



Knowledge base & Rule engine

2021.03.08



PART 01

Knowledge Base

Knowledge Base

A knowledge base (KB) is a technology used to store complex structured and unstructured information used by a computer system. The initial use of the term was in connection with expert systems; which were the first knowledge-based systems.

-Wiki

A common definition: A knowledge base is a database used for knowledge sharing and management.

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-Wiki

Structured and Unstructured Knowledge Bases

Knowledge Base

Difference between a knowledge base and a database?

- A database is a collection of information organized for easy access, management, and updating. The data it contains is in a basic form, and thus needs to be further analyzed and/or processed before it can be applied.
- A knowledge base is a repository typically used to store answers to questions or solutions to problems enabling rapid search, retrieval, and reuse, either by help desk personnel, or directly by those needing support.

Brodie M.L., Mylopoulos J. (1986) Knowledge Bases vs Databases. In: Brodie M.L., Mylopoulos J. (eds) On Knowledge Base Management Systems. Topics in Information Systems. Springer, New York, NY. https://doi.org/10.1007/978-1-4612-4980-1_9

Knowledge Base

Why knowledge base?

- Sharing
- Cooperation
- Full context
- Rapidly

Knowledge Base

How to use a Knowledge Base

- Step 1 Identify what key area of knowledge you wish to better manage in a knowledge base.
- Step 2 Decide if the knowledge base is to be managed or open
- Step 3 Appoint a knowledge base manager
- Step 4 Create the knowledge base

Knowledge Base

When to use knowledge bases

This question has already been partially answered, in the above description. Basically, wherever the need is to create new explicit knowledge and apply it, preferably as a team or collaborative community, collectively, there is a need for a knowledge base.

Knowledge Base

Where to use knowledge bases

Knowledge bases can be used anywhere in the organization. However, be cautious of 'over using' knowledge bases.

Think about the benefits of a knowledge base versus the costs, in financial terms, and in time and effort terms.

Think about the possible audiences and possible contributors.

Knowledge Base

Wikipedia

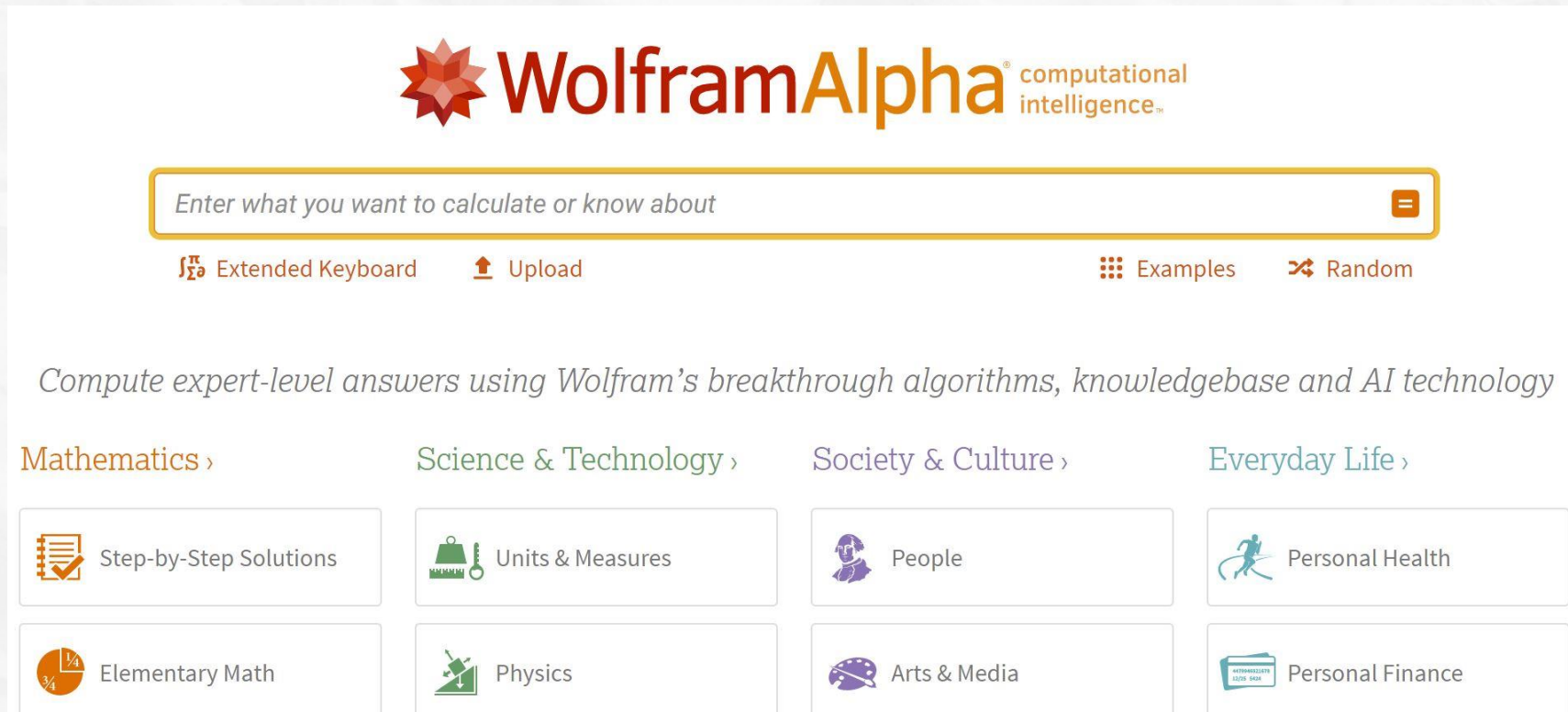
[Wikipedia](#) is a free, multilingual open-collaborative online encyclopedia created and maintained by a community of volunteer contributors using a wiki-based editing system. Wikipedia is the largest general reference work on the Internet, and one of the 15 most popular websites as ranked by Alexa; in 2021, it was ranked as the 13th most-visited. The project carries no advertisements and is hosted by the Wikimedia Foundation, an American non-profit organization funded mainly through donations.

