Wireless Sensor Module (WSeM™)

Configuration Tool – User’s Guide
1 Introduction
The Wireless Sensor Module (WSeM™) Configuration Tool serves as a dual purpose utility by enabling its users to view or set their WSeM™ nodes configurations as well as view the data associated with each of these nodes, stored in either CSV files or in a JDBC-compatible database.
2 System Requirements

The Oceana Sensor Module WSeM™ Configuration application runs on any computer running Windows XP, Service Pack 2 with 1GB of memory.

Other operating systems may be supported, please contact Oceana Sensor Module support for more information.

In order to use the utility, your system will need to have the following installed and configured:

- Install Java Runtime Environment
  - Run `jre-6u6-windows-i586-p-s.exe` from the CD
  - Install using all default settings

- Network connectivity
  - Your configuration application must have access to the network segment where the nodes are located, and have the IPv4 address 10.0.0.232 in order to receive the SNMP traps from the nodes. This address can be changed for each node individually from within the configuration utility once a link has been established.

- Firmware Updates
  - The firmware update daemon is a compiled application that runs on Windows. Other platforms are not currently supported.
3 Installation

Run WSeMDemoToolkit.msi from the CD. This starts the Windows Installer Wizard. Perform a “Typical” installation, using all default settings. This creates and populates the C:\Program Files\OceanaSensorModule directory.
### 4 WSeM™ Toolkit Configuration Utility

#### 4.1 Description
The WSeM™ Toolkit Configuration Utility (ToolConfig) is used to setup the data storage parameters as well as the PTPServer.

#### 4.2 Launching Application
The utility will be launched automatically at the end of the installation. To change parameters afterwards, launch from the Start->Programs->OSM WSeM Demo->Configure Data Storage Mode shortcut.

#### 4.3 Navigating through Toolkit Configuration Utility

![WSeM Toolkit Configuration](image)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTP Time Server Address</td>
<td>10.0.0.150</td>
</tr>
<tr>
<td>Data Location</td>
<td>Database</td>
</tr>
<tr>
<td>URL</td>
<td>jdbc:postgresql://10.0.0.150/wsemData</td>
</tr>
<tr>
<td>Username</td>
<td>wsem_daq</td>
</tr>
<tr>
<td>Password</td>
<td>wsem_daq_pass</td>
</tr>
</tbody>
</table>

**4.3.1 PTP Time Server Address**

The combo box will automatically be populated with IP Addresses configured on your system. Simply select one that will be on your WSeM™ Network (such as 10.0.0.150) and the PTPServer will bind to that interface and address when it next starts. (Manual restart of PTPServer required before changes are visible)

**4.3.2 Data Location**

This is where the data will be stored and/or fetched from. Default is CSV mode which will look for nodeid.csv files in your data folder. If you have a supported database server setup, you may also choose the Database option.

**4.3.3 Database Mode**

**4.3.3.1 URL**

This is the jdbc-compliant URL to connect to this database server. The supported drivers are listed in the combo-box. The text area is where you will store the address in hostname[:port] format.

**4.3.3.2 Username / Password**

These are your credentials to access your database on this server
5 WSeM™ Configuration Tool

5.1 Launching Application
Click on the shortcut in Start->Programs->OSM WSeM Demo->WSeM Config Tool.

5.2 Navigation within the Configuration Tool

![Node Configuration tab](image.png)

*Figure 5.1: Node Configuration tab*
5.2.1 Node Configuration

On the node configuration screen, you will be able to view, fetch and set many configuration parameters for your currently active nodes. This is done through the use of SNMP traps and get/set operations when the node comes up and “checks in” with your configuration application.

5.2.1.1 Sensor Node

The pull-down selector shows the list of nodes that have established contact with the configuration utility as well as ‘192.168.240.1’ that will be used in ‘wired’ mode in future releases. Simply select a node from this pull down to access its settings.

5.2.2 Configuration Items

Select one of the items in this list to view/set the corresponding parameter.

