The present invention relates to a utility computing environment involving dynamic management of features provided to users and the usage management in utility computing environment. The utility computing environment comprises of different components that provide computing to users, manage the usage and features requested by users and monitor and manage the different physical components in the environment. These components are spread over the three physical components in the environment, viz. a thin interface device at the users end, a server farm and the network that connects these two components.

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UTILITY COMPUTING DYNAMIC FEATURES MANAGEMENT

FIELD OF THE INVENTION

The present invention relates to a utility computing environment involving dynamic management of features provided to users and the usage management in utility computing environment. The utility computing environment comprises of different components that provide computing to users, manage the usage and features requested by users and monitor and manage the different physical components in the environment. These components are spread over the three physical components in the environment, viz. a thin interface device at the users end, a server farm and the network that connects these two components.

DESCRIPTION OF PRIOR ART

Currently, no design exist that covers dynamic delivery of features to a user end device and that manages the entire network. Also, there are no designs of a Utility Computing Management system with the complete management of the utility computing environment. Prior art devices are limited to the basic management and monitoring of Servers, Client and/or Network. They do not provide a single interface that allows user features to be configured dynamically or track usage of these features and applications. Also, current designs do not provide many remote features like Remote USB peripheral support, Remote microphone support, etc.

Prior art designs do not support feature management and are not capable of managing features dynamically. Usually, the client side devices come in with a preset features that can not be changed dynamically. Current designs do not support for enhanced features like:

a. Remote USB Peripheral - Users can not use many of the USB peripherals from their thin clients.

b. Remote Microphone support - Users can not use Voice over IP based applications, like Skype and Yahoo Messenger.
c. Encoded audio streaming from server to client - In the current scenario the raw audio data is passed from the server to client. Some operating systems do not provide forwarding of audio at all, in which case audio playback using media players are not possible. Usage of raw audio streams result in the choking of bandwidth in a network computer based environment.

Most of the prior art designs use a PC or a conventional thin client as the client side equipment. A conventional thin client does not posses the ability to support the features mentioned above. A PC can not be controlled in this manner at all. The PC has many independent features that make it unsuitable for the control and management required in a utility computing environment. As mentioned earlier, a utility computing environment has a number of physical and software components. There is no single window to manage and monitor all these components thus resulting in complexity and the need for multiple skills to manage the all the components in the network as mentioned above. There is also a dearth for utility computing environment manager.

While the prior art discloses various features management system, there is a significant need for an improved utility computing environment manager.

Whereby, it is desirable to provide a utility computing dynamic feature manager which will avoid the problems/disadvantages noted above and overcome other problems encountered in conventional methods. The objects, advantages and novel features of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the detailed description when taken in conjunction with the accompanying drawings.

OBJECTS OF THE INVENTION

Accordingly, the basic object of the present invention is to provide a utility computing dynamic feature manager that overcomes many of the disadvantages of the prior art devices.

It is another object of the present invention to provide for a utility computing dynamic feature manager wherein the components on the client, server and network would enable configuration of features required by users, dynamic deployment of features to the client
devices, monitoring and management of the clients and servers - Health of system and Utility Computing Management System.

It is another object of the present invention to provide for the utility computing dynamic feature manager which would deal with managing the entire utility computing network that consists of a network computer at the client end.

It is yet another object of the present invention to dynamically install, manage and monitor features and applications required by the customers.

It is another object of the present invention to provide the Client Device Manager which would be a component adapted such as to reside in the network computer and have the capability to decode audio-video streams like MPEG and MP3 with help of an embedded Digital Signal Processor, monitor the functioning of the network computer and have the capability of changing the system parameters of a network computer.

Yet further object of the present invention is directed to development of utility computing dynamic features management system which would be adapted to interact with the Utility Service Manager to install or uninstall new features and applications on the network computer and also favour keeping track of the network characteristics in its neighborhood.

It is yet another object of the present invention is to provide for the Server Manager which as a system component would monitor and manage the different servers in the utility computing environment, interact with the Utility Service Manager to install or uninstall new features and applications that are requested by customers and also keep track of the network characteristics in its neighborhood.

It is further the object of the present invention is to provide for the Information Consolidator which as a system component would generate reports of the system and preferably give customized reports using the different parameters that are collected from the servers, clients and network and further act as an interface that interacts with the
server, client and Utility Service Manager and further have a database manager adapted to interact with the database that stores all the collected data.

It is yet another object of the present invention wherein the Corrective-Preventive Action Manager as a component of the system would interact with the utility service manager to identify the types of corrective and preventive measures that should be followed in the utility computing environment.

