SNMP and Web-based Load Cluster Management System

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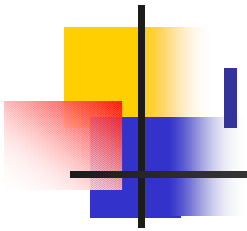
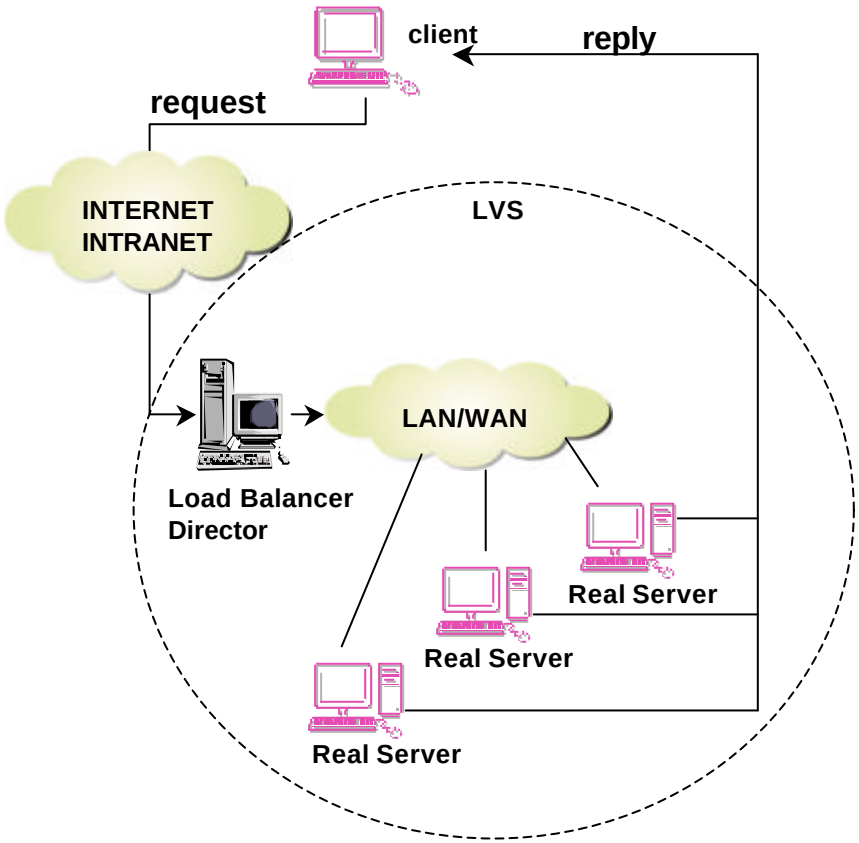


Introduction

- **Current problems with Internet services**
  - Explosive growth of the Internet and its users
  - Explosive increment in requests to popular Internet sites.
  - More powerful Internet server systems required
  - Cost effective solutions required
- **Advantages of Load Balancing**
  - Cost-effective solution
  - Good flexibility and extendibility
- **Load Balancing Types**
  - Dispatcher type: LVS, L4 switch
  - Parallel Filtering
  - Round-Robin DNS

