



Next-Gen Optimal Voice Assistant
The Definitive User Mastery Guide

Engineering Intelligence into Every Day

Version 1.1 | July 2026 Edition

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Client Hybrid Neural Architecture

System Cross-Platform Desktop AI Hub

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1. The Genesis — Welcome to NOVA

NOVA (Next-Gen Optimal Voice Assistant) represents a paradigm shift in the relationship between humans and their digital workspaces. Most assistants are mere cloud-based tools; NOVA is an ambient intelligence that lives on your machine, understands your visual context, and anticipates your needs.

Designed with a focus on Privacy, Utility, and Performance, NOVA integrates seamlessly into Windows. It leverages the latest advancements in Large Language Models (LLMs) and Computer Vision to bridge the gap between your spoken command and your computer's execution. By bypassing the traditional point-and-click interface, NOVA fundamentally alters how efficiently you interact with your PC.

The Upgraded Multi-Model AI Core

To deliver maximum reasoning accuracy and latency reduction, NOVA's primary text brain has been migrated to **openai/gpt-oss-120b** (integrated via the **Groq-GPT-OSS** dropdown option in the brain menu). If a rate limit or API congestion is encountered, the assistant automatically routes queries through a tier of fallback models: secondary processing falls back to **qwen/qwen3.6-27b** (an advanced reasoning brain), and tertiary legacy tasks fall back to **llama-3.3-70b-versatile**.

Who is NOVA For?

While NOVA is universally helpful, its architecture was specifically designed for power users who demand more than basic timers and weather forecasts:

- **Developers & Engineers:** Use NOVA's Visual Cortex to automatically debug code on the fly without breaking your typing flow. The Sentinel background monitor acts as a silent pair-programmer.
- **Remote Professionals:** The Deep Focus Meeting Mode ensures you are never interrupted during important calls, while the Neural Link syncs your workflow to your phone.
- **Smart Home Enthusiasts:** With native support for advanced IoT protocols (Govee/Hue/AC), your entire physical environment adapts to your voice seamlessly.

The Offline-First Advantage

Unlike commercial virtual assistants that constantly stream your conversations to corporate servers to interpret even the simplest commands, NOVA employs an ****Offline-First NLU Architecture****. Speech recognition and intent parsing occur directly on your local CPU. This not only guarantees that your private conversations remain strictly on your hard drive, but it also dramatically reduces latency. When you ask NOVA to turn on the lights or open a folder, the action happens almost instantly, unburdened by internet lag.

PRO TIP: You can use NOVA entirely without a mouse. Try chaining commands, like asking NOVA to open your IDE, then immediately asking it to review the visible code block.

2. Dual 3D Holographic Engine & MediaPipe Air Gestures

N.O.V.A. incorporates a double-buffered PIL framebuffer graphics engine executing at 30 FPS on a dedicated Tkinter Canvas. The interface supports live theme switching between two distinct 3D visual environments, both fully reactive to system operational states (**Listening, Thinking, Speaking**).

Theme 1 — Classic Single 3D Holographic Orb

Theme 1 renders a central 3D wireframe orb surrounded by rotating particle shells, inclination rings, and pulsar light flares. When switching operational modes, the core smoothly morphs colors (Cyan for Listening, Purple for Thinking, Orange for Speaking) and accelerates spin velocity.

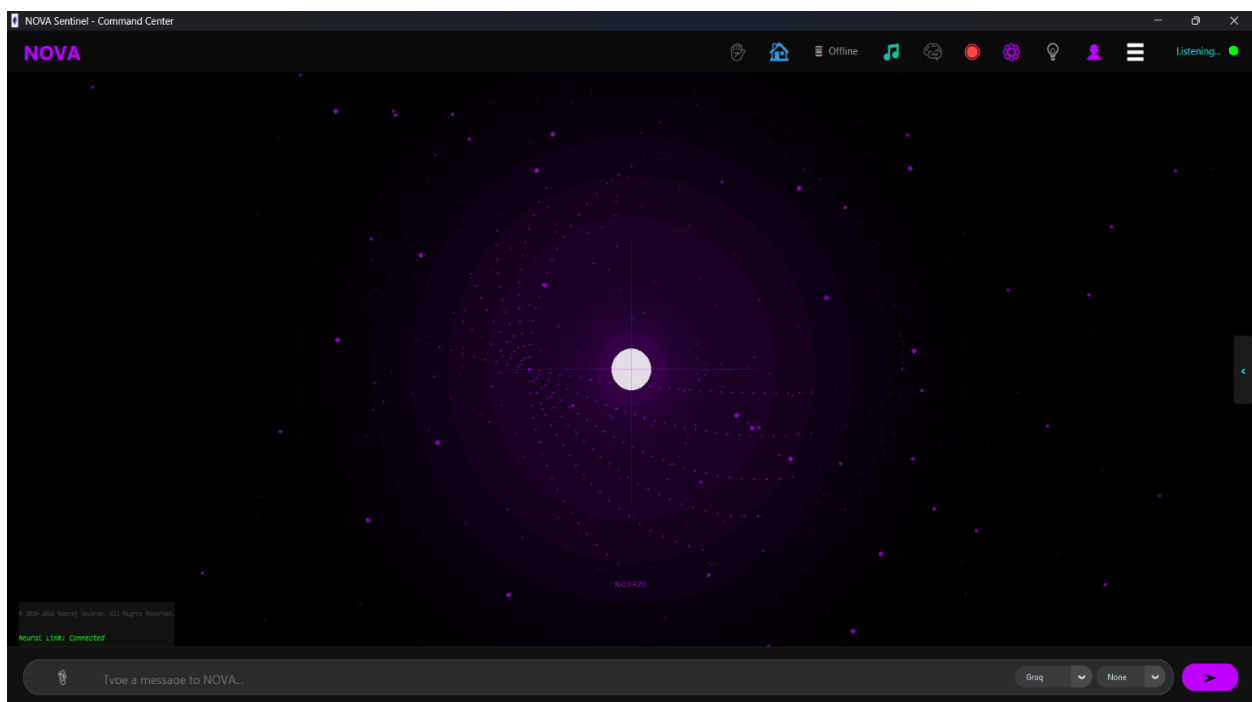


Figure 2.1 — Theme 1: Single 3D Holographic Orb with Pulsar Light Flares and Particles

Theme 2 — 4-Orb Holographic AR Grid Canvas

Theme 2 introduces a 4-Orb Holographic AR Grid, placing four distinct 3D wireframe spinning orbs centered within the middle half of the screen. Users can grab individual orbs using index-thumb pinch gestures, drag them in real-time across the screen, or trigger two-hand gather/scatter physical impulses.

