ServiceControl Manager Overview

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About the Author

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1. Abstract

Data center personnel are responsible for managing multiple systems. The system administrator's goal is to improve the availability of systems and services, as well as to increase administration efficiency, and reduce costs. A primary cause of inefficiency, high cost, and low availability is system administrator error as well as system management accountability.

The goals of ServiceControl Manager are to gain efficiency and reduce system administrator error. The ServiceControl Manager accomplishes this by promoting consistency and organization across multiple systems. It gains efficiency by simultaneously operating across multiple systems and centralizing access to multiple systems. Finally, it securely manages multiple systems while leaving a management audit trail.

2. Introduction

Currently UNIX servers are assuming much of the workload traditionally reserved for the monolithic mainframe. The mainframe has a long and storied history. During that history it has acquired the necessary system management tools necessary to efficiently and effectively manage it. Unlike the historical mainframe, the UNIX environment typically has an abundance of UNIX servers. This necessitates employing a larger number of system administrators to manage this plethora of servers.

Hewlett Packard recognizes the need to consolidate both data center servers as well as system administration of these data center servers. HP also recognizes the *many hands* concept. That is multiple administrators must securely manage different portions of the data center servers. Thus, it is necessary to partition the administrative functions among administrators with varying degrees of expertise.

3. System Management Goals

System administration at its core has the goals of:

- Reducing the overhead associated with maintaining system configurations
- Keeping similar machines in like software configurations
- Reducing the time and effort experienced administrators must devote to repetitive tasks
- Maintaining application and OS stability via software upgrades
- Proactively detecting application and system problems

4. ServiceControl Capabilities

Hewlett Packard developed the ServiceControl Manager for HP9000 servers. Its goal is to significantly increase a system administrator's span of control. See Figure 1. The ServiceControl Manager (SCM) is the core of the product. The ServiceControl Manager is a WEB accessible centralized system management tool that enables effective management of HP-UX servers. The ServiceControl Manager implements multi-system management capabilities inherently designed to be highly efficient in simultaneously delegating management tasks to multiple HP-UX system administrators. The ServiceControl Manager assists the HP-UX administrator in accomplishing her goals by integrating a core set of HP-UX system management technologies. These technologies allow the system administrator to efficiently:

- ◇ Backup and restore servers
- ◇ Distribute software and software patches
- ◇ Monitor hardware and software
- ◇ Maintain server configurations.

HP also recognizes that system administrators have a significant investment in their own custom administration tools. Thus, it allows for the integration of these custom tools into the SCM. These custom tools can take advantage of all the benefits of the SCM integration just like the HP integrated tools.
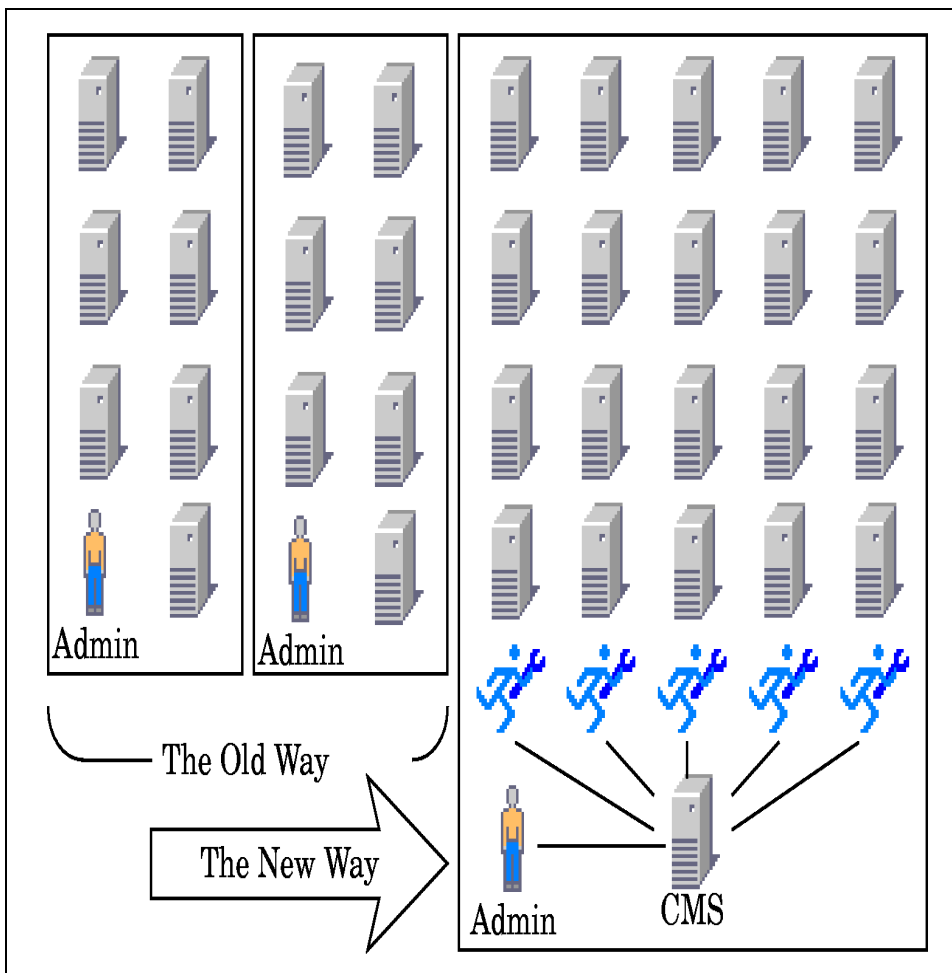
Figure 1. Multi-System Management Paradigm.