Load Cluster System

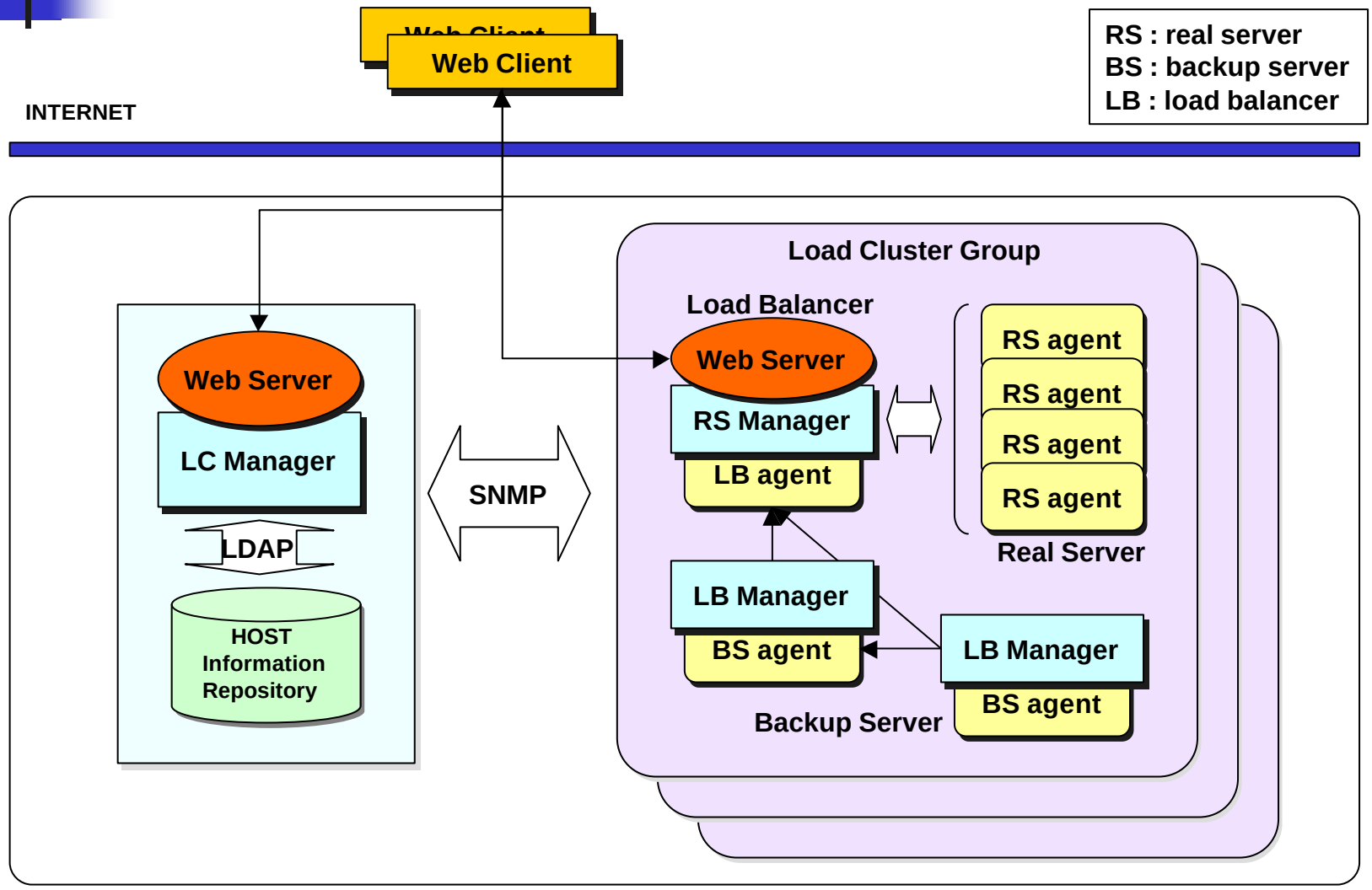


- **Linux Virtual Server (LVS) project**
- **LVS = Director + Real_Servers**
- **Single system image**
- **Single IP Address**
- **Director (Load Balancer)**
  - **New request** : looks for next server, creates an entry in a table pairing the client and server.
  - **Established connection**: passes request to appropriate server
  - **Terminate/timeout connection**: remove entries from table
- **Real Servers**
  - Real service provider
- **Connected by LAN or WAN**
- **Multiple servers appear as one single fast server**
- **network connection-based**

