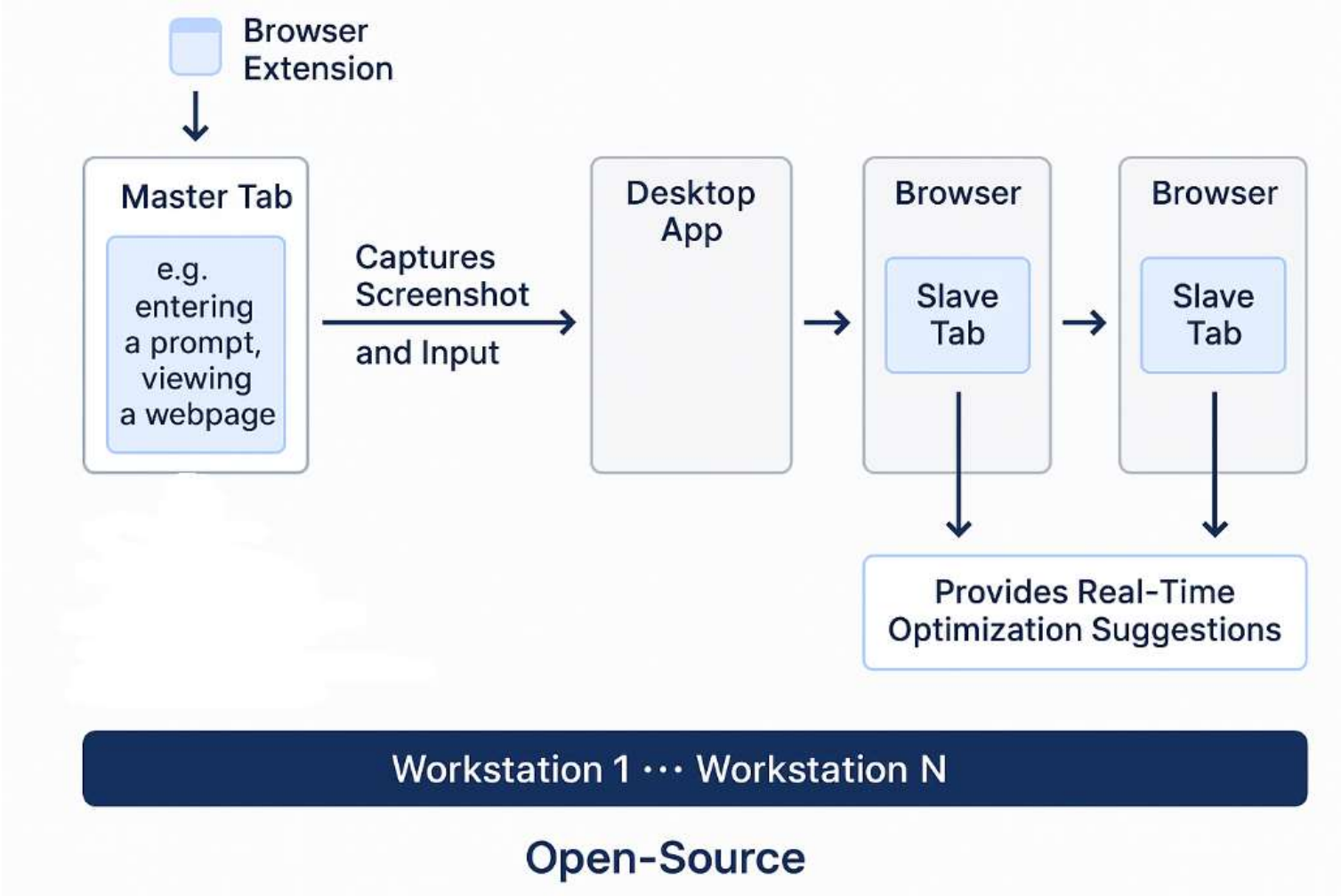
An Open-Source Browser-Based Master–Slave AI Agent Framework for Workspace Orchestration



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Abstract We introduce a novel open-source framework for browser-based AI agent orchestration, designed to deliver context-aware, real-time optimization suggestions that proactively assist users across digital activities. Developed under the direction of Oscar Schreyer and released under the **open-source** initiative of ***optimando.ai*, a company specializing in AI automation for businesses** —the system transforms the browser into a modular orchestration environment where distributed agents enhance user intent without requiring explicit commands.

The architecture uses a lightweight browser extension to connect browser tabs to a local orchestrator desktop application. Users assign roles to tabs as either **master interfaces**—the primary point of interaction—or **helper agents**, which are implemented as browser tabs. To support repeatable and scalable workflows, the system allows entire browser sessions, including tab roles and orchestration logic, to be saved and reloaded. This eliminates the need to reconfigure sessions manually. Additionally, the orchestrator includes built-in templates for intent recognition and optimization logic, enabling the system to proactively

interpret user goals and deliver relevant suggestions without manual prompting. The AI agents in the helper tabs follow simple instructions written in plain language—no coding needed.

This is a foundational design choice: All helper agents operate within the browser and run dedicated AI models—such as ChatGPT, Claude, DeepSeek, Gemini, Mistral, Llama, Grok, or even autonomous systems like Google's Project Mariner. These models can be integrated in various ways: via APIs into a custom website (enabling community-driven templates), through the providers' web interfaces, or by hosting open-source models locally—typically exposed through a browser-based UI as well.

In the default architecture, each AI helper and AI coordinator agent is hosted in its own browser tab. This setup is essential when working with web-based LLM chatbots, where the model interface is embedded in the frontend of a website and cannot be accessed via direct API calls. In such cases, the browser orchestrator must manage real tabs to maintain context and simulate user interaction.

However, when LLMs are integrated via APIs—whether from cloud providers or locally hosted models—it becomes technically feasible to consolidate all agent logic within a single custom-built website, running in a single browser tab. This orchestration page is hosted locally on-premise and defines each AI helper and coordinator agent using structured HTML snippets with embedded metadata (e.g., unique IDs, roles, endpoints, reasoning logic, and parameters). The browser extension then reads and executes the orchestration logic directly from this unified interface.

The unified page supports multiple profiles and modular AI agent configurations, each of which can be independently toggled—enabling flexible activation of specific workflows or toolchains. Hosting the

orchestration layer on-premise not only enhances privacy and data sovereignty, but also enables safe, community-driven sharing of reusable agent templates without exposing backend infrastructure.

Functionality remains consistent: master input tab context is preserved, and agent outputs are routed to display slots—while the traditional "one tab per agent" abstraction becomes optional in API-driven environments.

🔁 Adaptive Agent Architecture for Context-Aware Reasoning

Users configure AI agents in the system by defining behavior rules that guide how user input should be processed. A typical instruction might be:

“Interpret the user’s intent not only from the immediate input, but also from broader context, historical memory, and ongoing interaction patterns. Distinguish between short-term goals and long-term objectives. If helpful, generate up to five targeted follow-up questions or suggestions that either: (1) directly support the short-term goal, or (2) uncover smarter alternatives, missing steps, or overlooked opportunities that better align with the user’s long-term intent—even if these haven’t been explicitly requested.”

This high-level rule is executed by a chain of modular agents that work together to analyze, extend, and optimize user input dynamically.

🎛 Step 1: Input Coordination and Intent Expansion

All user input is first processed by an Input Coordinator Agent, which evaluates the complexity and intent of the request. It distinguishes between:

- Simple, factual queries → Direct response or light refinement
- Complex, strategic, or ambiguous inputs → Deeper inquiry and intent optimization

In the latter case, the agent generates follow-up prompts designed to clarify goals or surface smarter alternatives. These may include meta-level questions, such as:

"What additional questions could help uncover better options, reveal blind spots, or help the user reframe their original goal for a more robust outcome?"

"Could the user be aiming for an outcome they haven't articulated, possibly due to lack of technical vocabulary or system awareness?"

Unlike standard prompts, meta-level questions do not produce direct answers. Instead, they return new follow-up questions as output. This behavior triggers an internal feedback loop:

1. The meta-agent receives the original context and task framing.
2. It generates a set of secondary follow-up questions; each aimed at improving strategic alignment or surfacing hidden insights.

3. These secondary questions are routed to new Helper Agents, just like primary ones.
4. Only once those agents return their responses does the system proceed to synthesis and output.

This recursive mechanism allows the system to reason not only about *what* the user asked, but *whether they're asking the right questions*—turning the orchestration into a continuously optimizing cycle.

🧠 Step 2: Distributed Parallel Reasoning via Helper Agents

Each follow-up question is then delegated to a specialized Helper Agent, which processes it independently. These agents work in parallel, using tailored logic and data access scopes.

There are two execution modes:

1. Browser-Tab Mode (Default Web-Based Architecture)

Each Helper Agent is launched in a dedicated browser tab, managed by a browser-based orchestrator. This setup is essential when working with web-based LLM frontends (e.g., ChatGPT, Claude) where API access is unavailable. The orchestrator simulates user interaction across tabs to maintain context and autonomy for each agent.

2. API-Based Mode (Custom Website Integration)

When LLMs are accessible via API, all Helper Agents can run inside a single custom-built web interface. Each agent is defined as a modular component (e.g., HTML + metadata) with a unique ID. The browser extension routes queries directly to the appropriate module within the page—allowing agent logic to execute concurrently without multiple browser tabs.

Regardless of the mode, Helper Agents may utilize:

- Structured memory from a local or embedded vector database
- Context-specific data filters (e.g., safety documents only)
- Agent-specific prompt engineering or tool access

This modular parallelism enables domain-specific specialization, such as pricing analysis, compliance verification, or user behavior prediction.

📡 Step 3: Supervised Synthesis and Recursive Optimization

Once all Helper Agents return their results, the outputs are passed to a Supervising Agent, which:

- Merges, compares, and synthesizes all responses
- Detects redundancies, contradictions, or knowledge gaps
- Identifies emergent patterns and opportunities
- Triggers recursive follow-up actions if deeper inquiry is warranted

This Supervising Agent forms the core of the system's intelligent feedback loop—enhancing the user's original request based on learned context, not just answering it.

📺 Step 4: Output Coordination and Display Logic

Final results are routed to the Output Coordinator Agent, which governs how information is presented to the user through flexible, screen-aware display slots. These slots are implemented as dynamic flexbox containers that scale fluidly to fill available screen space across single or multiple monitors. The layout is fully customizable, allowing users to define the size, position, and behavior of each slot based on their workflow needs. To further enhance usability, the primary interaction layer—hosted in the master browser tab—can be looped through and snapped into the same grid. This is achieved by cloning the master tab and integrating it seamlessly into the layout, preserving a clear separation between orchestration controls and content delivery without sacrificing screen real estate. The Output Coordinator handles:

- Slot allocation, ensuring results are displayed in areas that reflect their importance and relevance
- Smooth transitions and display timing, including fade-ins, freezes, and content replacement logic
- Responsiveness and contextual awareness, adapting presentation based on the evolving task flow

- Event-Driven Refresh – New queries, memory updates, or evolving user goals can trigger partial or full re-rendering of display slots
- Topic Transitions – When a user switches topics, previous outputs may fade or be archived, while a “Back” button allows recovery of recent insights
- Time Management – Outputs may persist longer if deemed more relevant, or rotate out smoothly during high-frequency tasks
- The optimization layer and output slots can be manually toggled on or off by the user at any time, allowing for flexible screen usage and focus control. This ensures that advanced coordination features remain accessible without occupying screen space unnecessarily.

🎛️ Core UX Interactions

Each display slot may include built-in controls:

- Freeze – Locks an output to prevent it from being overwritten
- Expand – Reveals more details, context, or reasoning
- Tree-of-Thought View – Displays alternative reasoning paths or similar insights the system considered but filtered

🧑‍🚀 Human-in-the-Loop Controls

Most importantly, the system is designed to keep the human fully in control. At any time, the user may enter simple natural-language instructions such as:

“Keep this result visible for longer”
“Add a button to export as image”
“Refresh every 10 seconds”
“Hide all diagrams for now”

These textual overrides are processed by the Output Coordinator as part of its reasoning layer and are treated as live interface instructions, allowing seamless interaction without technical configuration.