An example: [Knowledge management](#)

Knowledge Base

Wolframalpha

[Wolfram Alpha](#) is a unique engine for computing answers and providing knowledge.



The screenshot shows the WolframAlpha homepage. At the top is the WolframAlpha logo, featuring a red 3D star icon and the text "WolframAlpha" in red and orange, with "computational intelligence" in smaller orange text below it. Below the logo is a large search bar with the placeholder text "Enter what you want to calculate or know about" and a small orange button with a right-pointing arrow. Under the search bar are four links: "Extended Keyboard" (with a keyboard icon), "Upload" (with an upload icon), "Examples" (with a grid icon), and "Random" (with a random icon). Below these links is a line of text: "Compute expert-level answers using Wolfram's breakthrough algorithms, knowledgebase and AI technology". At the bottom, there are four main category buttons: "Mathematics" (orange text), "Science & Technology" (green text), "Society & Culture" (purple text), and "Everyday Life" (teal text). Each category button has a sub-menu of specific topics. Under "Mathematics" are "Step-by-Step Solutions" (with a checklist icon) and "Elementary Math" (with a pie chart icon). Under "Science & Technology" are "Units & Measures" (with a wrench and key icon) and "Physics" (with a microscope icon). Under "Society & Culture" are "People" (with a person icon) and "Arts & Media" (with a paint palette icon). Under "Everyday Life" are "Personal Health" (with a running person icon) and "Personal Finance" (with a wallet icon).

WolframAlpha computational intelligence™

Enter what you want to calculate or know about

Extended Keyboard Upload Examples Random

Compute expert-level answers using Wolfram's breakthrough algorithms, knowledgebase and AI technology

Mathematics ›

- Step-by-Step Solutions
- Elementary Math

Science & Technology ›

- Units & Measures
- Physics

Society & Culture ›

- People
- Arts & Media

Everyday Life ›

- Personal Health
- Personal Finance



PART 02

Rule engine

Rule engine

What is a Rule Engine?