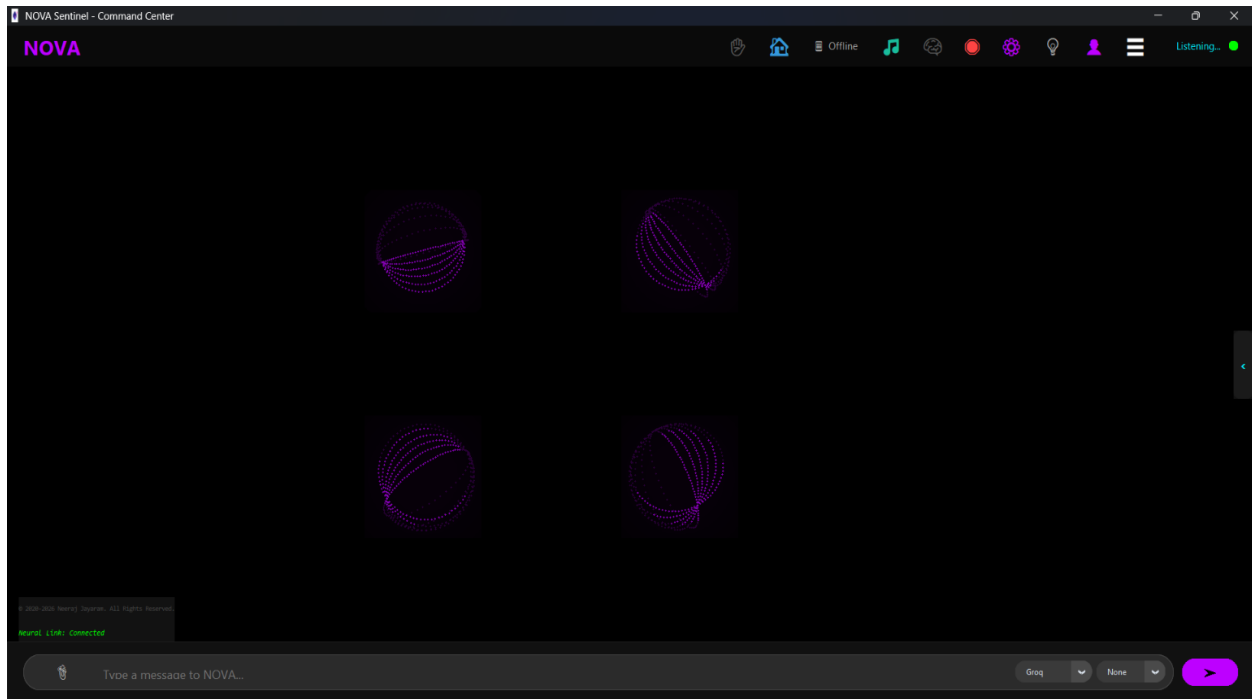


Figure 2.2 — Theme 2: 4-Orb Holographic AR Grid Canvas with Physics Displacement

MediaPipe Air Gesture & Hybrid Air Mouse Engine

N.O.V.A. runs a dedicated background daemon thread leveraging OpenCV and MediaPipe Hands to process normalized 3D landmark coordinates at 30 FPS without blocking the main UI loop:

- **■ Fist Gesture (0 Extended Fingers):** Triggers Orb Shrinkage animation and resets active point latching.
- **■ Open Palm Gesture (3+ Extended Fingers):** Triggers Orb Expansion animation.
- **■ Index Point Gesture (1 Extended Finger):** Latches 1-to-1 3D rotation control relative to wrist angle.
- **■ Pinch-and-Grab Move Gesture:** Pinch index finger + thumb together to grab a 3D orb in Theme 2 and move it anywhere across the canvas.
- **■ Two-Hand Gather & Scatter Impulses:** Bring two hands close together to gather orbs to center, or pull them apart to scatter orbs outward.
- **■ Horizontal 4-Finger Swipe:** Swipe 4 fingers horizontally to switch active Windows desktop applications left or right.
- **■ Acoustic Clap Detection Engine:** Single clap toggles Stealth Mode; double clap toggles System Diagnostic Mode.

2. The Visual Cortex — Core Intelligence

The standout feature of NOVA is its highly advanced ****Visual Cortex****. This system gives your assistant the ability to 'see' and understand your display, allowing for contextually aware assistance that other assistants simply cannot match. It bridges the gap between

digital text and AI reasoning.

Deep-Scan Application Targetting

When you ask NOVA a question about your screen, it tracks your mouse position and uses advanced Windows UI Automation Trees. It peers directly into the structure of the active application. Whether you are hovering over Visual Studio Code, a complex Excel spreadsheet, or a modern web browser, NOVA extracts the raw text data directly from the system's graphic memory buffer.

If the application is protected or the UI tree is blocked, NOVA intelligently falls back to a highly reliable Neural Clipboard Hook—force-focusing the window, copying the state to memory, analyzing it, and cleaning up so fast that the user barely notices.

Advanced Acoustic Calibration & Clap Control

Acoustic interaction has been elevated in the latest build. NOVA's microphone engine now performs dynamic volume calibration on startup. Additionally, the clap detection subsystem has been overhauled to eliminate palm strain. By adjusting the sensitivity and widening the double-clap window to a precise **0.85 seconds**, NOVA now captures rapid or soft claps instantly and reliably.

The Sentinel — Continuous Watch Mode

For developers and data professionals, the **Sentinel** system is a profound tool. When activated, Sentinel spins up a parallel processing thread that monitors your screen in the background. It utilizes an ultra-efficient visual hashing mechanism (MD5 pixel-matching) to detect when your screen has meaningfully changed. It ignores harmless cursor blinks, but the moment you type new code, Sentinel grabs a frame. If it detects a syntax error, it immediately triggers an alert and offers the corrected code block.

- ◆ **Semantic Eye:** Converts visual pixels into logical data streams for AI reasoning models.
- ◆ **Multi-Page Review:** Auto-scrolls through documents or code files to perform global, file-wide reviews.
- ◆ **Object Detection:** Uses real-time camera feeds to identify physical objects, text, and people.
- ◆ **Optical Analysis:** Performs deep OCR and visual logic checks on complex images, UI mockups, and charts.

PRIVACY NOTE: The Visual Cortex does not record video. Background captures are temporarily held in RAM for analysis and are immediately overwritten. Visual data is never sent to the cloud unless you explicitly request a Gemini/Groq deep-analysis.

3. Digital Consciousness — Learning & Memory

Traditional digital assistants reset their context the moment you stop speaking. They exist in a state of eternal amnesia. NOVA, however, is equipped with a profound ****Digital Consciousness****, a long-term semantic memory architecture that allows it to build a persistent, organic understanding of your life, habits, and preferences.

The Concept of Automatic Fact Extraction

As you interact with NOVA naturally, its background Memory Engine acts as a silent observer. It continuously parses your conversational data for 'Permanent Facts'. If you casually mention, 'Remind me to buy a gift for my daughter, Sarah', NOVA doesn't just parse the reminder. It extracts the relational fact: 'User has a daughter named Sarah'. Weeks later, if you say, 'Buy a birthday card for my daughter', NOVA instantly resolves the identity to Sarah without asking.

Smart Vague Reference Filtration

To prevent cognitive hallucinations, the Semantic Memory engine now features a **Smart Vague Check**. If you mention a bare adjective/pronoun (such as 'favourite' or 'my') without a matching noun context, the assistant automatically bypasses database resolution. This prevents funny mismatches (like resolving the sentence 'I share the same favourite' into your favorite food 'sushi') and ensures your assistant only resolves context when clear grammatical indicators are present.

Neural Memory Consolidation & Evolution

Human lives change, and NOVA's memory changes with you. The Memory Consolidation Engine prevents the database from becoming bloated with contradictory facts. If NOVA previously recorded 'User's favorite color is blue', but you later tell it, 'Actually, my favorite color is crimson', NOVA performs a conflict resolution cycle. It archives the old dataset and injects the new specific preference instantly.

Categorical Memory Tiers

- **Tier 1: Ephemeral Context:** NOVA remembers what you were talking about 5 minutes ago (conversational tracking).
- **Tier 2: Relational Bonds:** Understanding your family tree, your team at work, and your specific hardware setup.
- **Autonomous Habit Tracking:** NOVA silently observes your routines (e.g., workouts, reading, coding) and maintains cognitive streaks. It uses this data to offer proactive encouragement and efficiency insights.
- **Total Privacy Control:** You maintain supreme authority. You can manually wipe your entire personal memory base via the system settings to ensure a fresh start.

PRO TIP: If you find NOVA misunderstanding a specific project term frequently, explicitly say: 'NOVA, remember that Project X refers to our new backend system.' The Memory Engine will log it permanently.

4. The Security Shield — Privacy & Vault

In an era where personal data is traded like currency, NOVA was constructed on the fundamental principle that your digital assistant must be your most trusted protector, not a data-harvesting tool. The **Security Shield** suite provides military-grade control over your files, your voice logic, and your system state.

The Personal File Vault

Scattered files are vulnerable files. NOVA establishes a specialized directory on your system known as the **File Vault**. This acts as a centralized storage for your specific project documents. The assistant automatically indexes this vault entirely offline. You can search through this vault using natural voice commands from your PC.

