HP OpenView Service Assurance for Communication Networks

Concepts Guide

HP-UX, Solaris, Windows NT®

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1 Concepts

This document gives a high-level overview of HP OpenView Service Assurance for Communication Networks and answers the questions:

- What problems does this product solve?
- What is included in this product?
- Which pieces of the product do I need?
- What does a product installation look like?
- What decisions do I need to make before and after installation?
- What information do I need to gather to make these decisions?

Network Management

A computer network may include a wide variety of hardware and software. Each component in the network may transmit events describing its current condition. These events are usually sent in standard formats; however, there are several event standards, each specifying different information sizes and contents. The process of interacting with network components and maintaining their proper function is called network management.

An effective network management system serves many functions. These include:

- Receiving and interpreting events from a wide variety of equipment and applications.
- Communicating problem conditions to the network operator.
- Acting on these problem conditions when appropriate.
- Displaying network information to the screen in an easy-to-read format.
- Allowing the network administrator to limit the events received and the actions available to the operator.

Figure 1-1 shows the common pieces of a network management system.

A network may contain managed and unmanaged devices. Managed devices are those that the network management system monitors by tracking related events. The status information conveyed in these events contributes to the status of the managed devices. When a network device emits events in a non-standard, proprietary format, a proxy agent receives these events and maps them to a standard format, such as SNMP, before forwarding them to a data collector. While the network management system display may include unmanaged devices, it does not maintain status information about them.

A network that includes telecom equipment may contain one or more element management systems. An element management system acts as a proxy for telecom network elements that are not able to specify a remote event target. The element management system connects to each managed network element via a direct connection method, such as a socket, to receive events from the device. It forwards these events to a network management system data collector.

Network Management

A network management system contains one or more agents; each agent contains one or more data collectors. The network administrator configures each network element or device to send its events to a specific data collector on a specific agent. The data collector filters out unknown events and forwards recognized events to the network management server. The agent may do some preliminary interpretation and correlation of events.

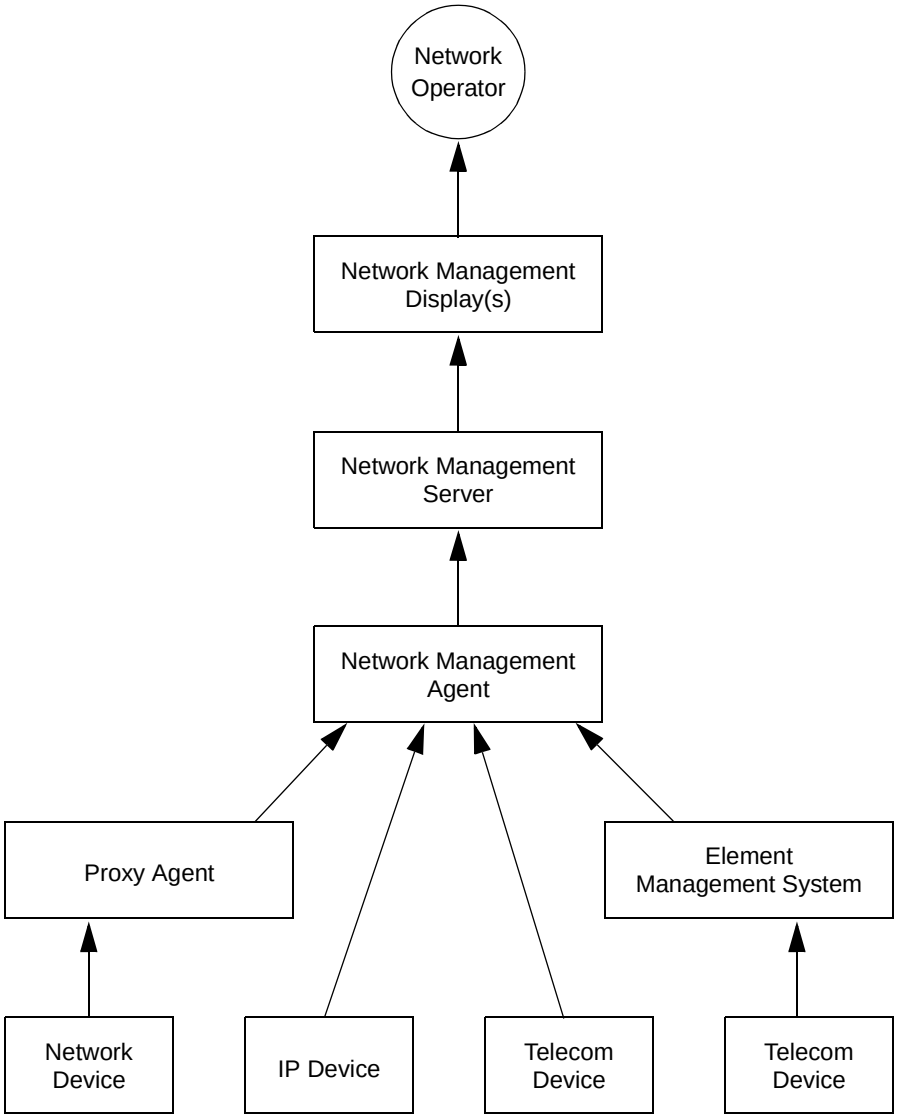
The network management server receives events from the agents and processes the events for use in network management. Some network management servers can trigger actions that occur automatically under certain conditions. For example, the receipt of a router down event may cause a network operator's pager to sound. Additionally, the network management server passes information to and receives input from the network management display.