This ensures that the UI layer remains not only intelligent and adaptive—but transparent, tunable, and collaborative.

🔧 Practical Example: Electrical Installation Business

A professional user—such as an electrician—can define a local folder as a live data source for one or more AI agents. This folder might contain:

- Wiring plans and layout diagrams

- Safety manuals and regulatory checklists
- Contracts, work orders, and customer correspondence
- Historical project notes or troubleshooting records

All files are indexed into a local vector database, allowing agents to retrieve relevant context instantly during reasoning.

When the user initiates a new task—such as drafting a project offer or reviewing a compliance-critical job—the system activates a coordinated AI workflow. Depending on the request, the agents may:

- Extract applicable safety or legal requirements
- Compare the task to previous projects to identify missing steps or recurring issues
- Suggest optimized layouts or resource allocations, based on learned best practices

Tasks can be flexibly distributed across local and external AI agents, with optional masking/demasking, data confiscation, and privacy filters applied where needed—allowing a secure and modular setup tailored to the user’s preferences and risk profile.

This hybrid model balances performance, privacy, and adaptability. Simple lookups and compliance checks can run locally, while deeper reasoning or advanced planning can leverage external models—without compromising control or context awareness.

💻 Local Execution & Privacy-First Design

The entire agent system can optionally be run inside a secure, sandboxed desktop app, giving users full control over:

- API-based cloud LLMs (e.g., OpenAI, Mistral, Claude)
- Self-hosted local LLMs (for partial or full offline operation)
- Private vector storage and memory indexing
- Full GDPR compliance and local data sovereignty

🧠 Summary

This architecture forms a dynamic AI optimization layer that adapts to task complexity in real time. It empowers professional users—entrepreneurs, engineers, educators—to work with increased foresight, efficiency, and strategic depth.

Instead of waiting for users to ask the “right” questions, the system actively helps surface smarter paths—offering not just answers, but direction.

🧩 *Additional Transparency and User Control via Local Configurable Interface*

To ensure real-time oversight of the AI orchestration process, the system includes an always-active, collapsible control panel embedded within the browser extension. Acting as the system's 'brain', it continuously visualizes the live reasoning and decision paths of agents such as the Input Coordinator, Output Coordinator, and Supervising Agent. While collapsed by default to preserve screen space, the panel can be expanded at any time and optionally rendered as a full display slot or replaced with user-defined templates. It runs entirely on-premise as part of the self-hosted orchestration environment and is fully configurable for advanced use cases.

🧠 *Live Reasoning Inspection and Adjustment*

The interface displays and allows real-time interaction with key system logic, including:

- *Detected goals and subgoals, derived from user intent*
  – Can be manually edited, toggled on/off, or locked to preserve critical objectives during reasoning
- *Generated follow-up questions and reasoning paths*
  – Each can be reviewed, edited, regenerated, or deleted individually
- *Adjustable control fields, such as:*
- *Maximum number of follow-up questions*
- *Trigger conditions (e.g., on input change, rule match, or time interval)*
- *Freeform context prompts (e.g., "Do you have more background info to support this goal?")*

- *Enable/disable checkboxes for logic modules, output types, or agent roles*
- *Display port toggle for routing specific outputs to predefined display slots (e.g., main area, sidebar, external screen)*

⚙️ *Output Control*

The behavior of the Output Coordinator Agent—including display slot logic, refresh behavior, and user interaction settings—can be adjusted here as well. Users may also submit natural-language overrides (e.g., "Freeze this result," or "Hide diagrams"), which are interpreted live by the system.

⚡ *Optimization Utilities and State Awareness*

- *Quick Optimize buttons can be used to trigger strategic prompt improvements or apply higher-order transformations across the agent graph*
- *The system automatically detects new goals or context shifts, e.g., when starting a new task or input thread*
- *Transitions are surfaced transparently, with the option to manually reset or revert the current reasoning context at any time*

Most of the logic displayed in the control interface is live-bound to the underlying DOM, meaning the change is reflected in real time within the running agent system. Rather than acting as a passive viewer, the user becomes an active manager—guiding the optimizer's evolving thought process with precision and flexibility.

This control layer is essential for high-responsibility use cases where transparency, explainability, and fine-tuned AI alignment are non-negotiable.

🔍 *Context Extension Prompts (with AI-guided gap detection)*

To better understand the user's intent, the system includes AI-driven context extension prompts. These are not static fields — they are generated or adapted based on what the system identifies as missing or ambiguous information.

For example:

- *If the detected user intent is a request to optimize a workflow but doesn't specify the tools used, the system might ask:*
  "Which platforms or apps are involved in this workflow (e.g., Notion, Outlook, Trello)?"
- *Or if a goal is stated without timeframe or constraints, it might suggest:*
  "Do you have any deadlines, technical constraints, or preferred automation tools I should consider?"

These prompts are designed to:

- *Actively identify potential context gaps*
- *Suggest relevant fields or clarification questions tailored to the task*

- *Help the AI refine its understanding of both short-term goals and long-term strategic intent*

The system continuously makes its reasoning process transparent, empowering the user with full control. If the output is not as expected, the user can inspect and adjust the underlying logic in real time. All automatically detected context gaps, follow-up questions, and reasoning steps can be toggled on or off, edited, or overridden at any time—ensuring the system remains aligned with the user's intent.

🔧 *Customizable, LLM-Driven Web Interface*

*The web-based interface is not static—it is **LLM-driven and fully customizable**. That means:*

- The system is designed to support dynamic adaptation of forms, logic triggers, and UI components through configurable profiles tailored to specific domains or workflows (e.g., electricians, lawyers, engineers). Users will be able to create and switch between these profiles to activate relevant reasoning strategies and interface behaviors. In addition to personal configurations, the concept includes a curated library of **vetted community templates** created by domain experts. For more open-ended or cross-domain scenarios, the system will also offer **broad, flexible optimization templates** that apply general reasoning strategies without being tied to a specific field.
- *The underlying logic (e.g., how subgoals are derived or how meta-questions are generated) is **controlled by LLMs**, which enables **semantic flexibility** far beyond static rule-based systems.*

- *Developers or domain experts can **extend the HTML interface** by integrating more complex reasoning steps, business rules, or specialized input fields.*
- *These **custom interface configurations** (form templates, goal models, control panels) can be **shared with the community** or bundled as open components.*

*This opens the door to a **plugin-like ecosystem** where:*

- *Anyone can create and publish **domain-specific optimizers**.*
- *Communities can evolve best-practice reasoning models **collaboratively**.*
- *On-premise deployments benefit from a growing **library of modular UI + logic bundles**—without compromising privacy or vendor lock-in.*

💻 Spatial Distribution & Extended Input Channels

While fully functional on standard laptops, the orchestration system is designed for **workstations with multiple screens** and **VR devices equipped with built-in browsers**, where the extended display space enables clear spatial separation of agent outputs and uninterrupted parallel interaction.

Outputs can also be routed to **external endpoints** like AR glasses or mobile dashboards, allowing findings from one user's session (e.g., a backend analyst) to be delivered in real time to another (e.g., a field technician).

To support more complex or resource-constrained environments, the system allows multiple **master input tabs** to operate in parallel—enabling input from different sources, users, or subsystems without interrupting coordination.

In addition to standard input methods, the architecture supports **sensor-level and system-state input**, including:

- Application state snapshots
- DOM structures from web interfaces
- Clipboard, pointer, and voice input
- Sensor feeds from AR/VR devices or robotics platforms

This extensibility allows the system to bridge physical and digital contexts in real time—making it suitable not just for analysis, but also for **situational coordination and cross-device collaboration**.

🧠 Example Use Case: From Simple Query to Informed Decision through Multi-Agent Orchestration

In this use case, a user interacts with the system via a chatbot interface and asks a seemingly simple question: “Can you find me a good USB stick?”

Rather than returning a single product recommendation, the system activates a parallel multi–AI agent workflow that expands the request across multiple dimensions—revealing smarter options, identifying hidden risks, and suggesting long-term strategies the user didn’t explicitly ask for.

The process starts with the Input Coordinator Agent, which interprets the prompt, consults memory, and determines that deeper inquiry is warranted. It generates a set of optimized follow-up questions that break down the request into technical, contextual, and strategic subcomponents.

Each question is then routed to a specialized AI helper agent:

- One agent builds a manufacturer comparison table, evaluating flash type (SLC, TLC), controller quality, encryption, shock resistance, and warranty
- Another matches USB stick types to different user profiles (amateur, professional, enterprise), factoring in durability, write endurance, and portability
- A third explores alternative storage media such as M-DISCs, WORM optical formats, or enterprise-grade immutable storage—surfacing scenarios where long-term data retention is critical
- A visual agent renders diagrams comparing lifespan, usage patterns, and reliability under various environmental conditions

These results are reviewed by the Supervising Agent, which identifies redundant outputs, fills contextual gaps, and ranks relevance. The refined insights are passed to the Output Coordinator Agent, which dynamically arranges the content across screen-aligned display slots—prioritizing clarity and continuity.

As the user continues the session, the system adapts:

- New outputs replace outdated ones or fill available visual slots
- Relevant results remain longer on screen to support decision continuity
- Layout and transitions are managed smoothly to avoid visual clutter

Behind this, the agents rely on global memory—which may include user-provided data such as company size, data sensitivity, access requirements, or past decisions. From this, the coordinator can infer hidden intent structures. For example:

“The user’s company handles internal legal documents and shares access across teams.”

From this, the system might infer and act on secondary objectives such as:

- “Prioritize encrypted or access-controlled storage devices.”
- “Recommend storage with long-term reliability under frequent use.”
- “Suggest a hybrid approach that offsets the weaknesses of single-device solutions.”

In this case, the system might suggest:

“Pair a USB stick for day-to-day use with an archival-grade M-DISC stored in a fireproof case inside a bank locker—ensuring redundancy, physical security, and long-term resilience.”

These types of proactive, meta-level suggestions help the user avoid critical oversights—such as trusting vital data to a device that may fail after 10 years, when alternatives exist that last 100+ years.

🎯 Optimized Outcomes Through Collective Reasoning

What distinguishes this system is not just its ability to answer, but its ability to **reveal what the user didn't know to ask**. As a result, the user is no longer making a superficial purchasing decision, but a **strategic, informed choice**—avoiding the silent failure mode of relying on a storage medium that may degrade silently over time.

🔄 A Continuous Feedback Loop

Throughout the session, a **recursive feedback mechanism** ensures the system evolves with the user. If initial queries reveal gaps, contradictions, or missed opportunities, the supervising logic can generate additional follow-up questions, activate more agents, or reprioritize display slots. This **feedback loop ensures both question space and answer space are continuously refined**.

💡 Final Outcome: Empowering Better Decisions

By the end of the session, the user has not just received product suggestions. They've been **guided through a structured, exploratory reasoning process**, supported by domain-relevant agents, coordinated for clarity, and presented in a form that helps them act with confidence.

In the specific scenario above, the system likely **prevented a flawed decision**: using a USB stick to store critical data long-term, unaware that such media can silently degrade over time. Without intervention, that

decision could have resulted in **irreversible data loss**. Through orchestration, the user was nudged toward **more durable and appropriate alternatives**—even though they had no prior awareness of their existence.

This exemplifies the system's core promise:

Turning vague user queries into structured, high-quality decisions—through intelligent, modular, and adaptive AI collaboration.

🖇️ Integration with External Services via Connector Protocols (e.g., MCP)

The orchestration tool can connect to external services—like email, calendar, task management, or CRM platforms—via standardized **connector protocols**. One prominent example is **Anthropic's Modular Context Protocol (MCP)** , but similar connectors exist across ecosystems (e.g., OpenAI Tools, custom APIs, function calling, or webhook bridges). These connectors act as **adapters**, enabling AI agents to interact reliably and securely with external systems.

🔍 Note: MCP itself is not a memory framework or agent host—it's a **context-passing protocol** that allows structured interaction with LLMs. The orchestration tool is **connector-agnostic** and can work with whichever integration protocol your chosen AI model or platform supports.

