Advanced Internet Engg.
Paper Code:
(Grid and Active Network)

Presented by:
Kamesh Palanisamy
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Papers:

- Towards Efficient Resource on-Demand in Grid Computing.
- Combining Active and Passive Network Measurements to Build Scalable Monitoring Systems on the Grid.

Towards Efficient Resource on-Demand in Grid Computing

Kun Yang, Xin Guo, Alex Galis
University College London, UK.
Bo Yang, Dayou Liu
Jilin University, China.

ABSTRACT

To provide efficient Resource on Demand (RoD), by providing effective Quality of Service (QoS)

Introduction

- Grid Computing is characterized by large-scale resource sharing, innovation applications, under a widely connected network.
- Grids consists of computational systems, software, resources such as CPU cycles, massive storage or scientific instruments.
- Efficient RoD is the essence of Grids.

Background and Related Work

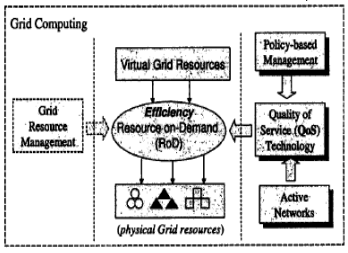


Figure 1: Efficient Resource on Demand in Grid Computing Environment

Efficient RoD

- **Quality of Service (QoS)**
  DiffServ, IntServ
- **Policy-based Management**
  Allows controlled elements to be scheduled (configured) on the fly
- **Active Network Technology**
  Delivery of the above management requirements
  Transforms store-and-forward to store-*compute*-and forward.

System Architecture

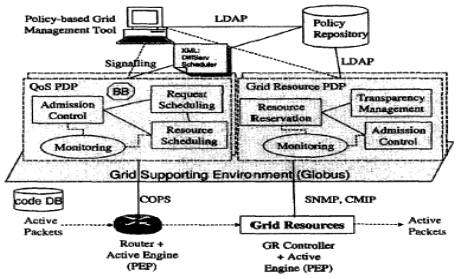


Figure 2: System Architecture for providing Efficient RoD

Components of PBM

- **Policy Management Tool**
  Where an administrator can create (define/edit/view) policies in a HLL.
- **Policy repository**
  Policies are stored as information objects in the form of LDAP (Lightweight Directory Access Protocol) directory.
- **Policy Decision Point (PDP)**
  Policy signaling information is sent here where it retrieves the policy and enforces it on the PEP.
- **Policy Enforcement Point (PEP)**
  PDP and PEP communicates via SNMP, CMIP or COPS transportation protocols.

ABLE Active Engine

- ABLE is an active network architecture that addresses Network Management Challenges
- Active Engine is attached to an IP router to form an Active node
- Deployment: mobile code is written in Java, encapsulated with data using ANEP (Active Network Encapsulation Protocol) headers over UDP

Active Networking Sequence in ABLE

- Java bytecodes, stored in the code database, is downloaded by QoS PDP to the PBM Station located in the ISP domain to which the Grid application connects.
- The Java class is encapsulated into ABLE packets and is sent to AN using reserved socket numbers.
- ABLE active engine then opens the file and writes the Java class to the active node.
- SessionManager is then invoked which forks the a loader for the JVM.
- Once the Java class is loaded it then starts to reconfigure the router to support QoS as instantiated by the Grid Application and the PBM system.

Experiment: Policy-based Active QoS

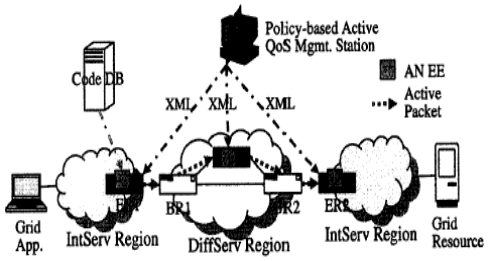


Figure 3: Active Grid QoS Scenario

Conclusions and Future Work

- Efficient Resource Management has been addressed from the Network Engineering point of view.
- PBM is used to enhance/modify the functionalities of QoS in a more flexible and automated way.
- Active Network is utilized for the fast delivery of various configurations and dynamic provisioning of functions (on-demand)

Pros & Cons of the Paper

Pros:

They tackle efficient RoD and QoS with the network standpoint

Give a holistic overview of the various components involved.

Cons:

Don't talk about the scalability issues.