4.1. Centralized

ServiceControl consolidates access to the core services in a single product and on a single customer selected server. This single server is the focal point for multi-system management. The Central Management Server is WEB accessible and provides a consistent set of command line interfaces. The CMS is the focal point for distributing single system tasks to multiple HP-UX servers. Thus, it is the hub of the HP-UX management domain.

4.2. Multi-System

This multi-system paradigm allows the ServiceControl administrator to execute a single administrative task that has an affect on multiple HP-UX servers. This relieves both the inefficiency and tedium of applying changes to a plethora of systems and reduces the risk associated with incorrectly applying a change across multiple systems.

4.3. System Deployment and Recovery

Operating System deployment constitutes a large portion of a typical system administrator's repetitive task base. Quickly and efficiently deploying operating system images is a primary system administration goal. At the same time, the administrator wishes to minimize server down time. The ServiceControl Manager integrates the *Ignite-UX* product as a powerful tool for distributed installation of operating system images to multiple systems. Ignite-UX creates standard and reusable configurations. The system administrator deploys these to create consistent operating environments. Ignite-UX also provides a highly efficient mechanism to archive the operating system configuration of a system over the network. System administrators can then boot and restore the operating system state.

4.4. Multi-System Software Management

Another goal of a system administrator is to apply software updates to multiple systems from a single point of control. The ServiceControl product delivers a *push* software and patch capability. This allows the multi-system administrator to effectively manage software and patch distribution from a single focal point. The ServiceControl Manager integrates the software management capabilities of the HP-UX Software Distributor product.

4.5. System Configuration Management

ServiceControl Manager integrates the System Configuration Repository functionality. This allows the administrator to compare the hardware and software configurations of managed nodes and maintain them in a consistent state. The administrator can scan the management server domain periodically or dynamically to ensure its consistent state. The SCR focuses on efficiently solving two classes of system administration problems. The first occurs when a managed node does not appear to functioning as well as a similiarly-configured node. With SCR, the system administrator compares the two configurations to note differences. The second class of system administration problem occurs when a managed node suddenly stops functioning or is functioning incorrectly. With SCR, the system administrator then compares the current configuration state with the last known good configuration state.

4.6. Hardware and Software Fault Management

ServiceControl Manager includes Hewlett Packard's Event Monitoring Service (EMS). EMS is a system monitoring application designed to facilitate real-time monitoring and error detection for HP products in the ServiceControl environment. This framework provides centralized management of software, hardware devices, and system resources. It provides immediate notification of real or potential problems and system status. EMS receives data on unusual activity, adds information on the problem's source, and provides problem resolution recommendations.

EMS is a set of system and network monitors and a monitoring environment. This monitoring framework provides an easy-to-use interface and a mechanism for monitoring resources,

registering monitoring requests, and sending notification when resources reach user-defined values. EMS monitors have default preset threshold values. System administrators can reconfigure event-monitoring thresholds to their desired levels.