When a network is large or spread across several regions, there may be multiple network management servers active in the network. In this case, one of these servers is generally the master server for network management. This server receives events from the other network management servers and, possibly, some agents. Each network management server may communicate with its own network management display.

The network management display is generally a graphical user interface (GUI) that presents information about network health to one or more network operators. The GUI displays a list of relevant events from network components and may include a symbolic representation of the network layout.

Typically, many network operators work together in a network operations center (NOC). Each network operator is responsible for maintaining a subsection of the network so that network users can do their jobs without concern for the network's availability. An operator responds to events that indicate a problem within the network and implements the appropriate solution. An operator may also use information from the network management system to identify potential problems and predict future demand on the network. The operator can then take proactive steps to improve the network's functionality.

Figure 1-1 Network Management System Conceptual Diagram



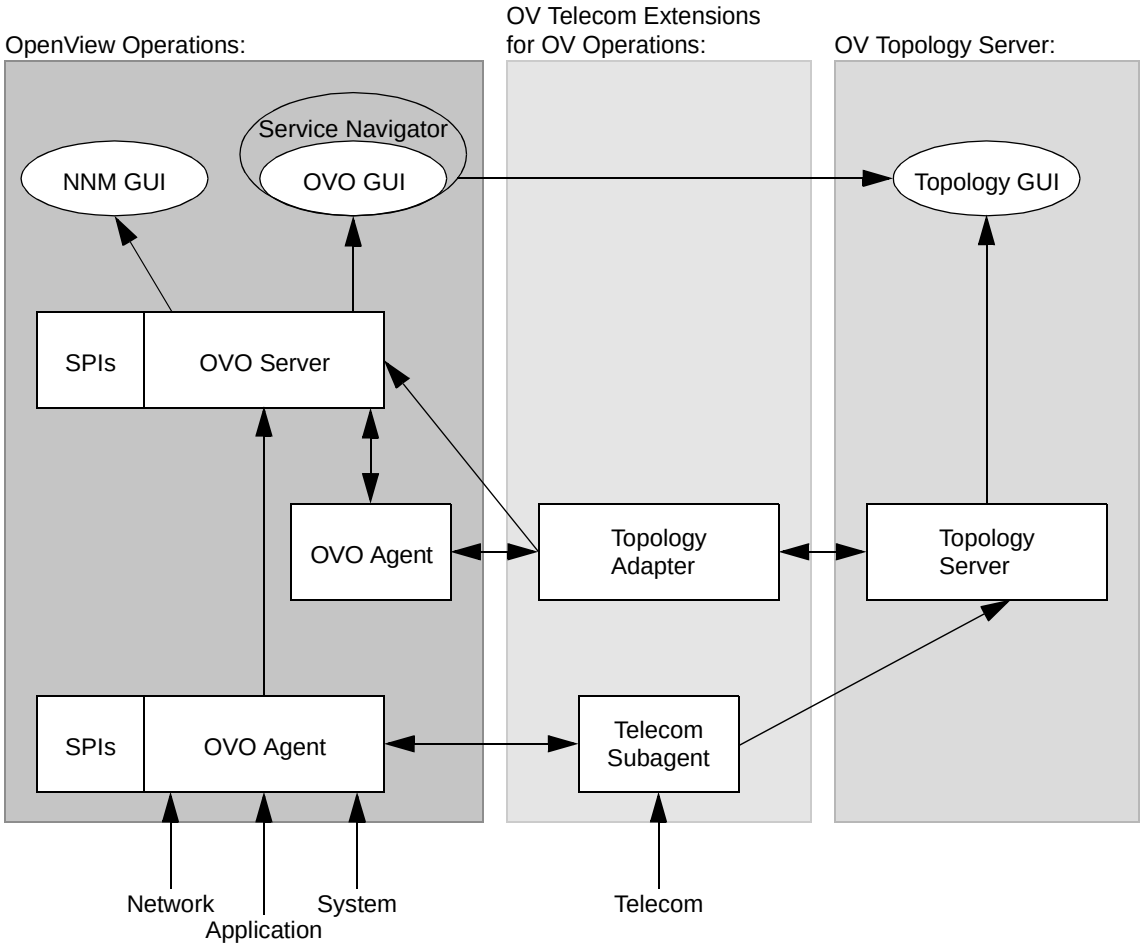
About HP OpenView Service Assurance for Communication Networks

Traditionally, managing a diverse network has required the implementation of several different network management systems. Each system would gather information about one type of technology (domain) in the network. A network operator would focus on that one domain to the exclusion of the other managed domains. For example, one network operator might use a network management system to maintain IP devices while another operator uses a different network management system to maintain telecom equipment.

