

# Multiple Authentication Providers

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Quantum supports running multiple authentication providers simultaneously, enabling scenarios such as an internal JWT provider alongside an external OIDC provider (e.g., Cognito, Keycloak, Auth0). Providers are registered via a single configuration property, and the framework automatically routes token validation to the correct provider based on the JWT `iss` (issuer) claim.

# Chapter 1. How It Works

The `AuthProviderFactory` is the central registry for all configured authentication providers. At startup it reads the `auth.provider` property, which accepts a comma-separated list of provider names, instantiates each one via CDI, and holds them in an ordered list.

```
# Single provider (default)
auth.provider=custom

# Multiple providers
auth.provider=custom,cognito
```

## 1.1. Provider Resolution

When a request arrives with a JWT, the framework resolves which provider should validate it:

1. **By issuer**—`AuthProviderFactory.getProviderForIssuer(String issuer)` iterates through all configured providers and calls `getIssuer()` on each. The first provider whose issuer matches the JWT `iss` claim wins.
2. **By name**—`AuthProviderFactory.getProviderByName(String name)` performs a case-insensitive lookup (e.g., "custom", "cognito").
3. **Default**—`AuthProviderFactory.getAuthProvider()` returns the first configured provider. If issuer-based lookup finds no match, the default provider is used as a fallback.

## 1.2. Canonical Identity Service

`CanonicalIdentityService` is the single entry point for token validation across all providers. It has two signatures:

```
// Use the default provider
SecurityIdentity validateAccessTokenCanonical(String token);

// Route to the provider matching this issuer
SecurityIdentity validateAccessTokenCanonical(String token, String issuer);
```

Internally, the service supports two provider interfaces:

- **ClaimsAuthProvider**—a modern SPI where the provider returns a `ProviderClaims` object (subject, roles, attributes). The service then passes those claims to `IdentityAssembler`, which resolves the `userId` from the credential store, merges roles from the token, credential, and user groups, and builds a canonical `QuarkusSecurityIdentity`.
- **Legacy AuthProvider**—the provider returns a `SecurityIdentity` directly, and the service normalizes it via `SecurityIdentityNormalizer` (ensuring the principal is always the `userId`, not the IdP subject).

This means you can mix modern claims-based providers with legacy ones in the same application.

# Chapter 2. Configuring application.properties

## 2.1. Minimal Custom JWT Provider

```
# Select the custom JWT provider
auth.provider=custom

# Enable SmallRye JWT validation
quarkus.smallrye-jwt.enabled=true

# Public key for token signature verification (classpath resource)
mp.jwt.verify.publickey.location=publicKey.pem

# Issuer claim that tokens must contain
mp.jwt.verify.issuer=https://myapp.example.com/issuer

# Audiences the token must target
mp.jwt.verify.audiences=my-api-client,my-api-client-refresh

# Signing secret for the custom provider (used for HMAC-based flows)
auth.jwt.secret=${JWT_SECRET:change-me-in-production}

# Token lifetimes (minutes)
auth.jwt.expiration=15
auth.jwt.refresh-expiration=30
```

## 2.2. Adding an OIDC Provider (e.g., AWS Cognito)

To add Cognito alongside the custom provider:

```
# Enable both providers
auth.provider=custom,cognito

# --- Custom JWT provider (unchanged) ---
quarkus.smallrye-jwt.enabled=true
mp.jwt.verify.publickey.location=publicKey.pem
mp.jwt.verify.issuer=https://myapp.example.com/issuer
mp.jwt.verify.audiences=my-api-client
auth.jwt.secret=${JWT_SECRET}
auth.jwt.expiration=15
auth.jwt.refresh-expiration=30

# --- OIDC / Cognito provider ---
quarkus.oidc.enabled=true
quarkus.oidc.auth-server-url=https://cognito-
```

```
idp.${aws.cognito.region}.amazonaws.com/${aws.cognito.user-pool-id}
quarkus.oidc.client-id=${aws.cognito.clientId}
quarkus.oidc.token.issuer=https://cognito-
idp.${aws.cognito.region}.amazonaws.com/${aws.cognito.user-pool-id}
quarkus.oidc.roles.role-claim-path=cognito:groups

# Cognito environment variables
aws.cognito.user-pool-id=${USER_POOL_ID}
aws.cognito.client-id=${APPLICATION_CLIENT_ID}
aws.cognito.region=us-east-1
aws.cognito.jwks.url=https://cognito-
idp.${aws.cognito.region}.amazonaws.com/${aws.cognito.user-pool-id}/.well-
known/jwks.json
```

