IBM eNetwork™ On-Demand Server Managing for e-business

Technical White Paper

IBM Network Computing Software Division

October, 1998

Introducing IBM eNetwork On-Demand Server

The Internet and its offshoot technologies are enabling enterprises to progress -- broaden their markets, improve their operations, and lower their costs -- faster and more creatively than ever before. Yet, the same qualities that make Java™ and other well-known Web technologies (CGI, HTML, etc.) so powerful also make them difficult to manage and control. As organizations begin to rely on this new generation, these applications need to offer the same level of security, reliability, and availability as mission critical legacy systems.

Until now the manageability gap found in Java and other Web applications, which are distributed from a server to run on a wide variety of clients, has limited how businesses were applying these new technologies. As a critical complement to Tivoli and other systems management software, IBM eNetwork™ On-Demand Server extends application management to the Java world. It allows programmers to transform Java programs into smart Web applications that have knowledge of the user, the device and the connection. Together they provide end to end management** and control of mission critical e-business applications. This latest addition to IBM's eNetwork Software family of products rapidly and securely delivers this new breed of transformational applications to any client located anywhere in the network.

Using New Technology for Transformation

The value of the e-business technologies stems from their ability to provide immediate universal access to data and applications, which means people -- customers, employees and business partners -- can get what they need when they need it from wherever they are. The resulting business environment creates satisfied customers, productive employees and advantageous business relationships.

Organizations are transforming into e-businesses with a number of innovative applications that are proving to be quite worthwhile.

To J.B. Hunt*** Transport Services, Inc., a $1.7-billion transportation and logistics company, managing more than two million truckload shipments a year has never been easier or more cost effective -- thanks to Java. J.B. Hunt Logistics developed the Java-based Internet Carrier Suite to help improve communications, reduce freight routing turnaround time and lower network costs for J.B. Hunt's third-party truckload carrier companies. In turn, the company expects to improve overall customer satisfaction.

The Internet Carrier Suite includes four Java-based applications that allow J.B. Hunt's third-party carrier companies to track carrier availability, schedule truck loads, track shipment status and enter freight invoices over the Internet. Before deploying the Internet Carrier Suite, JB Hunt communicated electronically with approximately 45% of their carriers using EDI, automated voice response or proprietary non-Internet software. With the Internet solution

approximately 86% of the carriers can take advantage of automated communication and J.B. Hunt can eliminate nearly one million manual phone calls a year.

The United States Postal Service (USPS) used Java technology on the internet to let its bulk mail customers work smarter and faster. Instead of having to fill out a myriad of confusing paper work, the customers can access a Java application on the USPS Web site. The Java-based forms look just like the paper ones but offer fill-in, auto-calculation and navigational features that can reduce the time a customer spends preparing a bulk mailing by between 60 and 80%.

KeyCorp*** has expanded its market by extending its existing loan processing systems to more than 6,000 automobile dealers and 1,500 recreational vehicle dealers. With the Java-based Key Auto Finance Loan Origination system, dealers can offer automatic loan processing over the Internet to customers from their Sales Department computers. Through its Web site (http://www.keybank.com), KeyCorp also offers an auto loan pre-approval service over the Internet.

Web Challenges

While the business potential of the Internet, Java and the like is almost intoxicating, actually managing applications in a production environment can be quite sobering. Running applications through Web browsers creates nontrivial challenges that must be addressed to ensure that these transformation technologies fulfill their potential and bring the expected benefits.

Applications run through browsers need flexibility because the characteristics of the runtime environment are completely changeable. One time an application can run on a high functioning laptop computer connected through a standard phone line and another time it may run on a diskless network computer directly linked to the server. And, as electronic equipment such as cell phones and pagers proliferate as computing devices, universal access to data and applications becomes even more challenging. Given this variability, the Web applications require intelligence to :

- provide access to different types of users without inconveniencing them,
- ensure the application is available in the correct format when a user requests it,
- protect the application from non-authorized users, and
- manage licensing.