It is yet another object of the present invention wherein the Commercial Service Manager deals as a component of the system will be adapted to carry out all the Customer Relation Management and Billing activities that the utility computing environment requires.

SUMMARY OF INVENTION

Thus according to the basic aspect of the present invention there is provided a utility computing dynamic feature management system comprising:

a thin interface client device comprising an embedded device or a network computer adapted to run at least one application;

said interface client device operatively connected to server farm and thereby adapted to provide complex user applications;

said server adapted for configuring desired features involving a utility service manager means in said device/network computer and also for dynamically managing of said features in said device/network computer; and

operative network means for desired communication there between said device and server for said utility computing.

Advantageously in the above system the Utility Service Manager means constitutes a core component of the utility computing environment adapted to interact with all the components to ensure that user gets all the requested features and the requisite Quality of Service. It interacts with all the above mentioned modules to achieve this goal. It also has a user interface component to gather the various user and administrator inputs. These are then stored in a database / data storage or are passed on to the relevant element in the environment.
Also, in the above utility computing dynamic feature management system said server is adapted to provide features and functionality required by the users and also manages the features requirement and other aspects of the complete environment.

Importantly, in the above utility computing dynamic feature management system the said interface device, server and network are adapted to selectively (a) Configure features required by users; (b) Dynamic deployment of features to the client devices (c) Monitoring and management of the clients and servers - Health of system; and (d) Utility Computing Management.

In accordance with an aspect in the utility computing dynamic feature management system the same comprises client device manager, server manager for monitoring and managing different servers in the utility computing environment, information consolidator, corrective-preventive action manager adapted to identify types of corrective and preventive measures operatively connected to said information consolidator, commercial service manager adapted for customer relational management and billing activities all of which interact with said utility service manager providing for installing or uninstalling desired new features and applications at the user terminals/network computers.

In the above utility computing dynamic feature management system the said client device management means is provided in said network computer and is adapted to (i) decode audio-video streams involving embedded digital signal processor (ii) monitoring the functioning of the network computer and network characteristics (iii) changing the system parameters of a network computer and interacting with the utility service management unit to install or uninstall new features and applications in the network computer.

In the utility computing dynamic feature management system the said information consolidator comprises means to generate reports of the system and has interfaces to interact with the server, client and utility service manager and includes a database manager adapted to interact with the database storing all data.
According to an aspect in the utility computing dynamic feature management system the said client device manager comprises utility interface means to exchange commands and responses with utility service manager, means to track vital statistics of a network computer and communicating to utility service manager periodically and monitoring and managing configurable parameters of the network computer including network parameters, USB peripherals, resolution and depth used, computing server details and video server details, feature manager and driver including for remote microphone, remote USB devices and encoded audio streaming, server interface applications, DSP controller and network manager.

According to yet another aspect in the said utility computing dynamic feature management system the said server manager comprises utility manager interface means to exchange commands and responses with utility service manager, server monitor and manager means adapted to track vital statistics and inform periodically including managing different configurable parameters of the server including network parameters, terminal licenses, users, feature managers and driver, client interface and network manager.

A further aspect of the utility computing dynamic feature management system of the invention involves the said utility service manager comprising of user interface layer adapted to obtain inputs from the administrator and other users of the utility system and forward to action manager, action manager adapted to receive inputs from the interface layer and either store the information in database/storage or pass the information to the appropriate component of the utility network, interface manger, database & storage manager.

The said information consolidator used in the system comprises means for collecting information from the client and server and also about the network status through said utility service manager, report generator means and report customization means.

It is thus possible by way of the above system to avoid one or more of the problems of the conventional prior art. Thus the above system enables a thin interface device which is
an embedded device or network computer that is at best capable of running one or two
applications to connects to a server farm to provide the complex applications required by
the user. The features in the network computer are configurable and are dynamically
managed by the server. The server consists of two components. One component provides
the features and functionality required by the users. The other component manages the
features requirements and the other aspects of the complete environment. The network
includes the physical network and the protocols that the client and servers use to
communicate with each other.

Accordingly, the present system would serve to provide a utility computing dynamic
feature manager that overcomes many of the disadvantages of the prior art devices.

Also the system would provide for a utility computing dynamic feature manager wherein
the components on the client, server and network allow (i) Configuration of features
required by users (ii) Dynamic deployment of features to the client devices (iii)
Monitoring and management of the clients and servers - Health of system and (iv) Utility
Computing Management System.

