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Developing and Deploying Multicloud .NET Apps with Oracle Database

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Developing and Deploying Multicloud .NET Apps with Oracle Database



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Agenda

Multicloud: AWS, Azure, Google
Cloud, and Oracle Cloud

Centralized Configuration Providers

Cloud Single Sign-on

Cloud Application Performance
Monitoring

Multicloud: AWS, Azure, Google Cloud, and Oracle Cloud

Organizations want multicloud

98%

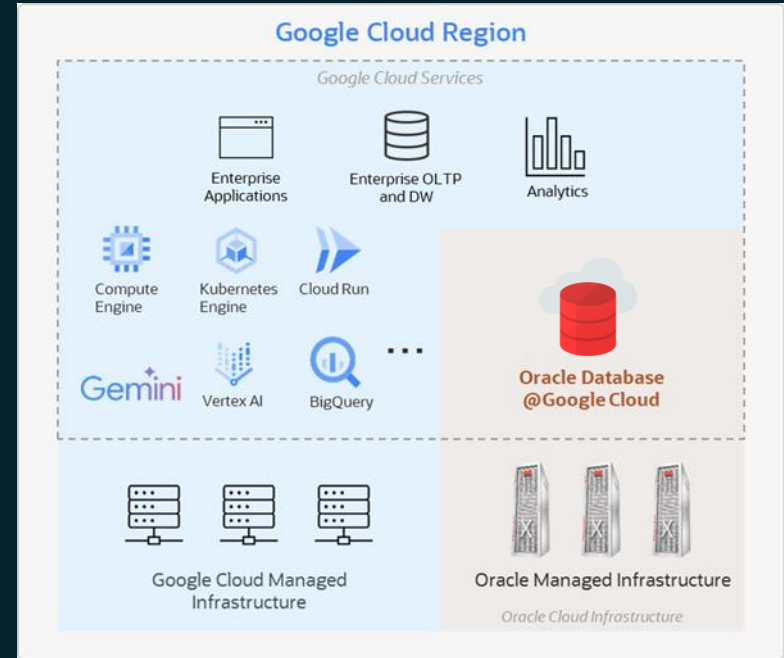
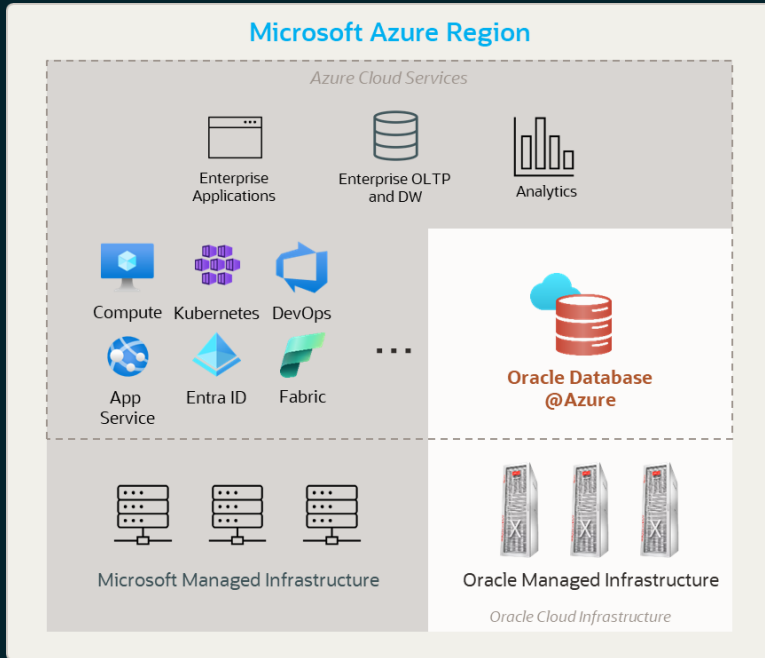
of companies in the cloud
use two or more clouds

