



Cisco Embedded Automation Systems - EASy Overview

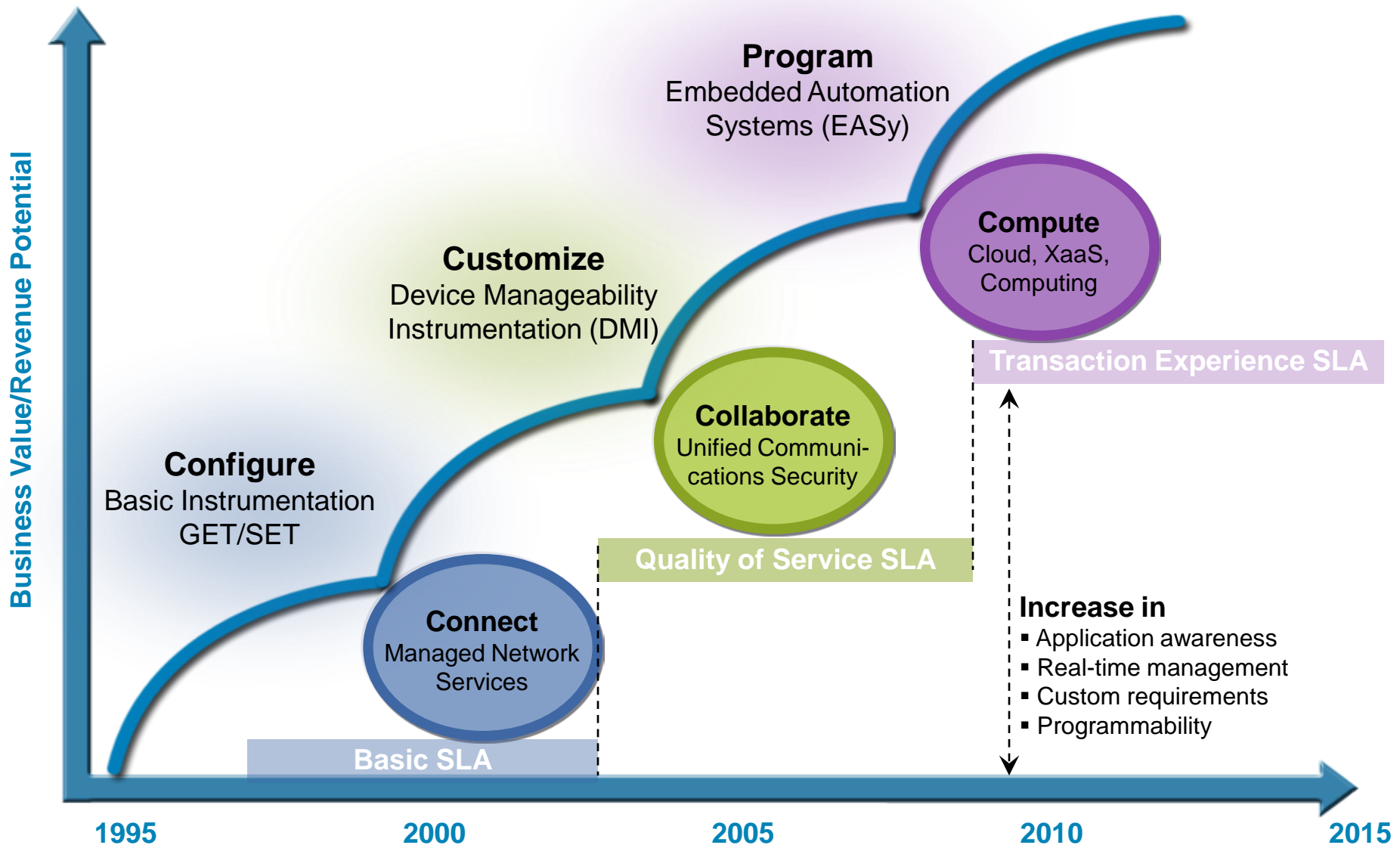


January 2010

Why Embedded Automations?