Table 5.1: Configuration Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Read/Write</th>
<th>Description</th>
<th>Starter Kit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>App Sensor Data Period (sec)</td>
<td>RW</td>
<td>Time between UDP Data packets from sensor node [second]</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must be a value between 10 and 28800 (8 hours)</td>
<td></td>
</tr>
<tr>
<td>WSeM™ Analog Channel 1-4</td>
<td>RW</td>
<td>Linear inverse scale * 1000 to be applied to values coming in from the ADC. The scale/offset formula is in the form of : output = input*1000/scale + offset</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Scale</td>
<td></td>
<td>5000</td>
<td></td>
</tr>
<tr>
<td>Offset</td>
<td>RW</td>
<td>Offset to be applied to the values coming from the ADC, after the scale has been applied.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Number of Samples</td>
<td>RW</td>
<td>This is the number of samples read from the ADC to create a block. This determinates how much data is returned in the 'time-series’ mode, or how many samples have been used to calculate the Average or Root-Mean-Square value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1024</td>
<td></td>
</tr>
<tr>
<td>Post-Operation:</td>
<td>RW</td>
<td>Time Series: values, as read after scale &amp; offset have been applied</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time Series</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average Amplitude: Average/Mean value computed on the block. 1/n * sum(values)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Root Mean Square (RMS): RMS computed on the block. Sqrt(1/n * sum(values^2)).</td>
<td></td>
</tr>
<tr>
<td>WSeM Wakeup Stage 1</td>
<td>RW</td>
<td>Duration (in ms) where the rtc_out_1 will be active prior to data collection. This is used to warm up sensors powered by a power supply controlled by this control pin.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>WSeM Wakeup Stage 2</td>
<td>RW</td>
<td>Warmup duration (in ms) after stage 1 where the analog portion of the ADC will be active. Use this to stabilize your AC Coupling circuit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Update QF4A512</td>
<td>WO</td>
<td>Setting this parameter will tell the node that there are new coefficients to be downloaded from the tftp server. (The tftp server is located on the data server)</td>
<td></td>
</tr>
<tr>
<td>Configuration</td>
<td></td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Sensor Node HW Version</td>
<td>RO</td>
<td>Sensor Node Hardware Version</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.11.0</td>
<td></td>
</tr>
<tr>
<td>Sensor Node BootROM Version</td>
<td>RO</td>
<td>Sensor Node Boot ROM Firmware Version</td>
<td>0.9.24</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----</td>
<td>--------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Sensor Node SW Version</td>
<td>RO</td>
<td>Sensor Node Application Firmware Version</td>
<td>1.0.0</td>
</tr>
<tr>
<td>Sensor Node Platform SW Version</td>
<td>RO</td>
<td>Platform Version</td>
<td>0.0.256</td>
</tr>
<tr>
<td>Node IP Configuration</td>
<td>RW</td>
<td>Static or DHCP</td>
<td>Static</td>
</tr>
<tr>
<td>Node IP Address</td>
<td>RW</td>
<td>Sensor Node IP Address</td>
<td>10.0.0.100</td>
</tr>
<tr>
<td>Node Subnet Mask</td>
<td>RW</td>
<td>Sensor Node Subnet Mask</td>
<td>255.255.255.0</td>
</tr>
<tr>
<td>Node Gateway IP Address</td>
<td>RW</td>
<td>Address of default gateway</td>
<td>10.0.0.254</td>
</tr>
<tr>
<td>Node MAC Address</td>
<td>RO</td>
<td>MAC address of Sensor Node Wireless Interface Programmed by Oceana Sensor Module</td>
<td></td>
</tr>
<tr>
<td>Scan Type</td>
<td>RW</td>
<td>WLAN AP Scan type: 0 for “Passive Scan”; 1 for “Active Scan.”</td>
<td>1</td>
</tr>
<tr>
<td>Preferred SSID1</td>
<td>RW</td>
<td>1st entry in preferred SSID list</td>
<td>WSeMDemo</td>
</tr>
<tr>
<td>Preferred SSID1 Channel</td>
<td>RW</td>
<td>802.11 channel of 1st entry in preferred SSID list. See Table 5.2 for allowed channel numbers.</td>
<td>11</td>
</tr>
<tr>
<td>Preferred SSID2</td>
<td>RW</td>
<td>2nd entry in preferred SSID list</td>
<td>WSeMDemo</td>
</tr>
<tr>
<td>Preferred SSID2 Channel</td>
<td>RW</td>
<td>802.11 channel of 2nd entry in preferred SSID list. See Table 5.2 for allowed channel numbers.</td>
<td>11</td>
</tr>
<tr>
<td>Preferred SSID3</td>
<td>RW</td>
<td>3rd entry in preferred SSID list</td>
<td>WSeMDemo</td>
</tr>
<tr>
<td>Preferred SSID3 Channel</td>
<td>RW</td>
<td>802.11 channel of 3rd entry in preferred SSID list. See Table 5.2 for allowed channel numbers.</td>
<td>11</td>
</tr>
<tr>
<td>PTP Server IP Address</td>
<td>RW</td>
<td>IP Address of the PTP Server</td>
<td>10.0.0.150</td>
</tr>
<tr>
<td>PTP Server Mac Address</td>
<td>RW</td>
<td>Mac Address of the interface holding the PTP Server IP Address</td>
<td>00-00-00-00-00-00</td>
</tr>
<tr>
<td>PTP Sync Interval</td>
<td>RW</td>
<td>Used for differential calculations with regards to PTP. Interval in seconds.</td>
<td>0</td>
</tr>
<tr>
<td>Primary SNMP IP Address</td>
<td>RW</td>
<td>Primary SNMP manager IP address. This is the IP address of the host machine that can wirelessly configure the sensor node (using WSeMDemo, for example).</td>
<td>10.0.0.150</td>
</tr>
<tr>
<td>Secondary SNMP IP Address</td>
<td>RW</td>
<td>Secondary SNMP manager IP address</td>
<td>10.0.0.160</td>
</tr>
<tr>
<td>ConfigTrap Period (sec)</td>
<td>RW</td>
<td>Time between</td>
<td>30</td>
</tr>
</tbody>
</table>
### ConfigUpdate commands (SNMP Trap) from sensor node [second]