Motivators

- Best-of-breed cloud services and applications
- Business agility and innovation
- Cloud vendor lock-in concerns
- Data residency
- Cost optimization

Source: S&P Global Market Intelligence 2023

Innovate with Oracle, Microsoft, and Google Services



App developer and administrator challenges

Challenge: Managing apps and users across clouds (and on-premises)

1. App configuration storage

- Connect descriptors and ODP.NET settings

2. Passwords and secrets storage

3. User identity

Goal: Store cross-cloud info into a central location



ODP.NET configuration providers

Centralize configuration location and enable single sign-on

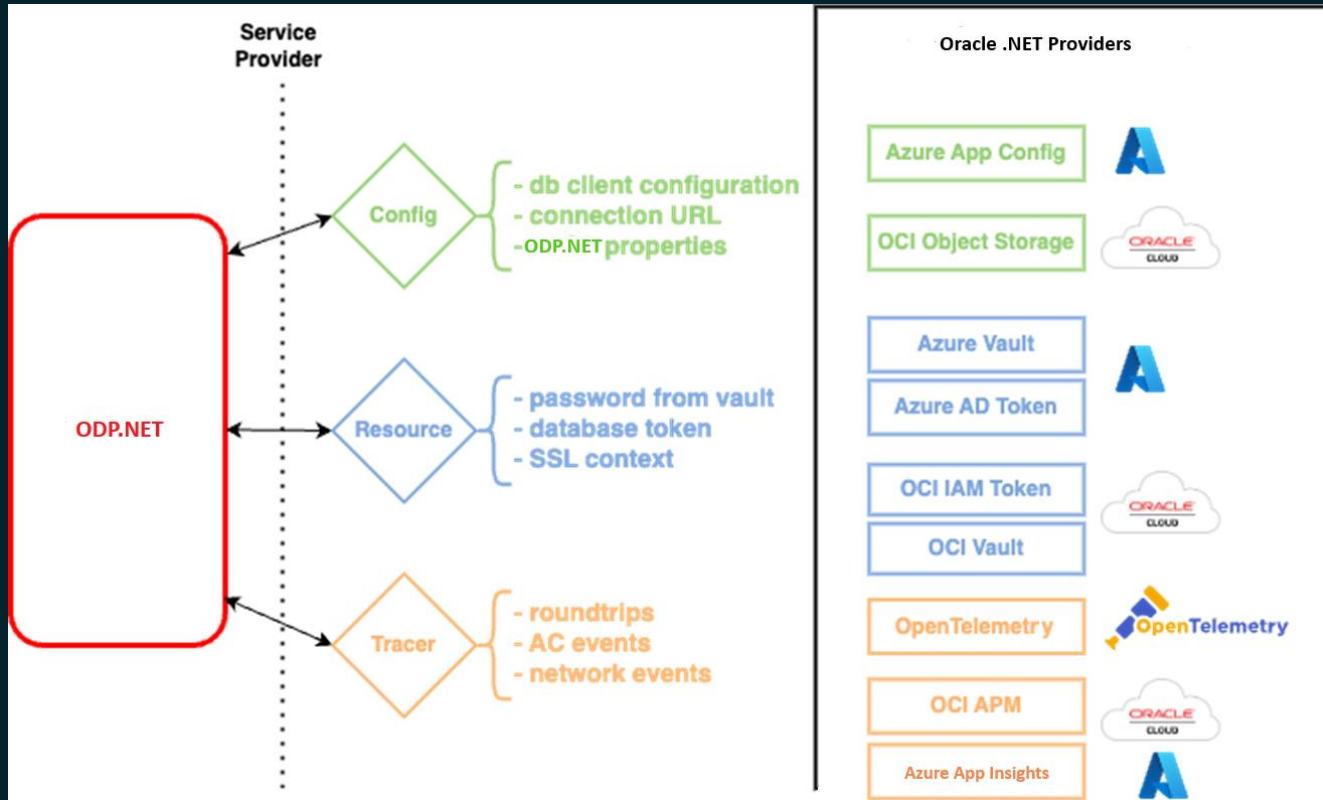
Benefits

- Easy to manage
 - Single location
 - No duplicates to manage
- Easy to update
 - No duplicates that can become out of sync
 - No app recompile nor redeployment required
- Better security
 - Store secrets in a cloud vault or use cloud directory services