## 2.3. Using Keycloak or Auth0

The pattern is the same—configure `quarkus.oidc.*` to point at the provider's OIDC discovery endpoint:

```
# Keycloak
quarkus.oidc.auth-server-url=https://keycloak.example.com/realms/my-realm
quarkus.oidc.client-id=my-client
quarkus.oidc.credentials.secret=${KEYCLOAK_CLIENT_SECRET}
quarkus.oidc.roles.role-claim-path=realm_access/roles

# Auth0
quarkus.oidc.auth-server-url=https://my-tenant.auth0.com
quarkus.oidc.client-id=my-client-id
quarkus.oidc.credentials.secret=${AUTH0_CLIENT_SECRET}
quarkus.oidc.roles.role-claim-path=https://my-app.example.com/roles
```

Quarkus OIDC automatically discovers the `.well-known/openid-configuration` endpoint from the `auth-server-url`, so you do not need to specify individual endpoints for token validation, JWKS, or user info.

# Chapter 3. Issuer Resolution in Detail

When a JWT arrives at the **SecurityFilter**, the following resolution path executes:

```
Incoming request with Authorization: Bearer <token>
|
v
SecurityFilter extracts JWT
|
v
Parse the "iss" claim from the token
|
v
CanonicalIdentityService.validateAccessTokenCanonical(token, issuer)
|
v
AuthProviderFactory.getProviderForIssuer(issuer)
|
+-- Iterate configured providers:
|   provider.getIssuer().equals(issuer) ?
|       -> yes: use this provider
|       -> no: try next
|
+-- No match: fall back to default provider
|
v
Provider validates token and returns ProviderClaims or SecurityIdentity
|
v
IdentityAssembler merges roles from:
- TOKEN (from JWT claims)
- CREDENTIAL (from credential store)
- USERGROUP (from UserProfile -> UserGroup membership)
|
v
Canonical SecurityIdentity with userId as principal
```

Each provider's `getIssuer()` method returns its expected issuer string. For the custom JWT provider, this is the value of `mp.jwt.verify.issuer`. For an OIDC provider, it is typically the `auth-server-url` (e.g., `<a href="https://cognito-idp.us-east-1.amazonaws.com/&lt;pool-id&gt;" class="bare">https://cognito-idp.us-east-1.amazonaws.com/&lt;pool-id&gt;</a>;</code>`).

## 3.1. Role Provenance Tracking

After token validation, the framework tracks the source of every role via **RoleAssignment**:

Source	Meaning
TOKEN	Role came from the JWT claims (e.g., Cognito <code>cognito:groups</code> or Keycloak <code>realm_access/roles</code> )
CREDENTIAL	Role stored in the credential record in MongoDB
USERGROUP	Role inherited from <code>UserGroup</code> membership via the user's <code>UserProfile</code>

The final `SecurityIdentity` contains the union of all three sources. Login and token-refresh responses include a `List<RoleAssignment>` so clients and audit logs can trace exactly where each role originated.