🎙️ Multi-Input Architecture with Specialized Roles

The orchestration logic allows **multiple master tabs** to operate in parallel; each linked to a different input modality or task role:

- **Master Tab 1** might connect to a **voice input stream**, used for natural-language commands like:
  - "Display the client follow-up draft in slot 5."
  - "Show today's calendar in slot 2."
  - "Copy the notes from slot 4 into slot 1."
- **Master Tab 2** may run a **text-based chatbot** for research, Q&A, or strategic reasoning—entirely separate from UI control commands.

This separation enables **fast, non-blocking interaction**, where operational UI actions and deeper reasoning tasks can proceed in parallel.

⚙️ Local LLMs for Low-Reasoning UI Tasks

To minimize API usage and boost performance, **simple orchestration commands**—such as:

- "Show the content from slot 3 in slot 1"
- "Freeze slot 5"

- “Move calendar view to slot 2”

can be processed entirely **by a small, locally hosted LLM** . These lightweight models handle basic intent parsing and slot routing with minimal latency—keeping cloud LLMs free for heavier reasoning tasks. This also enhances privacy and offline usability.

MCP Integration and Context-Oriented Orchestration

The orchestration layer in this system offers powerful support for modular, high-speed, and context-aware automation workflows. A key enabler of this architecture is the integration of external systems through connector protocols like MCP (Modular Context Protocol)—used by Anthropic—and similar interfaces available for other LLM platforms, including ChatGPT's connectors or even custom REST APIs.

These connectors allow agents within the orchestration framework to interact directly with external services such as email platforms (Gmail, Outlook), calendar tools (Google Calendar, Microsoft 365), project management apps, or CRM systems. When integrated correctly, the orchestration tool becomes not just a reasoning assistant, but a real-time operational interface.

🧠 Low-Level Reasoning with Lightweight Local Models

Simple routing tasks like "show draft in display slot 1" or "mirror output from slot 3 to slot 2" can be delegated to lightweight, locally hosted LLMs. This reduces latency and ensures that basic orchestration logic remains offline, transparent, and fully under user control.

🔁 Secure Human-in-the-Loop Execution

The orchestration tool does not force autonomy by default. Whether tasks are executed automatically or shown as drafts depends entirely on the template and system configuration. Secure templates prioritize:

- **Displaying all automation steps (e.g., email drafts, calendar entries) in a visual display slot first**
- **Requiring explicit user approval via voice or button before final submission**

That said, advanced users can configure fully autonomous flows if permitted by the connected service (e.g., n8n, custom APIs, or specific connector permissions).

🧩 n8n as a Seamless Integration Layer

An ideal companion to the Optimando orchestration system is n8n — a source-available, browser-based, and locally hostable automation engine. While not required for basic operation, it extends the

system's capabilities significantly by enabling deeper backend logic, integration with third-party tools, and automation of multi-step workflows.

n8n integrates cleanly into this modular architecture by:

- **Acting as the backend task executor triggered by orchestration logic**
- **Running predefined automation chains (e.g., send an email, query a CRM, fetch and process a document)**
- **Responding to display slot routing or contextual instructions from helper agents**

Since n8n operates within the browser, it can be opened in its own tab and authenticated locally. Once logged in, orchestration agents (e.g., controlled via user speech, text, or intent) can trigger logic either through DOM interaction or direct API/webhook calls. This creates a bridge between user-level prompts and complex, autonomous backend automation — all under full user control.

🧠 Real-World Example: Alias-Based Orchestration and Real-Time Voice Overrides

The orchestration system intents to allow users to trigger complex, multi-agent workflows using simple aliases — such as:
"Activate workspace747"

These aliases are predefined in a backend automation layer (e.g. using n8n etc.) and can launch full stacks of coordinated actions across agents, reasoning units, UI displays, and logic controllers.

Each element in the system — whether an agent, slot, coordinator, or setting — is assigned a unique identifier, generated from customizable HTML templates that define the structure of the orchestration stack

. These templates include:

- Global and immediate user intent
- Reasoning traces
- Follow-up questions
- UI display slot routing with settings
- Ai agent behaviors

The result is a fully modular interface in which every component is individually addressable and controllable. Once an AI agent, control element, or automation workflow is configured and active, the user can interact with it in real time via typed commands, voice input, or programmable keys (e.g., Streamdeck), referencing any unit by its unique ID.

- “agent 23– rephrase to sound more confident”
- “output_coordinator – expand slot_5 and highlight key terms”
- “reasoning_intent_1 – I search for the firmware not for the bug”
- “supervisor_22 – trigger a steeprocketsearch747(alias) why I can’t burn the MDISC”

Voice commands can act as a parallel master control layer, enabling overrides, adjustments, or clarifications even while automated flows are running. Since everything is driven by backend automation and HTML-defined identifiers, the entire stack remains fully configurable, extensible, and reusable — making the system highly adaptable for different users, workflows, and use cases. The architecture supports parallel input streams with unified or separate backend automation, where display slots—independent of the active master tab—can be dynamically managed by AI using simple logic patterns or manually assigned by users to specific tasks for flexible, context-aware layouts.

🎤 Multi-Device Voice Input Integration

Voice commands are intended to be captured through a lightweight voice interface embedded in multiple endpoints:

- A **mobile app** (smartphones/tablets) with push-to-talk or passive listening
- **AR headsets** or wearable devices equipped with microphone access
- A built-in module within the **orchestrator app itself**, allowing direct control via **headset or microphone** input while working in the browser

🧬 Intent-Triggered Automation: Passive AI Detection

In more advanced usage, no direct prompt is even necessary. The orchestration system can passively infer user intent from contextual activity. For example:

A user records a meeting through a master tab interface.

- **The system detects this is a structured team session and triggers:**
  - **Real-time transcription (via Whisper)**
  - **Context extraction: goals, risks, unresolved questions**
  - **Summarization and optimization suggestions**
  - **Gap and opportunity detection**

- These results are compiled into a structured PDF overview.
- The system drafts an email containing the meeting summary, PDF, and personalized follow-ups to each participant.
- The draft email is automatically displayed in an available display slot for review and confirmation.

This entire chain can be executed without cloud dependency — running locally on user-owned infrastructure or in a private n8n instance, preserving full data control and privacy.

🚀 Summary: Dynamic Human-AI Collaboration

This architecture redefines AI integration by enabling real-time, context-driven orchestration across modular agents — all triggered through speech, text, or detected behavior. By leveraging n8n's automation layer in combination with Optimando's orchestration logic, users gain an interactive, agent-driven environment where even highly complex workflows become intuitive and auditable.

Instead of isolated chatbots or opaque automations, the user sees exactly what happens — who does what, when, and why — and remains in control at every step.

💻 Technical Considerations and Limitations

Some connected services may block automation, especially if login sessions expire or DOM manipulation is restricted. In such cases, the system provides fallbacks:

- Users manually log into relevant services in browser tabs
- Agents use visual or metadata-based cues to navigate and trigger content display
- Inaccessible features are flagged, and alternatives (e.g., via n8n, email relay, or webhooks) are proposed

This architecture ensures reliability while retaining flexibility.

⚙ Optimized for High-Performance Workstations with Scalable Backend Flexibility

Optimando.ai is engineered to take full advantage of modern high-performance workstations — particularly those equipped with multi-core CPUs and high-end GPUs such as the NVIDIA RTX 5090. This setup supports fast, local execution of AI processes with high parallel throughput and minimal latency. It is especially well-suited for the demands of real-time, browser-based multi-agent orchestration.

Local Performance Capabilities

• **Local LLM Acceleration**
High-end GPUs enable efficient local inference of large language models such as LLaMA 3 or Mistral. A 5090-class GPU can process complex prompts with high token throughput and low latency, which is essential in multi-agent workflows where multiple reasoning paths run concurrently and interdependently.

• **Real-Time Speech-to-Text**
Transcription engines like Whisper (Large) benefit from GPU acceleration, enabling continuous, high-fidelity speech input to be processed in parallel with other tasks — critical for multimodal input scenarios and hands-free interactions.

• **Parallel Agent Execution**
With sufficient VRAM and compute power, multiple AI agents can operate simultaneously without affecting system responsiveness. This is particularly valuable in environments with multiple display slots, where agents generate, update, and refine results asynchronously.

🧩 Optional Automation Layer via n8n

While Optimando.ai is fully functional on its own, it can optionally be extended by integrating n8n as a backend automation engine — particularly useful for advanced or multi-layered workflow requirements. n8n is a separate system, but its modular, browser-based, and extensible design complements Optimando's orchestration principle perfectly.

When used together:

- Optimando handles frontend orchestration and visualization of agent outputs,
- while n8n manages backend automation tasks such as:
    - multi-step validations,
    - scheduling,
    - agent chaining,
    - file processing,
    - external API interactions.

On powerful local hardware, n8n can run side-by-side with Optimando, offering low-latency automation while keeping full control over data flow and system logic.

🌐 Scalable Design for All Hardware Classes

For less powerful systems — such as laptops or entry-level desktops — n8n can be hosted on a dedicated self-hosted server. In this configuration, frontend devices act purely as lightweight visualization interfaces: they receive and render the output of AI agents without executing any heavy computation locally.

This architectural separation allows even modest hardware to participate in complex, distributed AI workflows without performance issues.

Importantly, all core components in this stack can be self-hosted and are either open source or source-available:

- **Optimando.ai (frontend orchestration layer),**
- **local LLM backends (e.g., via Ollama),**
- **vector databases (e.g., Qdrant, Postgres),**
- **and the automation layer (e.g., n8n).**

While n8n is not open source in the OSI sense, it is licensed under a *source-available* model (Sustainable Use License). This means the full source code is publicly available, auditable, and

modifiable for self-hosted use — preserving transparency and enabling complete control over system behavior in professional environments.

✅ Summary

The Optimando.ai system is capable of scaling from lightweight, local deployments to high-performance multi-agent orchestration environments — all while maintaining user transparency, data sovereignty, and full modularity. When combined with optional backend tools like n8n, it offers a powerful, extensible, and privacy-respecting alternative to centralized SaaS AI platforms.

Multi-Screen and VR Environments

The orchestration interface is built to take advantage of extended display setups and VR headsets. Multi-monitor workstations and VR browsers enable spatial separation of inputs, outputs, and visual control panels.

Skilled User Configuration

Although normal users can operate the system with preconfigured templates, its advanced features are best utilized by professionals with a background in:

- Local deployment of LLMs or AI tools

- Configuration of connector protocols like MCP, ChatGPT connectors, or custom APIs
- Orchestration of automation flows using systems such as n8n
- Understanding of browser-based control environments and DOM interaction constraints

Templates, aliases, and agent roles can be customized, but a working knowledge of automation frameworks and privacy-aware system design is recommended for full control.

Scalable and Modular by Design

The architecture is inherently modular and scalable:

- **Entry-level users** can rely on hosted LLMs and run helper agents in minimal configurations.
- **Power users** can run multiple master tabs, integrate local and cloud LLMs, define trigger logic, and connect MCP-compatible services.

This flexibility ensures that the orchestration tool grows with its user base—from individuals testing workflows to full teams managing strategic operations.

In short, while accessible to a broad range of users, the system truly shines in professional hands, running on high-performance hardware, and configured by operators with domain-specific expertise in automation, AI integration, and real-time orchestration.

⚙ Technical Layer: Templates and Modularity

Each agent operates based on a **system prompt template** that defines its role, behavior, and expected output format. These templates are essential to task decomposition and relevance alignment. While templates are a core architectural element, their **quality and task-fit** are critical.

To support adaptability and optimization, both **Optimando.ai** and the broader **community** will contribute to a growing library of **highly optimized, task-specific agent templates**. These templates can be plugged into any orchestration instance, allowing users to extend or adapt the system for different industries, compliance needs, or domain-specific decision support.

The architecture is fully open-source and designed to run locally on user-owned hardware. It includes a browser extension, a lightweight desktop orchestrator, and optional device-side input apps. There is no built-in requirement for server-side logic. By default, all data remains on the user's system, and no external connections are made unless explicitly configured.

If users choose to enhance functionality by connecting to cloud-based language models, they remain in complete control over what data is shared. The system provides clear routing options that allow users to decide which data types are allowed to be sent to external services if the user decides to utilize external Llms. To support this even further, an optional privacy layer will be integrated that can help filter or mask typical sensitive patterns, such as names or credentials. While this layer can reduce exposure, the user always decides how much to rely on it, and can disable any external calls entirely.

