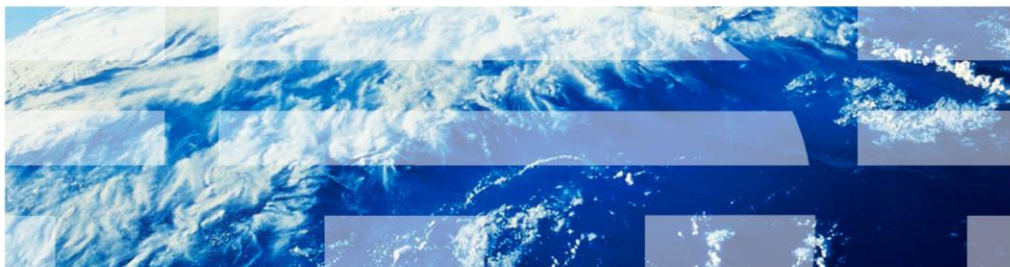


# IBM PureApplication System

## Monitoring overview



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This presentation will provide an overview of the monitoring capabilities provided in IBM PureApplication™ System.

## Contents

- Monitoring overview
- Monitoring roles
- Workload monitoring
  - Virtual system
  - Virtual application
  - Monitoring shared services
- System monitoring
- Enterprising monitoring integration
- Summary

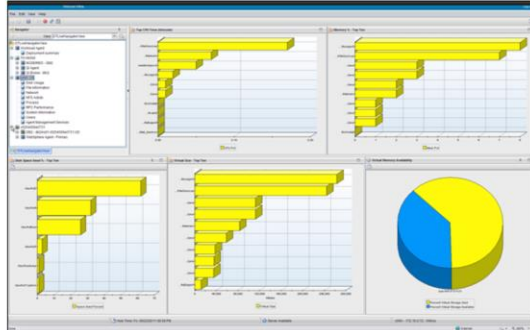
This presentation will start with a high-level overview of the different levels of monitoring provided by the IBM PureApplication System. It will then discuss security roles associated with the different levels of monitoring, then provide an overview of monitoring capabilities at both workload and system levels.

## ***Monitoring overview***

This section will provide a high-level overview of the different levels of monitoring provided by the IBM PureApplication System.

## PureApplication System monitoring (1 of 2)

- Integrated components
  - Context aware links for drill-down navigation
  - Single place to view all events
  - Integrates into enterprise monitoring



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IBM PureApplication System monitoring overview

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IBM PureApplication System provides a rich set of monitoring capabilities directly from the workload and system consoles. In many cases, console pages link directly to relevant monitoring data. In addition, you can monitor high-level aspects of your PureApplication System from your existing enterprise monitoring solution.

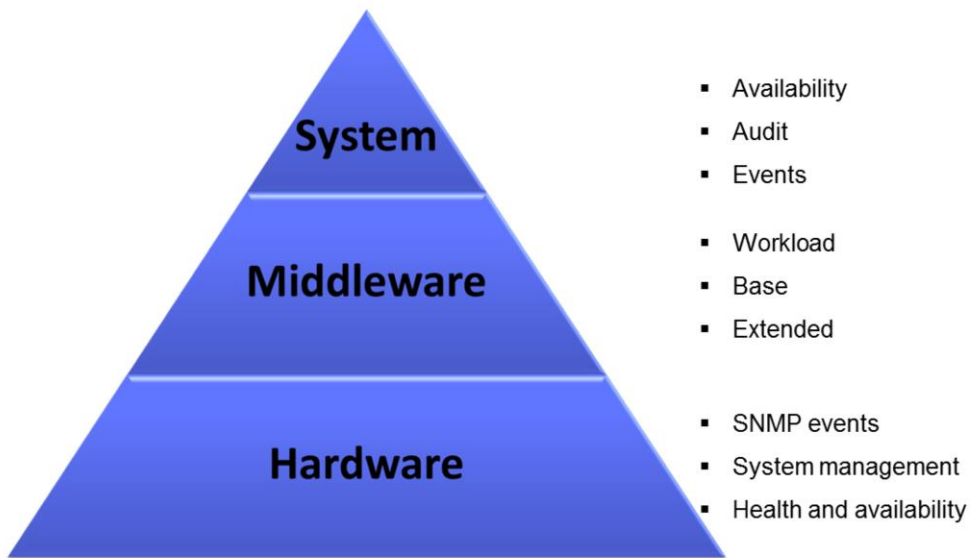
## PureApplication System monitoring (2 of 2)

- Seamless drill-down security
- Role based visibility
  - Deployers
    - Can drill down only into their middleware/db metrics
  - Monitor Operators
    - Allowed access to all user deployments
  - Monitor Administrators of cloud and hardware
    - Have Operator access
    - Allowed to see all hardware



IBM PureApplication system only requires a single login to access the system and workload consoles and all monitoring data a user is authorized to see. What is available is controlled by permissions granted to the user and the user's group membership. PureApplication System's monitoring capabilities recognize three general classes of users: deployers, also called cloud users, monitor operators, and monitor administrators. Each user class has access to different monitoring features.