5. ServiceControl Manager Capabilities

5.1. Central Management Server

The ServiceControl Manager administrates a group of HP-UX servers. This paper refers to the domain either as a managed cluster or by the HP brand name HyperPlex. See Figure 2. The *managed nodes* can be *HyperPlex* nodes or part of a MC/ServiceGuard cluster. The ServiceControl Manager communicates with the managed nodes via local area networking. The HP-UX administrator designates one of these managed nodes as the Central Management Server.
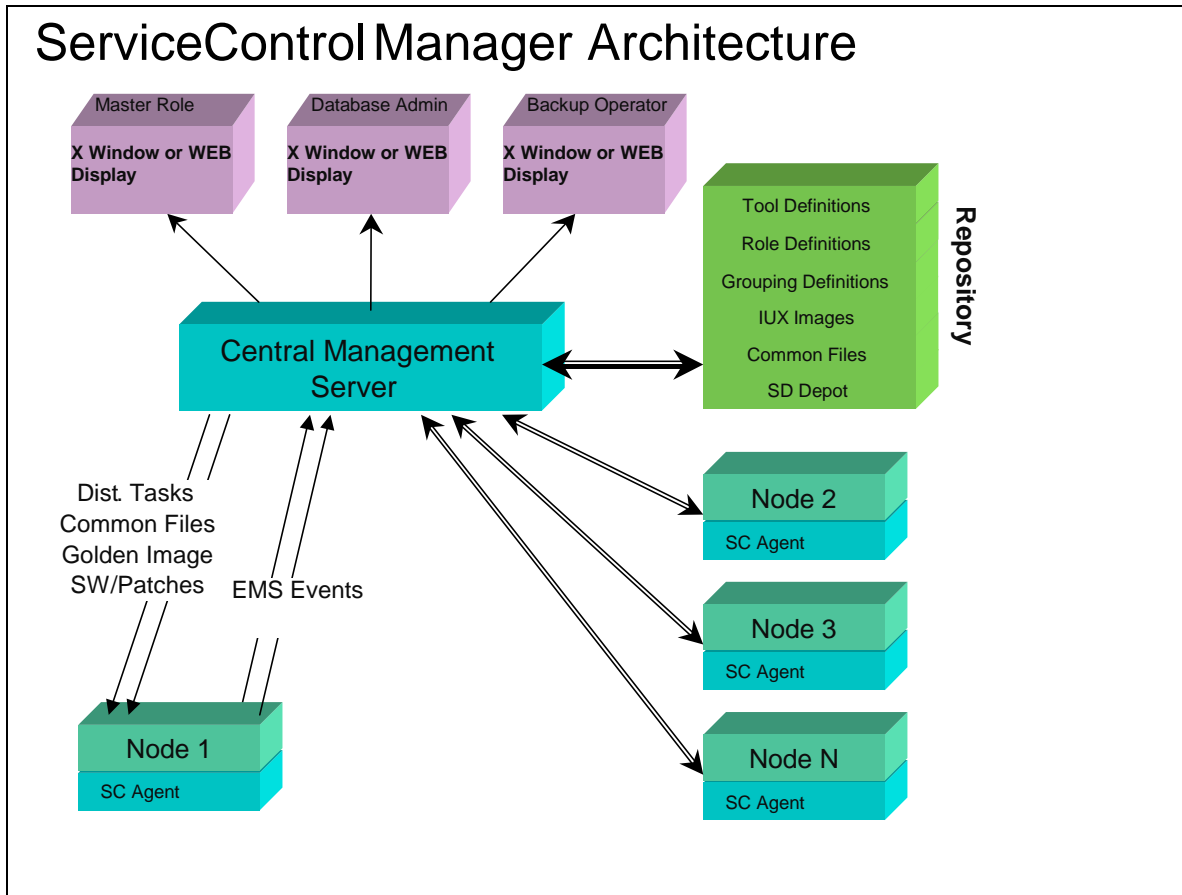

Figure 2. Central Management Server Architecture.

The Central Management Server houses the various management daemons necessary to effectively manage the newly created management domain.

SCM integrates *Ignite-UX* (IUX), a *push* capable *Software Distributor* (SD), the *System Configuration Repository* (SCR), and the *Event Monitoring Services* (EMS). In subsequent releases, SCM will tightly integrate additional HP system management products. The products will further enhance the multi-system management paradigm by providing integrated and centralized management of applications, security, and disk storage.

5.2. Managed Nodes

Each managed node executes a small footprint management agent that responds to administrative requests from the Central Management Server. Only the CMS initiates management tasks. The CMS is automatically a managed node. The ServiceControl administrator explicitly adds other managed nodes to the ServiceControl Cluster. If the ServiceControl administrator wishes to use the SD, SCR, and EMS capabilities then each managed node acquires an additional agent for these capabilities.

