to the type selected (for example, Gasoline, Diesel, Crude Oil).	Select a specific product type in the filter and check the data changes in the visualization.	Only selected product data appears in the visualization.	Passed
4.	Import Trend Visualization	Ensure import trends per product can be displayed in the form of a line graph.	Look at the trend graph and make sure the time data is displayed in the correct order.	The graph shows the trend of import changes over time.	Passed
5.	KPI Total Crude Oil Imports	Testing that the KPI "Total Crude Oil Imports" accurately calculates the total	Check the KPI value for total crude oil imports.	The value corresponds to the loaded data.	Passed

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NO	Tested Aspects	Test Description value of crude oil imports.	Testing Steps	Expected results	Status
6.	Dashboard Responsiveness	Test the responsiveness of the dashboard on various devices (desktop, tablet, mobile).	Test the responsiveness of the dashboard on various devices (desktop, tablet, mobile).	The dashboard looks neat and navigation works well on all devices.	Passed

CONCLUSION

This study successfully designed an interactive dashboard for visualizing petroleum product import data, which facilitates comparative analysis based on product type, volume, value, and country of origin. With time and product filter features, the dashboard supports an effective understanding of import trends and national energy needs. The trial results show that the dashboard can be used responsively across devices and helps decision makers better understand petroleum market trends. The use of this dashboard is expected to improve efficiency in energy policy evaluation and provide deeper insights for stakeholders in the energy sector. As a recommendation, further development can include the integration of predictive technology to estimate future import trends and the addition of deeper analytical features to support strategic decisions. In addition, collaboration with related institutions can enrich the data and increase the validity of the resulting analysis.

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