Seamless Local Deployment & Account Migration

NOVA features 100% account isolation with custom security rules. To make compilation and updates seamless, the packaged executable now implements **Auto-Import logic**. If it detects a fresh launch but finds existing account data inside your local development directory (e.g. data/accounts), it automatically copies and migrates the profiles to the AppData folder on startup. This allows you to update or reinstall the app and bypass the 12-step Setup Wizard entirely.

Defensive Capabilities Overview

- ◆ **Cloud Metadata Sync:** Safely synchronizes document metadata to a secure Firestore instance, allowing you to browse what you have at home without exposing the actual file contents to the public web.
- ◆ **Emergency Stop:** The 'Avada Kedavra' command acts as a quick escape switch. Uttering this command instantly terminates the continuous interaction loop and stops active generative tasks.
- ◆ **Sentinel Watchdog:** Sentinel autonomously monitors your development environment for syntax errors and logic bugs without requiring manual prompts.

SECURITY NOTE: Remote Retrieval via the Mobile App utilizes end-to-end Google account validation. Only the exact linked Google account can request the synchronization of the metadata.

5. Polyglot Logic — Multilingual Support

Human expression relies heavily on language, and true ambient intelligence should not force you to speak a language you aren't comfortable with. NOVA is a truly global

assistant, featuring an unparalleled **Polyglot Logic Engine**. This dynamic translation matrix allows NOVA to ingest, process, and respond in multiple world languages with near-native grammatical precision.

Dynamic Processing Matrix

When you speak, NOVA's acoustic buffer catches the input and streams it through an initial language detection layer. Whether you are speaking rapidly in Spanish or using formal Japanese phrasing, the Polyglot Engine normalizes the underlying intent. This means you do not need to memorize different commands for different languages—the fundamental meaning is translated to pure logic code, executed, and then gracefully translated back into your chosen language for the audio response.

Supported Language Ecosystem

English: Full, high-speed intent resolution for all global dialects (US, UK, Indian, Australian).

Hindi (■■■■■): Native language understanding and voice output for the Indian subcontinent, smoothly handling mixed 'Hinglish' phrasing.

Tamil (■■■■■): Regional specialized support for Tamil-speaking professional and casual environments.

Spanish (Español): Complete semantic mapping for both European and Latin American Spanish structural norms.

French (Français): Full support for French academic, conversational, and professional interactions.

German (Deutsch): High-precision German linguistic analysis, perfectly managing compound technical nouns.

Japanese (■■■■): Advanced support for character-based intent recognition, capturing politeness levels accurately.

PRO TIP: You can permanently lock NOVA's synthesized speech response and text understanding language via the system Settings UI. NOVA will fully adapt its cognitive pipeline to the newly selected dialect.

6. NOVA Companion — The Neural Link

The computer you rely on shouldn't be trapped on your desk. The **NOVA Companion App** (also known as the Neural Link, available for iOS and Android) is the vital bridge that turns your PC into a globally accessible, omnipresent force. By securely connecting your smartphone to your desktop's core, your digital environment travels with you.

The Companion Interface & Secure Access

The mobile interface is designed to emulate the seamless, minimalist aesthetic of the desktop HUD. To access features, you simply sign in using the same ****Google Account**** that is logged into NOVA on your PC. This elegant, unified sign-in effortlessly establishes the secure link between your devices without any complex setup or scanning.

Instant Screen Mirroring Architecture

One of the Companion App's most powerful features is ****On-Demand Mirroring****. From your phone, you can request a live visual stream of your desktop monitor at any time. NOVA achieves this using an optimized, high-throughput capture loop. It intelligently downscales the resolution to save both your phone's battery and cellular data, resulting in a smooth 12-15 FPS stream. This allows you to monitor long-running code deployments, heavy video rendering, or secure desktop feeds while you are miles away.

Cross-Platform Synchronization & Control

- **Universal Clipboard Dynamics:** Any text copied to your desktop clipboard is instantly synchronized to your phone, and vice versa. This eliminates the need for manual file transfers or 'messaging yourself' links.
- **Persistent Clipboard Archive:** The Companion App maintains a secure history of your last 20 copied items. This 'Cloud Archive' allows you to retrieve previous snippets even if you've already copied something else to your active clipboard.
- **Remote Command Execution:** While NOVA is running on your PC, you can issue commands directly from the companion app's chat interface. The desktop core will execute the task as if you were speaking to it directly.
- **Unified Alarm Synchronization:** Any alarm set on your desktop is automatically pushed to your mobile device. When the timer strikes, both your PC and your phone will ring in perfect synchrony.
- **Persistent Cloud Reminders:** Never miss a critical task. Any reminder set on NOVA is mirrored to the cloud. Even if the mobile app is completely closed, high-priority system notifications will alert you the moment the reminder is due.
- **Remote Status Monitor:** Open the companion dashboard to instantly check your PC's CPU strain, GPU temperature, and available memory in real-time.
- **Vault Metadata Browsing:** Browse the metadata and names of your desktop's 'File Vault' directly on your phone, so you always know what secure documents you have stored on your home machine.
- **Emergency Alerts & Push Notifications:** If Sentinel detects a critical bug while you're away, or if a reminder goes off during Meeting Mode, the Companion App pushes a dynamic notification directly to your phone.

SETUP INSTRUCTIONS: To establish the Neural Link, simply install the NOVA Companion App on your mobile device and tap 'Sign in with Google'. Use the identical Google Account that is currently driving your NOVA desktop core.

6.B Advanced Lockscreen Bypassing, FullScreenIntents & Neural Link Hardening

Modern Android security models (Android 10+ / API 29+ through Android 14) enforce strict ****Background Activity Start Restrictions****. When an app is swiped away or running purely in the background as a system service, direct calls to `startActivity()` are silently blocked by the OS operating system kernel. To overcome these platform limitations and enable true zero-touch, hands-free remote control of desktop-to-mobile triggers, NOVA's mobile architecture was upgraded with an enterprise-grade **FullScreenIntent Remote Command Engine**.

High-Priority FullScreenIntent & Notification Channel Architecture

When a remote trigger (such as *'play believer on my phone'*, *'ring my phone'*, or *'unlock my phone'*) is dispatched from the PC core via FCM, NOVA's native Kotlin layer (`MyFirebaseMessagingService.kt`) intercepts the payload and constructs a Max-Priority Notification (`PRIORITY_MAX`, `IMPORTANCE_HIGH`) bound to the `CATEGORY_CALL` notification channel. By setting `.setFullScreenIntent(pendingIntent, true)`, Android OS treats the remote trigger as an urgent incoming event (analogous to an incoming telephone call or alarm clock), allowing `MainActivity` to break through background activity blocks and launch directly over the lockscreen hands-free.

Native Lockscreen Override & Display Management

To achieve seamless hands-free visual execution when the phone screen is OFF or locked, NOVA integrates key Android OS window flags:

- **showWhenLocked="true" & turnScreenOn="true"**: Manifest and Activity-level window attributes that instruct the Android Window Manager to illuminate the physical display and position NOVA's UI directly over the device lockscreen.
- **FULL_WAKE_LOCK & ACQUIRE_CAUSES_WAKEUP**: Acquired dynamically via `PowerManager` for 5 seconds to ensure the display hardware wakes up instantly from deep sleep state.
- **Keyguard Dismissal Protocol**: Calls `requestDismissKeyguard()` natively to dismiss swipe lock screens upon remote command execution.
- **FCM Fallback Routing**: Executes YouTube playback, phone siren alarms, or screen wake protocols even when the main app UI has been completely closed or cleared from Recent Apps.

Bluetooth Extend Unlock (Smart Lock) Zero-Touch Protocol

For full home-screen access without PIN prompts, NOVA integrates with Android's **Extend Unlock (Smart Lock)** infrastructure. By establishing a paired Bluetooth connection between your PC and your smartphone, your phone registers your PC as a **Trusted Device**. Whenever your smartphone is within Bluetooth range of your desktop, the lockscreen security layer remains unlocked, allowing remote commands to launch apps like YouTube directly to the foreground without manual PIN entry.