*A **business rules engine** is a software system that executes one or more business rules in a runtime production environment. The rules might come from legal regulation ("An employee can be fired for any reason or no reason but not for an illegal reason"), company policy ("All customers that spend more than \$100 at one time will receive a 10% discount"), or other sources. A business rule system enables these company policies and other operational decisions to be defined, tested, executed and maintained separately from application code.*

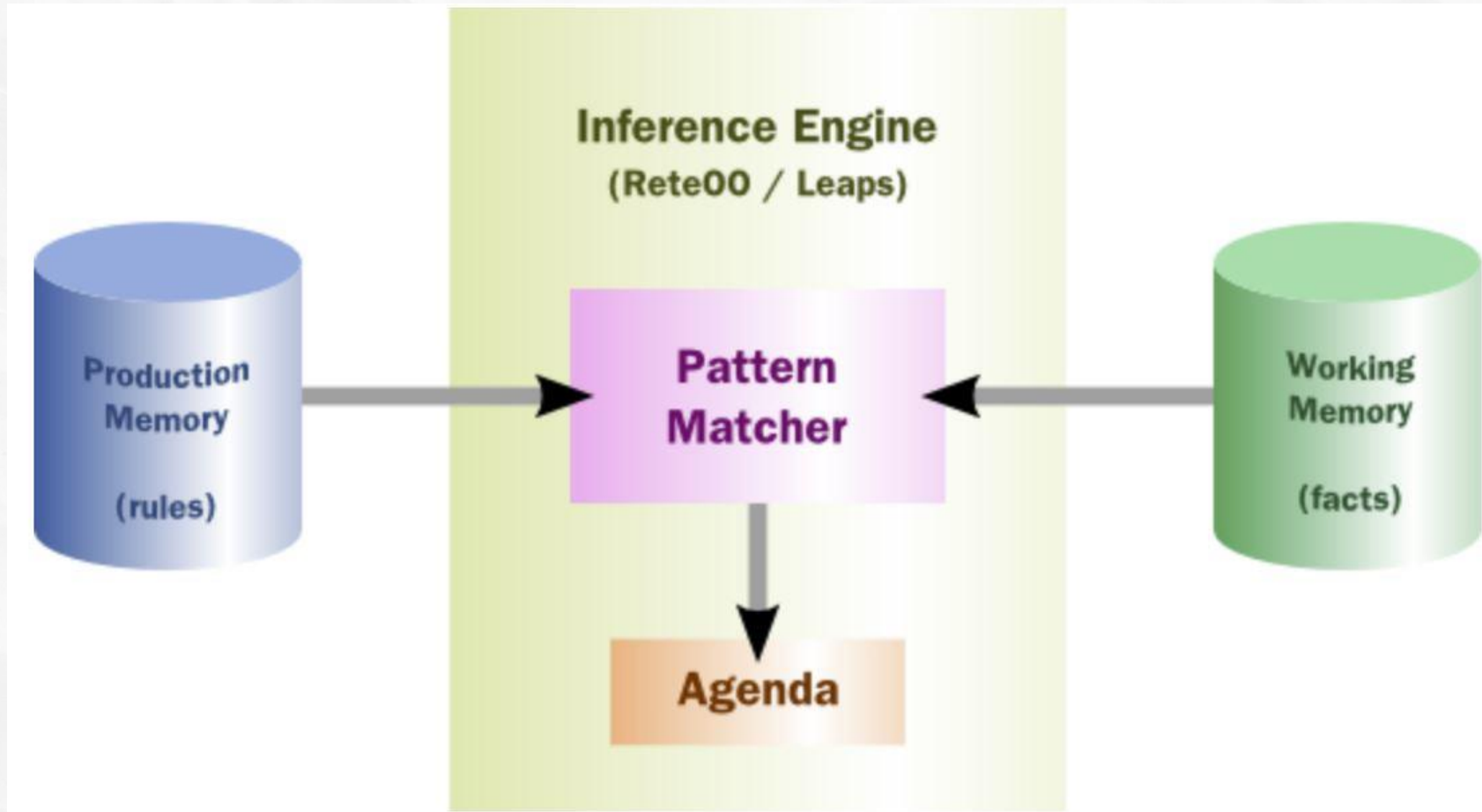
-Wiki

Rule engines typically support rules, facts, priority (score), mutual exclusion, preconditions, and other functions.

Chisholm, M. (2004). *How to build a business rules engine: extending application functionality through metadata engineering*. Morgan Kaufmann.