For advanced users or those who prefer additional security, the entire orchestration system can be run inside a local OS in a virtual machine (VM). This adds an extra boundary of isolation and helps ensure that the AI workflow is separated from the rest of the operating system. Setting up a VM takes only minutes and requires no deep technical knowledge. Ubuntu Desktop as example is free and an excellent OS for such a VM environment. When running in a VM, users can choose to handle especially sensitive tasks—such as authentication, payments, or sensitive messaging—directly on the host system instead. This separation ensures that privacy-critical processes remain fully insulated from the orchestration environment unless explicitly bridged.

Crucially, users who want to avoid cloud services altogether can embed local language models directly into the helper tab logic. Locally hosted Llms can run inside the browser without sending any data off-device. In this case the browser simply functions as connector to the local infrastructure.

Many newer PCs now include built-in AI acceleration hardware, such as neural processing units (NPUs) or dedicated inference cores. While current browser environments offer only limited access to such accelerators, the framework is designed as a forward-looking concept that anticipates their use in future local workflows. Today, companion desktop apps or native wrappers can already utilize these components for select tasks such as inference, summarization, or intent detection, provided appropriate integration via system-level APIs (e.g., DirectML, CoreML, or ONNX). In the future, deeper browser integration with local AI hardware could enable seamless, real-time performance improvements directly in the user's browser environment. These hardware units could help facilitate lightweight, privacy-preserving automation without relying on cloud services for these critical parts, particularly when paired with local models and orchestration logic. These components can be used to speed up specific AI tasks—including local inference, redaction,

summarization, or intent detection—directly on the user's device. The tab-based architecture also allows users to delegate distinct responsibilities to different tabs—for instance, using one tab to anonymize or pre-process data with a lightweight local LLM, while other tabs simultaneously leverage powerful cloud-based models, all within a controlled, user-defined workflow.

The overall design philosophy behind this framework is simple: the user stays in full control. Whether connecting cloud models, running everything locally, or blending both, the architecture adapts to individual preferences and privacy needs. It is a modular, forward-looking foundation for building intelligent, real-time workflows across devices—on the user’s terms.

Unlike traditional systems that rely on a single control point, our architecture supports distributed, multi-source control. A user might speak into their phone, type on a desktop, and run a secondary application—all at once—while helper agents receive the combined or distributed context and provide intelligent support instantly.

The system runs entirely on user-controlled devices and includes:

- A browser extension for managing helper agents,
- A desktop orchestrator app, and
- Optional input apps on smartphones, AR/VR devices, or other connected input data sources.

There is no reliance on cloud infrastructure. All logic can be executed locally, ensuring maximum data privacy, low latency, and independence from proprietary platforms. All components are open source, fostering transparency, extensibility, and long-term scalability.

This architecture represents a flexible, forward-looking foundation for real-time AI workspace automation—positioned for use in enterprise, education, science and productivity environments where data control and cross-device intelligence are strategic priorities.

The system is particularly effective in augmenting active digital workflows—whether interacting with LLMs, filling out forms, configuring automations, or managing content. It supports **real-time prompt refinement**, **tree-of-thought reasoning**, **structured brainstorming**, and **logic-driven output suggestions**. In LLM-based scenarios, the orchestrator can detect chatbot completion events and inject improved follow-up prompts automatically using DOM manipulation—enabling seamless, supervised multi-step interactions. In other use cases, it can offer contextual next-step optimizations, alternative strategies, or compliance-aware modifications—all delivered in real time based on the user's intent and setup.

Use cases span a broad range of digital activities, including—but not limited to—automation design, form completion, business logic configuration, knowledge work, research, business communication, training, live-coaching and brainstorming. The system dynamically observes the user's intent by analyzing the visible input and output context within the active master interfaces. Additionally, users can define a persistent global context that reflects broader goals, project parameters, or organizational constraints—enabling the helper agents to align their suggestions even more precisely with the intended outcome. Improvements range from

GDPR-compliant alternatives to optimized strategies, refined decision paths, or context-aware workflow enhancements tailored to the user's objectives.

The update interval for detecting chatbot completion, capturing screenshot or stream-based inputs, and triggering follow-up events can be precisely configured by the user.

Multi-tab orchestration

- **Multiple master tabs per session**, including support for distributed setups where multiple users, external apps, or even robotic camera systems can act as master input sources
- **Session templates** for reusable configurations
- **Autonomous and manual feedback loop triggers**: The orchestration logic allows for feedback loops between any combination of master and helper tabs. These loops can be triggered automatically based on predefined conditions, or manually by human-in-the-loop intervention. For instance, in a distributed setup, a team of AR device operators may continuously stream contextual data into the system. Desktop-based analysts or supervisors—acting as orchestrators—can monitor this data in real time and provide direct feedback back to the AR operators. In parallel, helper tabs can exchange insights or findings among themselves based on logic rules, further enhancing the feedback cycle. This enables the creation of semi-autonomous or fully autonomous workflows, which can be toggled on or off depending on task complexity, user preference, or regulatory constraints
- **Local-only, GDPR-compliant design possible (local LLMs only)**

- A strict separation between **logic/control (master)** and **browser-based execution (helper tabs)**

Modern knowledge work often involves frequent switching between browser tabs and applications, resulting in cognitive overhead and productivity loss. Studies suggest users switch between digital interfaces over 1,000 times per day, often losing several hours weekly to simple reorientation.

Agentic AI systems seek to reduce this friction by acting as intelligent intermediaries across applications. Users can instruct such systems to retrieve data, automate steps, or manage multistep workflows across interfaces. Recent efforts such as OpenAI's *Operator*, DeepMind's *Project Mariner*, and Opera's *Neon* browser illustrate growing capabilities in web-based agentic interaction using large language models (LLMs).

Architectures across these projects vary—ranging from browser-integrated assistants to cloud-hosted control environments. Common capabilities include form handling, navigation, summarization, and task execution using multimodal input. While promising, deployment remains subject to broader industry challenges such as session continuity, transparency, and user-aligned control structures.

The Optimando.ai framework introduces a modular, open-source orchestration concept designed to operate within standard browser environments, optionally backed by locally hosted LLMs. It enables **real-time, context-driven optimization** using multiple **independent AI helper agents**, each operating in its own browser tab. These helper tabs may host **distinct LLMs such as the web-based versions of ChatGPT. Gemini, Project Mariner, Claude, Mistral, Grok, Llama or local open source Llms** selected by the user based on the task's privacy, cost, or reasoning complexity.

For example, lightweight or low-cost LLMs can be used in helper tabs handling repetitive or less critical tasks and even form filling in helper tabs; advanced reasoning models can be reserved for complex, high-value workflows; and locally hosted LLMs may process sensitive or private information in fully self-contained tabs.

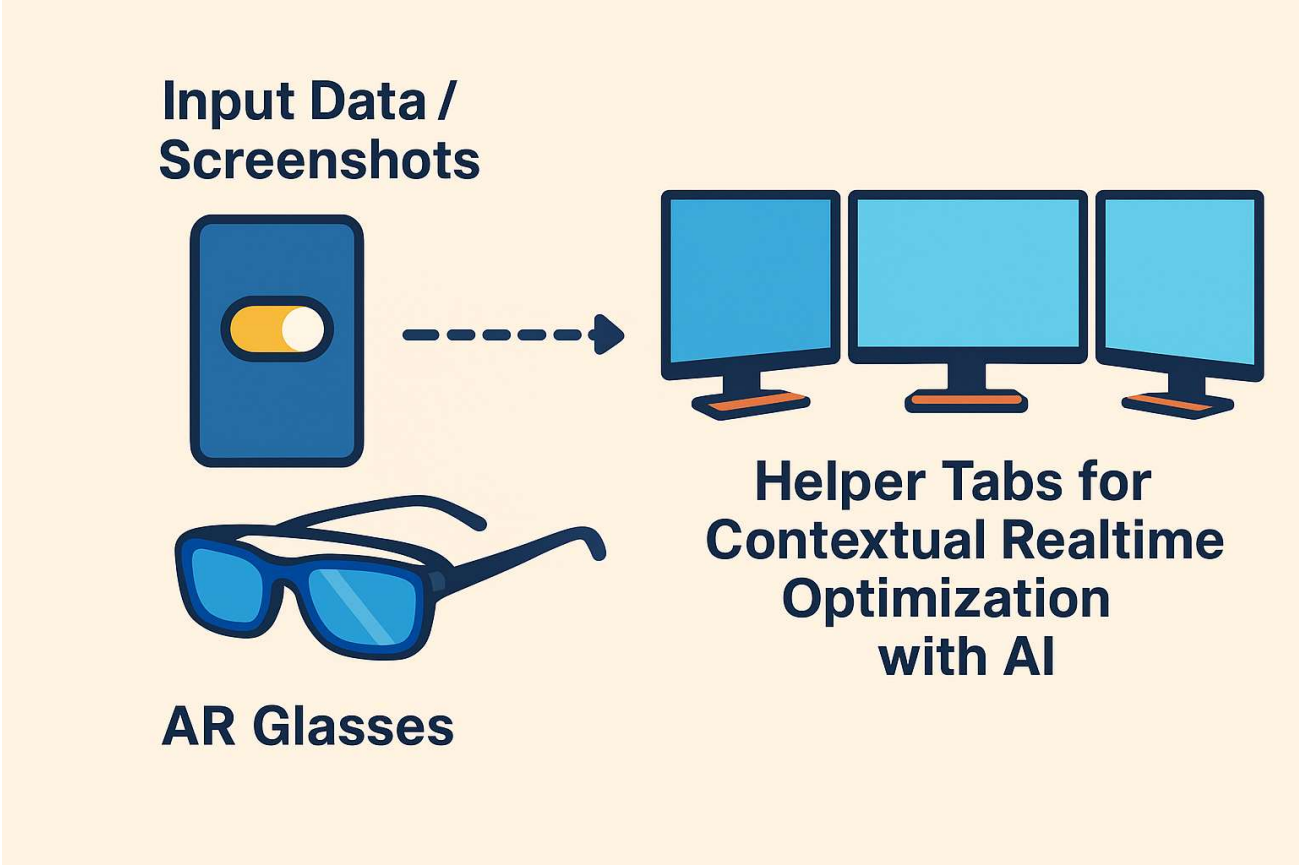
Input data to this system can be **multimodal**, including text, audio, screenshots, UI events, or camera streams. These triggers can originate from within the desktop browser or be activated remotely via smartphones or AR devices acting as **remote master agents**. Once toggled active, such devices send live input to a workstation. Contextual signals from any application—local, remote or on premise—can be 'looped through' to the master tab, effectively integrating them into the orchestration flow.

Users may operate directly at the orchestration workstation or remotely initiate tasks from other locations. The system supports both **autonomous execution** and **human-in-the-loop workflows**, enabling oversight, corrections, or adaptive feedback. This flexibility allows real-time augmentation, background execution, and hybrid workflows tailored to user preferences.

The overall architecture transforms the browser into a **distributed optimization surface** — a live environment where specialized AI agents process inputs contextually and reactively in real time. It emphasizes modularity, transparency, and cross-device orchestration, giving users full control over how intelligence is distributed and applied across their digital environment.

While still conceptual, the framework provides a **directionally unique and open model** for AI orchestration — enabling scalable, secure, and customizable workflows through heterogeneous agents and devices. Contemporary AI agent tools are typically designed around a **primary agent architecture**, operating within a browser interface or cloud-based environment. For example, Google's *Project Mariner* (2025) has been

described as an experimental browser assistant that allows users to interact via natural language. Based on public reports, it can autonomously navigate websites to perform actions such as purchasing tickets. More recent updates suggest that Mariner operates in a cloud-based environment, enabling concurrent task handling — though the interface remains structured around a single active agent session.



