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**Panel 2  
Self Management:  
Separating Facts from Fiction**

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**Fiction vs. Facts**

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- **Self Management = No Operators?**
- **Self Management = No Architects?**
- **Self Management = No Outages?**
- **Self Management = Less Overhead?**
- **Self Management = More Automation?**
- **Self Management = More Processes?**
- **Self Management = More Device “Intelligence”?**
- **Self Management = Increased Reliability?**

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# Self Management at the *Network Element*

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- **Idea: increase the “intelligence” of the network elements**
- **Approach: implement advanced device instrumentation**
  - leverage multiple MIBs
  - initiate actions when breaching thresholds
  - next level: integrated device managers
- **Results:**
  - Self-Monitoring and reporting of issues
  - Initiating actions automatically
- **Areas: Fault, Performance, SLA Management**
- **Examples:**
  - RMON, EVENT/EXPRESSION-MIB, IP SLA
  - Embedded Event/Resource Manager

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## Step 1: Leveraging MIBs for Self-Management

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- **The EVENT MIB (RFC 2981) provides a superset of the capabilities of the RMON MIB alarm and event functions**
- **It can monitor any MIB object (boolean tests, thresholds)**
- **EVENT-MIB allows alarms to be generated for MIB objects that are on another network element**
- **EVENT-MIB sends an SNMP notification in response to a trigger and introduces the concept of setting a MIB object (integers)**
  
- **EXPRESSION MIB (RFC 2982) allows to create new SNMP objects based on existing MIB variables and formulas**
- **Perfect complimentary for the EVENT-MIB**

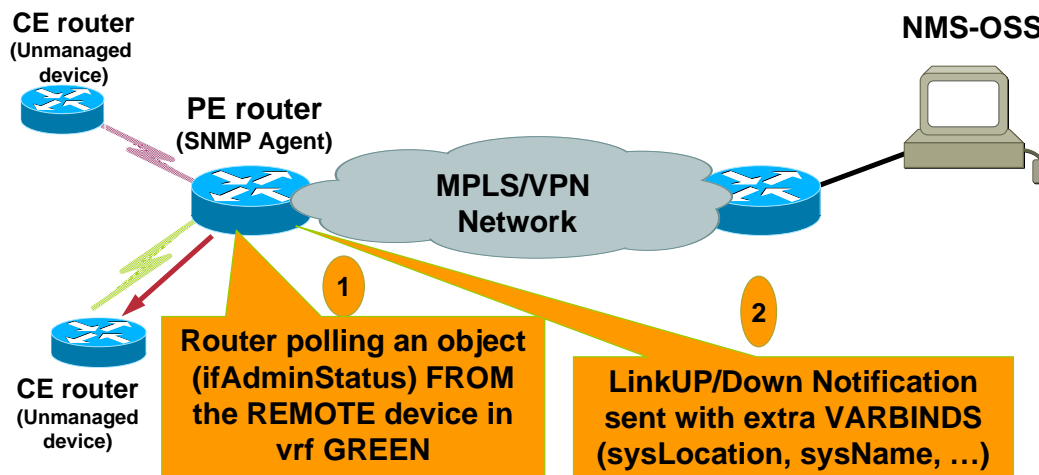
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# EVENT-MIB Example: Remote Device Monitoring

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# EVENT-MIB & EXPRESSION-MIB Example: Simple Capacity Planning

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- If the link utilization is above 50% for 1 hour, it's time to upgrade the link → send a notification
- Steps:
  1. Create an expression:

Expression-MIB

$utilization = (\Delta ifInOctets + \Delta ifOutOctets) * 800 / hour / ifSpeed$

Event-MIB

2. If utilization is above 50% of the bandwidth after one hour, generate an event.

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# Periodic MIB Data Collection and Transfer

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- Select multiple MIB variables and periodically group the data into lists
- Reduces the need for constant polling
- The collected data can then be transferred to a an NMS at user-specified transfer interval using TFTP, RCP, or FTP
- CLI level only
- Alternative: CISCO-BULKFILE-MIB



## Examples:

- IP SLA history of statistics
- Core Traffic Matrix
- Regular collection of NetFlow Top-Talkers
- Etc...

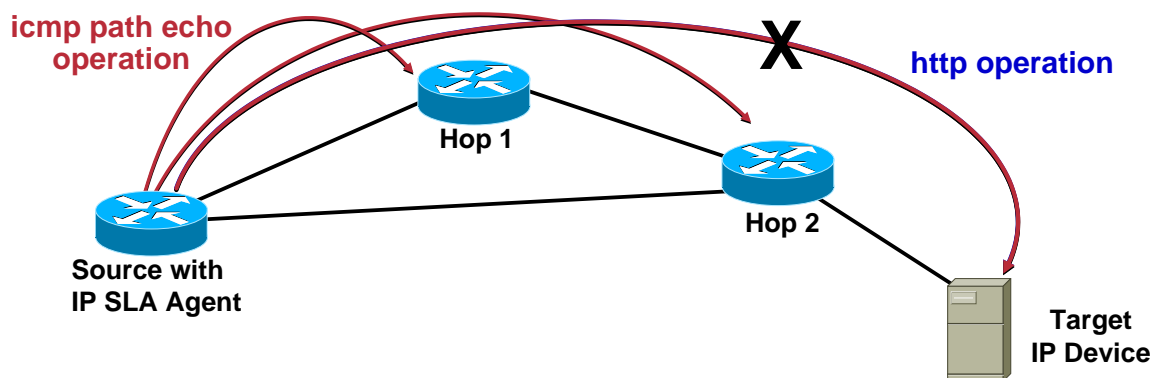
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## Step 2: Automated Diagnosis: IP SLA Operations