Demand for Automation and Differentiation



An Analogy



Airplane	Router
Instruments	Embedded Automations
21,000 Sensors	OIDs in MIBs

With increasing scale, complexity, differentiation, and availability requirements, operators rely on embedded automations

From: Full Control by a Single Central Authority

To: Operating a System of Self-Managing Components

Device Manageability Instrumentation



Cisco IOS® Device Manageability Instrumentation (DMI)

Fault

- **802.3ah**—Link monitoring and remote fault indication
- **802.1 ag**—Continuity check, L2 ping, trace, AIS
- **MPLS OAM**—LSP ping, LSP trace, VCCV
- **IP OAM**—Ping, trace, BFD, ISG per session
- **EEM**—Embedded Event Manager
- **EVENT-MIB**—OID-based triggers, events, or SNMP Set, IETF DISMON
- **EXPRESSION-MIB**—OID expression-based triggers, IETF DISMON
- ...

Configuration

- **E-LMI**—(service parameter and status signaling)
- **E-DI**—(Enhanced Device Interface, CLI, Perl, IETF Netconf)
- **EMM**—Embedded Menu Manager
- **NETCONF**—(XML PI)
- **CNS** and **WSMA**
- **TR-069**
- **KRON**—command scheduler
- **Config change**—logging and notifications
- **Config replace and rollback**
- **Diff**—context diff utility
- **MIB persistence**
- ...

Performance

- **IP SLA**—delay, jitter, packet loss, MPLS health monitoring, advanced object tracking
- **CBQoS MIB**—(class-based QoS)
- **NBAR**
- **RMON**
- **EPC**—Embedded Packet Capture
- **ERM**—Embedded Resource Manager
- **GOLD**—Generic Online Diagnosis
- **Smart Call Home**
- ...

Accounting

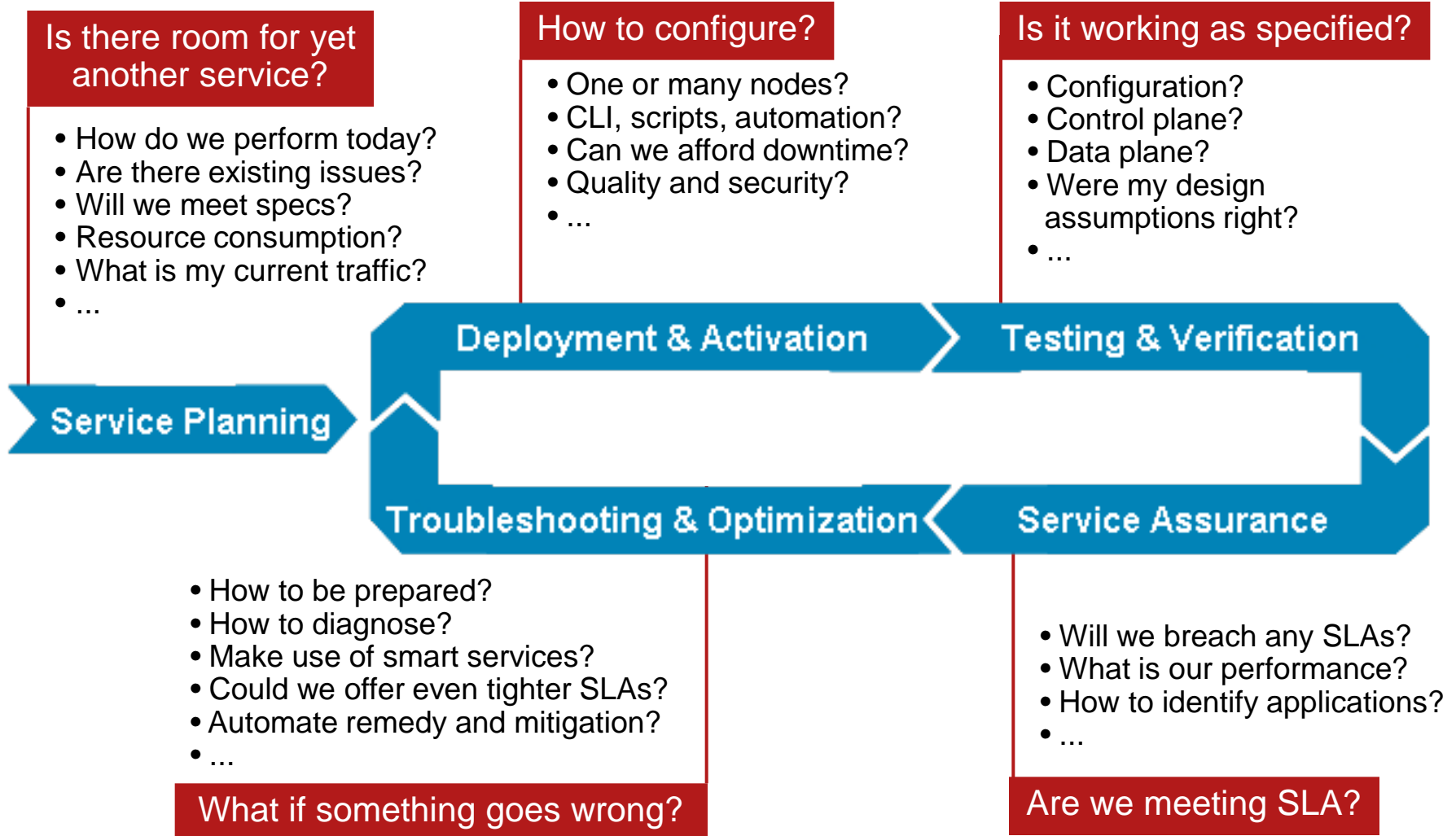
- **Flexible NetFlow**—IETF IPFIX
- **BGP policy accounting**—includes AS information
- **Periodic MIB bulk data collection and transfer**
- ...

