

ORACLE **AUTONOMOUS DATABASE** **LEARNING LOUNGE**



Data streaming with Kafka made simple: Transactional Event Queues in ADB

Autonomous Database Learning Lounge

Hosted by Marcos Arancibia

Autonomous Database Product Management

Agenda



**Anders
Swanson**



**Ben
Kocabasoglu**



**Nithin
Thekkupadam
Narayanan**

Oracle **Transactional Event Queues** (TxEventQ) is a high-performance **messaging platform** included with Oracle Database as a **built-in feature**, supporting real-time messaging and streaming events, with minimal setup at no added cost.

Topics

- How to use **Oracle Kafka connectors** to easily source and sink data **to and from Oracle Database** using TxEventQ.
- How to **eliminate the need for Kafka clusters** by directly connecting your Kafka applications using TxEventQ.

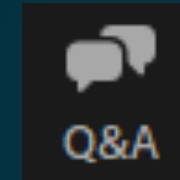
Q&A

- **Product Managers** will answer any questions

Before we begin...

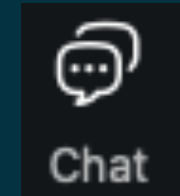
This session is for you !!!

Ask your questions using **Q&A**



Product Managers are monitoring your questions

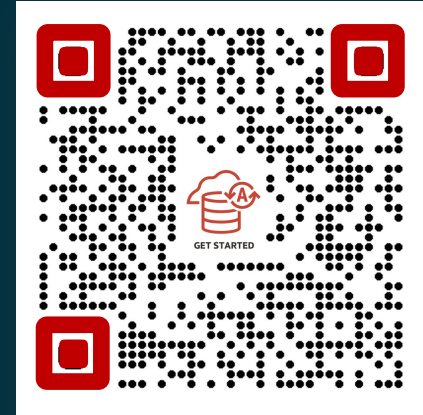
We will share links in **Chat**



The recording will be made available in a few days at
oracle.com/goto/adb-learning-lounge

