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# Introduction

Traditional monitoring and alerting involved a siloed approach for each infrastructure components such as storage, networking, and compute. These approaches have evolved towards a comprehensive application and service telemetry that can be leveraged for more than monitoring and enable application optimization, discover user insights, and drive business value.

This telemetry based approach provides:

* Visibility: foundational set of metrics, alerts, and notifications across core Azure services
* Insight: analytics and diagnostics across applications, compute, storage, and network resources, including anomaly detection and proactive alerting
* Optimization: Understand how users are engaging with your applications, identify sticking points, develop cohorts, and optimize business impact

## Audience

Use this guide to design, set up and configure Azure monitoring for your application or service.

The content in this guide is appropriate for use by (but not strictly limited to) individuals with the following areas of responsibility:

* Network Architects
* Enterprise Architects
* IT Architects
* Systems/Network Administrators
* CISO
* Security Architect

## Sections

Monitoring in Azure requires a composite view of the underlying infrastructure, third party dependencies, and application or services. This is achieved through the following layered approach:

1. Share Capabilities (Azure Alerts, Dashboards, and Metrics Explorer)
   * Azure service telemetry for monitoring and near real-time alerting.
2. Azure Core Monitoring (Azure Monitor, Azure Advisor, Azure Health)
   * Consolidated and indexed telemetry repository for monitoring, reporting, and alerting
3. Azure Infrastructure Monitoring ( OMS, Service Map, Log Analytics, and Container Monitoring, )
4. Azure Application Monitoring (Application Insights)
   * Application level telemetry
5. PowerBI: Consolidated reporting for trending and reporting distribution to non-technical audiences

![Monitoring](data:text/html; charset=utf-8;base64,)

Monitoring

## Next Steps

1. [Shared Capabilities](2.0-Azure-Shared-Monitoring-Capabilities.md)
2. [Azure Core Monitoring](3.0-Azure-Core-Monitoring.md)
3. [Azure Infrastructure Monitoring](4.0-Azure-Infrastructure-Monitoring.md)
4. [Azure Application Monitoring](5.0-Azure-Application-Monitoring.md)

# Azure Shared Monitoring Capabilities

## Overview

Dashboards, Metrics, and Alerts

The shared capabilities of the Azure monitoring stack can be leveraged to integrate into a consistent view. These include the following components:

Dashboards combine different kinds of data into a single pane in the Azure portal which can then be share with other Azure users. Dashboard can draw on information from different sources including Metrics Charts, Activity Logs, Log Analytics, and Application Insights.

Metrics are numerical values generated by an Azure resource to help you understand the operation and performance of the resource in near-real time.

Alerts provide proactive notification of critical conditions and potentially take corrective action. Alert rules can use data from multiple sources, including metrics and logs.

## Guidance

* Build dashboard to collaborate and work across support, development, testing, security, and infrastructure team and traditional tooling boundaries.
* Restrict access to dashboards and underlying data to authorized personnel.
* Create metric alert rule that sends a notification or takes automated action when the metric reaches the threshold that you have set.

## Procedures

1. Create a Dashboard

* [Create and share dashboards in the Azure portal](https://docs.microsoft.com/en-us/azure/azure-portal/azure-portal-dashboards)
* [Programmatically create Azure Dashboards](https://docs.microsoft.com/en-us/azure/azure-portal/azure-portal-dashboards-create-programmatically)

1. Setup an Alert

[Create, view, and manage alerts using Azure Monitor](https://docs.microsoft.com/en-us/azure/monitoring-and-diagnostics/monitor-alerts-unified-usage) [Create a metric alert with a Resource Manager template]

## Overview

Azure Monitor, Azure Advisor, Service Health, Activity Log

Azure Monitor enables core monitoring for Azure services by allowing the collection of near real-time metrics, activity logs, and diagnostic logs. As such, it provides a point-in-time snapshot of the state of Azure resources.