Centralized Configuration Providers

ODP.NET centralized configuration provider



ODP.NET centralized configuration providers



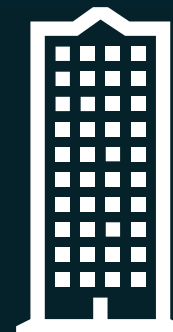
Azure

NuGet package:
Oracle.ManagedDataAccess
.Azure



Oracle Cloud

NuGet package:
Oracle.ManagedDataAccess
.Oci



IaaS and On-Premises

NuGet package:
Oracle.ManagedDataAccess
.ConfigFile

ODP.NET connection string URL

Azure syntax

```
config-azure://{Config Name}[?Key=Prefix&Label=Value&Option1=Value1&Option2=Value2...]
```

OCI syntax

```
config-ociobject://{Object-Url}[?key=name&option1=value1&option2=value2...]
```

Local file syntax

```
config-file://{File Path}[?Key=name&tns_admin=filepath]
```

ODP.NET sample connection string URL – Azure

```
// This ODP.NET URL uses Azure Managed Identity authentication
string connectionString = "config-azure://MyConfig?key=
    MyConnection/&Label=production&Authentication=Azure_Managed_Identity&
    Azure_Managed_Identity_Client_Id=111abccd8-18cc-4fa0-bf7b-d894e5981c67";
OracleConnection conn = new OracleConnection();
conn.ConnectionString = connectionString;
conn.Open();
```

ODP.NET Azure App Configuration and Key Vault sample

KEY	VALUE	LABEL
MyConnection/user	HR	production
MyConnection/ password	{“uri”: https://mykey.vault.azure.net/secrets/odppassword“}	production
MyConnection/ connect_descriptor	(description=(retry_count=20)(retry_delay=3) (address=(protocol=tcps)(port=1522)(host= adb.us-phoenix-1.oraclecloud.com))(connect_data= (service_name=mydb_high.adb.oraclecloud.com)) (security=(ssl_server_dn_match=yes)))	production
MyConnection/ODP/ Max Pool Size	200	production
MyConnection/ODP/ Connection Timeout	60	production

ODP.NET vault URL

Azure syntax

```
config-azurevault://{Secret Identifier}[?key=name&Option1=Value1&Option2=Value2...]
```

OCI syntax

```
config-ocivault://{Secret OCID}  
[?VersionNumber=Value1&Stage=Value2&key=name&Option3=Value3&Option4=Value4...]
```

Demo: ODP.NET Centralized Configuration Provider

Azure App Configuration and Azure Vault

Automated connection attribute refresh

ODP.NET connection info cached locally for better performance

Azure and OCI can refresh ODP.NET connection values

- Polling (pull)
 - Developer sets `config_time_to_live` to determine poll interval
- Change notification (push)
 - Azure: uses Event Grid and Service Bus
 - OCI: uses Event Listener and Notifications

Automatic Password Refresh



Cloud Single Sign-On

ODP.NET cloud single sign-on

Logon once to cloud directory server and be authenticated to Oracle Database

- Uses OAuth 2.0 tokens
- ODP.NET automatically retrieves, manages, caches, and refreshes access tokens
- App supplies authentication information for correct token retrieval

Benefits

- Developers: Eliminates most application token management code
- Administrators and end users: Fewer credentials to manage

Supported cloud directory services

- Oracle Cloud Infrastructure Identity and Access Management (IAM)
- Microsoft Entra ID/Azure Active Directory



