

Live Trace Visualization for System and Program Comprehension in Large Software Landscapes

ICSA 2017 Tutorial

Runtime Modeling and Visualization

Software Engineering Group, Kiel University

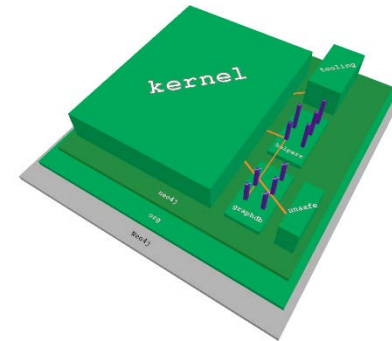
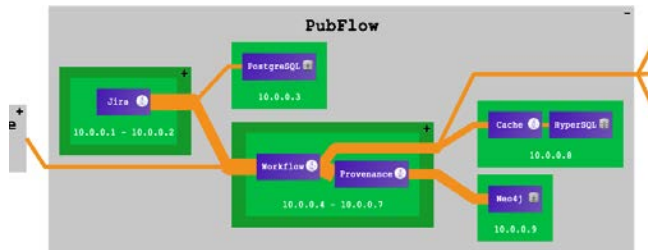
Christian Zirkelbach — April 04, 2017

ExplorViz



Schedule of Events

09:00 – 09:10	Welcome and General Introduction
09:10 – 09:40	Study Foundations
09:40 – 10:00	Model-based Software Application Monitoring
10:00 – 10:30	Runtime Architecture Modeling and Visualization
10:30 – 11:00	Coffee Break
11:00 – 12:15	Introduction to the ExplorViz, Palladio, and iObserve Approaches with following Tool / Visualization Demos
12:15 – 12:30	Study Setup
12:30 – 14:00	Lunch
14:00 – 15:30	Comprehensibility Study
15:30 – 16:00	Coffee Break
16:00 – 16:30	Live Database Trace Visualization in Large Software Landscapes
16:30 – 17:00	Feedback and Open Discussion



Live trace visualization of large software landscapes for comprehension of systems and applications

ExplorViz

Selected Challenges:

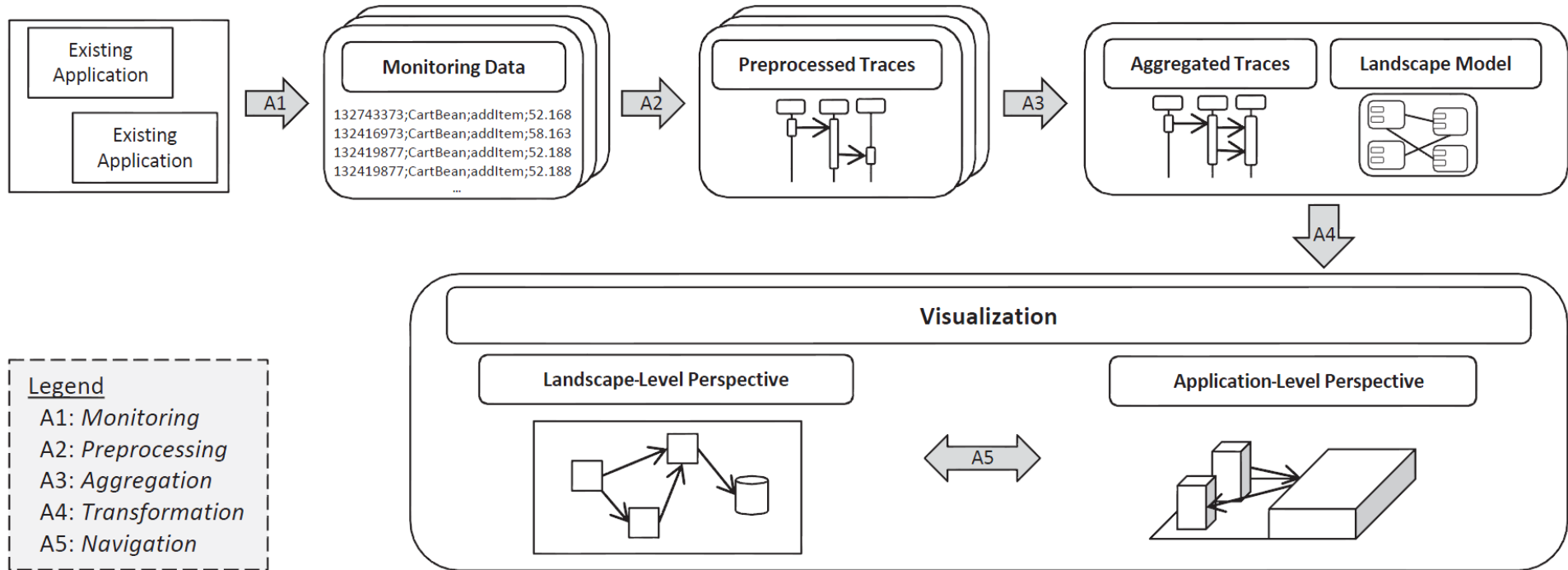
- Possible huge monitoring data amount (performance/cost efficiency)
- Finding abstractions to understand huge landscapes but also application-level details
- Live visualization of thousands or even millions of traces