Important links to bookmark

Links to get you started and to keep up to date with Autonomous Database



1 New Get Started page:
oracle.com/autonomous-database/get-started/

2 Join us: **LinkedIn**
bit.ly/adb-linked-in-grp [@AutonomousDW](https://twitter.com/AutonomousDW)

Bluesky
autonomusdb.bsky.social

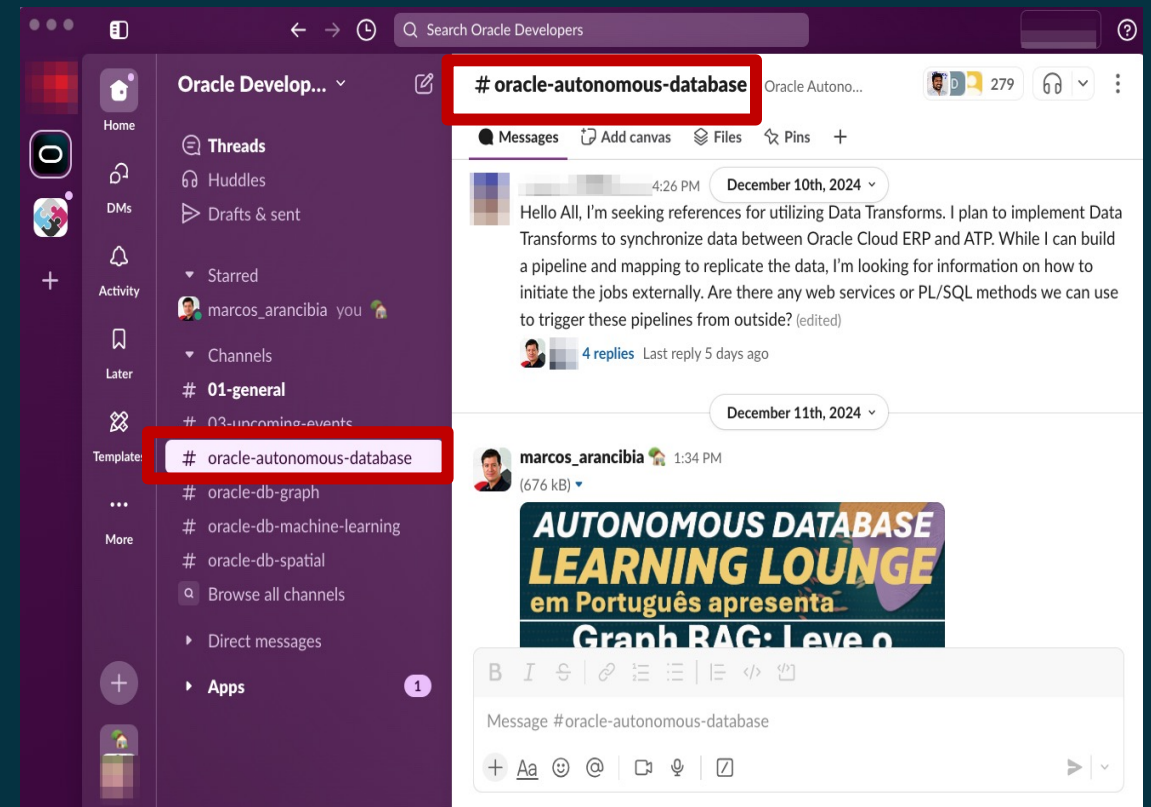
3 Got a question?
We are on stackoverflow
bit.ly/adb-stackoverflow

Join us on Developers Slack
(search #oracle-autonomous-database)
bit.ly/odevrel_slack

Join our External Slack

STEP 1: Join our Slack workspace at:
bit.ly/odevrel_slack

STEP 2: **search for #oracle-autonomous-database**
at the top and click on the Channel



Speakers



**Anders
Swanson**



**Ben
Kocabasoglu**



**Nithin
Thekkupadam
Narayanan**

ORACLE

Oracle Transactional Event Queue (TxEventQ)

Unifying the best of messaging and pub/sub for events with Kafka interoperability in your Autonomous Database

Anders Swanson, Ben Kocabasoglu, Nithin Thekkupadam Narayanan
Oracle TxEventQ
May 6, 2025

Outline

- ❖ Introduction to event streaming and TxEventQ
- ❖ Why TxEventQ – key differentiators and benefits of event streaming in database
- ❖ Integrations and compatibility
- ❖ Demo