5.3. Node Groups

The ServiceControl node grouping facility provides the administrator the ability to arbitrarily group nodes for ease of administration. This facility allows for overlapping membership. Thus, one node group can cluster managed nodes by application server type and another can cluster managed nodes by operating system level. See Figure 3.
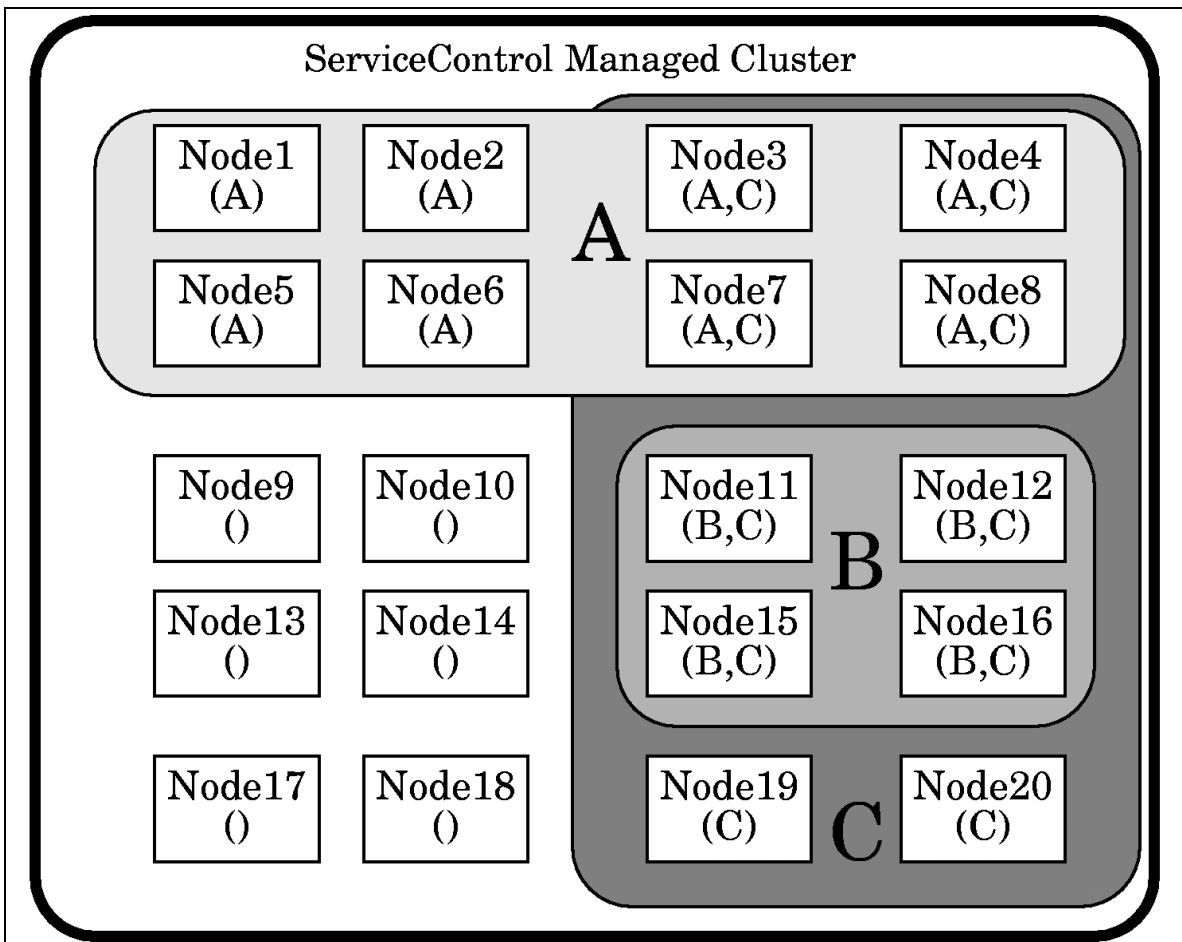

Figure 3. Node Grouping

5.4. Security

ServiceControl security is two-pronged. The ServiceControl Manager secures access to the managed nodes as well as access to the ServiceControl infrastructure itself. See Figure 4.
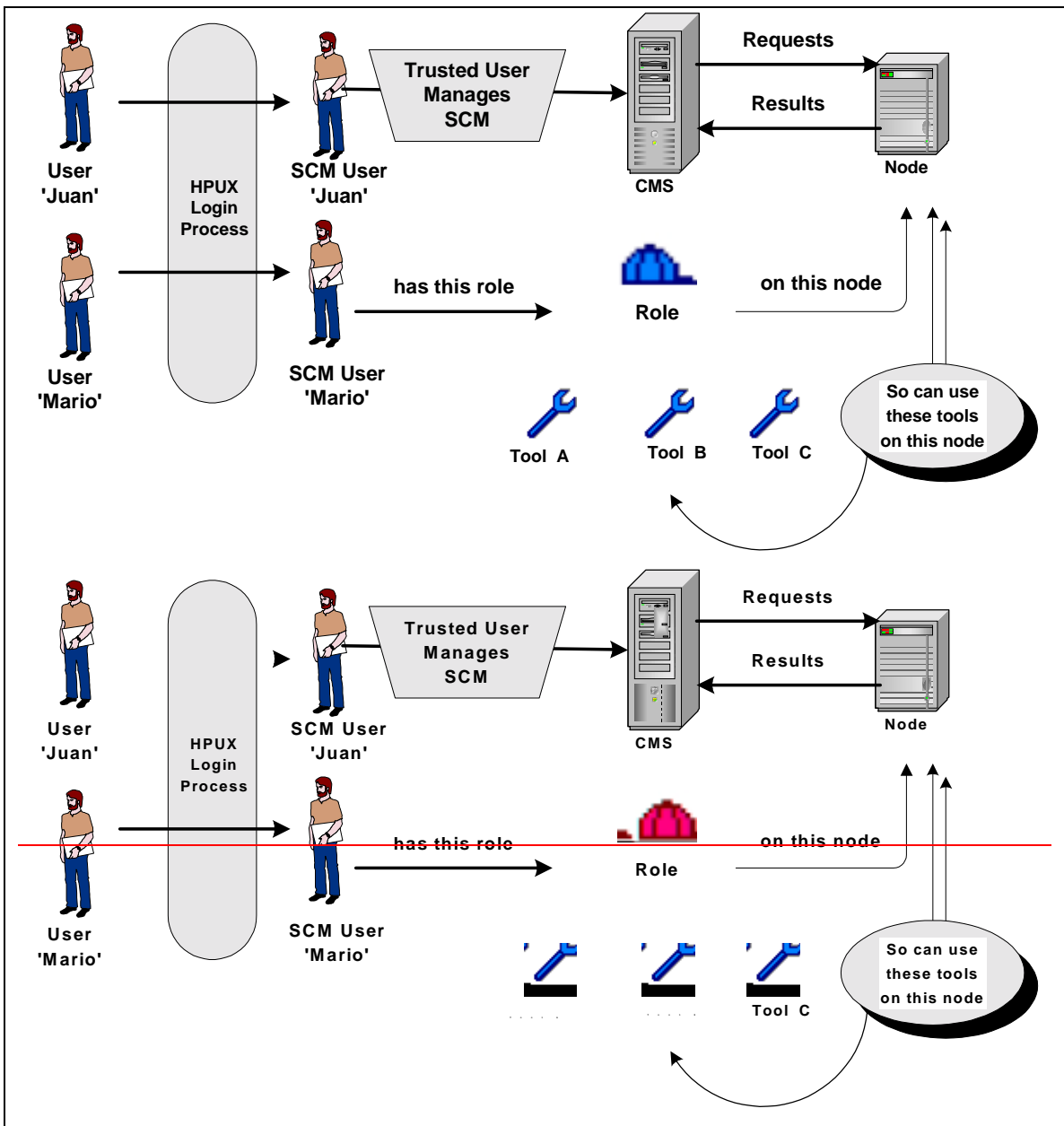
Figure 4. ServiceControl Manager Security.