- Enabling **live trace visualization** of large software landscapes
- Providing a **monitoring** and **analysis approach** capable of logging and processing the huge amount of conducted method calls in large software landscapes
- Monitoring approach utilizes a **low overhead** [Fittkau et al. 2013b, Waller et al. 2014]
- Applying **innovative display** and **interaction concepts** for the software city metaphor beyond classical 2D displays and 2D pointing devices

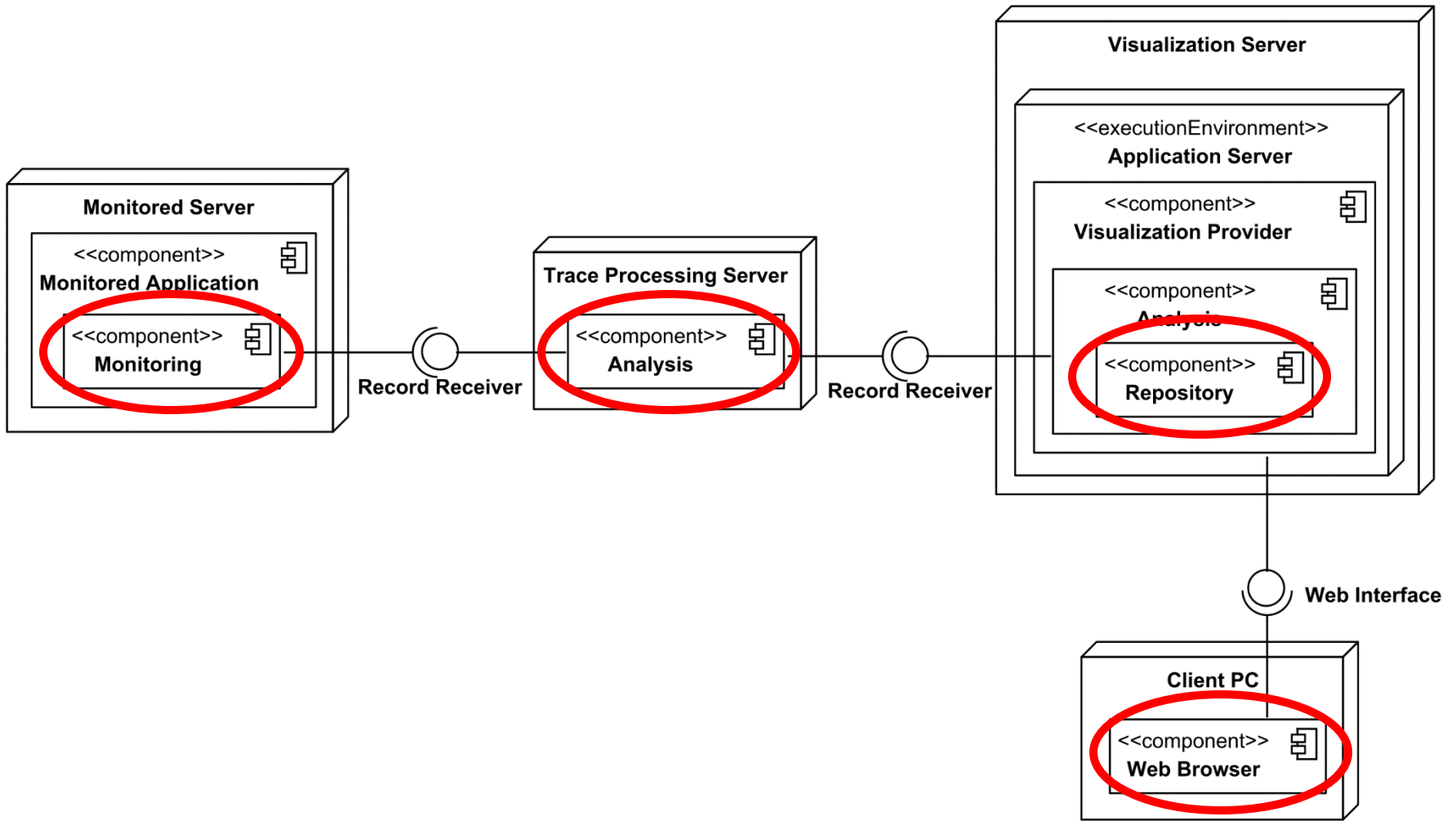