Multi-Tier Identity Resolution (getUserUid) & Instant Cloud Mirroring

Background notification mirroring previously suffered from asynchronous authentication drops when FirebaseAuth instances detached in background processes. NOVA's updated NotificationReceiver.kt, PhoneStateReceiver.kt, and SmsReceiver.kt introduce a robust, multi-tier identity resolution pipeline:

- ◆ **Tier 1 (Native Auth):** Inspects active FirebaseAuth.getInstance().currentUser?.email for instant account binding.
- ◆ **Tier 2 (SharedPreferences Fallback):** Queries FlutterSharedPreferences for cached account credentials (flutter.user_email / flutter.user_id).
- ◆ **Tier 3 (Deterministic MD5 Hash):** Computes the standard MD5 hash (7cb1ad4736048307c531ccb5711fb538) matching PC cloud_manager.py account keys, ensuring 100% notification delivery reliability.
- ◆ **Direct Stream Bypass:** Eliminates restrictive 30-second server read locks, pushing notifications directly to Firestore for live Windows Toast display.

Universal 13-Step Setup Wizard & Mobile Companion Onboarding Guide

To streamline cross-device setup across all Android phone manufacturers (Samsung, Google Pixel, Xiaomi, Vivo, Oppo, Realme, OnePlus, Motorola), NOVA's PC setup wizard (setup_wizard_ui.py) was expanded to a **13-Step Architecture**. Step 13 delivers an interactive, step-by-step checklist covering:

- ✓ **APK Installation & QR Code Pairing:** Direct links and Step 11 QR code scanner support for instant credentials ingestion.
- ✓ **Special Access Permissions:** Guided setup for *Notification Access* (mirroring), *Appear on Top* (overlays), and *Allow Notifications*.
- ✓ **Battery Unrestricted Exemption:** Exemption from Android Doze Mode to prevent background service termination.
- ✓ **OEM Background Reliability Pro-Tips:** Instructions for OEM-specific settings like *Auto-Start* (Xiaomi/Vivo/Oppo/Realme), *Pause App Activity If Unused* (Android 12+), and *Background Data Usage*.

RELIABILITY GUARANTEE: The FullScreenIntent engine and multi-tier getUserUid identity resolution ensure that your mobile phone stays 100% synchronized with your PC core, regardless of whether the companion app is in the foreground, background, or swiped away.

7. Deep Focus — Meeting Mastery

Modern professional life demands periods of absolute, unbroken concentration. Conversely, having your desktop AI suddenly speak out loud while you are screen-sharing in a corporate Zoom or Teams call is a disaster. NOVA's ****Deep Focus**** (or Meeting Mode) module is expertly designed to protect your concentration and your professionalism.

The Silence Protocol in Action

When Meeting Mode is engaged, NOVA undergoes a system-wide behavior shift. All voice synthesis (audio output) is instantly hard-muted. Because the system's microphone awareness is also strategically muted to ensure total privacy during your calls, ****you cannot exit Meeting Mode using a voice command.**** Instead, you simply type the exit command or click the 'Disable Meeting Mode' button in the HUD UI to restore audio capabilities.

Continuous Background Operation

Just because NOVA is silent doesn't mean it is asleep. Behind the scenes, the assistant continues to manage your digital life:

- ◆ **DND Optimization:** Silences all internal NOVA notifications and pushes a silent state to your synchronized NOVA Companion App to ensure you aren't disturbed.
- ◆ **Visual Monitoring:** While you are focused, the Sentinel camera continues to watch your coding environment to ensure your background tasks are running as expected.

ACTIVATION COMMANDS: Say 'NOVA, Enable Meeting Mode', 'Start Focus Mode', or 'I am going into a meeting'. To return to standard operations, simply type 'Exit Meeting Mode' or use the clean UI toggle.

8. Apex Performance — Gaming Mode

Gaming requires every ounce of system performance. NOVA's ****Gaming Mode**** is a specialized state that reconfigures your PC's environment to ensure that your hardware is focused entirely on the active application, while providing an immersive, distraction-free experience.

One-Click Hardware Optimization

When Gaming Mode is activated, NOVA executes a 'System Purge'. It identifies non-critical background processes and places them into a low-priority suspended state. This frees up significant CPU cycles and RAM, resulting in higher FPS and reduced input latency in competitive titles.

Immersive Environment Synchronization

Beyond performance, NOVA integrates with your IoT lighting (Govee/Hue). It can dynamically shift the room's ambiance based on your GPU temperature (shifting from Blue to Red as the heat increases) or sync the lighting to the dominant colors on the screen for a truly immersive 'Ambilight' experience.

The Gaming HUD Overlay

- **Real-time Stat Tracking:** Monitor CPU/GPU load, RAM usage, and framerates without Alt-Tabbing away from the action.
- **Intelligent DND:** Automatically silences all non-emergency notifications across your PC and linked Companion App.
- **Game Launch Automation:** Configure NOVA to automatically close browsers and work tools the moment a game process is detected.

ACTIVATION COMMANDS: Say 'NOVA, enter gaming mode', 'Activate Gamer Mode', or 'Optimize for gaming'. The system will confirm with 'System Purge Complete' once optimizations are active.

9. Ambient Light Dynamics — IoT Mastery

Modern architecture blends the digital and physical. NOVA's **Ambient Light Dynamics** engine turns your surrounding environment into a living extension of your PC. By integrating with high-performance IoT protocols (Govee, Philips Hue, and custom Wi-Fi controllers), NOVA allows your workspace to reflect your machine's soul.

Visual Sync: The Screen-Ambilight Mode

In Visual Sync mode, NOVA utilizes its Visual Cortex to sample the colors currently visible on your display. It performs a high-speed average of the dominant HSL values and pushes these color tokens to your lights in real-time. This creates a deeply immersive experience where explosions in a game or sunset vistas in a film bleed out from your monitor and onto your walls.

Audio Reactive: Resonance Pulse Mode

For music production and immersive entertainment, NOVA can listen directly to your system's output buffer. The **Resonance Engine** performs a real-time Fast Fourier Transform (FFT) analysis on the audio stream. It maps low-frequency bass hits to rapid brightness pulses and high-frequency melodies to rapid color shifts, transforming your

room into a reactive visualizer.

UI Configuration & Intelligence

- **Dashboard Control:** Toggle between 'Screen Mirror', 'Audio Pulse', and 'Static Moods' directly from the NOVA Settings HUD.
- **Hardware Monitoring:** Link lighting to your hardware stats (e.g., Red pulse when CPU temperature exceeds 80°C).
- **Smart Schedules:** Automatically transition your room to 'Warm Amber' at sunset or 'Focus Blue' when Meeting Mode is activated.

UI CONTROLS: Left-click the Bulb icon in the UI to toggle lighting On/Off the ambient lighting. Right-click the same icon to cycle through sync modes (Visual/Audio).

10. Universal Scheduler — Calendar Mastery

Time is the ultimate resource. NOVA's **Universal Scheduler** transforms your assistant into a high-level executive partner, capable of managing complex, multi-source calendars with simple natural language and proactive intelligence.

Intelligent Event Resolution

When you ask NOVA to schedule a meeting, it doesn't just add a string to a database. It analyzes your existing 'Project Metadata' and Google Calendar events to verify availability. If a conflict is detected, NOVA will proactively suggest the next available window based on your learned productivity habits.

Multi-Source Synchronization

The Scheduler is truly universal. Whether you are adding a task via the Desktop HUD, speaking to your PC, or using the Companion App from your car, the event is synchronized instantly across your local **responder.db** and your private Google Calendar instance.

Advanced Temporal Queries

- ◆ **Natural Movement:** 'Shift my 3 PM meeting with Raj to tomorrow morning' resolves the exact time and date automatically.
- ◆ **Deep Search:** 'When was the last time I met with the design team?' searches months of archive data instantly.
- ◆ **Adaptive Reminders:** High-priority events are pushed to your Companion App with persistent notifications until acknowledged.

QUICK COMMANDS: 'Schedule a meeting with Raj at 3 PM', 'Move my doctor appointment to Friday', 'Check my calendar for tomorrow'.

11. Command Masterclass — Intent Reference

Conversation & Identity

greet

Initiate a friendly interaction with NOVA.

