

ARTIFICIAL INTELLIGENCE

# n8n Automation, Workflows & AI Agents

Design powerful AI-driven automations to save time and scale processes efficiently.

Automate tasks, integrate apps, and build intelligent workflows without heavy coding.

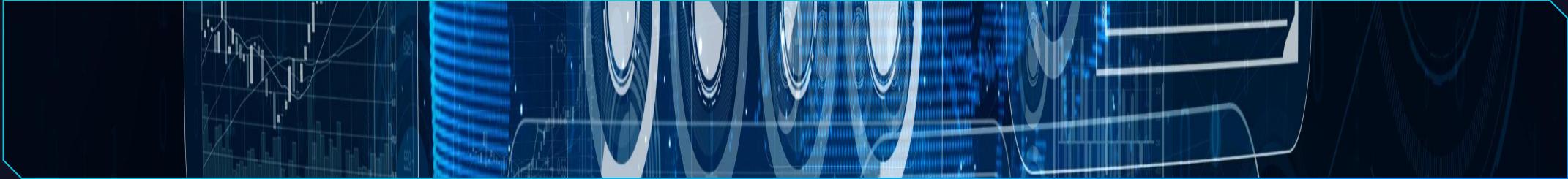
**n8n Workflows**



Create smart, scalable, and no-code automations using modern AI-powered workflows.



# What is n8n



n8n

- n8n means “node to node”
- “node to node has 8 letters in “node to “node” hence the name n8n.”
- the concept is very simple: data flows from one node to another.

n8n

- Design powerful AI-driven automations to save time and scale processes efficiently.
- Automate tasks, integrate apps, and build intelligent workflows without heavy coding.



## KEY PHILOSOPHY OF N8N

Visual Programming: No need to write code

01

Node -Baseed Achitecture: Every action has its own box.

02

Flow-Based Processing: Data always flows left to right

03

Simple eg: Like start a bike and run

04



## What is Workflow?

- A workflow is a structured sequence of connected nodes that work together to complete an automation from start to finish.
- It represents the entire journey of data and actions—beginning with a trigger, passing through logic, transformations, and integrations, and ending with a final outcome.
- In n8n, a workflow is not just a visual flow; it is the core intelligence that defines how tasks communicate, decisions are made, and processes run automatically.
- That's why a workflow is considered the SOUL of n8n, bringing automation to life through seamless connections and smart execution.



# Workflow has 3 parts

01

## Entrypoint

### Start

Every workflow starts with a trigger node, e.g., webhook trigger, schedule trigger, or form submission trigger (think of it as the ignition key). This step decides when and how the automation should begin.

02

## Processing chain

### Middle

Processing starts from here. What we can do: data transformation nodes, logic & condition nodes, API calls/integrations, validation & filtering, etc. This is the brain of the workflow, where decisions are made and data flows step by step.

