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# Towards a Decoupled Context-Oriented Programming Language for the Internet of Things

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## ABSTRACT

Easily programming behaviors is one major issue of a large and reconfigurable deployment in the Internet of Things. Such kind of devices often requires to externalize part of their behavior such as the sensing, the data aggregation or the code offloading. Most existing context-oriented programming languages integrate in the same class or close layers the whole behavior. We propose to abstract and separate the context tracking from the decision process, and to use event-based handlers to interconnect them. We keep a very easy declarative and non-layered programming model. We illustrate by defining an extension to Golo - a JVM-based dynamic language.

## Categories and Subject Descriptors

D.3.3 [Language Constructs and Features]: procedures, functions, and subroutines; D.2.11 [Software Architectures]: languages (e.g., description, interconnection, definition); D.2.8 [Software Engineering]: metrics—*complexity measures, performance measures*

## General Terms

Language, Performance

## Keywords

Programming Language, Context-Oriented Programming, Decoupled Architecture, Event-Based Handling, JVM, Golo

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## 1. INTRODUCTION

Easily programming behaviors is one major issue of a large and reconfigurable deployment in the Internet of Things. Such kind of devices often requires to externalize part of their behavior such as the sensing, the data aggregation or the code offloading. Most existing context-oriented programming languages integrate in the same class or close layers the whole behavior.

In this article, we propose

- to abstract and separate the context tracking from the decision process. Indeed, most context-oriented languages use event-condition-action rules embedded in the business class or in the context definition. This definition is rather restrictive and would benefit from more complex decision-making mechanism such as neural network or machine learning;
- to externalize these interactions by using API-defined context and decision maker, and interconnecting them with event-based handler mechanisms;
- to demonstrate the feasibility of such externalization by developing Congolo - *Contextual Golo*, an extension to Golo - a JVM-based dynamic language [17]. Preliminary performances are given.

Section 2 details related works. Section 3 introduces Congolo: language enhancements and architecture. Section 4 goes into Congolo implementation, and finally, section 5 gives preliminary results.

## 2. RELATED WORK

Several COP languages exist based on a variety of programming languages. Most of them implements the context with the use of layers. Layers include context tracker mechanisms and context reaction ones. In order to compare these languages, we can thus focus at first on the way the context are defined, then how they are activated and finally how they are used throughout the code. Table 1 proposes a summary.