The ExplorViz Approach



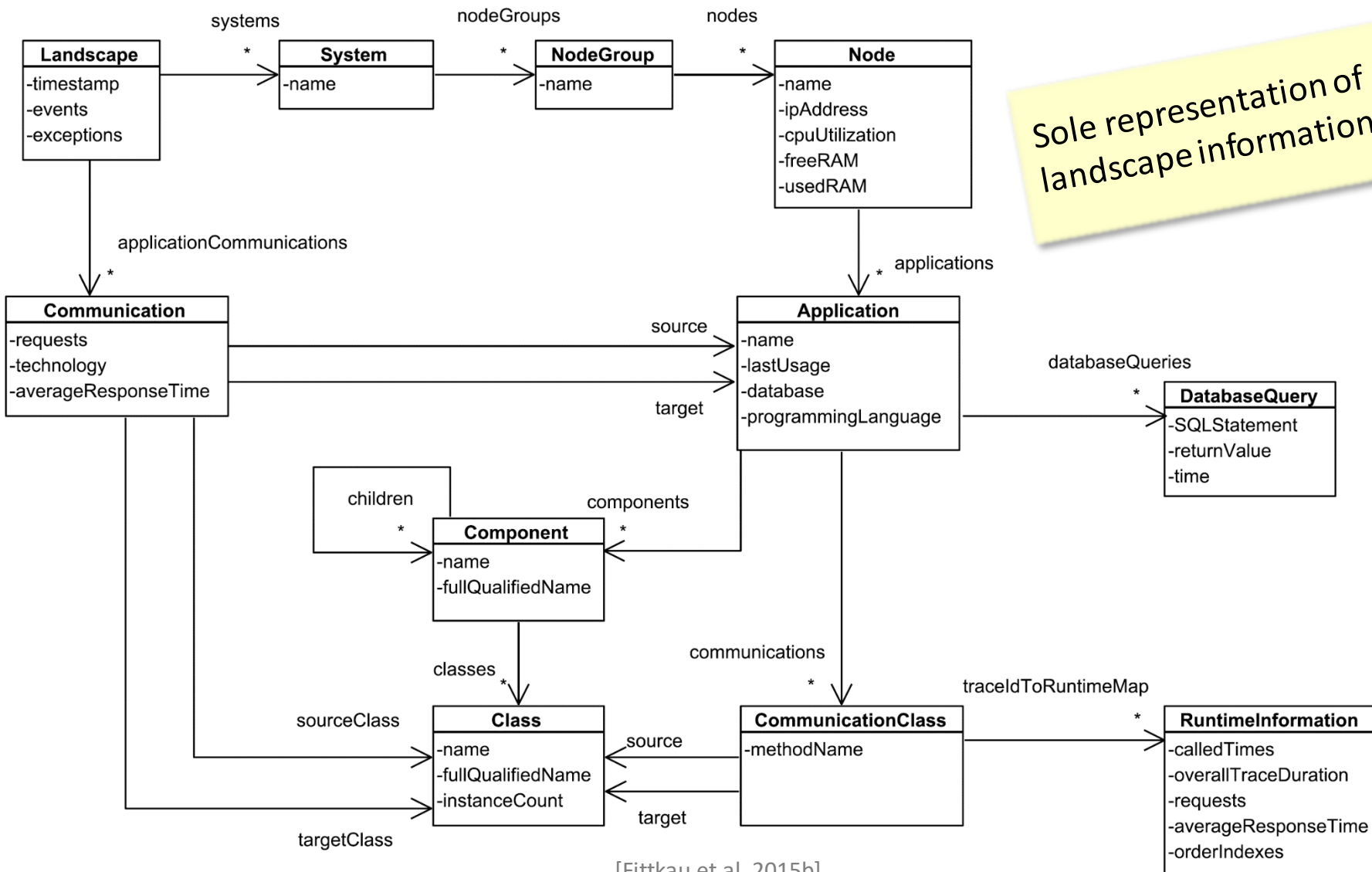
The ExplorViz Method



[Fittkau et al. 2013a]

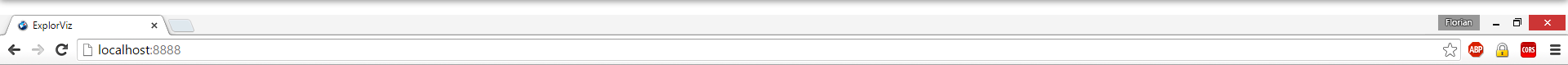


Landscape Meta-Model

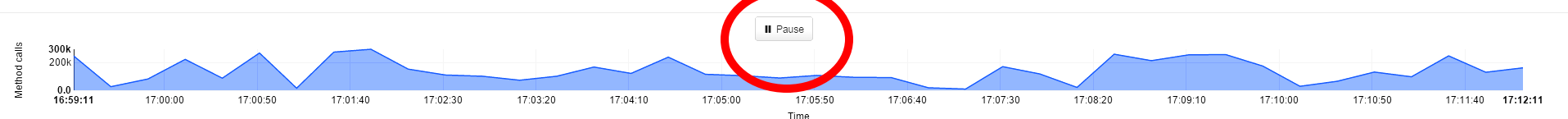
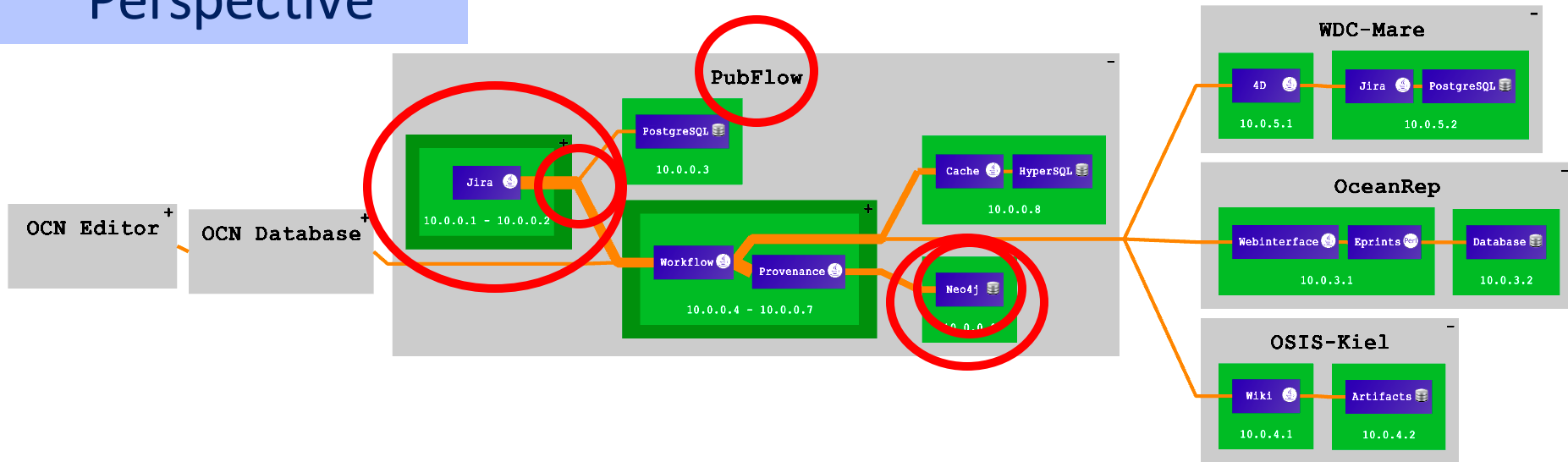


