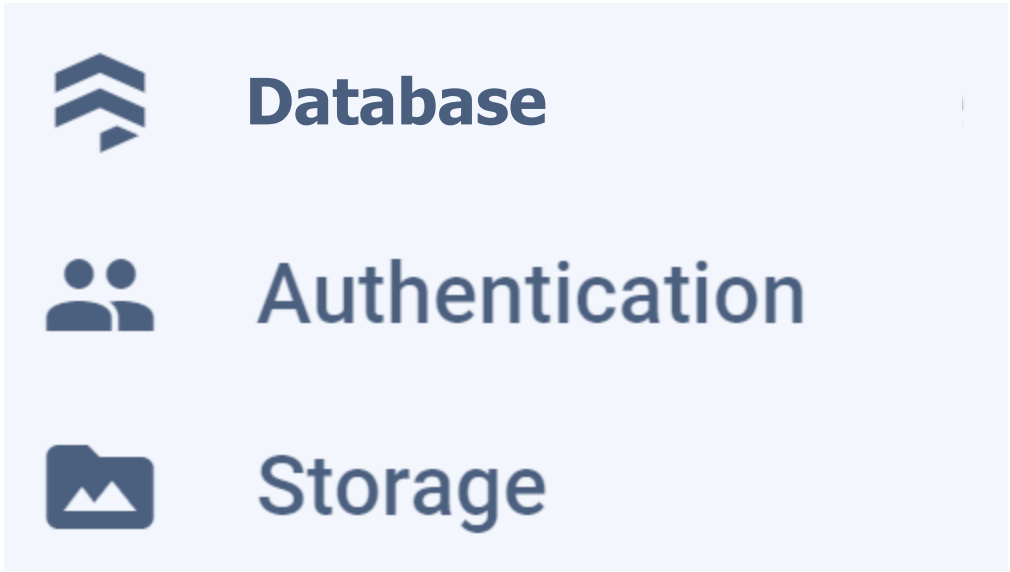
CMPS 312

Supabase Cloud Services



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Outline

1. Supabase Database
2. CRUD Operations
3. File Storage
4. Authentication
5. Access Image Gallery and Camera

Backend-as-Service (BaaS)

- **Purpose:** Provide ready-made backend for web & mobile apps
- Benefits:
  - No need to build/manage servers, databases, or APIs
  - Speeds up development and reduces infrastructure complexity & cost
  - Allows developers focus on frontend and core business logic
- Common Features: User authentication, Managed databases, File storage, Serverless functions, Notifications & analytics
- Examples: Supabase FirebaseAWS Amplify

What is Supabase?

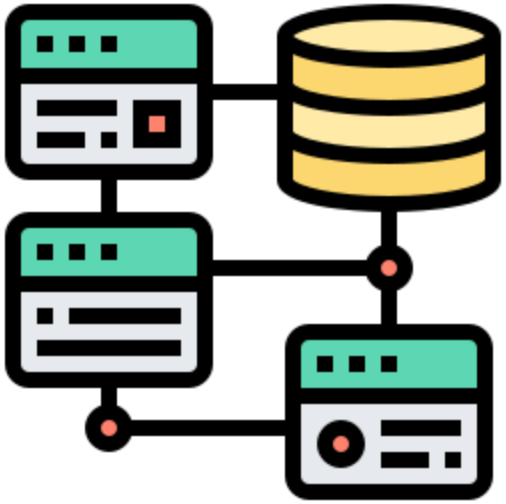
Supabase = Open-source Backend-as-a-Service (BaaS) built on PostgreSQL. Core Features:

- 🗄️ Database: Managed PostgreSQL with Row-Level Security (RLS)
- 🔐 Authentication: Secure user sign-in via email/password & OAuth providers
- ☁️ Storage: Scalable file storage with public/signed URLs
- 🔔 Realtime: Listen to database changes in real time
- ⚡ Edge Functions: Deploy serverless functions for custom logic
- 🛠️ Developer Tools: SDKs for **Flutter/Dart**, JavaScript, and more

Getting Started

- Add `supabase_flutter` to `pubspec.yaml`
- Initialize Supabase in `main.dart`
  - This Enables database, authentication, and storage features in your Flutter app.

```
await Supabase.initialize(
  url: 'https://your-project.supabase.co',
  anonKey: 'your-anon-key',
);
```



Supabase Database

Supabase Database

- Managed PostgreSQL: Includes SQL, views, triggers, policies, and functions
- Auto-Generated REST & GraphQL APIs for instant access
  - Use `.from('table')` to work with tables
- Schema First Design: Create tables via SQL or Supabase dashboard
- Row-Level Security (RLS) with customizable policies

