Title: TRIGGER SUPPORT FOR A BI-DIRECTIONAL BROKER

Abstract: A trigger support system and method for a bi-directional job broker (104) is provided. One or more action requests, or triggers (112), are registered, for example, by a manager job scheduler (102) or a broker (104). The one or more action request are associated with one or more jobs scheduled to run on a client job scheduler (106-110). A broker (104) communicates the one or more action requests to the client job scheduler (106-110). The client job scheduler (106-110) takes an action based on the one or more action requests and reports the result of the action to the manager job scheduler (102).
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

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.
TRIGGER SUPPORT FOR A BI-DIRECTIONAL BROKER

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application No. 60/486,753 entitled UNICENTER WORKLOAD TRIGGER SUPPORT FOR A BI-DIRECTIONAL BROKER filed on July 11, 2003, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

This application relates generally to computer systems, and more particularly to bi-directional scheduling in computer systems.

BACKGROUND

Automatic job management systems and workload scheduler systems both work to manage various processes running in enterprise-wide applications. Currently, a number of job management and scheduler systems are available, for example, from different software vendors. In some cases, the same vendor may be marketing a number of different job management and scheduler systems. Thus, a company or an enterprise may be running different job management and schedulers on the company's systems. Accordingly, it is desirable to allow these different job management and schedulers to communicate the jobs they are running with one another.

SUMMARY

A trigger support system and method for a bi-directional job broker is provided. The system in one aspect includes a manager job scheduler operable to
register one or more action requests. The one or more action requests are associated with one or more jobs scheduled on a client job scheduler. A broker is enabled to receive the one or more action requests registered by the manager job scheduler. A client job scheduler receives the one or more action requests from the broker and takes an action based on the one or more action requests and reports the result of the action. An example of one or more action requests include status information on a job scheduled to run on the client job scheduler. An action that the client job scheduler takes based on the one or more action requests may include invoking an event to report back a status of a job when that job is running or has completed. In another aspect, the broker may interrogate the manager job scheduler for interested jobs and register the one or more action requests.

The method in one aspect includes registering one or more action requests, transmitting the one or more registered action requests to a client job scheduler, converting the one or more registered action requests into one or more events in the client job scheduler, the one or more events associated with a job scheduled on the client job scheduler, and sending one or more messages associated with the one or more events as a result of the job being run.

Further features as well as the structure and operation of various embodiments are described in detail below with reference to the accompanying drawings. In the drawings, like reference numbers indicate identical or functionally similar elements.
BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating components of the present disclosure in one embodiment.

Fig. 2 is a flow diagram illustrating the method of the present disclosure in one embodiment.

DETAILED DESCRIPTION

The present application relates to workload trigger support for a bi-directional broker, and more particularly, to bi-directional scheduling. Embodiments of the present application can integrate, for example, the Unicenter AutoSys™ and the Unicenter Workload™ Job Schedulers. Trigger is a term used in workload to denote action taken by the Workload Manager (WLM) on startup as it pertains to external processes. In this case, the external process is AutoSys. The trigger registers external jobs that AutoSys will perform and report on, on behalf of the Workload Manager. For example, the Workload Manager registers jobs in AutoSys, to be run under AutoSys, on behalf of Workload. The AutoSys provides statuses of those jobs by converting the statuses to Workload understandable statuses and reports back to the Workload Manager.

Fig. 1 is a block diagram illustrating components of the present disclosure in one embodiment. In one embodiment, Workload Manager 102 communicates with AutoSys 106 via a process known as the broker (asbIII) 104. When WLM 102 starts, it reaches out to its list of clients 106, 108, 110 and registers its triggers with those clients or agents. The agents 106, 108, 110, upon receipt of those triggers take appropriate actions and report back to WLM 102. A trigger 112 may include a set
of conditions registered on the agents 106, 108, 110 that the agents review prior to doing the work for the manager 102. As part of this handshake, or exchange of triggers, the broker 104 can interrogate the startup message from WLM 102 and realize an interest on the part of WLM 102, for a particular set of jobs known to be pre-registered in AutoSys 106 or other clients 108, 110. In effect, WLM 102 is saying, 'AutoSys, I know you have these jobs that you may run at some point. When you do, tell me when you have started any of them and also tell me what the termination status is.'

