



# Scaling Power BI Delivery & Sharing Content Externally with Power BI Embedded:

THE DEFINITIVE GUIDE






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## To explore how Power BI Embedded can enhance the scalability of Power BI delivery and facilitate content sharing with external users.

### Abstract:

This white paper provides an in-depth exploration of Power BI Embedded; a powerful tool designed to enhance the scalability of Power BI delivery and facilitate the sharing of interactive content with external users. In today's data-driven business environment, the ability to efficiently distribute and manage analytics content is crucial for decision-making and strategic planning. Power BI Embedded, a feature-rich service offered by Microsoft Azure, addresses this need by enabling organizations to embed interactive reports and dashboards directly into their applications. This integration not only streamlines the analytics experience but also ensures that data-driven insights are more accessible to users outside the traditional Power BI ecosystem. This paper delves into the technical architecture, implementation strategies, and best practices for utilizing Power BI Embedded. It further discusses the benefits and challenges associated with this approach, including considerations for security, compliance, and cost-effectiveness. This paper aims to be a comprehensive guide for organizations looking to leverage Power BI Embedded for



# INTRODUCTION

## **Background: An overview of Power BI and its significance in data visualization and business intelligence.**

In the era of data-driven decision making, the ability to effectively visualize and analyze information is paramount for businesses of all sizes. Microsoft's Power BI stands at the forefront of this revolution, providing a robust yet user-friendly platform for data visualization and business intelligence. As an integral component of the Microsoft Business Intelligence stack, Power BI has redefined how organizations interpret vast amounts of data, transforming raw figures into actionable insights.

The significance of Power BI in the realm of data visualization and business intelligence cannot be overstated. Its comprehensive suite of tools enables users to connect to a wide array of data sources, simplifying the complex process of data consolidation and analysis. With its intuitive interface, Power BI allows even those with minimal technical expertise to create insightful, interactive, and visually appealing reports and dashboards. This democratization of data analytics has empowered departments across organizations to make informed decisions based on real-time data.

Furthermore, Power BI's advanced analytics capabilities, including AI-driven insights and machine learning, offer a competitive edge by forecasting trends and unveiling hidden patterns. This aspect is particularly vital in the current fast-paced business environment where predictive analytics plays a critical role in strategic planning.



## Importance of Scaling: The need for scalable solutions in the growing data-centric business environment.

In today's interconnected business environment, the ability to scale Power BI solutions is critical to ensure that actionable insights derived from data are accessible to all relevant stakeholders. Scaling refers to the process of expanding the capabilities of Power BI to meet the growing needs of an organization, allowing for efficient distribution and management of data across various departments and teams. This scalability is vital for several reasons:

# 1

### Democratization of Data:

Power BI's scaling capabilities democratize data access within an organization. By enabling a wider audience to interact with data visualizations and reports, Power BI fosters a data-driven culture where decisions are made based on insights accessible to all, rather than a select few. This democratization not only enhances transparency but also encourages a more collaborative approach to problem-solving and decision-making.

# 2

### Consistency and Accuracy:

As the scale of Power BI deployment grows, maintaining consistency and accuracy of data becomes paramount. Scaling solutions ensure that every user, regardless of their department or geographical location, accesses the same version of the truth. This uniformity is crucial in avoiding discrepancies and ensuring that all strategic decisions are based on accurate and up-to-date information.

# 3

### Customization and Security:

Effective scaling includes the ability to customize access and security settings. Power BI allows for tailored experiences where different users can have access to the data and insights relevant to their roles while maintaining strict data governance and compliance standards. This level of customization ensures that sensitive information is securely managed and only accessible to authorized personnel.

# 4

### Efficient Resource Management:

Scaling Power BI solutions enables organizations to manage their resources more efficiently. By optimizing the distribution of reports and dashboards, businesses can reduce server loads and improve performance. This efficiency is particularly important for large organizations dealing with vast amounts of data and numerous concurrent users.

# 5

### Futureproofing the Business:

A scalable Power BI solution is essential for future-proofing a business. As organizations grow and evolve, their data needs will change. A scalable solution can adapt to these changing needs, ensuring that businesses continue to gain valuable insights from their data without the need for significant overhauls or investments in new technology.

Scaling Power BI solutions is not just about handling larger datasets or accommodating more users; it's about ensuring that the entire organization can benefit from the insights that data provides. This scalability plays a pivotal role in building a truly data-driven organization where decisions are informed, strategic, and inclusive of insights gathered from across the entire business.