Rule engine

High-level View of a Rule Engine



Rule engine

What is a Rule Engine?

A Production Rule System is Turing complete, with a focus on knowledge representation to express propositional and first order logic in a concise, non-ambiguous and declarative manner.

```
when  
    <conditions>  
then  
    <actions>;
```

Rule engine

Pattern Matching

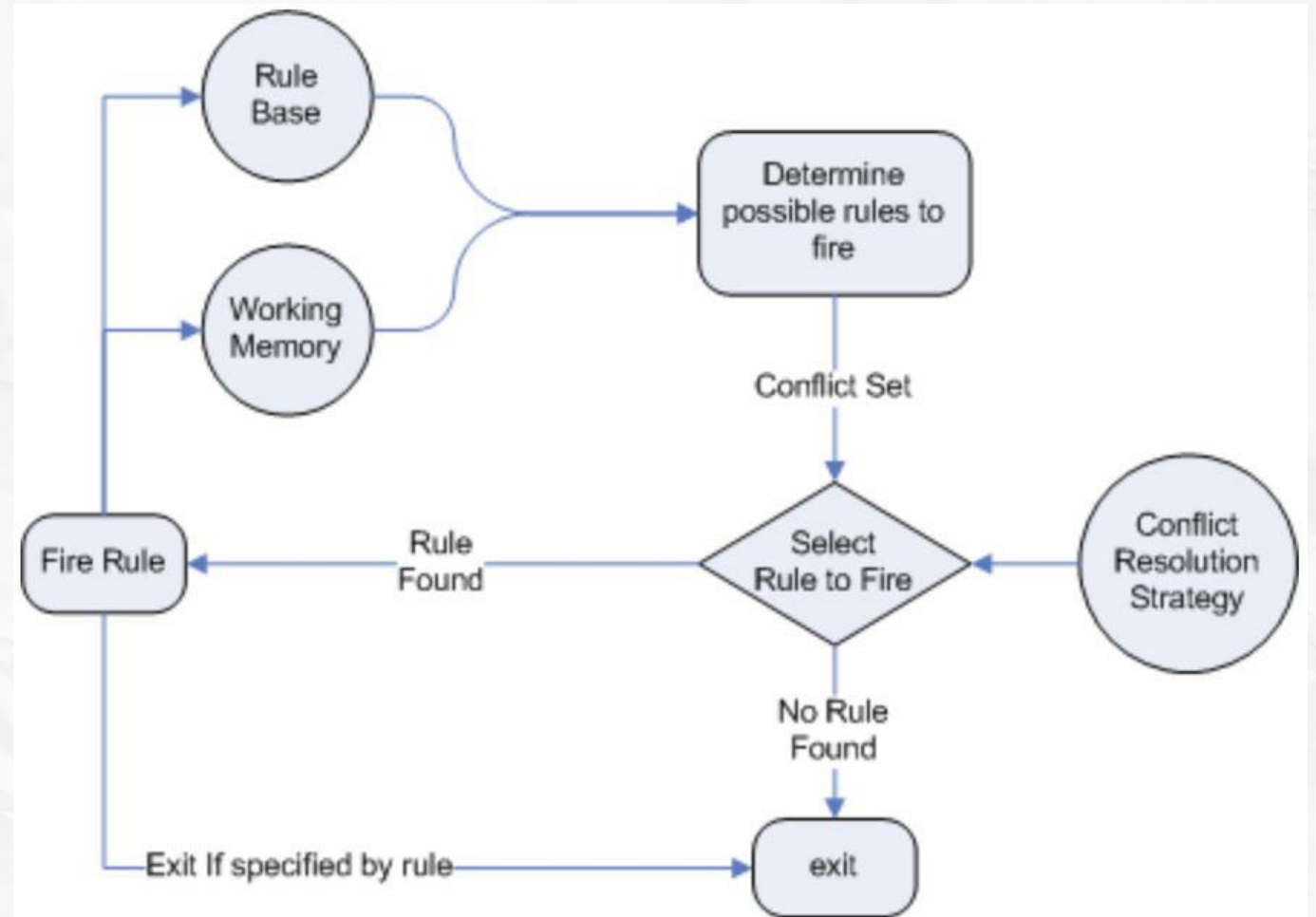
The process of matching the new or existing facts against Production Rules is called Pattern Matching, which is performed by the Inference Engine. There are a number of algorithms used for Pattern Matching by Inference Engines including:

- Linear
- Rete
- Treat
- Leaps

Rule engine

Execution methods for a rule system

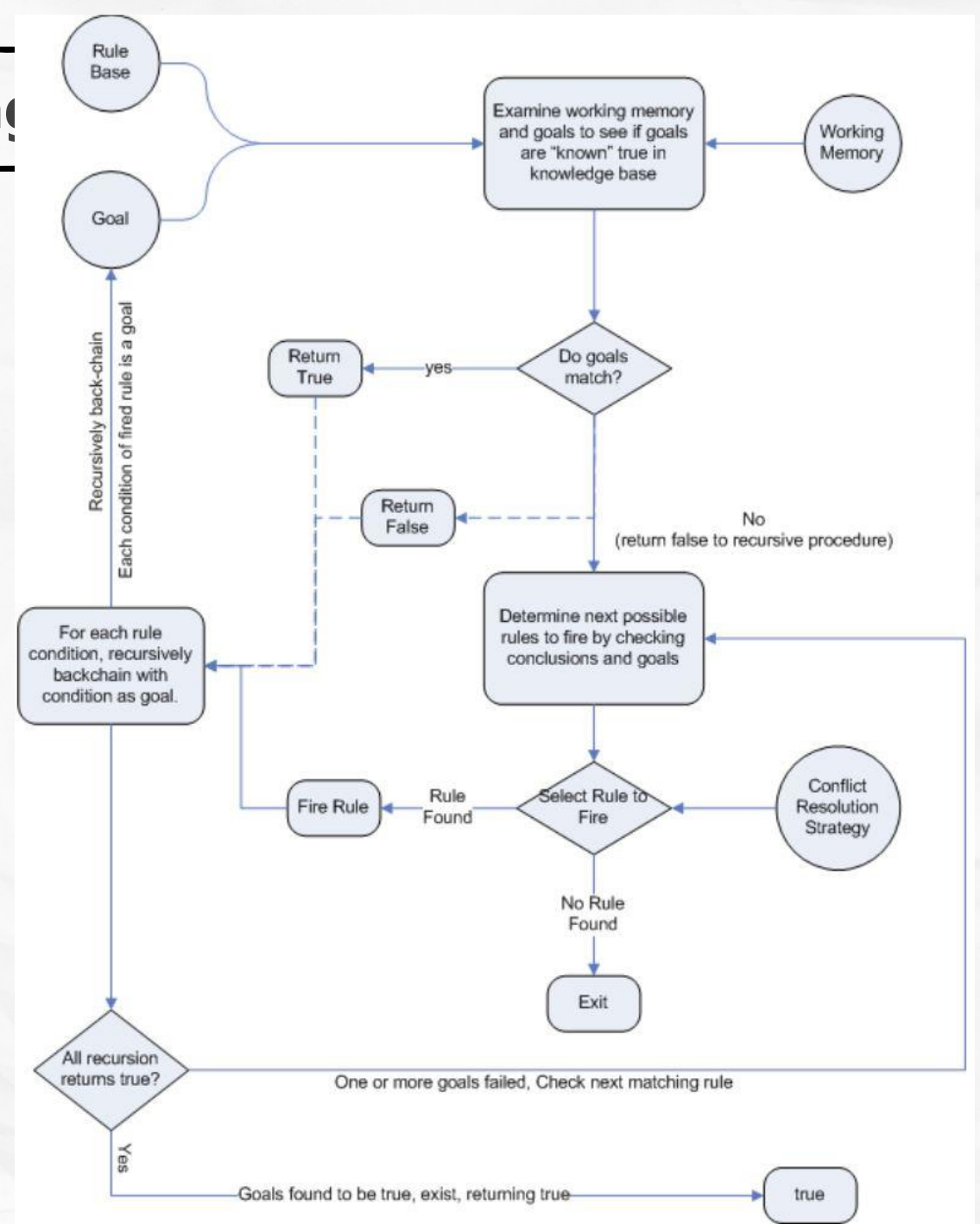
- Forward Chaining
- Backward Chaining



Rule engine

Execution methods for a rule system

- Forward Chaining
- Backward Chaining



Rule engine

Advantages of a Rule Engine

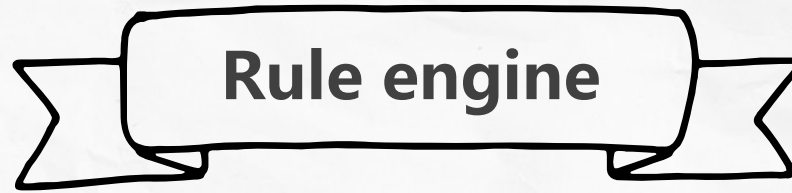
- Declarative Programming
- Logic and Data Separation
- Speed and Scalability
- Centralization of Knowledge
- Tool Integration
- Explanation Facility
- Understandable Rules

Rule engine

When should you use a Rule Engine?

when there is no satisfactory traditional programming approach to solve the problem.

- The problem is just too fiddle for traditional code.
- The problem is beyond any obvious algorithmic solution.
- The logic changes often
- Domain experts (or business analysts) are readily available, but are nontechnical.



When not to use a Rule Engine

