Quarter Project Phase 4 Documentation

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Phase 4:

Improvements to previous phases

We were only given 1/14 for AND but we are confident that it produces the right output now. We used the test.sri on piazza and it seems to be correct although codebreaker.sri might not.

We were also only given 8/20 for multithreading because it was thought that only 2 threads were created no matter how deep the recursion was. It has now been updated so it prints out the thread IDs correctly and they are all different(check last few digits). See phase 3 details down below for additional detail on our pipelining and multithreading since we did not change the algorithm only where thread ID was print as it might have caused to only print our main thread ID.

Since our sockets code can not do load, we included a folder with an updated phase 3 exclusively for bonus points for phase3 and phase2. Thank you.

Phase 4 Only Details

For our implementation of sockets, we have decoupled the SRI processing from the client. Our program is only guaranteed to work locally because one of the TAs, Sharath, said the firewall is blocking the connection. Our LOAD does not work so testing would have to be done with copying and pasting commands.

For additional info, please see inline comments and UML diagrams.

Phase 3:

As an update to the previous phase, we have a fully functional OR that should produce correct results. In addition to producing correct results, it implements parallelization. In each recursive depth of inference, it will create two threads to search the two operand(which could be either facts or rules for each). This creates simultaneous recursive branches that will keep going until it bottoms out when there are only facts to inference. Then when the two threads are done searching the threads will join and the logical operation(OR/AND) will be performed. For the implementation of multithreading, we used the c++11 standard library thread. Also as a fix to phase 2, inference now takes in flags to allow it to print the result or to store the results in the knowledge base. As of now AND is not correctly implement and will not always produce correct results. However due the nature of our recursive algorithm, the AND is pipelined. We will fix by next phase.

For additional info, see inline comments.

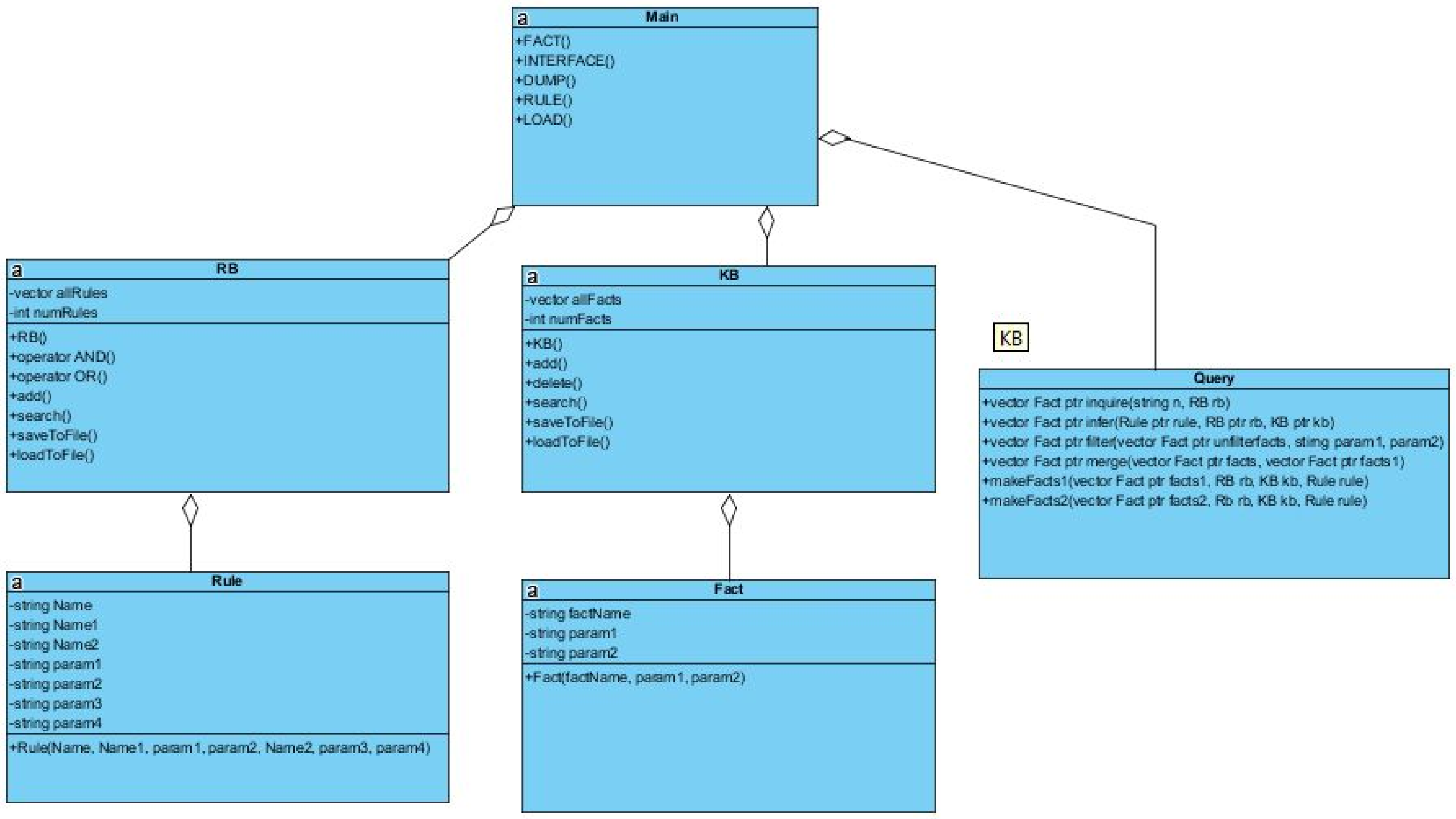
Phase 2:

