Architecture DreamScape - Documentation Complète

> **Architecture Hybride Big Pods** - 4 repositories de développement → 3 Big Pods de déploiement

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0. Prerequis

Installation Docker

Docker Engine (requis)

```
# Ubuntu/Debian
sudo apt update && sudo apt install docker.io docker-compose-plugin

# Vérification
docker --version
docker compose version
```

Permissions utilisateur

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```
sudo usermod -aG docker $USER
# Redémarrer la session
```

Configuration recommandée

- Docker Engine 24.0+
- Docker Compose V2
- 8GB RAM minimum
- 50GB espace disque libre

Récupération des Repositories

Clone des repositories de développement

```
# Créer le dossier de travail
mkdir -p ~/dreamscape-project && cd ~/dreamscape-project

# Cloner les 4 repositories
git clone https://github.com/dreamscape/dreamscape-infra.git
git clone https://github.com/dreamscape/dreamscape-services.git
git clone https://github.com/dreamscape/dreamscape-frontend.git
git clone https://github.com/dreamscape/dreamscape-test.git
```

Structure finale attendue

```
~/dreamscape-project/
├── dreamscape-infra/          # Infrastructure & Docker configs
├── dreamscape-services/       # Backend services (AI, Auth, Payment,
User, Voyage)
├── dreamscape-frontend/       # Frontend apps (Web-client, Panorama)
└── dreamscape-test/          # Tests & validation
```

Vérification

```
# Vérifier la structure
ls -la ~/dreamscape-project/

# Vérifier les branches principales
cd dreamscape-infra && git branch -a
cd ../dreamscape-services && git branch -a
cd ../dreamscape-frontend && git branch -a
cd ../dreamscape-test && git branch -a
```

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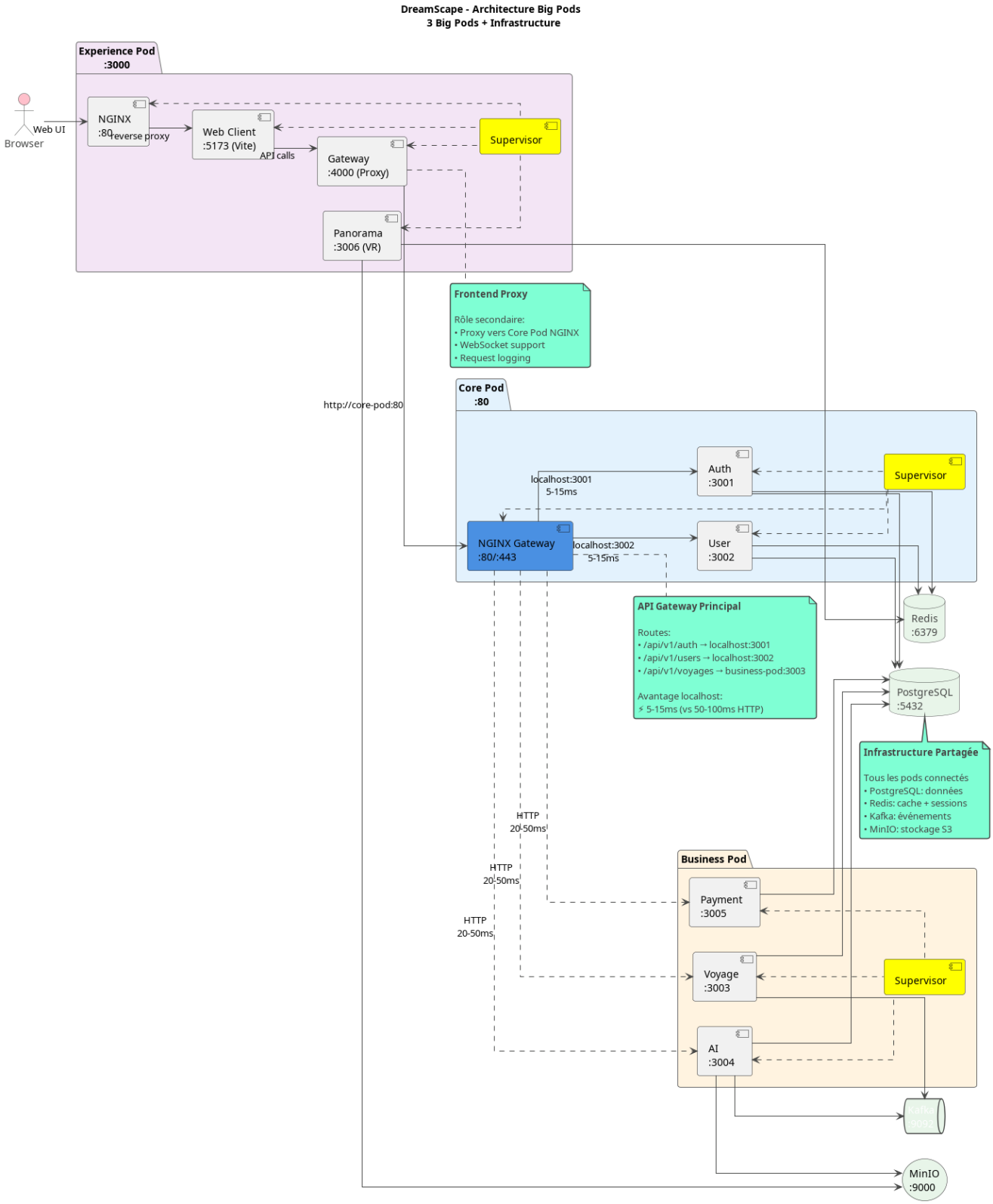
1. Vue d'ensemble

