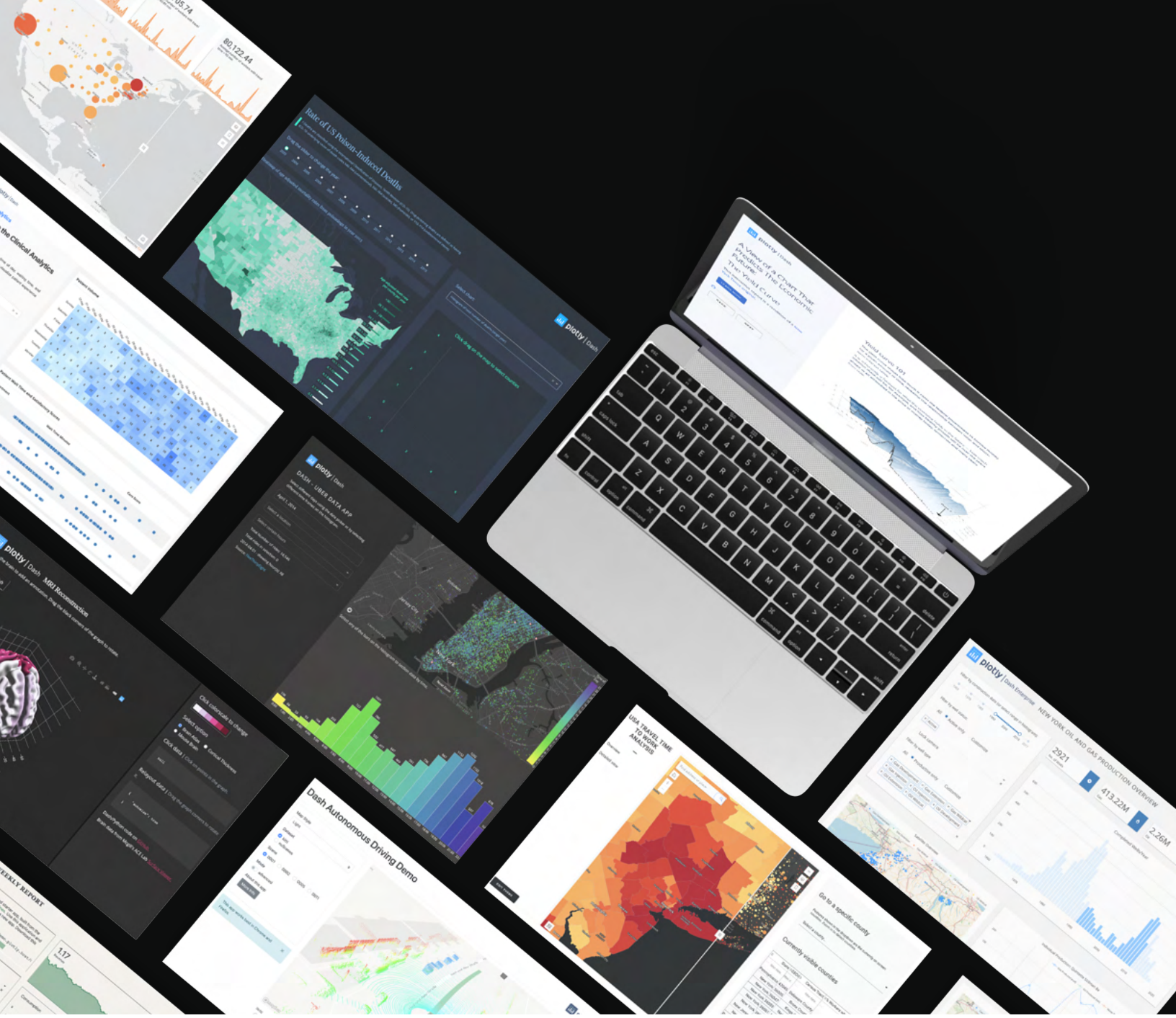


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From Static to Dynamic: Embracing the Next Generation of BI with Dash Enterprise

Learn how Dash is empowering organizations with real-time insights, interactive visualizations, and collaborative decision-making.