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- Define operations behavior:
  - threshold values
  - threshold types
  - timeout
  - connection loss
- Define actions: start another operation; send notifications, ...

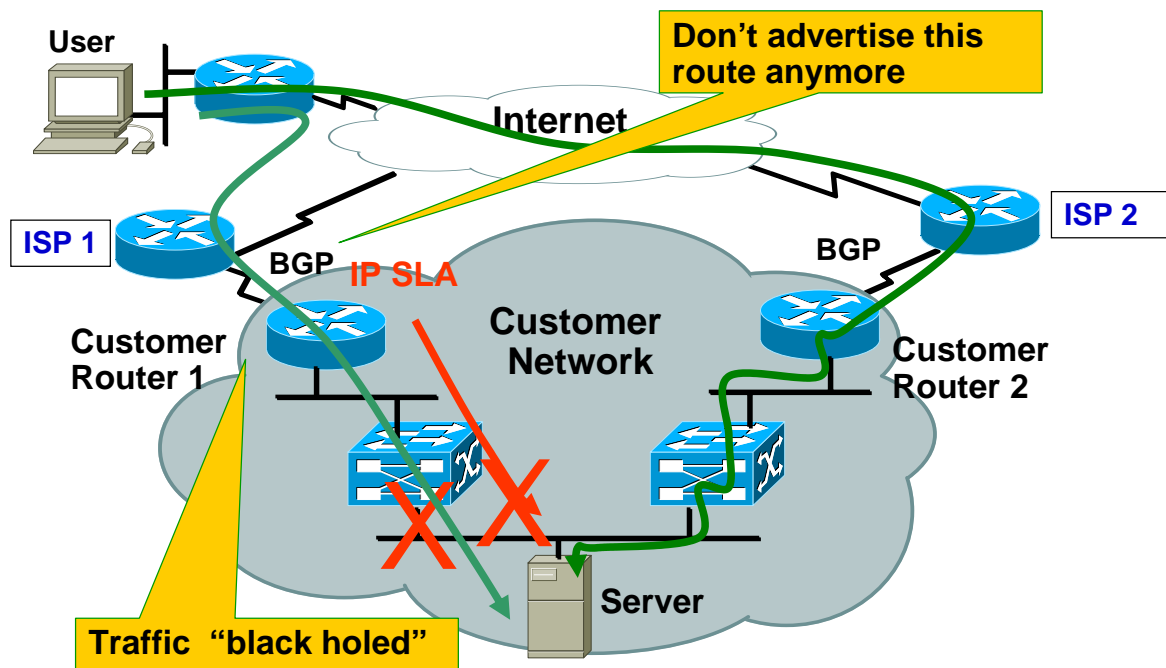
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# Automated Configuration: Enhanced Object Tracking

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## Step 3: Embedded Managers in Cisco IOS

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- Integrated device fault/event management enables self health-monitoring capabilities
- Embedded Event Manager (EEM) receives messages from Event detectors (ED) when an "event of interest" occurs
- Embedded Resource Manager (ERM) tracks local system resources: CPU, buffer, memory, IPC
- Ability to take local actions based on the system state:
  - Initiate actions based on configurable events
  - Log a prioritized Syslog message
  - Reload the entire system
  - Switch-over to Standby Route Processor
  - Send email, run TCL script, ...