## Monitoring layers



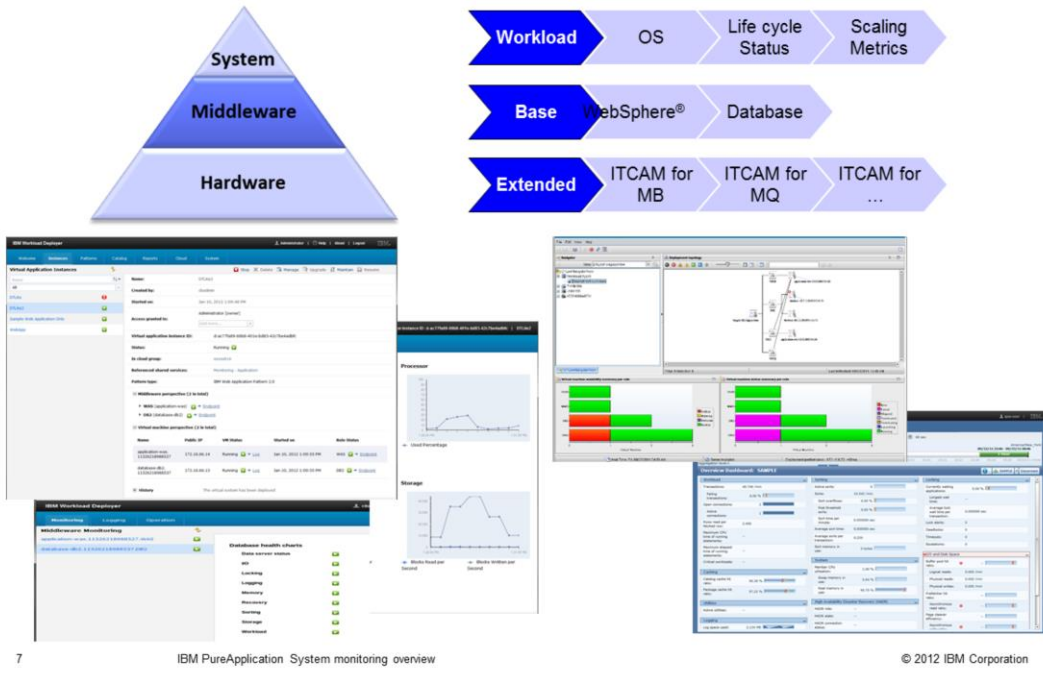
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IBM PureApplication System monitoring overview

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The PureApplication System provides monitoring at three basic levels: the hardware that comprises the system, the system management components, and virtual machines running on the system and the middleware running in them

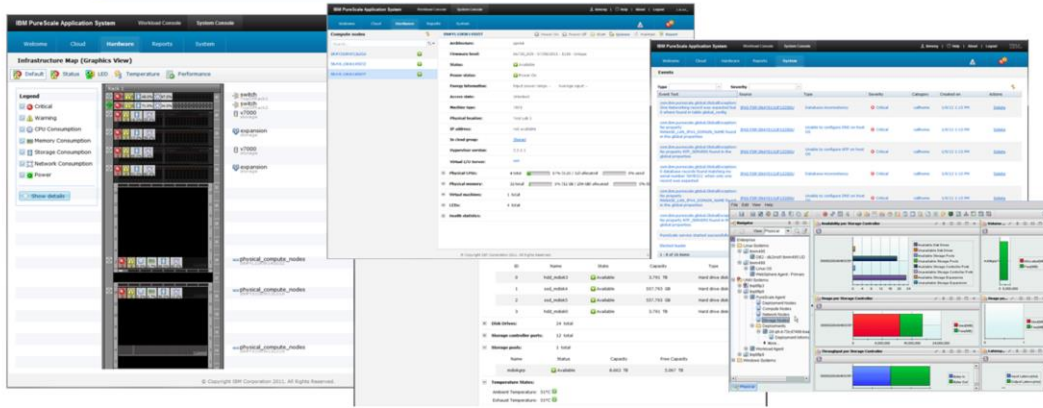
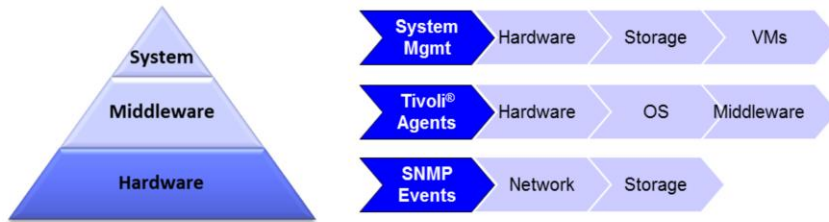
## Middleware monitoring



Every virtual machines deployed in a PureApplication System includes one or more agents that gather real-time metrics from the components running in the virtual machine. At a minimum, a PureApplication agent gathers basic statistics on the operating system and tracks the life cycle and health status for components in the virtual machine. Some virtual machines may include additional monitoring agents. For instance, Virtual machines running WebSphere hypervisor edition includes additional WebSphere monitoring agent, and DB2 database virtual machines include database monitoring agents.

Additional extended monitoring capability is available for selected components as separate licenses.

# Hardware monitoring



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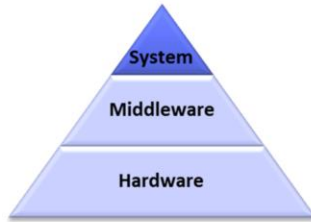
IBM PureApplication System monitoring overview

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The System console provides real-time metrics showing status of hardware, including compute nodes, storage nodes, and management nodes. The hardware nodes all run Tivoli monitoring agents that can feed data to your external IBM Tivoli Monitoring System. SNMP events are generated and can be viewed from the system console and can be consumed by external enterprise monitoring solutions.



# System monitoring



Cloud Group	Status	Allocated Storage (GB)	30 day average Allocation (GB)	30 day peak Allocation (GB)	Volume Count
CloudGroup1	Active	100	100%	100	100%
CloudGroup2	Active	200	200%	200	200%
CloudGroup3	Active	300	300%	300	300%
CloudGroup4	Active	400	400%	400	400%
CloudGroup5	Active	500	500%	500	500%
CloudGroup6	Active	600	600%	600	600%
CloudGroup7	Active	700	700%	700	700%
CloudGroup8	Active	800	800%	800	800%
CloudGroup9	Active	900	900%	900	900%
CloudGroup10	Active	1000	1000%	1000	1000%