Summary

- Part I: Rethinking Business Intelligence for Modern Challenges
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Part I: Rethinking Business Intelligence for Modern Challenges

In the ever-evolving business landscape, where data reigns supreme, organizations are increasingly recognizing the vital role of business intelligence (BI) in driving success. Global data volumes continue to grow exponentially, with Statista reporting that more than 64.2 zettabytes of data were generated, captured, copied, and consumed in 2020. By 2025, Statista predicts global data creation will grow to more than 180 zettabytes.

> *"Data volumes are skyrocketing, with over 64.2 zettabytes of data generated globally in 2020, and a predicted 180 zettabytes by 2025."* - *Statista*

As these data volumes grow, traditional BI systems are being pushed to their limits, highlighting the need for a more evolved approach.

Still, focusing solely on data volumes doesn't give the full picture of the challenges in the business intelligence (BI) field. It's also crucial to consider the complexities of dealing with data from multiple sources, including both structured and unstructured data, and the limited interactivity in traditional BI systems. All these challenges highlight the need for a more advanced and sophisticated approach to BI.

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Today, businesses require real-time insights, interactive visualizations, and collaborative decision-making capabilities. Traditional BI systems have served us well, providing static reports and predefined dashboards. Yet, they struggle to meet the demands of business users in today's data-rich environment.

One of the major shifts in BI technology has been the rise of data discovery and visualization tools. These tools have empowered business analysts to explore and analyze data without being dependent on traditional Extract, Transform, Load (ETL) processes and data modeling. This democratization of data analysis has significantly accelerated the speed at which companies can make data-driven decisions in highly competitive environments.

Data visualization has transformed BI into both an art and a science. It has made key performance indicators and insights accessible to employees at all levels, enabling better decision-making throughout the organization. As a result, BI vendors have integrated data discovery and visualization capabilities into their product portfolios to meet the growing demand.

On the other hand, interactive data applications, especially those operating in Python-based, low-code frameworks, have faced pressure from customers to provide enterprise-level features such as data governance, security, data preparation, and report generation. The need for these features highlights the growing importance of scalability, data integrity, and governance in the BI landscape.

So, should we be on the lookout for a BI 2.0? Or, can we go even further?

Going beyond BI means more than just adding features, it requires transforming the way you interact with data, and the insights you draw from it. It means having cutting-edge data science capabilities that enable predictive analytics, automated insights, and machine learning–all within one integrated platform.

Dash Enterprise is more than just a BI upgrade, it's a full-scale data revolution. So ask yourself, are you ready to go beyond BI?

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Part II: Embarking on a BI Evolution with Dash Enterprise

As modern data needs evolve, traditional BI tools continue to fall short. The increasing data demands, speed, complexity, and the necessity for customization have pushed traditional BI tools to their limits. As data volumes grow and analytical workflows become more diverse, BI tools hit a ceiling.

The limitations of traditional BI tools are evident: they are slow, restrictive, and rely on continuous support from data engineers to function effectively. Moreover, they lack true data-centricity, as essential tasks like data wrangling and cleaning are outsourced, hindering smooth analysis and decision-making processes.

Unlike typical BI tools, Dash Enterprise thrives on rapid development and adoption, ensuring quick deployment of interactive applications and faster time-to-value. With advanced interactivity and a remarkable user experience, Dash lets you create visually stunning dashboards that captivate and engage.

Additionally, Dash seamlessly integrates with popular data science and analytics tools, amplifying your existing capabilities and workflows for a seamless transition. Plus, its foundation on Kubernetes allows it to handle expanding data volumes and changing user needs effortlessly.

