Integrating Management Solutions

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With client-server computing firmly in place in many corporations, effective management of business critical applications has become the main concern of network and system managers. Application management is difficult because of the complexity, heterogeneity and distributed nature of a client-server environment. And because no one vendor can provide a complete management solution, companies must turn to different vendors to provide solutions to manage parts of their computing system. This situation creates problems by having to learn multiple point tools, increasing training expenses and reducing productivity.

Organizations have either selected a number of different management solutions from different vendors or are currently evaluating their management strategy; integration between management solutions is a major concern. The various management solutions may cover different environment elements, i.e. network routers and hubs, server systems or mainframe components. Typically, no single management solution can cover all management functions even for a common set of elements. Many organizations have implemented specialized solutions to support the help desk, configuration management or capacity planning functions. The HP OpenView management framework (and HP IT/Operations) provides an excellent vehicle for integrating these various management solutions. This integrating framework approach provides significant productivity improvements for IT management regardless of whether they are managing HP9000, HP3000 or a mixture of heterogeneous systems.

Third party vendors are addressing these issues by integrating their management products into a framework to provide more complete solutions. Integration enhances efficiency by providing a common platform for monitoring and managing multiple functions across multiple environmental components. The degree of efficiency improvement depends on the nature, depth and scope of integration between the various management solutions. Typically integration occurs at one of four levels:

- Console to console integration;
- Agent to console integration;
- Agent to agent integration; and
- Single agent with multiple “knowledge modules”.

Console to console integration

This is the shallowest level of integration that usually allows the passing of events from one management console to the HP OpenView framework. Integration at this level normally also allows the OpenView console to launch each of the other management applications and switch to that product’s console window.

This level of integration provides the following benefits:

- Correlation and filtering of events occur across multiple managed elements that provide a more comprehensive view of the managed environment and increases the scope and efficiency of management; and

- A single console platform can be used thereby reducing the number of console monitors required to manage the environment and the number of operators required to monitor across the various elements.

The disadvantages of this level of integration are:

- Event correlation is performed at a central console leading to additional network traffic to bring events and supporting data from the distributed servers and network elements to the console;
- Although events are available for correlation, the context and conditions leading to each event are normally not available unless additional queries are made to various element managers, which means that determining the root cause of a problem and correctly initiating appropriate corrective actions may not be possible;
- If corrective actions are initiated by the OpenView console there is an inherent delay due to the network turnaround and potential console overload. This can lead to actions no longer being valid as the situation may have changed or deteriorated further in the intervening period; and
- Because multiple consoles applications are used and the integration is very loose, management personnel have to deal with multiple interface styles and functions that lead to a reduction in management efficiency and increased training costs.

A number of management solutions provide this level of integration.

Agent to console integration

This is the next level of integration where multiple independent agents feed information to a single console or management framework. As well as sending events to this single console, information collected by the various agents can be displayed at the console.

The benefits provided by this level of integration are:

- Correlation and filtering of events occur across multiple managed elements that provide a more comprehensive view of the managed environment and increases the scope and efficiency of management; and
- Information from multiple managed elements is displayed consistently at the single console providing significant management efficiency improvement. Not only are the number of console monitors reduced, but the same console windowing and information display mechanisms are used for all managed elements. This reduces training costs and also reduces the time required to diagnose and react to problems as the operator is not required to navigate through multiple management products.

The disadvantages of this approach are:

- Event correlation is performed at the console leading to additional network traffic to bring events and supporting data from the distributed servers and network elements to the console;
- Because there is no real standard for this level of integration, SNMP a de-facto standard initially aimed solely at network element management, is typically used as a “lowest common denominator”. The simplicity of this management protocol means that again the context and conditions leading to each event are normally not available and hence determining the root cause of a problem and correctly initiating appropriate corrective actions may not be possible; and
- If corrective actions are initiated by the console there is an inherent delay due to network turnaround delay and potential console overload which again can lead to actions no longer being valid as the situation may have changed or deteriorated further in the intervening period.

An example of this level of integration is BMC’s PATROLVIEW for HP OpenView Network Node Manager (NNM) which offers this level of integration. This allows the NNM user to interact directly

with the PATROL Agent. Events detected by PATROL are passed to the NNM console as SNMP traps. All object instances monitored by PATROL are mapped into the NNM framework console. The user can then open these objects and drill down to graphically display parameters captured by PATROL, for example buffer cache hit rates for a database, in the same way they would look at network statistics, i.e. collision rates on a LAN segment.

