



Software Group | Enterprise Networking and Transformation Solutions (ENTS)

z/OS IP Load Balancing Advisor (LBA) for External Load Balancers: Background and the SASP Protocol

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z/OS Load Balancing Advisor (LBA) - agenda

- **Background**
- **The SASP protocol**





Background

Background information

➤ Several existing z/OS IP workload balancing solutions already exist

- / External load balancing solutions with little or no Sysplex awareness
- / Sysplex-aware external load balancing solutions
 - Such as Network Dispatcher
- / Sysplex-internal load balancing solutions
 - Such as Sysplex Distributor
 - Such as DNS/WLM

➤ So why add another?

- / No one solution is best for everyone - advantages and disadvantages
- / Things to consider...
 - Administration and configuration
 - Support for TCP and UDP applications?
 - Extra network flows?
 - Client/server affinities supported?
 - Network Address Translation required?
 - Use z/OS Network QoS policy?
 - Use WLM (WorkLoad Manager) recommendations?
 - Availability of load balancing when Load Balancing component is unavailable
 - Caching
 - Server health information available?
 - etc.

The rationale behind developing the z/OS Load Balancing Advisor (LBA)

➤ Let's assume that you have selected an external IP load balancing solution for your z/OS Sysplex environment

┆ Some possible reasons:

- Prefer to have a single load balancing solution across multiple platforms in your environment
- Administration of the load balancing functions belongs to network administration domain (not z/OS administrators)
- Requirements for content-based load balancing
 - Need to perform load balancing/routing decisions based on data content (inspection of URL, session IDs, cookies, etc.)
 - This is often combined with SSL offloading functions - need to decrypt data prior to inspection

➤ But what if the external load balancing solution has no awareness of the Sysplex environment?

- ┆ Is the Sysplex treated just like any other server cluster?
- ┆ Is it aware of the current/changing workload conditions on the various systems in the Sysplex cluster?
- ┆ Is it aware of the health and status of applications and/or systems?

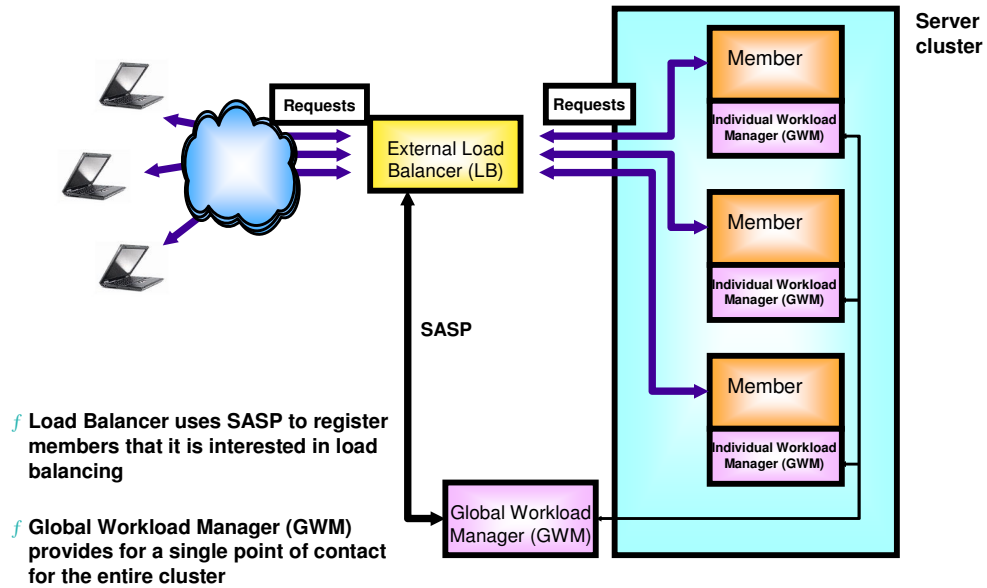
➤ Making the external load balancing solution "Sysplex aware" can help answer many of these questions

- ┆ The z/OS Load Balancing Advisor is a key component that allows any external load balancing solution to become "Sysplex aware".
 - The external load balancer needs to support the Server Application State Protocol (SASP) to obtain Sysplex information to use in its load balancing decisions.

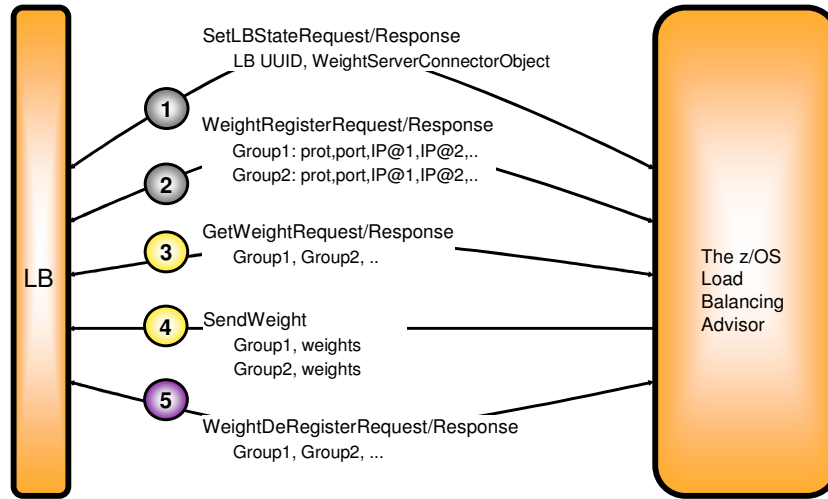


The SASP protocol

SASP - architecture



SASP protocol elements



- 1 and 2 performed during LB startup
- 3 and 4 performed at periodic intervals
- 5 performed during LB shutdown

SASP: Server Application State Protocol

Load balancer registrations through SASP

➤ **The load balancer may register two types of groups for which it wants weights:**

┆ A system group

- Represented by a list of IP addresses only.
- IP addresses are matched to TCP/IP stacks in the Sysplex.
- WLM weights for the LPARs are retrieved.
- CS weight indicates if IP address is active in the Sysplex or not
 - 0 means quiesced
 - 100 means not quiesced
- LBA displays will show a protocol value of zero for system group registrations.

