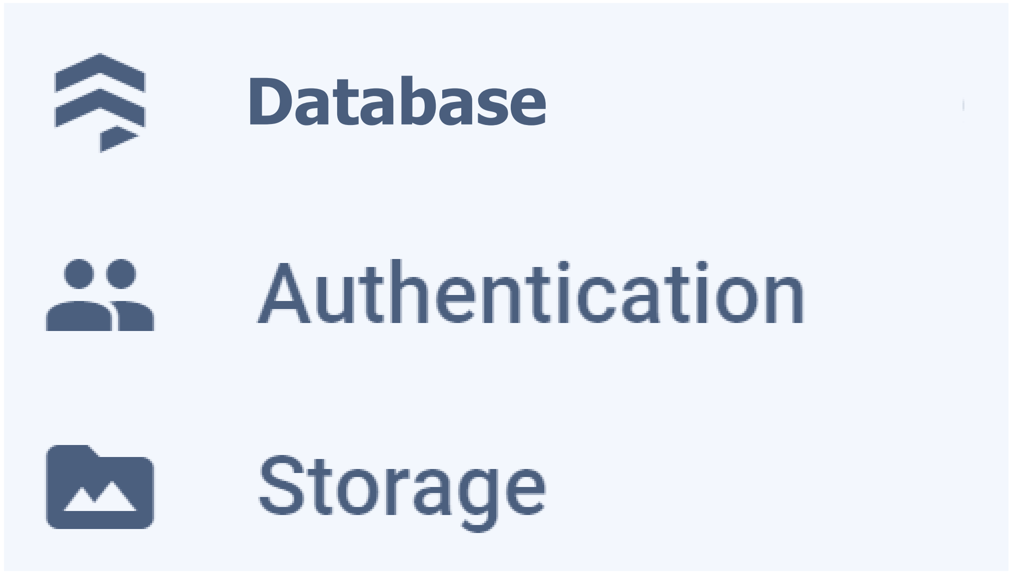
CMPS 312

Supabase Cloud Services



Dr. Abdelkarim Erradi

CSE@QU

Outline

Backend-as-Service (BaaS)

- Cloud service that provides ready-made backend functionality for web and mobile apps
- Eliminates the need to build and maintain servers, databases, and APIs
- Common features: user authentication, databases, file storage, serverless functions, notifications, analytics
- Speeds up development and reduces infrastructure complexity and cost
- Allows developers to focus on frontend and core business logic
- Examples: Firebase, **Supabase**, AWS Amplify

What is Supabase?

Supabase is an open-source is a cloud platform offering scalable *Postgres database*, file storage, authentication, and serverless functions that work together as a BaaS for mobile/web apps

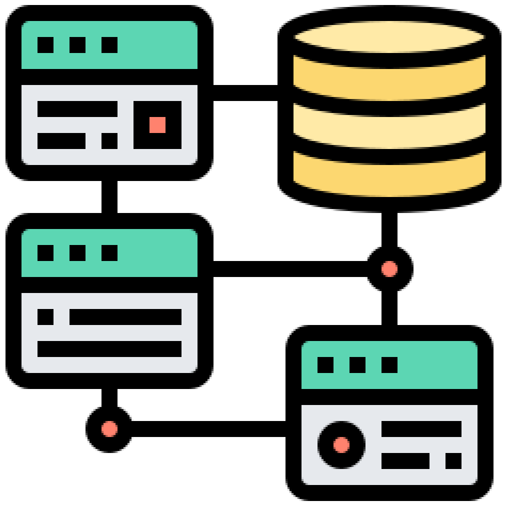
- 🗄️ PostgreSQL database with Row Level Security (RLS)
- 🔐 Authentication: secure user authentication using various identity provides (e.g., email/password, Google Auth)
- ☁️ File storage: store and retrieve files in buckets with public/signed URLs
- 🔔 Listen to Database **Realtime** Updates
- 📱 Flutter/Dart SDKs