In an exemplary embodiment, the jobs are not added to AutoSys 106 or other clients 108, 110. They exist in the AutoSys database and have been put there by the standard means available under AutoSys 106 or other clients 108, 110. Also, any component of the job definition is not changed. Given the fact that the job or jobs have been properly inserted in AutoSys 106, and given knowledge of that to the user of WLM 102, this functionality allows WLM 102 to register in AutoSys 106, the request for statuses when these jobs are run under AutoSys 106. This happens, for example, according to the job definition as it was defined in AutoSys 106.

In one embodiment, the bi-directional broker 102 includes two implied directions: inbound and outbound. These implied directions are from the standpoint of AutoSys which is, for instance, the client 106. So 'inbound' means coming into AutoSys 106 from WLM 102. Outbound means the opposite, leaving AutoSys 106 bound for WLM 102.

As noted, the broker 104 can work WLM 102 and AutoSys 104 in a bi-directional fashion. For instance, WLM 102 is the manager and AutoSys 106 is the client, or, alternatively, AutoSys 106 is the manager and WorkLoad
102 is the client. In the latter case, AutoSys communicates with a Workload Agent.

Fig. 2 is a flow diagram illustrating the method of the present disclosure in one embodiment. A job is inserted into the AutoSys database and the user on Workload has knowledge of that job. Given that, either WLM or the asbIII, a broker initiates contact at 202. Either the WLM was up, and the broker came up, or vice-versa. As part of that initial contact, the WLM sends to the client (for example, AutoSys) via the broker (for example, asbIII), its triggers at 204. The broker decomposes those triggers into AutoSys events and puts those events into the req_job table of the AutoSys database at 206. The existence of this event tells the event_demon at 208, that WLM is interested in the statuses of that job. The job will run on the conditions set in the job definition. This is done independently of WLM, the broker, or the triggers. But because this event is now registered in the AutoSys database, when the job does run, a message will be sent from the event_demon to the outbound side (asbIII) and the broker will take that message at 210, convert it into something WLM can understand and send it to the WLM at 212.

Thus, the flow of this functionality is in that direction in one embodiment. Initiated by WLM, received by the asbIII, inserted into the database, the event_demon then notes when the job starts and terminates. The event_demon then passes a message to the broker and the broker forwards an appropriate message or job status, back to WLM.

The functionality provided by the exemplary embodiments is generally referred to as Trigger Support for the Workload Manager in AutoSys. The particular trigger described herein deals with registration of
external jobs that AutoSys will perform and report on, on behalf of the Workload Manager. The present application describes in one embodiment, from the standpoint of AutoSys, Workload registration of jobs in AutoSys to be run under AutoSys on behalf of WorkLoad; and how the AutoSys statuses of those jobs are converted into Workload statuses and reported back to Workload.

In one embodiment, architectural changes do not need to be made to incorporate this functionality although changes in both the asbIII and event_demon which belong to the product AutoSys are changed. Those changes are described herein.

In the present application in one embodiment, AutoSys is considered as a client of Workload. AutoSys, for example, may be a particular type of client. It can register, run and report on jobs, on behalf of Workload. It does not, however, need to insert these jobs into AutoSys on behalf of Workload.

The system of the present disclosure may include modules to add and delete events to be processed in AutoSys as a result of triggers inserted into the broker.