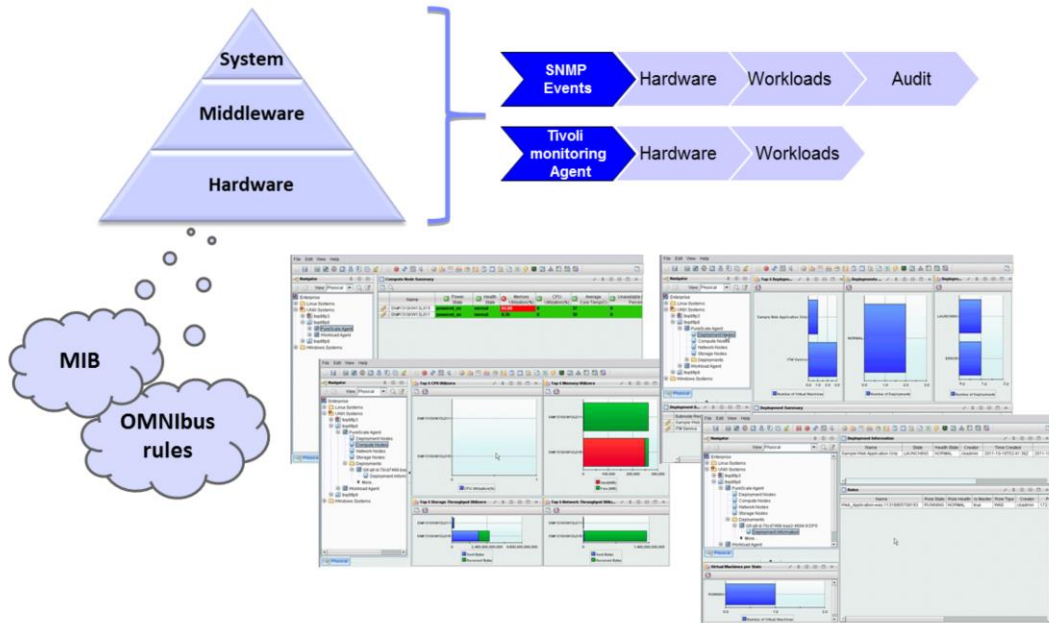
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IBM PureApplication System monitoring overview

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System monitoring includes health status for the major subsystems and current and historical usage statics. You can also view hardware and system events.

## External monitoring



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IBM PureApplication System monitoring overview

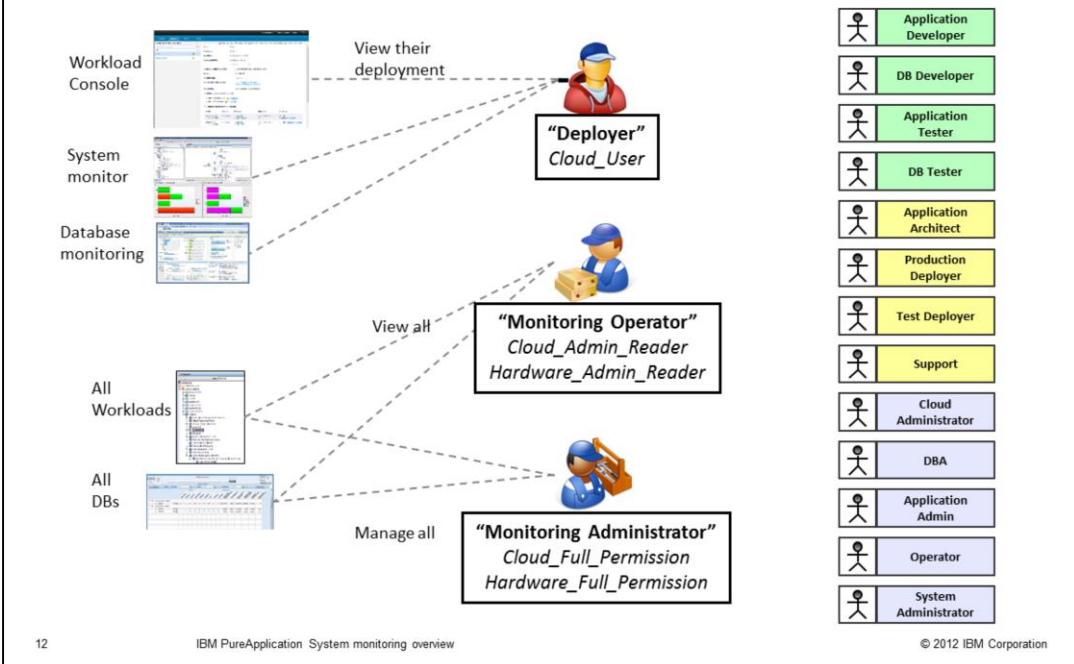
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Many external enterprise monitoring solutions can be used with PureApplication Server. For example, an IBM Tivoli/Omnibus external server can be configured as a trap destination for SNMP events from PureApplication System. These events include selected hardware and software events. A single PureApplication Server MIB is provided for external enterprise monitoring solutions and a set of OMNibus rules are provided for IBM Tivoli NetCool/OMNibus.

## ***Monitoring roles***

This section will describe user roles and permissions as they relate to PureApplication System monitoring.