Event streaming

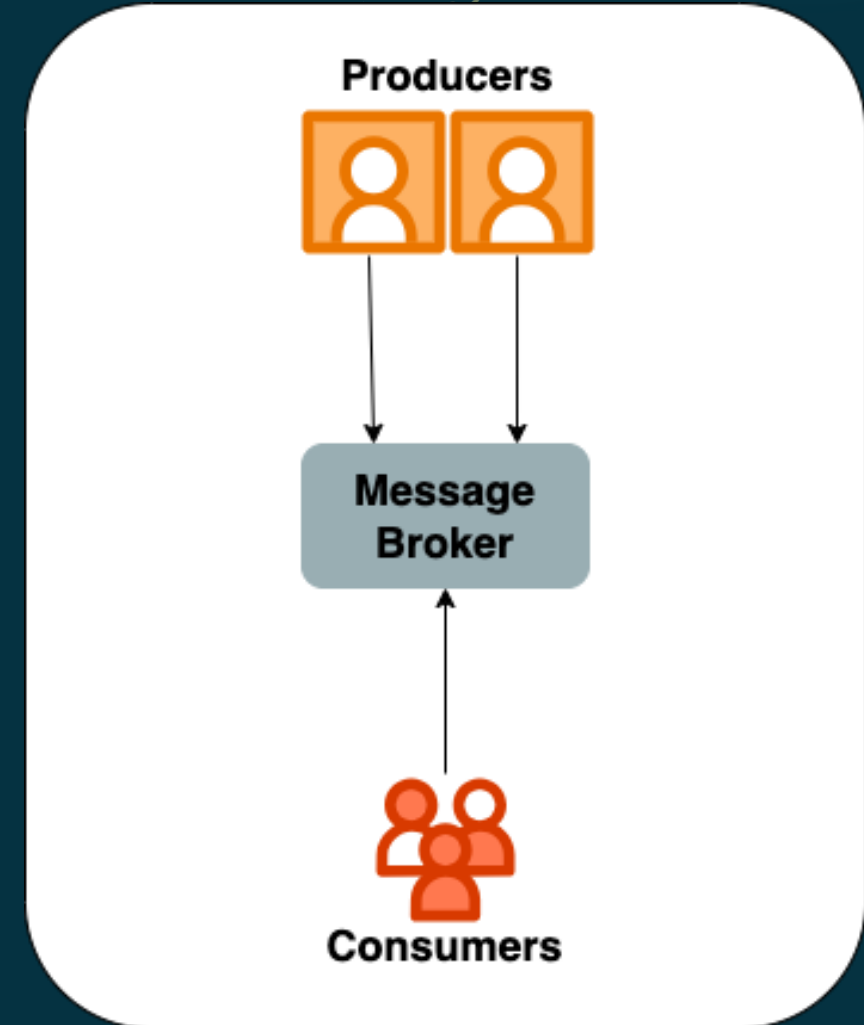
Let's start with what event streaming systems are

“...service(s) that facilitate communication between systems, acting as an intermediary for message exchange”

Primarily, messaging systems function to:

- Enable services to communicate without needing to be online at the same time.
- Ensure messages follow a specific structure for consistency.
- Direct messages to the correct destination and ensure they are delivered.
- Save copies of messages to storage for reliability and recovery.
- Handle large volumes of messages efficiently and can scale as needed.

There are many event streaming products and solutions including Oracle, Kafka, RabbitMQ, and NATS



When and why to use event streaming systems?

Event streaming applications support synchronous and asynchronous modes of communication

Synchronous communication like REST or gRPC is:

- Stateless, effective for services consumed by external clients over the internet
- Tightly coupled, participating services must be available for the duration of the request
- More challenging to scale
- Susceptible to cascading failures and a large "blast radius"

Asynchronous communication using event-driven architectures is:

- Resilient when encountering delays and upstream service failures
- Scalable, retrievable, and decoupled
- More complex to implement, monitor, and manage

Recommended Approach: **Synchronous** communication for public interfaces, **asynchronous** communication for internal event-driven architectures

Oracle TxEventQ enables scalable, reliable, and low-latency event streaming



Autonomous Database (ADB) introduced **Transactional Event Queue** (TxEventQ) in 19c to enhance the capabilities of its already popular Advanced Queues.

It has helped customers across diverse industry verticals to achieve business agility