It seems to me that in the excitement of working with rules engines, that people forget that a rules engine is only one piece of a complex application or solution. Rules engines are not really intended to handle workflow or process executions nor are workflow engines or process management tools designed to do rules. Use the right tool for the job. Sure, a pair of pliers can be used as a hammering tool in a pinch, but that's not what it's designed for.

--Dave Hamu

A hand-drawn banner with a black outline and a white fill, featuring the text "Rule engine" in a bold, black, sans-serif font. The banner has a ribbon-like shape with folded ends.

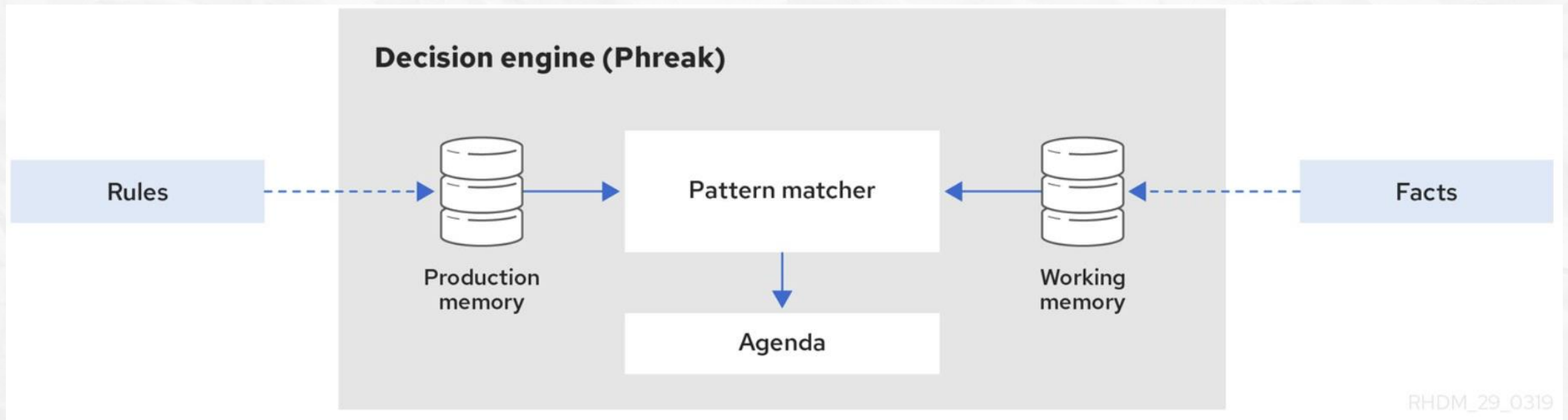
Rule engine

Drools

[Drools](#) is a business-rule management system with a forward-chaining and backward-chaining inference-based rules engine, allowing fast and reliable evaluation of business rules and complex event processing. A rules engine is also a fundamental building block to create an expert system which, in artificial intelligence, is a computer system that emulates the decision-making ability of a human expert.

Rule engine

Drools engine





THANK YOU

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