Security

- **Auto Secure**—one-touch device hardening
- **LDP Auth**—message authentication
- **Routing Auth**—MD5 authentication, BGP, OSPF
- ...

Device Manageability Instrumentation Has Evolved

Questions During a Service Lifecycle



What Are Embedded Automations?



Embedded Automation Systems (EASy)

Combine...

- A formerly reactive task outside the network

- Based on your service lifecycle model

- Real-life situations that are cumbersome or hard to solve

- Device manageability instrumentation

- To measure or trigger with the network

- At the source in near real-time

- Such as Flexible NetFlow, IP SLA, NBAR, MIBs, and many others

- Embedded automation capability

- To implement your custom logic

- Such as Embedded Event Manager (EEM), Cisco IOS® Safe-Tcl scripting, and Embedded Menu Manager (EMM)

Types of Embedded Automation Systems

- **Type 1:** Automation of manual operational tasks
 - Example: Low-TTL traffic monitoring
 - Example: NBAR/CBQoS effectiveness monitoring
 - Example: CPE-driven automated port reconfiguration
- **Type 2:** Automation of previously unsolvable challenges
 - Example: Packet capture based on NBAR \leftrightarrow Flexible NetFlow correlation
 - Example: Automated embedded diagnostics
 - Example: Performance-based topology/policy changes
- **Type 3:** Use of automation to architect new solutions
 - Example: Highly available mobile access router (HAMAR)
 - Example: Resilient Layer 2 DC interconnect
 - Example: High-throughput geo-redundant FW clustering

Anatomy of an EASy Package

- The actual embedded automation itself
 - Useful embedded automation for real-life situations
 - Can be type 1, 2, or 3 automation
- A menu-guided installation
 - Making installation a simple and reliable experience
 - Download the latest EASy Installer separately
- Introduction slides
 - Illustrating the purpose and concept
- A short video
 - Taking you through the installation and use