┆ An application group

- Represented by a list of IP addresses, protocols (TCP or UDP), and ports.
- Server address spaces are matched to registrations.
- WLM weights for the LPARs are retrieved.
- CS weights are calculated factoring in how well the server instances are performing.
- LBA displays will show protocol as TCP or UDP with the registered port numbers

➤ **When an external load balancer connects to a global workload manager, it instructs the manager how it wants weights presented:**

- ┆ The load balancer will poll every so often to obtain the current weights
- ┆ The load balancer requests the advisor to push weights down at certain intervals or when the weights change
 - This is how a Cisco CSM external load balancer behaves

SASP update frequency

➤ SASP supports both a "push" and a "pull" model for updating the load balancer with workload recommendations

- Support of either by the load balancer is implementation dependent
- Load balancer tells GWM which model it wants to use
- "Pull" model
 - GWM "suggests" a polling interval to the load balancer
 - z/OS Load Balancing Advisor uses the configurable update_interval value for this purpose
 - Load balancer has the option to ignore this value
 - Load balancer requests updates each polling interval
- "Push" model
 - GWM sends updated information to the load balancer on an interval basis
 - z/OS Load Balancing Advisor uses the configurable update_interval value for this purpose
 - GWM may send data more frequently than the interval period
- Load balancer determines whether it wants information about all members it registered or only changed information about its registered members

SASP update frequency (*continued*)

➤ Tradeoffs of higher vs. lower update frequency

┆ With more frequent updates...

–Benefits

- Workload distribution approaches real-time, reducing latency between when changes appear on the target application and when the load balancer is notified of them
 - ★ Workload distributed more accurately according to system and application capacity
 - ★ Application availability status is more accurate

–Costs

- More network flows
 - ★ Between the GWM and the individual workload managers
 - ★ Between the GWM and the load balancers
- Additional cycles consumed by GWM and LBs

➤ Push vs. Pull

┆ May be restricted to one or the other by the LB implementation

┆ Pull model may delay when status change information about an application reaches the LB

Products that support the SASP protocol (mid-2005)

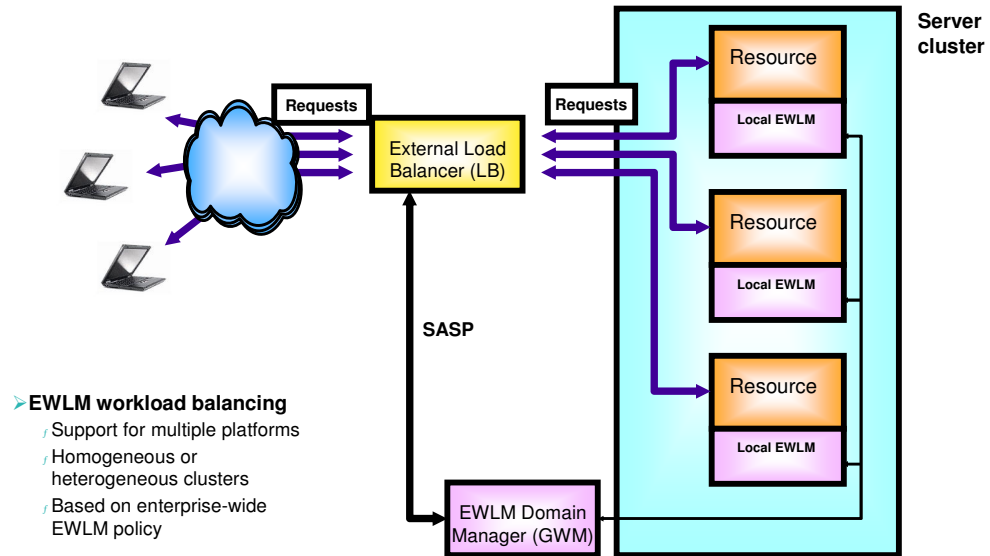
➤ SASP Global Workload Managers (GWMs)

- ┆ EWLM (Enterprise Workload Manager)
 - Part of IBM Virtualization Engine 1.0
 - Supported platforms:
 - ★ IBM AIX 5L Version 5.2
 - ★ Microsoft Windows 2000 Advanced Server, 2000 Server, 2003 Enterprise Edition, 2003 Standard Edition
 - ★ Sun Microsystems Solaris 8 (SPARC Platform Edition), 9 (SPARC Platform Edition)
 - ★ Linux on zSeries and System z9 for next release of IBM Virtualization Engine
- ┆ z/OS Load Balancing Advisor
 - Part of z/OS Communications Server (z/OS V1R4 and higher)

➤ Load Balancers

- ┆ Cisco Content Switching Module (CSM) level 4.1 (2.5)
 - Uses the "Push" model
- ┆ Cisco Content Services Switch (CSS)
 - Being tested with z/OS LBA
- ┆ Other vendors likely in the future

EWLM workload balancing



- **EWLM workload balancing**
 - Support for multiple platforms
 - Homogeneous or heterogeneous clusters
 - Based on enterprise-wide EWLM policy



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