Sole representation of landscape information

Landscape Perspective

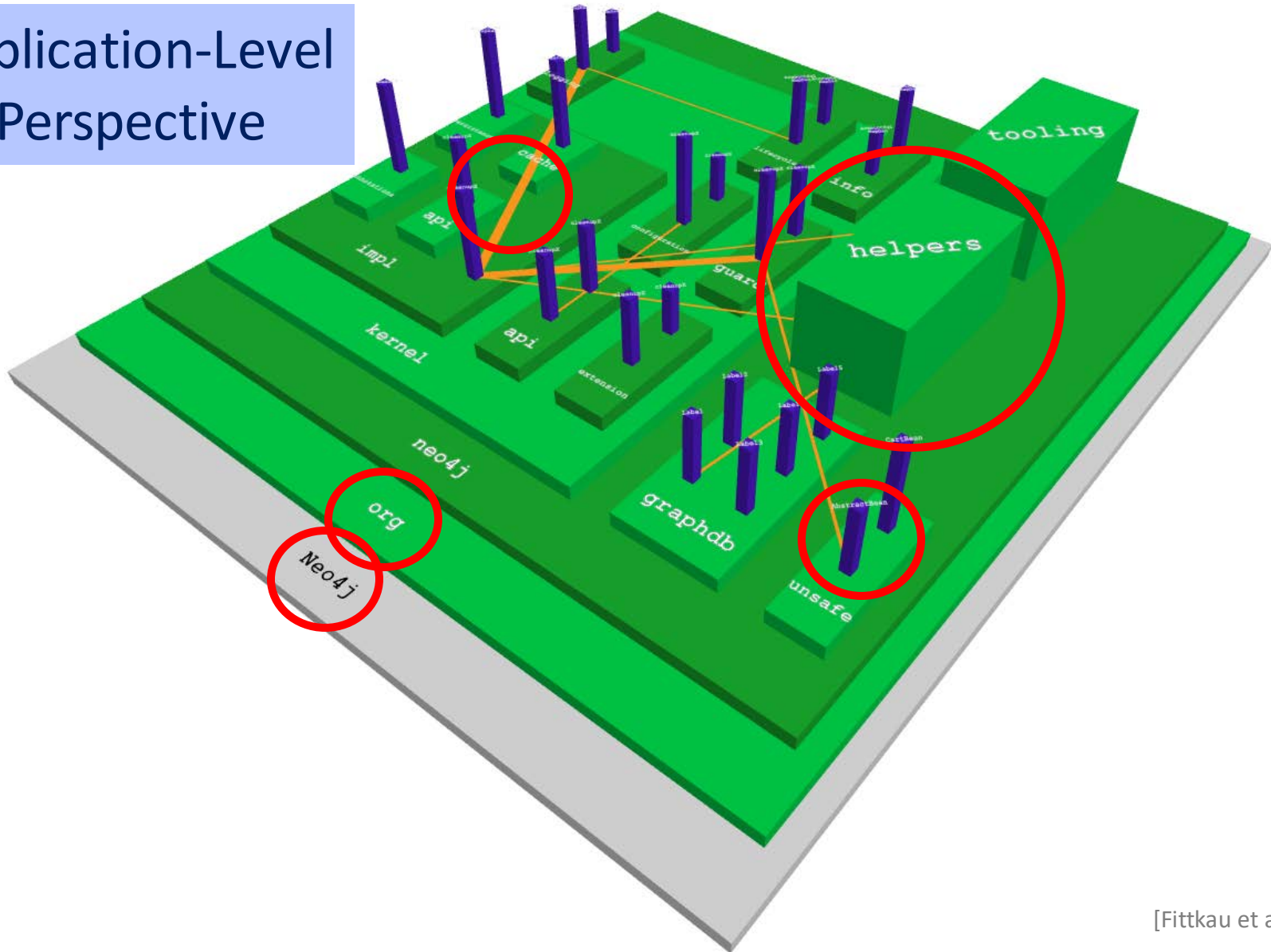


Landscape-Level Perspective



Application Perspective

Application-Level
Perspective



Selected ExplorViz Features

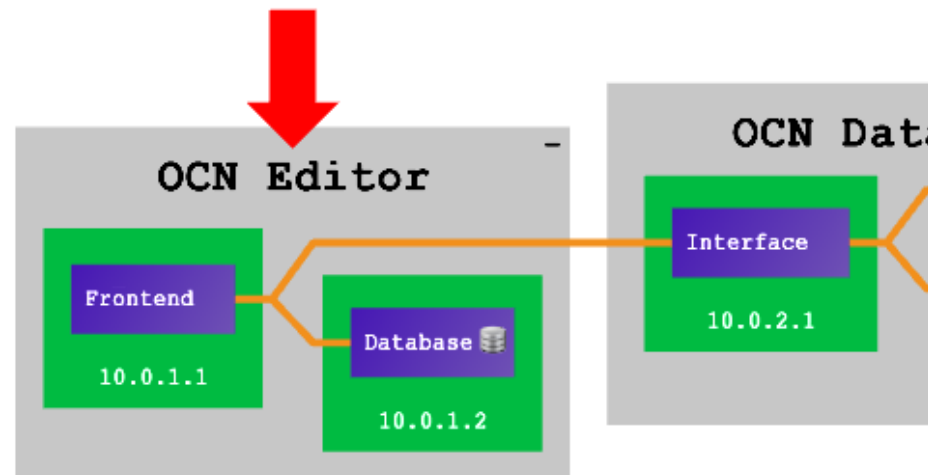


Step 2 of 32

The software landscape consists of several **systems**, and the **communication** between them. Thicker lines mean more communication.

To get a better overview over a landscape, it can be helpful to **minimize** the systems, so they take up less space. The ability to do so is indicated by the - in the top right corner.

To complete the first tutorial step, minimize the OCN Editor by double clicking it.



[Finke 2014]