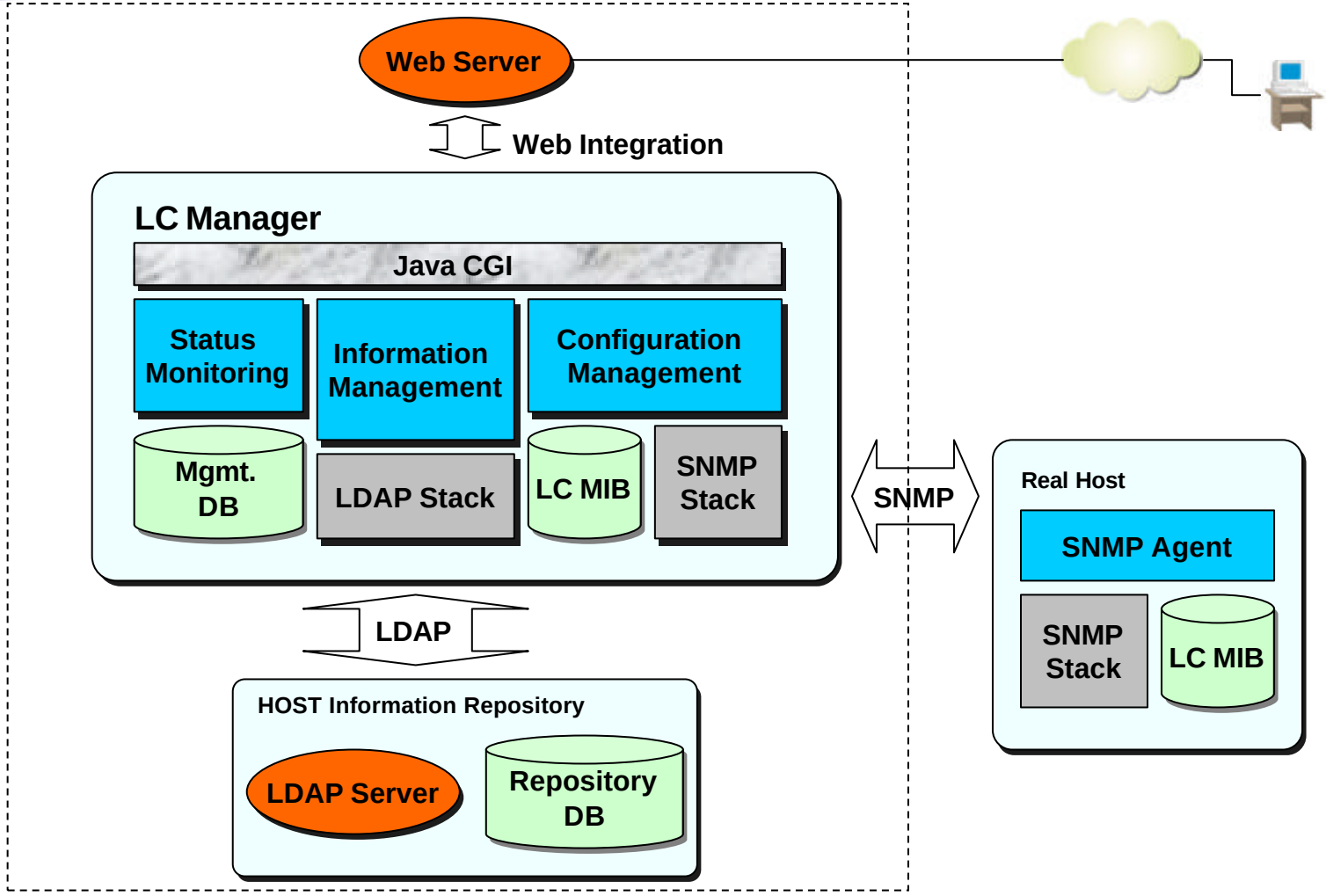
Requirements of Load Cluster Management System

- **Load Cluster Configuration**
  - Host Management
  - Cluster Group Management
- **High Availability**
  - Cluster Status Monitoring
  - Cluster Reconfiguration
- **Effective Manager Interface**
  - GUI-based User Interface
  - Visualized current status reporting
  - Manageability from INTERNET
- **Minimization of the Management Overhead**
  - Distribution of the management functionality
  - Reduce the network usage for LCMS

