

Cicada: Introducing Predictive Guarantees for Cloud Networks

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24th November, 2015

Agenda

- Background
- Solution
 - Predictive guarantee
 - Cicada
- Evaluation
- Summary

Background



Motivation

- Network-bandwidth guarantee can improve predictability of application performance and cost in cloud environment
- But tenants usually do not know how much they want
 - leads to over-provisioning or under-provisioning

Challenge

- Time-varying bandwidth consumption
- Spatially inhomogeneous

Solution



Predictive guarantees

1) Predict

- a) based on traffic between VMs
- b) using an averaging interval

2) Offer

- a) offer bandwidth guarantee
- b) customers may choose to accept or reject

Advantage

- Simpler for the tenant
- Support temporal variation and spatial variation
- May support fine-grained (VM-to-VM directed path) guarantee

Cicada

1. Collect + Predict + Offer
2. VM placement

Architecture

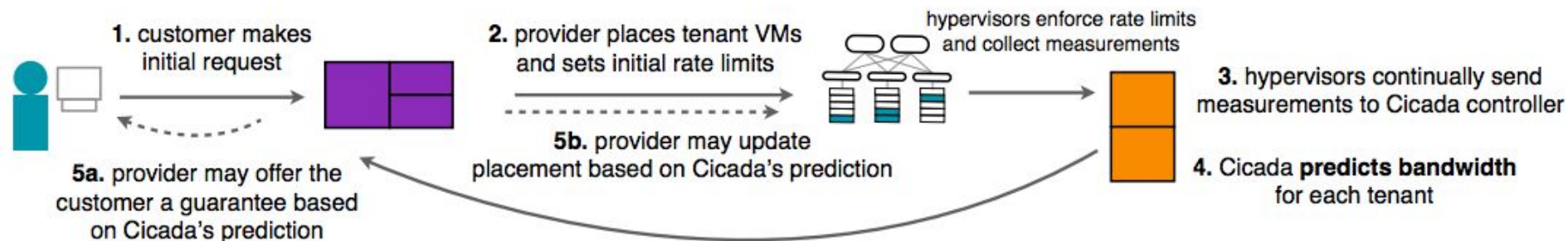


Figure 1: Cicada's architecture.

Prediction method

- Adapted Herbster and Warmuth's "tracking the best expert" idea
- Linear combination of all previously observed traffic matrices
- Weights are learnt in online fashion

Placement algorithm

- Greedy
 - place clusters on the smallest subtree
 - place the most-used VM pairs on the highest bandwidth paths

Data

- Six months of traffic data from an HP Cloud Services datacenter
- Collected from top-of-rack switches
- Captures VM-to-VM traffic patterns

Evaluation

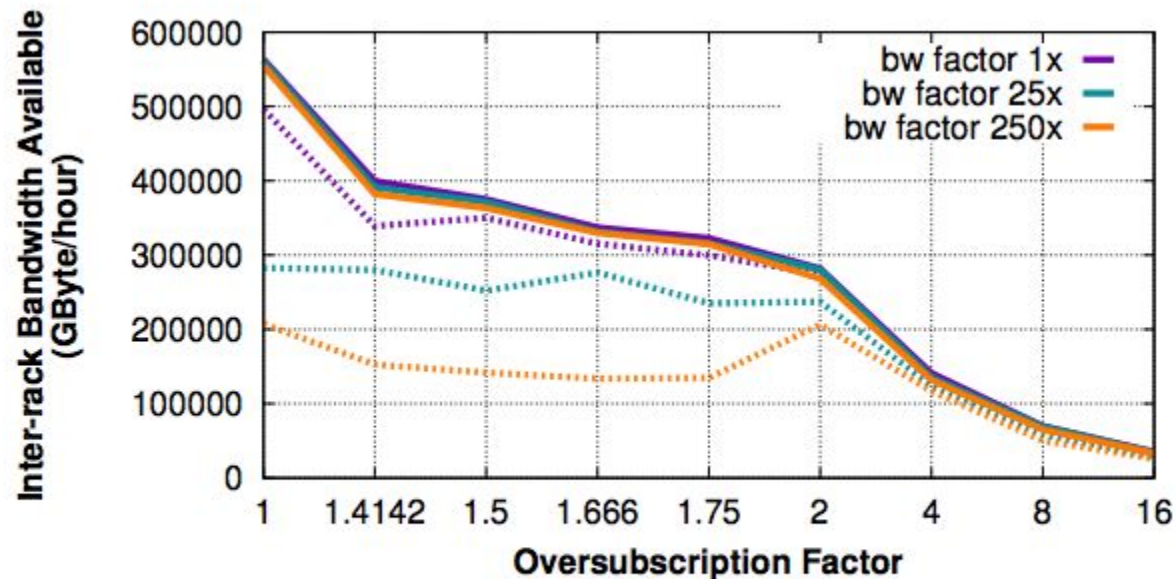


Figure 3: Inter-rack bandwidth available after placement.

Summary

- Cicada is different from existing works that it does not require the tenant to specify network demands up front
- Able to provide temporally- and spatially-varying guarantees

Critical Analysis

- Does it handle collocation of VMs (e.g. such that there's no traffic detected by Cicada)?
- Does it handle data traffic with SAN?
- Ignorant about CPU usage, memory, etc.
- Figures are not clear, very vague description