HP OpenView Service Assurance for Communication Networks (OVSACN) is an integrated solution for managing IP devices, telecom equipment, system information, and software applications. It consists of three purchasable products: HP OpenView Operations (OVO), OV Telecom Extensions for OV Operations, and OV Topology Server. OVO includes HP OpenView Network Node Manager (NNM) and provides the foundation for OVSACN, which is designed for the communications service provider. With the addition of HP OpenView Service Navigator, OVSACN accommodates management of services that depend on the proper functioning of components in one or more managed domains.

Figure 1-2 on page 11 presents a high-level overview of the OVSACN product architecture.

Figure 1-2 High-Level Product Architecture



HP OpenView Operations

OVO presents events from all managed devices and applications in one message browser. Network operators see the broad picture of the network state and can prioritize their efforts across the entire managed network. The OVO operator GUI shows the physical layout of the managed devices and displays icons for the managed applications. This GUI shows status of the represented elements based on the severity of the received events.

The primary components of OVO are:

- **OVO agent**—The OVO agent processes run on managed nodes throughout the environment to collect events from the processes running on those nodes. The OVO agent filters and formats these events according to information in configured message source templates. It then forwards relevant information in the form of messages to the OVO server. The OVO server responds with actions to prevent or correct problems on the managed nodes and passes the messages to the message browser in the OVO operator GUI.

  The OVO agent on the OVO server machine receives new problem and status messages from OV Topology Server. The OVO agent formats these messages and forwards them to the OVO server. This OVO agent also performs self-management by reading OVO server software and machine operating system log files and creating and sending applicable messages to the OVO server.

- **OVO server**—The OVO server receives formatted messages from all managed nodes (via the OVO agents). It manages these messages, initiating automatic actions as necessary, and groups messages according to the current configuration. The OVO server updates the messages and status information displayed in the OVO operator GUI. Additionally, the OVO server can forward messages to other management servers and can install, configure, and update the OVO agent software on managed nodes.

- **OVO GUI**—The OVO graphical user interface displays the nodes managed by the current operator in the node bank. When OV Topology Server is also configured, this node bank includes the upper topology[1] of the managed telecom network elements. (The lower topology[2] of the telecom network elements appears only in the topology GUI.) It also includes message groups, applications, and, with the purchase of Service Navigator, services. The OVO GUI

message browser displays formatted messages received from all managed devices and applications.

Network operators interact with the information presented in the Java OVO operator GUI to know the condition of the managed nodes they are responsible to maintain and to set priorities for their work day.

The network administrator uses the Motif OVO administrator GUI to configure each operator's working environment.

- **NNM GUI**—The Motif NNM administrator graphical user interface displays a network map of the managed IP devices. This map groups the IP devices into subnets and shows status for each managed component. The NNM GUI is populated by the automated IP discovery and layout mechanism and includes tools for troubleshooting problems in the IP network. A Java read-only copy of the NNM map is available from the OVO operator GUI.
- **Service Navigator**—Service Navigator is an add-on product to OVO that provides visual data about the availability of the services in the network. Service Navigator displays a hierarchy of services and shows the current status of each service. It supports the definition of relationships between these services and managed devices and applications such that an incoming event from a device or application can affect the status of an associated service. Service Navigator provides root cause analysis of service status issues. It can also show the services impacted by a particular failure condition listed in the message browser. When OV Topology Server is also configured, the service hierarchy can show the specific telecom network element that is causing a service degradation.

  1. The upper topology usually consists of virtual elements that correspond to geographic regions (such as sites and buildings) or to functional equipment groupings (such as GPRS/GSM). The purpose of the upper topology is to support higher level views and navigation models that match customer requirements. The upper topology also includes the managed network elements but does not include any network element subcomponents.
  2. The lower or physical topology is usually a direct model of the equipment. Normally, the topology includes only telecom equipment. However, other equipment can be included in the lower topology if the OV Topology Server is configured with information about the events these devices emit.

OV Telecom Extensions for OV Operations

The OV Telecom Extensions for OV Operations product adds one or more telecom data collectors to the OVO agent, thereby increasing the types of equipment that OVO can manage.

The primary components of the OV Telecom Extensions for OV Operations product are:

- **Telecom subagent**—The telecom subagent acts as a data collector to receive events from telecom network elements and telecom element management systems. The telecom subagent formats the received events using the configured message source templates. Additionally, the telecom subagent provides table lookup and time arithmetic capabilities. If OV Topology Server is configured, the telecom subagent formats the events into X.733 event format and forwards them to the topology server for further processing. If OV Topology Server is not configured, the telecom subagent forwards the events to the OVO agent.
- **Topology adapter**—The topology adapter forwards problems from the topology server to the OVO agent for inclusion in the message browser. It maps source topology elements to nodes in the OVO node bank for maintaining the OVO and topology GUIs. The topology adapter also maintains the synchronization between the message browser and the problems presenter by sending messages directly to the OVO server. This synchronization includes changes to problem ownership, severity, and acknowledged or discharged state. When Service Navigator is configured, the topology adapter assigns problems to the applicable services and communicates this information to the OVO server so the status of services that include elements in the telecom topology stays current.

  The topology adapter is included in the OV Telecom Extensions for OV Operations product but does not function without OV Topology Server being configured.