# Chapter 4. Creating a New Auth Provider

To add a new authentication provider:

1. Create an `@ApplicationScoped` CDI bean that extends `BaseAuthProvider` and implements `AuthProvider` and `UserManagement`.
2. Return a stable name from `getName()` (e.g., `"saml"`, `"apikey"`, `"azure-ad"`).
3. Implement `getIssuer()` to return the issuer string that your tokens will carry.
4. Implement `validateAccessToken(token)` to parse, verify, and build a `SecurityIdentity`.
5. Optionally implement `ClaimsAuthProvider.validateTokenToClaims(token)` for the modern claims-based flow.
6. Add your provider name to `auth.provider` in `application.properties`.

```
@ApplicationScoped
public class MyOidcProvider extends BaseAuthProvider
    implements AuthProvider, ClaimsAuthProvider, UserManagement {

    @ConfigProperty(name = "my.oidc.issuer")
    String issuer;

    @Override
    public String getName() {
        return "my-oidc";
    }

    @Override
    public String getIssuer() {
        return issuer;
    }

    @Override
    public ProviderClaims validateTokenToClaims(String token) {
        // Validate token against the OIDC provider's JWKS
        // Extract subject, roles, attributes
        // Return ProviderClaims
    }

    // ... implement remaining AuthProvider and UserManagement methods
}
```

Then activate it:

```
auth.provider=custom,my-oidc
my.oidc.issuer=https://my-idp.example.com
```

See [Authentication and Authorization](#) for the full `AuthProvider` and `UserManagement` interface contracts and `BaseAuthProvider` capabilities.

# Chapter 5. Key Pair Management

## 5.1. Default Keys Module (`quantum-default-keys`)

The framework ships a convenience module, `quantum-default-keys`, that places a default RSA key pair (`privateKey.pem` / `publicKey.pem`) on the classpath. This module is declared as an `<optional>true</optional>` dependency of `quantum-jwt-provider`, so it is available during framework development but does **not** propagate transitively to consuming applications.

To use the default keys in your application during development or testing, add the dependency explicitly:

```
<dependency>
    <groupId>com.end2endlogic</groupId>
    <artifactId>quantum-default-keys</artifactId>
    <version>${quantum.version}</version>
</dependency>
```

In production, either:

- **Remove** the `quantum-default-keys` dependency from your POM and supply your own keys externally, or
- **Override** the key locations via `application.properties` (see below) — the configured paths take precedence over any classpath defaults.



The default keys are published in the open-source framework repository and are intended only for development and testing. Never use the default keys in production. Always generate and deploy your own key pair.

## 5.2. Configurable Key Locations

By default, `TokenUtils` loads keys from classpath resources named `privateKey.pem` and `publicKey.pem`. You can override these locations in `application.properties` to point at external key files:

```
# Load signing key from the filesystem
quantum.jwt.private-key-location=file:/opt/keys/signing.pem

# Load verification key from the filesystem
quantum.jwt.public-key-location=file:/opt/keys/verify.pem
```

Supported path prefixes:

Prefix	Behavior
<code>file:</code>	Load from the filesystem (e.g., <code>file:/opt/keys/signing.pem</code> )
<code>classpath:</code>	Load from the classpath (e.g., <code>classpath:mykeys/signing.pem</code> )
(no prefix)	Treated as a classpath resource name (backward compatible with <code>privateKey.pem</code> )

When these properties are set, `TokenUtilsConfigurer` applies them at application startup and invalidates any previously cached keys.

### 5.2.1. Typical Production Setup

```
# Point at externally managed keys – no quantum-default-keys JAR needed
quantum.jwt.private-key-location=file:/etc/quantum/keys/privateKey.pem
quantum.jwt.public-key-location=file:/etc/quantum/keys/publicKey.pem

# SmallRye JWT validation must also reference the public key
mp.jwt.verify.publickey.location=/etc/quantum/keys/publicKey.pem
```



`TokenUtils` handles signing (private key); SmallRye JWT handles verification (public key via `mp.jwt.verify.publickey.location`). Both must reference the same key pair. When you move to external keys, update both the `quantum.jwt.*` properties and `mp.jwt.verify.publickey.location`.

## 5.3. Full Per-Tenant Design

For the complete multi-phase design including per-tenant MongoDB key storage, key rotation, JWKS endpoints, and vault integration, see the [Per-Tenant Key Pairs Design Document](#).