DreamScape utilise une **architecture hybride** qui combine :

- **4 repositories** pour le développement
  - **dreamscape-infra**: repo de l'infrasctuture
  - **dreamscape-services** repo des différents services (ai, auth, payment, user, voyage)
  - **dreamscape-frontend** repo du frontend (panomrama, web-client)
  - **dreamscape-test**: repo des tests
- **3 Big Pods** pour le déploiement (efficacité opérationnelle)
  - **experience-pod**: web-client, panorama
  - **business-pod**: voyage-service, payment-serice, ai-service
  - **core-pod**: auth-service, user-service

Diagrame App



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2. Composant détaillés

Experience pod - Interface & Expérience Utilisateur

Rôle : Gestion de l'interface utilisateur, expériences immersives VR et proxy API frontend

Services Inclus

- **Web Client (:5173)**
  Stack technique : React 18 + TypeScript + Vite + TailwindCSS

  Responsabilités :
  ✅ Interface utilisateur principale (recherche vols, réservation)
  ✅ Gestion de l'état (Redux Toolkit / Zustand)
  ✅ Authentification JWT (stockage tokens, refresh)
  ✅ Routing client-side (React Router)
  ✅ Hot Module Replacement (HMR) pour développement

  Fonctionnalités clés :

  - Moteur de recherche de vols
  - Calendrier de disponibilités
  - Formulaire de paiement
  - Profil utilisateur
  - Carte interactive des destinations

- **Panorama (:3006)**
  Stack technique : Node.js + Express + Three.js + WebGL

  Responsabilités :

  ```
  ✅ Streaming vidéos 360° (destinations VR)
  ✅ Gestion des assets VR (stockage MinIO)
  ✅ API de prévisualisation immersive
  ✅ Optimisation des textures (compression, CDN)
  ✅ Support WebXR (casques VR)
  ```

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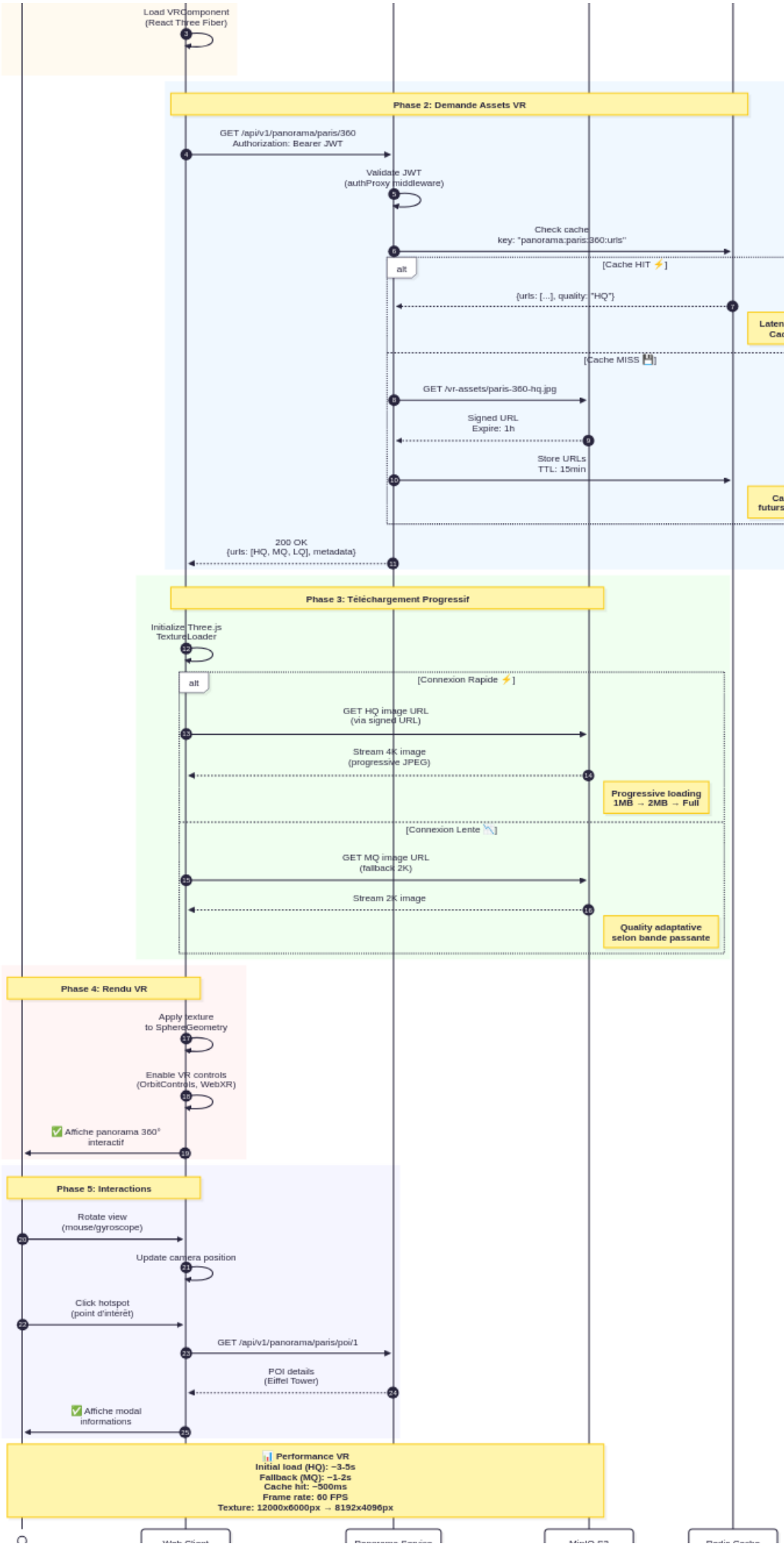
  Fonctionnalités clés :