Designed for organizations with enterprise-grade analytics ecosystems, Dash Enterprise caters to diverse demands, from analytical, AI/ML, and modeling workflows to data visualization and business specifications that require:

- **Rapid Development and Adoption:** Dash Enterprise enables organizations to quickly develop and deploy interactive applications, ensuring fast adoption and time-to-value.
- **Advanced Interactivity and User Experience:** Create visually stunning and highly interactive dashboards and applications that deliver an exceptional user experience.
- **Seamless Integration with Existing Analytics Capabilities:** Dash Enterprise seamlessly integrates with popular data science and analytics tools, leveraging existing capabilities and workflows.
- **Scalability and Flexibility:** Built on Kubernetes, Dash Enterprise offers architectural flexibility, scalability, and high availability to handle growing data volumes and user demands.
- **Complete Data Control:** Maintain full control over your data, ensuring data sovereignty, compliance, and security.

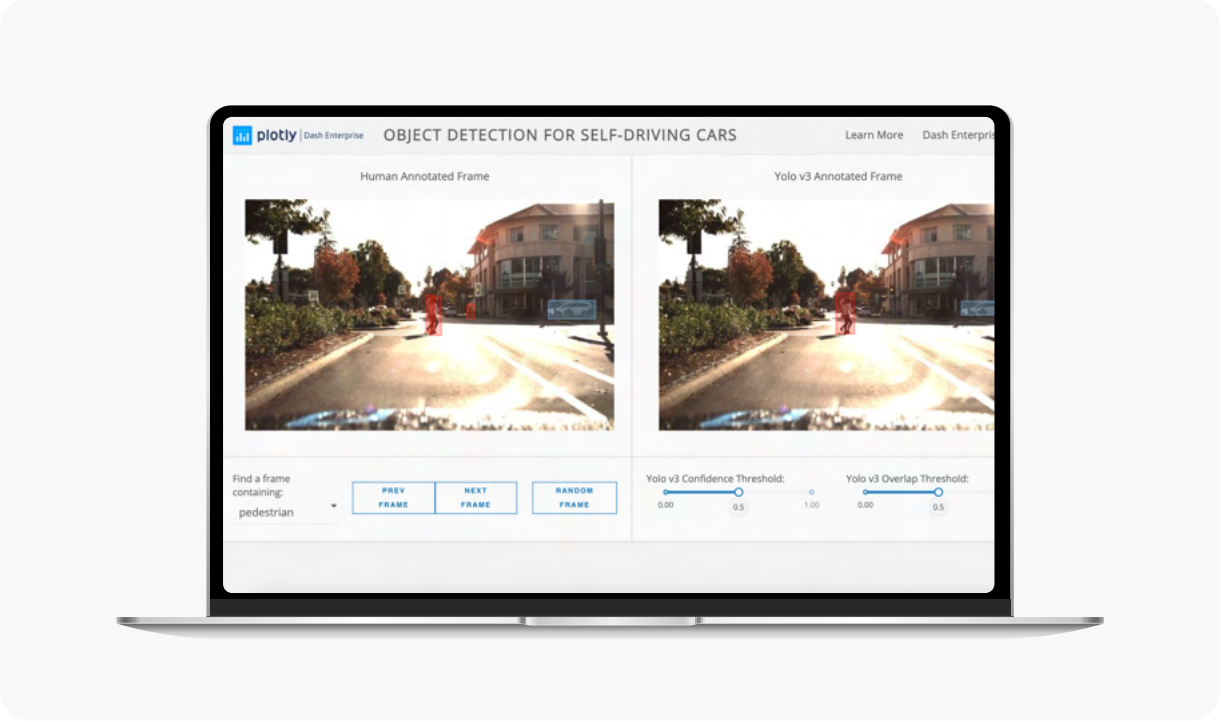
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Part III: Unleashing the Power of Interactivity and Customization

One of the key advantages of Dash lies in its high degree of interactivity. Users can create dynamic and responsive dashboards that allow for real-time exploration and analysis of data. This interactivity fosters a deeper understanding of the data and facilitates more informed decision-making.

Dash Enterprise also excels in handling custom and complex workflows, perfect for scenarios where organizations seek to leverage the flexibility and creativity of Python and its coding capabilities. As well, it provides a platform that empowers users to customize and tailor their dashboards to meet their specific needs, resulting in highly personalized and effective data visualizations.