## Monitoring roles

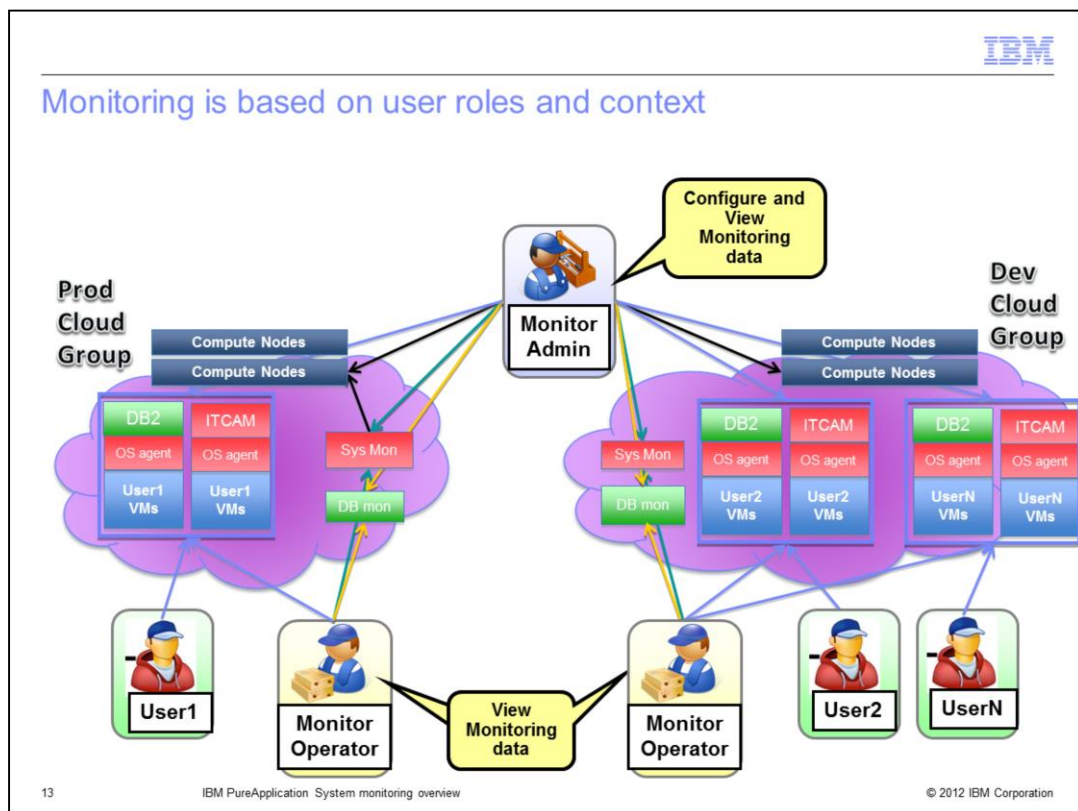


PureApplication System’s monitoring capabilities recognize three general classes of users. Deployers, also called cloud users, have basic authority to deploy patterns into the cloud.

In addition to this, monitor operators have at least read-only permission for workload resources administration, cloud group administration and hardware administration.

Monitor administrators must have full management permission for workload resources administration, cloud group administration and hardware administration.

## Monitoring is based on user roles and context



Workload monitoring is isolated to the cloud group level – that is, each cloud group has its own monitoring service instance which collects data for deployments within that cloud group. The management nodes collect data for the system and hardware.

What a user can see is controlled by permissions granted to the user.

A *deployer* can monitor all virtual application and virtual system deployments that they have access to.

A *monitoring operator* can monitor all deployments in all cloud groups, and can see system and hardware metrics.

*Monitoring administrators* can monitor everything a monitoring operator can, plus they can view high-level VM information, IP addresses, and system status.

To connect to the Tivoli Monitoring agent for PureApplication System from an external Tivoli Monitoring system, you need monitoring operator privileges.

## ***Workload monitoring***

This section will provide an overview of virtual application and virtual system monitoring.

## Virtual application instance dashboard – Monitor links and status

The screenshot displays the 'Virtual Application Instances' dashboard. On the left, a list of instances includes 'DTLite' and 'WebAppNoMon'. The main panel shows details for 'DTLite', including its name, creator (cbadmin), start time, and status (Running). It also lists referenced shared services like 'PureApplication System Monitoring' and 'Database Performance Monitoring'. A table at the bottom provides a flat list of deployment VMs with columns for Name, Public IP, VM Status, Started on, and Role Status. Each VM entry includes context-sensitive links for 'Log' and 'Monitor'.

**Annotations:**

- List of required shared services:** Points to the 'Referenced shared services' section.
- VMs listed by Role Type:** Points to the 'Middleware perspective' and 'Virtual machine perspective' sections.
- Flat list of deployment VMs with status:** Points to the VM table.
- OS and Role status from individual VMs are aggregated to create 'Deployment status':** Points to the 'Status: Running' field.
- Context sensitive links assist in navigation to other perspectives:** Points to the 'Log' and 'Monitor' links in the VM table.

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The virtual application instance dashboard shows high-level status for all deployed virtual applications. The summary status is an aggregation of the statuses of all of the components and roles included in the virtual application. The virtual machines details include Monitor links that will open the monitoring window for virtual application.

## Virtual application management console

The screenshot displays the IBM PureApplication System monitoring overview console. It features a central panel with instance details and three view options: OS view, WebSphere view, and DB2 view. Arrows indicate the navigation from the central panel to each of these views.

**Instance Details:**

- Name: DTLite
- Created by: cbadmin
- Started on: Feb 21, 2011 1:45:20 PM
- Access granted to: Administrator [owner]
- Virtual application instance ID: d-ef80106f-263f-4abc-a9f2-6ef7117e10fe
- Status: Running

**OS view:** Shows system-level metrics including Memory, Processor, Network, and Storage usage over time.

**WebSphere view:** Displays application-specific metrics such as JVM Load(%), JVM Runtime Heap Size(M), WebApplications Request Count, and WebApplications Service Time(ms).