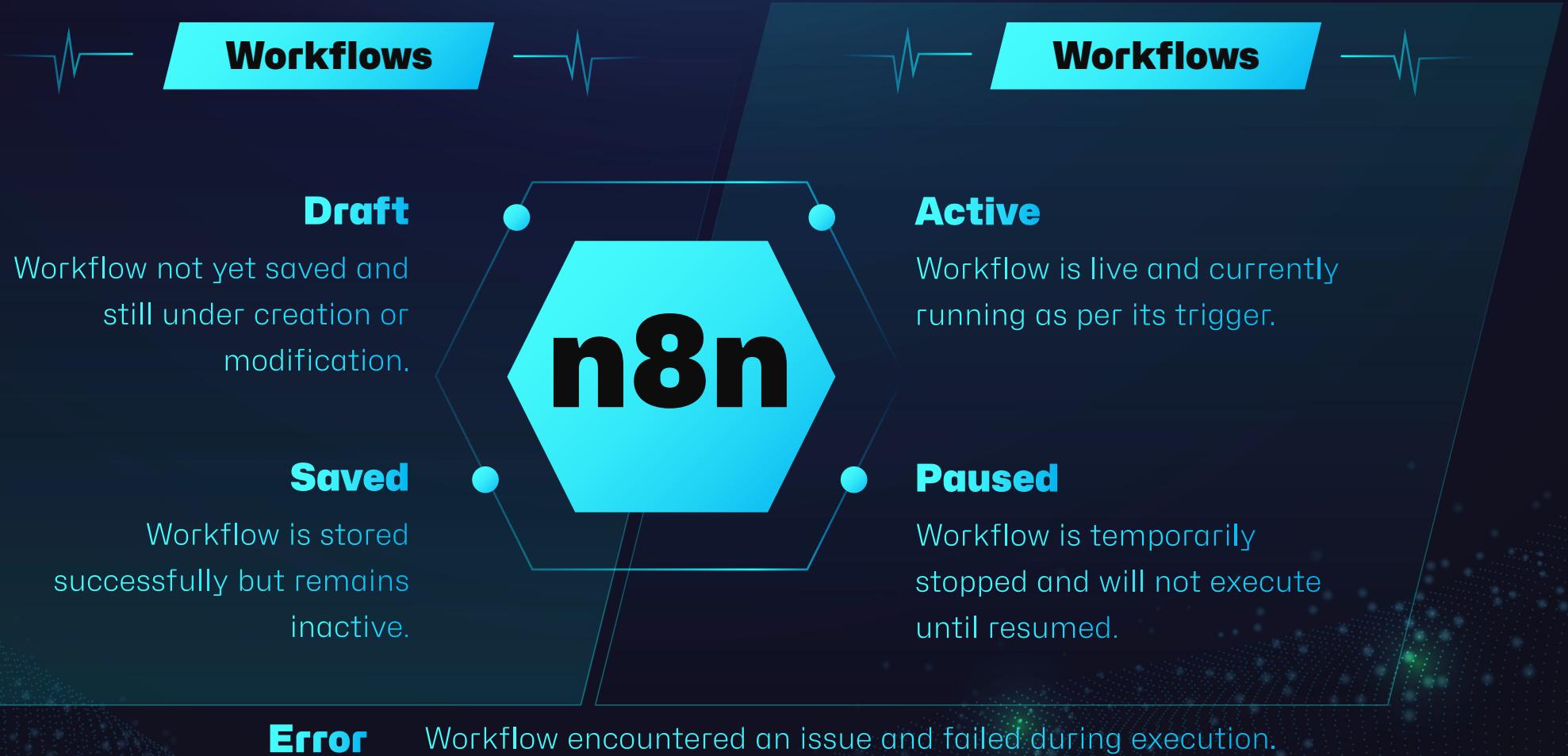
03

## Endpoint

### Exit

Final actions happen here like sending an email, saving data, notifying, etc. This stage delivers the final outcome and completes the automation process.

# Workflow Terms to Remember



# Execution nodes



80%

## Manual Execution

You press a button to run the workflow. This is mainly used during development and learning to understand how each node behaves and to debug step by step.



60%

## Automatic Execution

Runs automatically when the trigger condition is met. This mode is used in real-time or scheduled automations where no manual intervention is required.



30%

## Test Execution

Used for checking if the workflow works correctly or not. It helps verify logic, data flow, and outputs before activating the workflow in a live environment.

# What is AI Agent?



- It can make decisions based on rules, logic, or learned patterns.
- It can use tools such as APIs, web search, databases, and external systems.



It can remember past conversations or context to respond intelligently.

It can act independently to complete tasks without constant human input.



# Core Components of an AI Agent

## Brain:

The intelligence of the agent, powered by LLMs like GPT, Claude, or Gemini, which helps in thinking, reasoning, and decision-making.



## Memory:

Stores past interactions and context so the agent can remember conversations and respond more accurately.



## Tools:

External capabilities such as APIs, email services, databases, and web search that allow the agent to take real actions.

## Triggers:

Events that activate the agent, like a user message, a scheduled time, or system-based events.

# What is an AI Automation

## AI Automation

AI Automation means integrating a Large Language Model (LLM) like GPT-4 into a workflow to make it smarter, enabling tasks like text analysis, email categorization, and automatic responses without manual effort.



**Automation**



**Workflows**



**A+**

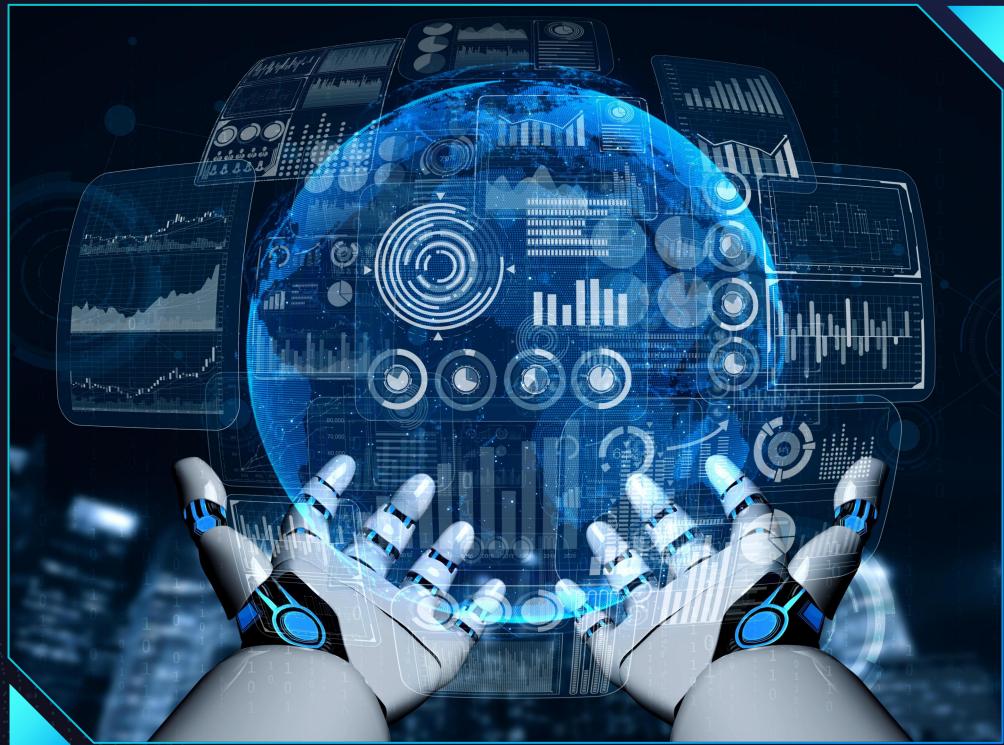
The LLM can analyze text, understand intent, and categorize emails.