Question 1 of 6

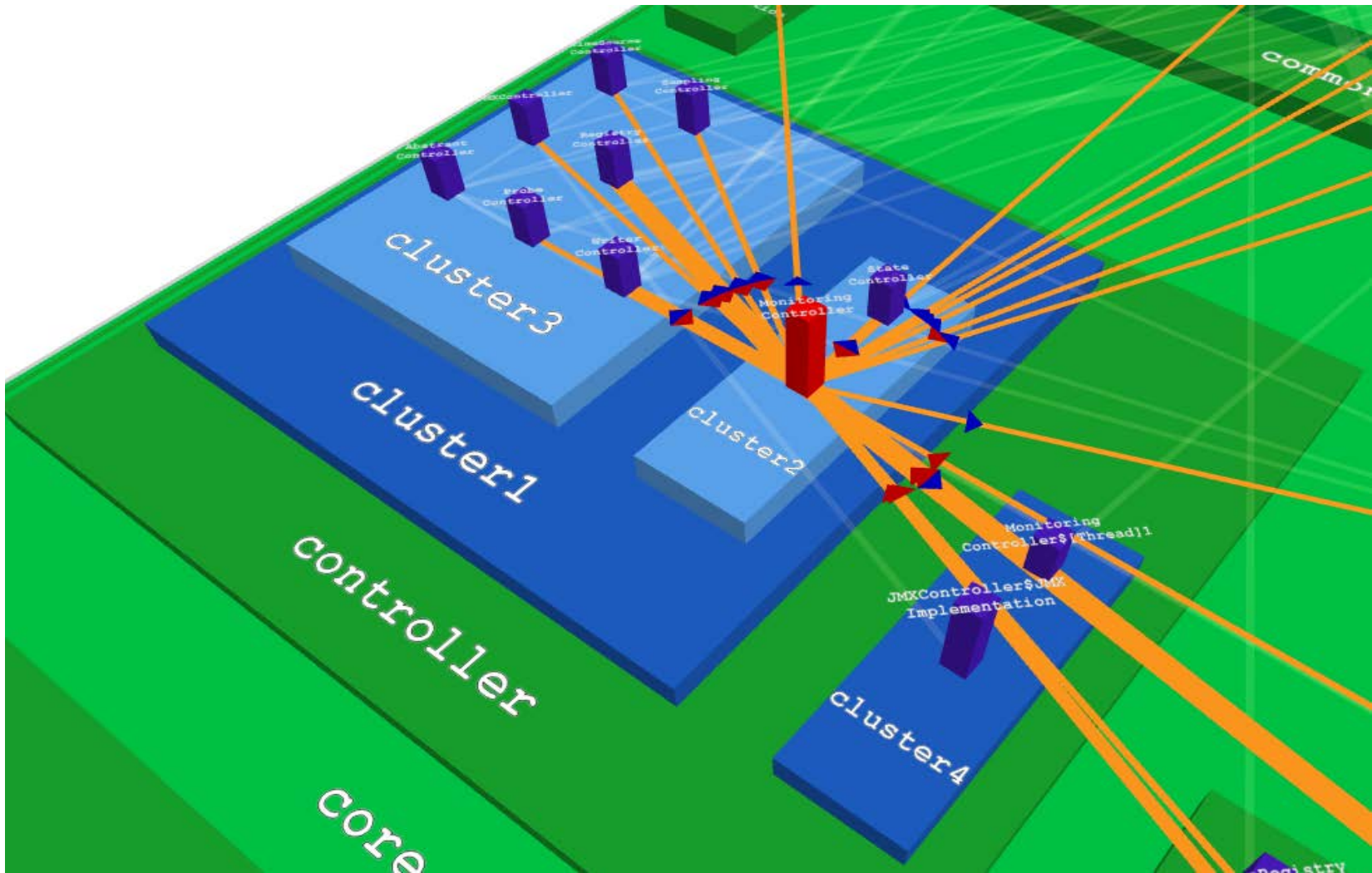
Q1: Name three classes (from different packages) that have high fan-in (at least 4 incoming communications) and almost no fan-out (outgoing communication).

Answer

Elapsed time: **3:27** (of 5 minutes)

Next >>

Clustering



[Barzel 2014]