Getting Started

- Add supabase_flutter to pubspec.yaml
- Initialize in main.dart

```dart
import 'package:supabase_flutter/supabase_flutter.dart';

void main() async {
  await Supabase.initialize(
    url: 'YOUR_SUPABASE_URL',
    anonKey: 'YOUR_ANON_KEY',
  );
  runApp(MyApp());
}
```



Supabase Database

< Back

Supabase Database

- A fully managed Postgres with SQL, views, triggers, policies, and functions:
  - Accessible via auto-created Web API
  - Schema-first: design tables in SQL or the Supabase dashboard
  - Security via Row Level Security (RLS) + policies

```
// Fetching data
final response = await Supabase.instance.client
  .from('profiles')
  .select()
  .execute();
```

Creatung Supabase Database

- Design tables in SQL or the Supabase dashboard

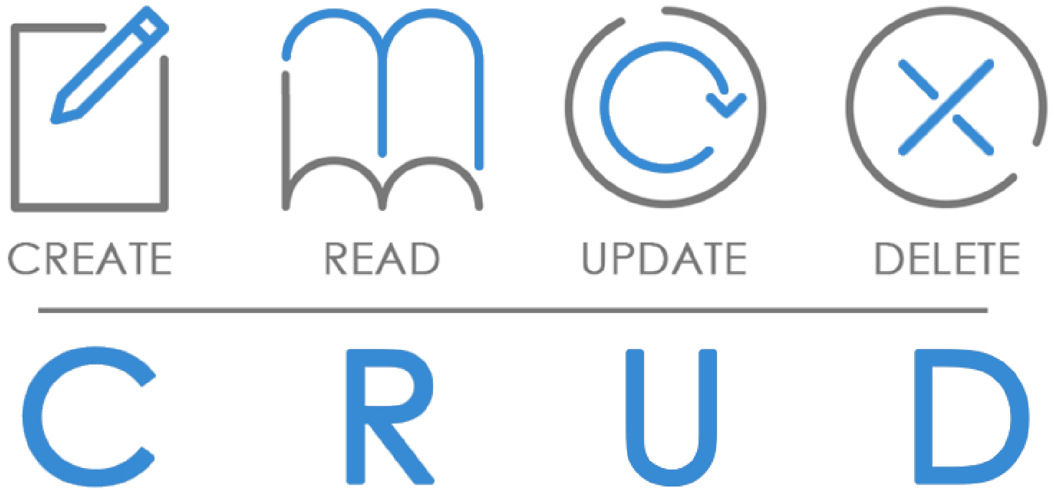
```
-- Example table: todos
create table if not exists public.todos (
  id uuid primary key default gen_random_uuid(),
  description text not null,
  type text not null check (type in
    ('personal','work','family')),
  completed boolean not null default false,
  created_at timestamptz not null default now(),
  user_id uuid references auth.users(id)
);
```

Row Level Security (RLS)

- Row Level Security (RLS)

```
-- Enable Row Level Security (RLS) policy
alter table public.todos enable row level
security;
create policy "read own" on public.todos
  for select using (auth.uid() = user_id);
create policy "modify own" on public.todos
  for all using (auth.uid() = user_id);
```

CRUD Operations



< Back

CRUD

CRUD allows creating, reading, updating, and deleting database records

```
// Create
await Supabase.instance.client
  .from('tasks')
  .insert({'title': 'New Task'})
  .execute();

// Update
await Supabase.instance.client
  .from('tasks')
  .update({'done': true})
  .eq('id', 1)
  .execute();

// Delete
await Supabase.instance.client
  .from('tasks')
  .delete()
  .eq('id', 1)
  .execute();
```

✍️ Database CRUD Operations

```dart
final client = Supabase.instance.client;
// CREATE
Future<void> addTodo(Todo todo) async {
  await client.from('todos').insert(todo.toJson());
}
// READ (list)
Future<List<Todo>> getTodos() async {
  final data = await client.from('todos').select().order('created_at', ascending: false);
  return (data as List).map((j) => Todo.fromJson(j)).toList();
}
// READ (single)
Future<Todo?> getTodoById(String id) async {
  final json = await client.from('todos').select().eq('id', id).maybeSingle();
  return json == null ? null : Todo.fromJson(json);
}
// UPDATE
Future<void> updateTodo(Todo todo) async {
  await client.from('todos').update(todo.toJson()).eq('id', todo.id);
}
// DELETE
Future<void> deleteTodo(String id) async {
  await client.from('todos').delete().eq('id', id);
}
// COUNT
Future<int> getTodosCount() async {
  final res = await client.from('todos').select().count(CountOption.exact);
  return res.count; // supabase_flutter 2.x
}
```

