

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 November 2000 (30.11.2000)

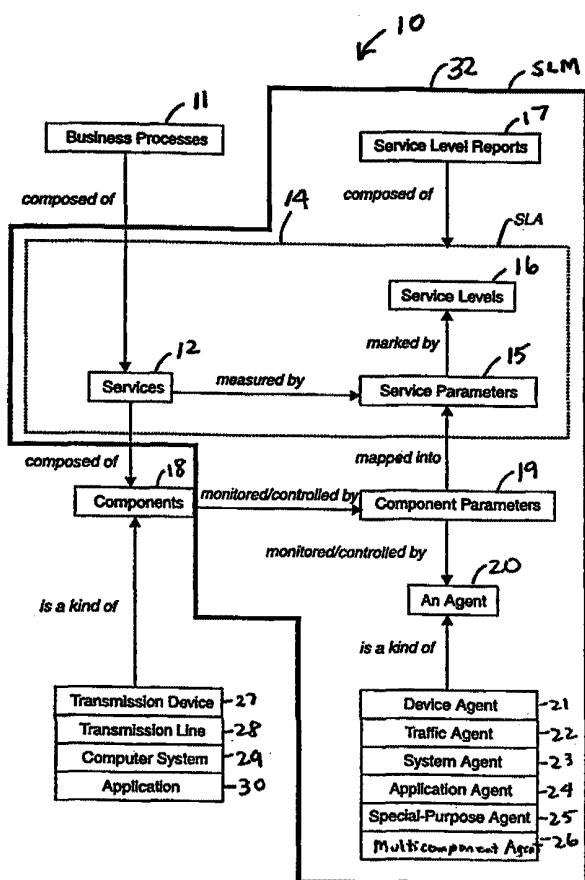
PCT

(10) International Publication Number
WO 00/72183 A2

- (51) International Patent Classification⁷: G06F 17/00
- (21) International Application Number: PCT/US00/14175
- (22) International Filing Date: 23 May 2000 (23.05.2000)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/135,492 24 May 1999 (24.05.1999) US
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- (81) Designated States (national): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE,
DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS,
LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO,
NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR,
TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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(54) Title: SERVICE LEVEL MANAGEMENT



(57) Abstract: Method and apparatus for service level management, wherein business processes are composed of services. A state of the service is defined by one or more service parameters, and the service parameters depend upon performance of network components that support the service, e.g., component parameters. The state of the service may depend, for example, on a collection of service parameter values for availability, reliability, security, integrity and response time. A service level agreement is a contract between a supplier and a customer that identifies services supported by a network, service parameters for the services, and service levels (e.g., acceptable levels) for each service parameter.



WO 00/72183 A2



Published:

— Without international search report and to be republished upon receipt of that report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SERVICE LEVEL MANAGEMENT

BACKGROUND OF THE INVENTION

5 This application claims priority to U.S. provisional Patent Application Serial No. 60/135,492 filed May 24, 1999 entitled METHOD AND APPARATUS FOR SERVICE LEVEL MANAGEMENT ... by Lundy Lewis.

10 In the early 1980's, campus-wide computer networks were being installed principally by universities to enable communication and the sharing of computer resources between various departments. The networking technology available at that time, and the scope of deployment, were both limited and relatively unsophisticated.

15 Today, the deployment and maintenance of "enterprise" networks (i.e., existing across multiple domains -- e.g., geographical, functional, managerial) occurs on a much grander scale. The enterprise still consists of network devices, transmission media, computers, and software applications, but there are many more of them and they are considerably more complex and difficult to manage. Furthermore, enterprises are connected with other enterprises via the Internet and third-party backbones, and applications are distributed over all of these. Most global business entities, in addition to large universities, now employ such sophisticated enterprise networks. Electronic commerce (EC) providers are creating similarly complex global networks, known as "Web server farms", on which industries install their Web sites. Industries have to be assured that their customers can always access their Web sites, that performance will be reasonably good, and that customer transactions are secure. Management of such distributed Web server farms is yet another example of the complexities of enterprise management today. Internet service providers also need to manage and provide customers with access to global networks on a 24-hour a day basis.

SUMMARY OF THE INVENTION

30 The present invention is directed to various aspects of service level management (SLM), whereby an entity (such as a company, university, Internet service

provider (ISP), electronic commerce (EC) provider, etc.) may, for example, map components of a network (i.e., network devices, transmission media, computer systems, and applications) into services in order to assess the state of those services. The state of those services, referred to herein as service parameters, may include availability, response time, security, and integrity. For example, EC providers need to assess availability -- their customers want their Web sites to be available at all times. Their users want quick response time -- they do not want to experience undue delay when retrieving information or moving around screens. They need to assess security -- customers want to be assured that no intruders (e.g., competitors) can sabotage their Web sites, and they want to be assured of secure transactions with respect to personal information such as credit card numbers. They need to assess integrity -- customers want the words and pictures on the screens to be clear, accurate and visually interesting.

Providers of network services may include certain guarantees of service level management in a service level agreement (SLA). The SLA may quantify systems performance, service availability, backup completions and restore times, and problem resolution metrics. SLAs may provide financial incentives for exceeding requirements and penalties for failing to meet performance objectives. Performance metrics (service parameters) for SLAs may be based on availability to the Internet and measurements of Web site access times. For example, availability may be defined as the total minutes that a Web server is actually available to the public. Access time may be measured on a regional basis using benchmarking methods.

Based on current networking technology such as packet marking, differential services, and switched networks, network service providers can offer different levels (grades) of service in each of these categories, and customers can choose their preferences. If customers want 100% availability, optimal response time, and maximal security and integrity, then they would pay more. Otherwise, they would pay less. The customer may select specific time periods over which various service grades are required. Preferably, the customers can access a service level agreement form on a Web site, and negotiate with the provider the terms of the agreement.

One aspect of service level management is monitoring of the various computer systems, network devices and software applications for both real-time display and historical reporting. A management system should provide visibility into component operational parameters that provide meaningful information to the IT staff for maintaining network availability and performance.

Another aspect of service level management is event management -- taking information from the monitoring agents in various embodiments, logging it, filtering it, correlating it and determining what actions or notifications, if any, need to take place. Preferably, the output of event management enables the information technology (IT) staff to become proactive in preventing service interruptions by identifying and responding to low-impact events that may be precursors to a more serious event that would cause a service outage.

Another aspect of service level management is the taking of operational data obtained by the monitoring agents and transforming it into management information to support the needs of both the business and technical operations within the organization. In various embodiments, service level reports provide an assessment of service parameters and service levels in a form adapted to the interests of users, IT staff, business owners, EC provider, etc.

Other elements of network management that may be useful in providing a specific level of service parameters in a service level agreement include:

- ◆ Configuration asset and change management;
- ◆ Software distribution;
- ◆ Problem management and automated fault management;
- ◆ Trend and performance analysis; and
- ◆ Security management.

Many businesses have made a large investment in their computer networks. This investment is sometimes called the total cost of ownership (TCO) regarding the enterprise. Most businesses, however, have difficulty understanding the extent to which the

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