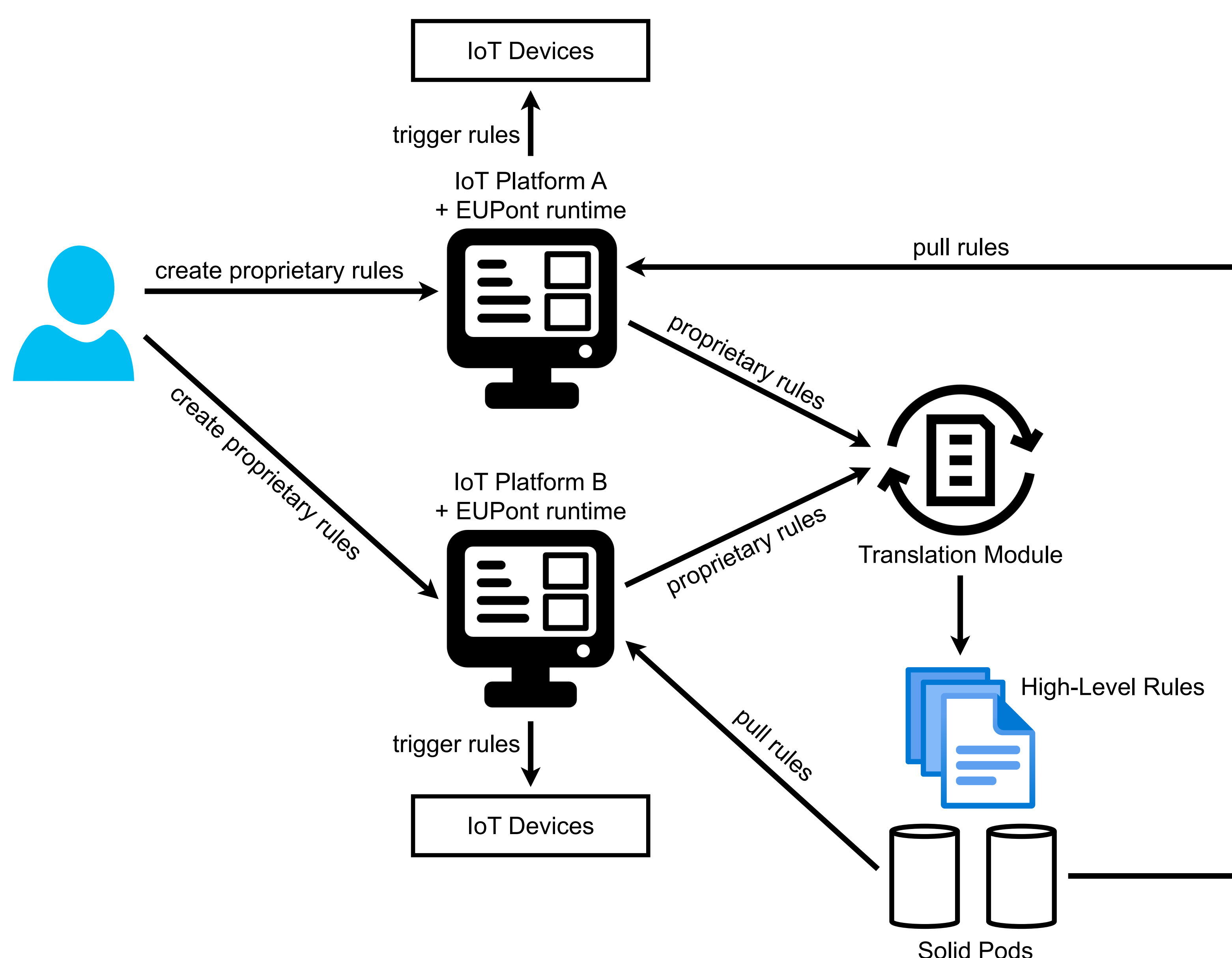


Towards a Write Once Run Anywhere Approach in End-User IoT Development

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Abstract

With the use of popular task automation platforms such as If This Then That (IFTTT), users can define rules to enable interactions between smart devices in their environment and thereby improve their daily lives. These platforms however are often implemented as closed systems, thereby preventing users from using their automations in environments other than those in which they were created.

Research Question

Our primary research question was: “How can we enable users to retain the tools they are familiar with while providing the possibility to use their automations across different platforms?”

Solution

We propose three different NLP-based methods (spaCy, AllenNLP and Combined) to automatically translate proprietary IoT rules to the EUPont format which can further be stored in Solid Pods. This enables rules defined in arbitrary proprietary formats (e.g. IFTTT) to be automatically translated into the EUPont format and then be executed on any IoT platform with an EUPont runtime.

Future Work

We will investigate how to consistently return the most accurate high-level generalisation for a user’s rules, by either using one or a combination of the presented methods. We also plan to focus on improving the accuracy of the results so that more often the first result returned is the most accurate high-level generalisation and the number of cases where no result is returned is minimised or even completely eliminated. Finally, we are going to investigate how our solution can best be integrated into existing IoT platforms.

Results

Approach	First Result	Top Five Result	No result
spaCy	13	9	16
AllenNLP	2	12	24
Combined	16	13	9

Approach	First Result	Top Five Result	No result
spaCy	10	8	22
AllenNLP	1	11	28
Combined	8	19	13

Contributions

Novel use of NLP algorithms in IoT

```
for each trigger x in EUPont dataset:
  for each trigger y in IFTTT dataset:
    run document_similarity(x,y)
return x, y, Similarity(x,y)
order by similarity descending
```

```
for each action a in EUPont dataset:
  for each action b in IFTTT dataset:
    run document_similarity(a,b)
return a, b, Similarity(a,b)
order by similarity descending
```



Use of Solid Pods
in End-User IoT Development

```
[
  {
    "ifttt_name": "Any event starts",
    "eupont_hypothesis": "Started Activity",
    "spacy_similarity": 61.39593233371522,
    "allen_nlp_entailment": 85.80678701400757,
    "allen_nlp_contradiction": 3.3948026597499847,
    "allen_nlp_neutral": 10.798408836126328,
    "combined_similarity": 73.6013596738614
  },
  {
    "ifttt_name": "Any event starts",
    "eupont_hypothesis": "Position Registration",
    "spacy_similarity": 57.52355435396419,
    "allen_nlp_entailment": 81.54605627059937,
    "allen_nlp_contradiction": 5.951366946101189,
    "allen_nlp_neutral": 12.50256896018982,
    "combined_similarity": 69.53480531228178
  },
  ...
]
```