Best Practices

- Implement data access in repositories
- Expore SupabaseClient as a provider
- Paginate with range() for large lists
- Use select() projections to limit payload
- Always handle errors (try/catch) and show user-friendly messages

📡 Real-Time Updates

- *Live Data Syncing:* Supabase Realtime streams table changes immediately to clients
  - Use cases: Live chat, dashboards, multiplayer games
  - Listen only to relevant tables/rows to optimize performance
  - Combine with state management for better user experience

```dart
final stream = Supabase.instance.client
  .from('messages')
  .stream(primaryKey: ['id']);

stream.listen((changes) {
  // Handle new/updated message objects
});
```

🔔 Listen to Database Realtime Updates

Postgrest Stream:

```
.from('table').stream(primaryKey: ['id'])
```

Stream for ToDo ist

```
Stream<List<Todo>> observeTodos() {
  final client = Supabase.instance.client;
  return client
     .from('todos')
     .stream(primaryKey: ['id'])
     .order('created_at', ascending: false)
     .map((rows) =>
rows.map(Todo.fromJson).toList());
}
```

File Storage

🗂️ File Storage

- Supabase Storage uploads, manages, and serves files securely
    - Upload/download user files or images
    - Use cases: Profile pictures, documents, content feeds
    - Create buckets via Supabase dashboard
    - Manage file access rules

```
Future<void> uploadFile(String filePath) async {
  final file = File(filePath);
  final response = await Supabase.instance.client.storage
      .from('uploads')
      .upload('filename.png', file);
}
```

File Storage

S3-like buckets with public/private access and signed URLs.

- Create buckets in the Supabase dashboard
- Store images, documents, or media; serve via public or signed URLs
- Secure with RLS-like bucket policies
- Best Practices
  - Use hashed/UUID file names; avoid collisions
  - Keep buckets private and use signed URLs where possible

🗂️ File Storage

```dart
final storage = Supabase.instance.client.storage;
// Upload bytes (e.g., from picker)
Future<String> uploadAvatar(Uint8List bytes, String userId) async {
  final path = 'avatars/$userId-${DateTime.now().millisecondsSinceEpoch}.png';
  await storage.from('avatars').uploadBinary(
    path,
    bytes,
    fileOptions: const FileOptions(contentType: 'image/png'),
  );
  // Return public URL (if bucket is public) or create a signed URL
  return storage.from('avatars').getPublicUrl(path);
}

// Signed URL (private bucket)
Future<Uri> getSignedUrl(String path,
     {Duration ttl = const Duration(minutes: 5)}) async {
  final url = await storage.from('avatars').createSignedUrl(path,
            ttl.inSeconds);
  return Uri.parse(url);
}
```

List

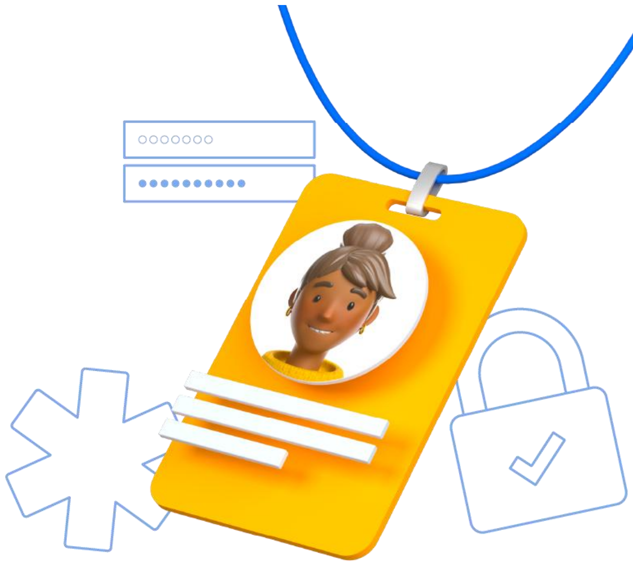
- Get URLs of files in particular subfolder

```
Future<List<String>> getImageUrls() async {
  final storage = Supabase.instance.client.storage;
  final files = await storage.from('images').list(path: '');
  return files.map((f) =>
        storage.from('images').getPublicUrl(f.name)).toList();
}
```