It can generate smart and context-aware replies automatically.

**eg.**

- When an email is received, the LLM classifies it as payment, service, or consultation.
- Based on the category, automation replies instantly or routes the email to the correct inbox.
- This saves hours of manual work and provides faster, smarter responses.

# What is an Agent?



- An AI Agent is smarter than an automation
- it can make decisions, use tools, remember past chats, and work autonomously
- Components Include:

- Trigger: user sends a message
- LLM (chatgpt): understand the message
- Memory: remembers past conversations
- Tools: like web search (eg. using serp API)

eg. you ask “what’s the latest news about openAI”?

- The agent searches the web
- Finds current articles
- Replies with real links and summaries

# What is Nodes?



## Name of the section

Nodes in n8n are the essential building blocks that make workflows functional and dynamic. While workflows are the soul of n8n, nodes act like the muscles and organs—they carry out the actual tasks and operations that bring automation to life. Each node represents a specific action or process, such as sending emails, fetching data from APIs, transforming datasets, or performing logical operations.

01

**Function Nodes  
(Trigger Nodes)**

Start workflows when an event happens (e.g., new email).

02

**Regular Nodes**

Handle actions like filtering, transforming, or connecting data.

03

**Core Nodes**

Prebuilt nodes for common tasks like files, databases, or notifications.

Here's how nodes work and are categorized:

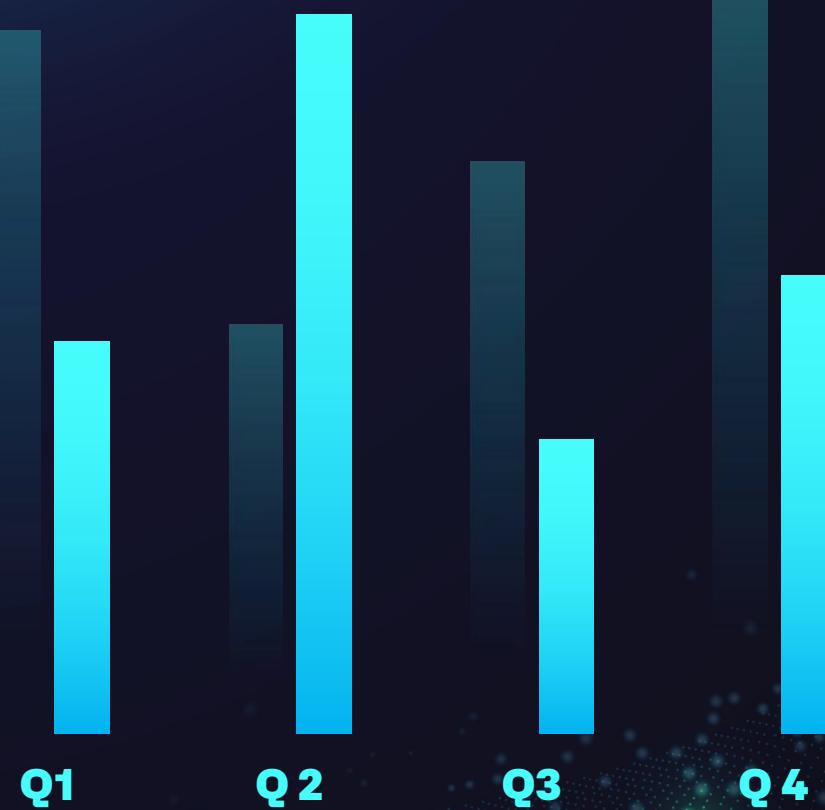
# Function nodes (start the workflow)



- Trigger nodes: start the workflow.
- Webhook Trigger: Receive data from external systems (real time)
- Schedule Trigger: Time-based automation (daily reports backups)
- Email Trigger: Fires when incoming emails arrive.
- Manual Trigger: Testing/Development purpose.
- Webhook Response: Sends response back



eg. Thank you after form submit



# Regular Nodes (Main Action Nodes)



## Communication Nodes

Enable sending and receiving messages or updates through platforms like Gmail, Slack, WhatsApp, and social media channels.