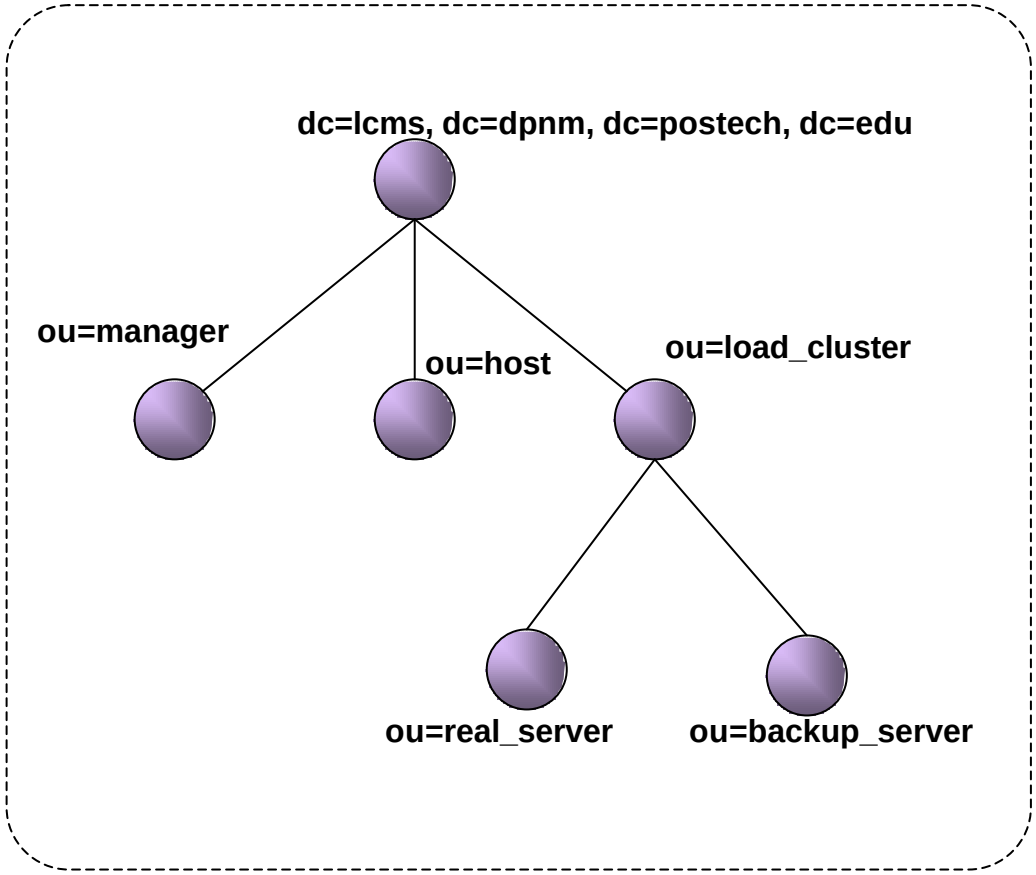
LCMS Architecture



LC Manager Architecture



Mgmt. Information Structure in LDAP



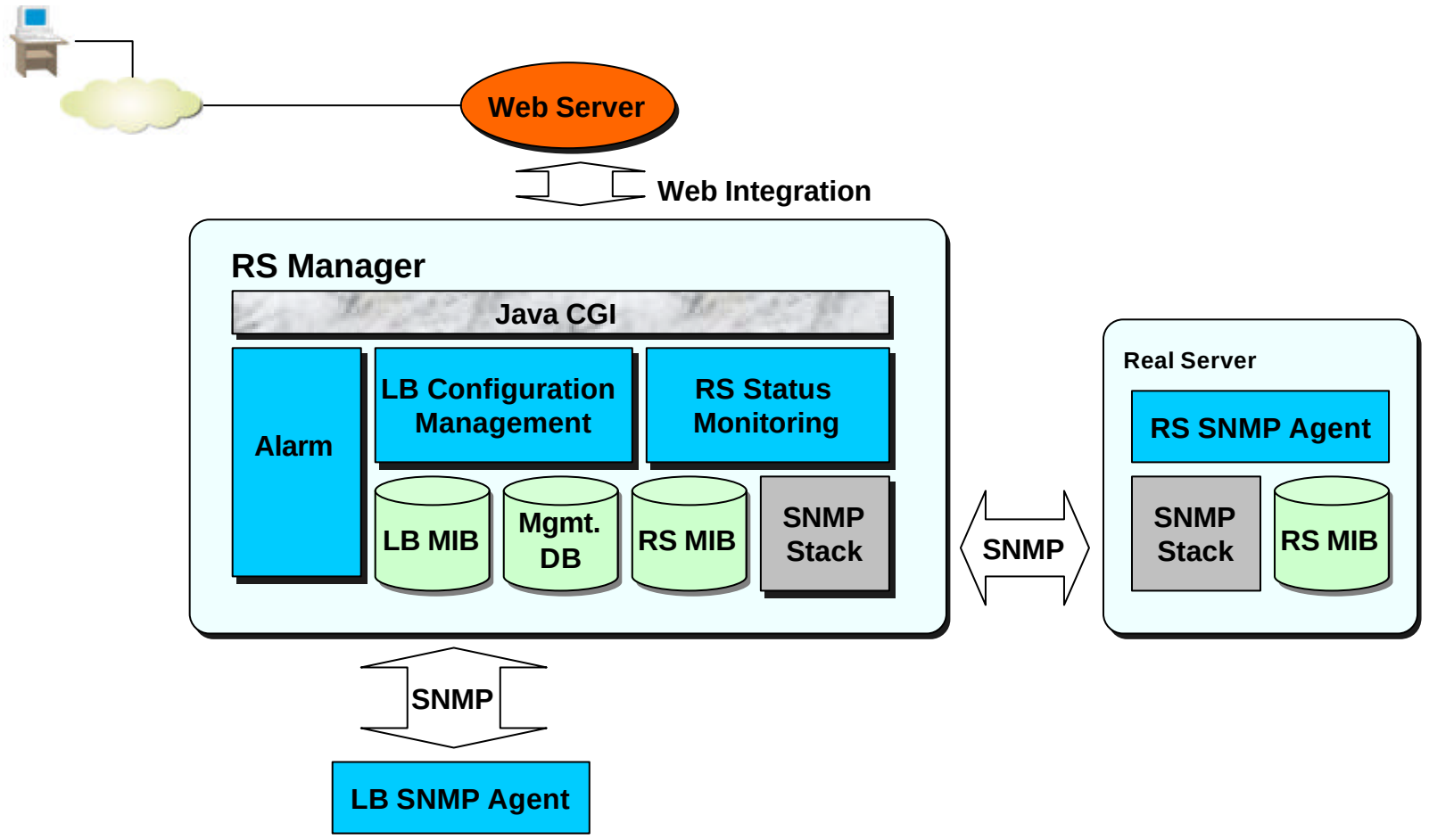
Directory Structure for LCMS Information Repository