The details for the invention, its object and advantages are explained hereunder in greater
details in relation to non-limiting exemplary illustration as per the accompanying figures
as detailed hereunder:

BRIEF DESCRIPTION OF THE DRAWINGS

So that the manner in which the features, advantages and objects of the invention, as well
as others which will become apparent, may be understood in more detail, more particular
description of the invention briefly summarized above may be had by reference to the
embodiment thereof which is illustrated in the appended drawings, which form a part of
this specification. It is to be noted, however, that the drawings illustrate only a preferred
embodiment of the invention and is therefore not to be considered limiting of the
invention's scope as it may admit to other equally effective embodiments.

Fig 1: Illustrates the Architecture for Utility Computing Management System.
Fig 2: Illustrates the Architecture of how remote microphone and USB stick functioning

Fig 3: Illustrates the Architecture of Feature Request functioning

Reference is first invited to accompanying figure 1 which illustrates the system of the invention according to an embodiment. As apparent from said figure the system according to this embodiment involves the Utility Computing Management System comprising the following (a) Client Device Manager (b) Server Manager (c) Information Consolidator (d) Corrective-Preventive Action Manager (e) Commercial Service Manager and (f) Utility Service Manager.

More specifically as further apparent from the figure, the Client Device Manager comprises of the following components and functionality of all such components is as described:

Utility Manager Interface - The Utility Manager Interface exchanges commands and response with the Utility Service Manager. Based on the commands this component receives, it will invoke one of the components described below. The commands belong to one of the following categories.

Monitoring - Request to the network computer to monitor a set of values at periodic intervals.

Management - Request to change certain characteristics of the network computer. For example, change the network parameters of the network computer.

Feature or application related - Install, uninstall or reinstall new features or applications.

Client Monitor & Manager - This component keeps track of the vital statistics of a network computer and informs the same to the Utility Service Manager periodically. The tracking includes the internal status of the processor, the network statistic of the client and peripheral status of the network computer. The Client Manager component manages the different configurable parameters of the network computer.
These include:

Network parameters - IP address and related parameters, like DHCP DNS and Gateway settings.

USB peripherals - Enable and disable different USB ports and different types of USB devices. For example, USB Mass Storage Devices might be disabled in certain setups.

Resolution and depth used
Computing server details
Video server details

Feature Manager & Driver - The network computer environment supports many new features that are not supported by a thin client based environment.

The primary features are as described below.

Remote Microphone - The user can use a microphone from the network computer and use it for VoIP applications on the server. The microphone driver captures the data from the microphone on the network computer. The driver then passes this data to the network driver, which sends it over to the server. The server contains a modified microphone driver or daemon, which gets the data from the network and passes it to any requesting application in the user's application execution space.

Remote USB devices - The USB driver capture the USB data and pass it over the network to the server. The modified USB driver or daemon on server takes the USB data from the network and processes it according to the type of device. The advantage in this case is that individual USB drivers need not be ported to the network computer.

Encoded audio streaming - In the current thin client based networks, audio is streamed from the server to the client as raw stream. The audio (speaker) driver or daemon on the server is modified to take the audio stream and encode it using any of the available schemes like MP3. The driver then passes the data to the client through the interconnecting network. The client sends the data to the embedded DSP for decoding and playback.
The foregoing mentioned features and many other features might not be available to the users by default. The users might acquire these features dynamically. When this happens, the Utility Service Manager sends the relevant applications, drivers and utilities to the network computer for installation. Subsequent to this installation, the feature is available to the user. Similarly, the feature can be uninstalled or updated based on user input. The network computer receives the feature related commands and data from the Utility Service Manager through the Utility Manager Interface.

Server Interface & Applications - These are thin applications and interfaces to the components on server that run on the network computer to achieve user's computing needs. These are installed and maintained based on the commands from the Utility Service Manager.

DSP Controller - The network computers in this invention contain a DSP to decode the different audio-video formats like MPEG and MP3. The Utility Service Manager controls the audio-video codec that the network computer supports.

Network Manager - This component collects data on the network status of the network computer and its immediate neighborhood. This data is then transferred to the Utility Service Manager.

It is yet another object of the invention wherein the Server Manager consists of the following components and functionality of all such components is as described:

Utility Manager Interface - The functionality of this component is the same as the Client Device Manager.

Server Monitor & Manager - This component keeps track of the vital statistics of a server and informs the same to the server periodically. The tracking includes the internal status of the server (CPU, RAM, etc.), the network statistic of the server and many other relevant statistics of the server. The Server Manager component manages the different configurable parameters of the server, like network parameters, terminal licenses, users, etc.
5 Feature Manager and Driver - The functioning of this component is similar to the one mentioned in the Client Manager Section above.