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

Creating Database Table

- Design tables using SQL scripts or Supabase dashboard (visual editor)

```sql
-- Example table: todos
create table if not exists public.todos (
  id uuid primary key default gen_random_uuid(),
  description text not null,
  -- Enforce data integrity with constraints
  type text not null check (type in
     ('personal','work','family')),
  completed boolean not null default false,
  -- Use timestamps for tracking
  created_at timestamptz not null default now(),
   -- Link todos to authenticated users
  user_id uuid references auth.users(id)
);
```

Row Level Security (RLS)

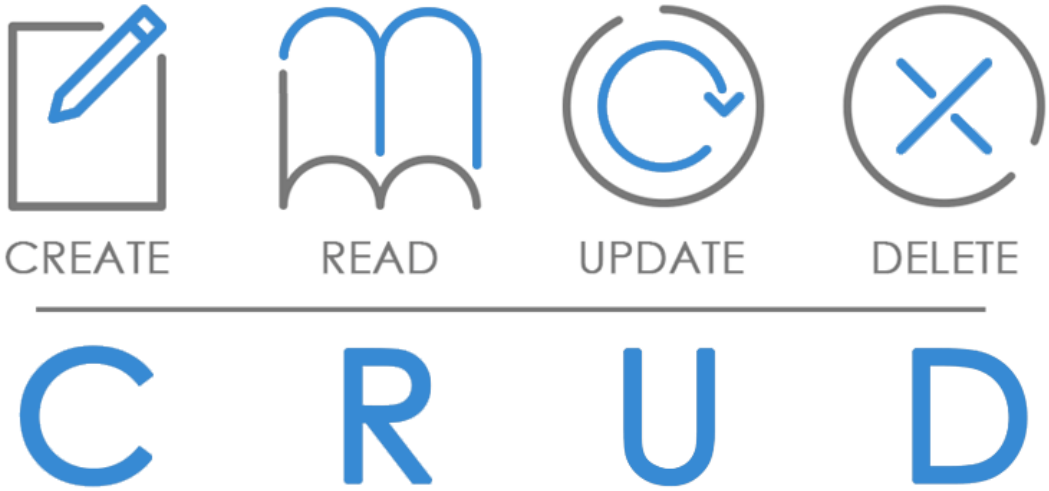
- RLS: Ensures users can only access and modify their own data

```
-- Enable RLS on the table
alter table public.todos enable row level security;

-- Policy: Read own rows
create policy "read own" on public.todos
  for select using (auth.uid() = user_id);

-- Policy: Modify own rows
create policy "modify own" on public.todos
  for all using (auth.uid() = user_id);
```

CRUD Operations



CRUD

CRUD

- Create: Add new records
- Read: Retrieve existing records
- Update: Modify existing records
- Delete: Remove records

- In Supabase perform CRUD via the auto-generated REST APIs

```
// 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

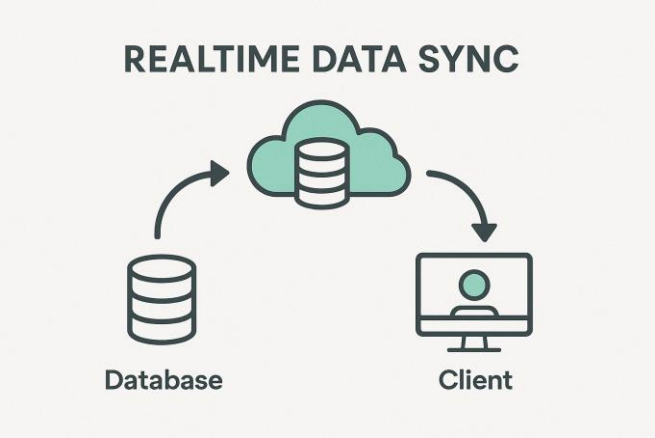
```dart
final client = Supabase.instance.client;
// CREATE
Future<void> addTodo(Todo todo) async {
  await client.from('todos').insert(todo.toJson());
}
// READ (list)
Future<List<Todo>> getTodos() async {
  final data = await client.from('todos').select().order('created_at', ascending: false);
  return (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;
}
```

Best Practices

- Implement data access in repositories
- Expose 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 Data Updates

- **What It Does:** Streams database changes instantly to connected clients
  - Enables **instant updates** without manual refresh, improving user engagement
- **Key Use Cases:** Live chat applications, Real-time dashboards, Multiplayer games
- **Best Practices:**
  - Subscribe only to relevant tables/rows to optimize performance
  - Integrate with state management for better user experience (UX)



🔔 Listen to Database Realtime Updates

Postgrest Stream:

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

Stream for ToDo list