Similarly, OpenAI's *Operator* (also referred to as the "Computer-Using Agent") utilizes GPT-4o with vision to interpret and interact with web pages. Operator appears to manage multiple tasks by launching separate threads or sessions, but each instance represents a distinct agent working within its own conversational context. Browsers themselves are beginning to integrate AI agents. Opera Neon (2025) is billed as the first "agentic browser": it embeds a native AI that can chat with the user and a separate "Browser Operator" that automates web tasks (forms, shopping, etc.). Opera also demonstrates a more ambitious "AI engine" that, in the cloud, can work on user-specified projects offline and do multitasking in parallel. However, Opera's agents are proprietary, deeply integrated into one browser, and not open for user modification. Opera One (a related product) has introduced AI Tab Commands: a feature where a built-in assistant can group or close tabs on command (e.g. "group all tabs about ancient Rome"). This helps manage tab clutter, but it still uses a single AI interface per browser to organize tabs, without supporting multiple cooperating agents.

Outside the browser domain, research on LLM-based Multi-Agent Systems (MAS) is rapidly growing. Tran et al. (2025) survey LLM-MAS and note that groups of LLM-based agents can "coordinate and solve complex tasks collectively at scale". Emerging orchestration frameworks (e.g. AWS Bedrock's multi-agent service or Microsoft's AI Foundry) allow specialized agents to collaborate under a supervisor, and enterprises are experimenting with central "Agent OS" platforms that integrate many agents. But these systems operate at the level of backend services or applications, not at the level of coordinating a user's browser environment. Crucially, we found no published work on orchestrating multiple AI agents distributed across browser tabs as a unified workspace.

Privacy and Control. As AI agents increasingly interact with web interfaces and user data, privacy and control have become central design concerns. Existing projects such as Opera's *Neon* emphasize that automation runs locally to preserve users' privacy and security. Similarly, OpenAI's *Operator* allows users to manually intervene in sensitive interactions via a "takeover mode" and is designed to avoid capturing private content without user intent.

The framework developed by Optimando.ai adopts a similar privacy-first philosophy. All orchestration components are **self-hosted** and run within the user-controlled environment. **No data is transmitted to any Optimando.ai server**. The coordination logic and agent communication infrastructure are open-source and designed to operate under user ownership and configuration. Users may choose to deploy the framework on local machines, private servers, or trusted edge devices depending on their needs.

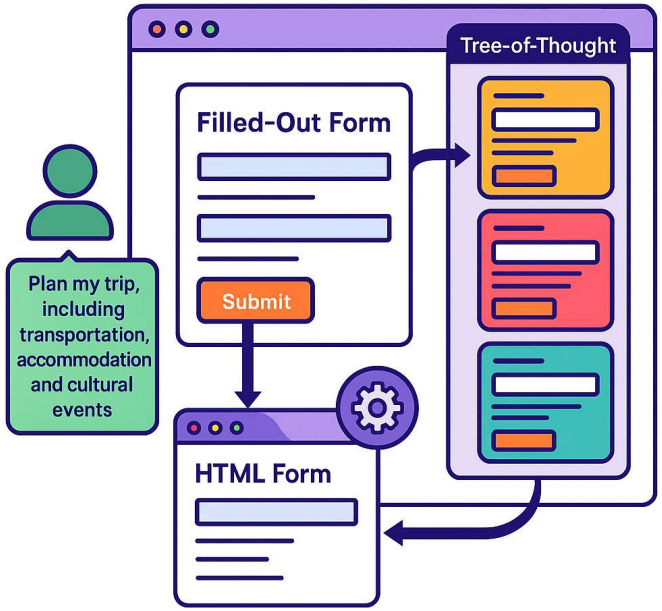
While remote input streams (e.g., from smartphones or AR devices) may transmit data over the internet to the orchestrator, all transmission paths and endpoints are defined and controlled by the user. Optimando.ai **does not operate or provide any backend services** that receive, log, or process this data. The system's observation is also strictly limited to in-browser content in explicitly configured tabs. There is **no tracking of desktop activity or full-device behavior**.

Each helper tab in the browser may be assigned a task-specific AI agent, using either a locally hosted LLM interface or a third-party web-based LLM (e.g., ChatGPT, Claude, Gemini). The **choice of LLM, its operational mode (cloud or local), and any associated data sharing are entirely the responsibility of the user**. Optimando.ai has no control over the behavior, data retention, or processing methods of any third-party services the user may connect.

🧠 Proactive DOM Manipulation via Helper Tabs with Tree-of-Thought Variant Expansion and Detached UI Controls

The *optimando.ai* framework introduces a browser-centric, tab-based agent orchestration model in which helper agents operate in isolated execution environments. These agents proactively analyze structured context from the user's active session, manipulate DOM elements, and generate fully rendered outputs — all displayed outside the main interaction tab in a clean, detached format.

Unlike traditional single-path AI tools, this architecture supports **multi-path reasoning** and **alternative pre-filled results** (even before the user starts to begin with filling out fields in the master tab), activated only when the user explicitly requests exploration via a Tree-of-Thought mechanism or other AI generated options that are displayed in the display slots.



🔧 DOM Execution in Background Helper Tabs

Each helper tab can act as an autonomous agent capable of:

- Parsing DOM structures from contextual input (e.g., a form, booking flow, legal interface).
- Proactively filling out entire forms or interfaces in its own environment — without affecting the active user tab.
- Executing reasoning, retrieval, and content augmentation based on the user's prompt and global session state.
- Generating a **complete, actionable version** of the task (e.g. a filled form, contract draft, booking process) and sending it to the **orchestrator for display**.

🧪 Generalized Example: Cross-Platform Action Planning

A user enters a request via the master input interface:

"Please plan my trip, including transportation, accommodation, and cultural events."

This triggers a coordinated, multi-agent response:

- A helper agent decomposes the task and distributes subtasks across several pre-defined services (e.g., airline booking portals, hotel sites, ticket platforms).
- Security-first logic ensures that no untrusted website is opened without the user's explicit domain whitelist. If broader exploration is needed, sandboxed environments like Google Mariner may be used — though this introduces profiling considerations.
- User interaction is required for all sensitive operations. The system will not perform actions on its own. Tabs must be opened by the user (e.g., to authenticate into Gmail or a booking portal), or previously opened, authenticated sessions are reused.

Once results are gathered, the best-matching itinerary is synthesized and displayed visually across dedicated output slots — rather than a single frame. This leverages the orchestration system’s adaptive layout, which utilizes available screen space intelligently, in contrast to conventional systems like Google Mariner that condense content into one unified panel.

Each itinerary component is annotated with metadata (e.g., pricing, provider rating, availability).

The master input tab can be toggled off or minimized to reduce distraction. Users may then focus entirely on the results and interact with the system directly via the display slots — including continuing or expanding the session using Tree-of-Thought expansion.

🔘 Interactive Output Features

The top result includes functional, user-controlled elements — which may be customized or even generated contextually by AI — but all actions require explicit user approval.

- Submit – Fully functional button, but only executes upon explicit user interaction. The logic behind this can be customized or extended.
- Tree-of-Thought – Reveals pre-processed reasoning paths and diverse alternatives:
    - Different platforms or service providers
    - Alternative travel schedules
    - Price tiers or bundled offers
- Compare & Combine – Allows hybrid planning (e.g., mix Flight A with Hotel B)
- Explain – Displays the reasoning and decision metrics used to generate the top result
- Augment – Enables real-time refinement (e.g., "add airport transfer", "include insurance")

The orchestration system shows only the primary recommendation by default. Users can dive deeper via expansion tools, ensuring an uncluttered yet powerful interface. This configuration empowers

users with intelligent, modular autonomy — decisions are enhanced by AI, but always confirmed by the human.

📄 Additional Example: Structured Form Completion

A user begins interacting with a financial or tax-related form.

- A helper tab interprets the structure and populates it with relevant user data (pre-uploaded context data), rule-based logic, or AI-completed content.
- The best-matching version (e.g., a conservative filing strategy) is displayed first.
- If ambiguity or multiple valid interpretations are detected, a **Tree-of-Thought button** becomes available:
    - When clicked, it reveals other fully generated versions (e.g. aggressive vs. conservative deductions, business vs. private allocations).
    - Each is independently rendered, side-by-side or in cascading slots, ready for user review and approval.

🌳 What Sets This System Apart

Most existing AI assistant systems:

- Operate in a single DOM/UI context

- Most conventional AI assistants do support multiple outputs, but these are often rendered inline within the same interface, making structured comparison difficult. The suggestions are usually presented in a linear or dropdown format, without architectural separation or agent-driven execution. This makes deeper exploration—such as Tree-of-Thought reasoning or cross-platform branching—difficult to manage or scale effectively.
- Do not support parallel reasoning paths or structured exploration

By contrast, the *optimando.ai* framework:

- **Isolates execution from interaction** — reducing risk, clutter, and interference
- **Supports cross-platform reasoning and multi-source orchestration**
- **Generates and renders variants only on demand**, using a **Tree-of-Thought button**
- Encourages structured, user-controlled decision-making, rather than opaque automation

Architectural Benefits

- **Non-invasive assistance**: The master interface remains unchanged; all suggestions appear in dedicated display zones.
- **Session-safe integration**: Helper tabs inherit authentication from the user's active browser session.

- **Parallel reasoning at scale**: Each agent tab can target a different platform or strategy — executed in true parallelism.
- **Human-in-the-loop control**: Results are passive unless approved; the user always decides what to apply or explore further by default.

🛞 Integration of Metaverse Interfaces into the Browser-Based Orchestration Framework

While the orchestration framework is based on browser tabs, AI agents, and configurable templates, the architecture is inherently extensible to virtual environments—**without requiring deep integration into game engines or metaverse platforms**. In this extended use case, the orchestration continues to run on a conventional computer, with AI agents distributed across browser tabs as defined by configuration files. Certain helper agents—originally designed to operate in the background—can optionally be linked to **visual representations within a 3D environment**, such as NPCs (non-playable characters). These NPCs serve purely as **front-end proxies**; the underlying logic, memory, and decision-making processes remain in the external orchestration system.

For instance, in a virtual shop scenario, a user may interact with digital products and approach a cashier NPC to initiate checkout. The NPC itself does not contain embedded logic; rather, it connects to a designated browser tab acting as a helper agent. This tab interfaces with external systems—such as a shop backend, support knowledge base, or legal compliance service—via automation platforms like **n8n** or **MCP-connected agents**. The orchestration layer interprets the user's intent (e.g. purchasing specific items) and generates structured outputs, such as a purchase summary, legal disclaimers, and pricing details. These are presented

in-world via spatial overlays or embedded screens—**visual equivalents of the system's display slots**. The user may confirm or cancel the transaction directly within the metaverse, triggering corresponding real-world actions through the connected orchestration backend.

Beyond service and commerce scenarios, this architecture can also be extended to **orchestrate real-time AI-controlled NPC teams**. In such cases, a user (e.g. a player, moderator, or team leader) can issue instructions that are routed through the orchestration backend, which interprets intent and assigns tasks to corresponding NPC agents based on preconfigured logic. This enables the coordination of **multi-agent NPC behaviors**—for example, managing logistics crews, training groups, or support units in real time—without requiring native AI infrastructure within the 3D environment itself.

This decoupled architecture allows metaverse applications to benefit from **advanced AI orchestration, decision logic, and automation**—while keeping the virtual environment lightweight and modular. By separating interaction from execution, it enables fast, maintainable integration of intelligent workflows into immersive spaces, using the same **tab-based orchestration layer** originally developed for browser-native contexts.

Privacy by Architecture: Local Control Through Tab-Based Orchestration

Modern AI automation presents a paradox: its usefulness grows with access to user context — but so do the privacy risks. *optimando.ai is designed to support users in protecting their privacy through a layered, modular system architecture. While it cannot prevent all risks — especially when users voluntarily share personal data*

with external services — its structure enables masked automation, local execution, and transparent control over agent behavior.

As an open-source platform without vendor lock-in, optimando.ai invites continuous improvement and innovation. Its flexible design allows the community to build on a privacy-aware foundation that evolves with real-world needs.

At the heart of the system is a browser-centric tab orchestration model, which allows users to automate workflows while preserving control over how, when, and what kind of data is processed.

📦 Layered System Components for Structural Privacy

This is not abstract or theoretical privacy; it is embedded directly in the system's architecture and enforced through clearly separated roles and control layers.

