API Key Authentication

DEPLOYING AI INTO PRODUCTION WITH FASTAPI

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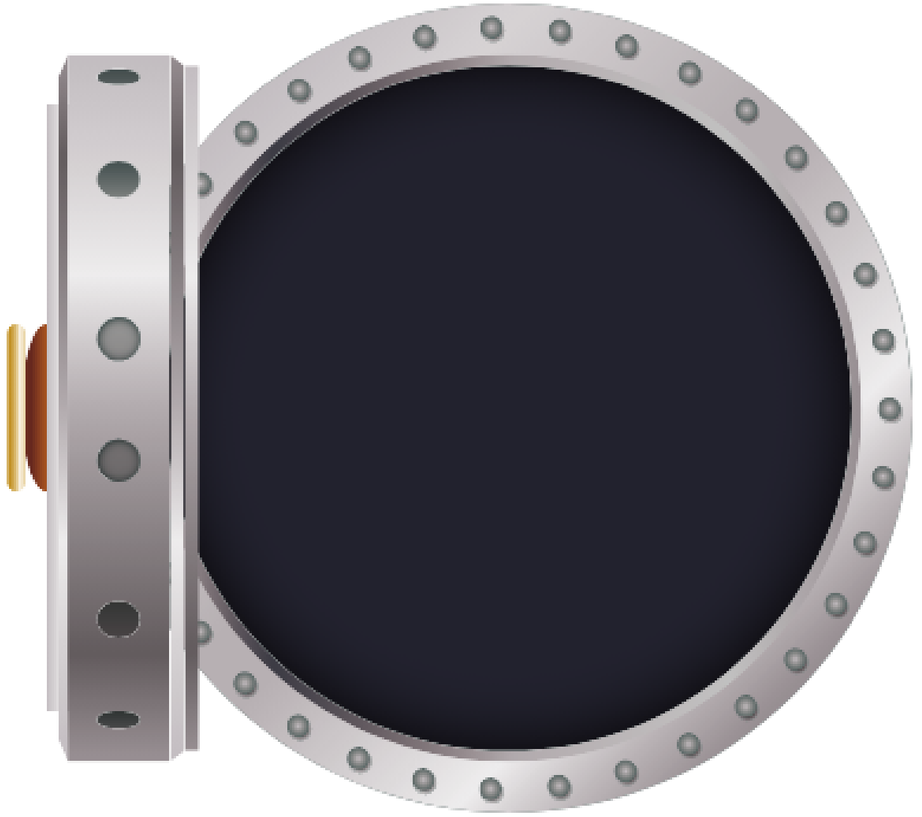
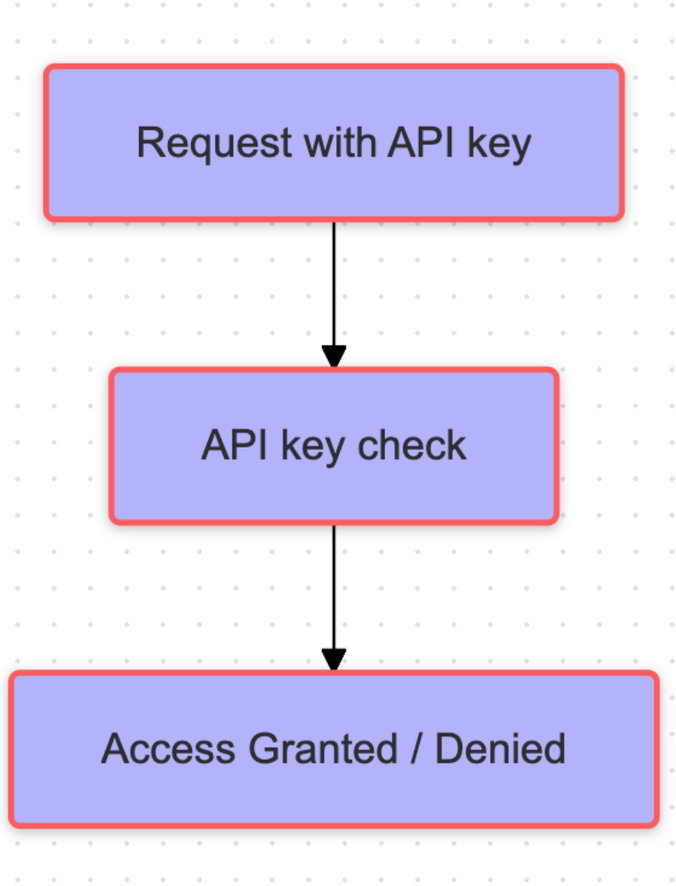
Why secure APIs?