Changes: AND is not functional as of now. KB and RB hold fact and rule pointers instead now. KB holds a vector of facts and RB holds a map of the rules, to make searching less time consuming. AND code is partially implemented, but is not tested. If one tries to input an AND query, it returns the OR Results instead. The parameters for facts and rules are in a vector now, so now rules and facts can have more than 2 parameters per relation. Most functions in main pass a KB and RB parameter to function correctly. Furthermore, there is a Query class, a static class that encapsulates all the methods necessary to complete a query. First the inquire method takes in the inference.the infer method makes an inference based on the given rule. Then, Filter handles the instances where a query is asking for a specific name in a position. Merge merges returned vectors (inferred and from KB directly) together and passes a vector of the vector of answers to the query. As of now, INFERENCE only prints and does not store, however, we are have unfinished implementation on this part.

Makefile Commands:

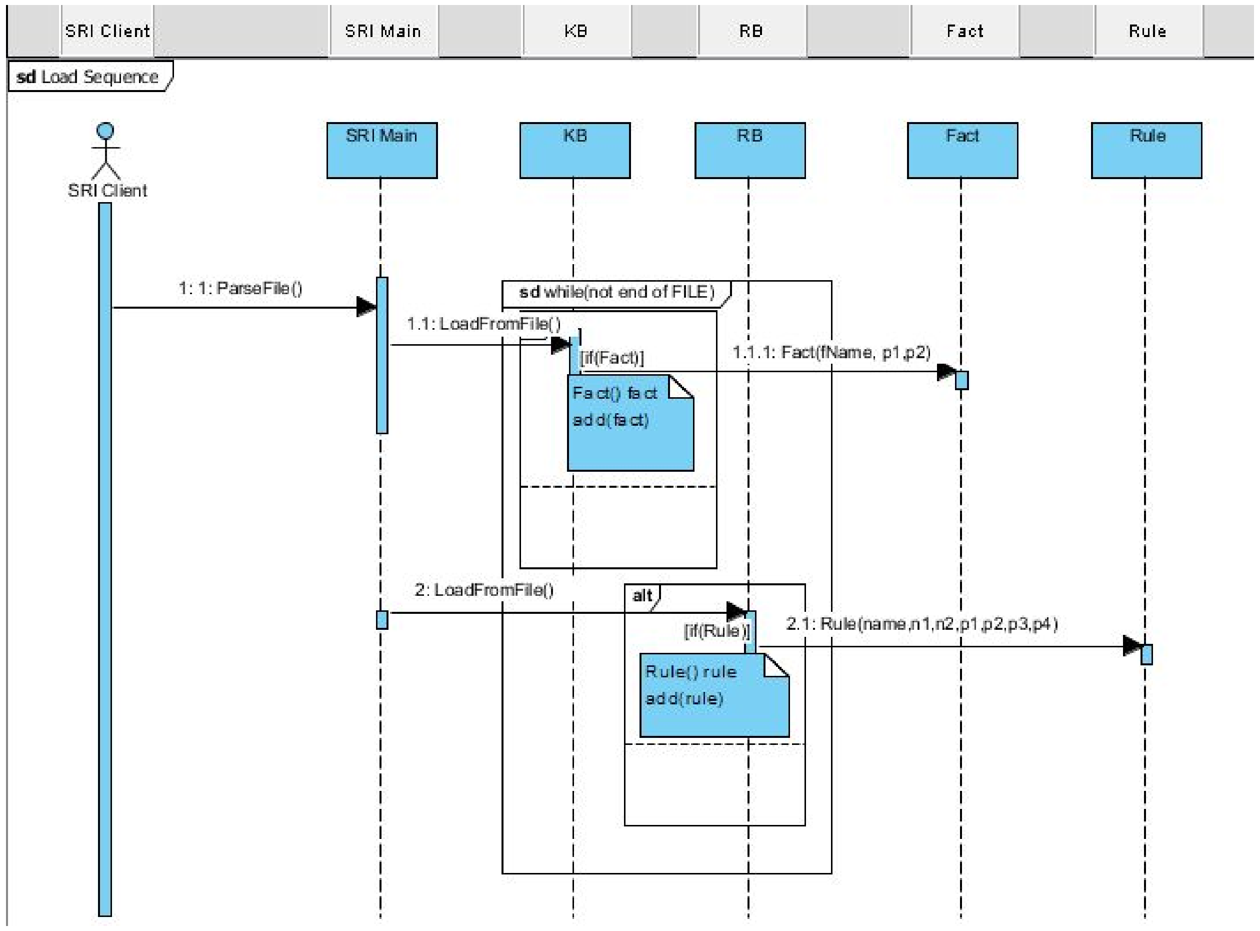
make clean (cleans object files and executables), make (makes all), make program1 (runs main)
For additional info, see inline comments.

Class diagram:

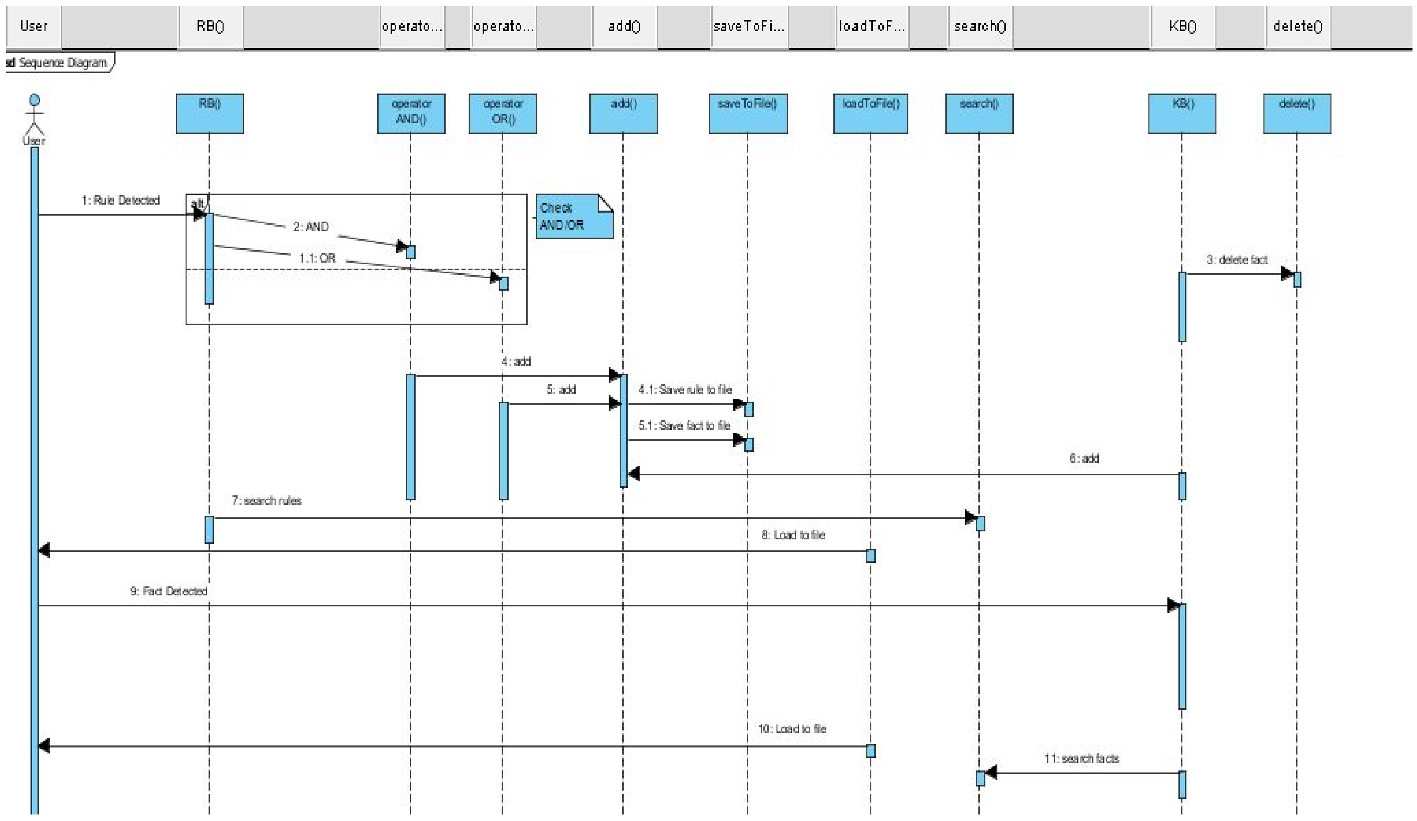

a
Main
+FACT()
+INTERFACE()
+DUMP()
+RULE()
+LOAD()
a
RB
-vector allRules
-int numRules
+RB()
+operator AND()
+operator OR()
+add()
+search()
+saveToFile()
+loadToFile()
a
KB
-vector allFacts
-int numFacts
+KB()
+add()
+delete()
+search()
+saveToFile()
+loadToFile()
KB
Query
+vector Fact ptr inquire(string n, RB rb)
+vector Fact ptr infer(Rule ptr rule, RB ptr rb, KB ptr kb)
+vector Fact ptr filter(vector Fact ptr unfilterfacts, sting param1, param2)
+vector Fact ptr merge(vector Fact ptr facts, vector Fact ptr facts1)
+makeFacts1(vector Fact ptr facts1, RB rb, KB kb, Rule rule)
+makeFacts2(vector Fact ptr facts2, Rb rb, KB kb, Rule rule)
a
Rule
-string Name
-string Name1
-string Name2
-string param1
-string param2
-string param3
-string param4
+Rule(Name, Name1, param1, param2, Name2, param3, param4)
a
Fact
-string factName
-string param1
-string param2
+Fact(factName, param1, param2)

Sequence Diagrams

Load Sequence:

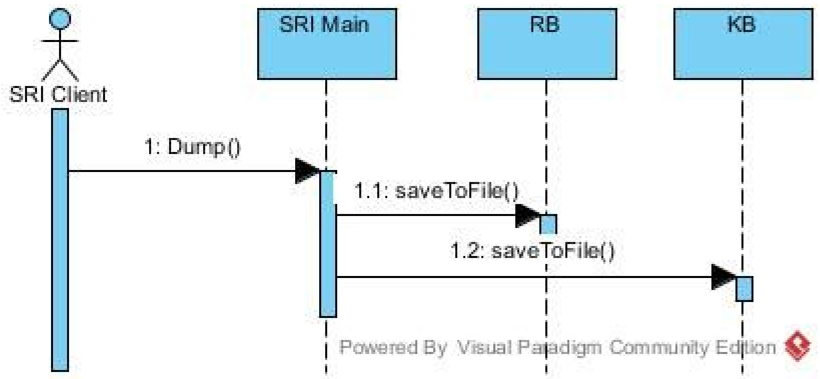


Rule and Fact Sequence:

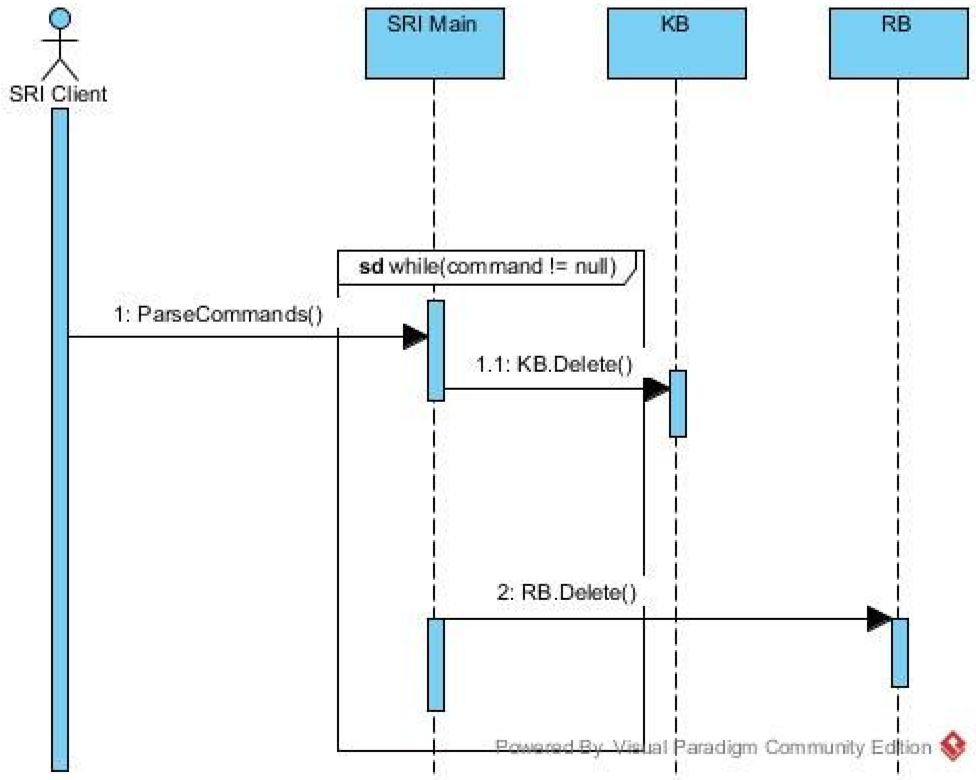


Notes: Rules are checked for AND/OR and added accordingly. Rules and Facts can be searched. They are saved to a file and can be loaded from some already filled file. Facts can be deleted. This diagram references the parsing that occurs in a different diagram because it was necessary to show the flow of events as the rules and facts are involved. Also for visual reasons, the method invocations were shown instead of the classes or objects - we will probably tweak this representation in a later version, or as the design changes.