Geocoding and routing



Personalized marketing



Electronic health record systems



Agile IT infrastructure



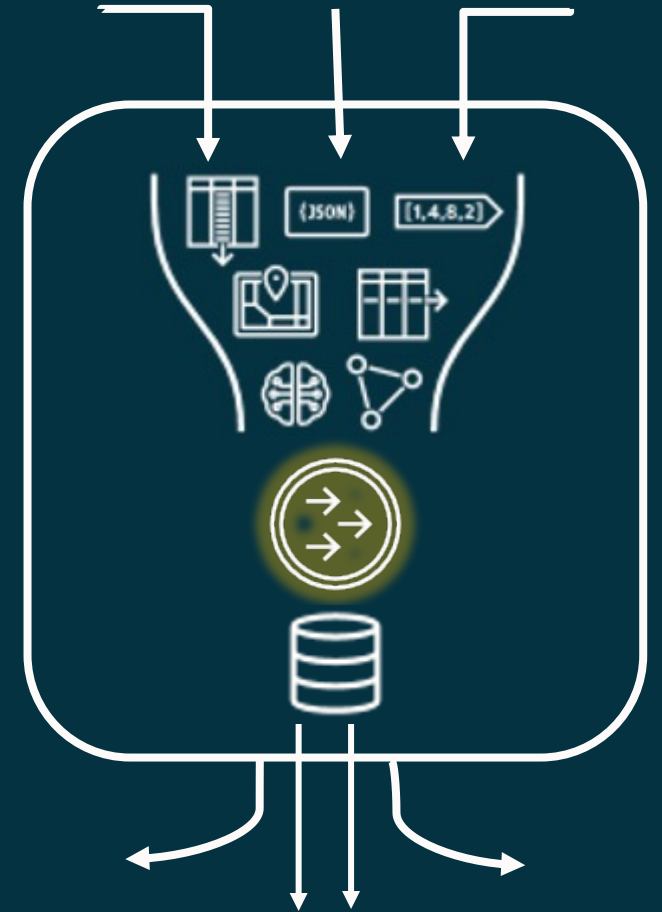
Ecomm Order Processing



Smart Power Meters (IoT)

What is TxEventQ

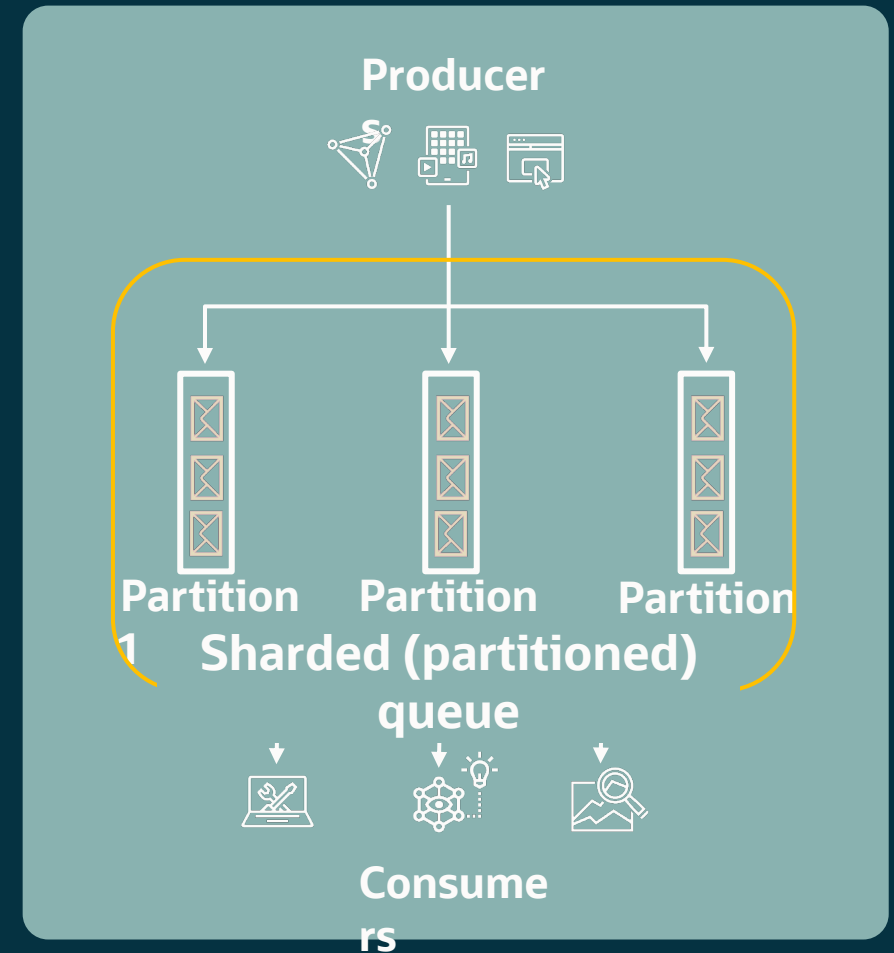
- Combines pub/sub and point-to-point messaging in a **single feature** at **no added cost**
- Available **on ADB, on-premises**, and anywhere you have an Oracle database
- **Kafka-compatible APIs** enable direct connection to database without a Kafka cluster
- Supports multiple languages, interfaces, and data types
- Allows event streaming and DML operations in a single local transaction
- Guarantees **exactly once** message delivery and **ACID** compliance
- Reduces development efforts in application with **rich messaging functionalities**