5.4.1. Role Based

ServiceControl uses the standard HP-UX login as the basis of its ~~role-based~~role based security. The ServiceControl Manager tracks ServiceControl users. When setting up the CMS the installer identifies the initial ServiceControl user. It assumes that IT management reasonably controls access to the ServiceControl Management Server and the managed nodes via typical IT security practices. The administrator via ServiceControl assigns roles to users on specific managed nodes or node groups. This *user-role-node/node group* triplet is the basis of the ServiceControl authorization mechanism. See Figures ~~5~~5~~5~~ and 6. Notice that a single ServiceControl user can possess multiple roles ~~and~~ on different managed nodes as well as multiple roles on a single managed node.
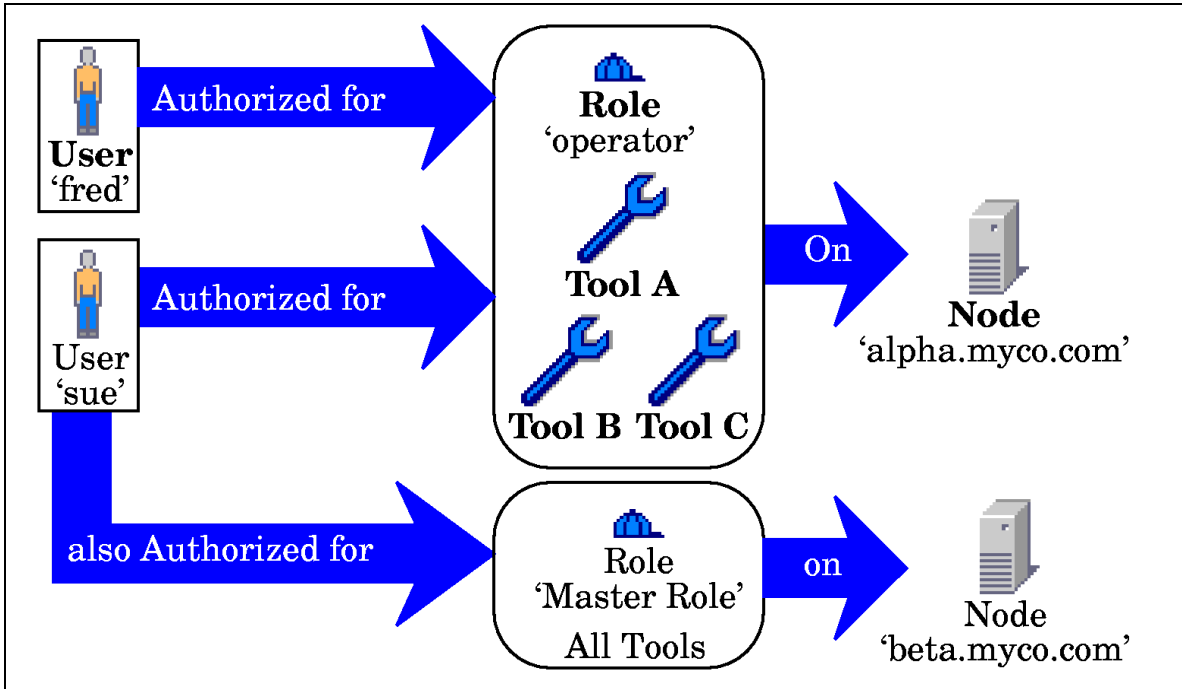

