22

Introduction to Strong Authentication

Strong authentication supports tools such as Transport Layer Security (TLS) to verify the identities of users who log in to the database.

- What Is Strong Authentication?
  You use authentication to prove the identities of users who are attempting to log into the database.
- Centralized Authentication and Single Sign-On
  Single sign-on enables users to access multiple accounts and applications with a single password.
- How Centralized Network Authentication Works
  A centralized network authentication system works with an Oracle server, an authentication server, and users who connect to the Oracle server.
- Supported Strong Authentication Methods
  Oracle Database supports industry-standard authentication methods.
- Oracle Database Native Network Encryption/Strong Authentication Architecture
  The Oracle Database native network encryption and strong authentication architecture complements an Oracle database server or client installations.
- System Requirements for Strong Authentication
  Kerberos, RADIUS, and Transport Layer Security (TLS) have a set of system requirements for strong authentication.
- Oracle Database Native Network Encryption and Strong Authentication Restrictions
  Oracle applications support Oracle Database native network encryption and strong authentication.

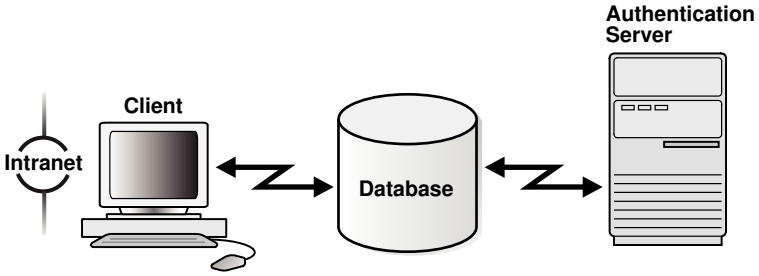
22.1 What Is Strong Authentication?

You use authentication to prove the identities of users who are attempting to log into the database.

Authenticating user identity is imperative in distributed environments, without which there can be little confidence in network security. Passwords are the most common means of authentication. Oracle Database enables strong authentication with Oracle authentication adapters that support various third-party authentication services, including TLS with digital certificates.

Figure 22-1 shows user authentication with an Oracle database instance configured to use a third-party authentication server. Having a central facility to authenticate all members of the network (clients to servers, servers to servers, users to both clients and servers) is one effective way to address the threat of network nodes falsifying their identities.

Figure 22-1 Strong Authentication with Oracle Authentication Adapters



22.2 Centralized Authentication and Single Sign-On

Single sign-on enables users to access multiple accounts and applications with a single password.

Centralized authentication also provides the benefit of single sign-on (SSO) for users. This is the ability of a user to authenticate once, combined with strong authentication occurring transparently in subsequent connections to other databases or applications. Single sign-on lets a user access multiple accounts and applications with a single password, entered during a single connection. Single password, single authentication. Oracle Database supports Kerberos and SSL-based single sign-on.

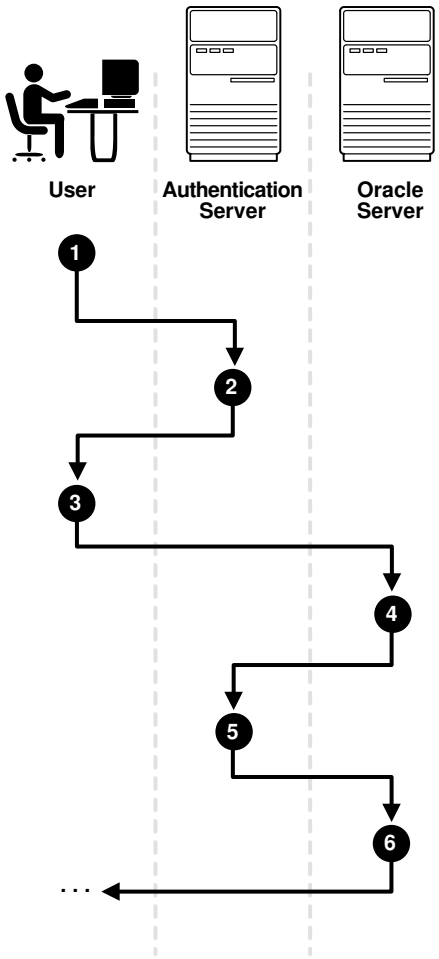
In single sign-on, a user only needs to login once and can then automatically connect to any other service without having to give the user name and password again. Single sign-on eliminates the need for the user to remember and administer multiple passwords, reducing the time spent logging into multiple services.