## Data Storage Nodes

Store, retrieve, and update data using tools such as Google Sheets, Airtable, MySQL, and Dropbox.



## CRM / Business Nodes

Manage sales, customers, and orders with platforms like Salesforce, HubSpot, Shopify, and WooCommerce.



## Utility Nodes

Handle technical tasks like HTTP requests, file operations, image processing, and PDF generation.

THESE NODES PERFORM THE CORE ACTIONS INSIDE A WORKFLOW, HANDLING COMMUNICATION, DATA MOVEMENT, BUSINESS OPERATIONS, AND UTILITY TASKS TO COMPLETE AUTOMATION END-TO-END.

# Core Nodes (Foundation of Workflows)

01

## Logic Nodes

Apply decision-making using conditions like IF/ELSE, combine data with Merge, and control workflow paths.

## Data Manipulation

Modify, structure, or transform data using Set Node, Function Node (Custom JavaScript), and field mapping.

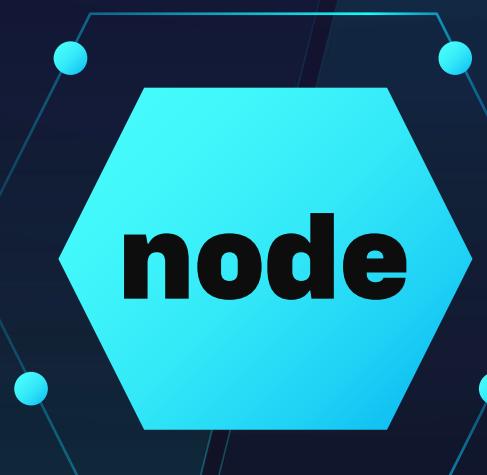
02

## Flow Control

Manage execution flow with nodes like Split in Batches, Wait, NoOp, and Stop/Error handling.

## Utility Core Nodes

Perform system-level tasks such as Date & Time operations, Crypto/Hashing, and data parsing for XML, HTML, and Spreadsheets.



Core nodes form the backbone of n8n workflows, handling logic, data control, and internal processing without relying on external apps.

# Node Anatomy



## Each node has:

Node Anatomy refers to the internal structure of a node in n8n. Each node consists of an input connection point on the left side of the panel, which receives data from the previous node, and an output connection point on the right side, which sends processed data to the next node in the workflow. Additionally, every node displays an icon and name, where the icon represents the service or tool being used and the name can be edited to clearly define the node's purpose within the workflow.



**Green**  
**Success**



**Red**  
**Error**



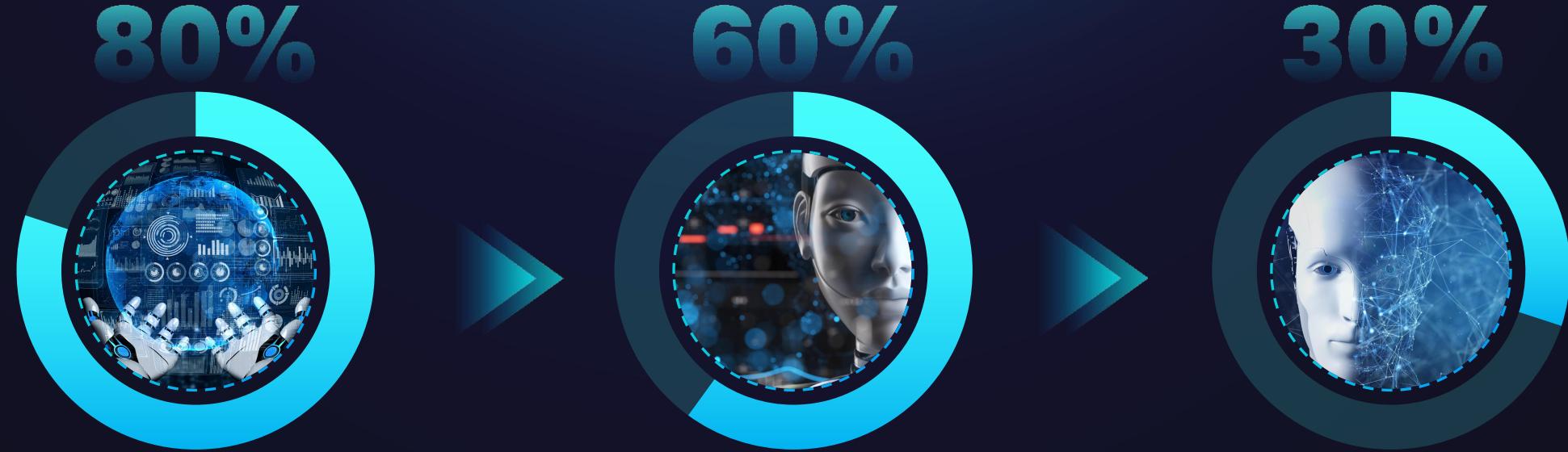
**Grey**  
**Not Executed**



**Orange**  
**Running**

## Status Indicators:

# Node Configuration



## Parameters Tab

Defines what the node does by selecting actions, operations, and required inputs.