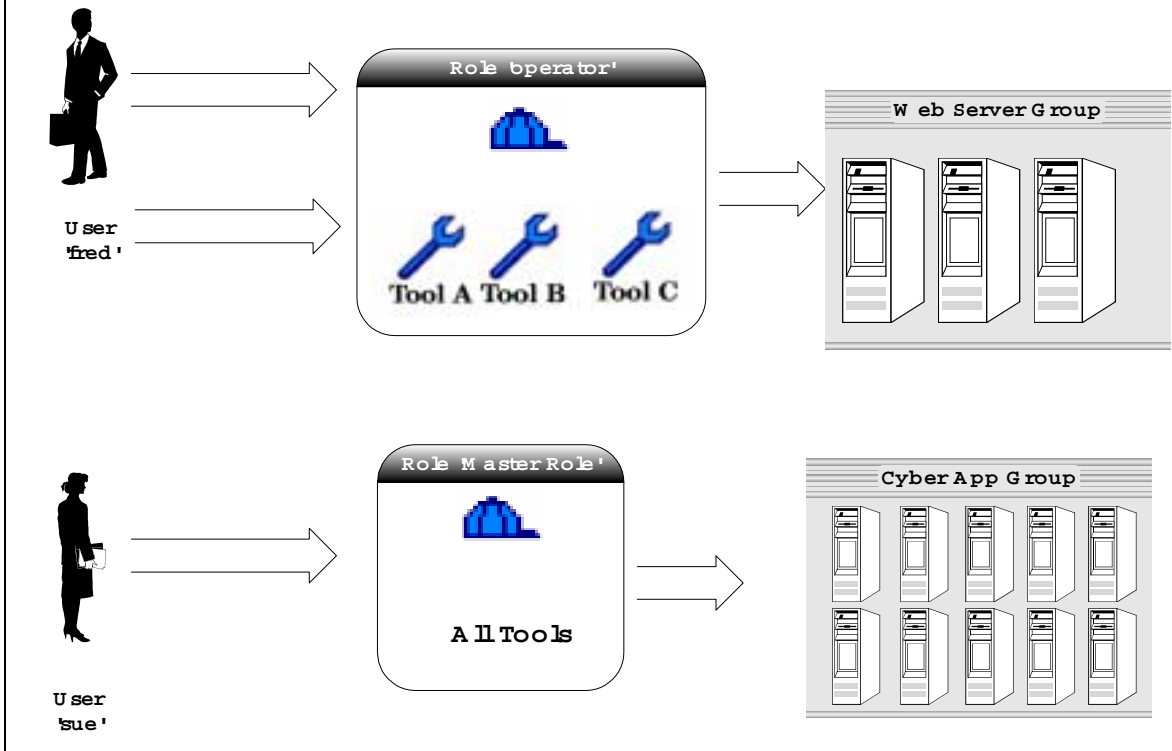Figure 5. Node Role Based Security.

Node Group Authorizations

Role 'operator'

Web Server Group

User
'fred'

Tool A Tool B Tool C

Role 'Master Role'

Cyber App Group

All Tools

User
'sue'

Figure 6. Node Group Role Based Security.

Figure 776 is is another way to visualize the ServiceControl Manager role based security model.

HP-UX Login	ServiceControl Role Name	ServiceControl Managed Node
fred	operator	alpha.myco.com
sue	operator	alpha.myco.com
sue	Master Role	beta.myco.com
fred	operator	Web Server Group
sue	Master Role	Cyber App Group

Figure 776. ServiceControl Authorization Triplets.