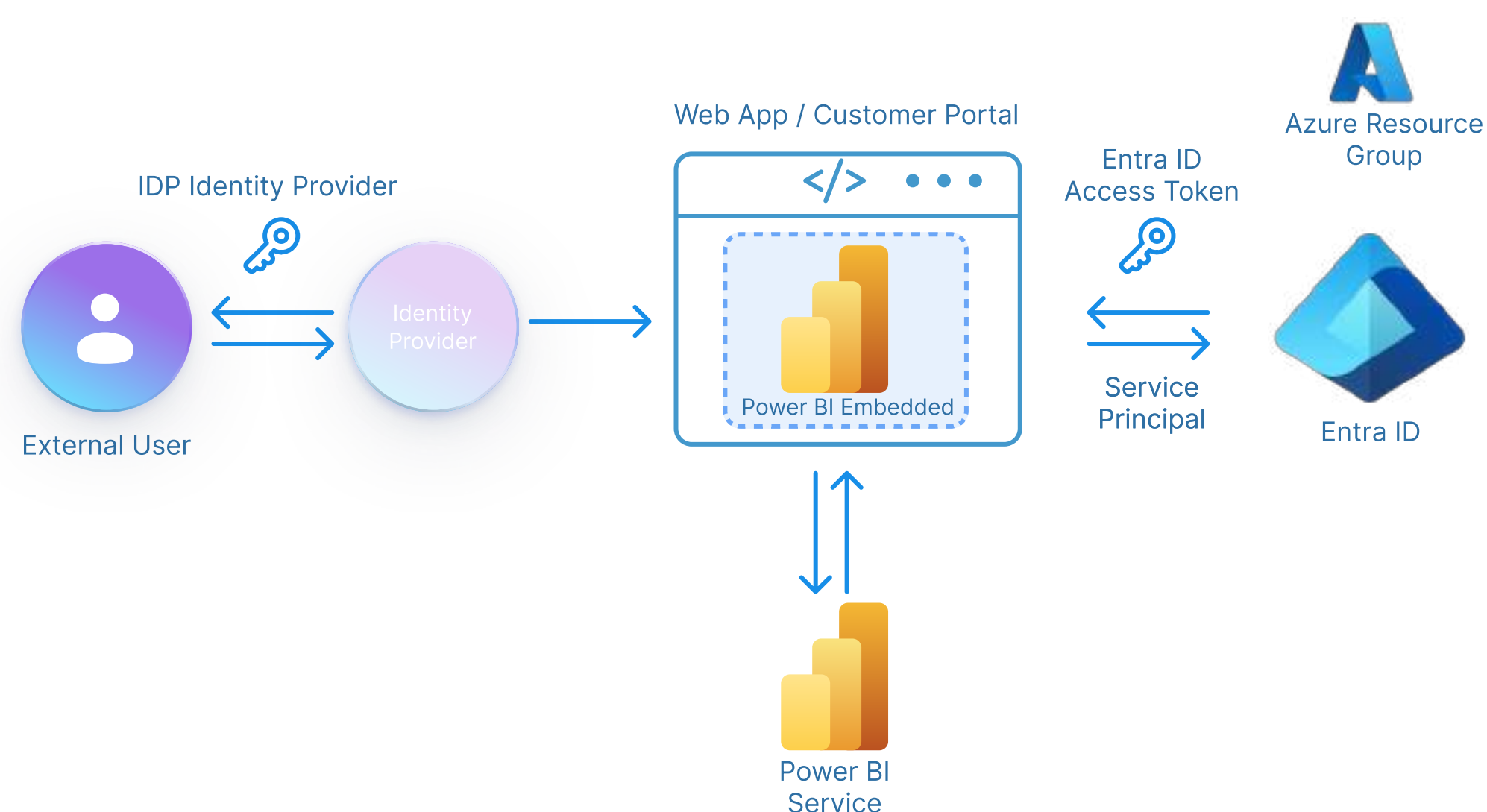




# POWER BI EMBEDDED: ITS ROLE IN SCALING & EXTERNAL SHARING

## What is Power BI Embedded?

Power BI Embedded is a Microsoft Azure service that enables developers to integrate Power BI report visuals into their own applications. This service allows users to create rich, interactive reports without the need for building their own analytics capabilities from scratch. The core functionality of embedding interactive Power BI reports and dashboards into custom applications or websites allows users to view and interact with Power BI content without needing a Power BI license. Power BI Embedded integrates with Entra ID (Azure Active Directory / AAD) for authentication and security. This integration ensures that access to the embedded Power BI content is secure and compliant with organizational policies. In the Azure framework, Power BI Embedded serves as a bridge between Power BI's data visualization capabilities and Azure's cloud infrastructure and services.







## The Significance of Power BI Embedded in the Business Intelligence landscape:

As organizations seek more advanced and integrated solutions for data visualization and sharing, Power BI Embedded emerges as a pivotal tool in the Power BI suite. This service is instrumental in extending the reach of Power BI beyond the confines of traditional internal business environments, facilitating both scaling and external sharing of data insights.

### **Integration with Applications and Websites:**

Power BI Embedded seamlessly integrates with existing applications and websites, allowing organizations to bring the power of Power BI to where users already work. This integration ensures a cohesive user experience, as users can interact with data insights without having to switch between different platforms or tools.

### **Scaling Data Visualization and Analysis:**

With Power BI Embedded, businesses can scale their data visualization and analysis capabilities more efficiently. It allows for the embedding of rich, interactive reports in applications accessed by a vast number of external users, extending the reach of data insights beyond internal stakeholders to clients, partners, and the public.

**Power BI is instrumental in extending the reach of Power BI beyond the confines of traditional internal business environments, facilitating both scaling and external sharing of data insights.**



### **Customization and Consistency:**

This service provides extensive customization options, enabling organizations to tailor the look and feel of the reports and dashboards to align with their branding and user interface. This level of customization ensures consistency in user experience and strengthens brand identity.

### **Cost-Effective and Efficient Resource Utilization:**

Power BI Embedded is designed to be cost-effective, with a pricing model that scales with usage. This pay-as-you-go approach ensures that organizations only pay for what they use, optimizing resource allocation. Additionally, since the processing is done in Azure, it alleviates the load on internal servers.

### **Enhanced Security and Compliance:**

Security is a paramount concern for all organizations, especially when sharing data externally. Power BI Embedded addresses this by offering robust security features including data encryption, network security, and compliance with global standards, and ensuring that data is protected throughout its lifecycle. This also includes row-level security, to ensure that data is only accessible to authorized users. It complies with various industry standards, ensuring that data handling meets rigorous security and compliance requirements.

### **Agile and Responsive:**

The service is designed to be agile and responsive, catering to the dynamic needs of businesses. It supports real-time updates, ensuring that embedded reports and dashboards always display the most current data.

In essence, Power BI Embedded is a powerful tool in the arsenal of any organization looking to scale its BI capabilities and extend the reach of its data insights. By embedding interactive data visualizations directly into applications and websites, Power BI Embedded not only enhances the user experience but also plays a crucial role in the external dissemination of information, making data insights more accessible and actionable to a broader audience.

## **Key Benefits of Power BI Embedded**

### **Enhanced User Experience:**

By integrating Power BI reports and dashboards within applications, users enjoy a seamless and integrated experience without the need to switch between platforms.

### **Increased Accessibility of Insights:**

Makes business intelligence insights more accessible to a wider audience, including external stakeholders like customers or partners, by embedding these insights directly into applications and portals they already use.

### **Cost-Effective:**

With its Azure-based pay-as-you-go pricing model, Power BI Embedded is a cost-effective solution for businesses. You only pay for what you use, which can be more economical than licensing individual users.





**Power BI offers excellent scalability, making it suitable for both small applications and large-scale enterprise solutions.**

**Data-Driven Decision Making:**

Provides real-time, interactive data insights, enabling users to make informed decisions based on the latest data.

**Secure Data Handling:**

Leveraging Azure's security features, Power BI Embedded ensures that data is handled securely, maintaining compliance and protecting sensitive information.

**Scalability:**

As a cloud-based service, it offers excellent scalability, making it suitable for both small applications and large-scale enterprise solutions.

**Customization and Flexibility:**

The extensive customization options allow for tailored BI experiences, making it possible to align the look and feel of the BI content with the branding and design of the application.

**Challenges Associated with Power BI Embedded**

**Technical Expertise and Learning Curve:**

Deploying Power BI Embedded requires a high level of technical expertise. The learning curve for developers and IT professionals can be steep, especially in understanding how to embed reports and manage the service.



### Integration Complexity:

Integrating Power BI Embedded into existing systems and applications can be complex. It requires a deep understanding of APIs, custom development, and the ability to resolve compatibility issues.

### Security and Access Control:

Implementing robust security measures and access controls is vital. This includes managing authentication and authorization, especially when integrating Power BI with other applications or services.