Incorporating machine learning models and parameterizations is another strength of Dash. Native support is available for integrating machine learning algorithms, enabling organizations to leverage predictive analytics and make data-driven decisions.



A real time object detection ML model being run on Dash Enterprise

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When it comes to collaboration and sharing, Dash Enterprise shines. It enables real-time dashboard-sharing capabilities, it creates an environment where teams can work together harmoniously, exchange insights, and collectively arrive at decisions.

Collaborative environments are also critical to avoiding data silos in organizations. A recent study by Forrester Consulting found that large organizations use an average of 367 software apps to manage their workflows. This dense, crowded system led to 79% of knowledge workers reporting their teams are siloed, and 68% reporting their work is negatively impacted by lack of visibility.

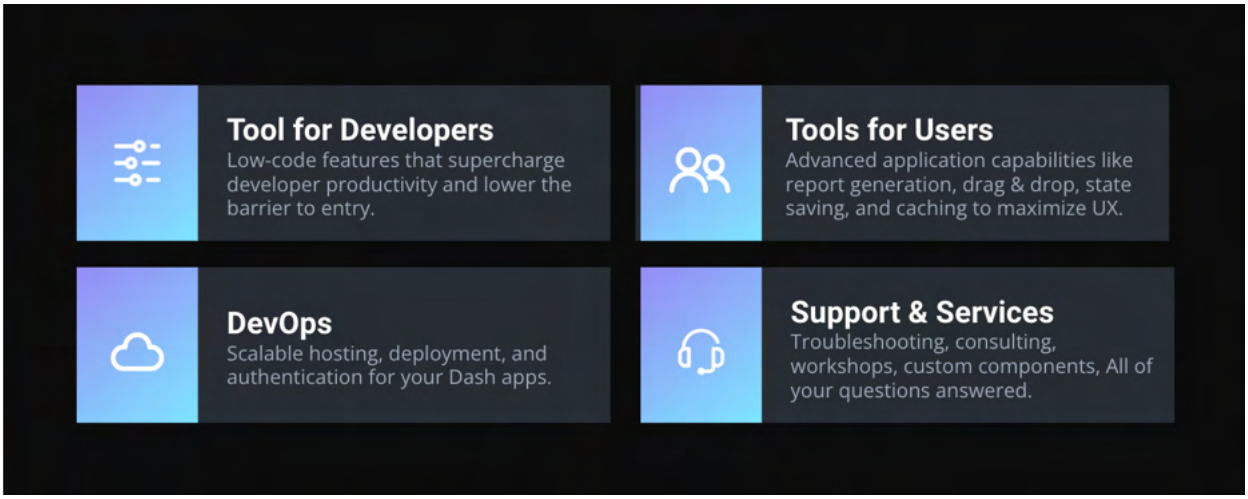
> *"79% of knowledge workers report data silos in their organizations, and 68% report their work is negatively impacted by a lack of visibility"*
> *- Forrester Consulting*

Dash Enterprise solves this issue with a single platform that allows team members to access, visualize, and explore data at the same time. This eliminates the need for manual updates, copy and pasting between different applications, enabling organizations to remain agile and aligned as they grow.

Dash Enterprise is ideal when there is a requirement for:

- A high degree of interactivity.
- Custom/complex workflows or a desire to harness the creativity and flexibility of Python's coded options.
- Customized branding with a focus on aesthetic appeal.
- Integration of multiple and/or unsupported data sources, and/or "unclean" data.
- Visualization of imagery and scientific data.
- Incorporation of ML models and parameterizations to enhance data insights and decision-making.

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Part IV: Comparison Chart: Dash vs. Traditional BI

Data visualization and analysis require powerful, customizable tools built for growing datasets. Dash Enterprise is renowned for its Python-based framework and offers unparalleled interactivity and customization, making it an excellent choice for complex workflows. On the other hand, traditional BI is better suited for organizations with smaller, less complex datasets.