Example 1: NBAR Effectiveness Monitoring

- **Problem:** Application protocols as well as user behavior are changing; hence the traffic mix changes too; we need to permanently assess how effective the NBAR deployment is—especially when using CBQoS with match protocol
- **Solution:** Automate the comparison between “unknown” versus “total” traffic

```
Router# show ip nbar protocol-discovery top-n 5 Serial0/0
```

Protocol	Input		Output	
	Packet Count	Byte Count	Packet Count	Byte Count
	5 minute bit rate (bps)		5 minute bit rate (bps)	
-----	-----	-----	-----	-----
:	:		:	
unknown	205	14976	204	10404
	0	0		0
Total	41304	2649809	40944	2619839
	3000	3000		3000

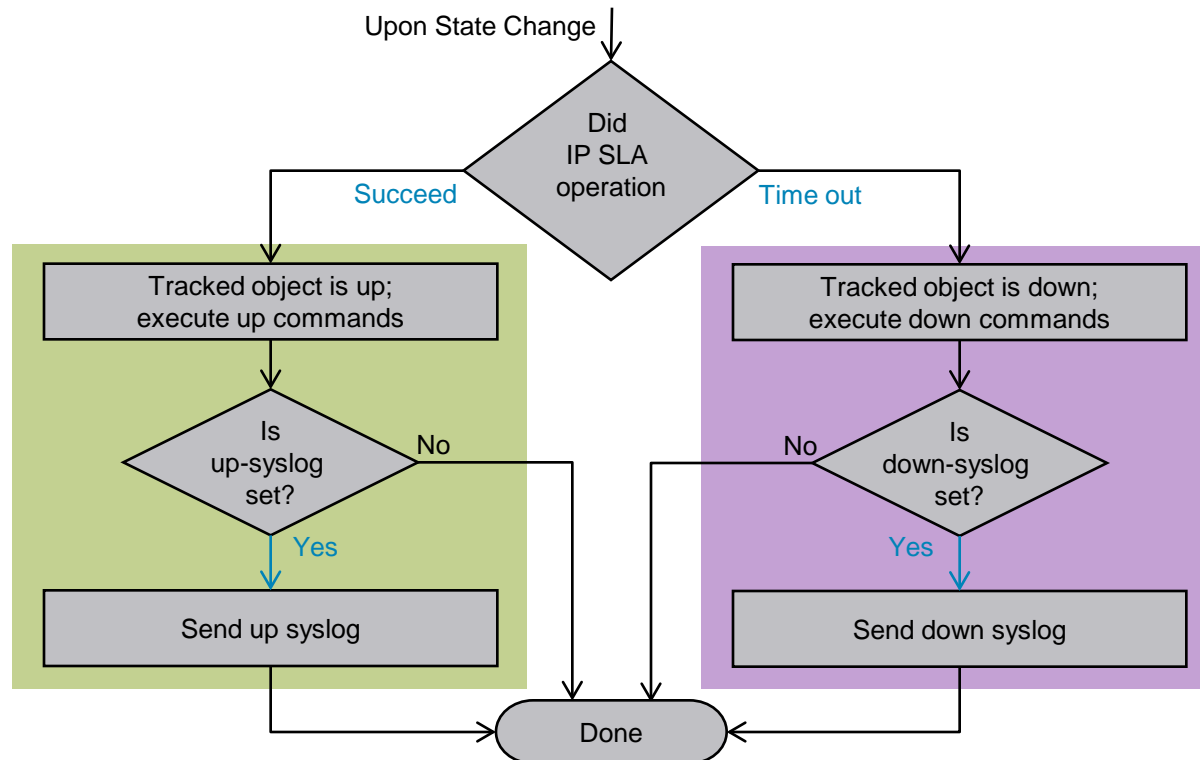
- Upon low percentage of traffic recognized by NBAR, it's time to check for new PDLMS...