  - Visites virtuelles de destinations
  - Prévisualisation hôtels en VR
  - Navigation interactive (gyroscope, contrôleurs)
  - Galeries photos 360°
  - Vidéos immersives lieux touristiques

  Exemple de flux VR :


Load VRComponent
(React Three Fiber)
Phase 2: Demande Assets VR
GET /api/v1/panorama/paris/360
Authorization: Bearer JWT
Validate JWT
(authProxy middleware)
Check cache
key: "panorama:paris:360:urls"
alt
[Cache HIT ⚡]
{urls: [...], quality: "HQ"}
Latency: ~5ms
Cache hit!
[Cache MISS 💾]
GET /vr-assets/paris-360-hq.jpg
Signed URL
Expire: 1h
Store URLs
TTL: 15min
Cache pour
futurs utilisateurs
200 OK
{urls: [HQ, MQ, LQ], metadata}
Phase 3: Téléchargement Progressif
Initialize Three.js
TextureLoader
alt
[Connexion Rapide ⚡]
GET HQ image URL
(via signed URL)
Stream 4K image
(progressive JPEG)
Progressive loading
1MB → 2MB → Full
[Connexion Lente 📉]
GET MQ image URL
(fallback 2K)
Stream 2K image
Quality adaptative
selon bande passante
Phase 4: Rendu VR
Apply texture
to SphereGeometry
Enable VR controls
(OrbitControls, WebXR)
✅ Affiche panorama 360°
interactif
Phase 5: Interactions
Rotate view
(mouse/gyroscope)
Update camera position
Click hotspot
(point d'interêt)
GET /api/v1/panorama/paris/poi/1
POI details
(Eiffel Tower)
✅ Affiche modal
informations
📊 Performance VR
Initial load (HQ): ~3-5s
Fallback (MQ): ~1-2s
Cache hit: ~500ms
Frame rate: 60 FPS
Texture: 12000x6000px → 8192x4096px

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- **Gateway (:4000)**
  Stack technique : Node.js + Express + http-proxy-middleware

  Responsabilités :

  ✅ Proxy API vers Core Pod NGINX (:80)
  ✅ WebSocket upgrade (chat, notifications temps réel)
  ✅ Gestion CORS pour frontend
  ✅ Logging des requêtes (monitoring)
  ✅ Retry logic (en cas d'échec temporaire)

  Architecture du proxy :

  Pourquoi un Gateway séparé ?