IBM eNetwork On-Demand Server provides tools developers can use to transform Java programs into smart Web applications that have the flexibility to handle a wide variety of users, device types and connectivity options.

A company that ignores these issues before deploying an e-business application can run into a number of problems -- resulting in anything from customer inconvenience to a competitive disadvantage to serious operational consequences. As a fictional example, take the Java-based forms application offered by the US Postal Service. Without the right security measures in place,

a local post office might find itself doing a bulk mailing for Joe's Bar and Grill and yet billing Sam's Hardware store.

Availability is another issue. Although KeyCorp has taken a sophisticated approach to ensuring its application is there when needed (by integrating it with Tivoli Systems Management software and running it on the NetDynamics*** Web application server), other banks may not be as well protected. In such a case if an application unexpectedly goes down and the IT shop doesn't realize it, potential customers could decide to use a competitor that also offers similar on-line services on the Web. The longer the IT shop remains unaware of the application being down, the more customers that might choose the competition. Furthermore, it just looks bad to have an application not working.

Completing the e-business Environment with eNetwork On-Demand Server

IBM eNetwork On-Demand Server completes the necessary tool set to create a secure, reliable and well-managed e-business. This eNetwork On-Demand Server infrastructure complements Web application and Web servers providing the necessary instrumentation and services to keep Java software running securely in a production environment.

On-Demand Server extends the value of existing systems management tools by communicating event and alarm information about the Java client. eNetwork On-Demand Server can identify e-business applications (enabled by the eNetwork On-Demand Server toolkit) that aren't working correctly and can even provide advance notice of potential problems. eNetwork On-Demand Server instrumentation collects the event and alarm information from Java client processes in a log file and sends this information to an On-Demand server machine. This information can than be used by the systems management tool. This is key to keeping mission critical applications up and running.

IBM eNetwork On-Demand Server also controls access to e-business applications so that unauthorized users can't get into a protected application. Furthermore, eNetwork On-Demand Server simplifies access for users by providing a single sign on for multiple applications. It also keeps track of user preferences eliminating redundant information entry.

In addition to simplifying tasks for the user, eNetwork On-Demand Server also makes administration easier. Administrators can manage a large number of clients from one central location -- or in fact from anywhere. With the proper authorization, a person can access eNetwork On-Demand Server administrative tasks from any client in the network.

The eNetwork On-Demand Server also comes with a toolkit that lets developers program systems management support into any Java application such as log/trace facilities as well as profile and license management. Beans for Java and industry standard programming interfaces (APIs) allow developers to include license management, user preference and Reliability, Availability and Serviceability (RAS) support to any Java applet. The bottom line on the toolkit

is that developers can focus on the meat of their applications rather than building a middleware support structure.

Business Significance

The universal access and portability of today's networking technologies offer incredible opportunities for an enterprise to expand its market and grow the businesses in new directions. But the applications that can lead to these benefits must be robust enough for enterprise deployment and the computing environment must have the right infrastructure in place to support these new technologies.

So becoming an e-business entails more than just using Internet technologies and Java to build innovative applications. It involves creating an environment that can support the unique operating characteristics of the new generation applications. Obviously it's important to discover brand new ways of operating with the newly available technologies. But it's just as important to fortify the supporting computing infrastructure. The support mechanisms need to ensure that the applications required by employees, customers and business partners are available on demand.

Once that infrastructure is in place, deploying and managing Java and other Internet applications becomes easier than ever. IBM eNetwork On-Demand Server provides the right mechanisms for maintaining control, minimizing risk and lowering cost as companies progress through their e-business transformations.

The Taxonomy of IBM eNetwork On-Demand Server

Often, when people hear about eNetwork On-Demand Server they are confused about how to categorize it. The confusion comes from trying to see it as a replacement for something that already exists. But eNetwork On-Demand Server is a new kind of product. IBM eNetwork On-Demand Server, a solution for multiple platforms, centrally deploys and manages Java applications. It works in conjunction with Web and Web application servers while complementing existing enterprise systems management systems.