$$NBAR_{recognized}(\%) = \frac{[(total - unknown) \times 100]}{[total]}$$

Available as an EASy package: <http://www.cisco.com/go/easy>

Example 2: Connectivity Verification

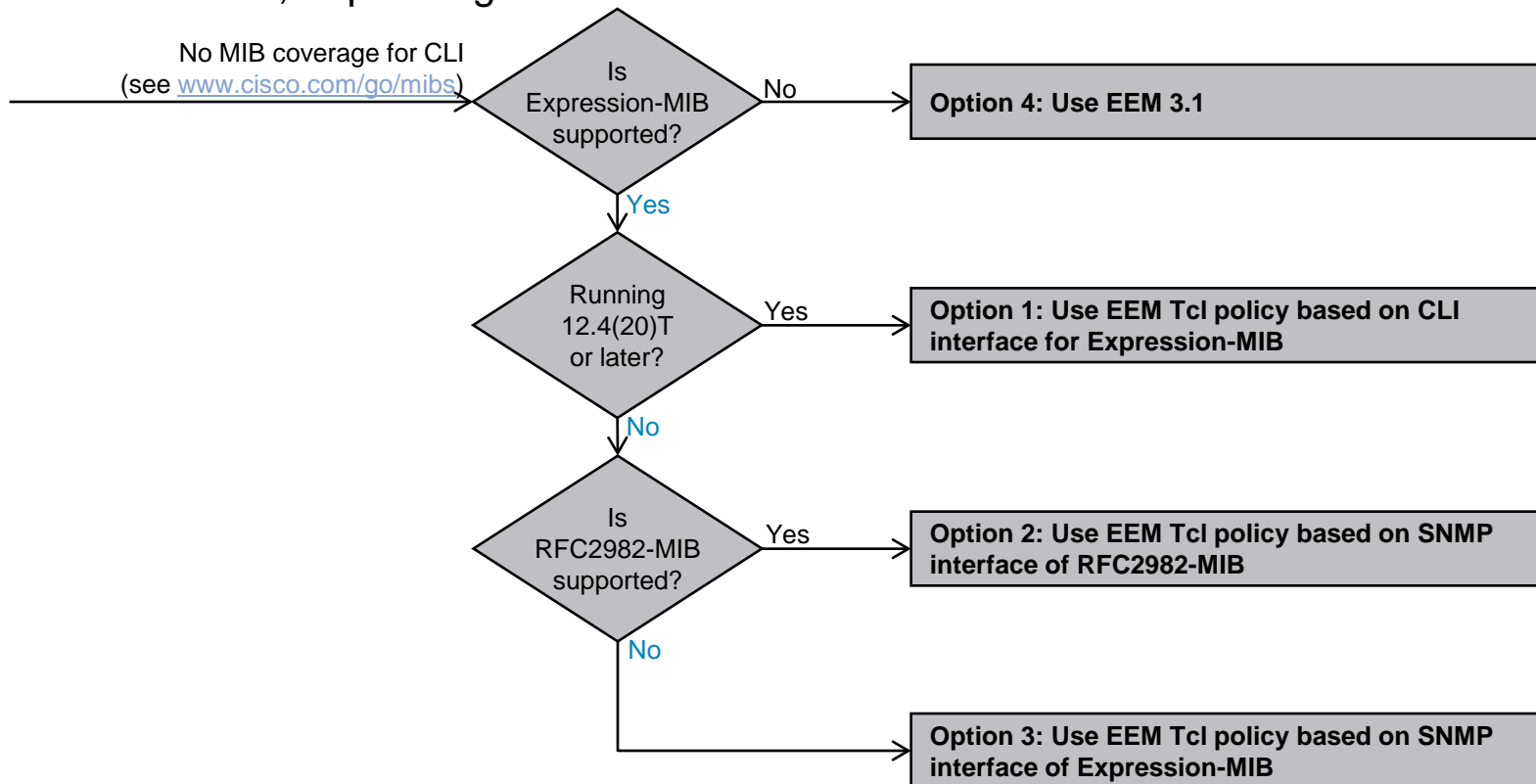
- **Problem:** We need a failover from the primary to the secondary link—but with flexibility and custom notification beyond what a simple routing protocol based solution provides
- **Solution:** Automate based on IP SLA, EOT, and Embedded Event Manager



Available as an EASy package: <http://www.cisco.com/go/easy>

Example 3: Custom MIB Polling

- **Problem:** Sometimes there is a show command but no MIB support; what if we still want to collect the information via SNMP?
- **Solution:** Automate Custom MIB polling via EEM and Expression-MIB or RFC2982-MIB, depending on the Cisco IOS® Software version



Available as an EASy package: <http://www.cisco.com/go/easy>

How Can I Engage?