- Stop unauthorized users
- Secure API endpoints with API key authentication



How API keys work

- Like a digital password for our API
- Sent in request headers
- Verified before accessing endpoints



Understanding APIKeyHeader

```
from fastapi import FastAPI
from fastapi.security import APIKeyHeader
header_scheme = APIKeyHeader(
                        name="X-API-Key",
                        auto_error=True
                    )
```

Authenticating an endpoint

```python
from fastapi.security import APIKeyHeader
from fastapi import Depends, HTTPException

header_scheme = APIKeyHeader(name="X-API-Key",
                             auto_error=True)

API_SECRET_KEY = "your-secret-key"

@app.get("/items/")
def read_items(
    api_key: str = Depends(header_scheme)
):
    if api_key != API_SECRET_KEY:
        raise HTTPException(
            status_code=403,
            detail="Invalid API key")
    return {"api_key": api_key}
```

- `ApiKeyHeader`
- `Depends` adds header scheme
- `HTTPException` for exceptions
- Defines API key header and secret key
- Validates API keys with `test_api_key`
- Raises `403` if the key doesn't match `API_SECRET_KEY`

Authenticating an app

```
def verify_api_key(api_key: str = Depends(header_scheme)):
    if api_key != API_KEY:
        raise HTTPException(status_code=403,  detail="Invalid API key")
    return api_key

app = FastAPI(
    dependencies=[Depends(verify_api_key)]
)
@app.post("/predict")
def predict_sentiment(text: str):
    return {
        "text": text,
        "sentiment": "positive",
        "status": "success"
    }
```

Testing the endpoint

Command with invalid API key:

```
curl -X POST \
  http://localhost:8000/predict \
  -H "X-API-Key: wrong-key" \
  -H "Content-Type: application/json" \
  -d '{"text": "This product is amazing!"}'
```

Invalid key output:

```
{"detail":"Invalid API key"}
```

Command with valid API key:

```
curl -X POST \
  http://localhost:8000/predict \
  -H "X-API-Key: your-secret-key" \
  -H "Content-Type: application/json" \
  -d '{"text": "This product is amazing!"}'
```

Valid key output:

```
{"text":"This product is amazing!",
 "sentiment":"positive",
 "status":"success"}
```

Let's practice!

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Rate Limiting

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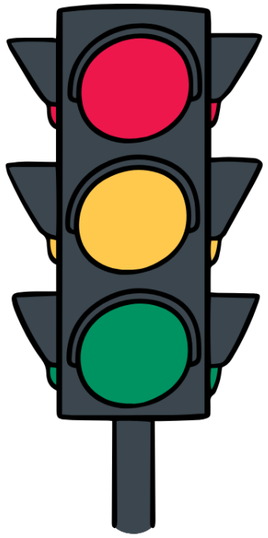
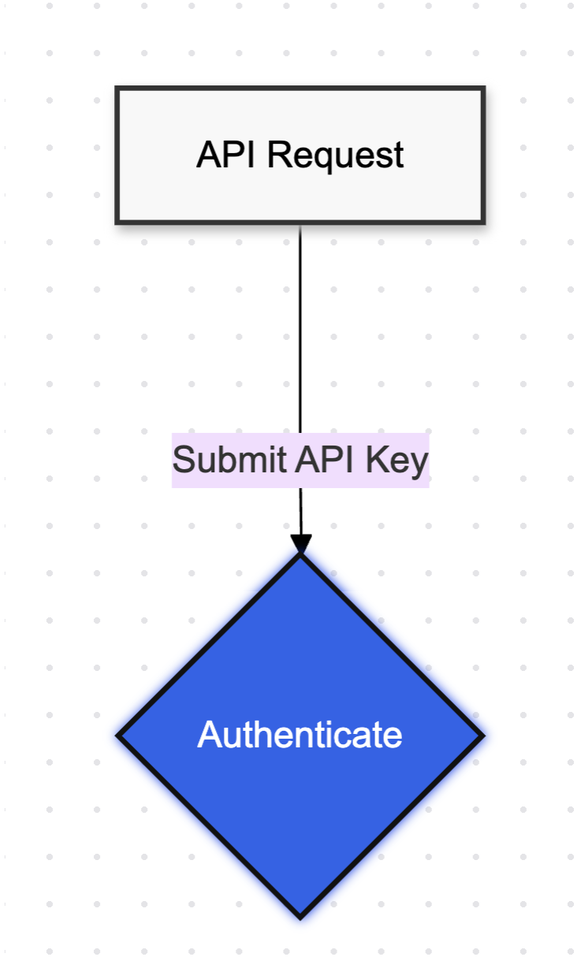
Introducing rate limiting