### Maintenance and Updates:

Regularly maintaining and updating the embedded solution to keep up with the latest Power BI features and security patches is necessary but can be resource intensive.

### Scalability:

Ensuring the solution scales efficiently with increasing data volumes and user load is crucial. This involves proper planning and capacity management.

## Technical Architecture Components

Implementing Power BI Embedded involves a technical architecture that consists of several key components. These components work together within Azure to facilitate the embedding of Power BI content into applications and websites, ensuring a seamless and efficient experience. Here's an outline of the primary components in the technical architecture of Power BI Embedded:

1

### Power BI Service

**Purpose:** The Power BI service is where the reports, dashboards, and datasets are created and managed. It's the central location for all Power BI content.

**Interaction:** This service is used to publish and update the Power BI content that will be embedded in applications or websites.

2

### Azure Power BI Embedded Service

**Purpose:** This Azure service hosts the Power BI content and provides the APIs necessary for embedding.

**Functionality:** It is responsible for rendering the Power BI content and managing interactions with the embedded reports and dashboards.

3

### Entra ID (Azure Active Directory / AAD)

**Purpose:** Entra ID is used for authentication and authorization.

**Role:** It manages access to Power BI content, ensuring secure and controlled access based on user roles and permissions.



# 4

## Azure App Service

**Purpose:** Hosts the custom application or website where the Power BI content will be embedded.

**Functionality:** This Azure service runs the application logic, handles user requests, and serves the application or website to the end-users.

# 5

## Embedding API (Power BI JavaScript API)

**Purpose:** The JavaScript API is used to embed Power BI reports and dashboards into applications or websites.

**Functionality:** It provides methods to interact with the embedded content, like applying filters, capturing events, and managing the embedded elements.

# 6

## Data Sources

**Purpose:** These are the databases or data storage services where the data for Power BI reports and dashboards is stored.

**Types:** Can include SQL databases, Azure Data Lake, Excel files, third-party services, etc.

**Interaction:** Power BI datasets connect to these data sources to fetch and refresh data.

# 7

## Application Users

**Purpose:** End-users who interact with the embedded Power BI content.

**Interaction:** Users access the application or website, view, and interact with the Power BI reports and dashboards embedded within.

# 8

## Custom Application/Website

**Purpose:** The platform through which the Power BI content is made available to end-users. Components: May include user interfaces, business logic, user management, and other functionalities typical of web or mobile applications.

# 9

## Network Infrastructure

**Purpose:** Ensures secure and efficient data transfer and communication between different components.

**Components:** Includes firewalls, load balancers, and other network components that support the security, scalability, and performance of the application.





## Security Considerations:

Deploying Power BI Embedded brings several security implications that need to be carefully considered and addressed. The integration of Power BI content into external applications and websites expands the accessibility of sensitive data, necessitating robust security measures. Here are the key security implications and considerations:

### 1. Data Access and Authentication:

**Entra ID (Azure Active Directory / AAD) Integration:** Power BI Embedded integrates with Entra ID for authentication. This setup requires careful management of user identities and permissions.

**Access Control:** Implementing and maintaining proper access controls is crucial. You need to ensure that only authorized users can access sensitive reports and data. Row-level security in Power BI can help control data access at a granular level.

### 2. Data Transmission Security:

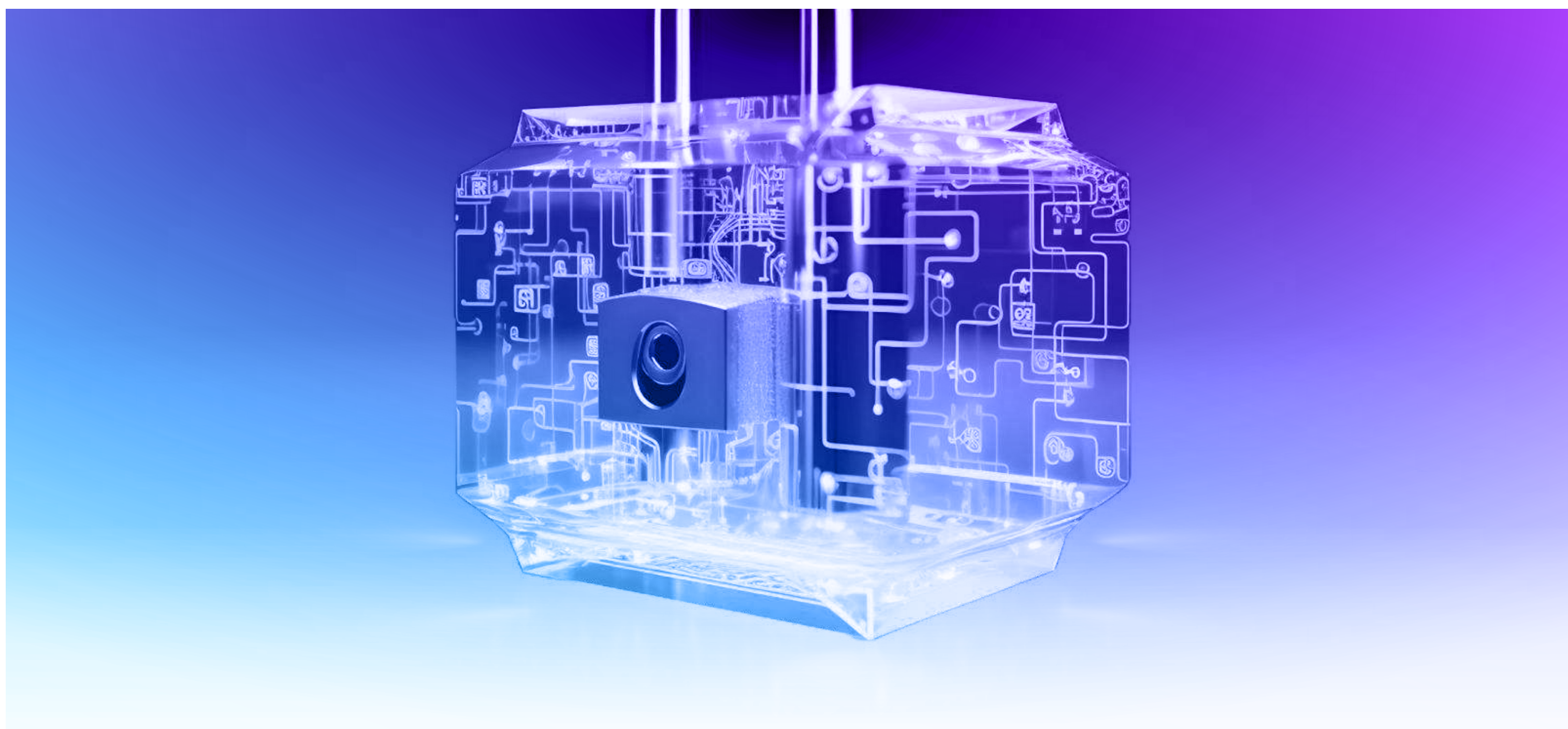
**Encryption:** Data transmitted between Power BI Embedded and the client application must be encrypted to prevent interception and unauthorized access. This typically involves using HTTPS for data transmission.