Statistical data of the experiment and comparison with standard forms not given.

Combining Active and Passive Network Measurements to Build Scalable Monitoring Systems on the Grid

Bruce B. Lowekamp
College of William and Mary
Virginia, USA.

Abstract

- Understanding Network performance is crucial to achieve good performance in Grids.
- Costs of injects measurement traffic inorder to monitor network complicate the problem.
- It's a preliminary report on Wren project, for developing scalable solutions for network performance monitoring.
- Wren combines Active and Passive monitoring techniques without sacrificing measurement accuracy. Uses *topology steering* to reduce the number or measurements taken.

Network Monitoring Requirements

- **Portability:**
  Measurements of the same basic characteristic, such as available bandwidth, must be interchangeable.
- **Topology:**
  Measurement system should be aware of the topology to detect local bottlenecks for WAN connections, and shouel be able to predict contention for parallel connections.
- **Scalability:**
  Measurements should be scalable for both LAN and WAN connections.

Wren System

- The principal feature such as to scale from clusters to WAN is *topology-based steering*.
- By knowing where the bottlenecks are, we can steer active measurements to only those links that may cause bottlenecks.
- This reduces complexity of measuring the connections between nodes from N^2 to approximately log N
- Reduces measuring load further by combining passive and active components into one system.

Networking Requirements

- Components of application requirement:
  - Operation the application performs.
  - Environment in which it is run on.
- Three application classes we will consider:
  - Bulk Data Transfer
  - Interactive visualization
  - Optimistic Computation

Requirements for measurement

BULK DATA TRANSFERS:

- Measurements must all be of the same type.
- Any shared bottlenecks must be reflected.
- Measurements must be valid for the machines performing the transfer.

INTERACTIVE VISUALIZATION:

- Must deal with connection between the users as well as the performance within the parallel resources that are being used.
- Short term bandwidth is more important than long term for performance and adaptation.

OPTIMISTIC COMPUTATION:

- Messages exchanged are short but frequent.
- It requires bandwidth and latency information to adapt to its optimum thresholds.
- Different algorithms can be run for different topologies, thus such adaptation requires precise information about each cluster.

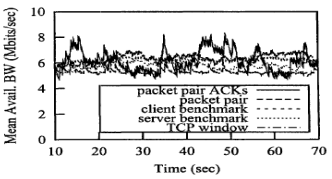
Summary of Applications

- Grid Applications have messages varying from Gigabytes to one packet.
- Timescales they care about vary from minutes to microseconds
- Systems vary from an Internet path to communications within clusters.

Thus Network Monitoring Systems for Grid applications must scale in all of the above dimensions just as the previously discussed applications do.

Combining Active and Passive Measurements

- Measurement Portability:



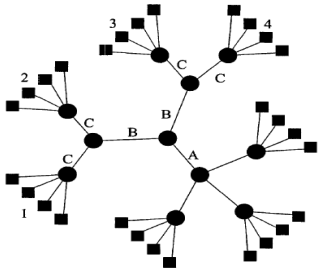
The correlation amongst the various techniques, for two hosts across a WAN exchanging data at full speeds, indicate that one can instrument the machines while the applications are running.

Topology-Based Steering

- Wren uses the knowledge of the topology to determine the best machines to use to take measurements.
- Detecting Topology

  Two approaches to characterizing topology are: ***Physical and functional.***
- Topology with Utilization
- Topology without Utilization

A Hypothetical Network Topology



Summary

- Wren project focuses using both active and passive measurements for scalability.
- Uses passive techniques for topology discover, utilization monitoring and traffic measurement.
- Using a small number of active probes, Wren will be able to achieve scalable measurements.

Upon completion Wren can be used as a standalone or a component to provide information to other systems.

Pros and Cons:

- **Pros:**
  Gives a good idea of the importance of network measurement especially in the Grid scenario.
  Explains the diversity of applications and its requirements well.
- **Cons:**
  Paper was very superficial.
  Does not explain underlying concepts very well.
  Lack of technical detail.
  Also the experimental results are not adequately cited.
  Language very confusing to understand.

Questions ?

- Questions:

1. Differentiate between IntServ and DiffServ.
2. What are the components in the Policy Based Management Components ?
3. What are the requirements of a good measuring tool ?
4. How can Active and Passive Measurements be combined to make network measurements efficient ?
5. What is Topology-Based Steering ?