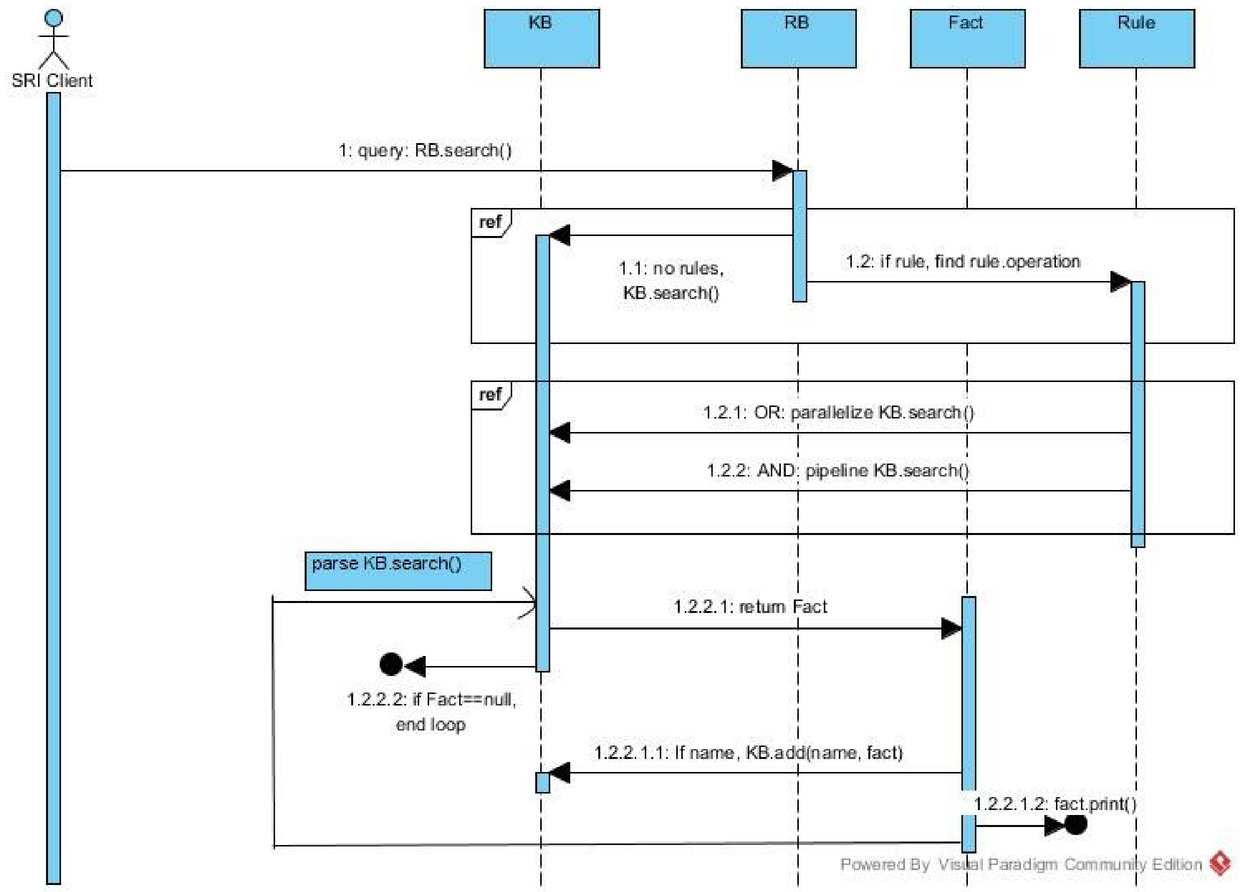
DUMP sequence:



DROP Sequence:



Inference Sequence:


KB
RB
Fact
Rule
SRI Client
1: query: RB.search()
ref
1.1: no rules, KB.search()
1.2: if rule, find rule.operation
ref
1.2.1: OR: parallelize KB.search()
1.2.2: AND: pipeline KB.search()
parse KB.search()
1.2.2.1: return Fact
1.2.2.2: if Fact==null, end loop
1.2.2.1.1: If name, KB.add(name, fact)
1.2.2.1.2: fact.print()
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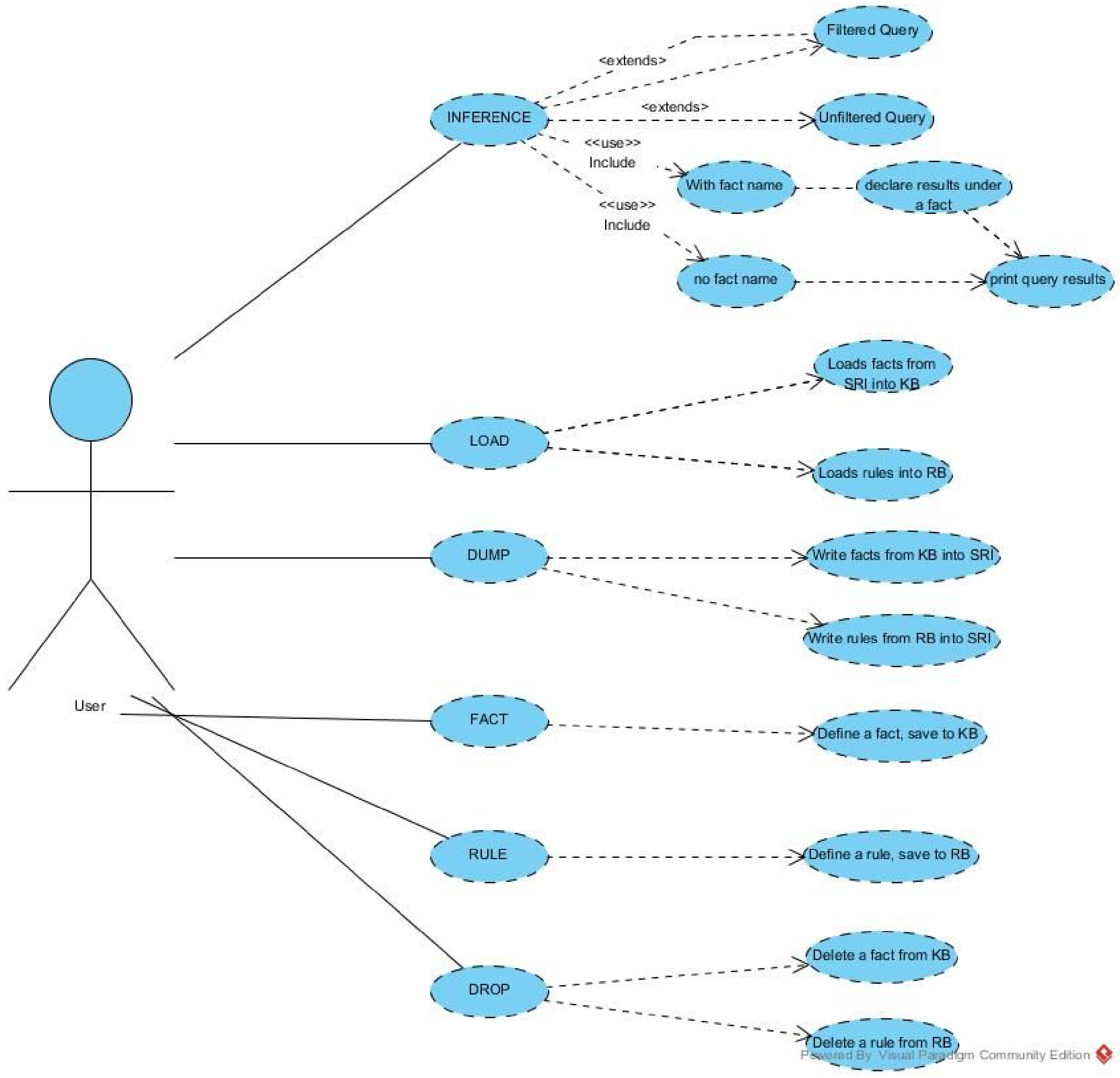
Use Case Diagram:


Filtered Query
<extends>
INFERENCE
<extends>
Unfiltered Query
<<use>>
Include
With fact name
declare results under a fact
<<use>>
Include
no fact name
print query results
Loads facts from SRI into KB
LOAD
Loads rules into RB
DUMP
Write facts from KB into SRI
Write rules from RB into SRI
User
FACT
Define a fact, save to KB
RULE
Define a rule, save to RB
Delete a fact from KB
DROP
Delete a rule from RB
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