## Settings Tab

Controls how the node behaves, including execution rules, retries, and error handling.

## Credentials Tab

Manages secure authentication such as logins, tokens, or API keys for safe access to external tools and services.

Node Configuration controls both the functionality and behavior of a node within an n8n workflow. It determines what action the node performs, how it executes that action, and how it securely connects to external services.



# HOW DATA MOVES IN N8N

## Input

01

Raw data enters the workflow from triggers or previous nodes, just like fresh vegetables coming into the kitchen.

## Processing

02

Data is cleaned, transformed, filtered, and enriched by different nodes, similar to cooking and preparing ingredients step by step.

## Output

03

The final processed data is delivered to the next system or user, just like a fully prepared dish ready to be served.

# Expressions & Fixed



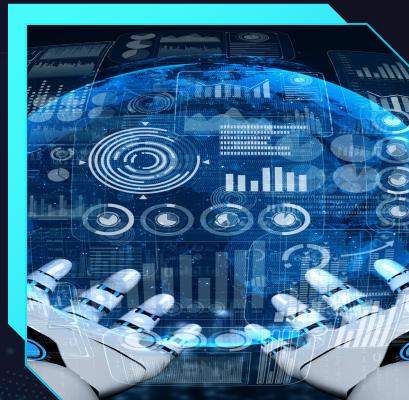
## Expressions:

Expressions allow n8n to work with dynamic data by pulling real-time values from previous nodes. They enable personalization and flexibility, such as automatically inserting a user's name, email, or order ID into messages, APIs, or documents based on incoming data.



## Fixed Values:

Fixed values are constant inputs that remain unchanged every time a workflow runs. They are useful for static prompts, default settings, fixed messages, or predefined parameters where dynamic behavior is not required.





## Workflow & Execution status

- Active workflows running, listening for triggers, green toggle button on will execute automatically.
- Inactive workflows only run manually. green toggle button on will execute automatically.

### Execution Status

- Waiting: Trigger node is idle and waiting for an event to occur.
- Executing: Workflow or node is currently running and processing data.
- Success: Execution completed successfully without any issues.
- Error: Execution failed due to an issue or misconfiguration.
- Cancelled: Execution was manually stopped by the user.
- Timeout: Execution exceeded the allowed time limit and stopped automatically.



# Credentials & Authentication

## API Key Authentication

- Used for simple API services.
- API key is securely encrypted in the n8n database.
- Requires adding a credential name and entering the API key.
- Connection can be tested before use.
- Same credential can be reused across multiple nodes.
- Examples: OpenWeatherMap, SendGrid, Twilio.



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## OAuth2 Authentication

- Used for Google, Microsoft, Facebook, and similar services.
- User clicks “Connect my account” to start the process.
- Redirects to the service login page.
- User grants required permissions.
- Access tokens are stored securely by n8n.
- Token auto-refresh is handled automatically.
- Examples: Gmail, Google Sheets, Slack, LinkedIn.

# Credentials & Authentication

01

## Basic Authentication (Username / Password)

- Used for traditional systems and databases.
- Credentials are stored in encrypted form.
- Requires username and password fields.
- Optional domain or host can be configured.
- Examples: FTP, SSH, database connections.

02

## Custom Header Authentication

- Used for custom APIs and bearer-token-based services.
- Requires defining a header name (e.g., Authorization).
- Header value can include Bearer tokens.
- Supports multiple headers in a single request.



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# What is Automation ?

## Trigger

The specific event that starts the automation, such as receiving an email, a form submission, or a data update, defining when the workflow begins. It ensures that the automation runs exactly at the right moment without manual intervention.

## Condition & Process

The logic, rules, or checks applied to determine whether the automation should proceed, ensuring only relevant and valid data triggers actions. This step helps maintain accuracy and prevents unnecessary or incorrect actions.

## Action (Execution)

The final step where the automation performs the task, delivers the desired outcome, and produces results like notifications, database updates, or reports. It transforms the workflow from a planned process into tangible results efficiently.

Automation is the process of converting repetitive manual tasks into automatic workflows, helping save time, reduce errors, and improve efficiency. Instead of performing the same task again and again, automation allows systems to handle it automatically based on predefined rules and events.

# Difference Between Traditional & AI Automation



- Can take intelligent decisions: Analyzes data and situations to make smart decisions beyond pre-defined rules.
- Can understand context: Recognizes patterns and context to respond appropriately in varying scenarios.
- Has learning capability: Uses machine learning to improve performance and outcomes over time.
- Natural language processing: Can understand and interact using human language, enabling smarter communication.