Figure 887 shows a view of ~~role-based~~role based authorizations using the Unified Modeling Language (UML). Note that an authorization forms a ternary relationship between a ServiceControl User, his/her role, and the ServiceControl managed node. Additionally, note that a tool can have one or many roles assigned to it. A ServiceControl trusted user ~~can~~could assign a role to zero or many tools.
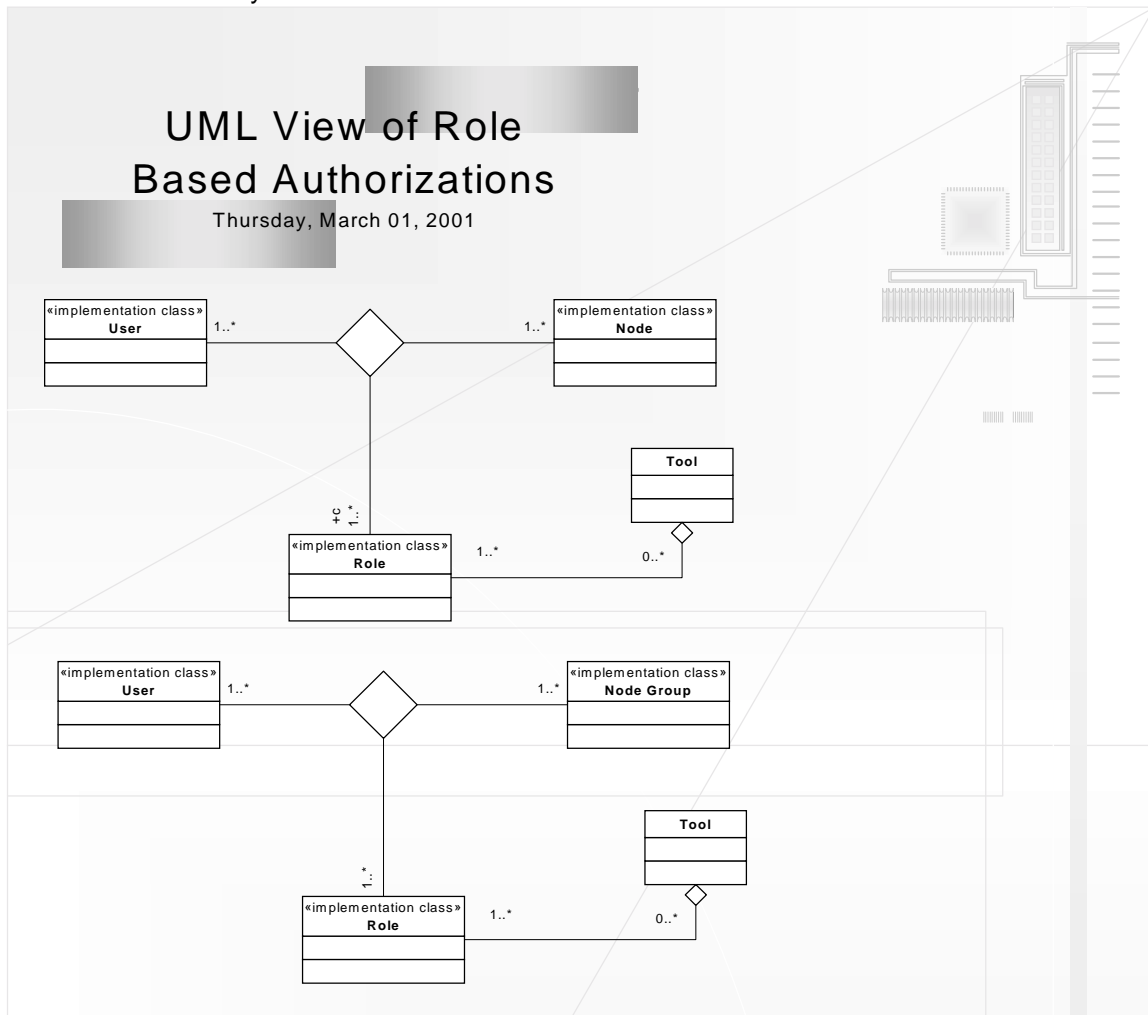

Figure 887. UML View of Role Based Authorizations.

In its current release ServiceControl Manager ships with the capability to define sixteen roles. Hewlett Packard predefines five of the roles as examples. ServiceControl trusted users may rename, redefine, disable, and enable all roles except the *Master Role*. Hewlett Packard recommends that SCM trusted users employ the *Master Role* as the most privileged role for the ServiceControl Cluster. The ServiceControl Manager places no special semantics on any of the role names. It is up to the SCM trusted user to apply the semantics. Thus, the ServiceControl Manager does nothing to prevent the anomalous situation where a trusted user assigns the predefined role *dbadmin* to the WEB administrator.

5.4.2. Server Security

During installation, the SCM not only identifies an initial ServiceControl user but it also tags the initial user with a special *trusted-user* attribute. This trusted-user status indicates that this ServiceControl user has special privileges within the ServiceControl Cluster. These privileges include the ability to:

- Add or remove a node to the ServiceControl Cluster
- Modify node group membership
- Create, modify, and remove user authorizations
- Modify any tool in the ServiceControl Cluster
- Modify ServiceControl roles