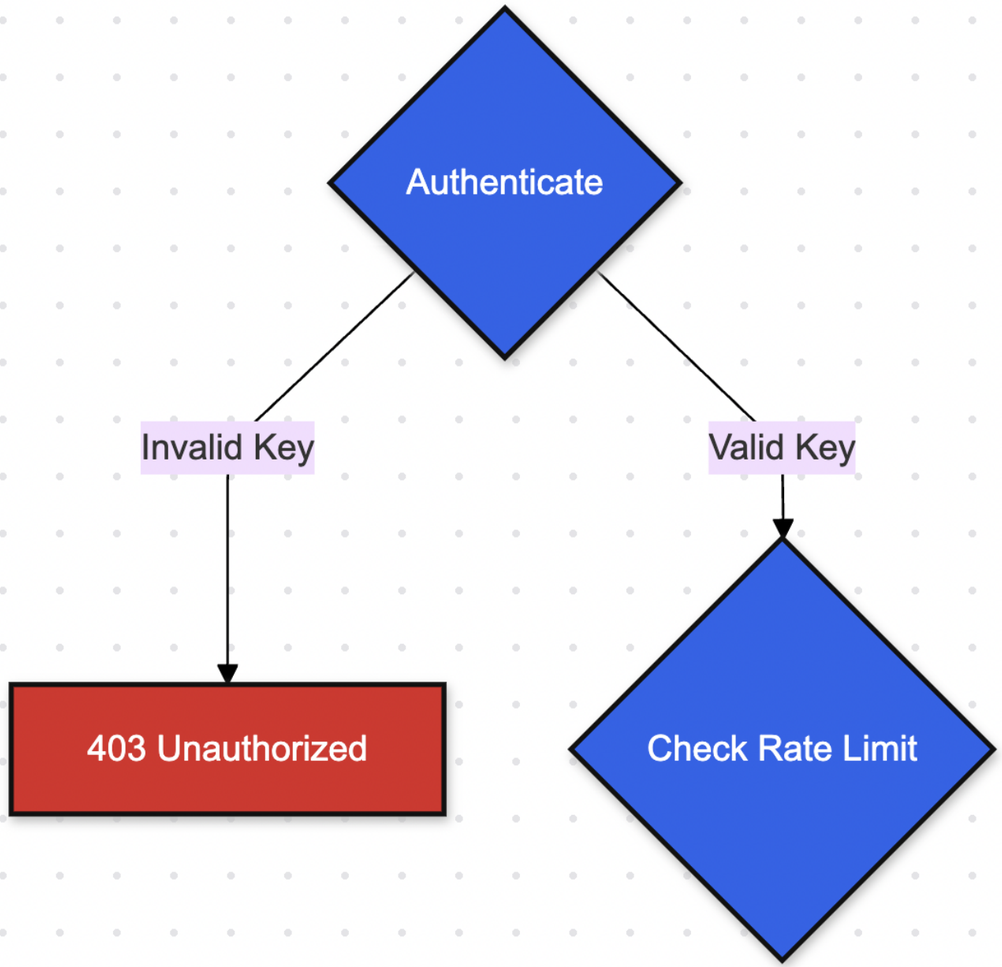


- **Purpose:** Controls the frequency of API requests.
- **Response:** Returns HTTP 429 ("Too Many Requests") when the limit is exceeded.