<table>
<thead>
<tr>
<th>Field</th>
<th>RW/RO/WO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linkup Trap Period (sec)</td>
<td>RW</td>
<td>Time between LinkUp commands (SNMP Trap) from sensor node [second]</td>
</tr>
<tr>
<td>FW Update IP Address</td>
<td>RW</td>
<td>Firmware Update Server IP address</td>
</tr>
<tr>
<td>FW Update Port</td>
<td>RW</td>
<td>Firmware Update Server UDP port</td>
</tr>
<tr>
<td>Initiate FW Update</td>
<td>WO</td>
<td>Set to 1 to initiate firmware update procedure.</td>
</tr>
<tr>
<td>Reboot</td>
<td>WO</td>
<td>Set to 1 to reboot sensor node. If the node is in Wired Provisioning mode (red LED slowly blinking), writing 1 will change to wireless mode.</td>
</tr>
<tr>
<td>App Sensor IP Address</td>
<td>RW</td>
<td>Sensor Node Data Server IP address</td>
</tr>
<tr>
<td>WPA2 Pre-Shared Key</td>
<td>RW</td>
<td>WPA2-PSK shared key</td>
</tr>
</tbody>
</table>

RW = Read/Write  RO = Read Only  WO = Write Only

### Table 5.2: Channels Used in Different Regulatory Domains

<table>
<thead>
<tr>
<th>Regulatory Domain</th>
<th>Allowed Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. (FCC)/Canada (IC)</td>
<td>1 to 11 (2.412 to 2.462 GHz)</td>
</tr>
<tr>
<td>Europe, excluding Spain (ETSI)</td>
<td>1 to 13 (2.412 to 2.472 GHz)</td>
</tr>
<tr>
<td>Spain</td>
<td>10 to 11 (2.457 to 2.462 GHz)</td>
</tr>
<tr>
<td>Japan (MIC)</td>
<td>1 to 13 (2.412 to 2.462 GHz) and 14 (2.484 GHz)</td>
</tr>
</tbody>
</table>

#### 5.2.2.1 Current Value

Field containing the currently set value for this parameter on this node. This is populated/updated by sending a ‘get’ request.