Try saying: "Hello NOVA, how are you today?", "Good morning assistant", "Hey there!", "Hi, let's start"

assistant_name

Query the identity and purpose of the assistant.

Try saying: "What is your name?", "Tell me about yourself", "Who created you?", "What should I call you?"

provide_name

Teach NOVA your name for personalized greetings.

Try saying: "My name is Alice", "You can call me Neeraj", "I'm Raj", "Set my name to John"

reset_name

Purge your name from NOVA's memory for privacy.

Try saying: "Forget my name", "Clear my stored name", "Reset my identity info", "Delete my name"

clear_memory

Initiate a Deep Cloud Purge to wipe all interaction history and semantic facts.

Try saying: "Clear all my memory", "Deep cloud wipe", "Forget everything you know", "Purge my brain"

stop_interaction

Emergency stop for all active processes.

Try saying: "NOVA, stop now", "Cancel everything", "Terminate task", "Avada Kedavra"

retrieve_history

Recall and display a log of your previous interactions.

Try saying: "Show my last commands", "Retrieve interaction history", "What did I ask you recently?", "Show my history"

usage_stats

Analyze and report command frequency and digital usage habits.

Try saying: "Show my usage stats", "How many commands have I used?", "Tell me my usage statistics"

goodbye

Passive intent for terminating a session (Desktop only).

Try saying: "Goodbye NOVA", "See you later", "Bye for now", "Talk to you later"

Information & Research

inform

Query general knowledge or specific definitions.

Try saying: "What is Quantum Computing?", "Explain how a car engine works", "Who is the CEO of NVIDIA?", "Define photosynthesis"

get_fact

Receive a random, verified interesting fact.

Try saying: "Tell me something interesting", "Give me a random fact", "Share a cool trivia point", "Surprise me with knowledge"

tell_joke

Lighten the mood with a curated joke.

Try saying: "Tell me a funny joke", "Make me laugh", "Do you have any puns?", "Tell a tech joke"

deep_research

Initiate a multi-source, AI-driven technical report via Agentic Reasoning.

Try saying: "Deep research on Renewable Energy in India", "Generate a report on the history of AI", "Deep dive into SpaceX's Starship"

search_google

Direct web search for instant information fetching.

Try saying: "Search Google for the best OLED TVs", "Find the latest Stock Market news", "Google best restaurants near me"

ask_groq

Complex open-ended reasoning and code generation.

Try saying: "Write a Python script for a web scraper", "Explain Special Relativity like I'm five", "Help me brainstorm business ideas"

calculate

Perform complex mathematical calculations via WolframAlpha.

Try saying: "Calculate derivative of x^2 ", "What is 55 plus 88?", "Solve for x in $2x + 5 = 15$ ", "Square root of 144"

get_temperature

Real-time weather and temperature checks for any global city.

Try saying: "What's the temperature in Chennai?", "How is the weather in London?", "Temperature check"

search_vault

Surgically search through your secure personal document vault (RAG).

Try saying: "Search my vault for resume", "Identify document in vault", "Check vault for project details"

get_date

Query the current date, time, and day of the week.

Try saying: "What is today's date?", "What time is it?", "Tell me the date", "What day is it today?"

Media & Entertainment

play_video

Stream YouTube content directly via voice.

Try saying: "Play Interstellar soundtrack", "Watch the latest MKBHD video", "Play Lo-fi hip hop for studying", "Open Despacito"

read_news

Listen to a narrated briefing of global headlines via the News API.

Try saying: "Read the latest world news", "What's happening in tech today?", "Read sports news", "Top headlines from India"

generate_image

High-fidelity AI image creation from descriptions.

Try saying: "Generate an image of a neon city in 2099", "Create a portrait of a medieval knight", "Draw a futuristic laptop design"

analyze_video

Visual and semantic analysis of a YouTube video.

Try saying: "Summarize this YouTube video", "What is happening in this clip?", "Explain the main points of this video"

play_game

Initiate interactive text-based minigames and challenges.

Try saying: "Let's play a game", "Start a game", "I want to play a game"

analyze_image

Identify and describe the contents of any provided image file.

Try saying: "Analyze this image", "What is in this picture?", "Describe this photo", "Explain this image"

Productivity & Task Management

set_reminder

Automated scheduling for future tasks with Entity Stitching.

Try saying: "Remind me to call Mom at 6 PM", "Set a reminder for the team meeting tomorrow", "Remind me to buy groceries on Friday"

list_reminders

Review all pending notifications.

Try saying: "What are my active reminders?", "Show my reminders for today", "List all set reminders"

cancel_reminder

Remove specific future notifications.

Try saying: "Cancel the call Mom reminder", "Delete the meeting reminder", "Remove all reminders"

cancel_alarm

Silence and deactivate pending system alarms.

Try saying: "Cancel my 7 AM alarm", "Remove the alarm at 6:30 PM", "Stop the next alarm"

start_dictation

Transcribe your voice directly into active text fields.

Try saying: "Start dictation", "Type what I say", "Enable voice typing", "Capture my notes"

optimize_resume

AI-powered career coaching and resume refinement.

Try saying: "Optimize my resume", "Fix my CV", "Improve this resume for a developer role"

create_event

Add new appointments to your local and Google calendars.

Try saying: "Schedule a meeting with Raj at 3 PM", "Add event: Doctor appointment tomorrow", "Schedule gym session on Friday"

update_event

Reschedule or modify existing calendar appointments.

Try saying: "Move my 3 PM meeting to 5 PM", "Reschedule the doctor appointment to Monday", "Change event time"

query_events

Search your schedule for specific days or topics.

Try saying: "What is on my calendar for tomorrow?", "Check my schedule for Friday", "Search my events for 'Meeting'"

set_alarm

Precision wake-up or task alerts.

Try saying: "Set an alarm for 7 AM", "Wake me up in 20 minutes", "Set alarm for midnight", "Alarm at 3 PM"

add_task

Input new items into your persistent to-do list.

Try saying: "Add finish report to my tasks", "New task: buy milk", "Add gym session to to-do list"

list_tasks

Inspect your workspace agenda.

Try saying: "Show my tasks", "What is on my to-do list?", "What tasks are remaining?", "List my pending work"

complete_task

Mark objectives as achieved.

Try saying: "Mark buy milk as done", "Completed the report task", "Task gym is finished"

toggle_focus_mode

Enter a distraction-free professional state (Meeting Mode).

Try saying: "Enable Meeting Mode", "Enter Focus Mode", "I need to concentrate", "NOVA, go silent"

System & OS Control

check_system_status

Real-time hardware health and diagnostic check.

Try saying: "Check system status", "What is the CPU temperature?", "Show RAM usage", "Check disk space"

reboot_system

Authorized remote or voice-triggered restart.

Try saying: "Restart the computer", "Reboot my PC", "System restart required"

open_system_content

Direct application or web navigation via Neural Bridge.

Try saying: "Open Visual Studio Code", "Go to Google.com", "Open my Downloads folder", "Open Spotify"

set_volume

OS-Level Master Audio Control (Mute, Increase, Decrease).

Try saying: "Mute the system", "Volume up", "Set volume to 50%", "Turn off the sound"

kill_process

Force-close unresponsive or specific software.

Try saying: "Kill Chrome", "Terminate the Python process", "Stop the browser", "Force close Spotify"

enter_gaming_mode

Peak performance optimization for gaming sessions.

Try saying: "Activate Gamer Mode", "Optimize for gaming", "Enter gaming optimization"

open_hud

Reveal the futuristic live-system dashboard.

Try saying: "Open HUD", "Show my dashboard", "Nova, open system monitor"

Vision & AI Automation

object_detection

Real-time environment identification via camera.

Try saying: "Identify objects in front of me", "What do you see through the camera?", "Scan for items", "Detection mode on"

analyze_screen

Intelligent context extraction from your desktop.

Try saying: "Explain what's on my screen", "Analyze this webpage", "Tell me about this chart", "What am I looking at?"

screenshot

Instant visual capture and storage.