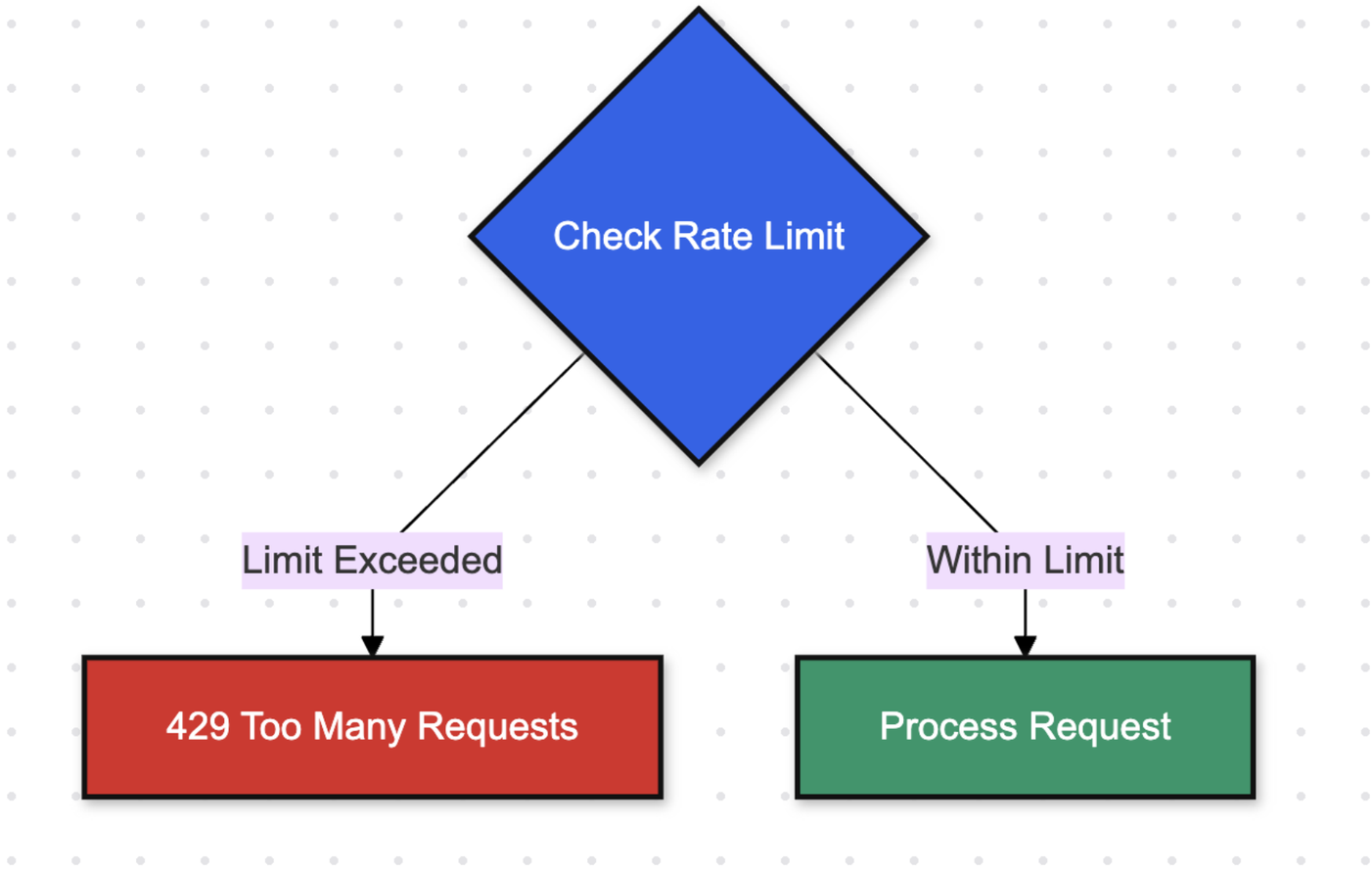
How rate limiting works



Authenticating incoming credentials



Rate limiting check

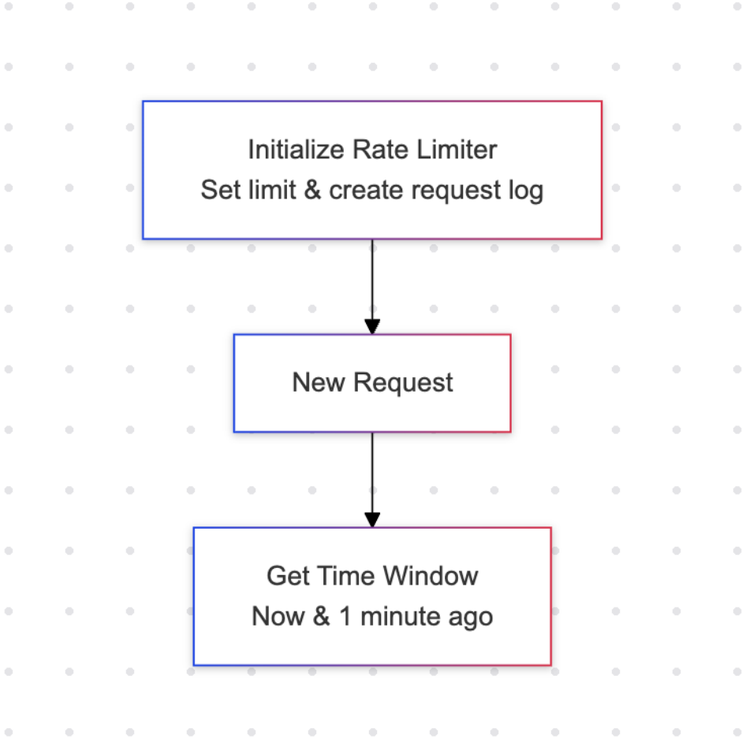


Setting up our API

```
from fastapi import FastAPI, Depends, HTTPException
from fastapi.security import APIKeyHeader
from pydantic import BaseModel

app = FastAPI()
model = SentimentAnalyzer(pkl_file_path)

API_KEY_HEADER = APIKeyHeader(name="X-API-Key")