🔒 If the bucket is **private**, use signed URLs instead:

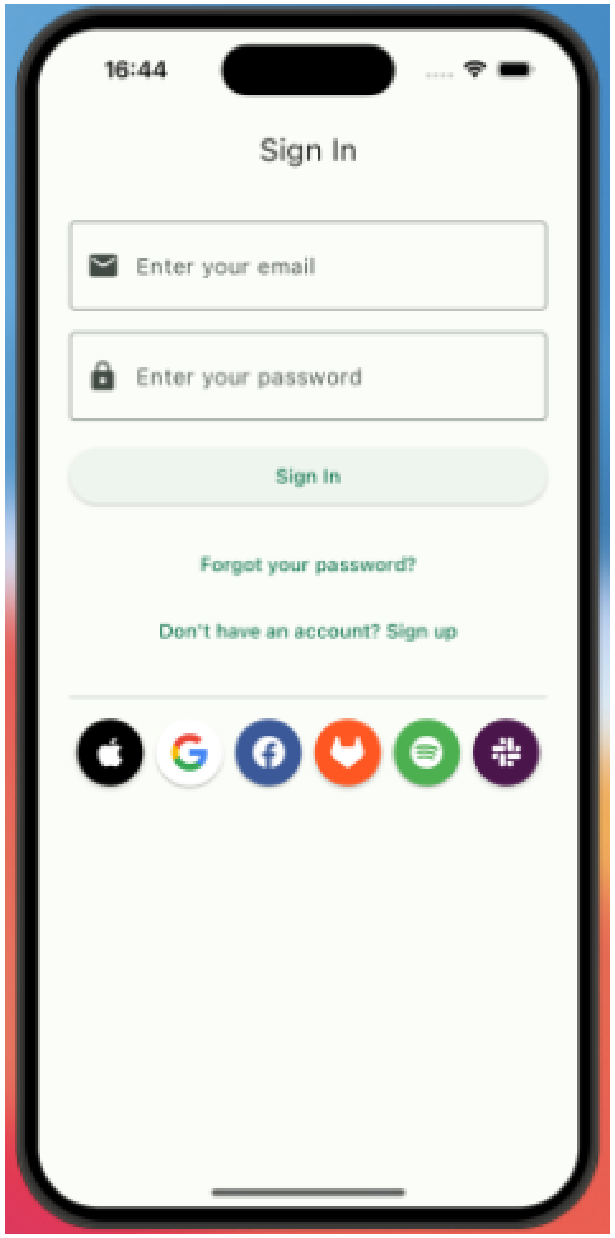
```
Future<List<String>> getImageUrls() async {
  final storage = Supabase.instance.client.storage;
  final files = await storage.from('images').list(path: '');
  return Future.wait(files.map((f) =>
        storage.from('images').createSignedUrl(f.name, 3600)));
}
```