Component	Privacy Role
Master Tab	**The user's primary interaction layer — which may include but is not limited to browsing, shopping portals, SaaS tools, embedded apps, or even external visual inputs (e.g., camera feeds, video streams, robots). This is the starting point for all activity.** **Because the Master Tab handles real-time input directly from the user and external sources, *optimando.ai* cannot intercept or mask visual or textual content before it**

Component	Privacy Role
	reaches cloud-connected systems. Users must be aware that any personal data or visual context shared here can be exposed, especially if routed to external AI services.
	optimando.ai* provides tooling to structure, automate, and augment downstream tasks — but **cannot enforce privacy at the source input level. The user remains in control.
	Sandboxed environments where AI agents operate. These tabs are designed to receive masked, preprocessed, or synthetic data, especially when handling structured automation tasks like form filling or contextual suggestion.
Helper Tabs	**However, the degree of masking depends on user configuration and workflow context. *optimando.ai* provides mechanisms to prevent the exposure of raw personal data, but cannot enforce this universally.It is the user's responsibility to ensure that privacy settings are correctly applied and that no sensitive inputs are embedded into prompts or data sent to cloud-based models without proper masking.**
Input/Output Coordinator Tab	**Routes logic, manages masking/demasking workflows, and controls agent output. It ensures context flow is constrained and reversible locally.**

Component	Privacy Role
Display Slots	Passive render areas. They display results from helper agents but do not trigger outbound data flow. If the user chooses to submit a form, it's sent directly to the target website, not to any AI system.

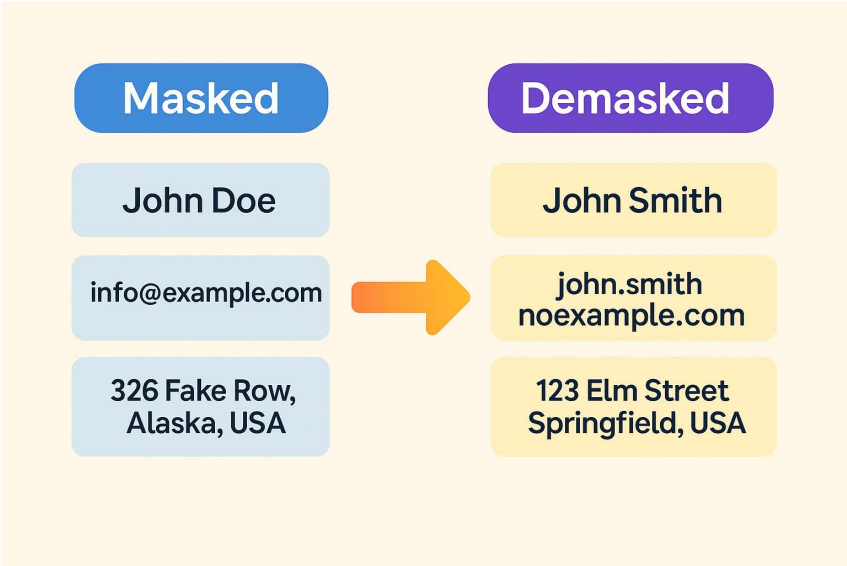
This orchestration strategy allows privacy protection at the execution level, not just via policy.

What's Protected: Contextual Data Masking

The system applies local masking and demasking to sensitive fields before sending them to helper agents. Supported transformations include:

- Names → pseudonyms (e.g., "John Doe")
- Addresses → synthetic or shifted variants
- Dates → randomized or offset
- Numbers → obfuscated mathematically

  (e.g., –30% for income)



🧠 Example: Privacy-Preserving Form Automation Using Local LLMs and Embedded Context Memory

When a user visits a structured form — such as a job application, tax return, or official registration — the optimando.ai orchestration framework can detect this intent and assist with intelligent, local form filling.

If the feature is enabled, the system loads the same page in a helper tab, where it attempts to prefill the form automatically. It does so using relevant user data (e.g., resumes, documents, income reports) that are stored locally — optionally within an encrypted container (e.g., VeraCrypt). These files are simply stored on the user's device.

A local LLM (e.g. Mistral) — optionally within an encrypted container (e.g., VeraCrypt), parses the content and embeds it into a private vector database (e.g., Qdrant). From this, it can derive context and field-level data (names, skills, income, etc.) and use DOM manipulation to fill in the form.

The resulting form is shown in a display slot — for example, on a second screen — allowing the user to check, adjust, and submit manually.

Even more broadly, if a user watches a YouTube video (master tab)—for example, a product walkthrough of a new AI tool—slave agents can assist by cross-referencing this information with the user's current goals or projects. One agent might highlight how the showcased tool could be integrated into the user's existing tech stack. Another might suggest more efficient or better-suited alternatives based on predefined system constraints or preferences. A third agent could retrieve relevant use cases or success stories, helping the user assess practical value. Together, they act as a live research and recommendation engine—turning passive content consumption into actionable insights aligned with the user's broader objectives.

The user sees outputs in display slot even from possible other remotely interconnected helper tabs or input sources as suggestions or context inserts in real time. This creates an optimization loop: the user steers the main task, customizable helper tabs continuously augment it automatically, and the user approves or refines the results. The human stays “in the loop” at every step, aligning with best practices in trustworthy AI.

🔐 Local by Default — But Flexible and User-Controlled

The architecture is designed around privacy-first principles, but remains adaptable:

- **By default, all tasks involving personal data (PII) are handled exclusively by the local LLM.**
- **Users retain full control — they decide whether and when to allow external assistance.**
- **The local model performs all tasks it can handle, especially any involving sensitive data.**

This privacy-by-design approach makes it possible to build automation capabilities for white-labeled websites similar to those seen in emerging agentic browser systems — such as Google Project Mariner or Manus — but without exposing profiling-relevant or PII data to third-party services.

☁️ Optional Cloud Reasoning — With Controlled Isolation

If the local model cannot solve a more complex reasoning task (e.g. legal interpretation, tax optimization, logic chaining), the user may choose to enable external LLM assistance. In these cases:

- **Only non-PII and abstracted fragments are sent to cloud LLMs.**
- **PII and sensitive identifiers stay on the local machine.**
- **Profiling-resistant techniques are applied, such as:**

- **Task splitting across providers**
- **Field-level masking/demasking**
- **Tree-of-Thought confusion, generating variants to conceal true intent or values**

Additionally, when users directly type information into the master tab (instead of using helper workflows), the system may trigger additional safeguards like DOM-based submit delays or selective field protection.

Strategic Privacy Design — Without Overpromising

Optimando.ai is an open-source, evolving framework. Privacy protection is a core design goal — but users should be aware:

- **Not all features are active from day one.**
- **It is built to grow with community input, legal requirements, and open-source innovation.**
- **While it applies state-of-the-art techniques to reduce data exposure and profiling risk, no system can guarantee absolute protection.**
- **The user stays in control, and bears responsibility for how the system is configured and used.**

Unlike many SaaS automation platforms, optimando.ai never assumes full ownership of user data. The goal is to enable powerful AI-assisted workflows — such as "autopilot" for complex digital tasks — without the user needing to hand over sensitive information.

🔐 Optional Encryption – Recommended Best Practice

While optimando.ai does not enforce encryption itself, users can and should take steps to protect their sensitive data. This includes:

- **Encrypting files containing personal documents (e.g. resumes, tax PDFs)**
- **Storing local LLM model files and vector databases inside encrypted containers (e.g. via VeraCrypt or similar tools)**
- **Ensuring that any local embeddings involving PII or data that can be used for profiling are also secured at rest**

Since embedded vectors or fine-tuned LLM memory can contain sensitive content, they should be treated as equivalent to raw data files from a privacy standpoint.

Encryption is entirely optional, but it is strongly recommended — especially for users working on shared machines, mobile devices, or in regulated environments.

This best-practice approach allows users to maintain complete control over their local data environment, without depending on external providers or complex infrastructure.

🔒 Local-Only Form Submission

When an agent completes a form, it appears in a Display Slot. If the user chooses to submit:

- **The submission goes directly to the target site (e.g., a booking or government portal)**
- **No AI model or external agent sees the unmasked data**
- **Execution happens via the user's own session and browser state**

This makes the entire interaction local, transparent, and user-driven.

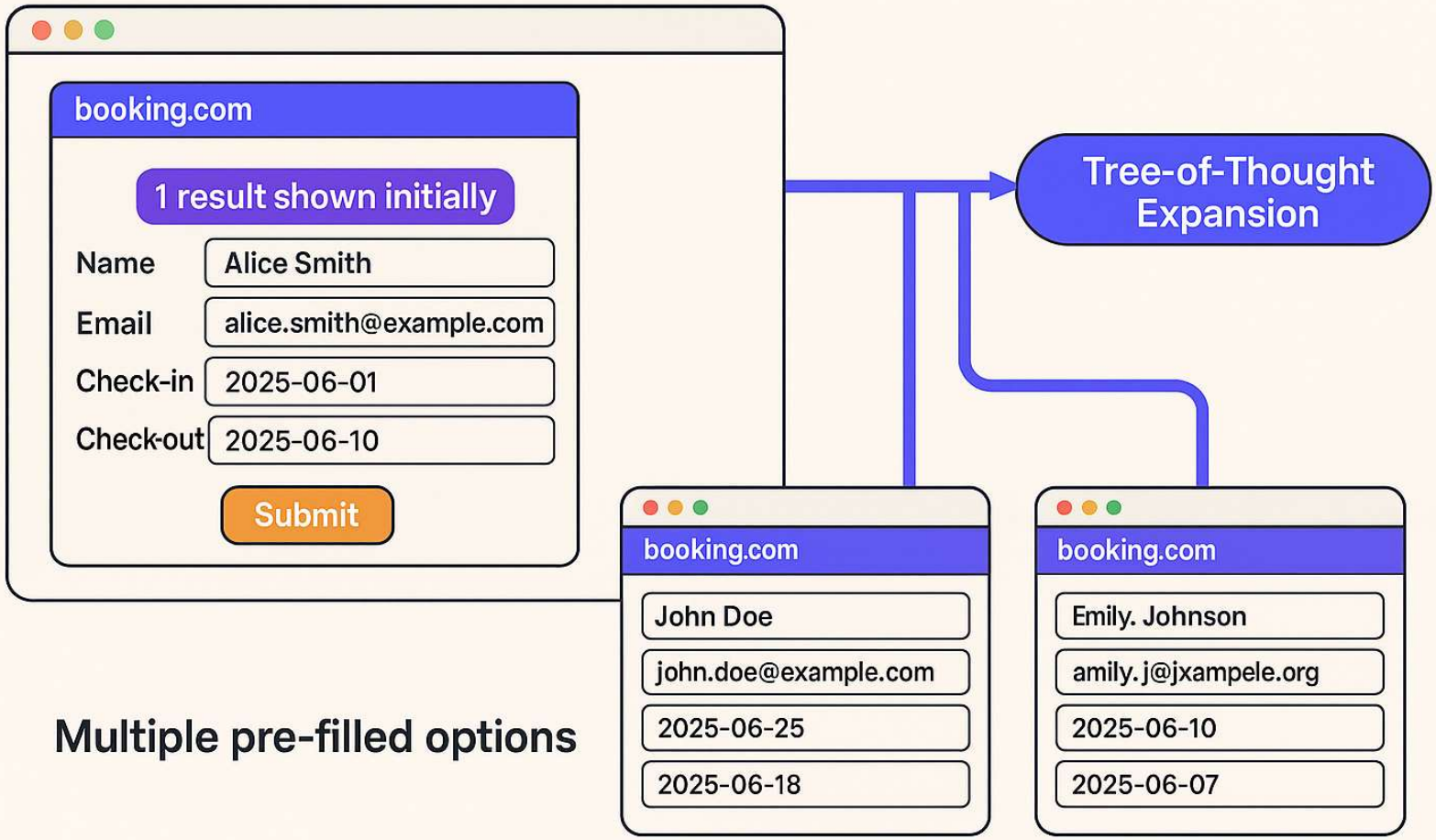
🌳 Tree-of-Thought Expansion & Intent Obfuscation

Thanks to its distributed helper-tab design, *optimando.ai* enables a novel privacy feature: intent obfuscation through variant generation.