  ✅ Découplage frontend/backend (isolation)
  ✅ Transformation des requêtes si nécessaire
  ✅ Rate limiting côté client
  ✅ Logs centralisés des appels API frontend

- **Nginx (:80)**
  Rôle : Reverse proxy local pour le pod Experience

  Configuration :

  Avantage : Un seul point d'entrée :3000 pour tout le frontend

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Métriques Experience Pod

Métrique	Valeur Cible	Réel (Dev)
Cold Start	< 30s	~25s
Hot Reload	< 2s	~1.5s (Vite HMR)
API Latency	< 100ms	~80ms (via Gateway)
VR Load Time	< 5s	~3.5s (vidéo 360°)
Memory	< 512MB	~400MB

Core pod - Authentification & Services Critiques

Rôle : Gateway API principal, authentification JWT, gestion utilisateurs, cache Redis

Services Inclus

- **Nginx Gateway (:80/:443)**
  Rôle : API Gateway central de DreamScape

  Responsabilités :

  ✅ Reverse Proxy : Route toutes les API vers les bons services
  ✅ Rate Limiting : Protection DDoS (10 req/s auth, 50 req/s API)
  ✅ Load Balancing : Distribution de charge (future échelle)
  ✅ SSL/TLS Termination : HTTPS (certificats Let's Encrypt)
  ✅ CORS Management : Headers sécurisés
  ✅ Health Checks : Monitoring santé

  Configuration clé :

  Avantage localhost :
  ⚡ 5-15ms latency (vs 50-100ms HTTP externe)
  📈 10x plus rapide pour Auth/User
  🔒 Pas d'exposition réseau interne

- **Auth Service (:3001)**
  Stack technique : Node.js + Express + Passport + JWT + bcrypt

  Responsabilités :

  ✅ Inscription utilisateurs (email + password)
  ✅ Login avec JWT (access token + refresh token)
  ✅ Validation tokens (middleware pour toutes les APIs)
  ✅ Gestion sessions (stockage Redis)
  ✅ OAuth2 (Google, Facebook - futur)
  ✅ Réinitialisation mot de passe (email)

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API Endpoints : htpp://localhost:3001/api/v1/

Auth Service - Complete Route List
Authentication Routes
Base: /api/v1/auth

User Registration & Login