Over the past ten years, IT shops have done an excellent job of automating business processes; but, the automation was pretty much confined to individual functional areas. Using Internet technology Web application servers like IBM Websphere™, Apache*** and NetDynamics, companies can connect the isolated islands that result from existing client/server systems and extend the enterprise beyond its traditional boundaries. Once the application server is in place there needs to be mechanisms that distribute and manage these applications in a production environment.

Enterprise systems management software from companies like Tivoli™ manage the complete back office environment including mainframes, the network, and the elements in the client/server world. However, as companies extend their computing infrastructures over the net and connect the islands of automation, applications emerge that aren't covered. That's where IBM eNetwork On-Demand Server comes in. eNetwork On-Demand Server combined with existing enterprise systems management tools covers mission critical environments from end to end -- from mainframe legacy systems to the latest Web applications.

The Role of IBM eNetwork On-Demand Server

eNetwork On-Demand Server provides different services to different people.

- Network Administrators - Using a simple browser interface, network administrators can define and manage network resources, including software, users, and groups. Administrators can also control access to specific applications through the use of userid and password authentication.
- Software developers - Through the eNetwork On-Demand Server Toolkit developers can create smart Web applications that can be accessed from anywhere in the network using a wide variety of device types. The smart applications can keep track of user preferences, access authorizations and hook into existing systems management solutions to avoid availability problems.
- Users - eNetwork On-Demand Server users can access their customized set of applications and data through a familiar and intuitive Web-enabled desktop. They can also save time with its single sign on capabilities, as well as set personal preferences for individual applications. And, this customized desktop follows the user - regardless of whether they are signing on from their office machine, from someone else's machine, or from somewhere on the road.

eNetwork On-Demand Server creates a computing environment in which software is centrally managed and available from any location in the network Files critical to application processing are stored on the server, preventing users from corrupting these files and reducing many of the causes of system crashes. An organization can quickly integrate new or existing Java applications and deploy them to users without the cost and complications that are associated with the traditional client/server model.

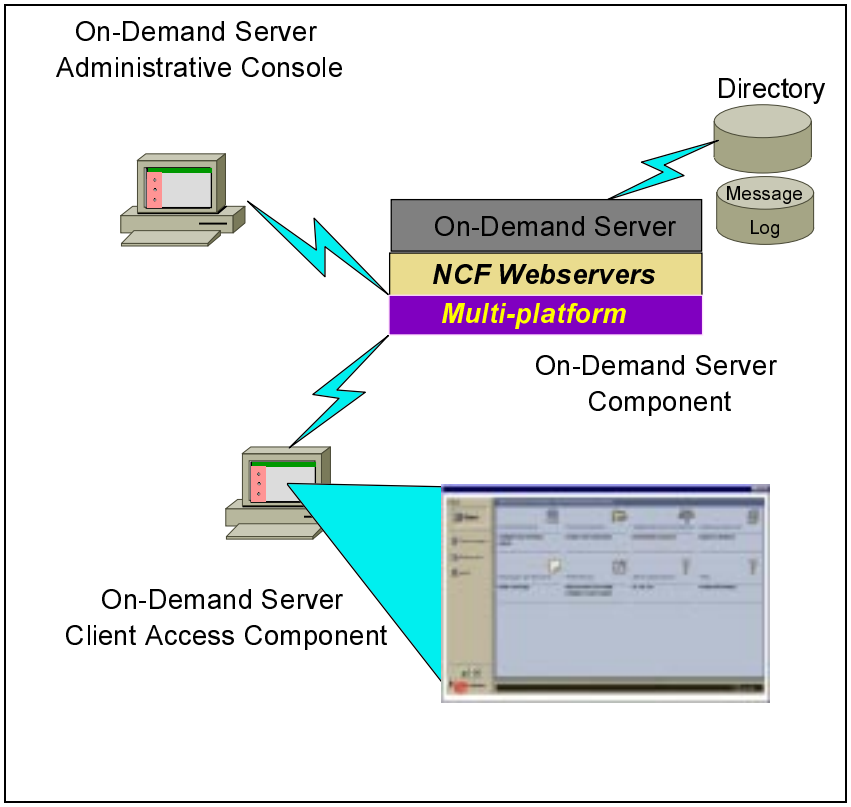
- eNetwork On-Demand Server delivers applications to a user's desktop where they run locally, conserving server and network resources.
- It facilitates the central management of software upgrades so that there is no need to install, restart, and reconfigure at each client device.
- eNetwork On-Demand Server supports multi-platforms and acts as an interface layer to map to Web servers from different vendors.
- It provides services for managing network software such as:
  - Event management services for centralized problem reporting and diagnostics
  - Logging and tracing support for applications
  - Monitoring software license use across the network