**Network Security:** The network infrastructure should be secure to prevent data breaches. This includes firewalls, intrusion detection systems, and regular network monitoring.

### 3. Embedding Security:

**Secure Embedding Practices:** When embedding Power BI content into applications, secure coding practices should be followed to prevent vulnerabilities like cross-site scripting (XSS) or SQL injection.





**Since Power BI Embedded is hosted on Azure, it benefits from Azure's built-in security features. However, configurations and settings within Azure should be optimized for security.**

**API Security:** The APIs used for embedding and interacting with Power BI content should be secured to prevent unauthorized access and misuse.

#### **4. Compliance and Data Governance:**

**Regulatory Compliance:** Depending on the nature of the data and the industry, compliance with regulations like GDPR, HIPAA, or others may be necessary.

**Data Governance:** Policies for data governance should be established and enforced, including data classification, handling sensitive data, and auditing data access.

#### **5. Application-Level Security:**

**User Authentication:** The application into which Power BI content is embedded should have its own robust authentication mechanisms.

**User Role Management:** Different users might have different levels of access and privileges within the application, which should be carefully managed.



## 6. Service Security:

**Azure Security:** Since Power BI Embedded is hosted on Azure, it benefits from Azure's built-in security features. However, configurations and settings within Azure should be optimized for security.

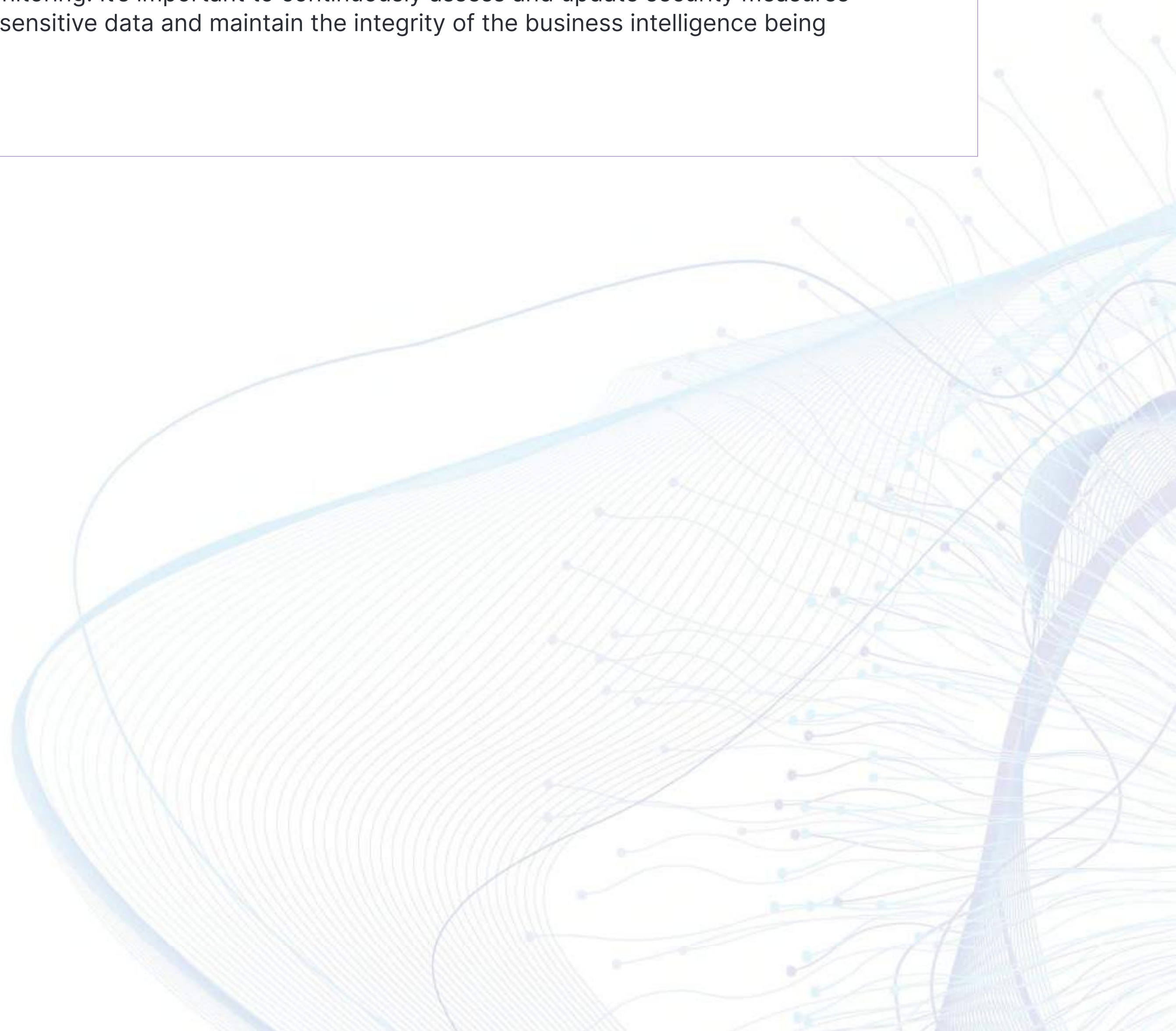
**Service Updates:** Regular updates and patches provided by Microsoft for Power BI and Azure services should be applied promptly to address any known vulnerabilities.

## 7. Monitoring and Auditing:


**Activity Monitoring:** Continuous monitoring of user activities and interactions with the Power BI reports and dashboards is important for identifying suspicious activities.

**Audit Logs:** Maintaining audit logs helps in tracking access and changes, which is crucial for security and compliance.

Deploying Power BI Embedded requires a comprehensive approach to security, encompassing user authentication, data protection, application security, compliance, and regular monitoring. It's important to continuously assess and update security measures to protect sensitive data and maintain the integrity of the business intelligence being provided.





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## **POWER BI EMBEDDED: SHARING CONTENT WITH EXTERNAL USERS**

When it comes to sharing Power BI Embedded reports and dashboards, there are several approaches and methods, each suited to different scenarios and requirements. The most common method for sharing externally is called “embedding for your customers” (often referred to as “App Owns Data”) and the one we are focusing on in this paper. The “App Owns Data” model along with using secure sharing techniques is a robust best-in-class approach to sharing your analytics content with external users.