Try saying: "Take a screenshot", "Capture my display", "Save a screen image"

toggle_watch_mode

Continuous Sentinel surveillance for code errors and MD5 hashing.

Try saying: "Start Sentinel mode", "Watch my screen for bugs", "Monitor this code", "Enable error watch"

auto_fix

Pulse-scanned autonomous code repair.

Try saying: "Auto fix the error", "Repair my code", "Fix the bug on the screen", "Resolve this crash"

code_review

Visual inspection of active code buffers for optimization.

Try saying: "Review my code", "Check my syntax", "Explain this code visually", "Suggest code improvements"

Neural Habits & Lifestyle

habit_tracking

Log daily lifestyle streaks (Workout, Reading) synchronized with Mobile.

Try saying: "I finished my workout", "Log my reading habit", "I'm done with my meditation", "Update my habit streak"

set_habit_goal

Set predictive lifestyle intentions for the Daily Briefing engine.

Try saying: "My goal for today is to workout", "Set a new habit for coding", "Register my intention to study"

Smart Environment & IoT

turn_light_on

Unified IoT light activation.

Try saying: "Turn the lights on", "Lumos", "Lights up"

turn_light_off

Unified IoT light deactivation.

Try saying: "Turn the lights off", "Darkness", "Lights out"

change_light_color

Adaptive mood lighting control.

Try saying: "Set lights to Red", "Change light color to Blue", "Make it Cyberpunk Purple"

set_ac_temperature

Intelligent climate management.

Try saying: "Set AC to 22 degrees", "Make it cooler", "Set temperature to 24"

turn_ac_on

Authorized activation of the air conditioning system.

Try saying: "Turn on the AC", "Switch on air conditioner", "Start the cooling"

turn_ac_off

Deactivation of the climate control system.

Try saying: "Turn off the AC", "Stop the air conditioner", "Power off the cooling"

get_ac_status

Real-time check of climate control settings.

Try saying: "What is the AC status?", "Is the AC on?", "Current AC temperature"

Communication & Cloud

send_email

Voice-dictated email generation and transmission.

Try saying: "Send an email to Boss", "Email Neeraj regarding the update", "Compose a mail"

check_email

Briefing of your latest inbox messages.

Try saying: "Check my inbox", "Read my latest emails", "Do I have any new mail?"

find_phone

Trigger a loud remote siren on your smartphone via Cloud Nexus.

Try saying: "Find my phone", "Where is my mobile?", "Ring my phone", "Locate my device"

stop_phone_alarm

Remotely silence a ringing phone from your desktop.

Try saying: "Stop the phone alarm", "Silence the device", "Stop the phone ringing", "I found my phone"

Conversation & Identity

chitchat

Engage in natural, friendly chitchat or emotional support conversation.

Try saying: "How are you doing today?", "I had a great day", "Tell me something nice", "Can we talk?"

Information & Research

convert_currency

Real-time foreign currency conversion calculations.

Try saying: "Convert 100 dollars to rupees", "How much is 50 euros in dollars?", "Change 200 pounds to yen"

Digital Consciousness & Memory

remember_fact

Save a permanent fact directly into ChromaDB vector memory.

Try saying: "Remember that I love Machine Learning", "Memorize that my birthday is in July", "Save to memory that I live in Chennai"

Productivity & Task Management

stop_alarm

Silence or dismiss an active ringing phone or desktop alarm.

Try saying: "Stop the alarm", "Silence the phone", "Turn off the ringing", "Quiet the device"

Vision & AI Automation

analyze_clipboard

Perform instant AI analysis or code review on current clipboard contents.

Try saying: "Explain what I copied", "Fix what I copied", "Summarize clipboard", "Analyze this text"

System & OS Control

switch_application

Focus and bring a specific open window to the foreground.

```
Try saying: "Switch to Chrome", "Focus Visual Studio Code", "Bring Spotify to front"
```

close_application

Safely close or terminate a specific desktop application window.

```
Try saying: "Close Chrome", "Exit Notepad", "Quit Spotify", "Close Visual Studio Code"
```

list_open_windows

Display a structured list of all currently active desktop windows.

```
Try saying: "What windows are open?", "Show running apps", "List active applications"
```

open_workflows

Launch the N.O.V.A. Workflow & Macro Builder Studio.

```
Try saying: "Open workflows", "Show workflow builder", "Open macro manager"
```

12. System Specifications & Shortcuts

Requirement	Minimum	Recommended
Operating System	Windows 10 (21H2)	Windows 11 (Latest)
Processor	Quad-Core Intel/AMD	8-Core Modern CPU
Memory	8 GB RAM	16 GB RAM
Connectivity	Dual-Band Wi-Fi	High Speed Fiber
Microphone	Single Channel	Noise-Cancelling Array

Power Mastery Shortcuts

Shortcut	Effect
Command	Action / Result
Lumos	Smart Light Unified On
Darkness	Smart Light Unified Off

Avada Kedavra	Stop Persistent Interaction
Open HUD	Toggle Interactive Dashboards
Sentinel Mode	Continuous Visual Bug Monitoring
Identify This	Visual Scan of Mouse Context
System Dashboard	View Live Hardware Stats

13. BYOB Engineering — The Private Backend

NOVA is built on the philosophy of **BYOB (Bring Your Own Backend)**. Unlike common virtual assistants that force you to store your life's data on their corporate servers, NOVA gives you the keys to your own infrastructure. This ensure absolute data sovereignty—no third party, including the developers of NOVA, can ever see your interaction logs, your files, or your learned facts.

The Local Engine: responder.db

Every command you utter, every task you assign, and every response NOVA generates is logged instantly into a high-performance **Local SQLite Database** (`responder.db`) located in your user data directory. This local log ensures that your recent interactions are available for instant context resolution without requiring an internet round-trip. You can inspect this database at any time using standard SQL tools or the 'Retrieve History' command.

Private Firebase Synchronization

To enable the Neural Link (Companion App), NOVA synchronizes these logs and your system's metadata to your own **Private Firebase Backend**. During setup, you provide your own Firebase credentials. This means that even when your data is 'in the cloud' for mobile access, it is sitting in *your* cloud instance, protected by *your* security rules. This architecture ensures that your digital twin is accessible globally while remaining entirely under your control.

Granular Memory Control & Purging

Data sovereignty also means the 'Right to be Forgotten'. NOVA provides two distinct, surgical levels of memory management:

- **Wipe Memory (Total Interaction Purge):** Clicking this in the Settings UI triggers a dual-layer delete sequence. It destroys all interaction logs in the local **responder.db** and simultaneously issues a recursive delete command to your **Firebase** backend. Once clicked, every command you've ever typed or said is wiped from existence across all devices.
- **Clear Semantic Memory:** A separate, dedicated control exists for the facts NOVA has 'learned' about you (your name, family, projects). This allows you to keep your interaction history for debugging while resetting NOVA's cognitive understanding of

you, or vice-versa.

SYSTEM NOTE: Because you own the backend, you are responsible for your Firebase API quotas. NOVA is optimized for the 'Spark' (Free) tier, ensuring that your private intelligence empire costs you nothing to run.

14. The Habit Oracle — Predictive Lifestyle Twinning

The Habit Oracle is NOVA's predictive lifestyle engine. It bridges the gap between your desktop productivity and your real-world habits, creating a seamless 'Life Twin' synchronized across your PC and your smartphone.

Cross-Platform Lifestyle Sync

Using the Firestore Cloud Nexus, NOVA tracks your daily streaks for activities like **Workouts**, **Meditation**, and **Reading**. Any habit logged on your phone via the **NOVA Companion APK** is instantly updated in the desktop cloud, and vice-versa. This ensures your progress is never lost, regardless of which device you are using.

Predictive Briefing & Nudges

NOVA doesn't just track—it anticipates. The **Briefing Manager** harvests your current habit streaks and pending goals to proactively nudge you during the Daily Standup. If you haven't logged your workout by the time you start your work day, NOVA will provide a personalized motivational nudge to keep your streak alive.