Method	Endpoint	Description	Auth Required	Rate Limited	Parameters

Method	Endpoint	Description	Auth Required	Rate Limited	Parameters
POST	/register	Register a new user	× No	✅ Yes	email, password, firstName (optional), lastName (optional), username (optional)
POST	/login	Authenticate user and get token	× No	✅ Yes	email, password, rememberMe (optional)

Profile Management

Method	Endpoint	Description	Auth Required	Parameters
GET	/profile	Get current user profile	✅ Yes	None (uses auth token)
PUT	/profile	Update user profile	✅ Yes	email (optional), firstName (optional), lastName (optional), username (optional)

Password Management

Method	Endpoint	Description	Auth Required	Parameters
POST	/change-password	Change user password	✅ Yes	currentPassword, newPassword

Token Management

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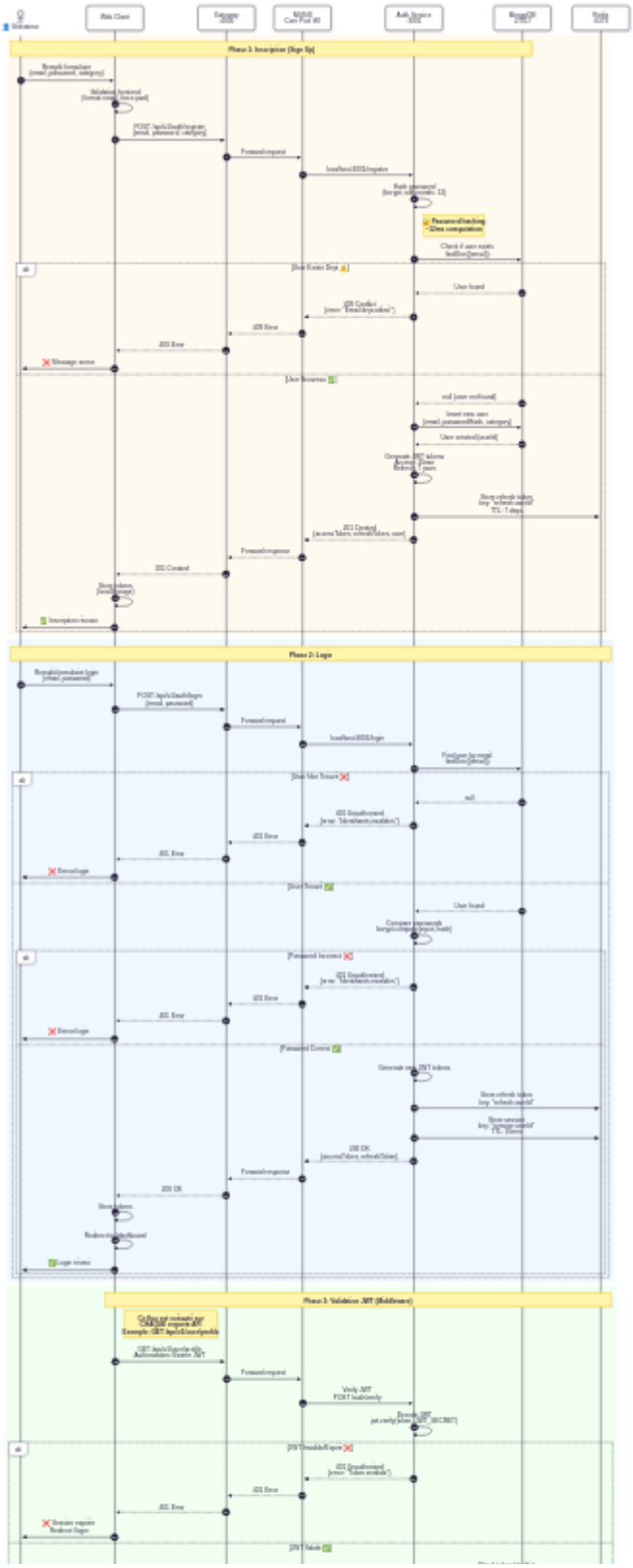
Method	Endpoint	Description	Auth Required	Rate Limited	Parameters
POST	/refresh	Refresh access token	× No (refresh token)	✅ Yes	refreshToken (cookie or body)
POST	/verify-token	Verify if token is valid	✅ Yes × No None (validates auth token)		

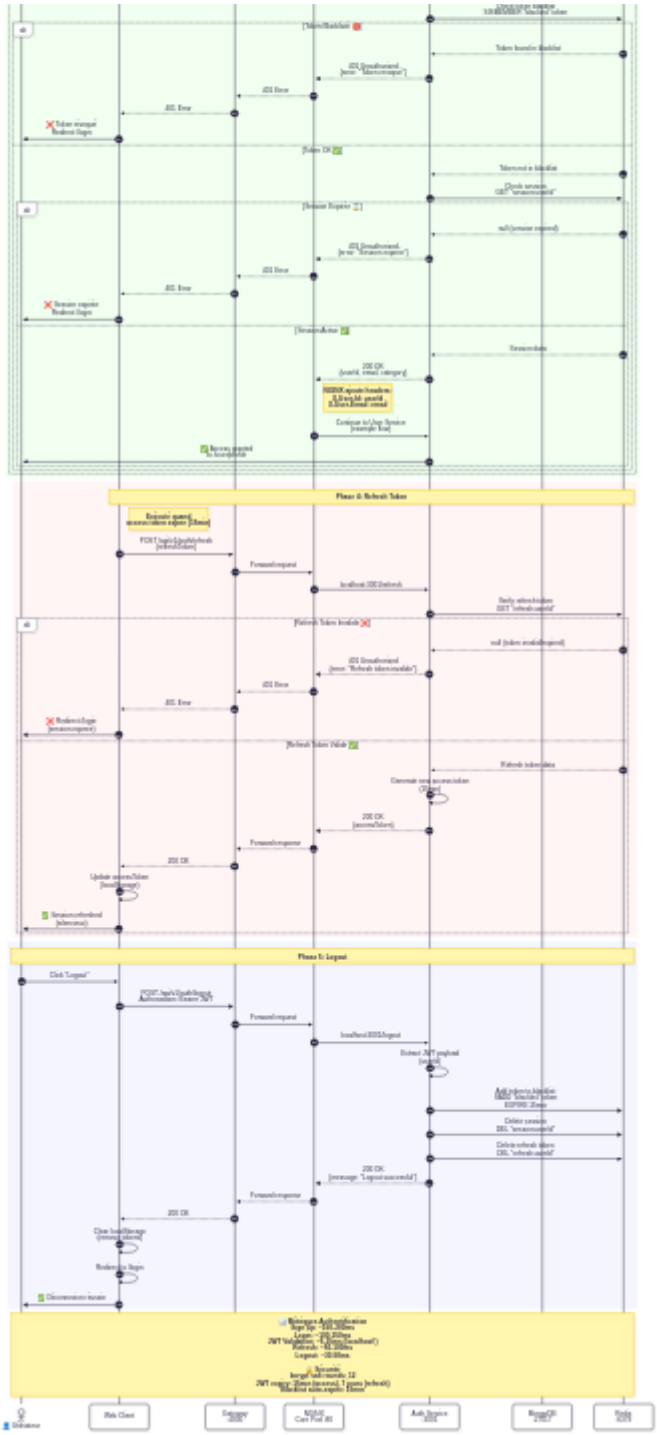
Session Management

Method	Endpoint	Description	Auth Required	Parameters

Method	Endpoint	Description	Auth Required	Parameters
POST	/logout	Logout user and revoke refresh token	× No	None (uses cookies)
POST	/logout-all	Logout user from all devices	✅ Yes	None (uses auth token)

Flux d'authentification :





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Sécurité :

Passwords: bcrypt (salt rounds: 12)
JWT expiration: 15min (access), 7 jours (refresh)
Secrets: Variables environnement (JWT_SECRET)
Rate limiting: 10 tentatives login/min

- **User Service (:3002)**
  Stack technique : Node.js + Express + Prisma ORM

  Responsabilités :

✅ Gestion profils utilisateurs (CRUD)
✅ Préférences voyages (catégories: LEISURE, BUSINESS, etc.)
