Task 1

Overview

This specification defines a FastAPI application for managing satellites, including CRUD operations. Satellites operate in circular orbits with arbitrary inclination and right-ascension-of-ascending-node (RAAN), represented by an Orbit resource.

Expected Format

Submit a single Python file that defines a FastAPI application with all required endpoints. The file must expose an `app` variable (the FastAPI instance). Use an in-memory database for all data storage; no external or persistent databases.

Endpoint Summary Task 1.1

Method	Endpoint	Description
GET	`/health`	Health check
POST	`/orbits/`	Create new orbit
GET	`/orbits/{id}`	Get orbit by ID
GET	`/orbits/`	List orbits with pagination
PUT	`/orbits/{id}`	Update orbit
DELETE	`/orbits/{id}`	Delete orbit
POST	`/satellites/`	Create new satellite
GET	`/satellites/{id}`	Get satellite by ID
GET	`/satellites/`	List satellites with pagination
PUT	`/satellites/{id}`	Update satellite
DELETE	`/satellites/{id}`	Delete satellite

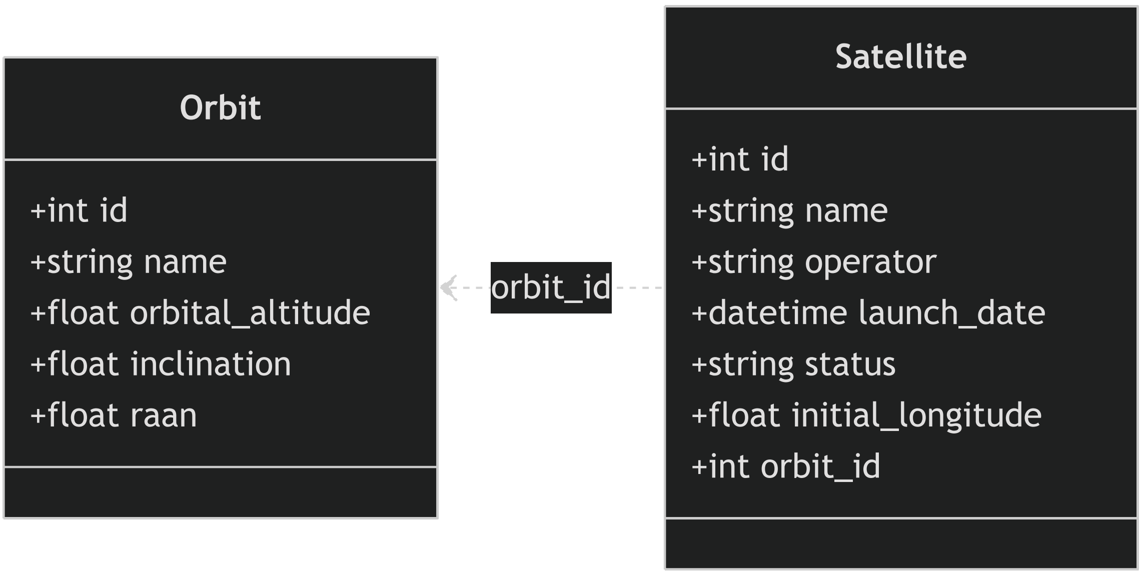
Environment

Python Version: `3.12`

Allowed Libraries:

- `fastapi >= 0.116.1`
- `uvicorn >= 0.32.1`
- `pydantic >= 2.11.7`
- `sqlalchemy >= 2.0.41`
- `python-dateutil >= 2.8.2`

Task 1.1



GET /health

Health check

Response (200):

```
{
  "status": "healthy"
}
```

GET /orbits/

Retrieve orbit by ID

Path Parameters:

- `id` : integer, positive

Response (200):

```
{
  "id": 1,
  "name": "Starlink-Shell-1",
  "orbital_altitude": 550.0,
  "inclination": 53.0,
  "raan": 120.0
}
```

Response (400): `{ "detail": "Invalid ID format" }`

Response (404): `{ "detail": "Orbit not found" }`

POST /orbits/

Create a new orbit

Request Body:

```
{
  "name": "Starlink-Shell-1",
  "orbital_altitude": 550.0,
  "inclination": 53.0,
  "raan": 120.0
}
```

Response (201): Body identical to GET /orbits/{id}

Response (409): `{ "detail": "Orbit name already exists" }`

Validation:

- `name` : string, 1-100 chars, unique
- `orbital_altitude` : float, 160 < value ≤ 40000 (km)
- `inclination` : float, 0 ≤ value ≤ 180 (deg)
- `raan` : float, 0 ≤ value < 360 (deg)

GET /orbits/

List orbits with pagination

Query Parameters:

- `skip` : integer, default 0, min 0
- `limit` : integer, default 10, max 100, min 1
- `name` : optional string, case-insensitive contains filter

Response (200):

```
{
  "orbits": [
    {
      "id": 1,
      "name": "Starlink-Shell-1",
      "orbital_altitude": 550.0,
      "inclination": 53.0,
      "raan": 120.0,
    }
  ],
  "total": 1,
  "skip": 0,
  "limit": 10
}
```

Response (400): `{ "detail": "Invalid pagination parameters" }`

PUT /orbits/

Update orbit

Path Parameters:

- `id` : integer, positive

Request Body: Same as POST, all fields required.

Response (200): Same as GET /orbits/{id}

Response (400): `{ "detail": "Invalid ID format or invalid data" }`

Response (404): `{ "detail": "Orbit not found" }`

Response (409): `{ "detail": "Orbit name already exists" }`

Notes:

- Full update; all fields must be provided.

DELETE /orbits/

Delete orbit

Path Parameters:

- `id` : integer, positive

Response (204): No content

Response (400): `{ "detail": "Invalid ID format" }`

Response (404): `{ "detail": "Orbit not found" }`

Response (409): `{ "detail": "Orbit in use by satellites" }`

POST /satellites/

Create a new satellite

Request Body:

```
{
  "name": "Starlink-1234",
  "operator": "SpaceX",
  "launch_date": "2024-01-01T00:00:00Z",
  "status": "active",
  "initial_longitude": -74.0060,
  "orbit_id": 1
}
```

Response (201):

```
{
  "id": 1,
  "name": "Starlink-1234",
  "operator": "SpaceX",
  "launch_date": "2024-01-01T00:00:00Z",
  "status": "active",
  "initial_longitude": -74.0060,
  "orbit_id": 1
}
```

Response (409):

```
{ "detail": "Satellite name already exists" }
```

Validation:

- `name` : string, 1-100 chars, unique (checked via database constraint)
- `operator` : string, 1-50 chars
- `launch_date` : ISO-8601 UTC datetime, must be in the past
- `status` : optional, ["active", "inactive", "deorbited"], default "active"
- `orbit_id` : integer, must reference an existing Orbit
- `initial_longitude` : float, -180 to 180 (degrees)

GET /satellites/

Retrieve satellite by ID

Path Parameters:

- `id` : integer, positive

Response (200):

```json
{
  "id": 1,
  "name": "Starlink-1234",
  "operator": "SpaceX",
  "launch_date": "2024-01-01T00:00:00Z",
  "status": "active",
  "initial_longitude": -74.0060,
  "orbit_id": 1
}
```

Response (400):

```json
{ "detail": "Invalid ID format" }
```

Response (404):

```json
{ "detail": "Satellite not found" }
```

GET /satellites/

List satellites with pagination

Query Parameters:

- `skip` : integer, default 0, min 0
- `limit` : integer, default 10, max 100, min 1
- `operator` : optional string, case-insensitive

Response (200):

```json
{
  "satellites": [
    {
      "id": 1,
      "name": "Starlink-1234",
      "operator": "SpaceX",
      "launch_date": "2024-01-01T00:00:00Z",
      "status": "active",
      "initial_longitude": -74.0060,
      "orbit_id": 1
    }
  ],
  "total": 1,
  "skip": 0,
  "limit": 100
}
```

Response (400):

```json
{ "detail": "Invalid pagination parameters" }
```

PUT /satellites/

Update satellite

Path Parameters:

- `id` : integer, positive

Request Body: Same as POST, all fields required.

Response (200): Same as GET /satellites/{id}

Response (400):

```
{ "detail": "Invalid ID format or invalid data" }
```

Response (404):

```
{ "detail": "Satellite not found" }
```

Response (409):

```
{ "detail": "Satellite name already exists" }
```

Notes:

- Full update; all fields must be provided.
- `created_at` cannot be updated.

DELETE /satellites/

Delete satellite

Path Parameters:

- `id` : integer, positive

Response (204): No content

Response (400):

```
{ "detail": "Invalid ID format" }
```

Response (404):

```
{ "detail": "Satellite not found" }
```

Good luck!

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