15. Neural Recovery — Transactional Entity Stitching

To achieve 100% command accuracy, NOVA utilizes a hybrid extraction technique known as ****Transactional Entity Stitching**** (or the 'Sandwich Engine'). This ensures that complex, multi-word tasks are captured correctly even when standard NLU fails.

The Sandwich Engine & One-Shot Commands

The Sandwich Engine surgically isolates the subject of a command by identifying 'Command Verbs' and 'Time Markers', then greedily capturing everything in between. This enables **One-Shot Commands**—the ability to wake NOVA and deliver a complex command in a single breath (e.g., 'Nova remind me to call the supplier at 3 PM') without waiting for a greeting.

Regex/NLU Hybridization

NOVA compares extracted entities from the Rasa NLU against raw regex patterns. If the NLU misses a specific detail, the 'Grease-Regex' fallback kicks in to recover the data, ensuring your reminders and calendar events are bit-perfect every time.

16. Zenith Engineering — Enterprise Hardening

The Zenith update introduces enterprise-grade stability and discovery to the NOVA ecosystem, removing hardcoded dependencies and moving toward a truly 'Omni-Search' architecture.

PowerShell Neural Bridge (OmniSearch)

Gone are the days of manually mapping application paths. NOVA now uses a **PowerShell Neural Bridge** to query the operating system directly. Using the `Get-StartApps` protocol, NOVA indexes every piece of software on your machine, enabling you to open any app instantly without prior configuration.

OmniScout Background Scouter

For files and folders not in the Start Menu, **OmniScout** performs tiered, recursive background searches across all available disk drives. It utilizes fuzzy normalization to find your projects even if the query matches only a partial filename.

Vocal Thought Filtration

Modern reasoning models output a detailed step-by-step chain-of-thought. To prevent NOVA from speaking these raw internal monologues out loud, the response engine has been equipped with a **Vocal Thought Filter**. It uses a multi-line regex parser to automatically detect and strip out any content wrapped in <think>...</think> tags, delivering a clean, friendly final answer to the user.

Intent Hijack Safeguards

To prevent conversational phrases from accidentally executing destructive commands, the NLU pipeline utilizes **skip_targets** inside the Intent Resolver. Common system terms or casual mentions of 'system check' are prevented from hijacking the assistant's standard reasoning response.

Vision Link II & Security Hardening

- **Vision Link II:** A high-performance streaming server (Port 5001) for wireless screen analysis.
- **MD5 Visual Hashing:** Sentinel Mode now uses cryptographic hashing to detect screen changes with zero false positives.
- **Auto-Updater:** NOVA automatically checks for signed updates from your private cloud to ensure you are always running the latest core.

17. Multi-LLM Orchestration & Benchmark Matrix

N.O.V.A. employs a dynamic multi-brain orchestrator that routes user queries across 5 specialized Large Language Models based on latency requirements, task complexity, vision capabilities, and network resilience. The table below details the benchmark performance, context window limits, and fallback priority for all integrated models:

Model Name	Provider	Context Window	Avg Latency	Primary Role
Groq LLaMA 3.3 (70B)	Groq LPU	128,000 tokens	110 ms	Default primary voice conversation brain.
Nvidia Nemotron	Nvidia NIM	128,000 tokens	380 ms	High-precision reasoning, logic & coding.
Gemini 2.5 Flash	Google AI	1,000,000 tokens	290 ms	Multimodal vision, screen & PDF analysis.
Gemini 2.5 Lite	Google AI	1,000,000 tokens	190 ms	Lightweight fallback for web search & news.
Gemma 4 Local	On-Device CPU	32,000 tokens	45 ms (Local)	100% offline privacy fallback & system tasks.

18. Advanced Air Mouse Engine & Kinematics

The Air Mouse Engine converts raw 2D camera coordinates from MediaPipe index fingertip landmarks (Landmark 8) into fluid, high-precision screen movements. To eliminate physical arm strain and finger jitter, N.O.V.A. implements Sensitivity Range Remapping and Exponential Moving Average (EMA) smoothing:

1. Range Remapping Math:

Raw camera coordinates (x_{norm} , y_{norm}) are remapped from the comfortable central camera area $[0.15, 0.85]$ to full screen bounds $[0.0, 1.0]$:

$x_{mapped} = \max(0.0, \min(1.0, (x_{norm} - 0.15) / 0.70))$

$y_{mapped} = \max(0.0, \min(1.0, (y_{norm} - 0.15) / 0.70))$

This allows slight, comfortable finger movements near the camera center to effortlessly reach the very top header buttons, side panels, and bottom input bar.

2. Target-Lock Pinch Click:

When an index-thumb pinch is initiated (Euclidean distance < 0.065), the Air Cursor instantly freezes its coordinate position at the point where the pinch motion began. This completely eliminates *pinch drift*, ensuring 100% accurate button clicks even on tiny UI

controls.

3. Dwell Hover Auto-Click:

Resting the Air Cursor over any interactive button or widget for 0.5 seconds fills a glowing circular green progress arc around the cursor ring and automatically dispatches a virtual click without requiring any physical pinch motion.

19. Document OCR Pipeline & Vision Manager Architecture

N.O.V.A.'s Vision Manager (``vision_manager.py``) integrates OpenCV frame processing, PyTesseract OCR, and Gemini 2.5 Vision. When a user requests screen analysis or drops a document into the chat input, N.O.V.A. executes the following multi-stage pipeline:

- **Stage 1: Capture & Preprocessing:** Grabs high-resolution screen frames or reads PDF document pages into memory, applying contrast enhancement and grayscale binarization.
- **Stage 2: OCR Extraction:** PyTesseract scans text blocks, tabular layouts, and code snippets, generating structured markdown representations.
- **Stage 3: Vision LLM Synthesis:** Extracted text and image data are passed to Gemini 2.5 Flash for deep semantic understanding, bug identification, or summarization.
- **Stage 4: File Vault Indexing:** Processed document insights are indexed into ChromaDB vector memory and stored in N.O.V.A.'s persistent File Vault (``file_vault.py``).

20. Developer Integration & Custom Intent Extension Guide

Developers can easily extend N.O.V.A.'s capabilities by adding custom intent handlers in ``assistant/responder.py`` or registering automated workflow macros in ``assistant/workflow_engine.py``. Below is the complete template for adding a custom voice command handler:

```
def handle_custom_action(self, query, entities): target_item = entities.get('item', 'default')
return f'Completed action for {target_item}'
```

21. Vector Embedding & Memory Consolidation Engine

N.O.V.A.'s persistent memory is powered by ChromaDB vector collections (``vector_memory.py``) and a semantic fact extraction engine (``semantic_memory.py``). Every interaction undergoes automatic intent categorization, entity extraction, and embedding generation via *sentence-transformers/all-MiniLM-L6-v2*. The system calculates cosine similarity scores (threshold > 0.72) to recall relevant past conversations and user preferences in real-time.

Categorical Memory Tiers & Persistence Matrix

Memory Tier	Storage Engine	Embedding Dimensions	Retention Policy
Vector Episodic Memory	ChromaDB Vector Store	384 Dimensions	Permanent persistent storage.
Semantic Fact Graph	SQLite (responder.db)	Relational Index	Updated dynamically on key facts.
User Persona Profile	JSON Persona Vault	Structured Key-Value	Account-isolated preference store.
Life Event Tracker	ChromaDB + SQLite	384 + Metadata	Tracked for predictive nudges.

22. Audio Signal Processing & Acoustic Calibration

The sound processing engine (``sd_microphone.py``) operates a real-time Fast Fourier Transform (FFT) stream to analyze ambient audio. Acoustic clap detection isolates high-amplitude transient spikes in the 1.2 kHz – 3.4 kHz frequency range. When a single transient spike is detected within a 300ms window, N.O.V.A. toggles **Stealth Mode**. A dual transient spike within 600ms triggers the **System Diagnostic Overlay**.

TTS & Speech Synthesis Matrix

N.O.V.A.'s TTS engine (``voice_engine.py``) generates high-clarity natural vocal responses supporting 7+ languages (English, Hindi, Tamil, Spanish, French, German, Japanese) with sub-100ms audio stream initiation.