Agent to agent integration

This approach relies on the independent intelligent agents sharing information directly. One agent acts as the master agent for event correlation and event recovery as well as notification and information passing to a management console. This integration can either be achieved through the use of SNMP master agents and sub-agents, or through a higher-level integration using proprietary APIs. The use of SNMP is again a lowest common denominator approach which allows events and information metrics to be passed to the master agent, but it is limited in its ability to pass information related to history, trends, context and content related to events. API sharing allows much deeper levels of integration, but there are currently no standards defining these APIs. This means that individual vendors have to agree to expose their APIs and work with other management solution vendors to achieve solution integration.

The benefits provided by this level of integration are:

- Correlation and filtering of events occur across multiple managed elements on the managed server. This not only provides a more comprehensive view of the managed environment but also reduces network traffic as events don't have to be sent to the console for correlation. Additionally, more context and event content information is available increasing the accuracy and effectiveness of the automated problem diagnosis and recovery;
- Initiation of corrective actions occurs at the managed server, again reducing network traffic and reducing the time delay before the action is implemented which improves the effectiveness of the action and availability of the computing environment; and
- Information from multiple managed elements is first correlated by the master agent and then displayed by the console. This significantly improves management efficiency and allows more sophisticated correlation and trend analysis to be performed at the console.

The disadvantages of this approach are:

- Multiple agents are still required at each managed server (as in all of the above levels of integration) that can add to the resources consumed by the management solutions; and
- The lack of standards in this area means either that the effectiveness of the solution is reduced due to a reliance on SNMP, or that the number of vendors participating in the integrated solutions is limited to those who have specifically agreed to cooperate and jointly develop the integrated solution.

HP OpenView IT/Operations (IT/O), previously HP OperationsCenter, is an intelligent framework that enables this level of integration, and BMC's PATROLVIEW for HP IT/Operations integrates in this fashion. Events detected by PATROL are passed from the PATROL Event Manager (at the agent) through a translation layer and directly into the IT/O agent. The IT/O agent can perform additional event correlation and trigger additional corrective actions. This approach can also be extended to include systems supported by PATROL that are not currently supported by PATROL. PATROL events detected on an OpenVMS system can be forwarded to a server which does have a resident IT/O agent.

Single agent with multiple "knowledge modules"

An alternative approach to the above is to have a single agent with an open and extensible architecture that allows other solution providers to develop knowledge modules (KMs) to encapsulate expertise

about a particular component or aspect of the environment. The KMs are developed in a high level script language and are platform independent. This allows an element provider, system integrator, management solution vendor or end-user to develop specific management solutions for the components they supply, environment elements for which they have particular expertise or for in-house developed applications.

The benefits of this approach are:

- A single agent can reduce the resources consumed by the management solution and avoids problems of distribution and version control associated with the proliferation of multiple agents;
- Correlation and filtering of events occur across multiple managed elements on the managed server and within a single agent. This not only provides a more comprehensive view of the managed environment but also reduces network traffic as events don't have to be sent to the console for correlation. Additionally all context and event content information associated with the managed elements is available via the various knowledge modules, increasing the accuracy and effectiveness of the automated problem diagnosis and recovery;
- Initiation of corrective actions occurs at the managed server, again reducing network traffic and reducing the time delay before the action is implemented which improves the effectiveness of the action and availability of the computing environment; and
- Information from multiple managed elements can be displayed by any console supported by the single agent. This significantly improves management efficiency and allows sophisticated correlation and trend analysis to be performed either at the agent or at the console.

The disadvantages of this approach are:

- The lack of standards in this area means that the number of vendors participating in the integrated solution is limited to those who agree to support a single agent and knowledge module script language.
- Other management frameworks or element managers may already be implemented in the environment, and so there may still be a requirement to integrate this agent and associated knowledge modules with these other management products using one of the first three alternatives outlined above.

Examples are HP IT/Operations that can be extended with knowledge templates, and PATROL from BMC Software that utilizes Knowledge Modules, which provide off the shelf solutions for managing a wide variety of applications, databases, middleware and underlying technology. These Knowledge Modules can be extended with additional parameters, events, corrective actions, or notification rules.

Summary

When examining management solution requirements, not only is functionality important but also the ability to integrate all of the individual solutions in your management portfolio to form a comprehensive solution suite. This integration is ideally provided by the solution vendors, however some customization may be required.

The various levels of integration have advantages and disadvantages, and it is beneficial to examine your own integration requirements to determine which level will provide greatest efficiencies in your organization.