Azure Advisor analyzes resource configuration and usage telemetry to recommends solutions to improve the cost effectiveness, performance, high availability, and security of Azure resources.

1. Service Health tracks three types of health events that may impact your resources:
2. Service issues - Problems in the Azure services that affect you right now.
3. Planned maintenance - Upcoming maintenance that can affect the availability of your services in the future.

Health advisories - Changes in Azure services that require your attention. Examples include when Azure features are deprecated or if you exceed a usage quota.

The Activity Log reports control-plane events for subscriptions and determine the “what, who, and when” for any write operations taken on the resources in the subscription.

## Guidance

* Enable Diagnostics on virtual machines, particularly if a monitoring agent isn’t being installed. Boot diagnostics are particularly useful for troubleshooting VM boot issues.
* Leverage Azure Advisor cost, performance, high availability, and security recommendations.
* Send these metrics and logs to Azure Log Analytics for trending and detailed analysis, or create additional alert rules to proactively notify you of critical issues as a result of that analysis.
* Add the Azure Activity Log from all subscriptions to Log Analytics to help identify when unexpected or conflicted changes are applied.

## Procedure

1. Azure Monitor

* Following [these steps and pinning all relevant tiles to a dashboard](https://docs.microsoft.com/en-us/azure/monitoring-and-diagnostics/monitoring-get-started) to create comprehensive views of your application and infrastructure.

1. Service Health

* [Pin a personalized health map to your dashboard](https://docs.microsoft.com/en-us/azure/service-health/service-health-overview#pin-a-personalized-health-map-to-your-dashboard)
* [Create activity log alerts on service notifications](https://docs.microsoft.com/en-us/azure/monitoring-and-diagnostics/monitoring-activity-log-alerts-on-service-notifications)

1. Activity Logs in Log Analytics

* [Collect and analyze Azure activity logs in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-activity)

1. Azure Advisor

* [et Azure Advisor Recommendations](https://docs.microsoft.com/en-us/azure/advisor/advisor-get-started#get-advisor-recommendations)

## Overview

### OMS, Log Analytics, Service Map

Operations Management Suite (OMS) is a collection of cloud-based services for monitoring and management the Azure environment. An OMS Workspace serves as a specified location for data storage, provides granularity for billing, ensure data isolation, and provides a scope for configuration.

OMS consists of the following cloud services:

* Log Analytics
* Azure Automation
* Azure Backup
* Azure Site Recovery

## Guidance

* Ensure correct Azure Active Directory tenant for your Organization is linked to the workspace
* Selection of OMS Workspace Model is based on business functions and user needs. In general, multiple workspaces lends itself to and organization with multiple departments, customers, locations, and requirements to charge them separately based on their usage and isolate their data storage.
* In general, multiple workspaces lends itself to and organization with multiple departments, customers, locations, and requirements to charge them separately based on their usage, and isolate their data storage.

|  |  |  |
| --- | --- | --- |
|  | *Single Workspace* | *Multiple Workspaces* |
| PROS | Unifying data collection from nodes, Azure resources, subscriptions, centralizing views & access. Simple to manage, one-time create of Log Analytics resources, Re-use | Distribute data collection from nodes Segregate views & access |
| CONS | No data-isolation | Need to be managed programmatically for scale: define the configuration in ARM template and redeploy and scale when needed. |

The following lists OMS Workspaces patterns to address common enterprise scenarios. These can be used individually, or in combination to address specific requirements.

|  |  |
| --- | --- |
| **Workspace Pattern** | **Description** |
| Global OMS Workspace | Common global OMS workspace for Azure telemetry the items which are global scope ie. Backup, Activity Logs in Azure, NSG’s, Key Vaults etc… |
| Operational Team Workspace | OMS workspaces aligning with operational teams – North America, India, Latin America |
| Reporting Dashboards | Dashboards consumable for non-operational resources for audit, management roles and performance management transparency. |

Use the [Azure role-based access](https://docs.microsoft.com/en-us/azure/role-based-access-control/role-assignments-portal) permission model to provide OMS Workspace Access using the [Log Analytics Reader, and Log Analytics Contributor roles](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-manage-access#managing-access-to-log-analytics-using-azure-permissions).