✅ Historique réservations
✅ Wishlist destinations
✅ Notifications préférences

API Endpoints : htpp://localhost:3002/

User Service - Complete Route List
Profile Routes
Base: /api/v1/users/profile

Method	Endpoint	Description	Auth Required	Parameters
GET	/	Get user profile and settings	✅ Yes	None (uses auth token)
POST	/:userId	Create user profile	× No	userId (param), firstName, lastName (body)
PUT	/	Update user profile and settings	✅ Yes	Profile data (body)
POST	/:userId/avatar	Upload avatar	× No	userId (param), avatar (file)
DELETE	/:userId	Delete user profile	× No	userId (param)

Activities Routes
Base: /api/v1/activities (Currently disabled - AmadeusService import issue)

Method	Endpoint	Description	Required Parameters
GET	/search	Search activities	(latitude + longitude) OR (north + west + south + east)
GET	/details/:activityId	Get activity details	activityId (param)
GET	/:activityId	Get activity by ID (alternative)	activityId (param)

Health Route

Method	Endpoint	Description
GET	/health	Health check endpoint

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Métriques Core Pod

Métrique	Valeur Cible	Réel (Dev)
Auth Latency	< 20ms	~8ms (localhost!) ⚡

Métrique	Valeur Cible	Réel (Dev)
JWT Validation	< 10ms	~5ms (Redis cache)
User Profile Load	< 50ms	~30ms (cache hit)
Throughput	1000 req/s	~800 req/s
Memory	< 1GB	~750MB

Business pod - Logique Métier & Intégrations

Rôle : Services métier (voyages, IA, paiements), intégrations API externes, traitement événements

Services Inclus

- **Voyage Service (:3003)**
  Stack technique : Node.js + Express + Amadeus API + Prisma

  Responsabilités :

  ✅ Recherche de vols (intégration Amadeus Flight Offers Search)
  ✅ Prix en temps réel (cache Redis 30min)
  ✅ Gestion réservations (statuts: PENDING, CONFIRMED, CANCELLED)
  ✅ Historique voyages (par utilisateur)
  ✅ Événements Kafka (voyage.booked, voyage.cancelled)

  API Endpoints : http://localhost:3003/

  Complete Route List for Voyage Service
  Health & Monitoring Routes
  Base: /api/health

Method	EndpEndpointoint	Description
GET	/	Full health check with all services
GET	/ready	Readiness probe
GET	/live	Liveness probe
GET	/cache	Cache statistics and status

  Flight Routes
  Base: /api/flights

  Search & Discovery

Method	Endpoint	Description	Required Parameters
GET	/search	Search flights with mapped DTOs	originLocationCode, destinationLocationCode, departureDate

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Method	Endpoint	Description	Required Parameters
GET	/destinations Search	flight destinations (inspiration)	origin
GET	/price-analysis	Flight price analysis	originIataCode, destinationIataCode, departureDate
GET	/inspiration	Flight inspiration search	origin
GET	/cheapest-dates	Flight cheapest date search	origin, destination

Flight Information

Method	Endpoint	Description	Required Parameters
GET	/status	Flight status	carrierCode, flightNumber, scheduledDepartureDate
