ClouDiA: A Deployment Advisor for Public Clouds

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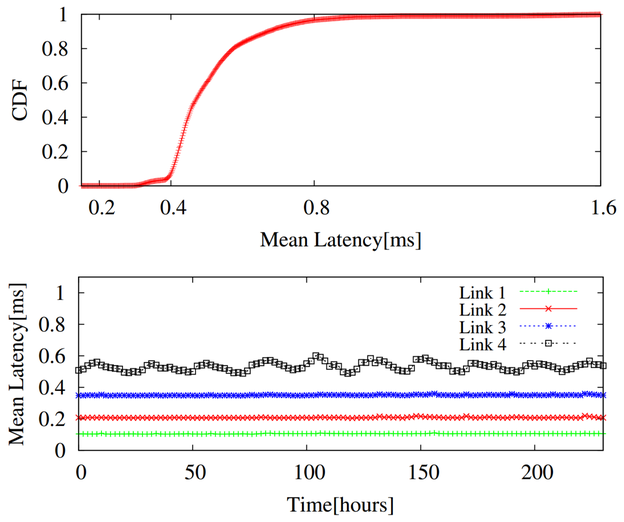
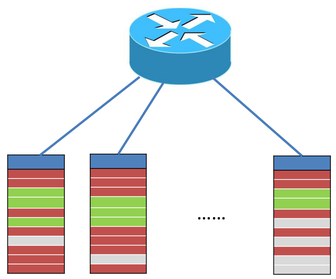
Heterogeneous Network Latencies in Public Clouds

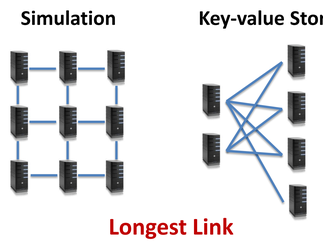


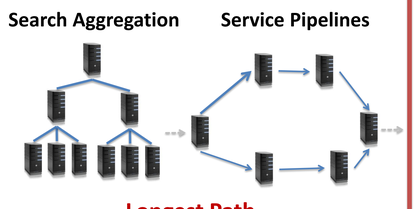
Physical Allocation vs. Logical Graph



Non-contiguous allocation

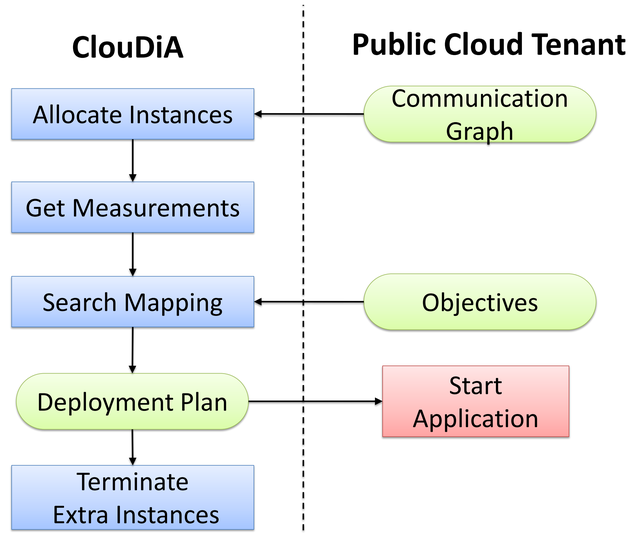
Heterogeneous pair-wise latencies





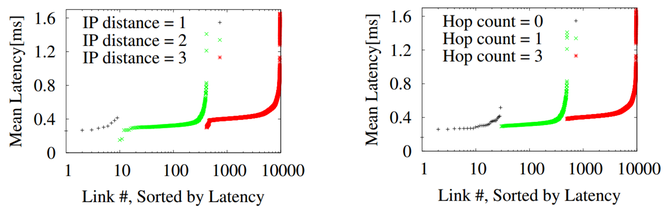
Challenge: How to create a
< logical graph, physical allocation> mapping
to minimize longest link (path)?

Architecture of ClouDiA

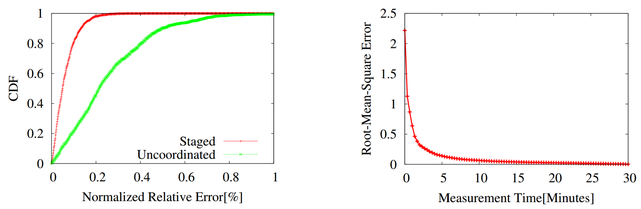


Measuring Network Distance

Approximations: IP Distance / Hop Count



Accurate Measuring: Uncoordinated / Staged



Search Mapping

Mixed-Integer Program and Constraint Programming for minimizing longest link

$$(MIP)\ \min c$$

$$s.t. \sum_{i \in V} x_{ij} = 1 \qquad \forall j \in S \quad (1)$$

$$\sum_{j \in S} x_{ij} = 1 \qquad \forall i \in V \quad (2)$$

$$c \geq C_{\mathcal{L}}(j,j')(x_{ij} + x_{i'j'} - 1) \qquad \forall (i,i') \in E, \forall j,j' \in S \quad (3)$$

$$x_{ij} \in \{0,1\} \qquad \forall i \in V, j \in S$$

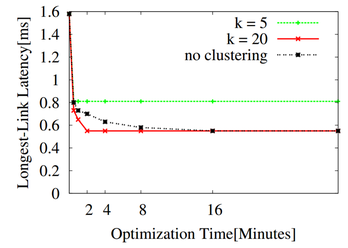
$$c \geq 0$$

$$(CP)\quad \texttt{alldifferent}\left((u_i)_{1 \leq i \leq |V|}\right)$$

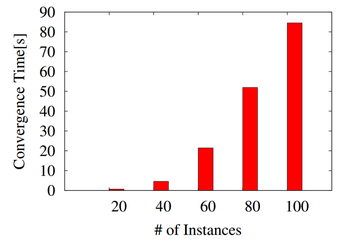
$$(u_i, u_{i'}) \neq (j,j') \qquad \forall (i,i') \in E, \forall (j,j') : C_{\mathcal{L}}(j,j') > c$$

$$u_i \in \{1,\ldots,|S|\} \qquad \forall 1 \leq i \leq |V|$$

CP convergence with k-means

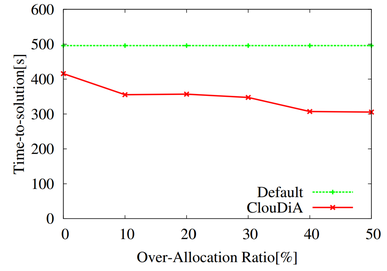


CP solver scalability



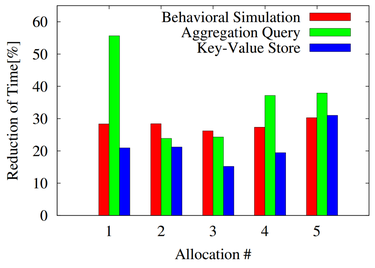
- IBM ILOG CP Optimizer
- Intel Core i7-2600 + 16GB RAM

Effect of Over-Allocation



- 100 instances + 10%-50% over-allocation
- Get Measurements + Search Mapping < 10 minutes

Overall Effectiveness



- 10% over-allocation