Host Info
Host name CPU type Memory size Network Interface type IP address Role status Role potential

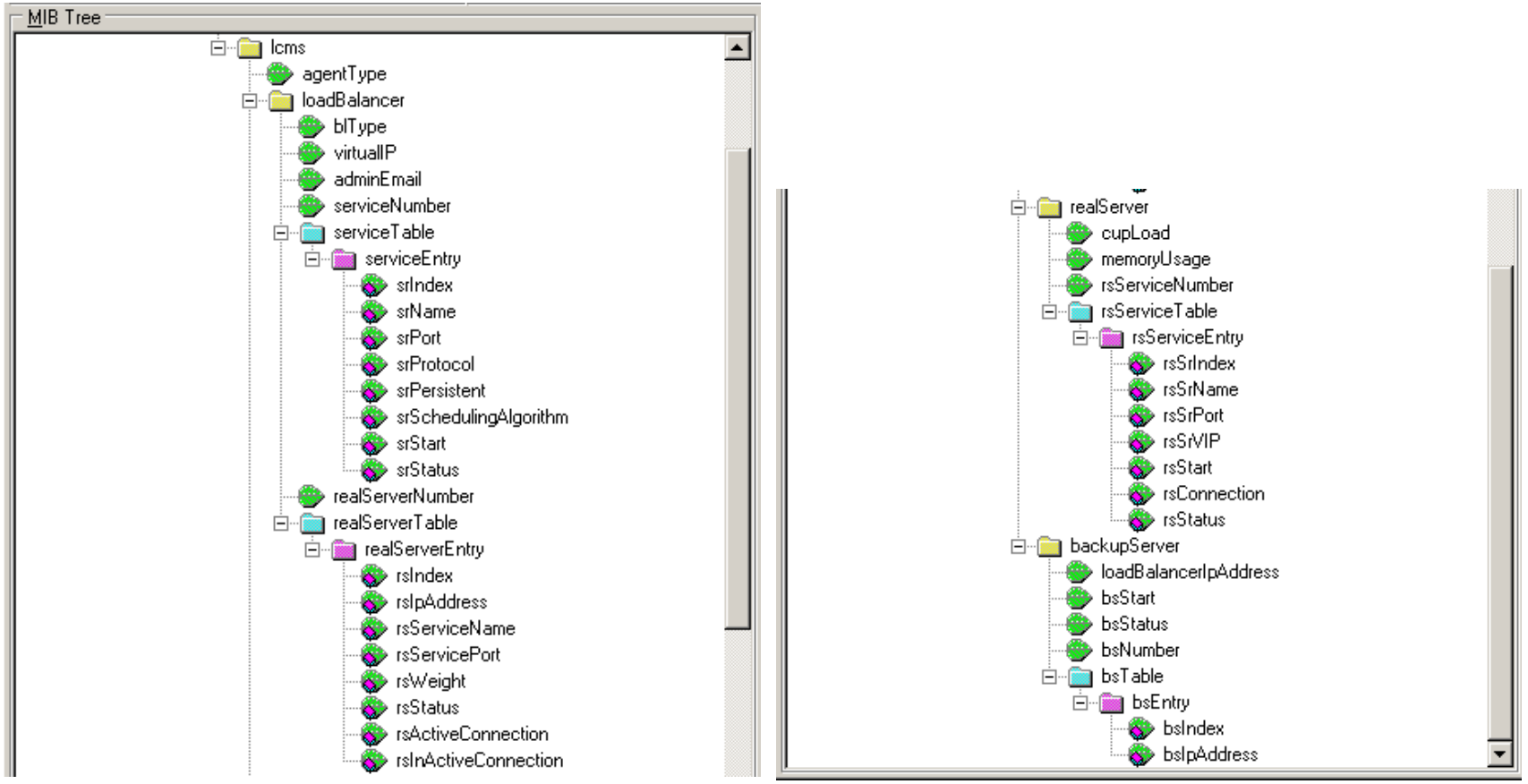
Load Cluster Info
Load Cluster ID Load Balancer IP Back Server IP's Real Server IP's Scheduling Algorithm Service type

