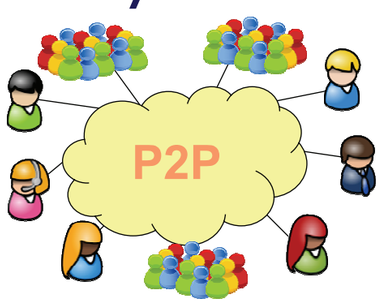
Kalman Graffi, Dominik Stingl, Julius Rückert,
Aleksandra Kovacevic, Ralf Steinmetz

Monitoring and Management of Structured Peer-to-Peer Overlays

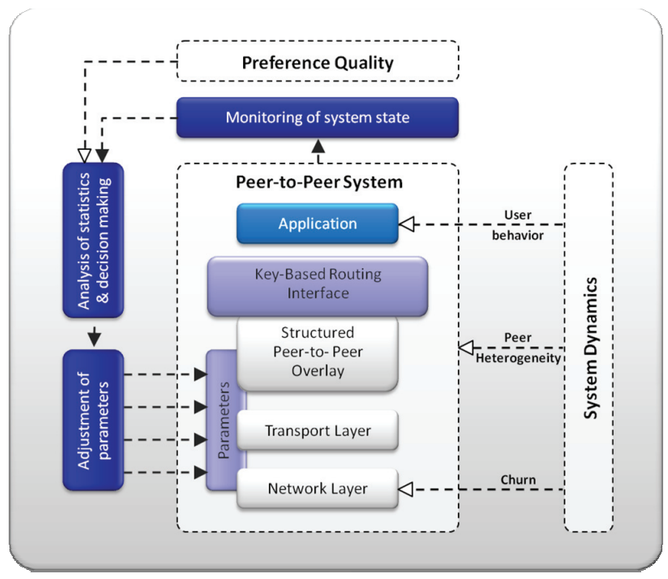
Motivation

Controlling the quality of p2p overlays

- In various scenarios
- To cope with system dynamics
- Reaching preset metric intervals
- Through automated self-configuration



A Layered View



Monitoring of Overlays: SkyEye.KOM

Goal: Gather system wide global view on large-scale p2p overlay

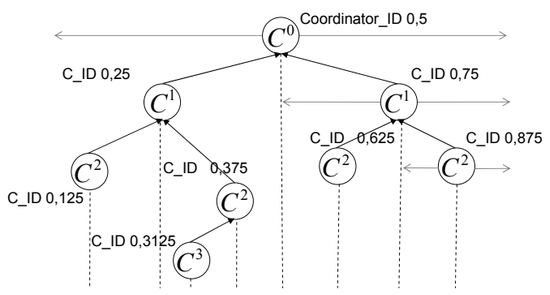
Provides:
Statistical representation (avg. / max. / min. / stddev. / …) of system metrics

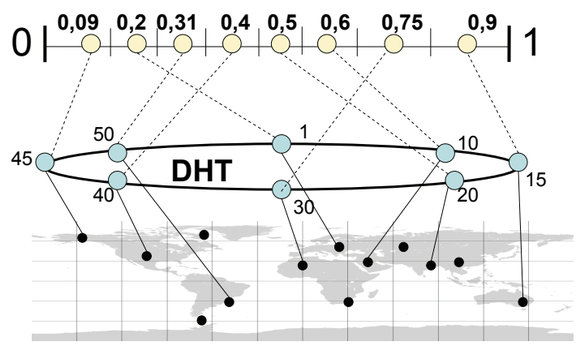
Requires: KBR - functionality route(msg, key), lookup(key)

Mechanism: SkyEye.KOM

General Metrics	Monitoring and Overlay
number of online-peers	monitoring: in-/out-traffic
average online-time	overlay: in-/out-traffic
complete in-/out-traffic	average bandwidth-consumption
average lookup-time in seconds	succeeded and failed operations
in-/out-traffic of lookup-messages	traffic of ping- and pong-msgs
number of join- and leave-messages	

Function	Description
MIN(metric)	Calculates the minimal value of a metric
MAX(metric)	Calculates the maximal value of a metric
SUM(metric)	Sums the values of a metric
SUMOFSQ(metric)	Sums the squares of the values of a metric
COUNT(metric)	Counts the number of metric values
AVG(metric)	Calculates the average of a metric
STANDARDDEV(metric)	Calculates the standard deviation of a metric





Non-functional requirements:

- Precise, fresh, complete results
- Lightweight and robust mechanism

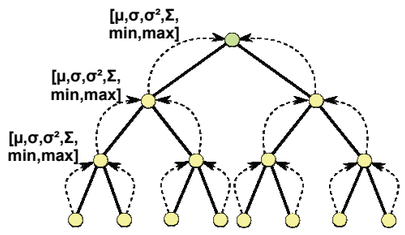
Design decisions:

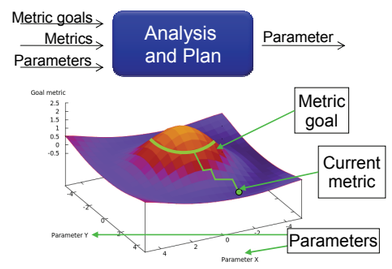
- Layer model: new vs. integrated
- Monitoring: proactive vs. reactive
- Topology: tree, bus, ring, star, mesh
- Peer roles: equal vs. heterogeneous
- Tree ID: dynamic vs. deterministic