Authentication



Back

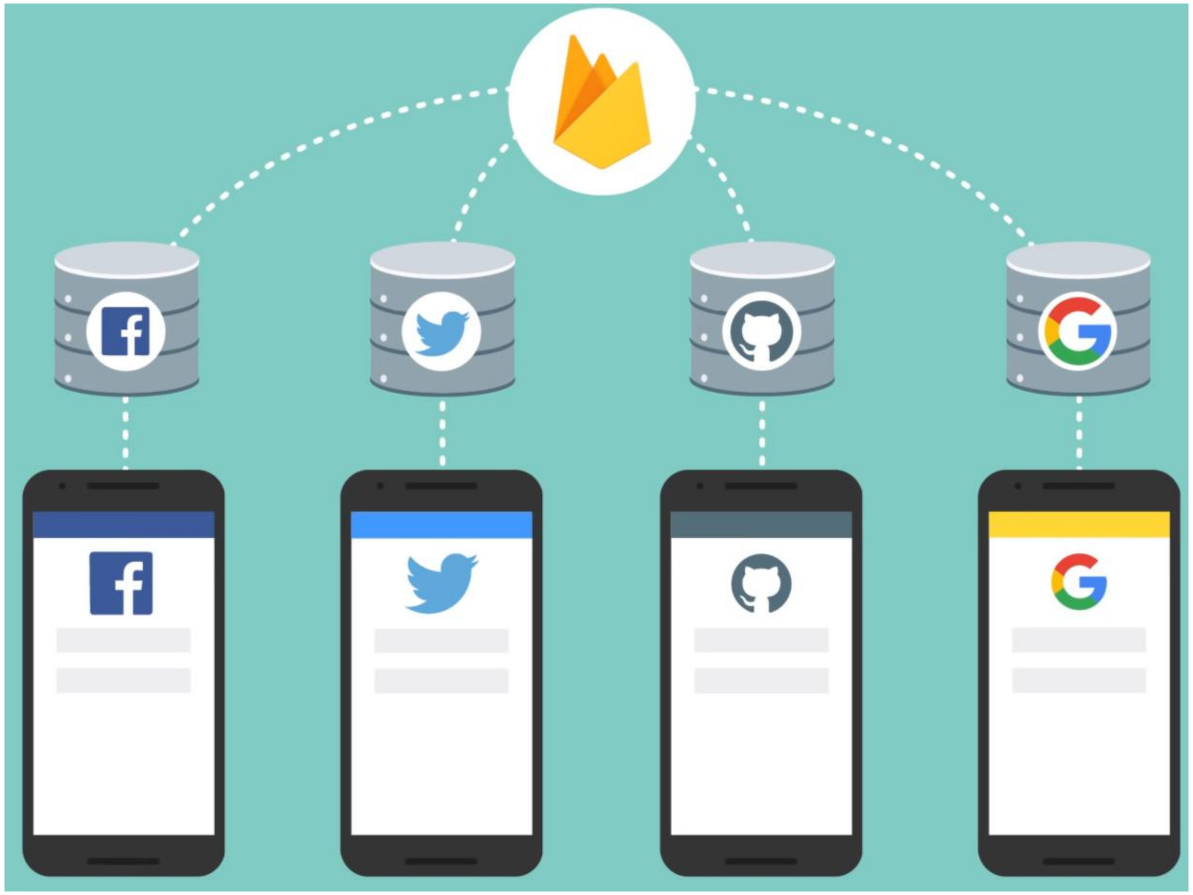
Authentication



- **Authentication** = **Identity verification**:
  - Verify the identity of the user given the credentials received
  - Making sure the user is who he claims to be
- Every user gets a unique ID
- Restrict who can read and write what data

🔑 Authentication

- Email/password, OTP/magic links, and OAuth providers (Google, Apple, etc.)
  - User sign-up, login, session management, password reset
  - Session-based auth with refresh tokens



Multiple Identity Providers can be used for Authentication

🔐 Authentication

```dart
final auth = Supabase.instance.client.auth;

// Sign up
Future<void> signUp(String email, String password) async {
  await auth.signUp(email: email, password: password);
}

// Sign in
Future<void> signIn(String email, String password) async {
  await auth.signInWithPassword(email: email, password:
password);
}

// Sign out
Future<void> signOut() async {
  await auth.signOut();
}
```