API_KEY = "your-secret-key"
```

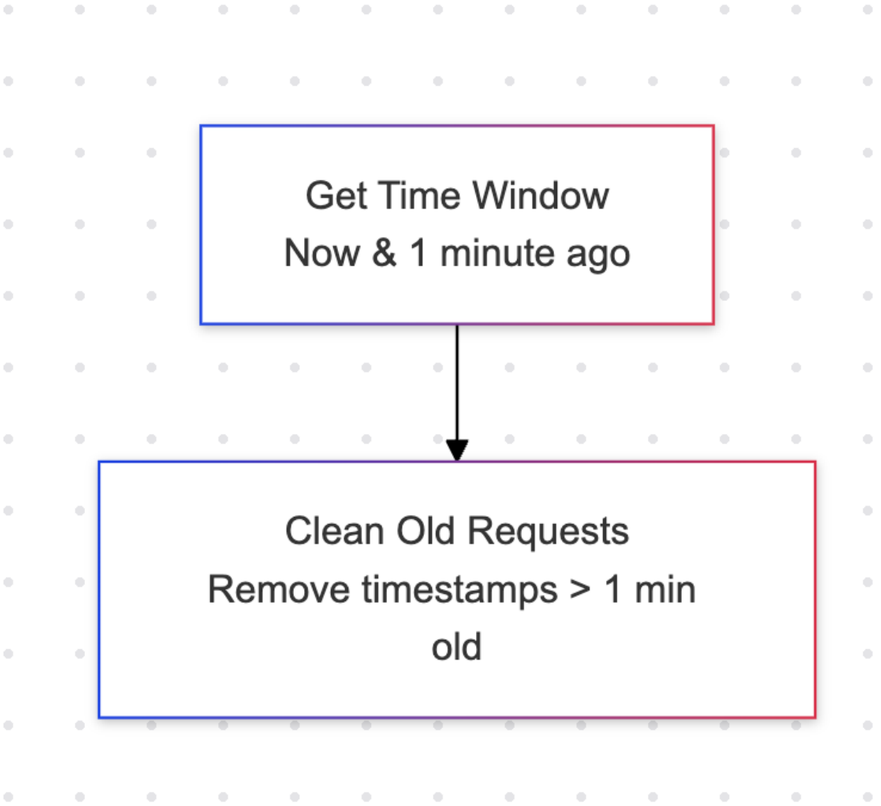
The rate limiter logic

```python
from datetime import datetime, timedelta

class RateLimiter:
    def __init__(self, requests_per_min: int = 10):
        self.requests_per_min = requests_per_min
        self.requests = defaultdict(list)
    def is_rate_limited(
        self, api_key: str
    ) -> tuple[bool, int]:
```