## Traditional Automation

- Follow fixed rules: Performs tasks strictly according to pre-defined rules without any variation.
- Works on if-then logic: Decisions are made based on simple conditional statements and static logic.
- Predetermined responses: Generates only expected outputs and cannot adapt to unexpected scenarios.
- No learning capability: Cannot improve or evolve its behavior over time based on new data or experience.



# Difference Between Automation, AI Automation & AI Agents



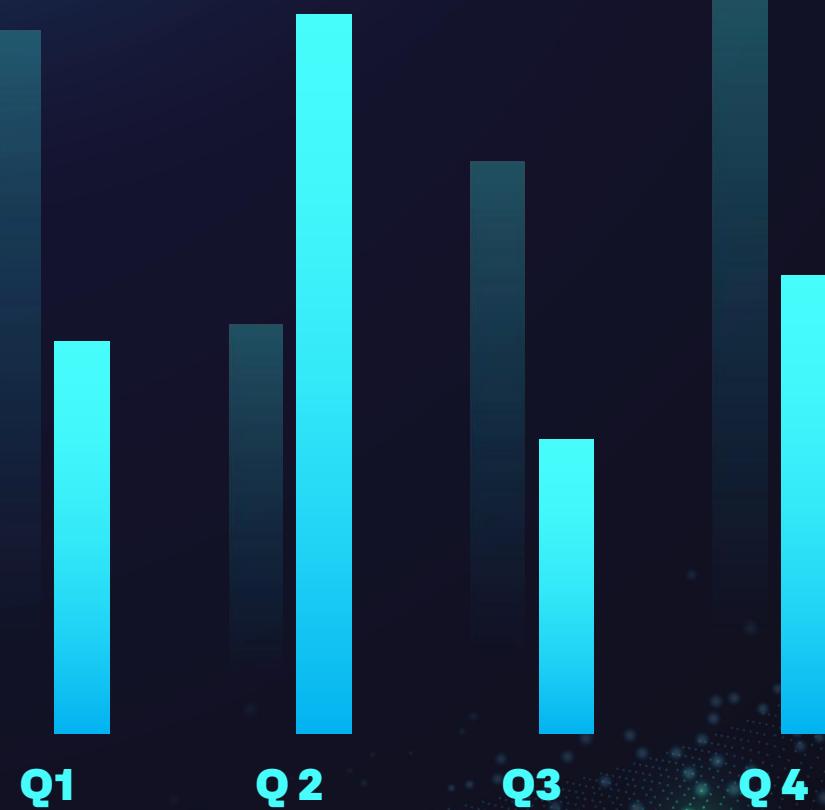
## Automation

- Works on predefined rules
- No intelligence or understanding of context
- Executes fixed, repetitive tasks
- No learning capability
- No memory
- Best for simple, structured workflows
- Example: Email alerts, data entry, scheduled jobs



## AI Automation

- Uses AI models with automation
- Can understand limited context
- Performs smart decision-making
- Limited learning, depends on data & APIs
- No long-term memory
- Suitable for medium-complex workflows
- Example: Chatbots, document classification, AI-based approvals



# ARTIFICIAL INTELLIGENCE



## AI Agent

- Fully intelligent & autonomous
- Understands context, goals, and intent
- Continuously learns and improves
- Has memory to retain past interactions
- Uses multiple advanced tools & APIs
- Handles complex, dynamic tasks
- Example: Autonomous assistants, AI copilots, task-planning agents