OV Topology Server

The optional OV Topology Server displays the upper and lower topologies of the telecom devices in a topology GUI. It receives all incoming events generated by equipment included in the lower topology and associates each event with a particular managed object instance in the topology GUI. The OV Topology Server correlates all received events into problems, displays them in a problems presenter, and forwards them to the OVO message browser. It also sets the status for each managed object instance according to the status of the associated problems.

The primary components of the OV Topology Server product are:

- **Topology server**—The topology server receives X.733 format events from the telecom subagent and maps them into the upper topology. It correlates these events into problems according to the topology and acts as a server to the topology GUI by updating the problems and status information displayed in the topology GUI.
- **Topology GUI**—The topology graphical user interface consists of five presenters. The map presenter displays both hierarchical and logical views of the lower topology of the telecom network elements. An example hierarchical view is server maps that display device containment. An example logical view is a map of managed services. The problems presenter displays the formatted problems correlated from the incoming topology events.

  Network operators who manage telecom equipment interact with the information presented in the topology GUI to monitor the condition of the managed objects for which they are responsible and to set priorities for their work day.

Smart Plug-ins

The OVO agent is configured via message source templates that specify the events of interest to the network management operator and define event processing. The agent can only format and forward an event that is described in a message source template. It can be very time-consuming to configure message source templates for all of your managed applications and devices. For that reason, HP and third-party partners offer HP OpenView Telecom Smart Plug-Ins (Smart Plug-ins) that contain pre-configured message source templates. Additionally, Smart Plug-ins often include custom applications for managing the supported applications or devices.

Smart Plug-ins for telecom equipment generally come in two flavors:

- Basic templates provide minimal interpretation of events. Their main purpose is to collect events from data sources and insert these events into the OVO agent. They may also contain associated mapping tables and additional discrimination on content to produce messages that are specific and meaningful to the user.
- Topology-Smart templates are versions of the basic templates that also include topology capabilities. A Topology-Smart template integration can work with or without the OV Topology Server configured.

Relationship Between GUIs

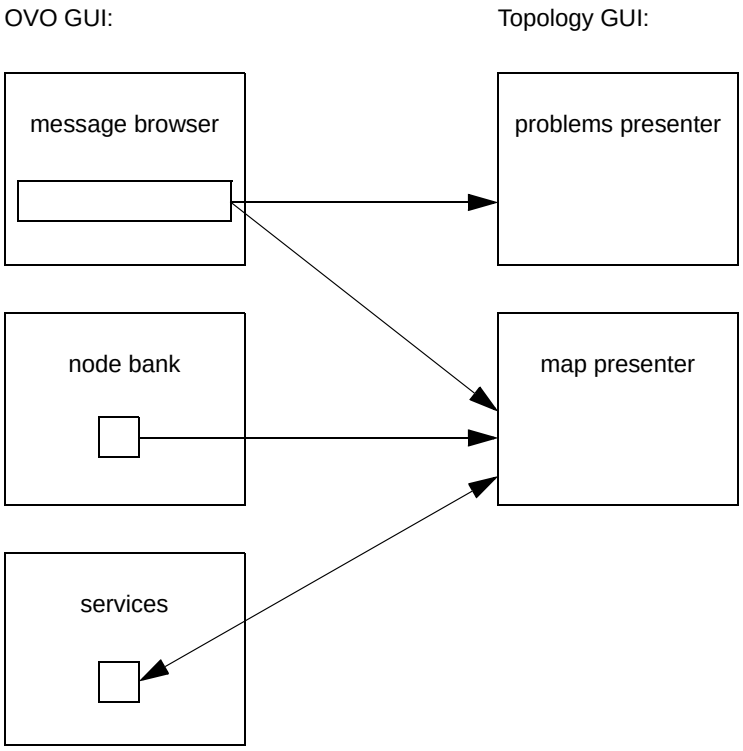
Together, the OVO, NNM, and topology GUIs are powerful tools for managing your entire network. It is possible to open a window in the NNM or topology GUI that shows information selected in the OVO GUI. This cross-launching functionality allows flexibility for each network operator's personal style without requiring separate logging on to each GUI.

The following cross launches from the OVO GUI to the topology GUI are supported:

- Given a problem message in OVO, open a topology GUI map containing the element or object that caused the problem.
- Given a problem message in OVO, show the events correlated in that problem and the problem history in the topology GUI.
- Given a node selected in the OVO node bank, show the related map in the topology GUI.
- Given a service in Service Navigator, open a topology GUI map that shows the elements affecting that service.
- Given an element in the topology GUI map, show a list of services with which that element is associated.

Figure 1-3 shows the possible cross launches from the OV Telecom Extensions for OV Operations GUI to the OV Topology Server GUI.