## Procedure

**1. Select OMS Workspace Approach**

* Review OMS Workspace patterns described above
* [Determine the number of workspace you need](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-manage-access#determine-the-number-of-workspaces-you-need)

**2. Managed OMS Workspace Access**

To grant access to the Log Analytics workspace using Azure permissions, follow the steps in [use role assignments to manage access to your Azure subscription resources](https://docs.microsoft.com/en-us/azure/role-based-access-control/role-assignments-portal).

## Overview

Over the years legacy datacenters have hosting a growing number of solutions where they owner is unclear, the original development team has moved on, the external dependencies are not identified. Profiling, monitoring, and migrating these workloads can difficult in these circumstances.

Through service dependency mapping Service Map can build an inventory of Windows and Linux workloads and establish that dependencies and then you can group applications.

In doing so, Service Map helps eliminate the guesswork of problem isolation by how systems are connected and affecting each other. In addition to identifying failed connections, it helps identify misconfigured load balancers, surprising or excessive load on critical services, and rogue clients, such as development machines talking to production systems.

Service dependency mapping can also be used as part of data center relocation efforts traditionally required small armies. Through dependency mapping tools such as Service Map this can be highly automation.

## Guidance

Leverage Service Map as part of an incremental workload migration to conduct dependency analysis to determine the appropriate workload migration approach: lift-and-shift, modernize, or leave it in place.

## Procedure

**1. Deploy the Service Map Solution from the Gallery**

* [Service Map in the Azure Marketplace](https://azuremarketplace.microsoft.com/en-us/marketplace/apps/Microsoft.ServiceMapOMS?tab=Overview)

**2. Install Dependency Agent**

* [Azure VM Extension](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-service-map-configure)
* [Install the Dependency Agent on Microsoft Windows](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-service-map-configure#install-the-dependency-agent-on-microsoft-windows)
* [Install the Dependency Agent on Linux](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-service-map-configure#install-the-dependency-agent-on-linux)

## Overview

Log Analytics is the Insights and Analytics component of the Operations Management Suite (OMS). Log Analytics is used to correlate information across data sources and provides opportunities for alerting on situations that merit attention.

The high-level approach consists of the following steps: 1. Collecting the Data

* There are different ways of collecting logs and metrics for Azure services:
  + Azure diagnostics direct to Log Analytics (see [Diagnostics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage) in the reference table)
  + Azure diagnostics to Azure storage to Log Analytics (see [Storage](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage) in the reference table)
  + Connectors for Azure services (See [Connectors](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage) in the reference table)
  + OMS Extensions for Azure VMS (See [Extension](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage) in the reference table)
  + Scripts to collect and then post data into Log Analytics (See the [reference table](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage) and for services that are not listed)

1. Querying the Data

* Kusto is the log search syntax is used to combine and correlate any machine data from multiple sources into query results.

1. Analyzing the Data

* Query results are displayed in a table or chart with Smart Diagnostics identifying significant sudden changes.

1. Creating Alerts

* You create Alerts via alert rules that automatically run log searches at regular intervals. If the results of the log search match a particular criterion, an alert record is created.