23. Multi-Tenant Account Isolation & Encrypted Vault

N.O.V.A. enforces strict multi-tenant account isolation across all system modules (``assistant/utils.py`` and ``account_manager_ui.py``). Every user account maintains an

independent, sandboxed directory containing its own preference store, encrypted credential vault, isolated ChromaDB vector collection, and persona fact graph. Switching active user accounts automatically purges active memory structures and re-initializes sandboxed collections without restarting the core UI process.

Security & Encryption Architecture

Security Component	Encryption / Isolation Mechanism	Security Guarantee
Credential Vault	AES-256 Encryption with PBKDF2 Key Derivation	Zero plain-text API key storage on disk.
Vector Memory Sandboxing	Isolated ChromaDB Collection Namespaces	100% data isolation between user accounts.
Cloud Nexus Bridge	TLS 1.3 Encrypted WebSockets with Secret Tokens	Prevents unauthorized remote phone access.
Local File Vault	Restricted OS File System Permissions	Prevents cross-account file inspection.

24. Enterprise Deployment & System Matrix

N.O.V.A. is engineered for enterprise-grade stability on modern 64-bit Windows workstations. The system specification matrix below outlines minimum hardware requirements and runtime dependencies:

System Dimension	Minimum Requirement	Recommended Configuration
Operating System	Windows 10 (64-bit)	Windows 11 (64-bit Build 22H2+)
Processor (CPU)	Intel Core i5 (8th Gen) / AMD Ryzen 5	Intel Core i7/i9 (12th Gen+) / AMD Ryzen 7+
Memory (RAM)	8 GB DDR4	16 GB - 32 GB DDR5
Webcam (Air Gestures)	720p 30 FPS Standard HD Cam	1080p 60 FPS Low-Light HD Cam
Python Runtime	Python 3.10 Virtual Environment	Python 3.11 Virtual Environment

25. Master Intent Command Index & Cheat-Sheet Matrix

The master intent index below lists primary voice triggers across all system categories, providing a quick cheat-sheet reference for interacting with N.O.V.A. across desktop, vision, memory, IoT, and mobile tasks:

Category	Voice Trigger Phrase	NLU Intent ID	Action Description
Visual Cortex	"Read my screen", "What is on my monitor?"	screen_read	Captures screen and summarizes visible windows/code.
Visual Cortex	"Debug this code", "Fix the visible error"	code_debug	Parses visible IDE text and suggests code fixes.
Air Gestures	"Enable air cursor", "Start gesture tracking"	start_gesture	Activates background MediaPipe hand tracking daemon.
Air Gestures	"Toggle stealth mode", "Single acoustic clap"	stealth_mode	Shrinks UI orb to corner and silences non-critical audio.
Memory & Persona	"Remember that I prefer dark theme"	add_fact	Stores fact into ChromaDB & User Persona Profile.
Memory & Persona	"What do you know about me?"	query_persona	Queries persona facts graph and summarizes preferences.
Phone Companion	"Find my phone", "Ring my mobile"	find_phone	Triggers remote siren on Android Nova Companion app.
Phone Companion	"Paste from phone", "Sync clipboard"	sync_clipboard	Fetches latest phone clipboard string into PC clipboard.
IoT & Ambilight	"Set lights to cyber cyan", "Resonance pulse"	set_ambilight	Sends UDP color packet to Wiz Smart Bulbs.
Deep Focus	"Start meeting mode", "Silence protocol"	meeting_mode	Suppresses notifications and opens meeting notes UI.
Dev Agent	"Build a Snake game in Python", "Code a calculator app"	build_project	Autonomous 5-phase voice-coded software development engine.

26. Autonomous Dev Agent & Multi-Model OpenRouter Engine

N.O.V.A. Dev Agent (``assistant/dev_agent.py``) represents a breakthrough in voice-driven software engineering. It acts as an autonomous pair programmer capable of planning, generating, building, executing, and self-debugging complete software applications across any programming language directly from a spoken or written prompt.

The OpenRouter Free Model Fallback Router

To deliver unlimited, high-speed code generation without token costs, N.O.V.A. connects to OpenRouter (``assistant/openrouter_client.py``) via a resilient, multi-tiered fallback chain of free state-of-the-art coding models:

- **Primary Coding Brain (Qwen 3 Coder):** qwen/qwen3-coder:free — Specialized for complex software architecture, multi-file planning, and precise syntax.
- **Secondary Fallback (Nvidia Nemotron 120B):** nvidia/nemotron-3-super-120b-a12b:free — High-capacity reasoning LLM for deep logic and mathematical computations.
- **Tertiary Fallback (Meta Llama 3.3 70B):** meta-llama/llama-3.3-70b-instruct:free — Highly reliable instruction follower for general code tasks.
- **Automatic 429 Cooldown Tracking:** If any provider responds with HTTP 429 (Rate Limit Exceeded), N.O.V.A. automatically places that model on a 60-second cooldown timer and seamlessly failovers to the next model in real-time.

The 5-Phase Autonomous Pipeline Architecture

- **Phase 1: Strategic Architectural Planner** — Analyzes the user request and outputs a structured JSON plan specifying file tree layouts, entry point scripts, and external library dependencies.
- **Phase 2: Real-Time Code Stream Writer** — Sequentially writes each file, streaming code line-by-line via Server-Sent Events (SSE) directly into N.O.V.A.'s Code Stream HUD.
- **Phase 3: Venv & Dependency Resolver** — Prompts the user, creates an isolated Python virtual environment (.venv), and automatically installs required packages via pip install.
- **Phase 4: Subprocess Execution & Live Terminal Test** — Executes the entry point script inside a subprocess, monitoring STDOUT and STDERR streams for execution errors or exceptions.
- **Phase 5: Self-Healing Debugger Loop** — If a runtime traceback occurs, N.O.V.A. feeds the error stack back into the LLM, performing up to 5 automatic code repair cycles until the application runs cleanly.

Floating Code Stream HUD & IDE Integration

During Dev Agent execution, N.O.V.A. launches a floating, non-blocking CTKToplevel window titled **NOVA Dev Agent — Code Stream**. The HUD displays real-time file tree badges (■, ■, ■), a live green-monospace code stream, an Amber Stop (■) button, and an automatic completion card featuring ■ **Open Folder** and ■ **Open in VS Code** launcher buttons.

27. OpenRouter API Key Vault & Dynamic Setup Wizard

N.O.V.A. integrates OpenRouter authentication into both its initial Setup Wizard (`assistant/setup\_wizard\_ui.py`) and its main Settings window (`nova\_ui.py`). Users can retrieve a free OpenRouter key via a direct link to openrouter.ai/keys.

Account Isolation & Key Security

API keys are encrypted and stored in account-sandboxed JSON vaults at `data/accounts/<user_email>/api_keys.json` and `user_preferences.json`. This guarantees zero key collisions when switching between different user profiles.

Dev Agent Customization Matrix

Setting Option	Default State	Functional Impact
Projects Output Directory	Desktop/NOVA_Projects/	Determines local directory where new project folders are generated.
Auto-Run After Building	Enabled (True)	Automatically executes entry-point script to verify zero-error runtime.
Create Isolated .venv	Enabled (True)	Isolated virtual environment created per project to avoid package conflicts.
Max Debug Attempts	5 Iterations	Maximum number of auto-fix attempts before returning control to user.

28. Cinematic Intro, Responsive Theme Engine & System Matrix

N.O.V.A. features a dramatic Cinematic Wake sequence that plays on initial startup and after 30 minutes of idle inactivity. The Settings UI includes a manual reset option to re-trigger the cinematic experience on demand.

Appearance & Real-Time Customization

N.O.V.A. supports live previewing of UI zoom scaling (80%, 100%, 120%), window opacity (50% – 100%), accent color palettes (Cyber Cyan, Neon Purple, Emerald Green, Amber Gold), and background chat themes.

NOVA is an evolving system. By utilizing the features outlined in this manual—from the Visual Cortex to the private BYOB architecture—you are tapping into the forefront of ambient intelligence. Welcome to the future of the desktop ecosystem.

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