Figure 1-3 Relationship Between GUIs



Relationship Between Messages and Problems

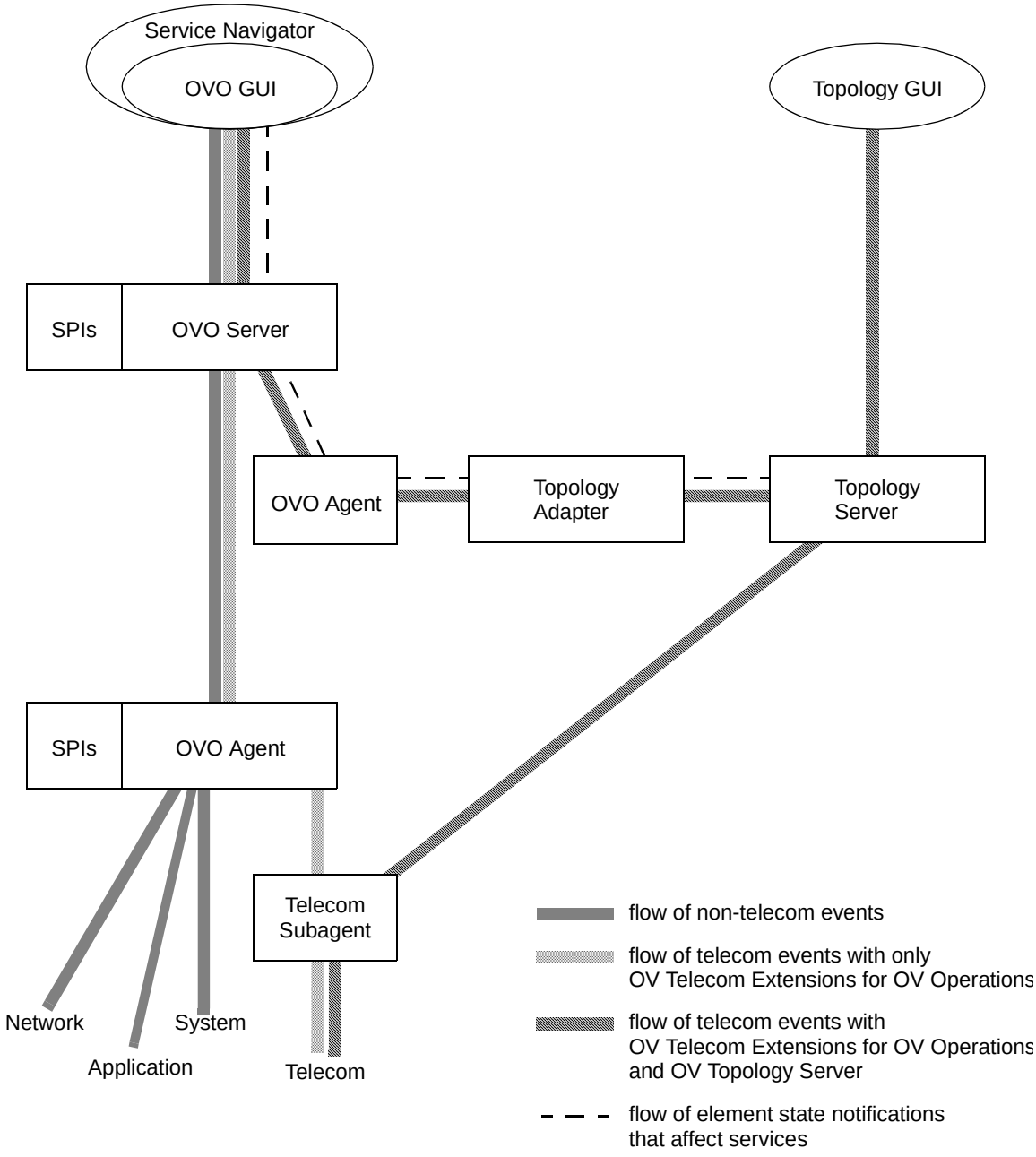
When OV Topology Server is configured, each telecom problem is represented in the OVO message browser and the topology GUI problems presenter. The problem information in the message browser contains a subset of the problem attributes available in the problems presenter. The problems presenter displays problem information in an easy-to-read format and is highly customizable. The determination of whether to use the message browser or the problems presenter for managing telecom equipment is a matter of network operator preference and/or network operations center policy.

The interaction between the OVO message browser and the topology GUI problems presenter is described here.

- OVSACN maintains the synchronization of the OVO message browser and the topology GUI problems presenter. Changes to a message's severity, ownership, or acknowledge state reflect in the problems presenter. Similarly, changes to a problem's severity, ownership, or discharge state reflect in the message browser.
- The topology server sets the severity of new problems to the severity in the received event.
- The topology server sends each problem to the OVO server so the message browser also includes problem messages.
- When the topology server changes a problem's severity, it sends a message to the OVO server to update the severity of the corresponding problem message in the message browser.
- Problem annotations are not synchronized between the message browser and problems presenter.

Figure 1-4 shows the flow of events through OVSACN.

Figure 1-4 Event Flow



Federation

The OV Topology Server can manage more than one million distributed objects over a distributed object management system. OV Topology Server is inherently scalable without compromising the existing installation. OV Topology Server manages objects transparently by distributing them over multiple topology servers in a federated topology that appears as a single topology to the topology GUI and the operator.

Distributed (federated) environments typically require custom installation and design. They are beyond the scope of this document.

Deployment

This section describes two common scenarios for deploying OVSACN.

- Scenario One describes the approach for deploying only the OV Telecom Extensions for OV Operations. This scenario is known as an entry-level deployment.
- Scenario Two describes the approach for adding the OV Topology Server to the OV Telecom Extensions for OV Operations. This scenario assumes that Service Navigator is installed with OVO and is called a standard-level deployment.