IBM eNetwork On-Demand Server Architecture

On-Demand Server consists of both executable code and a toolkit. The architecture of the executable portion, the eNetwork On-Demand Server base, centers around four key components.

1. The Server Component

2. The Administrative Console
3. The Client Access Component
4. The Directory



The On-Demand Server supports all of the key emerging Java and object technologies, many of which IBM is very active in helping to define. A sampling of the technologies used by the On-Demand Server include:

- JNDI, Java Naming and Directory Interface
- HTTP, HyperText Transfer Protocol
- HTTP-S, secure HTTP
- SSL, industry standard for secure sockets layer.
- IIOP, industry standard for Internet inter-ORB protocol
- RMI, Java remote method invocation
- LDAP, Light Directory Application Protocol - industry standard for directory services (release 2)
- SNMP, simple network management protocol
- NCMG Preference APIs

The On-Demand Server Component

With its rich functionality to deploy, manage and secure e-business applications, the Server Component provides the "heart" of the architectural implementation. The Server Component

actually controls the activities of the other components. It is the piece of code that interacts with the application or Web servers as well as with the enterprise management system.

It operates as a series of Java servlets that run on Web servers such as Websphere, Apache, NetDynamics, Domino Go™, as well as the server offerings from Microsoft® and Netscape®. And the supported operating systems currently include S/390®, AIX®, Windows NT®, and OS/2® with plans to extend the platform reach to other industry standard platforms.*

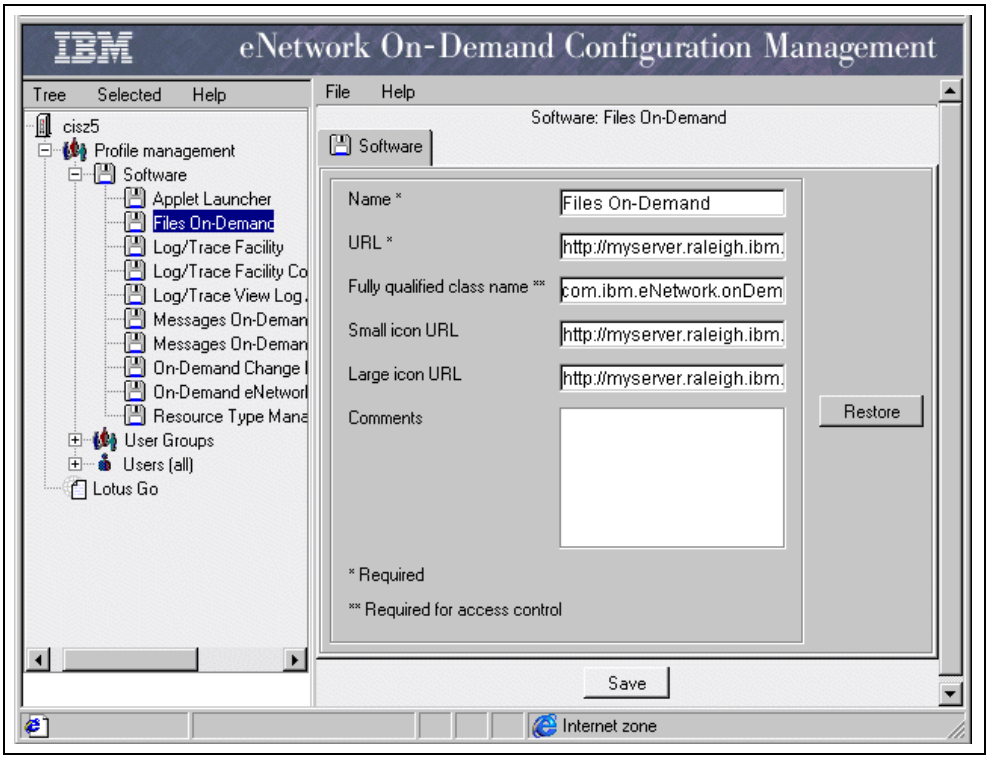
The IBM eNetwork On-Demand Server Administrative Console Component