ODP.NET cloud single sign-on



Azure

Stores database credentials
in Microsoft Entra ID

Oracle.ManagedDataAccess
.Azure



Oracle Cloud

Stores database credentials
in OCI IAM

Oracle.ManagedDataAccess.
Oci

ODP.NET authentication flows

OCI IAM

- API key
- Delegation token
- Instance principal
- Interactive
- Default – chooses first configured flow in following order
 - API key
 - Delegation token
 - Instance Principal

Azure

- Managed identity
- Service principal
- Interactive authentication
- Username and password
- Device code
- Default – chooses first configured flow in following order
 - Service principal
 - Username and password
 - Managed identity
 - Visual Studio credentials

ODP.NET sample Microsoft Entra ID single sign-on

```
var conn = new OracleConnection("User Id=/;Data Source=<NET SERVICE NAME>");
var tokenConfig = new AzureTokenAuthentication
{
    ClientId = "<VALUE>",
    TenantId = "<VALUE>",
    DatabaseApplicationIdUri = "<VALUE>",
    RedirectUri = "<VALUE>"
};
conn.WalletLocation = @".\wallet";
conn.TokenAuthentication = OracleTokenAuth.AzureInteractive;
conn.UseAzureTokenAuthentication(tokenConfig);
conn.Open();
```

Demo: ODP.NET Cloud Single Sign-on

Microsoft Entra ID (a.k.a. Azure Active Directory)

Cloud Application Performance Monitoring (APM)

ODP.NET cloud APM

Collect ODP.NET traces and metrics in the cloud

- OpenTelemetry traces
- .NET metrics

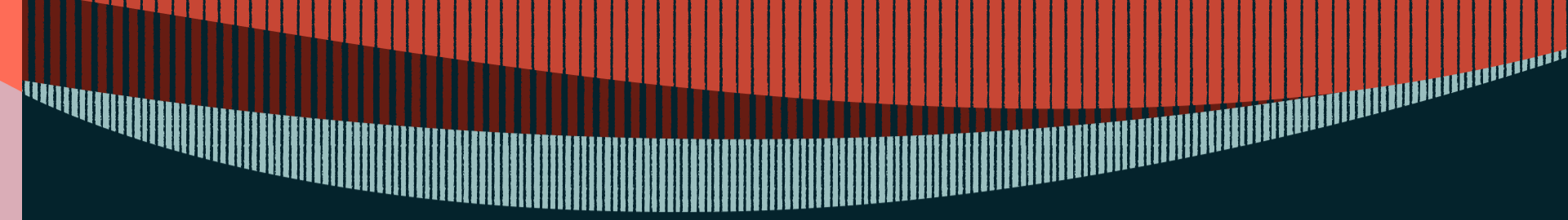
No ODP.NET-specific APM provider required

- Requires setup specific to APM cloud provider

Works with any APM

- Including OCI APM and Azure App Insights





Demo: Multicloud Monitoring using OpenTelemetry and .NET Metrics

Azure App Insights

Additional Oracle .NET Resources



Oracle.com
otn.oracle.com/dotnet



GitHub
github.com/oracle/dotnet-db-samples/



X (formerly Twitter)
x.com/OracleDOTNET



YouTube
youtube.com/OracleDOTNETTeam



Email
alex.keh@oracle.com



CloudWorld Demogrounds
Developer Productivity, Tools, Drivers, and Open Source Booth

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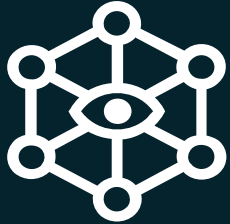
Customers provide feedback directly to Oracle .NET management leaders

Oracle briefs customers on future product direction

To learn more, contact alex.keh@oracle.com



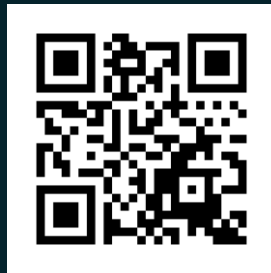
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