

t.Co.

Personal AI Travel Concierge

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M.Design — Design for Technological Environments

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11 Agents · 4 Stages · 1 Evolving Companion

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A Lifelong Companion for Every Journey

The Personal AI Travel Concierge is a multi-agent system designed to deliver hyper-personalized travel assistance at every stage of the journey — from initial inspiration to long-term travel memory. Unlike conventional travel apps that treat each booking as an isolated transaction, this system builds a continuous, evolving model of the traveler's preferences, behaviors, and aspirations.

At its core, an orchestrating AI coordinates eleven specialized agents across four distinct stages: pre-trip planning and booking, real-time in-trip guidance, post-trip curation and reflection, and long-term companion intelligence. Each stage feeds the next, creating a feedback loop that makes the system smarter and more attuned with every journey.

This document provides a complete specification of the system's agent topology, data flows, technical dependencies, and exhibition implementation scope. It serves as both an academic reference and a technical blueprint for the working demonstration.

The Four-Stage Agent Ecosystem

The system is organized around a central orchestrating intelligence — the Core Personal AI — which coordinates four specialized stage clusters. Data and context flow continuously between stages, and a feedback loop from Stage 4 back to Stage 1 ensures the system evolves over time.

Stage	Phase	Agents	Focus
S1	Before Trip	AGT-01 / 02 / 03	Planning & Booking
S2	During Trip	AGT-04 / 05 / 06	Real-Time Guidance
S3	Post Trip	AGT-07 / 08	Memories & Insights
S4	Long-Term	AGT-09 / 10 / 11	Evolving Companion

Eleven Specialized Agents Across Four Stages

S1 — Before Trip — Planning & Booking

Transforms raw travel intent into a confirmed, personalized itinerary.

AGT-01	Preference Profiling Agent	Implemented
	Builds a rich, structured model of the traveler's style, budget thresholds, interests, and constraints through natural conversation and behavioral inference.	
Inputs	User conversations & stated preferences · Past trip history · Budget & date constraints	
Outputs	Structured user profile (JSON) · Travel style taxonomy · Interest & constraint vectors	
APIs	GPT-4o · Vector DB · Claude	
AGT-02	Itinerary Creation Agent	Implemented
	Generates complete day-by-day travel plans optimized for the user's profile — balancing must-sees with hidden gems, respecting energy levels and budget.	
Inputs	User profile (AGT-01 output) · Destination, dates, group size · Budget envelope	
Outputs	Structured itinerary (JSON + readable) · Activity cards with location & cost · Map-ready coordinate set	
APIs	Google Places · OpenAI · Foursquare	
AGT-03	Booking & Management Agent	Conceptual
	Executes reservations across flights, hotels, and restaurants — organizes all confirmations, tickets, and calendar entries into a single travel pack.	
Inputs	Confirmed itinerary (AGT-02) · Payment preferences & loyalty accounts	
Outputs	Confirmed bookings & PNR codes · Calendar events & reminders · Document pack	
APIs	Amadeus · Booking.com · OpenTable	

S2 — During Trip — Real-Time Guidance

Acts as an always-on local guide – sensing context, resolving disruptions, bridging language barriers.

AGT-04	Location Context Agent	Conceptual
	Monitors real-time position and crowd levels to surface proactive, hyper-relevant suggestions before the traveler even asks.	
Inputs	GPS coordinates & heading · Timestamp & local conditions · Crowd density signals	
Outputs	Ranked nearby suggestions · Contextual alerts & detour advice	
APIs	Google Maps · Foursquare · HERE Maps	

AGT-05	Schedule Optimization Agent	Conceptual
	Continuously monitors for disruptions – delays, weather, closures – and automatically re-plans, triggering rebooking actions where needed.	
Inputs	Live itinerary state · Flight status feeds · Weather & event alerts	
Outputs	Updated itinerary · Rebooking actions via AGT-03 · Proactive notifications	
APIs	FlightRadar · OpenWeather · Google Maps	

AGT-06	Language & Culture Agent	Implemented
	Provides real-time spoken translation and culturally nuanced etiquette guidance – from pronunciation help to awareness of local customs.	
Inputs	User speech or typed text · Current GPS location · Target language context	
Outputs	Spoken & written translations · Cultural etiquette tips · Pronunciation audio	
APIs	Whisper STT · DeepL · ElevenLabs	

S3 – Post Trip – Memories & Insights

Transforms raw trip data into curated memories and actionable insights that feed the next journey.

AGT-07	Memory Curation Agent	Conceptual
	Organizes photos, visited locations, and experiences into a coherent travel narrative – ready to share or preserve as a personal journal.	
Inputs	Trip photos & media · Location history & timestamps · Booking records	

Outputs	Organized photo albums · Narrative travel journal · Social media-ready posts
APIs	Google Photos · GPT-4 Vision

AGT-08	Feedback & Learning Agent	Conceptual
	Captures explicit ratings and implicit behavioral signals to refine the user's travel profile — ensuring every future trip is better calibrated.	
Inputs	Star ratings & comments · Behavioral signals (time spent, skips) · Post-trip survey responses	
Outputs	Updated preference profile · Insights report per destination · Recommendation model refinement	
APIs	Sentiment Analysis · Vector DB · GPT-4o	

S4 — Long-Term Value — The Evolving Companion

Grows alongside the traveler over years — optimizing loyalty, wellness, and anticipating the next adventure.