```
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

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🗂️ File Storage

What It Does:

- Upload, manage, and serve files securely

Key Features:

- Upload/download user files or images
- Create storage buckets via Supabase dashboard
- Define file access rules (public, private, signed URLs)

Common Use Cases:

- Store Profile pictures, Documents, Images

Best Practices

- Use UUID file names to avoid collisions
- Keep buckets private and use signed URLs where possible

File Upload

```dart
final storage = Supabase.instance.client.storage;
/// Upload an avatar using a file path
Future<String> uploadAvatarFromPath(String filePath, String userId) async {
  final file = File(filePath);
  final fileName =
      'avatars/$userId-${DateTime.now().millisecondsSinceEpoch}.png’;
  await storage.from('avatars').upload(fileName, file,
        fileOptions: const FileOptions(contentType: 'image/png'),
      );
  // If bucket is public → returns public URL
  return storage.from('avatars').getPublicUrl(fileName);
}
```

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

List files in a bucket

- 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

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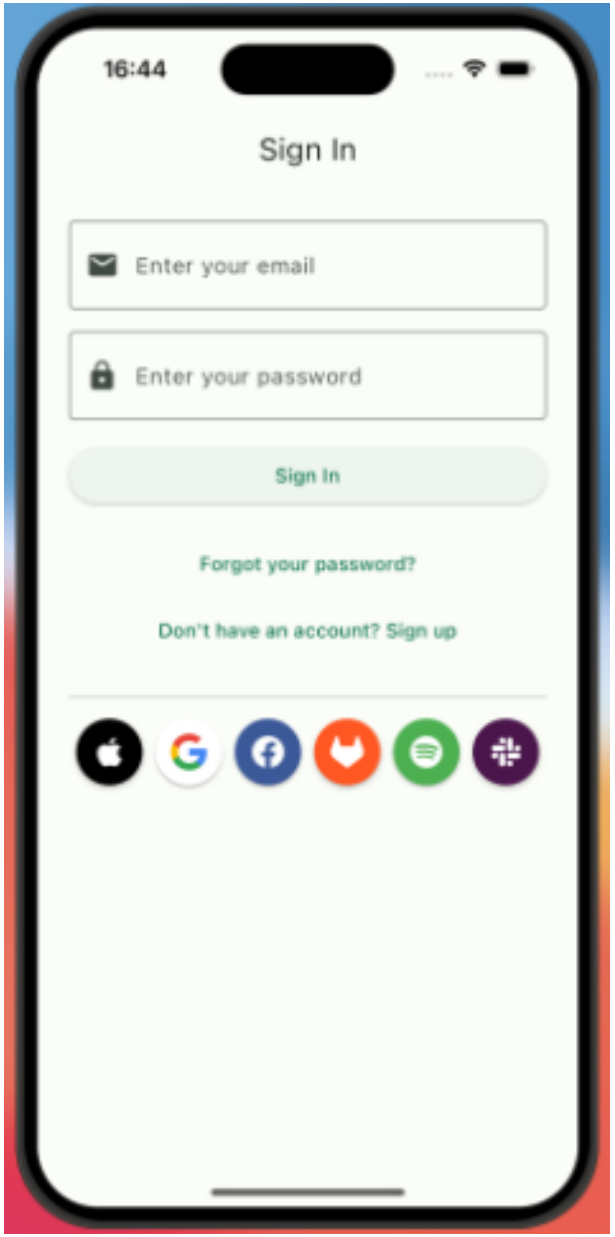
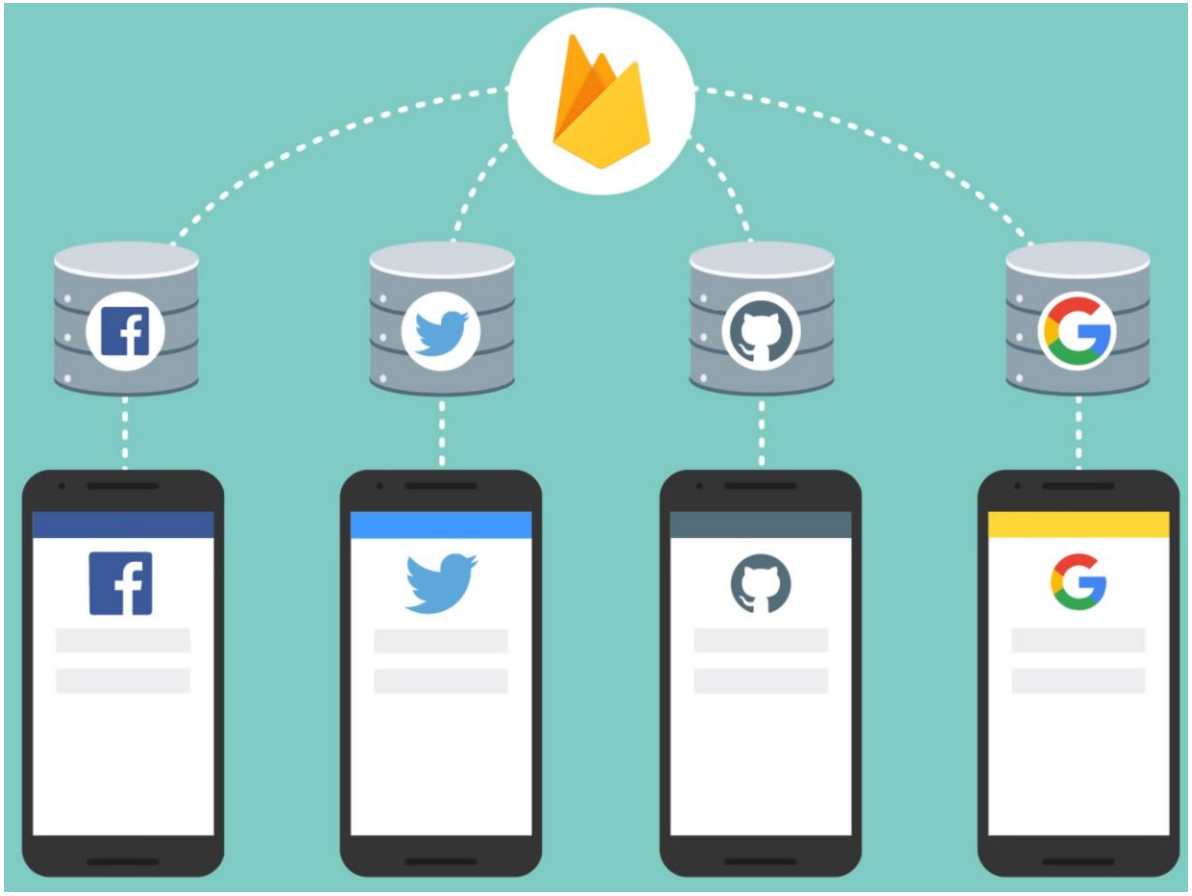
Authentication