### **Embedding for Your Customers (App Owns Data Model)**

In the “App Owns Data” model scenario, the application itself authenticates with Power BI, rather than the individual user. This is done using Entra ID (Azure Active Directory / AAD) and an application service principal. It’s particularly useful in scenarios where the end-users do not have Power BI accounts or licenses.

The ideal use-case for this method is best for customer-facing applications where users are external and may not have Power BI licenses. It’s common in scenarios like providing reports to clients through a web-application or in a client portal.



## Embed for your customers

### Integrating content into an external application

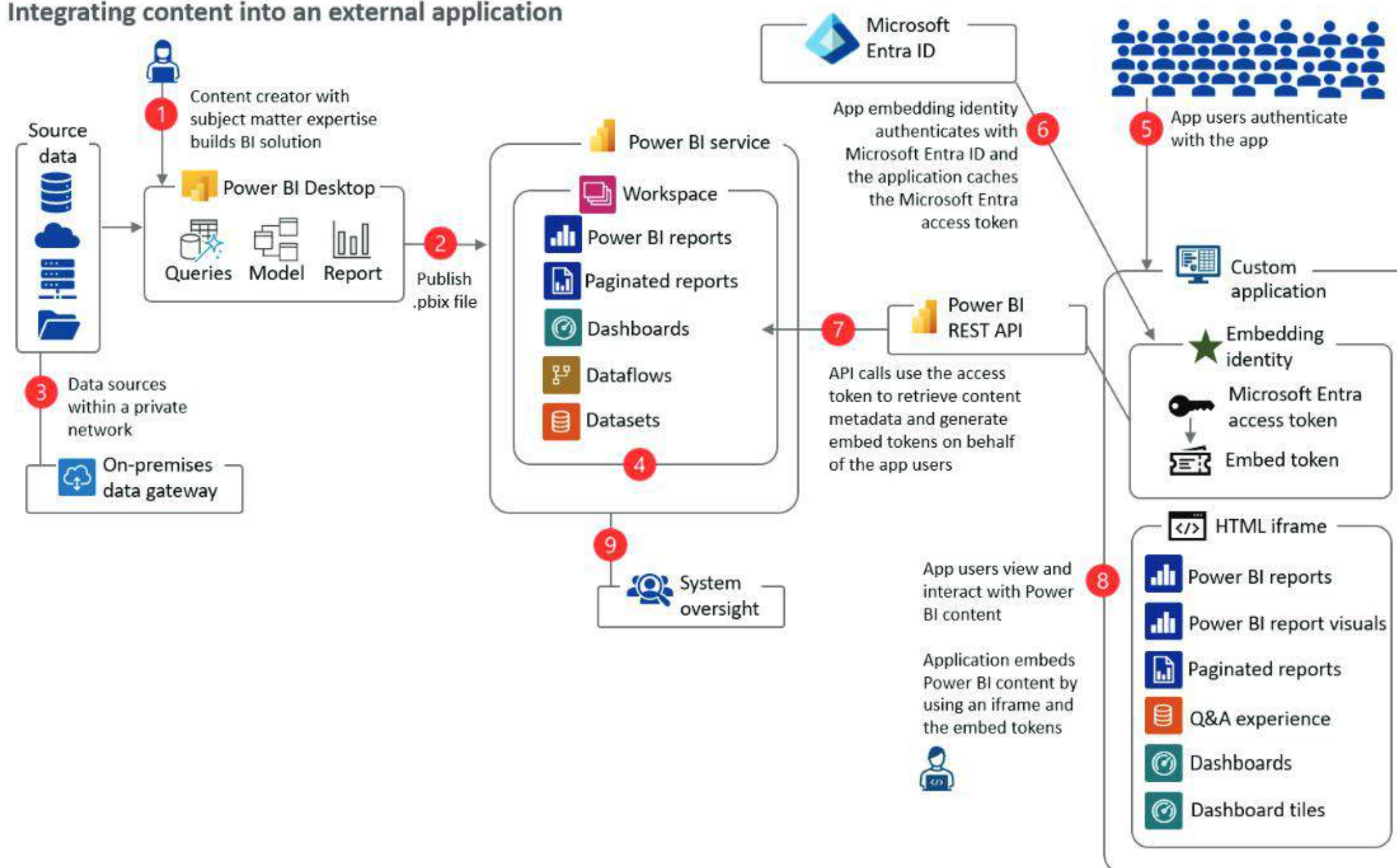


Image Source: <https://learn.microsoft.com/en-us/power-bi/guidance/powerBI-implementation-planning-usage-scenario-embed-for-your-customers>

## Secure Sharing Techniques

Power BI Embedded offers a range of secure sharing techniques to ensure that data and reports are shared in a controlled and secure manner. This is especially important for applications where data security and user privacy are paramount. Here are some key secure sharing techniques used in Power BI Embedded:

### Entra ID (Azure Active Directory / AAD) Integration:

Integrates Power BI with Entra ID for robust authentication and authorization. Entra ID security groups are used to manage user access to Power BI content. Although Entra ID is the default authentication method, additional authentication schemes can be implemented and work independently or alongside Entra ID.

### Row-Level Security:

Implement row-level security (RLS) in Power BI datasets to control what data can be seen by which user, based on their login credentials. RLS is Particularly useful when dealing with sensitive or confidential data that varies per user or security group.

### Using Service Principals for Authentication:

Utilize Entra ID (Azure Active Directory / AAD) service principals for application authentication. This allows applications to have their own identity, improving security and management. Service Principal Profiles can also be used in multi-tenant Power BI Embedded





deployments for an additional layer of segregations and security.

### **OAuth2 Authentication:**

Power BI Embedded uses Entra ID (Azure Active Directory / AAD) and OAuth2 for authentication. This ensures that access tokens are used for secure communication between the application and Power BI service. These tokens can be tightly controlled and have a limited lifespan for added security.

### **Embedding with Token-based Authentication:**

Use Power BI's token-based authentication to securely embed content. Embed tokens ensure that the embedded report is only accessible through the application and cannot be accessed directly. Your application should generate these tokens programmatically, ensuring that they are passed securely to the client for accessing the embedded reports and dashboards.

### **Data Encryption:**

Ensure data encryption both at rest and in transit. Power BI automatically encrypts data at rest, and you should ensure secure (HTTPS) communication for data in transit.

**Power BI automatically encrypts data at rest, and you should ensure secure (HTTPS) communication for data in transit.**



### **Entra ID (Azure Active Directory / AAD) Tenant Restrictions:**

You can enforce tenant restrictions in Entra ID to control which Entra ID (AAD) tenants can access your Power BI content. This is crucial for multi-tenant environments where data segregation is important.