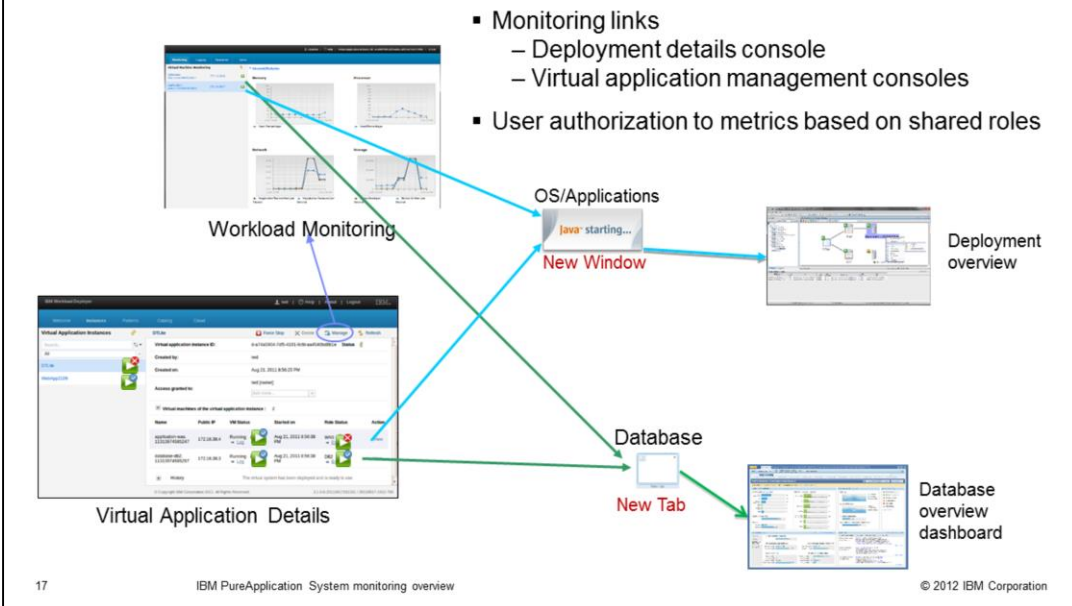
**DB2 view:** Provides database health indicators, including Data server status, I/O, Locking, Logging, Memory, Recovery, Sorting, Storage, and Workload.

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The virtual application management console includes graphs for basic operating system data for each virtual machine in the virtual application. In addition, WebSphere and database components provide component-specific monitoring data and status.



## Virtual application: Contextual monitoring drill-down



The virtual application instance dashboard and the virtual application management console both includes context sensitive Monitor links to the advanced monitoring services. For virtual application level monitoring the link will use Java WebStart to open a new window connecting to the system monitoring service. Note that only 32-bit Java WebStart is supported. For database components the Monitor link will open a new browser window to the database performance monitoring service.

## Virtual system monitoring

- Status indicator indicate deployment status, not health
- Access monitoring directly from Shared Service panels
  - Endpoint links for System and Database monitoring
- User authorization to metrics based on shared roles

The screenshot shows the IBM PureApplication System monitoring overview interface. It features a main dashboard with a table of virtual machines and several monitoring panels. Annotations include:

- System monitoring:** A red arrow points from the 'System monitoring' panel to a 'New Window' dialog box showing a 'java starting...' process.
- OS view:** A red arrow points from the 'System monitoring' panel to a set of OS monitoring charts.
- ITCAM view:** A red arrow points from the 'System monitoring' panel to an ITCAM monitoring view.
- Database overview dashboard:** A green arrow points from the 'Database Performance Monitoring' panel to a 'New Tab' dialog box showing a database dashboard.

At the bottom of the screenshot, the text reads: "18 IBM PureApplication System monitoring overview © 2012 IBM Corporation".

Virtual system instance dashboard also shows high-level status for all deployed virtual systems. This summary status is an aggregation of the deployment status of all of the individual virtual machines included in the virtual system. It indicates the deployment status of the virtual machines, but does not indicate the health of individual components. Virtual systems do not provide monitoring links directly to the virtual system instance dashboard. Instead, you must use the monitoring link from the monitoring shared services. These are covered in more detail in the next section.

## ***System monitoring shared service***

This section will cover the shared service which provides advanced monitoring for virtual application and virtual systems; the system monitoring shared service.

## System monitoring shared services

The screenshot displays the IBM PureApplication System monitoring interface. On the left, a sidebar shows 'Shared Service Instances' with a table listing instances like 'PurApplication System Monitoring' and 'Database Performance Monitoring'. The main area shows details for a selected instance, including its name, creation time, and status. On the right, there are two views: 'Workload view' showing a topology diagram and performance charts, and 'OS view' showing detailed OS metrics and a pie chart. Arrows indicate the flow from the service list to the workload view and then to the OS view.

- Shared service per cloud group
- Same OS and Role status on Workload console and virtual application console
- Links to IBM PureApplication System Monitoring for Workload and OS metrics.

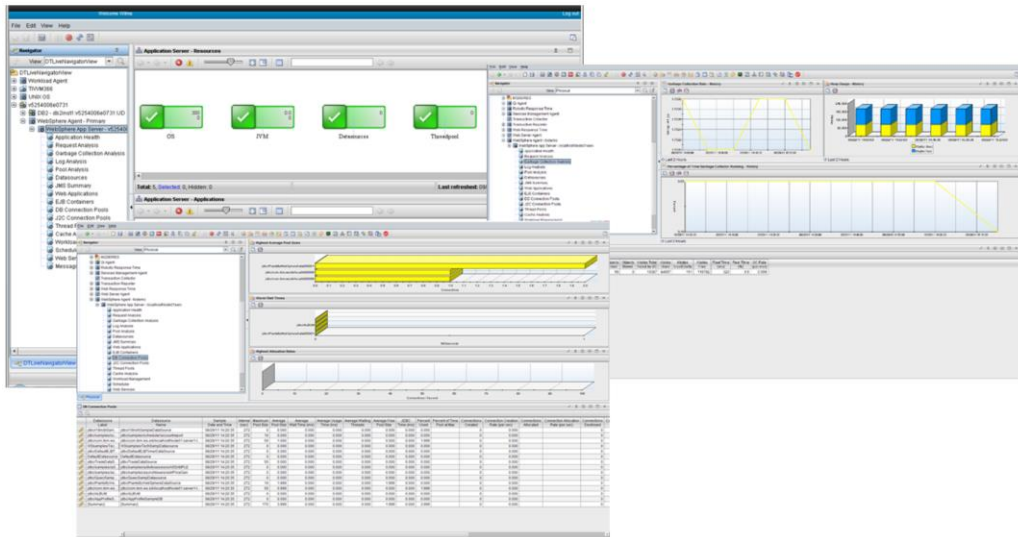
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IBM PureApplication System allows virtual applications and systems to use a common, or shared, set of services to provide advanced monitoring capabilities. When deployed, these services are shared amongst all virtual applications and systems within a cloud group. Each cloud group must have its own instance of a shared service for it to be available.