AGT-09	Loyalty Optimization Agent	Conceptual
	Tracks points, miles, and status across all programs — maximizing reward redemptions and steering booking decisions toward highest long-term value.	
Inputs	Booking history · Loyalty program memberships · Upcoming trip parameters	
Outputs	Redemption recommendations · Program upgrade suggestions · Optimal booking timing alerts	
APIs	Airline APIs · Hotel Loyalty · Points Calc	

AGT-10	Wellness Agent	Conceptual
	Monitors trip intensity, jet lag, and physical activity — proactively suggesting rest or recovery to maintain optimal well-being throughout the journey.	
Inputs	Activity & step data · Trip schedule density · Health preferences & conditions	
Outputs	Wellness alerts & rest nudges · Schedule lightening suggestions	
APIs	HealthKit · Wearable APIs · GPT-4o	

AGT-11	Future Trip Anticipation Agent	Conceptual
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	Proactively surfaces destination proposals – drawing on travel history, seasonal opportunities, trending destinations, and evolving interests.
Inputs	Full travel history & feedback · Trending destination signals · Seasonal & pricing calendars
Outputs	Ranked destination proposals · Optimal travel timing windows · Estimated budget previews
APIs	Web Search · Rec Engine · GPT-4o

The Intelligence at the Center

The Core Personal AI is not a passive router — it is the persistent intelligence that gives the system its character. It maintains a unified, evolving model of the traveler, mediates between agents, and ensures every interaction feels cohesive and intentional rather than stitched together from disconnected services.

<h3>Core Responsibilities</h3> <ul style="list-style-type: none">• Maintains the unified traveler profile across all sessions and trips• Routes user requests to the appropriate specialized agent• Manages conversation context window across all stages• Resolves conflicts between competing agent recommendations• Synthesizes multi-agent outputs into a single coherent voice• Triggers proactive outreach when context warrants it	<h3>Technology Foundation</h3> <ul style="list-style-type: none">• LLM backbone: Anthropic Claude / OpenAI GPT-4o• Multi-agent coordination: LangGraph / CrewAI• Persistent memory: PostgreSQL + Pinecone vector store• Real-time event bus: WebSocket + message queue• Prompt engineering: structured role cards per agent• Safety layer: content moderation + PII filtering
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Infrastructure & Integrations

Layer	Technologies
AI / LLM Layer	GPT-4o · Claude 3.5 · LangGraph · CrewAI
Voice Interface	OpenAI Whisper STT · ElevenLabs TTS · WebSpeech API
Location Services	Google Maps Platform · Foursquare Places · HERE Maps
Travel & Booking	Amadeus Travel API · Booking.com · OpenTable
Data & Memory	PostgreSQL · Pinecone · Redis · S3
Frontend	React 18 · Tailwind CSS · Framer Motion · Mapbox GL
Backend	Node.js · Python FastAPI · WebSockets · Docker
External Intelligence	DeepL Translate · OpenWeather · FlightAware

Exhibition Implementation vs. Full Vision

The exhibition demo presents a working proof-of-concept for the three highest-impact agents, demonstrating the core interaction loop — from preference intake through personalized itinerary generation — with voice interaction and live visual output.

Implemented for Exhibition	Conceptual / Future Work
AGT-01 — Preference Profiling (conversational onboarding)	AGT-03 — Actual booking execution (payment integration)
AGT-02 — Itinerary Creation (real-time generation + map viz)	AGT-04 — Live GPS-based recommendations
AGT-06 — Language & Culture Agent (live translation demo)	AGT-05 — Real disruption handling & rebooking
Voice interaction — speech-to-text input via Whisper	AGT-07 — Media curation & social sharing
AI voice output — spoken responses via ElevenLabs	AGT-08 — Multi-trip feedback learning loop
Real-time itinerary visualization on large screen	AGT-09 — Cross-program loyalty optimization
Interactive agent map — architecture visible as UI layer	AGT-10 — Wearable wellness integration
	AGT-11 — Long-horizon trip prediction engine

The Installation: Travel Intelligence, Live

The exhibition presents the system as an immersive, large-format installation. A visitor approaches a floor-standing screen — the AI companion initiates a natural conversation about their dream destination. Within minutes, a personalized itinerary materializes in real time, with a live map, day-by-day activities, and cultural insights. The full agent architecture is visible as an animated background layer.

#	Step	Description
01	Approach & Engage	Visitor approaches the screen. The AI avatar activates and greets them with a spoken welcome. Keyboard available as fallback input.
02	Dream Destination	The AI asks: 'Where have you always wanted to go?' — Preference profiling begins, extracting travel style and interests in natural dialogue.
03	Live Itinerary	A map materializes. Day-by-day activities appear in real time as the Itinerary Agent thinks — visitors watch the plan build itself.
04	Language Demo	The AI demonstrates the Language Agent — offering a phrase in the destination's language, with pronunciation and cultural context.
05	Architecture Reveal	The background agent map animates — showing which agents activated, the data flows, and how the system made its decisions.