### **Audit and Compliance Features:**

Utilize Power BI's auditing and compliance features to monitor access and usage of reports and dashboards. It's best practice to regularly review audit logs to detect any unauthorized access or anomalies.

The choice of approach for sharing Power BI Embedded content largely depends on your target audience, security requirements, and the level of control you need over the BI content. Embedding for your customers provides a highly integrated and customized experience, especially suitable for external users who don't have Power BI accounts. Secure sharing techniques are crucial for ensuring that data is accessed and shared in compliance with organizational policies and regulatory requirements, providing controlled access to sensitive information. Combining these approaches effectively can create a powerful and secure BI sharing environment that caters to a variety of business needs.

## **Compliance and Regulations Considerations**

### **Power BI Embedded, a Microsoft Azure service, addresses compliance and regulations in several ways, particularly concerning GDPR, HIPAA, and other relevant compliance issues:**

Compliance with GDPR (General Data Protection Regulation): Power BI Embedded adheres to GDPR requirements, which include ensuring data protection and privacy for individuals within the European Union. This compliance includes aspects like data minimization, secure data processing, and providing data subjects with control over their personal data. Power BI Embedded allows organizations to manage and control their data, offering tools and capabilities to support GDPR compliance.

### **HIPAA Compliance:**

The Health Insurance Portability and Accountability Act (HIPAA) sets the standard for sensitive patient data protection in the U.S. Power BI Embedded can be configured to comply with HIPAA requirements. This involves ensuring that appropriate safeguards are in place to protect sensitive health information, managing data access, and maintaining data integrity and confidentiality.





**Power BI Embedded adheres to various industry certifications and standards, such as ISO/IEC 27001, 27018, and more, which are essential for regulatory compliance.**

#### **Data Security and Privacy:**

Power BI Embedded provides robust security features, including data encryption at rest and in transit, advanced threat detection, and secure network connectivity. These features are designed to protect data and ensure privacy, thus addressing various compliance requirements.

#### **Audit and Reporting:**

Power BI Embedded offers extensive auditing and reporting capabilities, which are crucial for compliance. Organizations can track and monitor data access and activities, which is essential for regulatory compliance, including GDPR and HIPAA.

#### **Regional Data Storage:**

Power BI Embedded allows organizations to store data in specific regions, which is particularly important for compliance with regulations that have geographical data residency requirements.

#### **Certifications and Standards:**

Power BI Embedded adheres to various industry certifications and standards, such as ISO/IEC 27001, 27018, and more, which are essential for regulatory compliance.



### Customizable Security Policies:

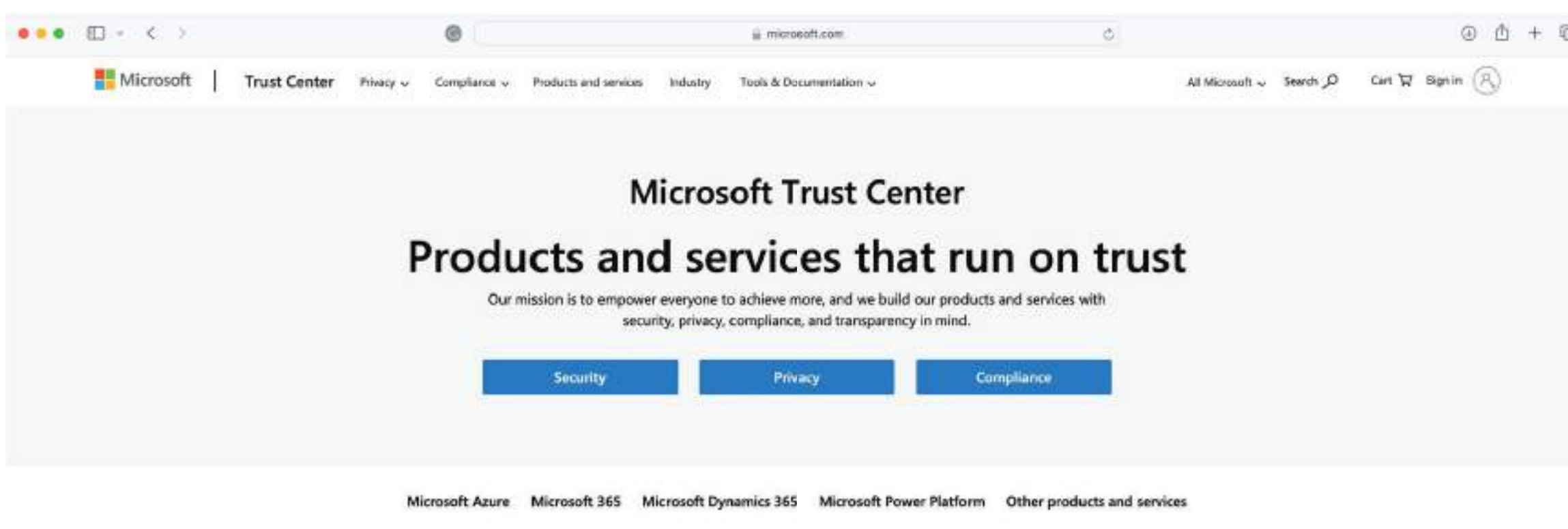
Organizations can implement their security policies in Power BI Embedded to meet specific compliance requirements. This includes role-based access control, data classification, and governance policies.

### Regular Compliance Audits:

Microsoft conducts regular audits of its Azure services, including Power BI Embedded, to ensure ongoing compliance with various standards and regulations.

By leveraging these features and practices, Power BI Embedded helps organizations to address compliance and regulatory requirements effectively, reducing risks associated with data management and analytics.

For more information visit the Microsoft Trust Center. (<https://www.microsoft.com/en-us/trust-center/product-overview>)



### Microsoft Azure





## IMPLEMENTATION STRATEGIES: BUILD VS. BUY

When it comes to implementing a solution with Power BI Embedded, there are two main routes you can take: building your own custom solution or using a pre-built and plug 'n' play software platform. Each approach has its own set of advantages and considerations, and the choice largely depends on your organization's specific needs, technical capabilities, budget, and strategic goals.

### Building Your Own Power BI Embedded Solution:



#### ADVANTAGES

##### Customization:

Building your own solution allows for a high level of customization. You can tailor the integration of Power BI reports and dashboards to fit precisely with your application's UI/UX, workflows, and feature requirements.

##### Control:

You have complete control over the embedding process, data handling, user authentication, and authorization. This can be particularly important for meeting specific security or compliance requirements.