Learn

1. Browse and download EASy packages:

www.cisco.com/go/easy

2. Make sure to also download EASy Installer

<http://cisco.com/assets/prod/ios-nxos/easy-installer.tcl>

3. Make sure to download EASy Installer Guide

http://cisco.com/en/US/prod/collateral/iosswrel/ps6537/ps6555/ps10777/application_note_c27-574650.html

4. Browse other embedded automations:

www.cisco.com/go/ciscobeyond

5. Learn about the technology under the hood:

www.cisco.com/go/instrumentation

www.cisco.com/go/eem

www.cisco.com/go/pec

Share

- Share with your peers
- Get creative
- Discuss, ask questions, provide suggestions and answers:

supportforums.cisco.com

- Upload your own examples to Cisco® Beyond:

www.cisco.com/go/ciscobeyond

Cisco Support Community

Search the Support Community

ANNOUNCEMENT: Welcome Cisco IronPort Community members

Support Communities

Network Infrastructure

Collaboration, Voice and Video

IP Telephony

Video Over IP

Unified Communications Applications

Telepresence

Digital Media System

Contact Center

Other Collaboration, Voice and Video Subjects

Security

Data Center

Application Networking

Server Networking

Storage Networking

Unified Computing

Other Data Center Subjects

Small Business

Challenges of Running a Small Business

Technologies for Small Businesses

Wireless - Mobility

Career Certification

Tell Us What You Think

Which social media most helps you solve IT issues? - More polls

YouTube (7/5)

Facebook (7/5)

LinkedIn (7/5)

Twitter (7/5)

Delicious (7/5)

I rarely use social media (2/5)

I never use social media (0/5)

View 204 - Full Results

Cisco Beyond

Browse Scripts

Script Title	Summary	Category	Date Posted	Rating
Twee from IOS	Twee information from IOS using EDM and Telnet's API	User Interface	Nov 16, 2009 09:42am PST	★★★★
Network Effectiveness Monitoring	Script combines an ERM policy based in ED Timer and Configuration-Monitoring (CMB) 3.8.1.4.1.9.10.22 (1.3.8.1.3.1.80) to validate the Recognized traffic by NMAP feature.	Network Management	Oct 29, 2009 12:54am PST	★★★
Crash HTTP Debug	Simple script to capture show tech info	High Availability	Oct 13, 2009 10:13am PST	
Syslog & Email-SMTP Client	Generate a syslog & sends an email when 011 is called	Security	Sep 11, 2009 12:42pm PST	★★★★
TCP Socket State Monitor	This EDM policy detects, sends a syslog message, and optionally cleans, TCP sockets hung in certain states.	Security	Aug 04, 2009 11:23am PST	
show2text:to	Quick and easy show command output into the server	Network Management	Jul 16, 2009 02:46am PST	
CLI -> Bash Integration	cli -> bash transformation space on the box	User Interface	May 28, 2009 03:45pm PST	
HTTP Server with CGI Support	HTTP server with CGI support	Network Management	Apr 22, 2009 10:56am PST	
iptables update	automates iptables firewall update with dynamic iptables endpoint	Routing	Apr 01, 2009 10:46am PST	

Contribute

- You've just built the smartest embedded automation on Planet Earth?
- You've got a really good use case?
- Or a great idea with a half-baked solution?
- Want to suggest additions to existing EASy packages?
- Or volunteer your scripting skills to improve an EASy package?

→ Contact ask-easy@cisco.com



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