22.3 How Centralized Network Authentication Works

A centralized network authentication system works with an Oracle server, an authentication server, and users who connect to the Oracle server.

The following diagram shows how a centralized network authentication service typically operates.

Figure 22-2 How a Network Authentication Service Authenticates a User



The following steps describe how centralized Network Authentication Process works.

1. A user (client) requests authentication services and provides identifying information, such as a token or password.
2. The authentication server validates the user's identity and passes a ticket or credentials back to the client, which may include an expiration time.
3. The client passes these credentials to the Oracle server concurrent with a service request, such as connection to a database.
4. The server sends the credentials back to the authentication server for authentication.
5. The authentication server checks the credentials and notifies the Oracle server.
6. If the credentials were accepted by the authentication server, then the Oracle server authenticates the user. If the authentication server rejected the credentials, then authentication fails, and the service request is denied.

22.4 Supported Strong Authentication Methods

Oracle Database supports industry-standard authentication methods.

- About Kerberos
  Oracle Database support for Kerberos provides the benefits of single sign-on and centralized authentication of Oracle users.
- About Remote Authentication Dial-In User Service (RADIUS)
  RADIUS is a client/server security protocol that is most widely known for enabling remote authentication and access.
- About Transport Layer Security
  Transport Layer Security (TLS) is an industry standard protocol for securing network connections.

22.4.1 About Kerberos

Oracle Database support for Kerberos provides the benefits of single sign-on and centralized authentication of Oracle users.

Kerberos is a trusted third-party authentication system that relies on shared secrets. It presumes that the third party is secure, and provides single sign-on capabilities, centralized password storage, database link authentication, and enhanced PC security. It does this through a Kerberos authentication server.

> **Note:**
>
> Oracle authentication for Kerberos provides database link authentication (also called proxy authentication). Kerberos is also an authentication method that is supported with Enterprise User Security.
>
> Enterprise User Security (EUS) is deprecated with Oracle Database 23ai.
> Oracle recommends that you migrate to using Centrally Managed Users (CMU). This feature enables you to directly connect with Microsoft Active Directory without an intervening directory service for enterprise user authentication and authorization to the database. If your Oracle Database is in the cloud, you can also choose to move to one of the newer integrations with a cloud identity provider.

Related Topics

- Configuring Kerberos Authentication
  Kerberos is a trusted third-party authentication system that relies on shared secrets and presumes that the third party is secure.

22.4.2 About Remote Authentication Dial-In User Service (RADIUS)

RADIUS is a client/server security protocol that is most widely known for enabling remote authentication and access.

Oracle Database uses this standard in a client/server network environment to enable use of any authentication method that supports the RADIUS protocol. RADIUS can be used with a variety of authentication mechanisms, including token cards and smart cards.

- **Smart Cards.** A RADIUS-compliant smart card is a credit card-like hardware device which has memory and a processor. It is read by a smart card reader located at the client workstation.
- **Token Cards.** Token cards (Secure ID or RADIUS-compliant) can improve ease of use through several different mechanisms. Some token cards dynamically display one-time

passwords that are synchronized with an authentication service. The server can verify the password provided by the token card at any given time by contacting the authentication service. Other token cards have a keypad and operate on a challenge-response basis. In this case, the server offers a challenge (a number) that the user enters into a token card. The token card provides a response (another number cryptographically derived from the challenge) that the user enters and sends to the server.

You can use SecurID tokens through the RADIUS adapter.

Related Topics

- Configuring RADIUS Authentication
  RADIUS is a client/server security protocol widely used to enable remote authentication and access.

22.4.3 About Transport Layer Security

Transport Layer Security (TLS) is an industry standard protocol for securing network connections.

TLS provides authentication, data encryption, and data integrity.

The TLS protocol is the foundation of a public key infrastructure (PKI). For authentication, TLS uses digital certificates that comply with the X.509v3 standard and a public and private key pair.