The On-Demand Server Administrative Console environment provides the administrator interface for managing On-Demand Server user, groups and applications. Administrators use a Web browser to configure eNetwork On-Demand Server. When the Configuration Management interface is started, it detects installed services and displays them in the left frame of the browser window. Clicking a service allows the administrator to view or modify its configuration in the right frame.

The console component operates with a Java compliant browser (Java Runtime Environment level 1.1.6 or later). The console applet is delivered on demand using standard Web Java technologies once the administrator completes his/her signon authentication process.

The profile management service allows administrators to define and customize new and existing Java applications. Profile management is used to add, define, update, and remove software. Software changes and updates are available from anywhere in the network, without requiring user participation in time-consuming installations or upgrades. When users log in using a Web browser, software configuration changes and updates are reflected immediately.

Administrators also assign user IDs, passwords and access privileges with profile management. The attached figure pictorially shows the screen that a system administrator will see when doing profile management. The example screen is for designating the applications which a given user or group is permitted to access. This information may be populated automatically via an import file or as part of the Tivoli (AMS) software distribution process.



This screen interface typically consists of two panels, the configuration tree panel and the configuration details panel. The configuration tree panel consists of a list of tasks that can be performed such as defining users and groups. The configuration details panel is context-sensitive based on the selection made by the administrator and will vary by task. For some tasks, a third panel is used to further simplify the process.

The IBM eNetwork On-Demand Server Client Access Component

The On-Demand Server Client Access component provides the operating environment for the On-Demand application set. The client connects to the server by specifying the Universal Record Locator (URL) for the logon applet. When this applet is launched, the client will optionally be presented with a user signon screen. This signon is optional because clients can also operate in kiosk mode where no "client visible" signon is performed. This signon screen will request the userid, password, and optionally an account which represents the role the user wishes to use with this signon. For example, one could use a single ID and password, but have multiple environments with which they wish to be presented. The account would be the determining factor in the preferences selection process.

Signing on consists of connecting with the server and transmitting the userid and encrypted password information to the eNetwork On-Demand Server, where the user is authenticated. Once the authentication process is completed, the user will be presented with a desktop known as an applet launcher, a customized set of applets and services that the user is permitted to access. Users can access their customized desktop and software from any location in the network.

When a user launches an application, On-Demand Server presents the application with a single set of coalesced preferences. The browser caches this preference information to reduce download times for subsequent sessions. When preferences change on the eNetwork On-Demand Server, the cached copy is updated automatically and transparently sent to the end user.

The IBM eNetwork On-Demand Server Directory

Typically an enterprise class environment will consist of many eNetwork On-Demand Servers. The common link between these eNetwork On-Demand Servers is the directory. Each server will have access to eNetwork On-Demand Server enterprise data through this directory. Even in a single server environment, the directory will act as the repository for eNetwork On-Demand Server configuration data.

The directory manages client resource information, including system and device configuration data, user preference data, and desktop and application preference data. The directory is what allows a roaming user to access his desktop or applet launcher from wherever he is located.

While the initial release of the eNetwork On-Demand Server uses a proprietary network directory, subsequent releases will employ industry standard LDAP (Lightweight Directory Access Protocol) schemata (a set of attributes and values) and protocols for querying and modifying directory contents. Access to the directory will be performed using Java Network Directory Interface (JNDI) and LDAP standard protocols.

