A MODERN DATA STACK FOR YOUR BUSINESS

_WHITEPAPER

HOW TO MAXIMIZE SUSTAINABILITY: ENABLING EFFICIENT ENERGY CONSUMPTION WITH A MODERN DATA STACK

Data-driven solutions for a more ecological, economical and social energy consumption

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Contiamo is a premier consultancy based in Berlin. We partner with leading businesses in Germany and Europe, harnessing the power of data, machine learning and AI. We drive insights, improve efficiency and facilitate decision-making.

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Why a modern data stack?

In today's competitive business environment, data-centricity is paramount, and organizations that do not adapt accordingly may be outpaced by their competitors.

A modern data stack comprises a selection of reliable, scalable technologies and tools that enable companies to efficiently collect, store, process, and analyze data, ensuring optimal performance and adaptability to their unique requirements.
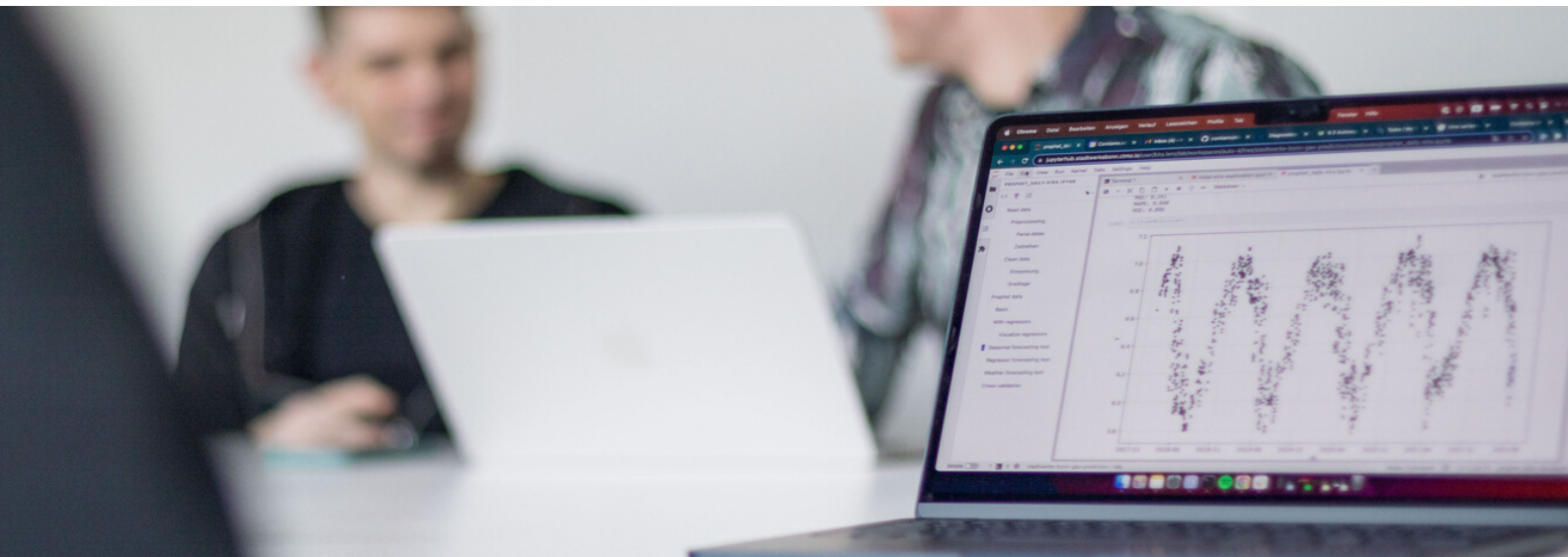
Companies that fail to adopt a modern data stack face several challenges in today's data-driven business landscape. One significant issue is the inability to efficiently collect and manage data from diverse sources, leading to information silos and a lack of visibility into valuable insights. This hinders decision-making and prevents businesses from capitalizing on opportunities for growth.

Another challenge is the difficulty of processing and analyzing data in real-time, which can result in outdated or incomplete information being used to make critical business decisions. Without a modern data stack, organizations may struggle to scale their data infrastructure, limiting their ability to adapt to rapidly changing market conditions.

These issues can contribute to a loss of competitiveness, as businesses that lack a modern data stack struggle to keep pace with competitors who are leveraging cutting-edge technologies to gain actionable insights and make data-driven decisions.

How can a modern data stack help?