GET	/delay-prediction	Flight delay prediction	Multiple (see code)
GET	/checkin-links	Flight check-in links	airlineCode
GET	/seatmap	Seat map display	flightOfferId
GET	/branded-fares	Branded fares upsell	flightOfferId

Analytics

Method	Endpoint	Description	Required Parameters
GET	/analytics/most-traveled	Most traveled destinations	originCityCode, period
GET	/analytics/most-booked	Most booked destinations	originCityCode, period
GET	/analytics/busiest-period	Busiest traveling period	cityCode, period

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Booking & Orders

Method	Endpoint	Description	Required Parameters
POST	/choice-prediction	Flight choice prediction	Flight offers (body)
POST	/offers/pricing	Flight offers price	Flight offers (body)
POST	/availabilities	Flight availabilities search	originDestinations, travelers, sources (body)

Method	Endpoint	Description	Required Parameters
POST	/orders	Flight create orders	Order data (body)
GET	/orders/:orderId	Flight order management	orderId (param)

Hotel Routes
Base: /api/hotels

Method	Endpoint	Description	Cache TTL	Required Parameters
GET	/search	Search hotels	5 min	checkInDate, checkOutDate, (cityCode OR latitude+longitude)
GET	/details/:hotelId	Get hotel details	15 min	hotelId (param)
GET	/ratings	Hotel ratings	-	TBD
POST	/bookings	Hotel booking	-	Booking data (body)
GET	/list	Hotel list	1 hour	TBD
GET	/:hotelId/images	Get hotel images	-	hotelId (param)

Location Routes
Base: /api/locations

Method	Endpoint	Description	Required Parameters
GET	/search	Search locations (cities, airports, etc.)	keyword
GET	/airports	Search airports	keyword

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Transfer Routes
Base: /api/transfers

Method	Endpoint	Description	Required Parameters
GET	/search	Transfer search	startDateTime, passengers
POST	/bookings	Transfer booking	Booking data (body)
GET	/orders/:orderId	Transfer order management	orderId (param)

Airline Routes
Base: /api/airlines

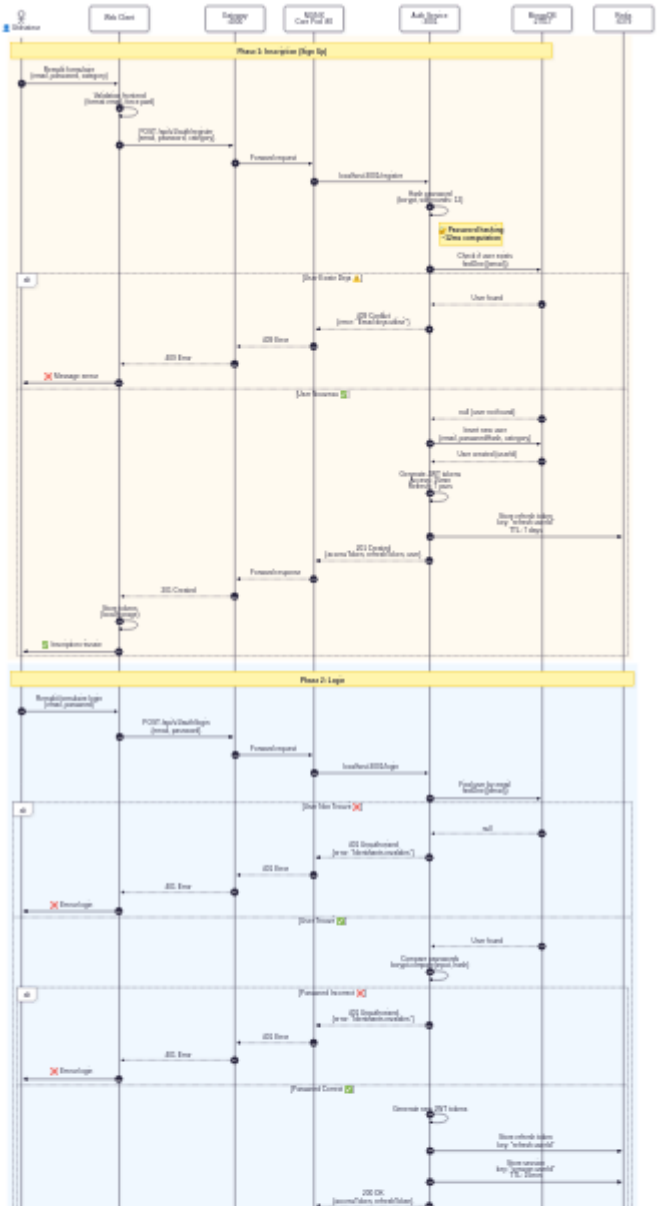
Method	Endpoint	Description	Required Parameters
GET	/lookup	Airline code lookup	None (optional: airlineCodes, IATACode, ICAOCode)
GET	/routes	Airline routes	airlineCode

Airport Routes
Base: /api/airports

Method	Endpoint	Description	Required Parameters
GET	/on-time-performance	Airport on-time performance	airportCode, date
GET	/nearest	Airport nearest relevant	latitude, longitude
GET	/routes	Airport routes	departureAirportCode

Intégration Amadeus :

Flux de réservation :



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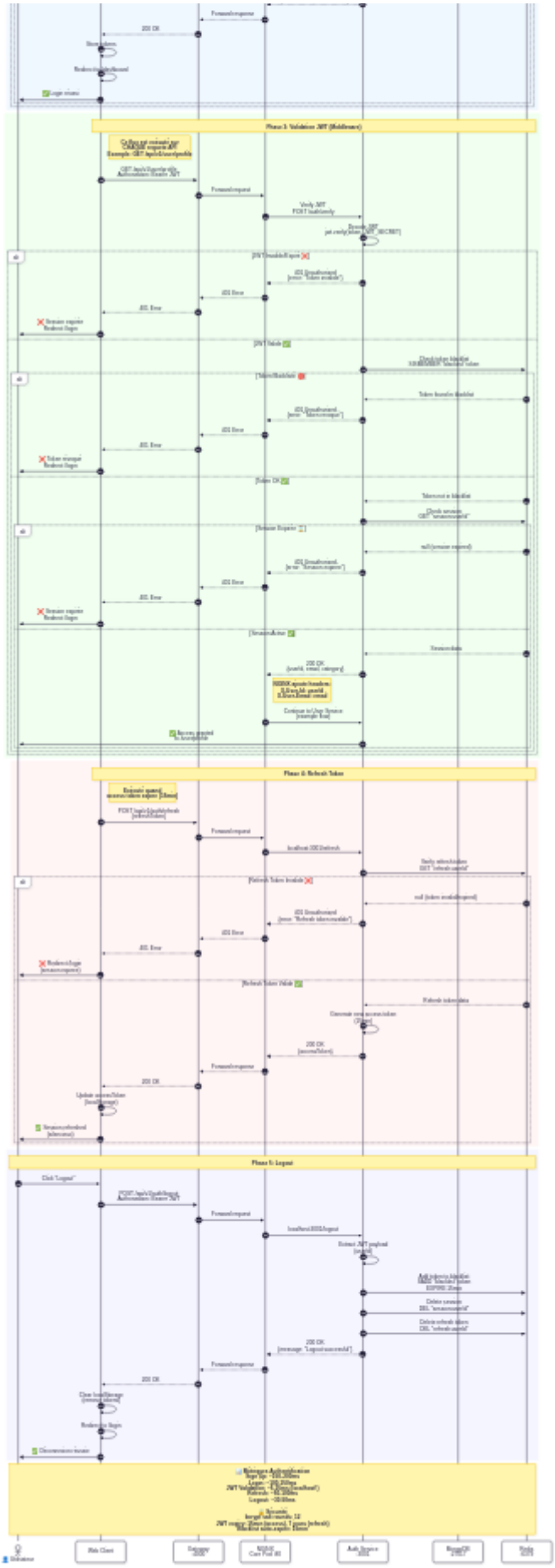

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Connexions :

- **AI Service (:3004)**
  Stack technique : Python (FastAPI) + TensorFlow + OpenAI API + MinIO

  Responsabilités :

  ✅ Recommandations personnalisées (ML model: collaborative filtering)
  ✅ Génération d'itinéraires (OpenAI GPT-4)
  ✅ Prédiction de prix (time series forecasting)
  ✅ Analyse de sentiment (avis destinations)