Client Interface - These are interfaces to a few components on client that require a communication channel with the server to achieve their functionality. These are installed and maintained based on the command from the Utility Service Manager.

Network Manager - This component collects data on the network status of the server and its immediate neighborhood. This data is then transferred to the Utility Service Manager.

It is yet another object of the invention wherein the Utility Service Manager consists of the following components and functionality of all such components is as described:

User Interface Layer - The User Interface Layer gets the inputs from the administrator and other users of the Utility Management System and passes it to the action manager for further processing. This is the one point interface for all the components in the Utility Management System.

Action Manager - The Action Manager gets the user input from the interface layer and takes one of the following actions.

Store the information in database / storage - Typically information like all the available features and applications for the various systems in the network is stored for later use.

Pass the information to the appropriate component of the Utility network - The information is passed on to the Interface Manager, which contacts the appropriate control system in the Utility Computing Network to achieve the request.

Interface Manager - The Interface Manager exchanges the commands based on the administrator / user inputs to the individual components. This component interacts with Utility Manager Interface in each of the components, which further direct the command to the appropriate module.

Database & Storage Manager - Stores information regarding the various components in the Utility Management System in the database. Application and feature installation are stored in the appropriate location (for example, hard disk, tapes, etc.).
It is yet another object of the invention wherein the Information Consolidator consists of the following components and functionality of all such components is as described:

Collection Agents - The Collection Agents collect information from the Client and Server about their status and also the network status. This data is then stored in the database for report generation. The fields that have to be collected are defined by the administrators. This information flows into this component from the Utility Service Manager.

Report Generator - This component generates the reports based on the data collected from the individual components of the system. The reports of interest are defined by the administrators of the system through the Utility Service Manager.

Report Customization Agent - This component lets customizations of the collected data and reports. It interacts with the Utility Service Manager for its inputs.

It is another object of the present invention to wherein the utility computing dynamic feature manager deals with managing the entire utility computing network that consists of a network computer at the client end.

Accompanying figures 2 and 3 illustrate some exemplary forms of interaction selectively present between the server, network computer and utility service manager directed to achieve the utility computing dynamic feature management in accordance with the present invention.

It is possible by way of the present invention to dynamically install, manage and monitor features and applications required by the customers.

Advantageously, the Client Device Manager is a component that resides in the network computer, which has the capability to decode audio-video streams like MPEG and MP3 with help of an embedded Digital Signal Processor. It monitors the functioning of the network computer. It also has the capability of changing the system parameters of a network computer. This component interacts with the Utility Service Manager to install or uninstall new features and applications on the network computer. This component also keeps track of the network characteristics in its neighborhood.
The Server Manager is a component that monitors and manages the different servers in the utility computing environment. This component interacts with the Utility Service Manager to install or uninstall new features and applications that are requested by customers. The Server Manager also keeps track of the network characteristics in its neighborhood.

The Information Consolidator is a component that generates reports of the system. The administrators of the system can get customized report using the different parameters that are collected from the servers, clients and network. This component has interfaces that interact with the server, client and Utility Service Manager. It also has a database manager used to interact with the database that stores all the collected data.

The Corrective-Preventive Action Manager is a component which interacts with the utility service manager to identify the types of corrective and preventive measures that should be followed in the utility computing environment. It takes actions based on the data collected by the Information Consolidator.

Commercial Service Manager is adapted to deal with all the Customer Relation Management and Billing activities that the utility computing environment requires. This module interacts with the Utility Service Manager to provide to enable a single interface for the entire utility computing environment.

Importantly as clearly apparent from the above, the Utility Service Manager is the core component of the utility computing environment that interacts with all the components to ensure that user gets all the requested features and the requisite Quality of Service. It interacts with all the above mentioned modules to achieve this goal. It also has a user interface component to gather the various user and administrator inputs. These are then stored in a database / data storage or are passed on to the relevant element in the environment.

It is thus possible by way of the above-disclosed system of the invention to favour providing possible dynamic management of features to users and the usage management in utility computing environment. The system of the invention would thus favour
dynamic delivery of features to a user end device and manage the entire network. Importantly also the system would enable utility computing management system with the complete management of the utility computing environment and serve as the much desired single interface which would allow user features to be configured dynamically or track usage of these features and applications. Moreover, it would now be possible to provide remote features like Remote USB peripherals support, Remote microphone support etc. and encoded audio streaming from server to client and would serve as a significant advancement in the utility computing environment.
We Claim:

1. A utility computing dynamic feature management system comprising:
   a thin interface client device comprising an embedded device or a network
   computer adapted to run at least one application;
   said interface client device operatively connected to a server farm and thereby
   adapted to provide complex user applications;
   said server adapted for configuring desired features involving utility service
   manager means in said device/network computer and dynamically managing of
   said features in said device/network computer; and
   operative network means for desired communication there between said device
   and server for said utility computing.