- **Multiple helper agents generate alternative form completions (e.g., booking dates, tax strategies, application paths).**
- **Only some are "real" — but the AI doesn't know which. The user sees only real results.**
- **The others act as plausible decoys and are processed in the helper tabs.**

This makes it difficult for even a remote AI system to infer true user preferences or intent — especially in planning and decision-heavy workflows.The concept is simple: the more plausible paths exist, the harder it is to profile the user. This concept

Tree-of-Thought Confusion



Conceptual Feature: Tree-of-Thought Confusion and Profiling Risk Mitigation

A privacy-first feature currently in internal design is the Tree-of-Thought Confusion mechanism, combined with real-time profiling risk detection and dynamic masking/demasking overlays in the Master Tab. It is designed to mitigate unintended profiling when users interact with LLM systems in sensitive contexts such as healthcare, legal, or financial domains.

Example Use Case: "Please find a list of oncologists near Berlin for my ongoing cancer treatment."

This seemingly routine request reveals highly sensitive personal data. With the growing use of LLMs — across both trusted and opaque platforms — many users remain unaware of the long-term profiling risks. If such profiles are logged, shared, or leaked, the consequences could be significant — from discrimination to surveillance.

This concern is particularly relevant for:

- **Journalists and whistleblowers** , researching or reporting sensitive topics
- **NGO workers or activists** , operating in authoritarian or high-risk environments
- **Professionals and individuals** handling confidential medical, legal, or financial data

For these groups, accidental exposure of intent, interests, or vulnerabilities through AI-driven interfaces poses a real and growing threat.

Technical Outlook: Local AI and Real-Time Protection

The proposed system envisions a local privacy layer powered by lightweight LLMs such as Mistral 7B, which already run on most modern workstations (32–64 GB RAM). These models could enable:

- On-device detection of sensitive input and real-time overlay augmentation
- Dynamic obfuscation and decoy logic (Tree-of-Thought style)
- Intelligent result routing and masking within the orchestration layer

By avoiding cloud dependency, the system offers privacy-preserving workflows tailored for security-conscious users.

Although such augmentation is technically feasible, reliable implementation—especially DOM manipulation, prompt interception, and UI-level delays—is non-trivial. Many modern web apps use dynamic frontends (e.g., React), requiring resilient engineering to ensure consistency across sessions and platforms. For this reason, these capabilities are not part of the initial release, but are being explored for future development.

Systems with limited resources may fall back to simpler rule-based methods, such as keyword filters or DOM-based context tagging, which still offer value in less complex environments.

⚠ Always keep in mind

This system mitigates risks, but it's not magic.

- **If a user types their real name, address, or salary into a public chatbot — that data is exposed.**
- **If a task requires semantic accuracy (e.g., legal document interpretation), masking may break the logic.**

optimando.ai does not claim to prevent all leakage. It offers technical control where feasible, and leaves informed decisions to the user.

🧠 The User Is Always in Control

Privacy in *optimando.ai* isn't based on trust — it's based on architecture. But it also assumes that:

- **The user understands what happens where**
- **The user decides what is masked, unmasked, or revealed**

The system never processes or acts autonomously on private data without explicit user permission.
All integrations, logic flows, and connected services are defined by the user. The user remains fully in control of which tools are used, how data is routed, and when execution is allowed. This is human-in-the-loop AI orchestration — not blind automation.

For more control: API-Based Chatbot Mimicry

To overcome the limitations of DOM manipulation in dynamic web apps, the system can mimic chatbot interfaces using a controlled, API-connected frontend. This enables:

Prompt Filtering
Apply real-time sensitivity checks before sending prompts to the model.

Decoy Injection
Generate and route plausible decoy prompts to obfuscate user intent.

Overlay Augmentation
Add dynamic masking/demasking layers directly in the controlled UI.

Output Separation
Ensure only the real response is shown in the display slot; decoys remain background-only.

Built-In Delivery
Since the orchestration tool includes a locally hosted web interface, this functionality is available out of the box for users who need more control.

⚠ **Note:** The mimicked API interface may not replicate all features of the provider's original web UI. Some elements like UI-specific memory, live suggestions, or threaded context may differ, depending on how the provider structures their API.

✅ Summary: Real Privacy, Built In

optimando.ai enables advanced AI automation — form completion, variant suggestion, workflow support — without exposing user identity, sensitive values, or decision logic to remote models. Through tab orchestration, masking, and local submission, the system offers:

- **Agent-level PII protection**
- **Tree-of-Thought obfuscation**
- **Local demasking and rendering**
- **Full user control at every step**

What makes this system stand out is not just what it does — but what it lets the user choose not to do.

Conceptual Feature: On-Premise Augmentation Overlay for Masked Reasoning

As part of future development, we propose an experimental feature designed to improve the interpretability and safety of decision-making under data masking: a Master UI overlay that dynamically highlights critical input fields and allows users to simulate randomized variations of masked data locally.

This concept—referred to internally as the Augmentation Overlay—would provide a user-facing mechanism to explore how masked or obfuscated data influences the system's reasoning path. The feature is intended only for on-premise execution and is designed to ensure that no sensitive data is ever transmitted or logged

externally. The overlay itself could be toggled on or off. After all we aim for a fully autonomously real-time user intent and prediction loop with forward-thinking real-time support.

Key Ideas Behind the Overlay Concept

- **Dynamic Field Highlighting**
  The Master UI would automatically detect which input fields are involved in the current masking/demasking logic and visually augment them using a transparent overlay. Fields may be color-coded or animated to indicate their importance in the current reasoning context.
- **Simulated Input Randomization**
  Users can press a button to generate plausible random values for any field involved in the masking logic. This enables counterfactual simulations: "What would the system conclude if these values were different?"
- **Human-in-the-Loop Reasoning Validation**
  By observing how simulated changes affect the output, users can monitor whether the reasoning engine reacts in unexpected or overly sensitive ways. This strengthens transparency and helps identify fragile dependencies in automated decision logic.
- **Field Sensitivity Feedback (optional extension)**
  Future iterations of the concept could introduce a sensitivity score per field, highlighting which data points have the greatest impact on logic flow when masked or altered.

Privacy and Security Implications

Importantly, all logic and transformations would occur exclusively on the user's machine. The feature is meant to aid local inspection and debugging. As such, it aligns with strict privacy requirements (e.g., GDPR, HIPAA, and industry-specific compliance standards).

Development Status

This feature is currently a conceptual proposal and will not be part of the initial release. It represents an advanced step toward interactive AI debugging, and its feasibility, usability, and performance implications must be carefully evaluated before full implementation.

Nonetheless, the Augmentation Overlay aligns with the broader vision of giving end users greater control, visibility, and confidence when interacting with masked data and semi-autonomous agent systems.

⎈ Use a Dedicated Virtual Machine (VM) or Isolated Workspace

It is recommended to run the orchestration environment (including Master Tab, Coordinator, and agents) inside a dedicated virtual machine or isolated operating environment.

This provides two core benefits:

1. Technical Isolation – Prevents cross-contamination of session data, cookies, or clipboard content between personal activity and AI workflows.

2. **Contextual Awareness –** Using a VM helps users mentally distinguish between "AI mode" and regular activity, reducing the risk of unintentionally exposing sensitive data. The separation acts as a continuous reminder that interactions may be processed, embedded, or analyzed — and should be treated accordingly.

🌐 Use a Separate Browser Profile or Session

For users not using a full VM, it is advised to run *optimando.ai* in a dedicated browser profile or container session. This limits access to personal cookies, autofill data, and login states that may otherwise be unintentionally exposed to AI agents or helper tabs.

🧩 Masking Defaults and Manual Overrides

Users should:

- Review and configure default masking rules (names, addresses, numbers, etc.) before running automation tasks.
- Use manual overrides only when necessary — e.g., for document reasoning tasks that require semantic fidelity.
- Understand that masking only applies within agent-controlled flows and does not affect direct input into third-party AI systems (e.g., public chatbots).

🚫 Avoid Manual PII Entry in Master Tabs Connected to AI-Services

The Master Tab is the entry point to many workflows. While it is architecturally isolated from helper agents, it may still be connected to external systems (e.g., websites, LLM chat interfaces).

Users are responsible for avoiding direct entry of personal, financial, or sensitive data into services where masking cannot apply.

🖥️ Prefer Local or Air-Gapped Modes for High-Sensitivity Tasks

When working with proprietary, legal, or highly sensitive data, users should:

- Prefer offline LLMs or local inference engines
- Disable or restrict outbound AI service calls entirely
- Inspect agent logic manually before execution

optimando.ai is fully open source and supports air-gapped use cases — making it suitable for deployment in secure environments.

License (CC BY-SA 4.0). This dual licensing model for the software, along with the **CC BY-SA 4.0** for conceptual works, ensures both robust open-source integrity and safeguards for attribution and openness across all project artifacts. For commercial, closed-source, or enterprise environments requiring alternative terms (including specific UI attribution mandates), a separate commercial license is available.

Feature Comparison

Feature	Proposed Framework	Opera Neon	Google Project Mariner
Realtime backend optimization suggester	Yes (context-aware AI suggestions tied to global user goals)	No	No
Multi-agent coordination	Yes (multiple slaves per tab)	Partial	Partial
Browser tab as agent	Yes (users tag tabs)	No	No
Open-source	Yes (user-run)	No	No
User-controlled LLM selection	Yes (any open or cloud LLM)	No	No
Data sovereignty	High (all local, opt-in cloud)	Medium	Low
Man-in-loop by design	Yes	Yes	Yes
Unique agent IDs (multi-user)	Yes	No	No

Multitasking / parallel tasks	**Yes (multiple slaves)**	**Yes**	**Yes**

⚖️ Strategic Trade-Offs and Professional Target Group

The **Optimando.ai** architecture is designed around **autonomy, data privacy, and advanced user-controlled automation**. As a concept, it acknowledges several strategic trade-offs that professional users and potential investors should be aware of:

- **Higher Token and Context Costs**: Workflows involving large prompts, multi-agent logic, or external reasoning (e.g., cloud LLMs) can lead to increased token usage. However, these costs are steadily decreasing as open models improve.
- **Local Resource Requirements**: Running local LLMs and orchestration logic requires capable hardware (e.g., sufficient RAM and CPU/GPU). While often more efficient than cloud alternatives for burst workloads, continuous usage still implies measurable local energy use.
- **Advanced Setup Needs**: The system assumes a professional or technically literate user base. Users manage their own storage, security (e.g., encryption), and model selection.

These are not flaws, but deliberate design trade-offs in favor of **data control, workflow transparency, and security**. Most cloud-first systems offer convenience but at the cost of vendor lock-in and profiling risks.

Optimando.ai is conceptually positioned for **entrepreneurs**, **researchers**, **educators**, and **technically skilled professionals** — users who gain long-term strategic value from maintaining control over their data and automation stack. For these users, the **advantages clearly outweigh the operational complexity**.

Evaluation and Distinction:

Novelty of optimando.ai's Approach

Given the landscape above, **optimando.ai's** combination of features **does appear to be novel and unmatched**. In particular, no known system offers *all* of the following in one package:

- **Fully local, browser-native multi-agent orchestration:** Many systems run in the cloud or require server components. Those that are local (browser extensions like Nanobrowser or RPA tools) don't typically orchestrate multiple autonomous agents across several browser tabs without user direction. Optimando's design of a local master tab coordinating slave tabs for different subtasks is unique.
- **By integrating directly into the browser landscape—**the primary interface for digital activity worldwide—optimando.ai enables real-time optimization or intelligent, context-aware, goal-driven optimization suggestions at scale, putting AI orchestration into the hands of every user without relying on proprietary platforms, cloud dependencies, or specialized infrastructure

- **Autonomous, proactive assistance:** Most current solutions are *reactive*. They await user queries or commands. A system that observes the user's context and proactively generates suggestions or carries out optimizations (e.g. automatically augments your task flow across multiple sites) is not mainstream yet. Yutori's "Scouts" come close conceptually (monitoring in the background)[github.com](), but those operate on specific user-defined goals (like watching a particular site or alert type) **rather than generally optimizing any ongoing browsing activity**. **An *AI that feels like a colleague actively helping unprompted* is largely aspirational right now.**

- **Multi-agent parallelism in a user-facing application:** While research and some closed prototypes leverage multiple agents in tandem, typical user-facing AI assistants are single-agent. Optimando.ai's vision of parallel agents (each potentially with specialized roles or focusing on different tabs) coordinating in real time to help the **user is cutting-edge**. We see early signs of this in Opera Neon's ability to multitask and in Nanobrowser's planner/navigator duo, but these are either constrained or not autonomous. **No product fully utilizes a swarm of browser-based agents to continuously adapt to what the user is doing.**

- **Context-aware cross-tab optimization:** This implies the system maintains a high-level understanding of the user's objectives across multiple browser tabs or tasks. None of the surveyed tools truly does this. For instance, if a user is doing research with several tabs, current AI assistants might summarize one tab at a time when asked, but they won't *on their own* consolidate information from all tabs or reorganize them for the user's benefit. **Optimando.ai** aiming to provide "**real-time, context-aware optimization**" suggests it would do exactly that – **something quite novel**.