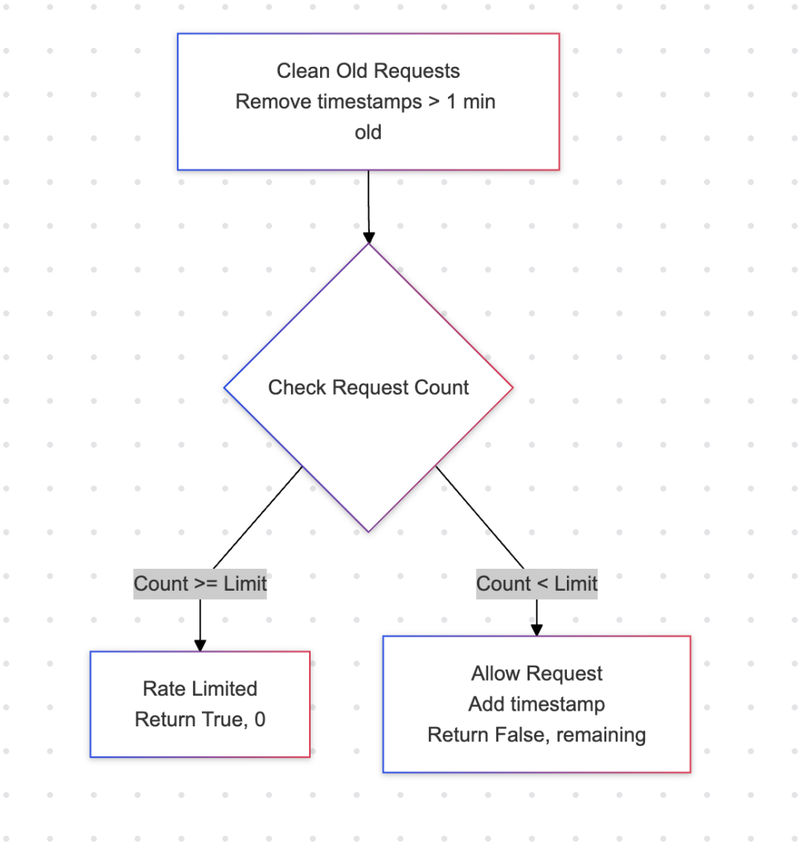
Deleting old requests

```python
from datetime import datetime, timedelta

class RateLimiter:
    def __init__(self, requests_per_min: int = 10):
        self.requests_per_min = requests_per_min
        self.requests = defaultdict(list)
    def is_rate_limited(
        self, api_key: str
    ) -> tuple[bool, int]:
        now = datetime.now()
        minute_ago = now - timedelta(minutes=1)
        self.requests[api_key] = [
            req_time for req_time in
          self.requests[api_key]
          if req_time > minute_ago
        ]
```



Check request count

```
    def is_rate_limited(self, api_key: str) ->
tuple[bool, int]:
        now = datetime.now()
        minute_ago = now - timedelta(minutes=1)
        self.requests[api_key] = [
          req_time for req_time in
          self.requests[api_key]
          if req_time > minute_ago
        ]
        recent_requests = len(self.requests[api_key])
        if recent_requests >= self.requests_per_min:
            return True, 0

        self.requests[api_key].append(now)
        return False
```



Add rate limit check

```
rate_limiter = RateLimiter(requests_per_minute=10)
def test_api_key(api_key: str = Depends(API_KEY_HEADER)):
    if api_key != API_KEY:
        raise HTTPException(
            status_code=403,
            detail="Invalid API key"
        )
    is_limited, _ = rate_limiter.is_rate_limited(api_key)
    if is_limited:
        raise HTTPException(
            status_code=429,
            detail="Rate limit exceeded. Please try again later."
        )
    return api_key
```

Apply rate limit to endpoint

```python
@app.post("/predict")
def predict_sentiment(
    request: SentimentRequest,
    api_key: str = Depends(test_api_key)
):
    result = sentiment_model(request.text)

    _, requests_remaining =
           rate_limiter.is_rate_limited(api_key)

    return {
        "text": request.text,
        "sentiment": result[0]["label"].lower(),
        "confidence": result[0]["score"],
        "requests_remaining": requests_remaining
    }
```

Send request 11 times:

```
curl -X POST "http://localhost:8000/predict" \
     -H "Content-Type: application/json" \
     -H "X-API-Key: your-secret-key" \
     -d '{"text": "I love this product"}'
```

Output:

```
{"detail":"Rate limit exceeded.
           Please try again later."}
```

Let's practice!

