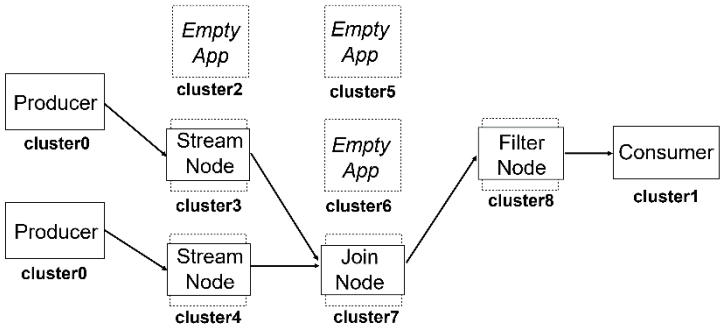
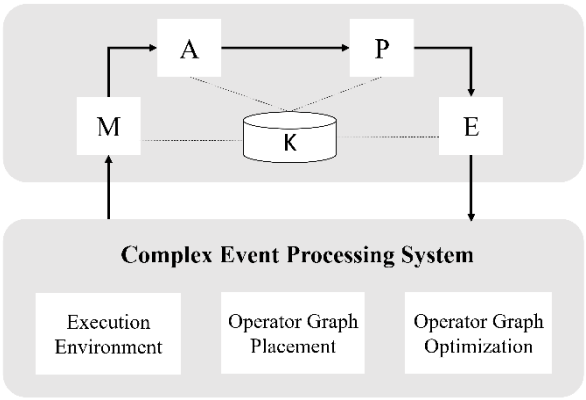
Adaptation of Big Data Systems using Mechanism Transitions

Master- / Bachelor-Thesis/ HiWi Job

TECHNISCHE UNIVERSITÄT DARMSTADT





Description:

The Future Internet connects billions of heterogeneous devices producing tremendous amount of data per second. An example of such an emerging class of applications that connects massive amount of devices are Internet of Things (IoT) applications. Most of these applications needs ability to react to the occurrence of real-world situations in real-time. Complex Event Processing (CEP) is a big data system that can provide this by obtaining situations to react from low-level data through *operator graphs,* which jointly represent the situation of interest for the user. This is mainly accomplished by optimal placement and optimization of CEP *operators* inside the network. However, these mechanisms readily become inefficient because of the frequent changes in the environmental context, e.g., incoming event rate. This have a strong influence on the desired quality levels required by the application. A CEP system must react to this by reconfiguration of *operators* and its *mechanisms*. To achieve this, we investigate methods and algorithms for (proactive) adaptation of a CEP system, e.g., by applying machine learning on the concept of *mechanism transitions*.
If this general description interests you, please get in touch with me.

Research Problems:

- Algorithms to perform proactive adaptation.
  - Distributed MAPE-K adaptation loop for highly scalable transition execution.
  - Analysis of distributed design patterns of MAPE-K adaptation loop.
- Apply machine learning for proactive adaptation of CEP system.
  - Proactive selection of CEP mechanism as a consequence of transition.
  - Prediction of changes in environment to trigger proactive adaptation.

Related Literature:

[1] M. Luthra, B. Koldehofe et al. Adapting to Dynamic User Environments by Enabling Transitions between Operator Placement Mechanisms. In the Proceedings of 12th ACM International Conference on Distributed and Event-Based Systems, 2018.
[2] M. Luthra, B. Koldehofe et al. Transitions for Increased Flexibility in Fog Computing: A Case Study on Complex Event Processing. To Appear in Informatik Spektrum, Special Issue on Fog Computing Reality, 2019

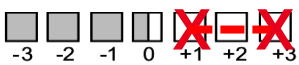
Opportunities:

You can contribute to the above research problems as part of a Bachelor or Master thesis or as a HiWi at KOM. A detailed topic for the thesis shall be finalized after face-to-face discussions.

Manisha Luthra, M. Sc.
manisha.luthra@kom.tu-darmstadt.de
S3|20 217, Rundeturmstr. 10,
64283 Darmstadt

Theoretical (Analytical)

Empirical (Simulation)



Practical (Implementation)

Literature

Prof. Dr.-Ing. Ralf Steinmetz
Multimedia Communications Lab (KOM)
www.kom.tu-darmstadt.de