## CONSIDERATIONS

### Technical Expertise Required:

Developing a custom Power BI Embedded solution requires a significant level of technical expertise in both Power BI and software development.

### Resource Intensive:

It requires dedicated resources and ultimately higher up-front cost for development, testing, and maintenance compared to a plug-and-play solution.

### Time Intensive:

Deploying a Power BI Embedded solution from scratch is a time intensive process typically taking months.

### Complexity in Maintenance:

Ongoing maintenance and updates are significant and occur regularly, requiring dedicated IT support and resources.



## Deployment Using a Pre-built Software Platform:



## ADVANTAGES

### Ease of Use:

Plug-and-play solutions are designed for ease of use. They typically require little to no technical expertise and can be deployed more quickly and cost effectively than custom-built solutions.

### Lower Initial Investment:

These platforms often require less upfront investment in terms of resources, and development costs.

### Time-to-Market:

Pre-build solutions are often turn-key that allow you to significantly reduce the time-to-market of your Power BI Embedded solution.





### **Support and Maintenance:**

The platform provider usually offers support and takes responsibility for maintaining the software, which reduces the burden on your IT team.

### **Scalability:**

Pre-built platforms are designed to scale effortlessly with your growing user base.



## **CONSIDERATIONS**

### **Limited Customization:**

While plug-and-play solutions offer convenience and often white-label, brandable and configurable features, they might not offer the same level of customization as a custom-built solution.

### **Dependence on Vendor:**

You are reliant on the vendor for updates, feature enhancements, and support which might not always align with your specific needs or timeline.

The choice between building your own Power BI Embedded solution or using a pre-build software platform should be based on a careful assessment of your organization's specific needs, technical capabilities, budget constraints, and strategic objectives. If you require a highly customized solution and have the resources and expertise, building your own solution may be the way to go. However, if you prefer a quicker, less resource-intensive implementation, a plug-and-play platform could be more suitable.



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## PERFORMANCE OPTIMIZATION: STRATEGIES TO MAXIMIZE PERFORMANCE

Optimizing the performance of a Power BI Embedded deployment is crucial to ensure that users have a smooth and responsive experience when interacting with the embedded reports and dashboards. Here are several strategies you can employ to enhance the performance:

### 1. Optimize Power BI Reports and Dashboards

#### **Simplify Visuals:**

Use simple and efficient visuals where possible. Complex visuals can slow down report rendering.

#### **Reduce Data Model Size:**

Optimize the data model to reduce its size and complexity. Smaller models load and refresh faster.

#### **Limit Data Volume:**

Only load the data necessary for your reports. Use filters to limit the amount of data being processed and displayed.





Optimize DAX Queries: Ensure that DAX (Data Analysis Expressions) queries are well-optimized for performance.

## 2. Effective Data Refresh Strategy:

### **Scheduled Refreshes:**

Use scheduled refreshes to ensure data is up-to-date without overloading the system with frequent refreshes.

### **Incremental Loading:**

If possible, use incremental data loading to refresh only the data that has changed, reducing the load on the system.

## 3. Use Appropriate Power BI Embedded Capacities:

### **Choose the Right Capacity:**

Select a Power BI Embedded capacity (A-SKUs, EM-SKUs, F-SKUs, P-SKUs) that fits your performance needs and expected user load.

### **Monitor and Scale Capacity:**

Regularly monitor your capacity's performance and scale up if needed, especially during peak usage times.

## 4. Caching Strategies:

**Preload Reports:** Preload important reports, especially during off-peak hours, so that they are readily available when users need them.

**Select a Power BI Embedded capacity (A-SKUs, EM-SKUs, F-SKUs, P-SKUs) that fits your performance needs and expected user load.**



### **Cache Management:**

Utilize Power BI's caching capabilities to store frequently accessed data, reducing retrieval times.

## **5. Optimize Application and Network Performance:**

### **Efficient Data Retrieval:**

Ensure that the application retrieving and displaying the Power BI content is optimized for performance.

### **Network Latency:**

Minimize network latency. Consider the geographical location of your Power BI Embedded service and its proximity to your users.

## **6. Leverage Async Rendering:**

### **Asynchronous Loading:**

Use asynchronous loading for reports and visuals. This ensures that the entire page or application doesn't have to wait for the Power BI content to load completely.

## **7. Conduct Performance Testing:**

### **Regular Testing:**

Regularly test the performance of your Power BI reports and the application in which they are embedded.

### **Identify Bottlenecks:**

Use testing to identify and rectify performance bottlenecks.

## **8. Stay Updated with Power BI Changes:**

### **Keep Updated:**

Stay informed about updates and changes to Power BI that may affect performance, such as new features or optimization techniques.

## **9. User Experience Considerations:**

### **Load Essential Content First:**

Load the most critical content first to improve perceived performance.

### **Feedback to Users:**

Provide loading indicators or messages to inform users when reports are loading.



## Monitoring and Maintenance

Monitoring and performing maintenance on your Power BI Embedded environment are crucial for ensuring its continued efficiency and reliability. Here are several key steps and tools you can use to monitor and maintain your Power BI Embedded deployment:

### 1. Utilize Azure Metrics and Logs:

#### Monitor Performance Metrics:

Azure provides various metrics for Power BI Embedded such as Query Duration, Render Duration, and Memory Usage. Regularly check these metrics to monitor the performance of your embedded reports and dashboards.

#### Analyze Logs:

Azure also offers detailed logs that can help you identify issues with report loading, user access, and more. Analyze these logs regularly to detect and troubleshoot problems.

### 2. Report & User Usage Metrics:

#### Usage Metrics:

Monitor the usage of your Power BI reports and dashboards. This can help in understanding user behavior and identifying popular or underutilized reports.

**Audit Logs:** Audit logs can provide information about how users interact with reports, including access times and the types of interactions they are performing.

### 3. Capacity Management:

#### Monitor Capacity Utilization:

Regularly check your Power BI Embedded capacity utilization. If you're consistently hitting capacity limits, consider scaling up your resources.

#### Performance Optimization:

If certain reports are consuming excessive resources, you might need to optimize these reports or allocate more resources.

### 4. Set Up Alerts:

#### Configure Alerts in Azure:

You can set up alerts in Azure to notify you when certain thresholds are reached, such as high memory usage or long query durations.

#### Proactive Monitoring:

These alerts can help you be proactive in addressing performance issues before they impact end users.



## 5. Regularly Update and Optimize Reports:

### Optimize Reports:

Regularly review and optimize your Power BI reports for performance. This includes optimizing DAX queries, reducing report complexity, and improving data models.

### Stay Updated:

Keep your Power BI Desktop and reports updated to the latest version to take advantage of performance improvements and new features.