Trace Replayer

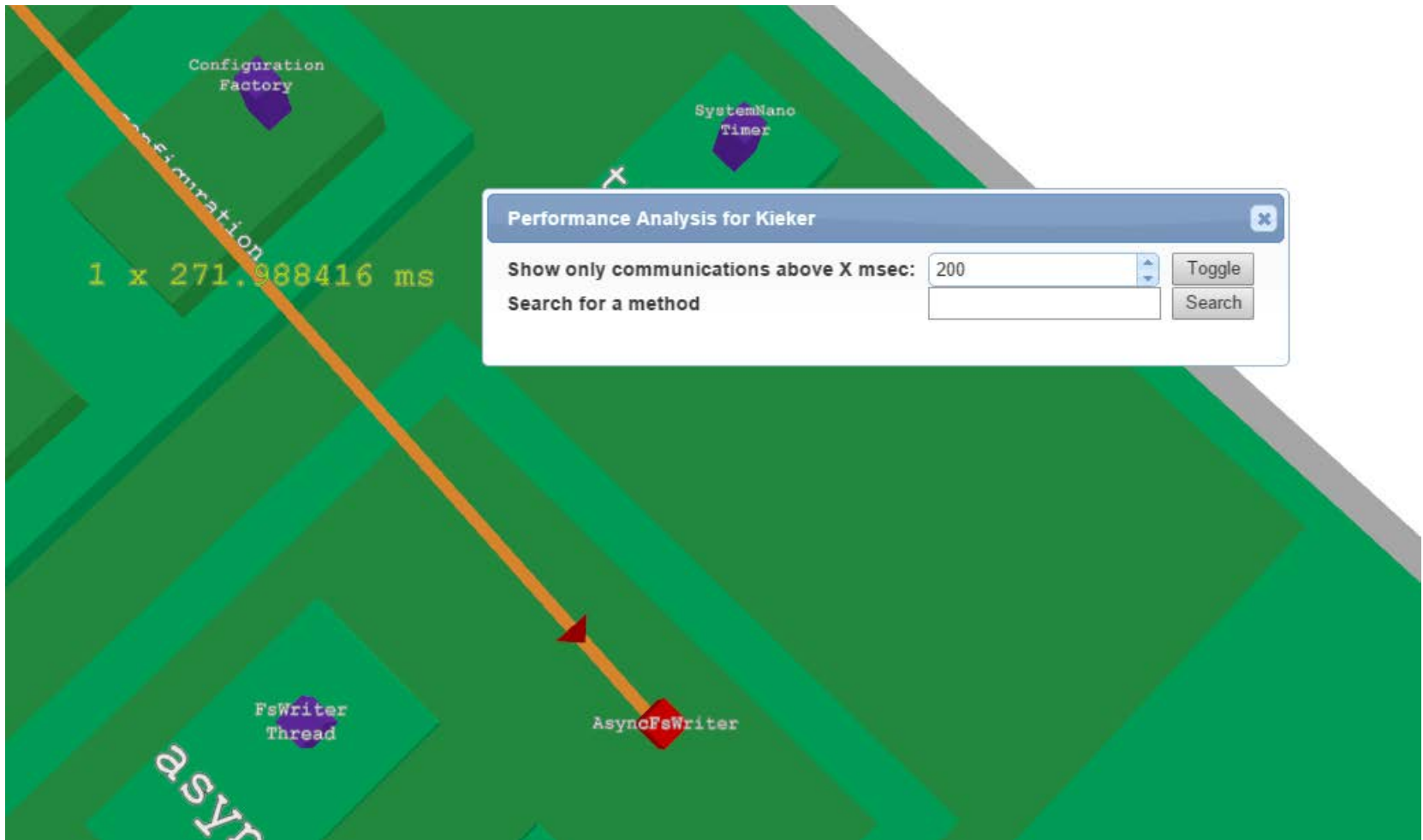
The screenshot displays the 'Analyzing Trace 5' window with the following details:

- Position:** 617 of 754
- Caller:** Registry
- Callee:** Registry\$Segment
- Method:** new Registry\$Segment(..)
- Avg. Time:** 0.46 ms
- Self-Edges:**
- Animation:**

A slider below the window shows the current position at 603, with markers at 1, 151, 302, 452, 603, and 754. Navigation buttons for 'Previous', 'Play', and 'Next' are located at the bottom of the window.

The background features a 3D visualization of the trace with labels for 'Registry', 'Registry\$HashEntry', 'Registry\$Segment', and 'new Registry\$Segment(..)'. A red arrow points from the 'new Registry\$Segment(..)' label to the 'Registry\$Segment' label, and an orange arrow points from the 'Registry' label to the 'Registry\$HashEntry' label.

Performance Analysis



Live Demo

<https://www.explorviz.net/demo.php>



Conclusions & Outlook



Live trace visualization for large software landscapes
available as **open-source software**
(Apache License 2.0)

ExplorViz

<http://www.explorviz.net>

<https://github.com/ExplorViz>

All evaluation **results available online**

- Raw results, R scripts, code, ratings, ...
- ExplorViz versions used in the experiments
- Screen and camera recordings more than 160 hours material
- Long-time archival on Zenodo.org



Collaborative Github project with
more than 32k LOC (without comments and blank)

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