## Guidance

* Select nearest Azure Region to your Datacenter where Log Analytics and other OMS services are available to reduce latency in data send/receive
* Configure the Log Analytics dashboards to create visualizations of saved log searches.
* IaaS
  + Always use OMS Extension (ARM or PowerShell to deploy) so VM is recognized as an Azure VMs. Do not use DSC to deploy the agent, only to ensure it’s running
  + Enable Diagnostics on virtual machines, particularly if a monitoring agent isn’t being installed. Boot diagnostics are particularly useful for troubleshooting VM boot issues.
* Route all diagnostics to Log Analytics (or Application Insights) to provide analytics, search, and custom alerting on metrics data from resources to gain a holistic view of application health.
* The Azure Marketplace contains the [list of management solutions](https://azuremarketplace.microsoft.com/en-us/marketplace/apps/category/management-tools?page=1&subcategories=management-solutions) for Log Analytics. In addition to collecting data, solutions typically include log searches and views to help you analyze the operation of a particular application or service.
* Begin with the relevant Marketplace solutions and enhance them with individual dashboards and alerts as required. Enable only required solution packs in a phased approach.
* Current [SLA for Log Analytics](https://azure.microsoft.com/en-us/support/legal/sla/log-analytics/v1_1/) states that at least 99.9% of the time, log data will be indexed within 6 hours of the data being queued for indexing by the Operations Management Suite Log Analytics Service.
* Add the Azure Activity Log from all your subscriptions to Log Analytics to help identify when unexpected or conflicted changes are applied.
* There are ingestion and storage costs related to the use of Log Analytics. For custom logs, strategies such as pre-parsing logfiles may be required to ensure the most valuable logs are being processed.
* Use the [Log Analytics Usage](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-usage#understand-the-usage-dashboard) dashboard to review and analyze data usage. Extrapolate usage metrics for production sizing for expanded periods such as month/year: [Analyze data usage in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-usage)
* For reporting including external datasets, Power BI with Log Analytics allows log queries that export their results to corresponding datasets in Power BI. The query-and-export continues to automatically run on a schedule.
* Hybrid
  + OMS Gateway: For large-scale or hybrid or multi-cloud deployments, use OMS gateway to pool and forward logs to LA. For small-scale deployments, use OMS gateway or Direct agent to forward logs to Log Analytics.

## Procedures

### 1. Collect Data

* Leverage Marketplace solution, and iterate
  + [Add a management solution](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-add-solutions)
* Deploy OMS Extension using ARM
  + [OMS Virtual Machine Extensions for Windows](https://docs.microsoft.com/en-us/azure/virtual-machines/extensions/oms-windows)
  + [OMS Virtual Machine Extensions for Linux](https://docs.microsoft.com/en-us/azure/virtual-machines/extensions/oms-linux)
  + QuickStart Template : [Deployment of a Windows VM with OMS Extensions](https://github.com/Azure/azure-quickstart-templates/tree/master/201-oms-extension-windows-vm)
* Additional Data Sources
  + [Collect Azure service logs and metrics for use in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-storage)
  + [Configure collection of Azure PaaS resource metrics with Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-collect-azurepass-posh)
  + Collect custom logs through the [Runbook to Log Analytics](4.5-Runbook-to-Log-Analytics.md) pattern.
* Manage the data volume collected by Log Analytics
  + To avoid incurring unexecpected costs [Create an alert when data collection is higher than expected](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-usage#create-an-alert-when-data-collection-is-higher-than-expected)

## 2. Query the Data

* Understand the Query Language
  + [Getting Started with Queries](https://docs.loganalytics.io/docs/Learn/Getting-Started/Getting-started-with-queries)
  + [Log Analytics Examples](https://docs.loganalytics.io/docs/Examples/Log-Analytics-Examples)
* Integrated external data, or publish to users by [importing Azure Log Analytics data into Power BI](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-powerbi)

## 3. Analyze the Data

* [Create a custom dashboard for use in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-dashboards)
* [Create custom views by using View Designer in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-view-designer)
* [Import Azure Log Analytics data into Power BI](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-powerbi)

## 4. Create Alerts from Log Analytics

* [Create an Alert Rule](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-alerts-creating#create-an-alert-rule)
* Define an action through the [details of the alert rule](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-alerts-creating#details-of-alert-rules)
  + Use [Email Action](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-alerts-creating#email-actions)Send an email with the details of the alert to one or more recipients.
  + Use [Webhook Actions](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-alerts-creating#webhook-actions) to invoke an external process through a single HTTP POST request
  + Select [Runbook Action](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-alerts-creating#runbook-actions) to start a runbook in Azure Automation ## Overview