Scenario One (Entry-Level)

Scenario One includes deploying only the OV Telecom Extensions for OV Operations with OVO. This approach is appropriate for small and moderately sized networks that have not yet used a telecom equipment-specific network management tool. The effect of this scenario is to add a new set of data collection elements to those provided with the standard OVO product. Use of Scenario One should show immediate return on a small time investment for product installation and configuration.

In this approach, there is no message to problem correlation via the topology engine, no root cause correlation, and no cross launching of the topology GUI. The telecom data collectors are deployed as a subagent to the OVO agent. The telecom subagent preprocesses the telecom events to do time arithmetic and table lookups for some event fields and inserts these events into the OVO agent for normal OVO handling. Normally, the agent is deployed remotely at a site close to the managed elements, requiring little consulting to initially deploy.

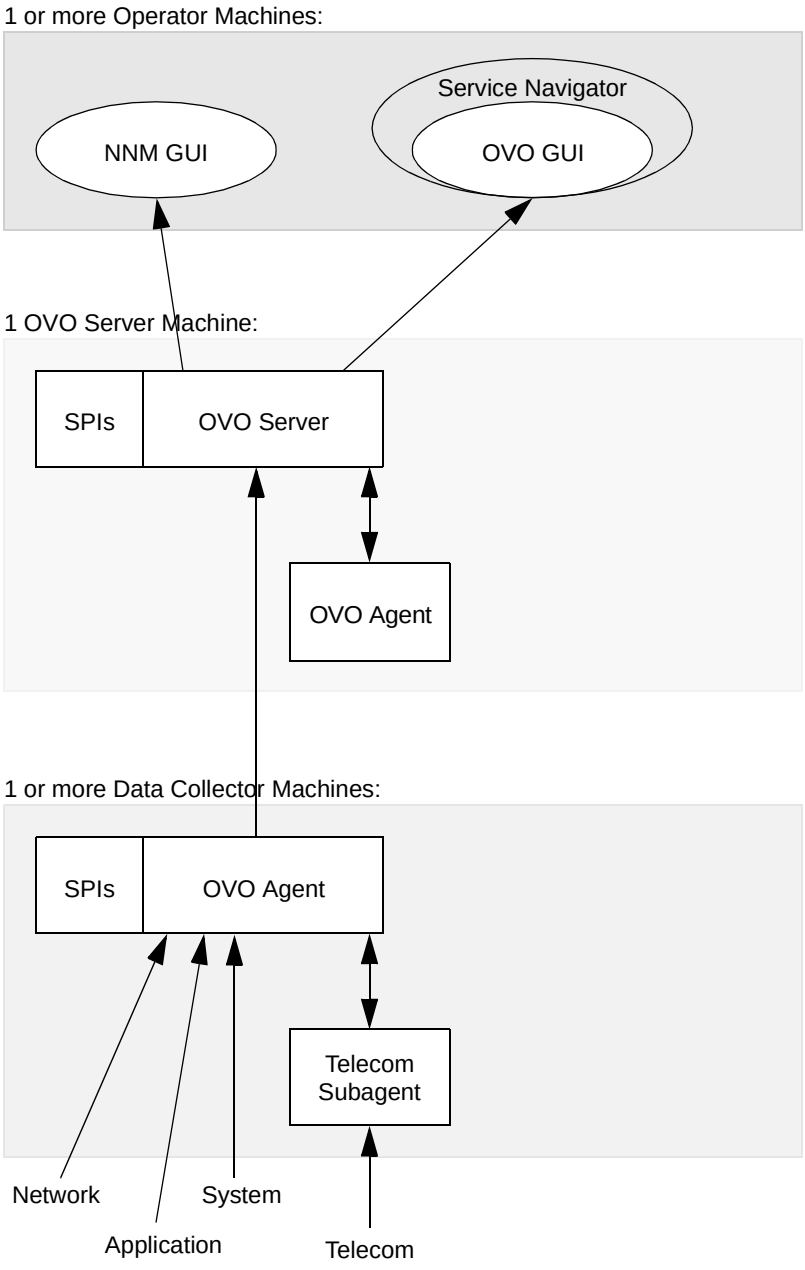
As shipped, the telecom subagent can receive events via TCP (passive and active) and FIFO pipes. The OVO agent can receive events via SNMP and can read application log files and generate messages when the configured conditions occur.

Custom data collectors may be needed for element management systems that use proprietary APIs to send events. The OVO developer's toolkit provides an interface for writing such custom data collectors to receive events via the proprietary API and insert these events directly into the

OVO agent message interceptor in an appropriate format.

Figure 1-5 shows the recommended distribution of OVSACN software for Scenario One.

Figure 1-5 Distribution of Software Components for Scenario One



Scenario Two (Standard-Level)

Scenario Two includes deploying OV Telecom Extensions for OV Operations, OV Topology Server, and Service Navigator with OVO. This approach is appropriate for most communications service provider deployments.