Sign up

- Sign up and the user details to authentication

```
Future<User?> signUp(User user) async {
  try {
    final auth = Supabase.instance.client.auth;
    // Create a new user with email and password
    User authResult = await auth.signUp(
      email: user.email,
      password: user.password,
    );

    // If the user was created successfully, update their profile
    if (authResult.user != null) {
      await authResult.user!.updateDisplayName('${user.firstName} ${user.lastName}');
      await authResult.user!.updatePhotoURL('http://test.com/spongebob.png');
      // Refresh the user to apply changes
      await authResult.user!.reload();
    }

    return authResult;
  } catch (e) {
    print('Error during sign up: $e');
    return null;
  }
}
```

Get current user details

- Anywhere in the app you can access the details of current user

```
void getCurrentUser() {
  final auth = Supabase.instance.client.auth;
  User? user = auth.currentUser;
  if (user != null) {
    print('User is signed in! Email: ${user.email}');
  } else {
    print('No user is signed in.');
  }
}
```

Listen to auth state

- Listen to auth state changes

```
// Listen to auth state
void listenAuth() {
  auth.onAuthStateChange.listen((event) {
    final session = event.session;
    // navigate or rebuild providers
  });
}
```

Route Auth Guard

- Auth Guard (GoRouter + Riverpod)
- Use guards tied to auth state

```dart
final authStateProvider = StreamProvider((ref) {
  return Supabase.instance.client.auth.onAuthStateChange
    .map((e) => e.session);
});

final authGuard = GoRoute(
  path: '/account',
  builder: (context, state) => const AccountScreen(),
  redirect: (context, state) {
    final session = context.read(authStateProvider).maybeWhen(
      data: (s) => s,
      orElse: () => null,
    );
    return session == null ? '/signin' : null;
  },
);
```

🧭 Architecture & Patterns

- Use Riverpod providers to expose repositories

```
final supabaseClientProvider = Provider((ref) =>
Supabase.instance.client);

final todoRepositoryProvider = Provider((ref) {
  final client = ref.watch(supabaseClientProvider);
  return TodoRepository(client);
});
```

✅ Best Practices & Recommendations

1) Security
   - Enable RLS on every table; write least-privilege policies
   - Use signed URLs for private assets; short TTLs for sensitive files
2) Performance
   - Use projections and pagination; avoid select(’*’) in production
   - Prefer streams for live lists; batch UI updates
3) Keep migration SQL in version control
4) Use Edge Functions for server-side logic

Access Image Gallery and Camera

Back

Access Image Gallery and Camera

- Using **`image_picker`** package for picking images from the image gallery or taking new pictures with the camera

```
Future<File?> pickImage(ImageSource source) async {
  final imagePicker = ImagePicker();
  final pickedImage = await imagePicker.pickImage(
    source: source, // camera or gallery
    maxWidth: double.infinity,
  );

  if (pickedImage == null) return null;
  return File(pickedImage.path);
}
```

image_picker methods

```
final ImagePicker picker = ImagePicker();
// Pick an image
final XFile? image = await picker.pickImage(source: ImageSource.gallery);
// Capture a photo
final XFile? photo = await picker.pickImage(source: ImageSource.camera);
// Pick a video
final XFile? galleryVideo =
    await picker.pickVideo(source: ImageSource.gallery);
// Capture a video
final XFile? cameraVideo = await picker.pickVideo(source: ImageSource.camera);
// Pick multiple images
final List<XFile> images = await picker.pickMultiImage();
// Pick singe image or video
final XFile? media = await picker.pickMedia();
// Pick multiple images and videos
final List<XFile> medias = await picker.pickMultipleMedia();
```

Summary

- **Supabase** database store/query app's data
  - Data model consists tables having relationships
- File **Storage** is used to store and retrieve files
- **Authentication** provides built-in backend services to ease user authentication
  - email/password authentication allows users to register and log in to the app
  - Secure user's authentication using various identity provides (e.g., email/password, Google Auth)

📚 References

- Supabase Flutter Docs: https://supabase.com/docs/guides/getting-started/quickstarts/flutter
- Realtime: https://supabase.com/docs/guides/realtime
- Storage: https://supabase.com/docs/guides/storage
- Auth: https://supabase.com/docs/guides/auth
- RLS Policies: https://supabase.com/docs/guides/auth/row-level-security