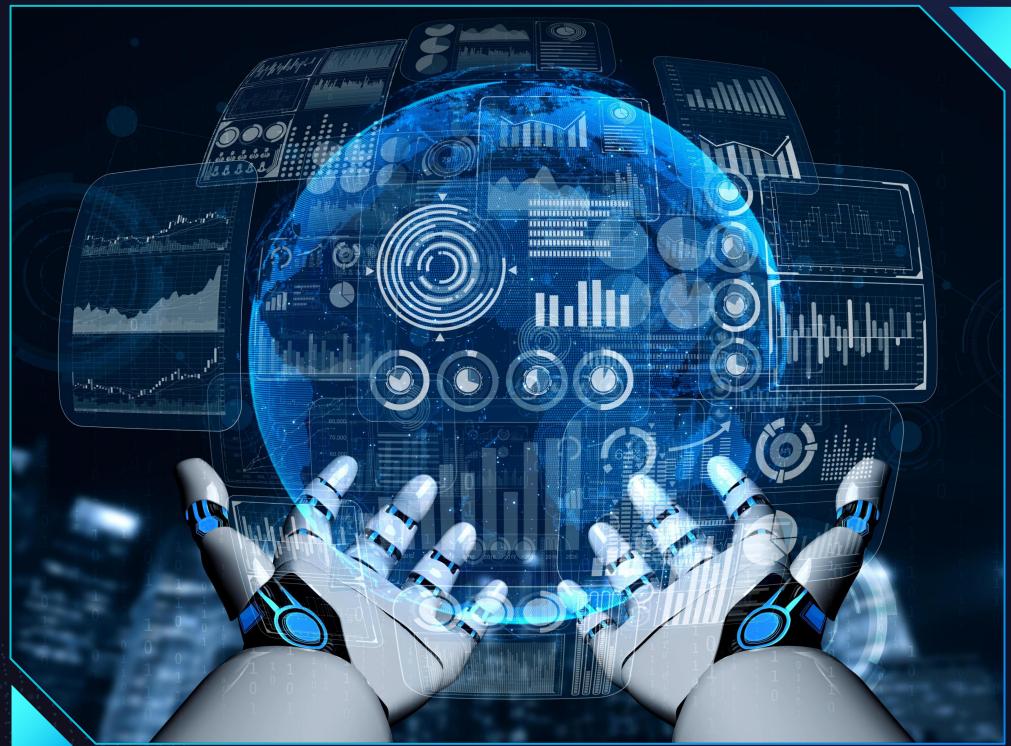
## Summary

- Automation → Rule-based & simple
- AI Automation → Intelligent but controlled
- AI Agent → Smart, autonomous, and adaptive

## Business Impact

- Automation: 60% time saving on repetitive tasks
- AI Automation: 75% time saving + improved quality
- AI Agents: 85% time saving + strategic insights + 24/7 availability

# More n8n Terms



## Canvas:

A canvas is workspace where you create your workflows. simply put, it's like a whiteboard where you connect different blocks. (called nodes)



## Template:

A template is a ready - made workflow. that means you don't need to design from scratch - you get a pre - build structure which you can adjust for your use case.



## Workflow:

A workflow is a series of connected steps. whenever a trigger happens, these steps run in sequence, and the automation completes.



## Loop:

A loop repeats the same task for multiple items.

# More n8n Terms

## Nodes:

A node is a single step in the workflow. every node has a specific job - like fetching data, sending an email, or writing to a database.



## Trigger Node:

A trigger node is a special node that starts the workflow. for eg. a webhook arrives, an email is received, or a schedule time hits.

## Queue:

A queue is a line that manages workflow executions. it prevents overload and ensures tasks run smoothly in sequence.

## Expression:

Expression means using dynamic data. static values are fixed, but with expressions, data can change in real time - like automatically inserting the user's name in an email.

## Static v/s Dynamic Data :

(static data = fixed values)  
dynamic data = changes while the workflow runs.

# More n8n Terms

## 01 n8n

### **Execution:**

Execution means the workflow is actually running. Data flows one node to another until the job is complete.

## 02 n8n

### **Parallel Execution:**

Parallel execution means the workflow performs multiple tasks at the same time, making processing faster.

## 03 n8n

### **Credential:**

Credentials are basically login details: Like API keys, passwords, or OAuth tokens. They securely connect with external apps.

### **Execution Logs:**

Logs are the history of workflow run. They record inputs, outputs, and any errors.

# More n8n Terms

- Variable: A variable is a small data holder that temporarily stores values for later use.
- OAuth Authentication: OAuth is a secure method for connecting third - party apps. (like gmail, stack, facebook) without directly storing passwords.
- Conditional Logic: Conditional logic = if this condition is true, do this; otherwise, do something else.
- Loop: A loop repeats the same task for multiple items.
- Webhook: A webhook is like a gate - whenever an external system sends a request, it triggers the workflow.
- Webhook Response: A webhook response is the reply you send back to the requesting system.
- Data Mapping: Data mapping means connecting the output of one node to the input of the next node so the data flows correctly.
- Metadata: Metadata is extra information - like timestamp, who ran the workflow, or system - generated nodes.
- Workflow chaining: Workflow chaining means the output of one workflow becomes the input of another.



# More n8n Terms



- Database integration: Database integration connects n8n with databases like mysql, postgresql, or mongodb to read/write data.
- Data Transformation: Data transformation means modifying data.
- Error Handling Error handling is a strategy for when a workflow fails.
- Evaluation: Evaluation lets you compare past workflow runs to track performance and optimize.

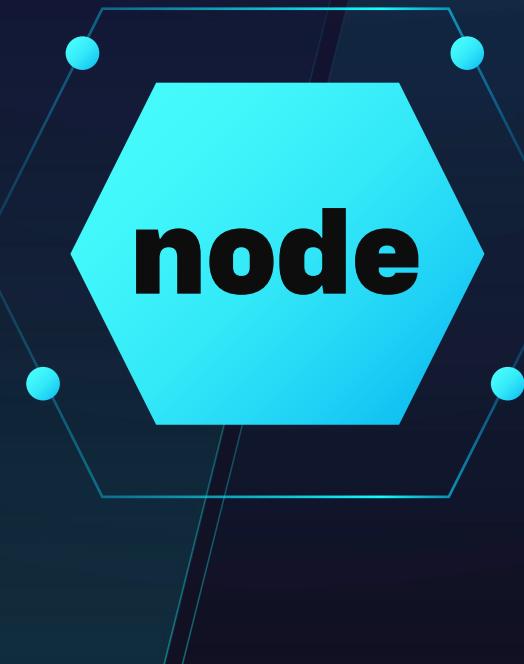
- Project: A project is like a folder that organizes workflows, variables, and credentials - especially useful when teams work together.
- Data Pinning: Data pinning means temporarily locking a node's output for testing, so it shows the same data every run.
- Function Node: A Function node lets you write custom javascript to manipulate data however you want.
- Split & Merge: split & merge = process data separately, then combine again.