In this approach, a remote telecom subagent collects telecom events and forwards them to the topology server for correlation into problems. Problem correlation reduces the number of inputs a NOC operator must consider and increases the information available in each displayed message. As problems are produced, they are injected as problem messages into the OVO agent on the OVO management server. This approach provides a higher level of abstraction into OVO and offloads the OVO server because it has fewer inputs to handle.

As the topology server generates problems, these problems generate network element state changes in the topology. These changes are based on the outstanding problems and status propagation. Service Navigator generates additional messages to represent the state changes. The events are assigned to a service based on the element to service mappings, resulting in service state changes in the OVO GUI.

Depending on personal preference, the NOC operator may manage telecom equipment from either the OVO message browser or the topology GUI problems presenter. The operator may navigate from the telecom problem message to the topology GUI map via cross launching mechanisms. The related events that were correlated to produce a particular problem are available in the topology GUI problem history event viewer.

The operator may navigate from Service Navigator to a view representing the elements contributing to that service. In the case of telecom equipment, these views are via the topology GUI map presenter. Additionally, in the topology GUI, the operator may show a list of services for any topology element.

HP supports the installation of the topology server on the same machine as the OVO server (single server model) or on a separate system from the OVO server (dual server model). The dual server model is preferred for several reasons:

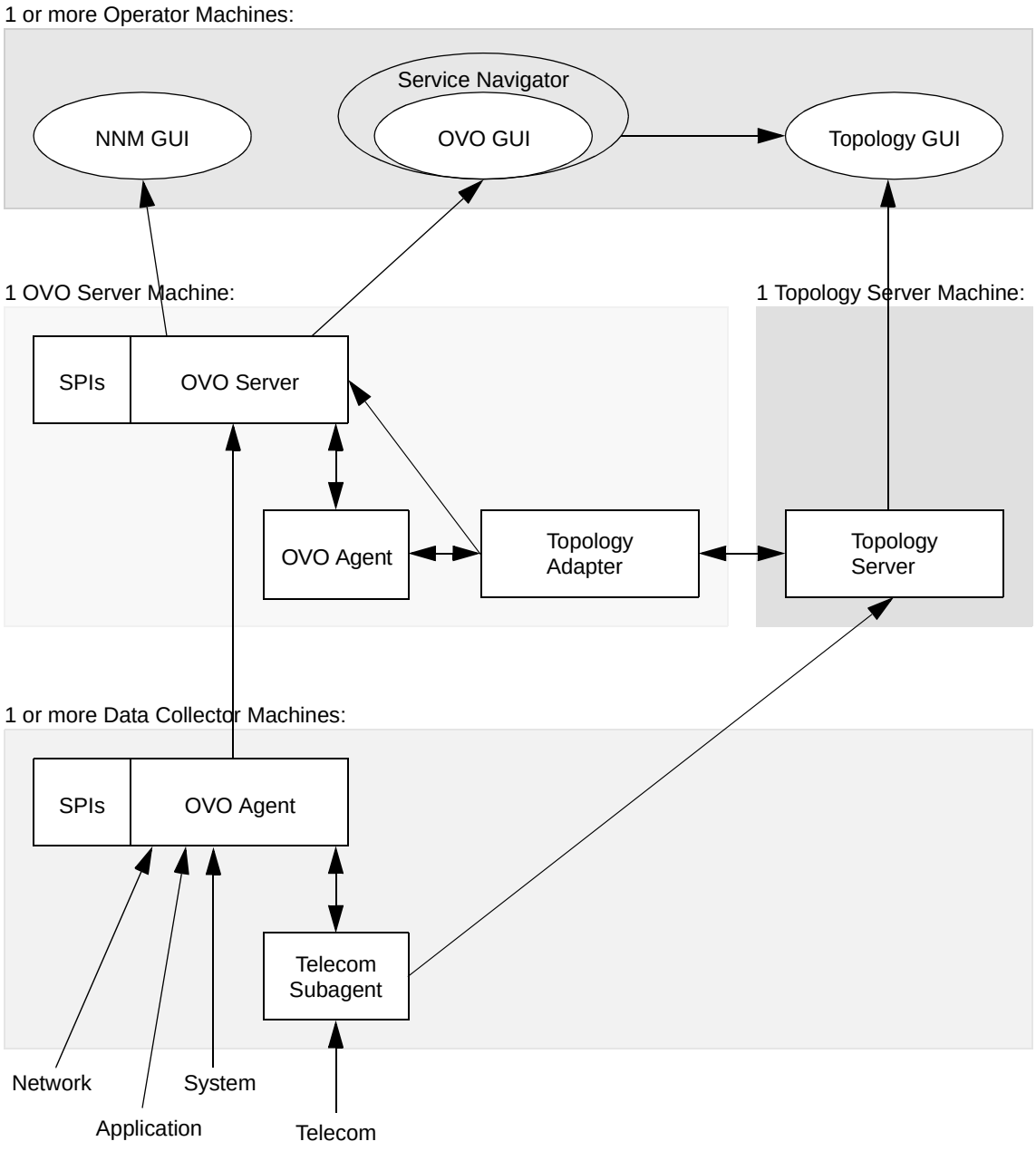
- OVO, NNM, and the topology server all use a lot of CPU time. Having all three components deployed on the same server system may overload its processing power. Deploying the topology server

separately from OVO and NNM provides a significant increase in scalability and capacity.