Wondering how Dash compares to traditional BI systems? Let's break it down, feature by feature.

Need for Python

Dash Enterprise takes the lead with its explicit support for Python, a popular and versatile programming language widely used in data analysis and visualization.

On the other hand, traditional BI tools may offer limited or partial support for Python, leaving users with fewer options for advanced data manipulations and customizations.

Ease of Use

Dash Enterprise offers a range of exclusive packages like the Dash Design Kit, Reporting Engine, and Dashboard Engine. These packages make it simple for developers to start building their Dash applications and provide them with the flexibility to customize their apps beyond what traditional BI systems allow.

In contrast, traditional BI tools often rely on drag-and-drop interfaces, which may offer ease of use but come with limitations in terms of customizability and complex visualization capabilities.

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Cost of Ownership

Dash Enterprise adopts a developer-centric approach, basing its pricing on the number of developers or dashboard authors rather than charging on a per-user basis. This can be more cost-effective for organizations with numerous users who need access to dashboards and applications.

Traditional BI tools, however, often follow a per-user licensing model, which can lead to higher costs for larger organizations.

Data Sources

Unlike traditional BI tools, which may have limited connectors, Dash Enterprise's Python coding capability allows it to connect to virtually any type of data source. This flexibility means users are not restricted to specific connectors and can access data from unsupported sources as well.

Customization

Dash Enterprise offers unparalleled customization options, especially with its Python-based framework, allowing users to create complex visualizations and conduct in-depth data analysis.

Traditional BI tools also provide customization features, but they are often limited compared to Dash, requiring additional effort to achieve sophisticated visualizations and analytical capabilities.

Ability to Handle Large Datasets

Dash Enterprise is engineered to handle large datasets efficiently, leveraging Python's robust capabilities for high-performance data visualization. It employs optimized algorithms and parallel processing, enabling faster processing and analysis of extensive data volumes.

In contrast, traditional BI tools may struggle with larger datasets, leading to performance issues, data modeling challenges, and increased memory constraints.

Deployment

Dash Enterprise offers flexible deployment options, including on-premises, cloud-based, and hybrid setups. It integrates seamlessly with various services and platforms, such as Azure Active Directory (AAD), Azure Blob Storage, and SQL Server, allowing for enhanced scalability and control.

Traditional BI tools, however, typically focus on cloud-based deployments and may have a narrower range of integration options.

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Real-Time Data Sharing

Dash Enterprise stands out with its powerful real-time data streaming capabilities, allowing for extensive customization and integration. Its robust security features ensure data confidentiality and compliance, making it a favorable choice for organizations requiring real-time data sharing with advanced security measures.

While traditional BI tools also support real-time data streaming, they might not match Dash Enterprise's level of customization and flexibility.

AI/ML Readiness

Dash Enterprise is fully equipped for AI/ML applications, providing seamless integration with popular Python-based ML libraries and AI platforms. Capabilities like Explainable AI can be quickly incorporated to answer “what if?” questions and probe what the ML models have learned from the data with ease.

Traditional BI tools may also incorporate ML features, but their readiness varies, and they might not offer the same level of integration and support for advanced ML workflows as Dash Enterprise.

Real-Time Machine Learning Models

Dash Enterprise takes a step ahead with its native support for real-time ML models using popular Python libraries, such as Scikit-learn, TensorFlow, and PyTorch. This feature allows users to deploy and interact with ML models in real time without the need for custom integration.

Other traditional BI tools often require manual integration of R/Python scripts, which can be time-consuming and less efficient.

Data Interactivity

Dash Enterprise empowers users with highly customized and granular data interactivity. With the ability to create interactive components like dropdowns, sliders, and text inputs, users can link these components to specific data queries or visualizations for a more engaging analytical experience.

While traditional BI tools also offer data interactivity, Dash Enterprise's capabilities enable more versatile and personalized interactions.