In conclusion, the core architecture of ***optimando.ai*** – a local master–slave tab framework enabling an autonomous multi-agent assistant system – **is novel**. Existing systems offer pieces of the puzzle (cloud-based autonomy, local extensions, multi-tab tools, etc.), but none delivers the same integrated experience. Therefore, **optimando.ai's** implementation would represent a distinct advancement in browser AI orchestration and autonomy. Its closest peers (Google's Mariner, OpenAI's Operator, Opera's Neon, academic Orca, and various extensions) each lack at least one crucial element (be it full local execution, open-source, proactivity, multi-agent parallelism, or deep context integration). As such, optimando.ai's concept stands out as unmatched in combining all these features into one system, **marking a potentially significant innovation in the AI browser assistant space.**

References: The analysis above references key details from current systems, including Google DeepMind's Project Marinertechcrunch.comtechcrunch.com, OpenAI's Operatortechcrunch.comtechcrunch.com, UCSD's Orca browser researcharxiv.orgarxiv.org, the Nanobrowser open-source projectgithub.comgithub.com, Opera's AI initiatives (Aria and Neon)press.opera.compress.opera.com, and curated lists of web AI agents and automation toolsgithub.comgithub.com. Each of these informs the feature comparison and underscores the novelty of optimando.ai's approach.

✅ **Novel Innovations of *optimando.ai***

⚙️ **Real-Time Contextual Optimization Layer**

An **open-source, browser-based orchestration tool** that continuously interprets **user behavior, screen context, and intent** to dynamically route tasks to specialized AI agents — enabling **real-time assistance**

without requiring explicit commands.
optimando.ai proactively supports the user based on their current activity — such as drafting, summarizing, or researching — rather than relying solely on typed input.
Users can initiate multi-step automations via natural language, speech commands, or automatically detected user intent — including instructions to display results in designated visual slots within the interface. Display slots can also be allocated dynamically based on contextual relevance and priority, allowing high-urgency or decision-critical outputs to automatically surface in more prominent or persistent positions.

The system responds dynamically by monitoring the workspace (e.g. tab content, interaction patterns) and coordinating agents in real time.

This represents a **novel open-source approach to AI-driven workflow orchestration**, combining live context awareness, voice-driven control, and visual task management in a unified, browser-centered environment.

. Integrated Privacy Layer with Risk Mitigation

On-device logic detects sensitive content, delays or masks prompt execution, and can optionally inject decoys to obscure real user intent.

This layered approach to privacy — combining detection, execution control, and obfuscation — is not present in mainstream tools. It addresses profiling risks directly at the orchestration level, which most cloud- or agent-based systems do not offer.

🔐 Air-Gapped, Multi-Agent Orchestration (No Cloud Dependency)

A fully local deployment option where multiple AI agents run in coordination without internet access, suitable for high-security or regulated environments.

While platforms like **LangChain**, **AutoGPT**, **Cognosys**, **Lindy.ai**, **Superagent**, **AgentOps**, **Microsoft AutoGen**, and various open-source agent frameworks offer components such as agent coordination, multi-step automation, or tool integration, they typically lack one or more of the truly distinctive features that *optimando.ai* provides.

In particular, while some tools offer local model integration or agent chaining, *optimando.ai* uniquely provides an **open-source, plug-and-play multi-agent orchestration system** that can run **fully offline if needed** — including **real-time context interpretation**, **contextual intent support**, **speech-triggered automation**, and a **visual slot-based interface** for task execution.

This combination of capabilities is **currently unmet** in other AI automation offerings, positioning *optimando.ai* as a **novel solution for privacy-sensitive, highly interactive, and locally controlled AI-driven workflows**.

These three features — especially in **combination** — position *optimando.ai* as a **privacy-focused, locally-executable orchestration system with intelligent agent coordination**, which is **currently unmatched** in the browser-based LLM tooling space.

Unlike Mariner or Orca, optimando.ai does not wait for the user to act. It acts with the user, continuously enhancing workflows as they unfold—across tools, content types, and digital services. It is not a helper or assistant. It is a real-time orchestration layer for the modern web workspace.

To our knowledge, no existing system—academic or commercial—combines autonomous multi-agent orchestration, tab-based modularity, proactive real-time augmentation, and privacy-first, local execution. This positions optimando.ai as a breakthrough platform in browser-native AI automation.

🔥 From Real-Time Gaming to Real-Time Intelligence: A Paradigm Shift

Modern gaming has become a proving ground for real-time computing performance. Today’s top-tier systems deliver:

- 🎮 **144–360 FPS forward rendering,**
- ⏱️ **Sub-10ms input-to-photon latency,**
- 🧠 **DLSS/Frame Generation by AI,**
- **and instant asset streaming over hybrid cloud-edge setups.**


Tree of Thought
Analytics
46%
87.8%
5%
6%
AI Orchestration
Agants
Task Flow

🧠 High-Fidelity, Real-time Optimization Towards Predicted or Defined Goals

These same principles—low-latency responsiveness, forward-thinking, dynamic rendering, and distributed compute—are now crossing into productivity and automation. Breakthroughs on multiple levels will make unimaginable things possible within the next decade and this conceptual browser orchestration framework puts this power into the hands of everybody with a pc and internet access. After all advanced AI-driven fast-pace gaming compute is similar to real-time data generation.

Imagine a knowledge worker's future desktop setup:

💻 **Screen 1:** A browser helper tab hooked to an LLM refines every question and interaction you write—augmenting your thinking through prompt optimization and chain-of-thought amplification.

📊 **Screen 2:** Another tab visualizes live data from an internal MCP (Multi-Channel Processing) server, rendering interactive, high-frequency charts in real time using forward-rendering browser tech via WebGL or WebGPU.

🎬 **Screen 3:** A helper agent watches your actions and assembles a narrated video tutorial using generative AI—documenting decisions, insights, and process flows as you work.

💡 Responsive Output via Smart Buffering

To ensure a fluid user experience, the output coordinator buffers AI results before displaying them in visual slots. Only complete, relevant outputs are shown, keeping the interface responsive and distraction-free. As

AI performance and computation capabilities improves over time, this buffer time will shrink — moving the experience closer to true real-time interaction, even in complex multi-agent scenarios.

🛠️ The Technical Foundation

Unlike traditional agent systems that rely on centralized cloud logic or bespoke SDKs, the optimando.ai framework is built on:

- Browser-native orchestration using tabs, not containers
- DOM-level prompt injection and readback, per desktop/mobile app and browser extension
- User-defined session templates and context-aware routing logic
- Customizable update intervals (DOM completion, screenshot loop, stream window)
- Autonomous or manual feedback triggers, including peer-to-peer helper tab interactions
- Full MCP server compatibility via orchestrator logic via helper tab (local/remote event listeners)
- Hybrid LLM handling, where each helper tab can run:
    - Local models (e.g., Mistral, LLaMA, Phi-3)
    - Cloud models (e.g., GPT-4, Claude, Gemini, Deepseek, Mistral)
    - Or even autonomous agents (e.g., OpenDevin, Project Mariner)

- Security by Design through browser sandboxing, session isolation, and non-invasive architecture
- The browser, long seen as a passive interface, is now the orchestrated runtime layer.
- Security by Design: The system leverages native browser sandboxing, session isolation, and a non-invasive architecture (no root access, no background daemons), reducing attack surfaces and simplifying compliance.
- Modern autonomous agents—such as OpenDevin, Google's Project Mariner, or Baidu's Ernie Bot Agent—highlight the global trend toward AI-driven process delegation. However, many existing solutions remain closed, platform-bound, or require deep system integration. Optimando.ai takes a more flexible route: its browser-based helper tab concept allows users to integrate AI agents and automation tools—including LLMs, n8n, Zapier, Make, or other cloud/local services—without leaving the familiar browser environment.
- This architecture enables real-time orchestration of AI workflows and brainstorming sessions across browser tabs, supporting both cloud-based APIs and fully local execution. It offers a modular and scalable framework that allows organizations to incrementally adopt AI-driven automation—without lock-in, without compromising data ownership, and with minimal infrastructure requirements. The result is a powerful, interoperable AI workspace that aligns with existing digital behavior while opening the door to highly personalized and responsive task automation.

🌐 The Browser as a Universal AI Gateway

Why the browser? It is universally available, cross-platform, and runs on every device

- **It has evolved with WebGPU, Service Workers, Security Sandboxing, and full user-level isolation**
- **It allows interaction with any digital tool or AI system that exposes a UI**
- **It is where 98%+ of digital work happens—from cloud IDEs to enterprise dashboards**

optimando.ai leverages this to orchestrate entire multi-agent workflows from within the browser, controlled by a single orchestrator app on your device and a browser addon. No need for server-side logic—only tabs. For users seeking maximum privacy and control, the orchestration tool can be installed on a bootable, encrypted SSD preconfigured with a hardened Linux distribution such as Ubuntu. This setup allows the entire orchestration environment—including the browser-based agent system and supporting components—to run in an isolated, portable, and tamper-resistant workspace.

To simplify deployment, Optimando.ai will offer a ready-to-use secure setup, which includes full disk encryption, pre-installed orchestration software, and optional integration of local language models (LLMs) for fully offline workflows. This approach is ideal for professionals, researchers, or organizations that require both AI automation and strict data sovereignty.

🔐 Secure Deployment via Bootable Encrypted SSDs

To support privacy-focused and offline use cases, the orchestration framework can be deployed on a bootable SSD with full-disk encryption, running a desktop-capable Linux distribution such as Ubuntu 22.04 LTS Desktop Edition. This configuration allows the entire orchestration system—including the browser-based interface, coordination logic, and helper agents—to run in a graphical, self-contained, and tamper-resistant

environment. The inclusion of a full desktop environment is essential, as it provides the graphical interface needed for interacting with browser tabs, multi-agent outputs, and visual workflows—similar to how a typical end-user system operates (e.g., on Windows or macOS).

For maximum security, the entire device should be encrypted using technologies like LUKS full-disk encryption, ensuring that no part of the disk remains exposed to boot-time malware or unauthorized data access. The system image can also be cryptographically hashed to enable post-installation integrity checks and reproducible builds. Additional hardening measures such as secure boot and optional air-gapped operation may be applied depending on the threat model.

This deployment strategy is particularly useful in environments with strict data governance policies, limited or no internet access, or where offline, local AI processing is required.

🏁 A Timestamped Innovation. First Public Release of Its Kind.
The conceptual design and technical outline of this system were first made publicly accessible in 2025 and cryptographically timestamped using OpenTimestamps.org on the Bitcoin blockchain. This verifiable proof-of-publication ensures authorship precedence and protects against future claims of originality.

📌 To the best of our knowledge, this was the first publicly released open-source orchestration framework enabling browser-central, tab-based AI agents to coordinate, optimize, and suggest real-

time strategies—across devices, sessions, and users. Unlike traditional automation tools that react only to explicit user input, this system is built around proactive, forward-thinking, continuous monitoring and intelligent feedback loops. Helper tabs autonomously observe context and suggest optimizations without requiring manual triggers—delivering a dynamic, adaptive AI experience across the user's digital workspace.

Concept Timestamped on Bitcoin