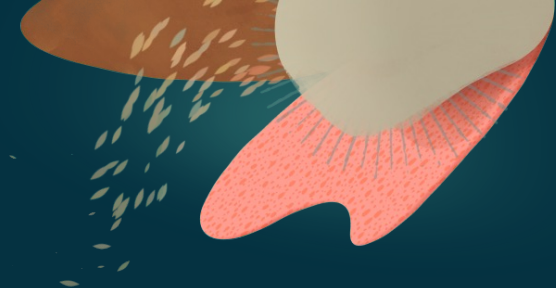
TxEventQ is designed for **highly performance** and to **scale** vertically and horizontally

TxEventQ's **sharded architecture** allows you to scale across multiple cores or database instances

- **In-memory implementation** handles billions of messages/day
- Special purpose **message cache** with **redesigned queue tables** reduces database operations for high performance
- Supports real-time **monitoring** with Prometheus/Grafana
- Inherits all the Oracle database **security** features
- **Propagation feature helps** to distribute and consolidate messages for recipients without overloading a queue



Event-streaming challenges and how TxEventQ can help



Challenges		Mitigation using TxEventQ
Barrier to entry	Setting up a new event streaming platform requires expertise and infrastructure investments	TxEventQ is a feature in ADB and requires no additional infrastructure
2-Phase Commit (2PC) Problem	Coordination across messaging platform and database adds complexity in application	TxEventQ combines atomic writes with in-memory implementation to prevent 2PC problem and to ensure high performance
Security	Additional components introduce more security vulnerabilities	TxEventQ inherits all security features of Oracle database
Data Divergence or Loss	Even small inconsistencies can lead to significant data divergence over time.	TxEventQ ensures data consistency and integrity through exactly-once delivery and robust transactional support
ACID Properties	Messaging systems prioritize throughput over strict ACID compliance	TxEventQ, as a feature within the database, adheres to ACID properties



TxEventQ offers a rich set of messaging features

TxEventQ provides many messaging features that applications may otherwise need to build themselves

Enqueue options

Visibility: Determines when the message becomes visible to consumers (e.g., immediate or delayed).

Priority: Sets the priority of the message, which can affect the order in which messages are dequeued.

Delay: Specifies a delay time before the message becomes available for dequeuing.

Expiration: Defines how long the message remains in the queue before it is automatically removed.

Transformation: Allows for message transformation before enqueueing (though this is not supported in all implementations).

Recipients: Specifies the list of recipients for the message, which can override the default subscriber list

Dequeue options

Visibility: Determines whether the message is visible to other consumers while being processed.

Wait Time: Specifies how long the dequeue operation should wait (or timeout) for a message to become available.

Dequeue Mode: Defines the mode of dequeuing, such as browsing (reading without removing) or locking (reading and locking the message).

Consumer Name: Identifies the specific consumer for multi-consumer queues.

Filtering: Allows filtering messages based on a pre-defined key or conditional expression.