Manager Info
Real Name User ID Password E-mail

RS Manager Architecture

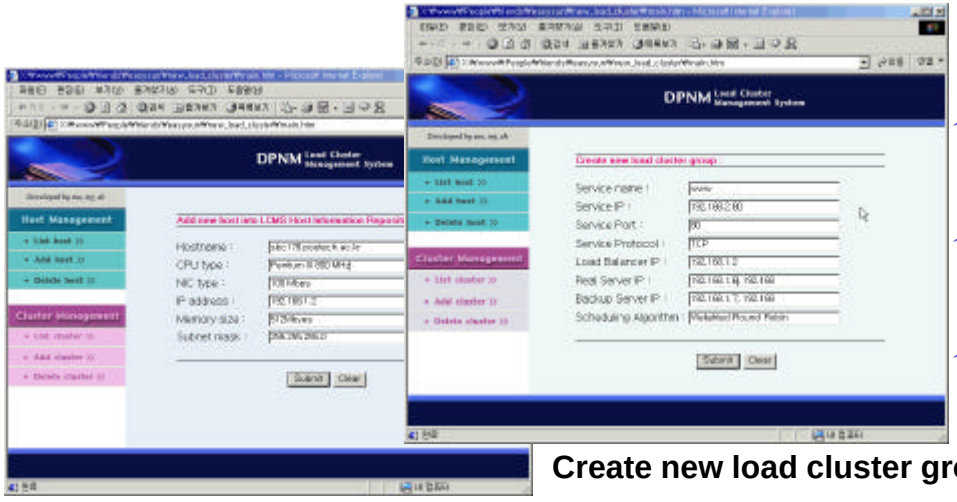


LCMS Agents


MIB Tree
lcms
agentType
loadBalancer
blType
virtualIP
adminEmail
serviceNumber
serviceTable
serviceEntry
srIndex
srName
srPort
srProtocol
srPersistent
srSchedulingAlgorithm
srStart
srStatus
realServerNumber
realServerTable
realServerEntry
rsIndex
rsIpAddress
rsServiceName
rsServicePort
rsWeight
rsStatus
rsActiveConnection
rsInActiveConnection
realServer
cupLoad
memoryUsage
rsServiceNumber
rsServiceTable
rsServiceEntry
rsSrIndex
rsSrName
rsSrPort
rsSrVIP
rsStart
rsConnection
rsStatus
backupServer
loadBalancerIpAddress
bsStart
bsStatus
bsNumber
bsTable
bsEntry
bsIndex
bsIpAddress

Implementation of LCMS

Streaming Service using LVS



Add new host to repository

Create new load cluster group

- **Operating System**
  - **Linux 2.2.18**
  - **Linux Virtual Server with RS type**
- **Streaming Service on Internet**
  - **Real media streaming Server**
  - **Apache for windows media format and quicktime format**
- **Host Information Repository**
  - **OpenLDAP 1.2.11**
  - **JNDI library in JAVA 1.3**
- **SNMP Library**
  - **joeSNMP library**
- **SNMP Agent**
  - **UCD-SNMP**
- **User Interface**
  - **Apache Web Server**
  - **JSP, Java Applet, Java Servlet**
  - **JDK 1.3**
  - **Tomcat 3.2.1 for JSP engine**

Summary & Future Work

- **SNMP & Web-based LCMS**
  - Provides distributed management architecture to reduce the management overhead
  - Can reduce network bandwidth using SNMP
  - Easy to use because of Web-based manager interface
  - High portability and scalability by using Java in Implementation
  - Efficient access control by using LDAP for user accounts
- **Future work**
  - Measure the exact work load of LCMS, and compare with other cluster management systems
  - Extend this system to other types of Load Cluster System
  - Apply the monitoring data such as CPU Load and Memory Usage to scheduling algorithm