- Installation of the OVO and topology servers on the same system may be complex.
- The dual server model is the preferred setup for migrating from an existing HP OpenView Communications/Service Assurance installation.

Figure 1-6 shows the recommended distribution of OVSACN software for Scenario Two for a dual server model. In the single server model, the OVO server machine and the topology server machine are the same physical hardware.

Figure 1-6 Distribution of Software Components for Scenario Two



Configuration Points

This section describes the types of information needed to effectively configure OVSACN. It is best to understand this information for your environment before proceeding with product installation and configuration as this information may influence some of your decisions.

Telecom Configurator

The Telecom Configurator tool provides common topology configuration across OVSACN. Administrators use the Telecom Configurator to configure a telecom-specific managed network. For entry-level deployments, this tool helps administrators configure data collectors and agents. For standard-level deployments, this tool helps administrators define and configure:

- Topology network object models.
- Topology object instances.
- Data collectors and agents.
- Message processing on the topology server.

OV Telecom Extensions for OV Operations

The telecom subagent checks every incoming event against a list of known begin/end patterns and accepts only those events with a recognized pattern. The OVO agent then interprets each received event according to the configuration in the message source template. Incoming events that do not match any of the configured message source templates are discarded.

Configuration of the telecom subagents requires knowledge of the following items:

- The devices to be managed: what they are, where they are located, and the port on which each device sends events.
- The begin/end patterns for the events to be received. Each unique begin/end pattern requires the configuration of a message source template. HP and our partners provide Smart Plug-ins that include message source templates for many device types. Consider

purchasing one of more of these Smart Plug-ins to meet your data collection configuration needs.

- The event fields to be mapped to X.733 values (topology server only). The telecom subagent can use lookup tables to map event field values to X.733 format event values. For example, a lookup table for event severity might map the number of asterisks in the severity field to the X.733 name for that severity. If you will be using the OV Topology Server, compare the content of the incoming events from your managed telecom devices to the content required by X.733 and generate lookup tables as necessary.
- The location of the topology server, if configured.
- The upper topology:
  - — Upper level instances.
  - — Equipment short name mapping to fully distinguished name (FDN).
  - — Equipment node bank mapping.
  - — Element to service mapping.

OV Topology Server

The optional OV Topology Server requires that each managed object be included in the topology as a managed object instance. Each managed object instance is identified by a fully distinguished name (FDN). In OVSACN, the FDN is the concatenation of the relative distinguished name (RDN) for the lower topology in the topology GUI and the RDN of the upper topology.

Configuration of the lower topology requires knowledge of the following items:

- The managed object class of each type of network element and each subcomponent of the network elements to be managed.
- The RDN of each physical device to be managed.
- The object model of the lower topology.

iNOC Console

Each OVSACN user must have a logon name for the iNOC Console. Additionally, each logon name must be associated with an operation profile. The operation profile defines the actions and privileges available to the logged on user. Configuration of an OVSACN user requires knowledge of the following information:

- The logon name and initial password.
- The operation profile to be associated with the logon name.

NOTE

Operator logon names must match between the OVO and topology servers. The administrator logon names `opc_adm` and `oemfadm` are handled specially and do not require matching logon names on the topology server.

Configuration of an operation profile requires knowledge of the following information:

- The actions to be made available. This should be a logical grouping of actions that match one or more user's network management needs.
- Optionally, the hours of the work shift for which the configured actions or services are required.
- The operator responsibilities and work hours associated with each configured service.

Service Navigator

With the Service Navigator product installed, incoming events and changes to the state of elements in the map presenter can affect the state of services in the OVO GUI. Service Navigator presents the services in a service hierarchy that reflects changes to a lower-level service throughout the managed services.

Configuration of the service hierarchy requires the following knowledge.

- The services to be managed.
- The events and managed elements that affect the services.
- The hierarchical relationship of the services.

- The desired propagation algorithm by which lower-level services impact higher-level services.
- The reports required for each service.

When the message source template for an incoming event includes an optional service name attribute, the severity of that event is included in the calculation of the state for the named service. The mapping of events to services requires the name of the service(s) that each event condition affects, if any. Some Smart Plug-ins provide out-of-the-box service instrumentations.

When topology elements are mapped to services, the OV Topology Server generates element state notifications and assigns the appropriate service name to the notification.

The mapping of topology elements to services requires the name of the service(s) that each topology element affects, if any.

For Detailed Information

The *HP OpenView Service Assurance for Communication Networks Quick Start Guide* contains information on:

- Getting useful information out of the product with low initial time investment.

The *HP OpenView VantagePoint Operations for UNIX Administrator's Reference* guides contain information on:

- Agents.
- Customizing the event viewer.
- Configuring and using OVO.

The *Managing Your Network with Network Node Manager* guide contains information on:

- Configuring and using NNM.

The *HP OpenView Service Assurance for Communication Networks Configuration Guide* contains information on:

- Telecom templates.
- Topology service.
- Service to element mapping.

The *HP OpenView Service Assurance for Communication Networks Customization and Maintenance Guide* contains information on:

- Customizing the problems presenter.