Links for the system monitoring shared service launch a new window using Java WebStart. At this time only 32-bit Java is supported.

The default view for a virtual application provides a topology view of the components of the application. When you click the Endpoint link for the System Monitoring shared service the monitoring service opens to the topology view for the shared service itself. From the topology overview, a deployer can drill into operating system metrics for each virtual machine included in the virtual application.

## Deployer can drill into WebSphere metrics



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IBM PureApplication System monitoring overview

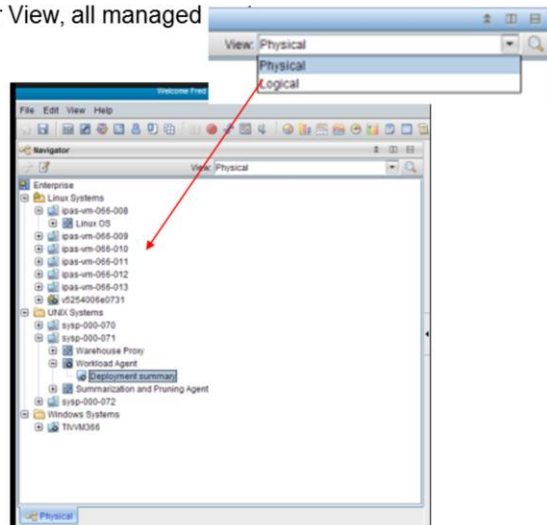
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If the optional ITCAM for WebSphere Application Server monitoring is installed you can also view detailed WebSphere metrics.

Other ITCAM installers are available through extended monitoring licenses.

## Monitor virtual systems

- Physical Navigator View, all managed



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IBM PureApplication System monitoring overview

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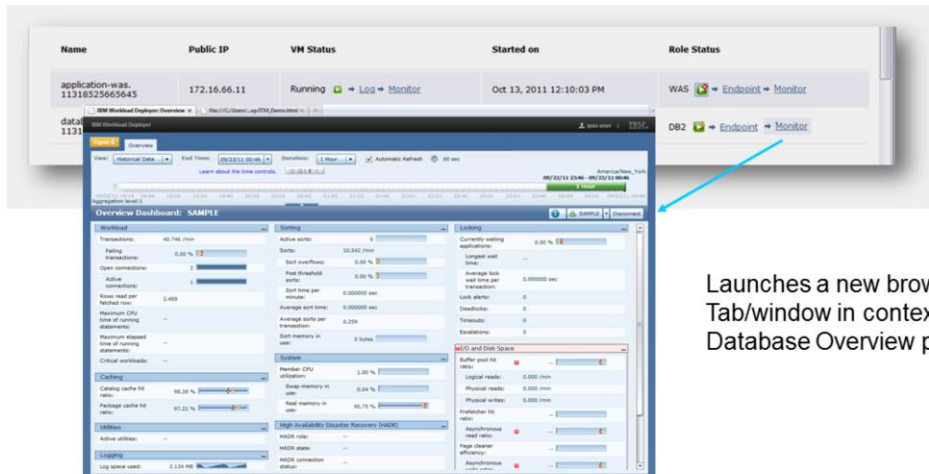
The “View” pull down on the system monitoring application will show all deployed virtual applications you have access to. To view monitoring information for a virtual system you must select “Physical” from the view pull down. This view shows all virtual machines you have access to: a deployer can see only his own deployments, but an operator or administrator can access all resources in the cloud group where the service is deployed.

## ***Database performance monitoring shared services***

This section will cover the database performance monitoring shared service.

## DB2 metrics

- Deployer is allowed to see detailed DB2 metrics from the Workload Console if the optional Database monitoring shared service has been deployed.
- Operator can view all databases in the cloud group and drill-down into a specific instance.



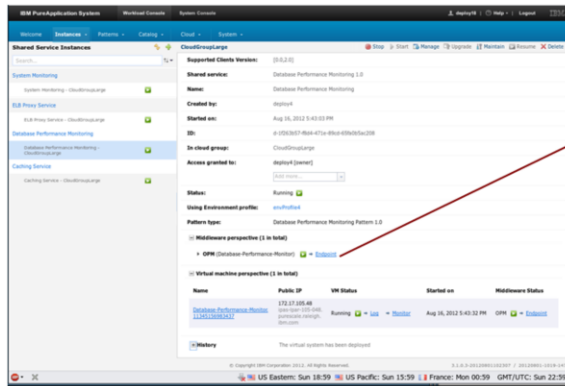
Launches a new browser Tab/window in context to Database Overview page

The virtual application instance dashboard provides a Monitor link for DB2 roles that will open a new browser window to the detailed data for the database instance. This link is only available if the database monitoring shared service has been deployed and monitoring is enabled for the database.



## Database performance monitoring shared service

- Endpoint link for given Database performance monitoring shared service
- Leads to dashboard overview of all DB instances for the given cloud group.