With a public and a private key page, a set of two numbers are used for encryption and decryption, where one is called the private key and the other is called the public key. Public keys are typically made widely available, while private keys are held by their respective owners. Though mathematically related, it is generally viewed as computationally infeasible to derive the private key from the public key. Public and private keys are used only with asymmetric encryption algorithms, also called public-key encryption algorithms, or public-key cryptosystems. Data encrypted with either a public key or a private key from a key pair can be decrypted with its associated key from the key-pair. However, data encrypted with a public key cannot be decrypted with the same public key, and data enwrapped with a private key cannot be decrypted with the same private key.

Oracle Database TLS can be used to secure communications between any client and any server. You can configure TLS to provide authentication for the server only, the client only, or both client and server. You can also configure TLS features in combination with other authentication methods supported by Oracle Database (database user names and passwords, RADIUS, and Kerberos).

To support your PKI implementation, Oracle Database includes the following features in addition to TLS:

- Oracle wallets, where you can store PKI credentials
- The `orapki` and `mkstore` (deprecated) utilities, which you can use to manage your Oracle wallets.
- Certificate validation with certificate revocation lists (CRLs)
- Hardware security module support

Related Topics

- Configuring PKI Certificate Authentication
  You can configure Oracle Database to use PKI certificates for end-user authentication.

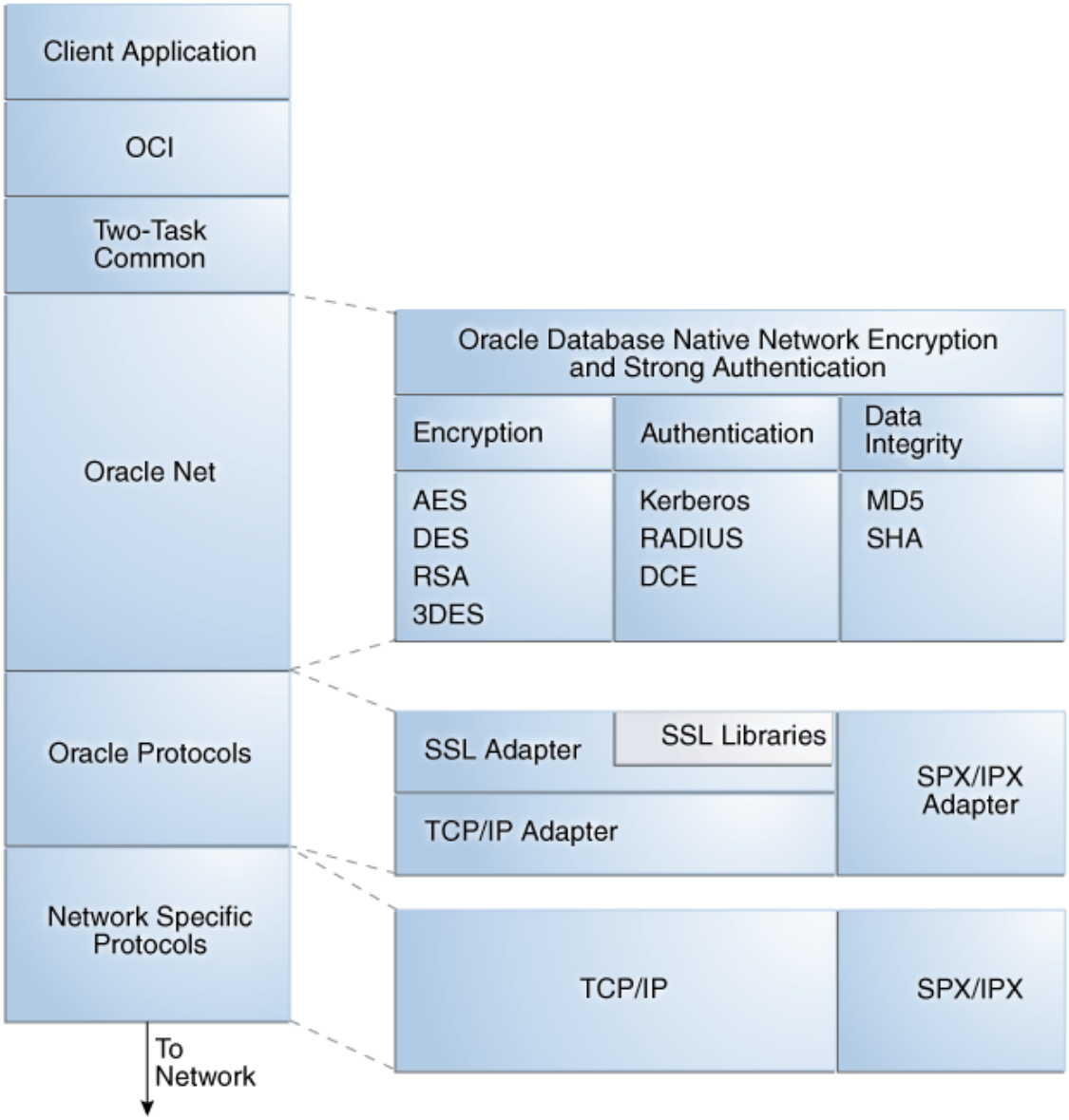
- Customizing the Use of Strong Authentication
  You can configure multiple authentication methods under Oracle Database native network encryption and strong authentication.