OMS Management solutions, available from Microsoft and partners in the Azure Marketplace, typically collect information into Log Analytics and provide preset log searches and views to analyze collected data. They may also leverage other services such as Azure Automation to perform actions related to the application or service

## Guidance

* Leverage existing OMS Management solutions and configure them for the specific environment.
* Solutions are typically available at no cost but collect data that could invoke usage charges
* OMS Gallery on the [Azure Marketplace](https://azuremarketplace.microsoft.com/en-us/marketplace/apps/category/monitoring-management?page=1&subcategories=management-solutions).

The following tables lists common foundational management solution:

|  |  |
| --- | --- |
| **Service** | **OMS Gallery Solution** |
| Syslog | [Syslog Data Sources in Log Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-data-sources-syslog) |
| Application Gateway | [Azure Application Gateway Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-networking-analytics#azure-application-gateway-analytics-solution-in-log-analytics) |
| Application Insights | [Application Insights Connector](https://blogs.technet.microsoft.com/msoms/2016/09/26/application-insights-connector-in-oms/) |
| Automation Accounts | [More Information](https://docs.microsoft.com/en-us/azure/automation/automation-manage-send-joblogs-log-analytics) |
| Key Vault | [Key Vault Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-key-vault) |
| Logic Apps | [Logic Apps B2B](https://azuremarketplace.microsoft.com/en-us/marketplace/apps/Microsoft.LogicAppB2B?tab=Overview) |
| Network Security Groups | [Network Security Group Analytics](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-networking-analytics#azure-network-security-group-analytics-solution-in-log-analytics) |
| Site Recovery | [Azure Recovery Services Analytics](https://github.com/krnese/AzureDeploy/tree/master/OMS/MSOMS/Solutions/recoveryservices) |
| Service Bus | [Service Bus Diagnostic Logs](https://docs.microsoft.com/en-us/azure/service-bus-messaging/service-bus-diagnostic-logs) and [Service Bus Analytics Quickstart](https://github.com/Azure/azure-quickstart-templates/tree/master/oms-servicebus-solution) |
| Service Fabric | [Azure Service Fabric (Preview](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-service-fabric) |
| SQL (v12) | [Azure SQL Analytics (Preview)](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-azure-sql) |
| Storage | [Azure Storage Analytics (Preview)](https://github.com/Azure/azure-quickstart-templates/tree/master/oms-azure-storage-analytics-solution) |

## Procedure

Install a OMS Solution from the Azure Marketplace - [Install a management solution](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-solutions#install-a-management-solution) - [Install a QuickStart solution from the community](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-solutions#install-a-solution-from-the-community)

## Overview

Azure Kubernetes Service (AKS) is an Azure offering which reduces the complexity and operational overhead of managing a Kubernetes cluster by offloading it to Azure. As a managed service, AKS does not provide detailed built-in monitoring.

As the same time, Customers will need to be concerned about these services as since they can affect container health and workloads. Customized Kubernetes monitoring for AKS must integrate with the overall Azure Monitoring tools.

## Guidance

* [Container Monitoring](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-containers)
* [AKR Performance](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-container-health)

## Procedure

1. Enable Container Monitoring

* [Installing and configuring the solution](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-containers#installing-and-configuring-the-solution)

1. Enable AKS Monitoring

* [Enable container health monitoring for a new cluster](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-container-health#enable-container-health-monitoring-for-a-new-cluster)
* Enabling monitoring of your AKS container already deployed cannot be accomplished from the portal, it can only be performed using the provided Azure Resource Manager template Enabling monitoring of and existing AKS using the ARM templates. See [Enable container health monitoring for existing managed clusters](https://docs.microsoft.com/en-us/azure/monitoring/monitoring-container-health#enable-container-health-monitoring-for-existing-managed-clusters).