The eNetwork On-Demand Server exploits a standard LDAP schema with groups, users, and accounts providing the hierarchical structure of the schema. The hierarchy is represented in the attached figure. Note that the eNetwork On-Demand Server supports a user being part of multiple higher level groups. This function is extremely valuable in larger enterprises where preferences can be specified at a corporate, division, department, user, and even account level, thereby greatly reducing the administrative overhead required.

The Developer Toolkit

The developer toolkit includes a rich set of documented application interfaces to quickly enable Java applications with eNetwork On-Demand Server features. The toolkit consists of a set of class libraries for software and hardware developers to use to exploit eNetwork On-Demand Server's cross-enterprise functionality. Using the toolkit a developer can enhance a Java application with:

- Logging and Trace Facility - simple APIs and a recording infrastructure for logging with four levels of tracing of various components of your applets, along with an applet for controlling and viewing these activities

- License Tracking - a single API to enable your customers to track usage of applets

- Preference Persistence and Management - an extension of the common java.utils class to store properties, defaults, or user preferences

- Tivoli-Ready System Management hooks for software distribution, monitoring, and exception event management.

IBM plans to expand eNetwork On-Demand Server support with additional APIs and extensions to existing ones.

Logging and Tracing API

The toolkit includes a Java class that logs events and traces information to the server event log. Along with the corresponding servlet processes, it provides the recording infrastructure for logging as well as four levels of tracing to track multiple components of an applet. The kit also contains an applet for controlling and viewing the trace activities. The event log is accessible to the administrator who has the option of filtering and forwarding it to Tivoli enterprise software. In that case, a Tivoli Event Console can monitor events so that corrective actions can occur automatically.

License Use Management (LUM) API

The licensing Java class, when embedded in an application, tracks the number of seats down to the applet level. Administrators can access this information in a file so they can determine if usage is within specified guidelines. Alternatively license tracking can be automated with the eNetwork On-Demand Server bean for Java. This bean communicates with an eNetwork On-Demand servlet, which in turn acts as a client to a LUM Server that could also service other types of applications in the enterprise.

Preference API

The eNetwork On-Demand Server preference API is an extension to the standard Java properties class. It allows user preferences and application properties to be defined, saved, and retrieved in a network registry or directory. User preferences could include screen colors and resolutions as well as default directories.

Typically administrators set preferences as defaults. When a user launches the application these preferences are delivered to the user already set up in the application. Similarly the properties class extension coalesces user property values, groups, and additional system defaults to return a single property sheet. Through the use of this API an administrator can control the preferences of an applet for a user or group simply by launching the applet from the context of the Administrative console and altering the properties as appropriate.

Systems Management Integration

eNetwork On-Demand Server Plus for Tivoli provides Application Management System (AMS) 1.0 compliant tools. AMS, a widely-accepted industry standard for reporting information to network management products, offers the following.

- Distributed Monitoring enables Tivoli consoles to have status visibility and to automatically trigger corrective action using built-in Tivoli platform monitors as well as eNetwork On-Demand Server and custom monitors..
- Software Distribution deploys eNetwork On-Demand Server to servers across the enterprise. More importantly, it automatically does the Tivoli customization for easy packaging and distribution of applet resources using eNetwork On-Demand Server as the proxy.

- Event Management filters, reformats and sends logging and tracing records to the Tivoli console enabling eNetwork On-Demand Server applications to take advantage of automated alarms and corrective actions.
- Remote Operations enables eNetwork On-Demand Server applets to benefit from standard Tivoli remote operation tasks.

Advantages of IBM eNetwork On-Demand Server

IBM eNetwork On-Demand Server offers a number of advantages in the e-business environment. It's not that Web applications won't or can't run without eNetwork On-Demand Server. Obviously they do. But eNetwork On-Demand Server strengthens Web applications in a number of ways for the rigor of running in a mission critical environment.