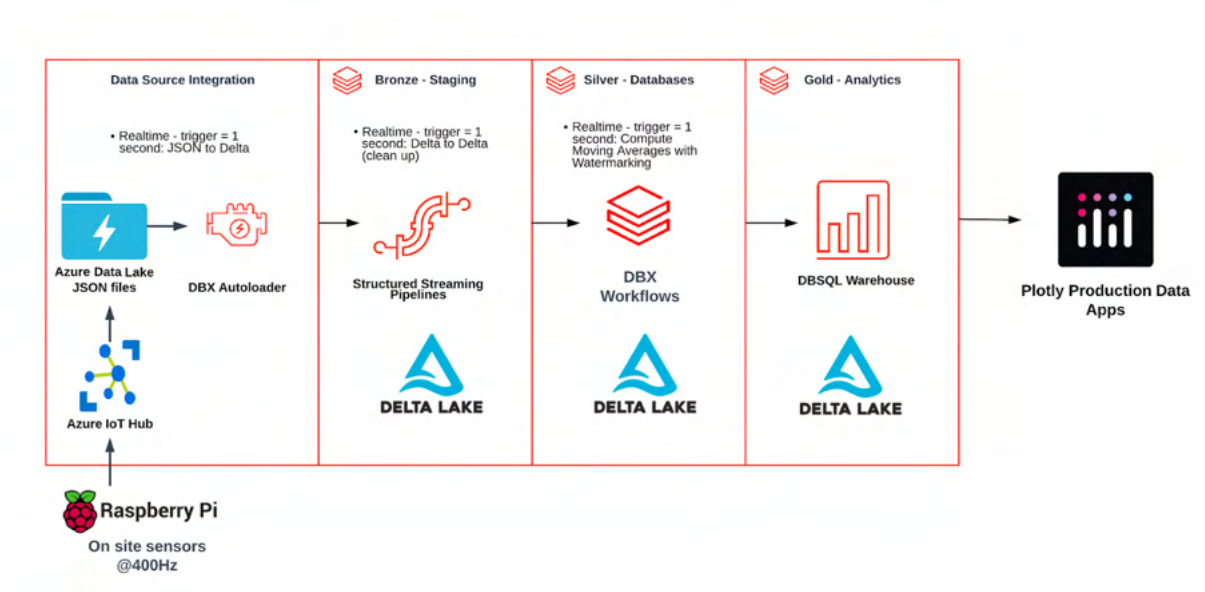
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	Dash Enterprise	Traditional BI
Need for Python	Yes	Maybe
Ease of Use	Offers a Dashboard Engine for non-Python users.	Uses easy-to-approach drag-and-drop interfaces.
Cost of Ownership	Based on the number of developers or dashboard authors, with unlimited applications and dashboards access.	Typically charges on a per-user basis, which can be costly for large organizations.
Data Sources	Can connect to any data source.	Have limited connectors compared to Dash.
Customization	Fully customizable with Python-based framework, enabling complex visualizations and data analysis.	Allows customization but with limitations and more steps.
Ability to Handle Large Datasets	Easily handles large datasets with Python's capabilities. Designed for high-performance data visualization, with optimized algorithms and parallel processing capabilities that can handle large volumes of data quickly.	Often faces issues with larger datasets, including performance issues, memory constraints, data modeling challenges, data source limitations, and cost implications.
Deployment	Offers scalability, control, security, and hybrid deployment options.	Emphasizes ease of use, cloud-based deployment, and extensive marketplaces.
Real-Time Data Sharing	Provides a powerful and flexible platform for real-time data streaming.	Also supports real-time data streaming but may lack customization.
AI/ML Readiness	Supports Python-based ML libraries and seamless integration with popular AI/ML platforms.	Incorporates ML, but the level of readiness varies across tools.

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	Dash Enterprise	Traditional BI
Real-Time Machine Learning Models	Natively supports real-time ML models using popular Python libraries.	Limited native support, requires custom integration of R/Python scripts.
Data Interactivity	Enables highly customized and granular data interactivity.	Allows two-way data interactivity with real-time visualizations and drill-throughs, cross-highlighting, and filtering.