Database performance monitoring

Instance Name	Public IP	VM Status	Started on	Middleware Status
Database Performance Monitoring 1.0	172.17.0.149	Running	Aug 16, 2012 5:43:33 PM	UPM - Enabled

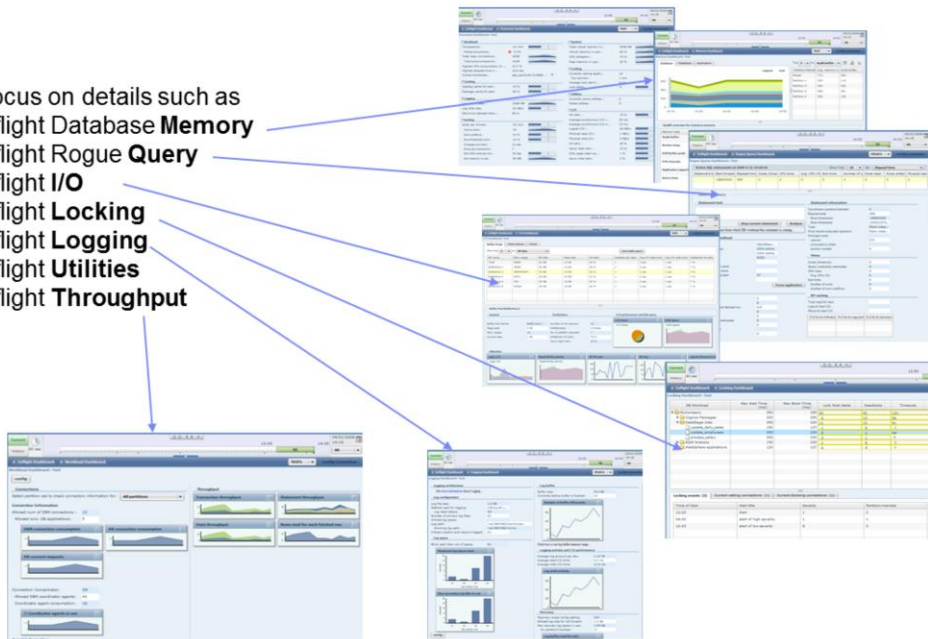
All DBs view

The Database Performance Monitoring shared service provides an Endpoint link that opens a new browser window. The default view shows summary information for all database deployments that your user ID is allowed to see.

Deployers can view all databases they deployed. Operators and administrators can view all databases in the cloud group.

## Detailed DB2 metrics

- Can focus on details such as
  - Inflight Database **Memory**
  - Inflight Rogue **Query**
  - Inflight **I/O**
  - Inflight **Locking**
  - Inflight **Logging**
  - Inflight **Utilities**
  - Inflight **Throughput**



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IBM PureApplication System monitoring overview

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The database performance monitoring shared service provides several selectable dashboards that allow you to drill down to specific data for your database.

## ***System monitoring***

This section will cover system-level monitoring.

## Hardware administrator

- Real-time system metrics
  - Rack overview
  - System console
- External IBM Tivoli Monitoring
  - with ITM Agent for PureApplication System
  - Real-time system metrics
  - Detailed history
- Application and database alerts in the system console
  - Or use a SNMP based collection tool outside of the rack to generate notifications.

Hardware administrators have rich collection of monitoring capabilities to help them manage the hardware and workload.

The System console provides a graphical overview of the status of all hardware components in the rack, with drill-down capability to see detailed status of individual components.

Each hardware component in the PureApplication System runs an ITM agent which can connect to an external IBM Tivoli Monitoring instance. The agents provide an "appliance" view of the rack including detailed hardware metrics and high-level deployment information provided.

In addition to status, application and database alerts are available from the System Console, or you can use an SNMP based collection tool outside of the rack to generate notifications.

## Real-time system metrics

The screenshot displays the IBM PureScale Application System console interface. The main view is the 'Infrastructure Map (Graphics View)', which shows a graphical representation of the hardware components, including switches, expansion units, and physical compute nodes. A legend on the left indicates various status indicators: Critical (red), Warning (yellow), CPU Consumption (blue), Memory Consumption (green), Storage Consumption (purple), Network Consumption (orange), and Power (light blue). Below the map, there are tabs for 'Default', 'Status', 'LED', 'Temperature', and 'Performance'.

Two detailed views are overlaid on the main map:

- Network Devices View:** Shows a list of network devices with columns for Name, Health, and Status. A detailed view for a specific device (ID: 0000011111111111) is shown on the right, including fields for Health Type (Top of Rack), Description, Physical Location (Rack 01.1), Firmware (1), Software Version (3.4.0.0 (P40000001) active configuration), Model, Serial Number, and Temperature (45). A table below lists ports with columns for Port Number, State, Speed, and Action.
- Storage Services View:** Shows a list of storage services. A detailed view for a specific service (ID: 0000020000000000) is shown on the right, including fields for Name (Storage 17000-2076-Cen-17000-14-001), Firmware (3.2.0.4 (SAB 30.7.1111040000)), Status (Available), Capacity (8,863 TB), and Free Capacity (5,067 TB). A table below lists managed disks with columns for ID, Name, Status, Capacity, and Type.

At the bottom of the console, there is a copyright notice: '© Copyright IBM Corporation 2011. All Rights Reserved.' and '© 2012 IBM Corporation'.

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IBM PureApplication System monitoring overview

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IBM PureApplication System's system console provides a graphical hardware infrastructure map. It displays data for all of the hardware components in the system, including overall status, graphical representations of hardware LEDs, utilization, temperature, and performance data. By default the entire system and basic status are displayed. Errors or warnings for any of the hardware components are shown directly in this default view. Clicking on any component in the map will display more detailed information about the component.

## Administrator can see events

- Application and database alerts in the system console
- SNMP based collection tool outside of the rack to generate notifications.