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Asynchronous processing

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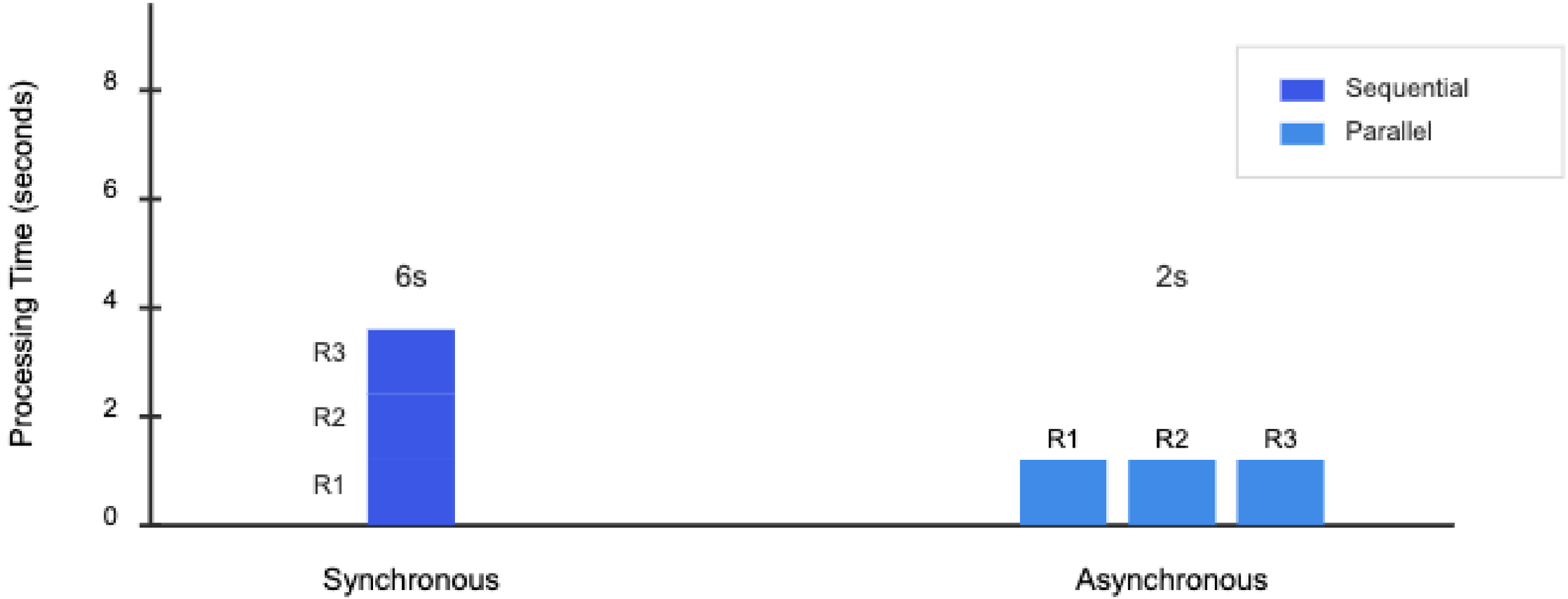
What is asynchronous processing

Allows handling multiple requests concurrently

Synchronous vs asynchronous requests



Turning synchronous endpoints asynchronous

```python
@app.post("/analyze")
def analyze_sync(comment: Comment):
    result = sentiment_model(comment.text)
    return {"sentiment": result}
```

```python
import asyncio

@app.post("/analyze")
async def analyze_async(comment: Comment):
    result = await asyncio.to_thread(
        sentiment_model, comment.text
    )
    return {"sentiment": result}
```

Implementing background tasks

```
from fastapi import BackgroundTasks
from typing import List
```

```
@app.post("/analyze_batch")
async def analyze_batch(
    comments: Comments,
    background_tasks: BackgroundTasks
):
```

```
    async def process_comments(texts: List[str]):
        for text in texts:
            result = await asyncio.to_thread(
              sentiment_model, text)
    background_tasks.add_task(process_comments,
                              comments.texts)
    return {"message": "Processing started"}
```

- `BackgroundTasks` manage comment processing queue
- `background_tasks` handles post-response processing.
- `add_task` schedules `process_comments` asynchronously.

Adding error handling

```
@app.post("/analyze_comment")
async def analyze_comment(comment: Comment):
    try:
        sentiment_model = SentimentAnalyzer()
        result = await asyncio.wait_for(
            sentiment_model(comment.text),
            timeout=5.0
        )
        return {"sentiment": result["label"]}
```

Adding error handling

```
    except asyncio.TimeoutError:
        raise HTTPException(
            status_code=408,
            detail="Analysis timed out"
        )
```

```
    except Exception:
        raise HTTPException(
            status_code=500,
            detail="Analysis failed"
        )
```

Let's practice!

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