# More n8n Terms

**01****02**

- Cron job (Schedule node): A cron job or schedule node runs workflows at set intervals. (hour, day, weekly)
- Cluster Node: A cluster node is a group of nodes working together
  - one root node defines the main task, sub - nodes extend it.
- Root Node: The root node is the main node in a cluster that defines the core task.



- Sub Node: A sub node supports the root node by handling specialized tasks.
- Custom Node: A custom node is one you create yourself for a specific automation need.
- API (Application programming interface): An API is a bridge that connects two applications to exchange data automatically.

Core nodes form the backbone of n8n workflows, handling logic, data control, and internal processing without relying on external apps.

# More n8n Terms



**Real Time Workflow Execution:**  
This means workflows run instantly as soon as data arrives (usually via webhook or streaming)



**Large Language Model(LLM):**  
An LLM is an advanced AI model that generates text, answers question, and analyzes data.



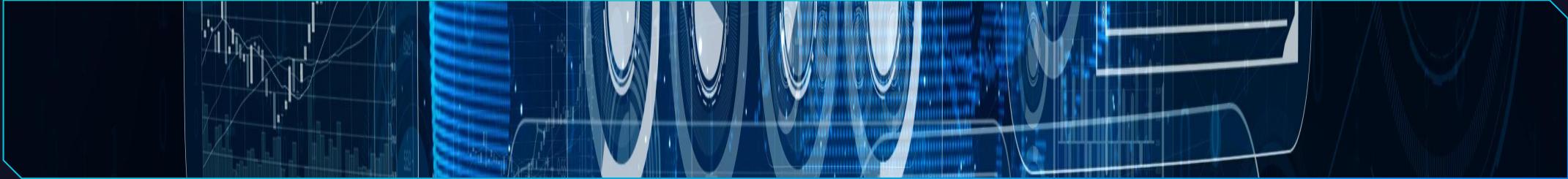
**Workflow Optimization:**  
Optimization = Making workflows efficient by removing extra steps, reducing API calls, and running tasks in parallel.



**AI Agent:** An AI agent is an intelligent systems that understands request, makes decisions, and executes tasks.



# More n8n Terms

**n8n**

- Retry Logic: Retry logic = if execution fails, the workflow automatically retries after a delay.

**n8n**

- Timeout: Timeout = limit on how long a node/workflow waits for a response before stopping.
- Access Control: Access Control = Defines what rights each user has (edit, run, view)



# MORE N8N TERMS

- AI Tool: An AI tool is an external function/resource that gives AI extra power - like fetching data.
- AI Embedding: Embedding = converting text/data into numbers so AI can detect patterns and relationships.
- AI Vector Store: A Store is a special database that stores embeddings, allowing AI to search/analyze easily.
- Persistent AI Memory: Persistent Memory = AI remembers knowledge and context across multiple runs.
- Autonomous AI Agents: These are AI systems that take independent decisions and perform complex tasks without human help.
- Prompt Engineering - Giving AI the correct, effective prompt for accurate responses.

01

02

03

04

# More n8n Terms



- AI Memory: AI memory means AI remembers past interactions and uses context to give better answers.
- AI Chain: An AI chain is a sequence of multiple AI steps that run one after another - but without memory retention.



- AI Tool: An AI tool is an external function/resource that gives AI extra power - like fetching data.
- AI Embedding: Embedding = converting text/data into numbers so AI can detect patterns and relationships.



# More n8n Terms

- Retrieval - Augmented Generation (RAG) : AI retrieves relevant external data first, then generates an answer.
- Fine - Tuning AI Models: Customising a pre - trained AI model with domain - specific data.

**n8n****node to node****AI**

- Multi - Modal AI : Multi modal AI understands multiple input types - text, images, audio, video.
- LangChain: LangChain is a framework that makes LLMs more powerful by connecting them with tools, memory, and workflows.

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# CONTACT ME



Connect with me directly by clicking on  
the LinkedIn, GitHub, Website, X and  
Email



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01



GitHub

02



Website

03



X

04



Email

05

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# THANKS

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Insert a catchy quote or valuable sentence here



01

# Thank You!

Thank you for your attention!  
For feedback, improvements, or project collaboration:

Every great presentation is complete with a great audience and that's you