- **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 Auth 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 and save Profile data

```
Future<User?> signUp(User user) async {
  try {

    final auth = supabase.auth;
    // ------------------- 1) Sign up --------------------
    final response = await auth.signUp(
      email: user.email,
      password: user.password,
      data: {
        // Optional metadata stored inside auth.users
        'firstName': user.firstName,
        'lastName': user.lastName,
      },

    // ------------------- 2) Save profile ---------
    await supabase.from('profiles').upsert({
      'id': authUser.id,
      'first_name': user.firstName,
      'last_name': user.lastName,
      'avatar_url': 'http://test.com/spongebob.png',
    });
    return response.user;
  } catch (e) {
    print('Error during sign up: $e');
    return null;
  }
}
```

```
create table profiles (
  id uuid primary key references
   auth.users(id) on delete cascade,
  first_name text,
  last_name text,
  avatar_url text,
  created_at timestamp default now()
);
```

Get current user details

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

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

Listen to auth state

- Real-time Updates: If you need to react to authentication state changes (e.g., a user logs in or out), you should listen to the **onAuthStateChange** stream provided by Supabase Auth

```
supabase.auth.onAuthStateChange.listen((data) {
  final AuthChangeEvent event = data.event;
  final Session? session = data.session;


  if (event == AuthChangeEvent.signedIn) {
    print('User signed in: ${session?.user?.email}');
  } else if (event == AuthChangeEvent.signedOut) {
    print('User signed out');
  }
  // Handle other events like AuthChangeEvent.userUpdated, etc.
});
```

Route Auth Guard

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

```
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 for Supabase

Security

- Enable **Row-Level Security (RLS)** on all tables
- Apply **least-privilege policies**
- Use **signed URLs** for private assets
- Set **short TTLs** for sensitive files

Performance

- Use **projections** and **pagination**; avoid SELECT * in production
- Batch UI updates
- Keep **migration SQL** under version control
- Use **Edge Functions** for server-side logic

Access Image Gallery and Camera

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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

```dart
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

- **Database**: Store and query app data using tables with defined relationships
- **Authentication**: Built-in backend services for user sign-up and login
  - Supports **email/password** and **Auth providers** (e.g., Google)
- **File Storage**: Securely upload, store, and retrieve files
- **Security**: Protect user data with authentication and authorization policies

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