Message ID: Enables retrieval of a specific message by its unique identifier

And much

Modern Apps use multiple data technologies

To enable richer **experiences** for users, and more **value** for enterprises

New Types of Data



Relational

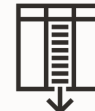
{ JSON }

Documents



Spatial

New Types of Analytics



SQL



Machine
Learning

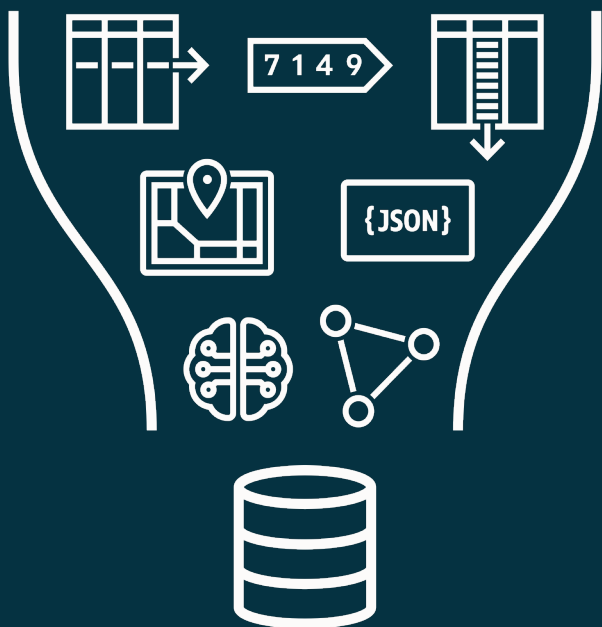


Graph

TxEventQ supports all datatypes that
ADB supports

Rich support for Java, C/C++, Python,
and .NET, combined with high
performance, empowers your
analytics applications.

ADB's Converged Database Architecture is your answer



Provides Complete & Simple support for **all** modern data types, workloads, and development styles in **one database**

With Complete & Simple consistency, scalability, and availability

Think of it as the **Smartphone of Data**

- New data technologies are **features**, not separate **products**
- To use a new data type or workload you **add a queue**, instead of adding a database

TxEventQ simplifies building event streaming applications on your Converged Database, eliminating the need for a separate messaging platform

Integrations and compatibility



—
Supports a diverse ecosystem

Spring framework

The Spring Framework is highly popular among Java developers who want to simplify application development with features like dependency injection and transaction management

The **Spring cloud stream binder API** lets you seamlessly integrate TxEventQ with Spring Cloud Stream

Spring starter for JMS and Kafka helps you autoconfigure your clients by providing pre-configured templates and settings, reducing the need for manual setup and ensuring consistent configurations.



Interoperate with or replace your Kafka clusters

TxEventQ is architecturally similar to Kafka, and you can interoperate with Kafka ecosystem in more ways than one

With Oracle Kafka Connectors for TxEventQ, you can move events between Oracle Database and a Kafka cluster

OR

You can use Kafka Clients Java APIs to produce to and consume from TxEventQ directly in your Oracle database, without needing a Kafka cluster





Key Takeaways

- 1 TxEventQ is a feature of ADB with no added cost
- 2 It is highly scalable, performant and can be enabled on any cloud
- 3 Enables modern application development with support for a variety of datatypes and APIs
- 4 Its rich messaging features within the database avoids the need for redundant infrastructure
- 5 It offers exactly once semantics and ACID compliance

Get Started Today with Transactional Event Queues



- Developer Guide: <https://oracle.github.io/microservices-datadriven/transactional-event-queues/>
 - Code Samples for Java, JMS, Kafka APIs, PL/SQL
 - Monitoring and Observability with the Oracle Database Exporter
 - Performance Tuning
 - Migrate from Advanced Queuing to Transactional Event Queues
- Code Samples: <https://github.com/oracle/spring-cloud-oracle/tree/main/database/starters/oracle-spring-boot-starter-samples>
 - Spring JMS
 - Spring Cloud Stream Binder
 - Kafka Java Client for Oracle Database Transactional Event Queues
- Oracle Documentation: <https://docs.oracle.com/en/database/oracle/oracle-database/23/adque/aq-introduction.html>
- How to reach us:
<https://support.oracle.com/> (Product - Oracle Database - Enterprise Edition, Problem Type>Information Integration>Advanced Queuing. (mention TxEventQ in the description.

