Parallel and Distributed Systems Group
Faculty of Electrical Engineering, Mathematics and Computer Science
Delft University of Technology

Paper Review 1
Seminar Cloud Computing(IN4392)
2016-2017

Bernard Jollans
4620984

September 23, 2016

Paper Reviewed

Jonathan Mace, Peter Bodik, Rodrigo Fonseca, and Madanlal Musuvathi, "Retro: Targeted Resource Management in Multi-tenant Distributed Systems", 12th USENIX Symposium on Networked Systems Design and Implementation (NSDI 15) 2015, pp. 589-603

Abstract

In today's shared distributed systems, management of resources is a real issue. This is due to three main reasons: The unexpected behavior of tenants, the low control over applications after they start and system specific unusual tasks like failure recovery. Bad management often results in overloaded resources and high latencies in the system. The paper presents Retro, a resource management framework which promises to address these problems. A central idea, which separates Retro from similar frameworks such as "Cake" and "IOFlow", is that it is system independent. It separates the resource management policies from the resource usage measurement and policy enforcement. The latter is done by Retro itself, where as the policies are designed according to the system. Retro's design revolves around three concepts: workflow, resources and control points. A workflow is anything that requires resources, like an application or a system process. What exactly the workflows are, can be configured by the system designer. A workflow passes a number of control points, at which its throughput can be throttled by a central controller. The throttling happens on the basis of two metrics: slowdown and load, which specify how much load is put on a resource by a given workflow and how much this slows it down. Finally the authors conduct tests in a VM environment, using three different policies, which they explain in depth. They manage to show the positive effect Retro has on the slowdown and load in the system.

Main Strengths

- The technology is novel and very relevant
- The underlying issues are well explained with examples
- The tests are well illustrated with graphics
- The paper requires no previous knowledge

Main Weaknesses

- The comparison to similar frameworks is only theoretical
- The paper gets side tracked during the evaluation
- The paper's explanatory graphics add little value

Detailed Comments

- The paper gives a novel approach to resource management and is relevant to its field.
- The paper constantly gives examples to make its explanations more comprehensive.
- The tests during the evaluation are very well illustrated with comprehensive graphics.
- The graphics before the evaluation phase add little value to the explanations in the text.
- When the paper explains its LatencySLO policy during the evaluation, it goes too in depth and seems to get side tracked. This can help system designers who plan to use Retro, but it is off topic.
- The paper compares Retro to other frameworks only in a theoretical manner, without tests. This is justified by saying that Retro is the only framework which is system independent. However the comparisons against other frameworks could have been conducted per system.
- The paper advertises Retro as system independent, yet only conducts tests on a single system. It mentions however, that Retro works equally well on other systems.
- The paper underlines the issues being addressed with opinions of prominent companies (e.g. Microsoft).
- The paper does not require prior knowledge. It gives a short introduction to the underlying system used for the illustrations and tests.

Overall Evaluation

The paper is original in its solution to resource management of shared distributed systems. Since it is system independent and works effectively, Retro seems like a promising tool for its field. Revisions are needed for the papers testing phase. The numeric evaluation is as follows:

- Originality: 5/5
- Technical Content: 4/5
- Readability: 4/5
- Overall: 4/5

Suggestion for Improvement

As mentioned there should be practical comparisons to system specific frameworks, which build on the theoretical evaluation. Additionally the graphics used while explaining the design should be reworked, as they add little value to the overall understanding.