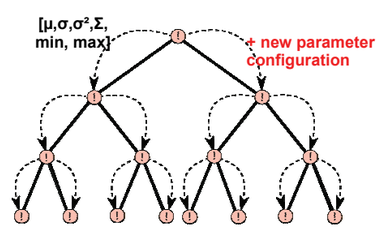
Management of P2P Overlays

Goal: Reaching and holding preset metric intervals

Step 1: Monitor current system state
Step 2: Analysis state, plan new parameters
Step 3: Distribute and adopt new parameters on all peers

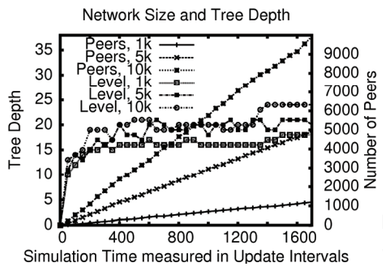


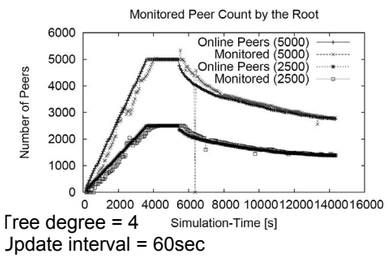


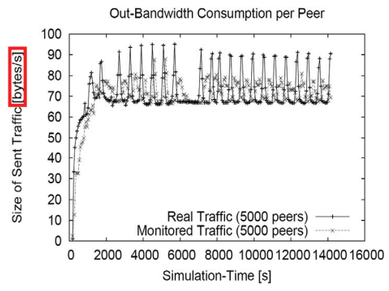


- Root is deciding component
- P2P overlay parameterizable
- Monitoring reveals system state
- Predefined quality goals given
- Detects missed quality intervals
- Plans new configuration
- Spreads new configuration to all peers using SkyEye.KOM
- Peers adopt locally the new rules

Evaluation of SkyEye.KOM





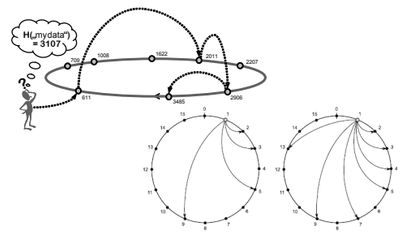


Observations: Logarithmical tree height, scalable

Information age depending on tree degree and update interval

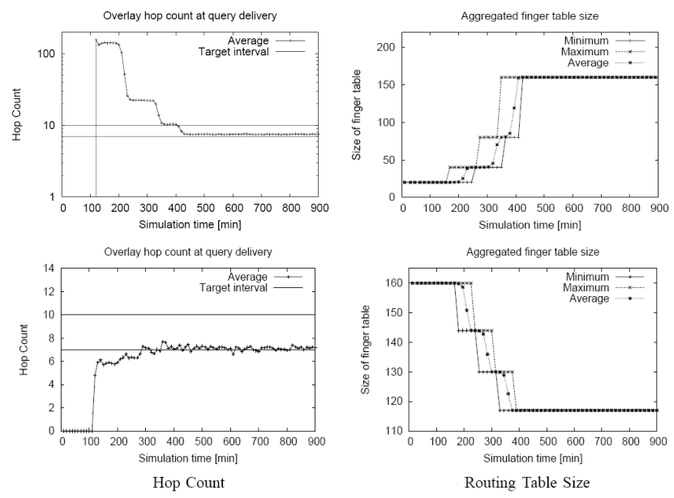
Monitoring information very precise, mechanism very cost efficient

Evaluation of Reconfiguration Cycle



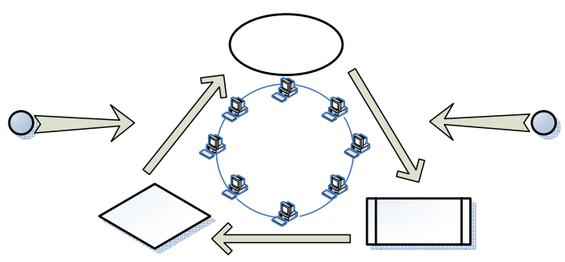
In Chord: Relate finger table (FT) size to hop count

- If hop count < [7;10] : double FT size (+100%)
- If hop count > [7;10] : decrease FT size by 10%



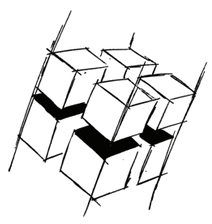
Hop Count | Routing Table Size

TECHNISCHE UNIVERSITÄT DARMSTADT





Contact:
Kalman Graffi
Multimedia Kommunikation (KOM)
Technische Universität Darmstadt
Merckstr. 25, D-64283 Darmstadt
Tel.: +49 (6151) 16-4959,
Email: graffi@KOM.tu-darmstadt.de



QuaP2P