The system and method of the present disclosure may be implemented and run on a general-purpose computer. For example, the system and method may be implemented as set of computer instructions to be stored on computer memory units and executed on the computer processor. The embodiments described above are illustrative examples and it should not be construed that the present invention is limited to these particular embodiments. Thus, various changes and modifications may be effected by one skilled in the art without departing from the spirit or scope of the invention as defined in the appended claims.
We claim:

1. A trigger support system for a bi-directional job broker, comprising:
   a manager job scheduler operable to register one or more action requests, the one or more action requests associated with one or more jobs scheduled on a client job scheduler;
   a broker enabled to receive the one or more action requests registered by the manager job scheduler;
   a client job scheduler operable to receive the one or more action requests from the broker, the client job scheduler further operable to take an action based on the one or more action requests and report result of the action.

2. The system of claim 1, wherein the one or more action requests include one or more requests for statuses of one or more jobs running on the client job scheduler.

3. The system of claim 1, wherein the client job scheduler reports the result of the action to the manager job scheduler via the broker.

4. A trigger support system for a bi-directional job broker, comprising:
   a manager job scheduler;
   a broker operable to interrogate the manager job scheduler to register one or more action requests, the one or more action requests associated with one or more jobs scheduled on a client job scheduler; and
   a client job scheduler operable to receive the one or more action requests from the broker, the client job scheduler further operable to take an action based on the
one or more action requests and report result of the action.

5. The system of claim 4, wherein the one or more action requests include one or more requests for statuses of one or more jobs running on the client job scheduler.

6. The system of claim 4, wherein the client job scheduler reports the result of the action to the manager job scheduler via the broker.

7. A trigger support method for a bi-directional job broker, comprising:
   registering one or more action requests;
   transmitting the one or more registered action requests to a client job scheduler;
   converting the one or more registered action requests into one or more events in the client job scheduler, the one or more events associated with a job scheduled on the client job scheduler; and
   sending one or more messages associated with the one or more events as a result of the job being run.

8. The method of claim 7, wherein a broker registers the one or more action requests;

9. The method of claim 7, wherein a manager job scheduler registers the one or more action requests.

10. The method of claim 7, further including converting the message into a manager job scheduler format.
11. A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform a trigger support method for a bi-directional job broker, comprising:

   registering one or more action requests;
   transmitting the one or more registered action requests to a client job scheduler;
   converting the one or more registered action requests into one or more events in the client job scheduler, the one or more events associated with a job scheduled on the client job scheduler; and
   sending one or more messages associated with the one or more events as a result of the job being run.

12. The program storage device claim 11, wherein a broker registers the one or more action requests;

13. The program storage device claim 11, wherein a manager job scheduler registers the one or more action requests.

14. The program storage device claim 11, further including converting the message into a manager job scheduler format.
Fig. 1
Fig. 2
### INTERNATIONAL SEARCH REPORT

**International application No.**
PCT/US04/22522

**A. CLASSIFICATION OF SUBJECT MATTER**

<table>
<thead>
<tr>
<th>IPC(7)</th>
<th>G06F 3/00,15/16,15/173</th>
</tr>
</thead>
<tbody>
<tr>
<td>US CL</td>
<td>719/318; 709/202, 223</td>
</tr>
</tbody>
</table>

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

| U.S. | 719/318; 709/202, 223 |

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

IEEE, JPO, DERWENT, IBM-TDB

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 5,889,944 A (BUTT et al) 30 March 1999 (30.03.1999), see entire document.</td>
<td>1-14</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:
  * "A" document defining the general state of the art which is not considered to be of particular relevance
  * "E" earlier application or patent published on or after the international filing date
  * "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  * "O" document referring to an oral disclosure, see, exhibition or other means
  * "P" document published prior to the international filing date but later than the priority date claimed

*"F"* inter document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

*"X"* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

*"Y"* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

*"A"* document member of the same patent family

Date of the actual completion of the international search

12 November 2004 (12.11.2004)

Date of mailing of the international search report

24 Nov 2004

**Name and mailing address of the ISA/US**

Mail Stop PCT, Attn: ISA/US Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Passimile No. (703) 305-3250

Authorized officer
Michelle L. Eaton
Jeffrey A Gaffin

Telephone No. 571 272-2100

Form PCT/ISA/210 (second sheet) (January 2004)