5.5. Distributed Task Facility

The Distributed Task Facility (DTF) is the core of the ServiceControl Manager. The DTF is responsible for executing management tasks on the managed nodes. It connects to the managed node agents in order to monitor and collect the results of the management tasks. These connections are two-way authenticated via an exchange of a private key signed message digest signature. The agent must assure itself that management requests originate from the CMS. Conversely, the CMS must assure itself that status reports originate from authenticated agents. The DTF uses the ServiceControl auditing capabilities to log the management task results. It also provides the ability to force the termination of any executing management tasks. See Figure 998.
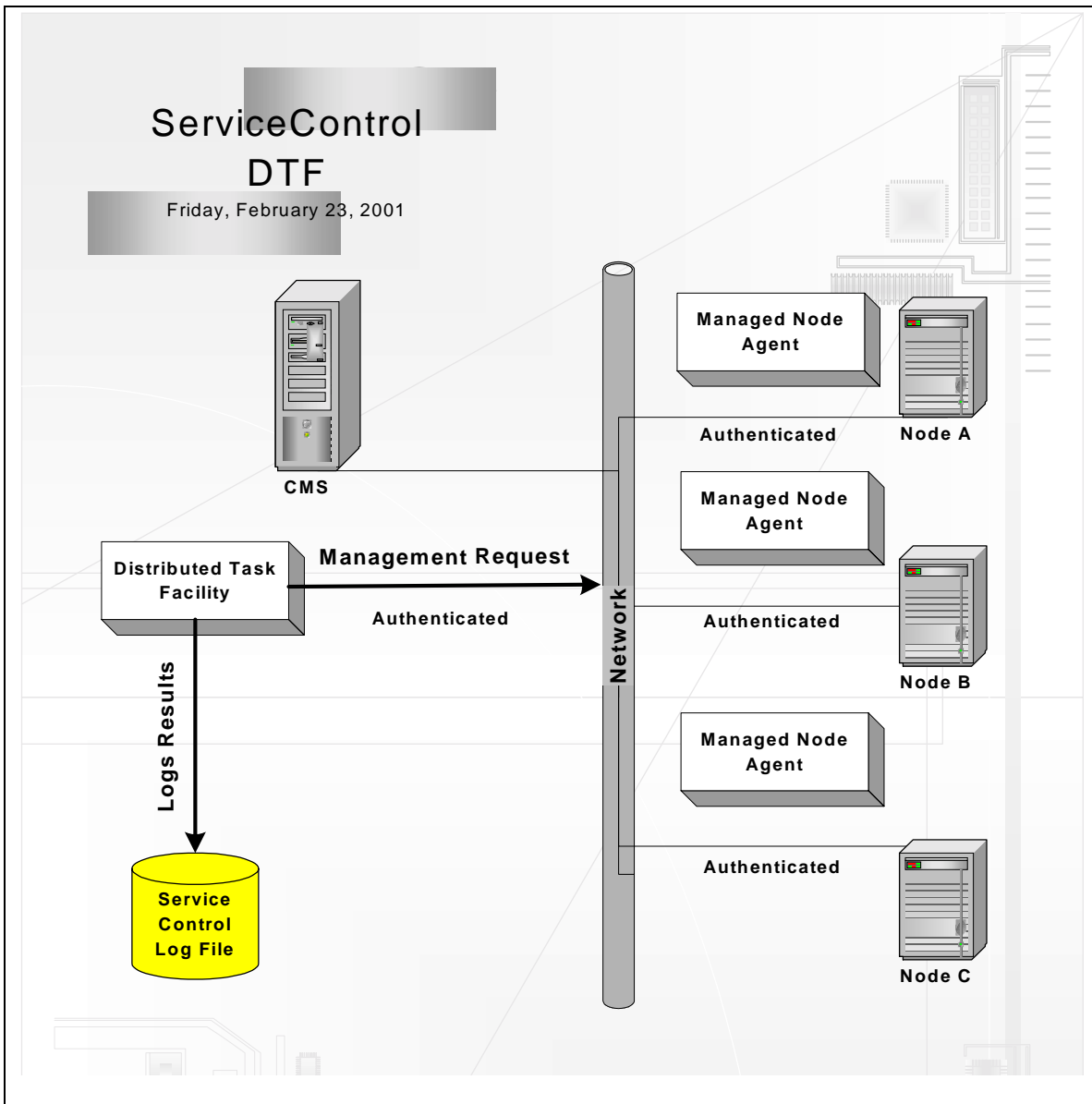

Figure 998. ServiceControl Distributed Task Facility.

5.6. Tools

ServiceControl tools are wrappers around applications, command line interfaces, or shell scripts. ServiceControl adds additional attributes to the tool abstraction in order to control execution via roles, modification via the owner field, and input parameters via dynamically provided input. Tools morph into tasks once all the following have occurred:

> ✧ The ServiceControl Manager authorizes a specific ServiceControl user to execute the tool on a specific set of nodes or a single node
> ✧ The administrator fully specifies the tool command line.

Tools also have an attribute list that consists of a set of role names. This list specifies the role that a ServiceControl user must possess on any node on which the user wishes to execute the tool.

5.7. Auditing

An integral part of the ServiceControl Manager functionality is the ability to record and maintain a history of management task results. This includes details such as:

- Users who initiated managed node configuration changes
- Task launch time
- Target nodes affected
- Results of task

ServiceControl Manager also tracks configuration changes to the ServiceControl Cluster. These include but are not limited to adding, modifying, and deleting:

- Users
- Nodes
- Node groups
- Tools
- Authorizations
- Modifying roles

The Service Control Manager also audits task execution events associated with running a tool. The details include:

- The identity of the user, who launched the task
- The task identifier
- The task start time
- The tool and command line arguments
- The list of target nodes
- The start time on a managed node
- Exceptions when running on a managed node
- The task exit code
- Associated *stdout* and *stderr*

6. Summary

The ServiceControl Manager provides an integrated solution for managing multiple HP-UX servers consistently and effectively. It improves the key metrics of availability, reduced costs, and the administrator to server ratio. It accomplishes these by providing the following features:

- ✧ Role Based Management
- ✧ Centralized Management
- ✧ Multi-system Management
- ✧ Backup and Restore Capability
- ✧ OS Deployment
- ✧ Asset and Change Management
- ✧ Software and Patch Management
- ✧ Fault Management
- ✧ Auditing
- ✧ Customer extensibility