Part V: Sample Workflow - Databricks & Dash



Sample Workflow: Databricks and Dash

This sample workflow showcases the integration of Databricks and Dash Enterprise to build a real-time IoT data application.

By leveraging Databricks Structured Streaming solution and the powerful capabilities of Dash Enterprise, organizations can create scalable and interactive applications for streaming data that far outstrip the static reports generated via BI platforms.

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1. Data Source Integration:

- Gather data from Raspberry Pi Azure IoT Online Simulator, which provides simulated sensor data.
- Connect Raspberry Pi online simulator to Azure IoT Hub and create a Stream Analytics job to process the data.

2. Staging (Bronze):

- Read the stream from the cloud storage (Azure Data Lake Storage).
- Ingest the raw data into Databricks' Bronze Delta Table, leveraging the Auto Loader engine for efficient and real-time data ingestion.
- This stage serves as the foundation for the Production Data Application (PDA).

3. Databases (Silver):

- Load the Delta table as a stream source.
- Use watermarking and windowed aggregation to manage late-arriving data and reduce noise in the data.
- Aggregated and cleaned data is stored in the Silver Delta Table.

4. Analytics (Gold):

- Create a Gold-level view that further processes the aggregated data.
- Calculate moving averages and other analytics on the Gold Delta Table.
- The Gold Delta Table serves as a query source for the Plotly Dash application.

5. Building the Front End for the Production Data Application:

- Set up the Plotly Dash user interface (UI).
- Utilize the app.py file as an entry point for the application, containing layout and interactivity code.
- Implement callback functions to add interactivity and streaming capabilities to the application.

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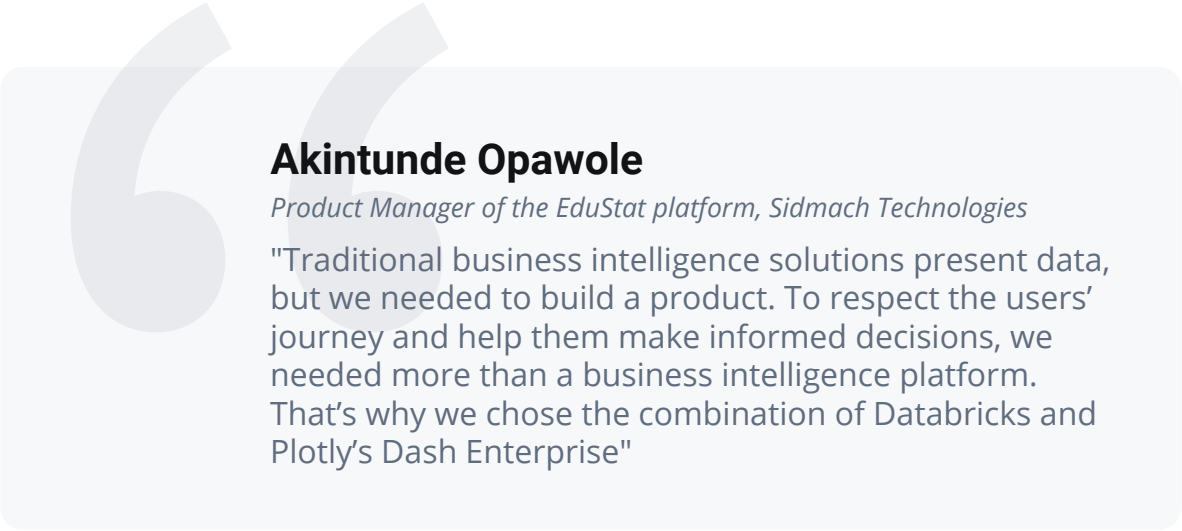
6. Connect App and Run:

- Connect the Plotly Dash app to the Databricks database using the Databricks SQL connector for Python.
- Set variables, import the connector, and establish the connection.
- Implement a dcc.interval component and callback functions to automatically update the dashboard with new data.