22.5 Oracle Database Native Network Encryption/Strong Authentication Architecture

The Oracle Database native network encryption and strong authentication architecture complements an Oracle database server or client installations.

The following diagram shows the this architecture within an Oracle networking environment.

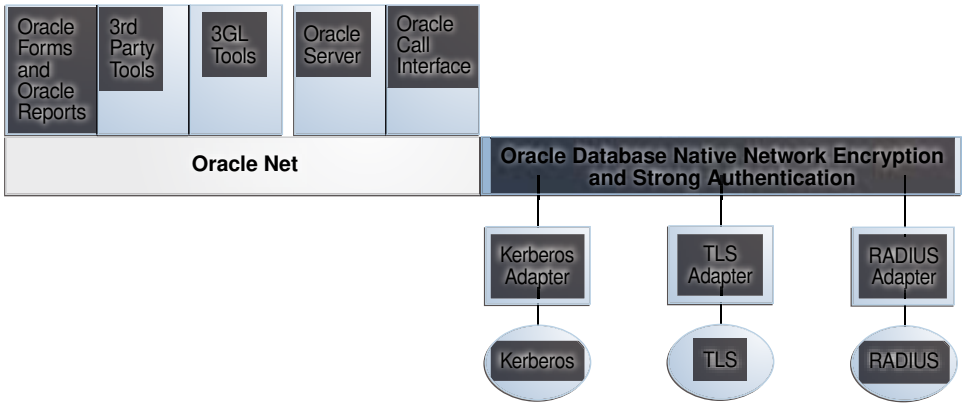
Figure 22-3 Oracle Native Network Encryption and Strong Authentication Architecture



Oracle Database supports authentication through adapters that are similar to the existing Oracle protocol adapters. As shown in Figure 22-4, authentication adapters integrate the

Oracle Net interface, and allow existing applications to take advantage of new authentication systems transparently, without any changes to the application.

Figure 22-4 Oracle Net Services with Authentication Adapters



> **See Also:**
>
> *Oracle Database Net Services Administrator's Guide* for more information about stack communications in an Oracle networking environment

22.6 System Requirements for Strong Authentication

Kerberos, RADIUS, and Transport Layer Security (TLS) have a set of system requirements for strong authentication.

Table 22-1 lists the TLS system requirements for strong authentication.

Table 22-1 Authentication Methods and System Requirements

Authentication Method	System Requirements
Kerberos	• MIT Kerberos Version 5, release 1.8 or above. • The Kerberos authentication server must be installed on a physically secure system.
RADIUS	• A RADIUS server that is compliant with the standards in the Internet Engineering Task Force (IETF) RFC #2138, *Remote Authentication Dial In User Service (RADIUS)* and RFC #2139 *RADIUS Accounting*. • To enable challenge-response authentication, you must run RADIUS on an operating system that supports the Java Native Interface as specified in release 1.1 of the Java Development Kit from JavaSoft.
TLS	• A wallet that is compatible with the Oracle Database 10g and later versions of the `orapki` and `mkstore` (deprecated) utilities.

22.7 Oracle Database Native Network Encryption and Strong Authentication Restrictions

Oracle applications support Oracle Database native network encryption and strong authentication.

However, because Oracle Database native network encryption and strong authentication requires Oracle Net Services to transmit data securely, these external authentication features are not supported by some parts of Oracle Financial, Human Resource, and Manufacturing Applications when they are running on Microsoft Windows.

The portions of these products that use Oracle Display Manager (ODM) do not take advantage of Oracle Database native network encryption and strong authentication, because ODM does not use Oracle Net Services.