Oracle Sessionless Transactions & REST

- Allows a database session to **suspend** a local (non-XA) transaction and **resume** it later in a different database session
- Transaction can be eventually committed or rolled back in yet another session
- Using ORDS and Sessionless Transactions, developers can build RESTful Web Services interfaces that span a database transaction across multiple REST calls (including REST calls for TxEventQ)
- For more information, see blog <https://bit.ly/oracle-sessionless-transactions>

Database transaction can span many REST calls to an Oracle database involving both event streaming and database (DML) activity

Building event streaming in the database reaps benefit from new database features



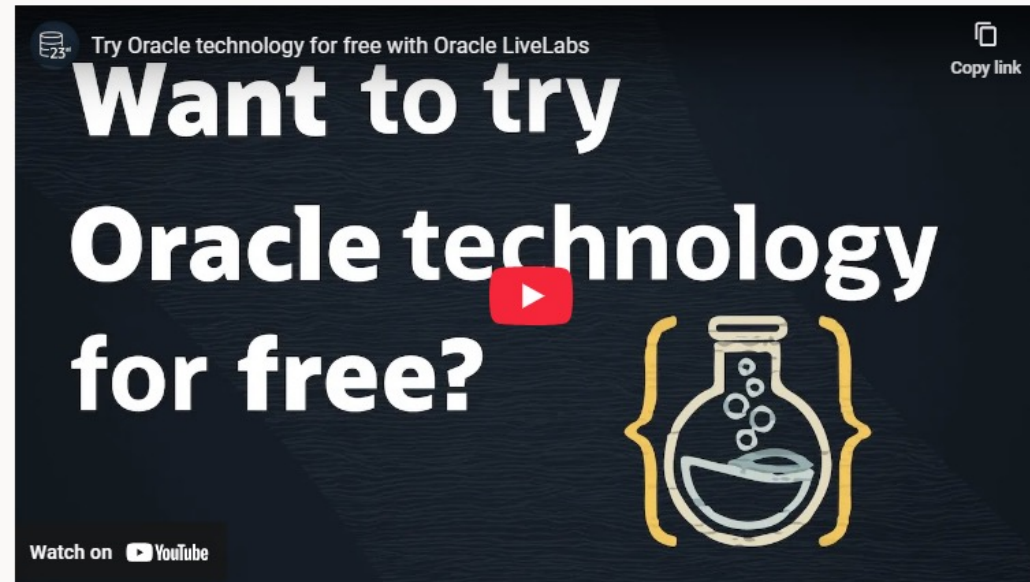
Get Hands-On with Oracle Database Transactional Event Queues

livelabs.oracle.com

Getting Started With Oracle Database Transactional Event Queues

Share

Start



1 hour, 30 minutes

Outline

- Introduction
- Get Started
- Lab 1: Setup the environment for TxEventQ
- Lab 2: Core Concepts
- Lab 3: Queue Management
- Lab 4: Message Operations

Prerequisites

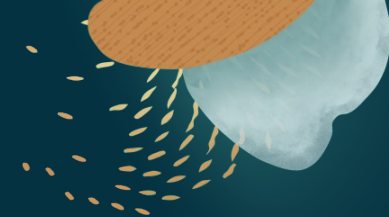
- Familiarity with Oracle Database is desirable, but not required
- A basic understanding of PL/SQL programming
- Some understanding of event streaming terms is helpful, but not required

About This Workshop

Oracle Transactional Event Queues (TxEventQ) is a messaging platform built into Oracle Database that combines the best features of messaging and pub/sub systems. TxEventQ was introduced as a rebranding of AQ Sharded Queues in Oracle Database 21c, evolving from the Advanced Queuing (AQ) technology that has been part of Oracle Database since version 8.0. TxEventQ continues to evolve in Oracle Database 23ai, with Kafka Java APIs, Oracle REST Data Services (ORDS) integration, and many more features and integrations.

