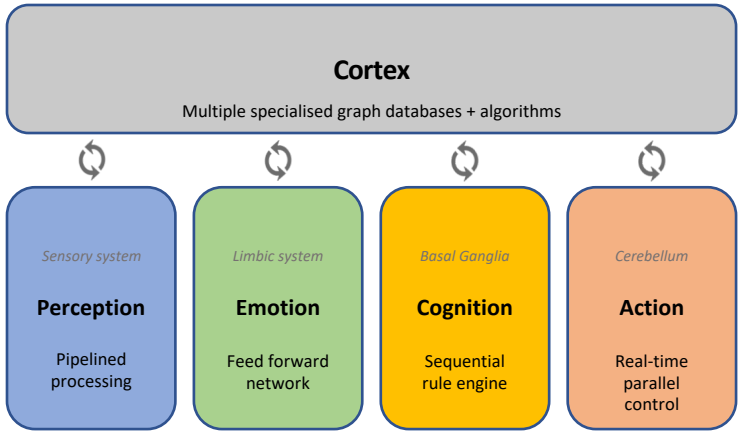
Human-agent collaboration and the **Sentient Web**

Cognitive AI – *mimicking human memory, reasoning and learning*

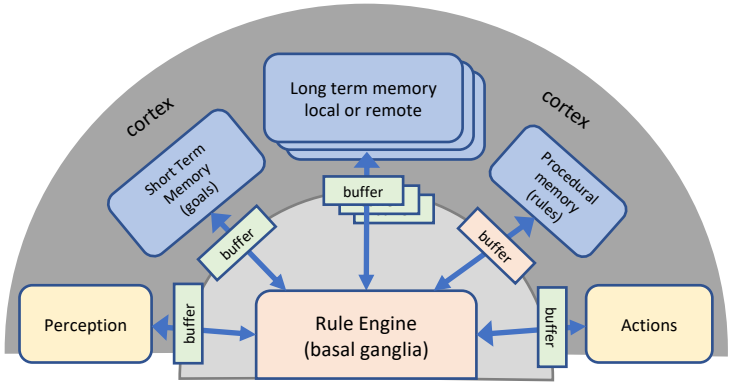
Web-based **Cognitive DB** chunks + algorithms

- Inspired by advances in the cognitive sciences and over 500 million years of neural evolution
  - Functional models suitable for conventional computer hardware
  - Complements Deep Learning
- W3C Cognitive AI Community Group
  - https://www.w3.org/community/cogai/
- Chunks as collection of properties referencing other chunks
  - Each chunk is equivalent to concurrent firing of the bundle of nerve fibres connecting to a given cortical region
  - Chunks map to *N*-ary relations in RDF
  - Easier to work with than RDF
  - Formal spec as draft CG Report
- Combination of symbolic + sub-symbolic approaches
  - graphs + statistics + rules + algorithms
  - explainable AI, learning with smaller datasets using prior knowledge
- Growing Suite of web-based demos
  - Counting, decision trees, industrial robots, smart homes, natural language, self-driving cars, browser sandbox
  - JavaScript chunks library

Cognitive Architecture with multiple cognitive circuits loosely equivalent to blackboard model



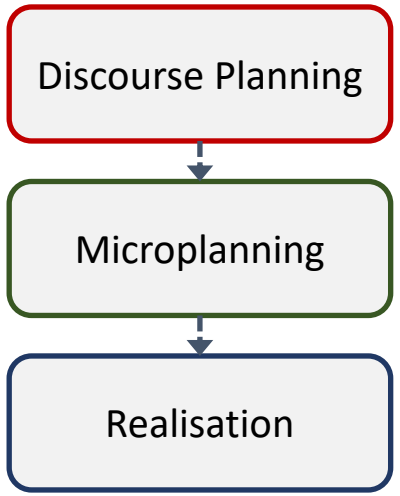
Cognition – Sequential Rule Engine



Cognitive Buffers hold single chunk
Analogy with HTTP client-server model

- Natural language is key to human-agent collaboration as well as for teaching skills to bypass manual programming bottleneck
- NLU with shift-reduce phrase structure parser using word by word concurrent processing of syntax and semantics to avoid backtracking
- Syntax-semantic mapping rules + statistics shared between NLU and NLG
  - Inductive generalisation from examples
  - Informal operational semantics
- Lexicon, dialogue context, declarative and procedural memory represented with chunks

Natural Language Generation as 3 stage pipeline



Plan recognition and adaptation, content planning, discourse goals

Referring expressions, word choice, aggregation

Transforming into real text with syntactic agreements and forms