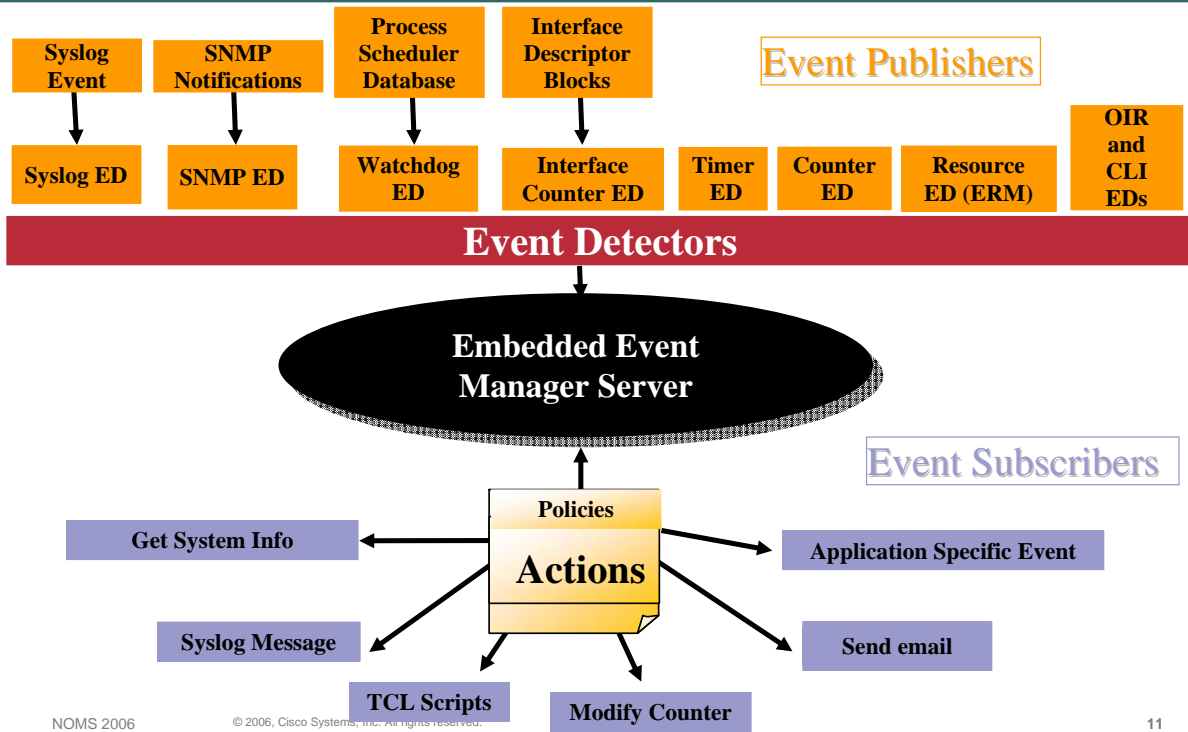
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# Cisco Embedded Event Manager (EEM)

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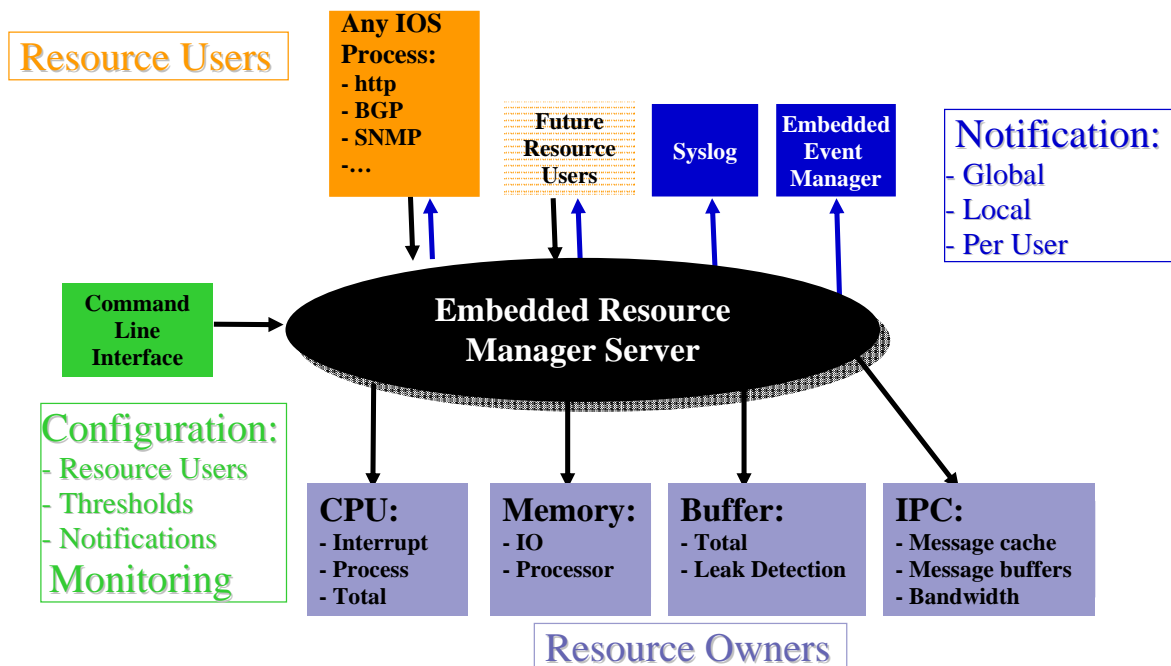
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# Cisco Embedded Resource Manager (ERM)

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# Summary

- **Self Management is a valid concept to achieve service availability of ~100 %**
- **Advanced device instrumentation allows the devices to take an active role in Self Management**
- **It needs to be implemented at every level (Network element ... NMS/OSS/BSS apps)**
- **Cross-vendor cooperation completes the big picture**
- **It only happens with customer's buy-in ☺**

# Questions ?