TxEventQ is designed for high-throughput, reliable messaging in event-driven microservices and workflow applications. It supports multiple publishers and consumers, exactly-once message delivery, and robust event streaming capabilities. On an 8-node Oracle Real Application Clusters (RAC) database, TxEventQ can handle approximately 1 million messages per second, demonstrating its scalability.

Try it for free!



Oracle Database Free

oracle.com/database/free/



Oracle Autonomous
Database

oracle.com/cloud/free/



Developer Center

oracle.com/developer/



Oracle
LiveLabs

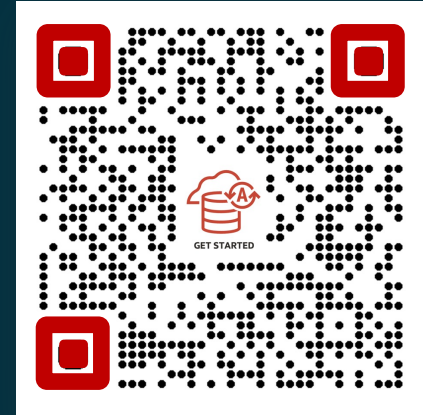
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Q&A Open



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Links to get you started and to keep up to date with Autonomous Database



1 New Get Started page:
oracle.com/autonomous-database/get-started/

2 Join us: **LinkedIn**
bit.ly/adb-linkedln-grp **@AutonomousDW**

Bluesky
autonomusdb.bsky.social

3 Got a question?
We are on stackoverflow
bit.ly/adb-stackoverflow

Join us on Developers Slack
(search #oracle-autonomous-database)
bit.ly/odevrel_slack

Final Thoughts

oracle.com/goto/adb-learning-lounge

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For more information on all things **Autonomous Database**, make sure to go to our site for **Get Started with Autonomous Database** at: <https://www.oracle.com/autonomous-database/get-started/>

There are other **Autonomous Database Learning Lounge** series for **different languages**:

- Autonomous Database Learning Lounge en Español: <https://oracle.com/goto/adb-learning-lounge-es>
- Autonomous Database Learning Lounge em Português: <https://oracle.com/goto/adb-learning-lounge-pt>


The listing below shows the Autonomous Database Learning Lounge sessions, their recordings, links to the slides and other important resources in each session.

Show All

Upcoming

Replays

Upcoming



Build AI-powered apps: A Step-by-Step Guide to Autonomous Database and GenAI


11 March 2025 09:00 AM US/Pacific

Marcos Arancibia, Marty Gubar

English

1 Hour

Log In To Register



Developer's nirvana with Autonomous Database: JSON-Relational Duality in Oracle Database 23ai


18 March 2025 09:00 AM US/Pacific

Marcos Arancibia, Michelle Malcom

English

1 Hour

Log In To Register



Autonomous Database: SQL Firewall, because hackers deserve 404s

25 March 2025 09:00 AM US/Pacific


Marcos Arancibia, Michelle Malcom

English

1 Hour

Log In To Register

Replays



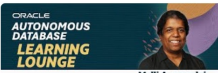
Migration to ADB Part III: OCI Database Management, the Swiss Army knife for databases

Derik Harlow, German Viscuso

English

53.6 Mins

161




Graph RAG: Bring the Power of Graphs to Generative AI

Meli Annamalai

English

54.17 Mins

787




Migration to ADB Part II: Easily migrate from previous database releases with DMS

Jorge Martinez

English

59.98 Mins

134



Migration to ADB Part I: Visualize and Evaluate your entire database estate with Oracle Estate Explorer

Simon Griffiths, Paul Brankin

English

54.05 Mins

125

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Upcoming

Replays

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