  ✅ Chatbot voyage (RAG sur base de connaissances)

  API Endpoints : http:/localhost:3004/

AI Service - Complete Route List
Recommendations Routes
Base: /api/v1/recommendations

Method	Endpoint	Description	Auth Required	Required Parameters
GET	/	Get travel recommendations	× No	cityCodes

Optional Parameters:
travelerCountryCode - Country code of the traveler
destinationCountryCode - Country code of the destination

Predictions Routes
Base: /api/v1/predictions

Method	Endpoint	Description	Auth Required	Required Parameters
GET	/trip-purpose	Predict trip purpose	× No	originLocationCode, destinationLocationCode, departureDate, searchDate,returnDate(optional)

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Health Route

Method	Endpoint	Description
GET	/health	Health check endpoint

- **Payment Service (:3005)**
  Stack technique : Node.js + Express + Stripe API + Prisma

  Responsabilités :

  ✅ Création Payment Intent (Stripe)
  ✅ Webhook Stripe (confirmation paiements)

✅ Gestion remboursements
✅ Historique transactions
✅ Sécurité PCI-DSS (pas de stockage carte)

API Endpoints : http://localhost:3005/

Flux de paiement :
Paiment

Sécurité :

🔒 PCI-DSS Compliant (Stripe gère les cartes)
🔐 Webhook signature (validation Stripe-Signature header)
🚫 Idempotency keys (évite double paiement)
📝 Audit logs (toutes transactions loggées)
Exemple code Stripe :

Métriques Business Pod

Métrique	Valeur Cible	Réel (Dev)
Voyage Search	< 2s	~1.5s (cache hit) / ~3s (Amadeus)
AI Recommendations	< 500ms	~350ms (model inference)
Payment Intent	< 1s	~800ms (Stripe API)
Throughput	500 req/s	~400 req/s
Memory	< 2GB	~1.5GB

Infratructuture - base de donnée , S3

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- **Redis (:6379)**
  Rôle : Cache applicatif + stockage sessions

Utilisations :

Configuration :

Avantages :
⚡ Latency < 1ms (in-memory)
📈 Réduit charge Postgres de 60-80%
🔄 TTL automatique (sessions expirées supprimées)
🔧 Supervisor

Rôle : Process manager (PID 1 du container)

Configuration :

Pourquoi Supervisor ?

✅ Gère 3 processus simultanés (nginx + auth + user)
✅ Auto-restart on crash (container ne meurt pas)
✅ Logs centralisés (/var/log/supervisor/)
✅ Ordre de démarrage contrôlé (priorities)

Solution Big Pods :

Gain : -90% latence sur Auth/User ! 🚀

Exemple Concret : Validation JWT
Scénario : User fait une recherche de vol

Performance totale : ~600-800ms (dont 90% API Amadeus)

Si Auth était en microservice séparé :

Validation JWT: 50-100ms au lieu de 5-15ms
+100ms sur CHAQUE requête API !

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6. Deploimenent

1. Remplir toutes les conditions du prérequis.
2. Copier le fichier d'environnement
3. lancer le script de generation des secrets: dreamscape-infra/scripts/bigpods/generate-dev-secrets.sh
4. Ajouter ces clées personneles pour les différentes API
5. Lancer le script de dev dev-bigpods.sh
6. Lancer le script de deploiment deploy-bigpods.sh