Customization eNetwork On-Demand Server enables the management, selection, and delivery of a choice of client desktops. Customization mechanisms allow the administrator to set modifiable or permanent defaults for users, groups, or applications. The administrator can also allow users to customize their desktop and applications or the administrator can do it. In a future release, users and administrators will have the ability to customize device characteristics such as screen resolution.

Applications that are eNetwork On-Demand Server "ready" (i.e. modified or written with the eNetwork On-Demand Server toolkit) access customization information (preferences or properties) through a central service called the preference engine. This keeps the overhead associated with maintaining the preferences transparent to the application.

Application Access While individual users and administrators both have the ability to set application access, administrators can override a user's preference by restricting access to any application. The eNetwork On-Demand applications can be delivered across intranets, extranets, and the Internet.

The beauty of the eNetwork On-Demand Server technology is that it delivers applications "just in time", assuring that the user gets the latest version of the application. Applications are delivered to client devices on an "as needed" basis but do not have to be redelivered with each access. Instead the applications can be cached on the client devices using industry standard Web browser caching technology.

Security Security services support a range of user authentication and authorization mechanisms, ranging from a simple logon with user name and password with digest authentication to support for X.509 certificates. A very simple, yet key, provision of the eNetwork On-Demand Server technology enables user passwords to transmit in a secure protocol such SSL. The growing importance of public key technology will require management of users' key rings or vaults as well as authentication and authorization.

A different aspect of security requires that administrators and users have different authority levels. And multiple classes of client users may also be needed. The eNetwork On-Demand Server specifies various group levels, with the end user being part of this hierarchical group

structure. For each of the levels, eNetwork On-Demand Server enables the appropriate level of access controls. For example, an administrator must have the ability to determine the resources (e.g. applications, Web sites and data) that any user can access, but visibility of users are obviously more limited.

In release one security service supports user authentication. IBM plans to also support device authentication in a future release. This service will verify that it is valid to provide a client device with network information or operating system code without assuring proper access credentials.

Single Signon A user typically only wants to sign on once and yet have access to a complete set of resources, including native host applications, Windows applications, Java applications and web-sites. He doesn't want to have to enter signons for each individual resource. In addition to applications, eNetwork On-Demand Server's single signon service provides access to local and remote device resources as well as the user's work environment (e.g. preferences, home directory) through a single authentication process.

Performance The eNetwork On-Demand Server technology strives to optimize response time through several means including delivering applications only as needed instead of populating the client with all of its applications at "connect time". The robust environment of the eNetwork On-Demand Server client space permits the sharing of class libraries across applications, further reducing the volume of code delivered to the client. Improved performance as well as efficient use of network resources is a key advantage of eNetwork On-Demand Server.

Device Mapping (planned for a future release) A user may use multiple types of computing devices to sign on and reach the same environment, namely his desktop, his applications and preferences. This requires that the device characteristics and capabilities be automatically discovered and mapped to rules set by the application, the coalesced user and administrator preferences. Device mapping services will interoperate with native management technologies such as the mobile (MNCRS) and network computing specifications (NCRP).

Administration eNetwork On-Demand Server simplifies many administrative tasks. It allows administrators to define users, groups, application access rights, network peripherals, such as printers, and as well as access authorization from a central point.

Overall, on-demand computing --- delivering information based products and services in a focused, customized and proactive fashion --- can really differentiate a company from its competitors. IBM eNetwork On-Demand Server can strengthen an enterprise's e-business strategy by ensuring that applications are accessible, available when needed and easy to use.

IBM will deliver the first release of the IBM eNetwork On-Demand Server product set in 4th Quarter 1998.

*** This overview contains statements related to the future development and direction of IBM eNetwork On-Demand Server. These represent only current plans or goals of IBM as of the date of publication and are subject to change without notice based on IBM's technical and business judgment.**

****Integration with and/or utilization of functions provided by systems management products may be limited by dependencies (such as platform support) contained within such systems management products.**

Any reference to third party companies does not imply any involvement with or endorsement of IBM or IBM products.