Leverage cloud benefits

With cloud-based solutions, companies gain a tailored modern data stack that offers enhanced scalability, flexibility, and security, enabling them to focus on core competencies and make data-driven decisions effectively.

Choose the right tools

Build an effective modern data stack by selecting a centralized data warehouse, efficient data loading and transformation tools, data governance/catalog solutions, and advanced analytics, ensuring seamless integration for optimized data management and insights.

Scale data warehouses

At the core of a modern data stack is a centralized data warehouse where all data converges. Ensuring this crucial component is scalable allows for efficient data management, cost-effectiveness, and ease of administration, while maintaining high performance levels and enhanced insights as data volumes grow.

_Use Cases

The modern data stack has revolutionized various industries by harnessing data analytics and insights. Its diverse applications have transformed operations and decision-making across sectors. Let's delve into five key industries where a data-driven approach is making a significant impact, showcasing the versatility and potential of the modern data stack.

Healthcare
Modern data stacks improve patient care, streamline processes, and facilitate medical research by analyzing large datasets and EHRs.

Retail and E-commerce
Data-driven insights optimize product recommendations, targeted marketing, and supply chain management in retail and e-commerce.

Finance and Banking
Identifying fraud, assessing credit risk, and personalizing financial services are possible through a modern data stack in finance and banking.

Manufacturing and Supply Chain
Data analysis optimizes production, enhances quality control, and improves inventory management in manufacturing and supply chain industries.

Energy and Utilities
Modern data stacks help manage energy supply and demand, predict outages, and support renewable energy development in the energy and utilities sector.

Use Case: HOW TO TACKLE THE ENERGY CRISIS with a modern data stack?

In addition to the switch to renewable energies, a central task of the energy transition is digitization. The exchange and processing of real-time data are central aspects to enable accessibility and co-design of the energy market.

The energy transition is data-driven

With the expansion of renewable energy, EU-wide metering and interconnection, and the increasing electrification of heating and mobility services, the energy market is changing dramatically and driving the shift towards a more holistic energy ecosystem that meets the needs of consumers.

Distributed electronic applications must be enabled

The goal of the client's initiative is to develop digital solutions that put the consumer at the center of the energy transition. Understanding consumer needs is critical to unlocking the potential of flexible production and demand and integrating more renewable energy. This can reduce CO2 emissions, improve security of supply, and increase consumer satisfaction through a variety of energy services.

To realize these goals, smooth integration of new and distributed electronic applications must be enabled. A secure digital backbone is needed to give consumers and service providers access to energy data. Real-time processing of price and energy signals forms the basis for managing the balance of the power system. It is also necessary to support the flexible combination of data from different sources such as electric vehicles, heat pumps and photovoltaic systems.

_DEVELOPING A SOLUTION

Our vision was to make energy consumption more ecological, economical and social. We wanted to help multifamily buildings save CO2, reduce costs, and enable the energy transition. To achieve this vision, we wanted to enable these communities to take advantage of dynamic market prices and optimize consumption by participating in an energy community.

The app we developed initially shows interested individuals how they can benefit. Once they are members of the community, it provides recommendations on how to optimize energy consumption, such as when to charge the battery and when to consume electricity from the grid.

Well-integrated modern data stack required

The efficient development of such a prototype, which includes multiple data streams and serves different data layers, requires a well-integrated modern data stack.

In terms of technical requirements, the solution developed needed to be quick to set up, suitable for the size of a test group, consume data in real time, be easily transitioned to a production-ready setup, and fit seamlessly into the customer's environment.

Working in the GCP environment allowed us to implement the requirements with powerful tools. Data provisioning for data science exploration was done using the BigQuery DWH. The native availability of Jupyter as an exploration environment was very convenient. Prototyping of the mobile application was easily done with the combination of a Python/Flask app and Google Cloud Run. Even initial performance improvements could be achieved by caching data in a Postgres DB.

In simulations, up to 33% less power costs and 26% less CO2 emissions could be achieved.

_PROJECT STEPS

_PROJECT INITIALIZATION

We kicked off the project with initial discussions with the project partner to identify desired outcomes, specific targets and requirements. The team then began the ideation phase, brainstorming available real-life challenges that can be solved. Different application and service designs were considered and evaluated.

_INFRASTRUCTURE SETUP

We then discussed available infrastructure with various IT and data experts. After obtaining our GCP accesses, we were also given access to documentation and the company's own data portal. GitHub was used for code version control.

_DATA INSPECTION

We inspected various data sources provided in the scope of the challenge using Jupyter notebooks. In addition to individual consumption data, which form the basis of the application, we selected pricing data and CO2 footprint of electricity based on relevance. Wallbox data and photovoltaic data were deprioritized.