2. A utility computing dynamic feature management system according to claim 1
   wherein said server is adapted to provide features and functionality required by
   the users and also manage the features requirement and other aspects of the
   complete environment.

3. A utility computing dynamic feature management system according to claim 1
   wherein said interface device, server and network are adapted to selectively (a)
   Configure features required by users;(b) Dynamic deployment of features to the
   client devices (c) Monitoring and management of the clients and servers - Health
   of system; and (d) Utility Computing Management.

4. A utility computing dynamic feature management system according to claim 1
   comprising client device manager, server manager for monitoring and managing
   different servers in the utility computing environment, information consolidator,
   corrective-preventive action manager adapted to identify types of corrective and
   preventive measures operatively connected to said information consolidator,
   commercial service manager adapted for customer relational management and
   billing activities all of which interact with said utility service manager providing
   for installing or uninstalling desired new features and applications at the user
   terminals/network computers.
5. A utility computing dynamic feature management system according to claim 3 wherein said client device management means is provided in said network computer and is adapted to (i) decode audio-video streams involving embedded digital signal processor (ii) monitoring the functioning of the network computer and network characteristics (iii) changing the system parameters of a network computer and interacting with the utility service management unit to install or uninstall new features and applications in the network computer.

6. A utility computing dynamic feature management system according to claim 4 wherein said information consolidator comprises means to generate reports of the system and has interfaces to interact with the server, client and utility service manager and includes a database manager adapted to interact with the database storing all data.

7. A utility computing dynamic feature management system according to claim 4 wherein said client device manager comprises utility interface means to exchange commands and responses with utility service manager, means to track vital statistics of a network computer and communicating to utility service manager periodically and monitoring and managing configurable parameters of the network computer including network parameters, USB peripherals, resolution and depth used, computing server details and video server details, feature manager and driver including for remote microphone, remote USB devices, and encoded audio streaming, server interface applications, DSP controller and network manager.

8. A utility computing dynamic feature management system according to claim 4 wherein said server manager comprises utility manager interface means to exchange commands and responses with utility service manager, server monitor and manager means adapted to track vital statistics and inform periodically including managing different configurable parameters of the server including network parameters, terminal licenses, users, feature managers and driver, client interface and network manager.
9. A utility computing dynamic feature management system according to claim 4 wherein said utility service manager comprises of user interface layer adapted to obtain inputs from the administrator and other users of the utility system and forward to action manager, action manager adapted to receive inputs from the interface layer and either store the information in database/storage or pass the information to the appropriate component of the utility network, interface manager, database & storage manager.

10. A utility computing dynamic feature management system according to claim 4 wherein said information consolidator comprises means for collecting information from the client and server and also about the network status through said utility service manager, report generator means and report customization means.

11. A utility computing dynamic feature management system substantially as herein described and illustrated with reference to the accompanying figures.
FIGURE 1:

Utility Service Manager

- User Interface Layer
  - Action Manager
- Interface Manager
  - Client
  - Server
  - Information Consolidator
  - Commercial Service Manager
  - Corrective-Preventive Action Manager

Information Consolidator

- Report Customization Agent
  - Report Generator
  - Client Collection Agent
  - Server Collection Agent
  - Network Collection Agent

Network Layer

- Switches
- Routers
- Cables

Commercial Service Manager

- CRM Integration
  - Billing
  - Customer Care

Corrective-Preventive Action Manager

- Database Manager
  - Diagnostics
  - Self Healing
  - Pattern Analyzer

Server Manager

- Utility Manager Interface
- Server Monitor
- Server Manager
- Feature Manager
- Network Manager

Client Interface

OS

Client Device Manager

- Utility Manager Interface
- Server Interface
- Applications

DSP Controller

FIGURE 2:

Server

1. Demand data from USB port/Mic
2. Find IP address of client
3. Forward request to client
4. Network Interface
5. Request flows to client
6. Return data to server
7. Request getting data from USB device/Mic
8. Return data from USB device/Mic

Network Computer

- USB/Mic Driver
- Network Interface
- Network Driver
- USB/Mic Driver
- USB Device / Mic