7. Run the App:

- Execute the app by running the python app.py command in your local IDE.
- The app will start streaming data from the Databricks database and display real-time insights through the Plotly Dash user interface.

Part VI: Sidmach's EduStat Platform Transforms Decision-Making Using Dash Enterprise and Azure Databricks



Akintunde Opawole

Product Manager of the EduStat platform, Sidmach Technologies

"Traditional business intelligence solutions present data, but we needed to build a product. To respect the users' journey and help them make informed decisions, we needed more than a business intelligence platform. That's why we chose the combination of Databricks and Plotly's Dash Enterprise"

In the dynamic landscape of education, Sidmach Technologies, an ICT firm, recognized the untapped potential within the West African Examination Council's (WAEC) examination performance data — a treasure trove of insights that could shape public policy, guide educational decisions, and attract international funding. However, barriers to access and the limitations of traditional processes hindered the full utilization of this valuable resource.

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Driven by their vision to transform education through data, Sidmach embarked on a journey to create a game-changing solution. They understood the need for a self-service platform that would enable users to explore, select, and pay for data—all within a single, intuitive interface. It was clear that traditional business intelligence tools would not suffice; they needed a more advanced and customizable solution.

To realize this vision, Sidmach turned to Plotly's Dash Enterprise and Microsoft's Azure Databricks. The combination of these cutting-edge technologies provided the perfect foundation for their data analytics platform, EduStat.

Armed with Dash Enterprise's interactive data visualization capabilities and Azure Databricks' scalable and future-proof infrastructure, Sidmach's data science team set out to redefine the data-driven landscape of education. They leveraged the power of Python, the language of choice for data science, to create a seamless user experience.

Dash Enterprise empowered Sidmach to go beyond traditional business intelligence solutions. They crafted a highly customizable platform that transcended static reports and predefined dashboards. With the flexibility offered by Dash Enterprise, Sidmach's data science team could create interactive components and link them to powerful data queries and visualizations. This allowed users to dive deep into the data, uncovering valuable insights and making informed decisions.

The results were remarkable. Sidmach achieved faster time-to-market, delivering a working prototype of the EduStat platform in a short period. Access to over 200 million rows of WAEC data enabled government entities, academics, funding agencies, and the public to drive impactful change in education.

With Dash Enterprise and Azure Databricks, Sidmach streamlined the once-manual and paper-based process. The platform enabled users to make informed decisions, offering cost control, instant invoicing, and easy report generation.

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Conclusion: Embracing a Future Free from the Limitations of BI with Dash Enterprise

In summary, Dash Enterprise offers a transformative solution that addresses the evolving needs of business intelligence. Its powerful features and capabilities set it apart from traditional BI tools, providing organizations with:

- **Easy Dashboard Creation:** Full-stack data application creation with dynamic UI/UX in just Python.
- **Advanced Analytics:** Real-time execution of dynamic data science, machine learning, and advanced analytics models.
- **Data Integration and Write-Back:** Ability to write back data and models directly to dashboards and databases.
- **Big Data Handling:** Seamless handling of large volumes of data and integration with popular libraries.
- **Mobile Accessibility:** Mobile readiness is out of the box for easy access on any device.
- **Reporting and Printing:** Features for printing, saving live dashboard states, and generating interactive or static PDF reports.
- **Cost-Effective Scalability:** Lower cost of ownership and scalability for large-scale deployments.
- **AI/ML Readiness:** AI/ML readiness and transparent deployment of advanced models without complex APIs.

With Dash Enterprise, organizations can democratize access to insights throughout their teams. It provides a powerful and cost-effective solution that empowers decision-makers, enhances collaboration, and drives business success through informed decision-making.

About Plotly

Plotly is a software company whose mission is to enable every company, around the world, to build data apps. Our product, Dash Enterprise, is a platform of best-in-class development tools to quickly and easily visualize data in Python from virtually any data source. With customers across the Fortune 500, Plotly is a category-defining leader in enabling data-driven decisions from advanced analytics, machine learning, and artificial intelligence.

For more information, visit https://plotly.com

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