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_PROJECT STEPS

_DATA PREPROCESSING

The team performed data cleaning and preprocessing to prepare the data for analysis. As the data quality was in a good state, the necessary steps were limited to mainly formatting, conversion and basic transformations.

_DATA ANALYSIS

Using the provided data, different scenarios have been tested out to validate the feasibility of the use case. Analyses were performed to define a limited set of recommendations. Metrics for the targeted savings metrics have been created.

_DATA PIPELINE SETUP

In the previous steps developed simulations have been transferred from their explorative stage to a more automated pipeline. Queries have furthermore been refined. Integrating a postgres DB for caching improved performance.

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_PROJECT STEPS
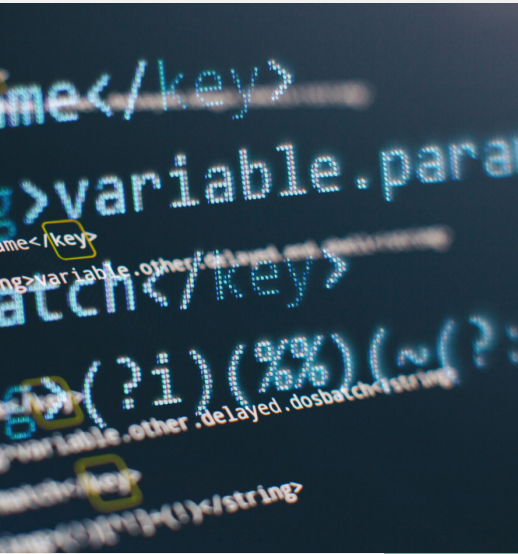
_APP DEVELOPMENT

The Python/Flask app was developed in an iterative manner. Starting with the initial user simulation, the functions were expanded to include real-time monitoring and recommendations. During this phase, we communicated very regularly with the project partner to refine the requirements and optimize the user experience.

_APP DEPLOYMENT

We decided to use the GCP tools like Cloud Run because they facilitate future reusability of assets. Future deployment decisions will be made based on the initial testing results.
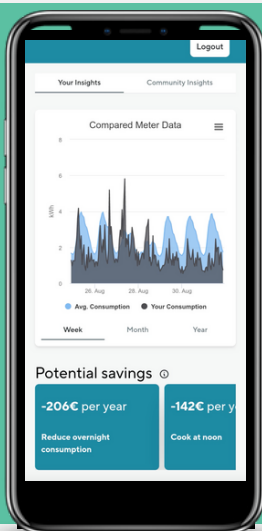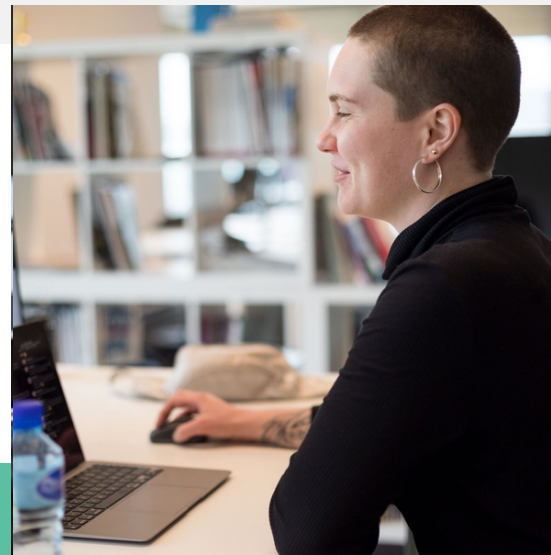
_APP TESTING

The first step of the test phase is an internal feedback round. Employees from various departments are allowed to test the app and provide comments on user-friendliness, functionality and potential added value. In parallel, scalability and performance with larger data volumes can be evaluated and optimized.

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_Summary

The modern datastack was one key success factor for the efficient development of the app protoype.

Good integration allowed bringing all required datasets efficiently together, thus providing enormous added value. The flexibility of the stack supported the development of an intuitive application with clear visualizations and recommendations.

Especially for prototype developments that span different data disciplines, a modern data stack supports collaboration and provides the best conditions for a production rollout.

_Key Benefits

- ⚡ Independent energy management made possible

- 🎯 Detailed but clear insights for customers

- 📈 Powerful and stable architecture

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Mike's strong people, sales and project management skills guarantee a customer-centric approach to any challenge.