Optimizing a Power BI Embedded deployment involves a combination of optimizing Power BI reports, choosing the right capacity, managing data refreshes efficiently, implementing effective caching, and ensuring that both the application and network are optimized for performance. Regular monitoring and

## COST ANALYSIS: Understanding Cost Drivers

Deploying a Power BI Embedded solution involves various cost components that you need to consider for effective budgeting and financial planning. The cost structure primarily depends on the Azure services used, the scale of your deployment, and usage patterns. Here are the key elements of the cost structure for a Power BI Embedded deployment:

### 1. Power BI Embedded or Fabric Capacity:

Power BI Embedded and Fabric is Billed through Azure. You'll need to purchase dedicated capacity in Azure, which is priced based on the level of resources and performance you require.

#### Capacity Tiers:

Azure offers different tiers (A-SKUs, F-SKUs, and P-SKUs) for Power BI Embedded, each with its own pricing. A-SKUs are generally for dedicated Power BI Embedded capacities, F-SKUs for Fabric capacities, and P-SKUs for large-scale enterprise deployments.

**Scale Up/Down Flexibility:** You can scale your capacity up or down based on your needs, which will directly affect cost. Higher capacity tiers offer more resources but at a higher price.



## 2. Azure APP Service Plan

The cost of Azure App Service depends on the pricing tier you choose (Free, Shared, Basic, Standard, Premium, Isolated). These tiers differ in terms of features, scalability, and price. The higher the tier, the more features, performance, and scalability options you get, but the cost also increases.

## 3. Development Costs

### Power BI Pro Licenses:

Developers will need Power BI Pro licenses for creating and publishing reports, which incurs a monthly fee per user.

### Development Resources:

Costs associated with the development team who will design, implement, and maintain the Power BI reports and the embedding within applications. This cost will be higher in build-your-own implementation scenario vs. buying a pre-built solution.

## 4. Software License Costs

In a buy implementation scenario, there will be licensing, or subscription fees associated with the software platform being used to deploy Power BI Embedded. These licensing costs are independent of the Azure service and Power BI costs.

## 5. Additional Azure Services

If your deployment uses other Azure services like Azure SQL Database, Azure Functions, etc., these will add to the overall cost.

### To accurately estimate the cost:

Use the Azure Pricing Calculator. Add each component of your deployment to the calculator to estimate the total cost. Consider the scale of your deployment (number of users, amount of data, etc.) as this heavily influences costs, especially for Power BI Embedded.

Review Azure App Service Plan tiers to determine the appropriate level for your application's needs. It's also advisable to monitor your usage and costs regularly through Azure's cost management tools to avoid unexpected charges.

### ROI Analysis:

Calculating the Return on Investment (ROI) for deploying a Power BI Embedded solution involves evaluating both the tangible and intangible benefits against the costs incurred. An effective ROI calculation should consider all relevant factors over a specified period. Here is a framework to guide you through the process:

## 1. Identify Costs (Investment)

Initial Setup Costs: Include development costs, licensing fees for Power BI Pro (for developers), and any initial training or consultancy fees.

### **Operational Costs:**

Ongoing costs such as Azure capacity charges for Power BI Embedded, Software licenses, maintenance, support, and any additional costs for data storage and processing.

### **Upgrade or Scale Costs:**

If scaling up is required during the period of calculation, include these costs as well.

## **2. Quantify Benefits**

### **Direct Financial Gains:**

Increased revenue that can be directly attributed to deploying Power BI Embedded, such as new customers gained or increased sales due to better data insights.

### **Efficiency Gains:**

Savings from reduced time and resources in report generation, data analysis, and decision-making processes. Quantify the labor cost savings.

### **Improved Customer Satisfaction and Retention:**

If applicable, estimate the financial impact of improved customer satisfaction and retention due to enhanced data reporting and insights.

### **Risk Mitigation:**

Estimate the value of any risks mitigated through better data insights, such as avoiding costly errors or making more informed strategic decisions.

## **3. Consider Intangible Benefits**

### **Improved Decision Making:**

While difficult to quantify, enhanced decision-making capabilities due to better data insights can have a significant long-term impact.

### **Competitive Advantage:**

The value of being more data-driven than competitors, leading to potential market advantages.

### **Scalability and Flexibility:**

The long-term benefits of having a scalable solution that can adapt to changing business needs.



## CONCLUSION

In conclusion, Power BI Embedded emerges as a pivotal solution in the realm of business intelligence and data analytics, offering a scalable, cost-effective, and highly integrative approach to delivering insights and sharing content with external users. By harnessing its robust features and leveraging its seamless integration capabilities, organizations can enhance their data-driven decision-making processes and provide their customers and partners with interactive, real-time analytics experiences. The flexibility and security provided by Power BI Embedded ensure that businesses of all sizes can adapt to the rapidly evolving landscape of data analytics, maintaining a competitive edge in their respective industries. As we continue to witness the growth of data-centric business environments, Power BI Embedded stands as a critical tool in empowering organizations to unlock the full potential of their data, foster collaborative insights, and drive innovation.



## About the Reporting Hub

The Reporting Hub is a fully deployed web-based Business Intelligence Portal that seamlessly integrates with Power BI using Azure infrastructure and Power BI Embedded API's. It is a pre-built white label application that deploys within your Azure environment and allows you to instantly scale your Power BI delivery in a more efficient, simplified, and cost-effective manor.

The Reporting Hub allows organizations to instantly take advantage of all the Power BI Embedded benefits without any of the complexity or development effort.

- To learn more please visit: <https://thereportinghub.com>
- To schedule a demo contact: <https://calendly.com/reportinghub/reporting-hub-demo>
- To get started for FREE: <https://docs.thereportinghub.com/getting-started/deployment-step-by-step>



## Additional Resources:

Power BI Embedded Documentation:

<https://learn.microsoft.com/en-us/power-BI/developer/embedded/>

Microsoft Trust Center:

<https://www.microsoft.com/en-us/trust-center/product-overview>

Entra ID Documentation:

<https://learn.microsoft.com/en-us/entra/fundamentals/>

Azure Pricing Calculator:

<https://azure.microsoft.com/en-us/pricing/calculator/>

Power BI Embedded Pricing:

<https://azure.microsoft.com/en-ca/pricing/details/power-BI-embedded/>

Power BI Embedded Capacity Planning

<https://learn.microsoft.com/en-ca/power-BI/developer/embedded/embedded-capacity-planning>

Microsoft Fabric Capacity Pricing:

<https://azure.microsoft.com/en-ca/pricing/details/microsoft-fabric/>

Azure App Service Pricing:

<https://azure.microsoft.com/en-ca/pricing/details/app-service/windows/>