## Pattern Usage

There are scenarios where the details are not accessible through the standard sources. This might include connecting to custom services or extracting specific resource attributes, such as tags. In these situations, collecting data in Log Analytics with an Azure Automation runbook in a practical pattern.

## Implementation

![Runbook](data:text/html; charset=utf-8;base64,)

Runbook

|  |  |
| --- | --- |
| **Component** | **Use** |
| Azure Automation Runbook | PowerShell commands, including Azure cmdlets to collect data from Azure resources. Powershell can also be used to transform the Log Analytics JSON format using ConvertTo-Json. |
| OMS Workspace | Existing OMS Workspace used to monitor Azure resources |
| HTTP Data Collector API | Log Analytics ingestion API used to create a log entry of type Log Automation This can be send to Log Analytics from an Azure AutomationJob using the Send-OMSAPIIngestionFile PowerShell command. |
| OMS Log Analytics Query | Use the OMS Log Analytics Query to join data as required and enrich the Log Analytics data. The AutomationJob\_CL table can be joined with the other types, such as Perf, to create the required response. |
| Visualize and add Dashboard | Use the OMS Log Analytics Chart visualization and pin to the desired dashboard. |

## Pattern Description

**Benefits** - Leverages OMS workspace used to monitor Azure resources - Leverage Azure automation account and runbook and monitoring strategies already in use - Results can be aggregated and joined with existing OMS Log Analytics Data sets.

**Disadvantages**

## Overview

Application Insights

Application Insights is a set of services that provide actionable insight into applications at all stages of the application lifecycle. This data is then integrated into the monitoring and alerting and development tools and process.

The usage of Application Insights consists of the following key scenarios:

* Monitor through dashboard and live metric streams
* Detect, Diagnose correlate failures with exceptions, stackdumps, tracelogs.
* Build, Measure, Lean: measure the effectiveness of newly deployed features

As result, Application Insight telemetry can support both operational and business processes and stakeholders.

## Guidance

* Leverage Application across the application lifecycle (development, testing, and production.) To avoid confusion, send the telemetry from different development stages to separate Application Insights resources, with separate instrumentation keys.

### Monitoring Guidance

* Leverage 2 watcher nodes: the first from within Azure using Network Performance Manager (NPM), the other from outside, such as those provide through Application Insights Availability Tests.
* The following compare the use of Application Insights LiveStream and Azure Monitor Metrics:

|  |  |  |
| --- | --- | --- |
|  | **Live Stream** | **Metrics Explorer and Analytics** |
| Latency | Data displayed within one second | Aggregated over minutes |
| No Retention | Data persists while it’s on the chart, and is then discarded | [Data Retained for 90 Days](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-data-retention-privacy#how-long-is-the-data-kept) |
| On Demand | Data is streamed while you open Live Metrics | Data is sent whenever the SDK is installed and enabled |
| Cost | There is no charge for Live Stream data | Subject to [pricing](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-pricing) |
| Sampling | All selected metrics and counters are transmitted. Failures and stack traces are sampled. TelemetryProcessors are not applied. | Events may be [sampled](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-api-filtering-sampling) |
| Control Channel | Filter control signals are sent to the SDK. We recommend you [secure this channel](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-live-stream#secure-channel). |  |

### Detect and Diagnose Guidance

* Detect application code execution exceptions
* Set Alerts and meaningful thresholds throughout the application lifecycle for the following key application metrics:

|  |
| --- |
| **Guidance** |
| Server Response |
| Failed Requests |
| Page Views |
| Page Load Network Connect Time |
| Send Request Time |
| Client Processing Time |
| Browser Page Load Time |
| Browser Exceptions |
| Server Exceptions |
| Test Duration |
| Availability |
| ASP .NET Request Execution Time |
| ASP .NET Request Rate |
| ASP .NET Requests in Application Queue |
| Available Memory |
| Exception Rate |
| Process CPU |
| Process CPU (all cores) |
| Process IO Rate |
| Process Private Bytes |
| Processor Time |
| Request Rate |