Type	Severity	Event Text	Source	Type	Severity	Category	Created on	Actions
com.ibm.purescale.global.GlobalException:	Critical	One networking record was expected but 0 where found in table global_config	IPAS FSM SN#Y011UF13Z0DU	Database inconsistency	Critical	callhome	1/9/12 1:15 PM	Delete
com.ibm.purescale.global.GlobalException:	Critical	No property MANAGE_LAN_IPV4_DOMAIN_NAME found in the global properties	IPAS FSM SN#Y011UF13Z0DU	Unable to configure DNS on host OS	Critical	callhome	1/9/12 1:15 PM	Delete
com.ibm.purescale.global.GlobalException:	Critical	No property NTP_SERVERS found in the global properties	IPAS FSM SN#Y011UF13Z0DU	Unable to configure NTP on host OS	Critical	callhome	1/9/12 1:15 PM	Delete
com.ibm.purescale.global.GlobalException:	Critical	0 database records found matching my serial number '06VB321' when only one record was expected	IPAS FSM SN#Y011UF13Z0DU	Database inconsistency	Critical	callhome	1/9/12 1:15 PM	Delete
com.ibm.purescale.global.GlobalException:	Critical	No property MANAGE_LAN_IPV4_DOMAIN_NAME found in the global properties	IPAS FSM SN#Y011UF13Z0DU	Unable to configure DNS on host OS	Critical	callhome	1/9/12 1:15 PM	Delete
com.ibm.purescale.global.GlobalException:	Critical	No property NTP_SERVERS found in the global properties	IPAS FSM SN#Y011UF13Z0DU	Unable to configure NTP on host OS	Critical	callhome	1/9/12 1:15 PM	Delete
PureScale service started successfully	Informational		IPAS FSM SN#Y011UF13Z0DU	PureScale Service	Informational	Alert	1/9/12 1:15 PM	Delete
Elected leader	Informational		IPAS FSM SN#Y011UF13Z0DU	Leader Election	Informational	Alert	1/9/12 1:16 PM	Delete

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IBM PureApplication System monitoring overview

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The system console's provides a single place where you can view all system events. The Events panel allows you to filter events by type, severity, category, or event text. You can view details for individual events, and many events include links to the component that generated the event.

## ***Enterprise monitoring integration***

This section will cover IBM PureApplication System integration with external enterprise monitoring systems.

## Enterprise monitoring integration

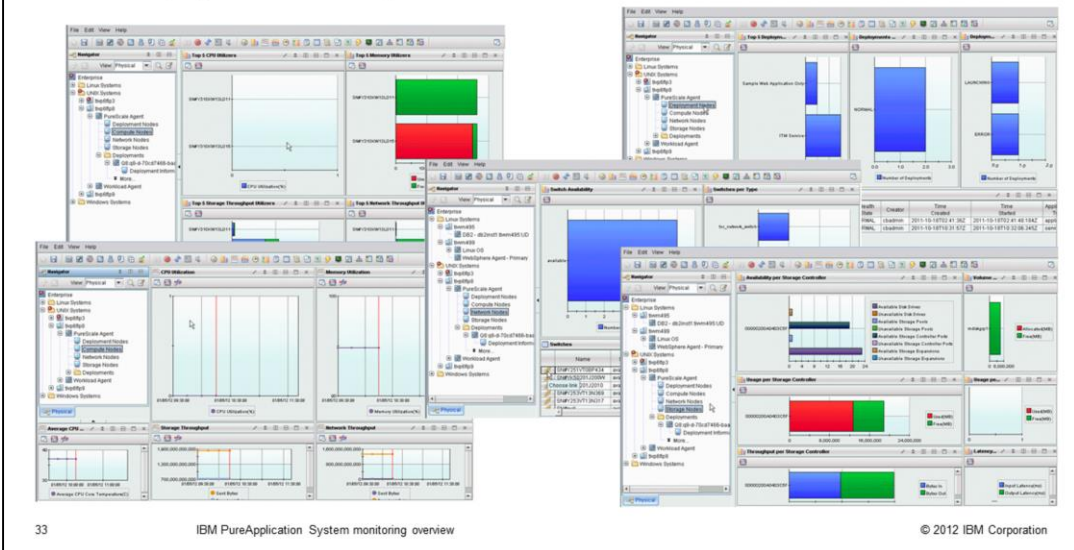
- Any monitoring solution that imports a MIB can be used for external monitoring
  - MIB download link provided
- External IBM Tivoli NetCool/OMNIBus server
  - Can be configured as trap destination
  - OMNIBus rules download link provided
- MIB and OMNIBus rules help you monitor for:
  - Hardware events
    - Compute node, chassis, network storage, and more
  - Software events
    - Management infrastructure, deployments, VM starts and stops, OS events, WebSphere Application Server events, DB2 events, and more

Many external enterprise monitoring solutions can be used with PureApplication Server. For example, an IBM Tivoli/Omnibus external server can be configured as a trap destination for SNMP events from PureApplication System. These events include the hardware events and software events listed on this slide. A single PureApplication Server MIB is provided for external enterprise monitoring solutions and a set of OMNIBus rules are provided for IBM Tivoli NetCool/OMNIBus.



## System metrics history

- Integration with IBM Tivoli Monitoring 6.2.2 or later
  - Tivoli Monitoring Agent provided
    - “Appliance” view of the rack – hardware metrics
    - Deployment details – high level view of VM information, IP addresses, and status



For integration with external IBM Tivoli Monitoring 6.2.2 (or later) environments, PureApplication Server provides an ITM agent which provides an "appliance" view of the rack. This slide shows the hardware metrics and high-level deployment information provided, such as status, VM information, and IP addresses.

Section

## ***Summary***

This section will provide a summary of the presentation.

## PureApplication system monitoring

### ▪ Integrated Components

- Context aware links for drill-down navigation
- Detailed workload monitoring
- Single place to view all events
- Integrates into enterprise monitoring

### ▪ Role based drill-down

- Cloud users can drill down only into their middleware/db metrics
- Operators are allowed access to all user deployments within a cloud group
- Administrators of cloud and System
  - Have Operator access
  - Allowed to see all hardware



IBM PureApplication System provides a rich set of monitoring capabilities for workload running on the system and the system itself. In addition, you can monitor high-level aspects of your PureApplication System from your existing enterprise monitoring solution.

IBM PureApplication system only requires a single login to access the system and workload consoles and all monitoring data a user is authorized to see. What is available is controlled by permissions granted to the user and the user's group membership. PureApplication System's monitoring capabilities recognize three general classes of users: deployers, also called cloud users; monitor operators; and monitor administrators. Each user class has access to different monitoring features.

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