### Build Measure Learn Guidance

* Consider server-side event logging first over client-side (JavaScript).
* Integrating the SDK through Visual Studio and redeploying the application is preferred over leveraging the wizard to drop specific DLLs for Application Insights into your website bin folder.
* Existing applications must manually add the [Application Insights NuGet package](https://www.nuget.org/packages/Microsoft.ApplicationInsights.Web/) to integrate with Application Insights.
* Limit us of multiple trace listeners because they execute sequentially.
* Avoid using the default wadlogstable to store all events to prevent it from becomes so large that data filtering is not possible. Consider e other frameworks like NLog, Log4Net, or Slab in such cases.
* Establish a consistent strategy in terms of event ids, event data structure.
* The [Azure naming convention](https://docs.microsoft.com/en-us/azure/architecture/best-practices/naming-conventions) will be used as starting point.
* Consider Environment, Location, Instance, Service, Role, Object
* Code changes to applications to enable instrumentations will need to be carefully planned/tested. Related code changes should be aligned to deployment release windows.
* Data upload fine-tuning required (in terms of quantity & quality)
* A phased approach required for complex systems to ensure no impact to production systems, can slow down progress
* Logging normalization requires core code changes. ## Procedure

**1. Create an Application Availability Test and Alert**

* [Monitor availability and responsiveness of any web site](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-monitor-web-app-availability)

**2. Detect Application Exceptions**

* [Diagnose exceptions in your web apps with Application Insights](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-asp-net-exceptions)
* [Diagnose sudden changes in your app telemetry](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-analytics-diagnostics#exceptions)
* [Event telemetry: Application Insights data model](https://docs.microsoft.com/en-us/azure/application-insights/application-insights-data-model-event-telemetry)

**3. Pin Application Insights to Azure Dashboard**

* [Add to a dashboard](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-dashboards)

## Overview

Use this guidance to achieving single pane of glass for Microsoft SaaS and Azure solutions.

## Guidance

### O365

Use the [Office 365 management solution](https://docs.microsoft.com/en-us/azure/operations-management-suite/oms-solution-office-365) for OMS to monitor Office 365 environment using Log Analytics

|  |  |
| --- | --- |
| **Advantages** | **Disadvantages** |
| O365 Management Solution collects telemetry from Azure Active Directory and Accounts, Exchange Administration and Mailboxes, SharePoint Administration and Files. | Telemetry is subject to Log Analytics ingestion costs. |
| [Log Analytics query language](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-analytics-tour#browser-timings-table) can be used to search telemetry and Application Insights pinned to Azure dashboard. |  |

### D365 Customer Engagement / CRM

[Organizational Insights](https://docs.microsoft.com/en-us/dynamics365/customer-engagement/admin/use-organization-insights-solution-view-instance-metrics) as part of Dynamics 365 CE is a monitoring solution comes with OOTB dashboards.

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| --- | --- |
| **Advantages** | **Disadvantages** |
| Active Usage - This contains information on the active users, api calls, CRUD operations in the specified time. The System Jobs dashboard provides details on the workflows & system jobs. The Plug-ins dashboard shows the execution and performance of plugins. The Storage dashboard shows the storage used by the tenant, instances and tables in D365. The API Calls Statistics shows the API calls performance which is useful for monitoring and troubleshooting of API calls |  |
| Organizational Insights logs these data into custom entities in CRM and there are multiple ways to monitor these custom entities in Power BI. PowerBI can be utilized to fetch data from online instance directly or an Azure Export Service can be configured to replicate data from Dyn365 to an Azure SQL Server to monitor them in Power BI |  |

### D365 for Finance and Operations / Retail

* Dynamics for Finance and Operations (and Retail) leverages [LCS for lifecycle management and monitoring](https://docs.microsoft.com/en-us/dynamics365/unified-operations/dev-itpro/lifecycle-services/monitoring-diagnostics), Use LCS monitoring and diagnostics to obtain a detailed view of the current state of the D365 instance. However, there is currently no public [LCS API](https://experience.dynamics.com/ideas/idea/?ideaid=19754dbc-3710-e811-80c0-00155d7cb38d).
* D365 (in general) does not support for [Application Insights telemetry](https://experience.dynamics.com/ideas/idea/?ideaid=19754dbc-3710-e811-80c0-00155d7cb38d) keys to provide server-side telemetry.
* To provide application health indicators leverage Application Insights web tests and client-side telemetry to monitor D365 solutions.

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| --- | --- |
| **Advantages** | **Disadvantages** |
| Provides visibility into SaaS-based solution with telemetry on page-load times, browser exceptions, page view events, and page counts. | Telemetry is client-side based and cannot identify server-side cause of applications issues. |
| [Log Analytics query language](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-analytics-tour#browser-timings-table) can be used to search telemetry and Application Insights pinned to Azure dashboard. | Telemetry is subject to Log Analytics ingestion costs. |

## Procedures

**1. Add O365 Management Solution**

* [Add the Office 365 solution to your subscription](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-add-solutions)

**2. Monitor service health from O365 Admin Center**

* [Obtain real-time status of Dynamics 365 (online) and Office 365 services with the Office 365 Admin Center](https://docs.microsoft.com/en-us/dynamics365/customer-engagement/admin/check-online-service-health).

**3. Install the Organizational Insights Solution for CRM**

* [Install and view the Organization Insights solution](https://docs.microsoft.com/en-us/dynamics365/customer-engagement/admin/use-organization-insights-solution-view-instance-metrics

**4. Create a D365 Availability Test and Alert**

* See procedures to create a web application test and alert in [Monitor availability and responsiveness of any web site](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-monitor-web-app-availability).

**5. Enabling Client-Side Telemetry for D365**

* Embed client-side code into D365 solution as described in [Enabling Telemetry for Microsoft Dynamics CRM Online using Application Insights](https://docs.microsoft.com/en-us/azure/application-insights/app-insights-sample-mscrm)

Overview

Microsoft PowerBI is a suite of business analytics tools supporting data analysis and visualization. Azure resource and application telemetry from Log Analytics and Application Insights can be exported to PowerBI dataset and automatically refreshed to publish timely operational and business reporting.

##Guidance

Leverage PowerBI to support the following scenarios:

* The required report combines datasets from sources beyond Azure
* The report audience does not have access to the Azure portal
* When the report requires historical data beyond the Log Analytics or application Insights data retention period
* When the report requires statistical analysis
* When the data are complex such as geospacial.

## Procedure

**1. Activity Log to PowerBI** - [Azure Activity Log Analytics](https://appsource.microsoft.com/en-us/product/web-apps/microsoft-powerbi.pbisolntemplate_azure_activity_log?tab=Overview)

**2. Azure Log Analytics and PowerBI** - [Import Azure Log Analytics data into Power BI](https://docs.microsoft.com/en-us/azure/log-analytics/log-analytics-powerbi)

**3. Application Insights and PowerBI** - [Connect to Application Insights with Power BI](https://docs.microsoft.com/en-us/power-bi/service-connect-to-application-insights)

**4. D365 PowerBI**

**5. Configure PowerBI Adapter for CRM** - [Download the PowerBI Content Packs](https://technet.microsoft.com/en-us/library/dn708055.aspx#Anchor_1) - [Embed PowerBI Visualizations in Dashboards](https://technet.microsoft.com/en-us/library/dn708055.aspx#Anchor_2) - [Connect with PowerBI Desktop](https://technet.microsoft.com/en-us/library/dn708055.aspx#Anchor_3)

**6. O365 to PowerBI**