#### 5.2.2.2 Set Value

Select or populate wanted value prior to sending a ‘set’ request. This may be empty if operation does not require a parameter (i.e. reset), a pull-down if only a subset of parameters can be used (fw update) or a text field otherwise.

#### 5.2.2.3 Set/Get Buttons

Set: Push to set value(s) populated in the ‘Set Value’ input area for that item on that node.

Get: Push to get the value(s) associated with this item on this node.

#### 5.2.2.4 Command Queue at Host

List of Get/Set requests from user (queued or already executed)
5.2.2.5 Get/Set Responses from WSeM™ Node

List of responses from the WSeM™ node. Get and Set requests will also populate the ‘current value’ field with the value fetched from the response.

5.2.3 Sensor Data Viewer

After selecting the ‘Sensor Data Viewer’ tab below the title, you will be presented with a graphing interface to show you the time:values presented in a x-y plot for your 4 channels, as well as the battery level and the Received Signal Strength Indication (RSSI) for the node.

5.2.3.1 WSeM™ Nodes

This lists the available sensor nodes where data is available to be graphed. By contrast to the WSeM™ node selector in the config panel, these nodes do not need to be currently active.

5.2.3.2 Samples

This indicates the number of samples to plot. The last x samples (if there are less number of samples than this value, all samples will be plotted) will be fetched from the data repository and used to create a graph. On active WSeM™ nodes, this graph will be updated periodically as newer data becomes available to show only the most recent x samples.

5.2.3.3 Navigation inside the graph

The graph itself offers a variety of options to zoom in/out or to save to disk. Simply bring your mouse over the graph and press the right mouse button for more details. Be wary that zooming in on the time axis will set your range to be absolute and as the graph is redrawn, may become unavailable.

5.2.4 Firmware Updates

The firmware update process will let you update either the WLAN or the Application firmware on your WSeM™ Node. After sending a set request, the node will acknowledge when it is ready at which point the Firmware update utility will be launched to push the contents of the new firmware to the node. When the update is successful, the firmware update utility will return successfully and the node will send an ‘APP1 SW Success’ message back. This is only visible in the window where the configuration application was launched and where the application’s log output is visible.

5.2.4.1 Location of Firmware Images

The folder where the images are to be stored is set by the ‘GAINSPAN_FW_PATH’ environment variable and the names of the images in GS1010_APP1_FILE and GS1010_APP2_FILE.

5.2.4.2 Requesting update

From the configuration panel, select the node you’d like to target, ‘Initiate FW Update’ from the Config Item selector, then ‘APP’ from the list of options presented. Follow by initiating the set request by pressing the Set button.

In the Command Queue, you will see “Set Command Queued Initiate FW Update” added to the list of commands. If not, press the set button again until you see it. Next, in the log output window,

Output of ProxyFWUpdater application:

Running command 'ProxyFWUpdateServer.exe 3 9000 "10.0.0.1"'
Started the server on port 9000
Please wait for a few seconds to update....
Extracting the contents of the file: C:\GainSpan\EvalKit\Bin\APP\TLS-FWU-APP2.bin
File open success 6690716
File Len 90249
Extracting the contents of the file: C:\GainSpan\EvalKit\Bin\APP\TLS-FWU-APP1.bin
File open success 6690820
File Len 115152

FW Successfully Updated.....Exiting

Confirmation from Node:
INFO: 10.0.0.1: Wed May 28 16:06:15 EDT 2008 : SNMP FW Update Trap Received :
,FW Update Success-APP1 Success

5.2.4.3 Known Issues
Proxy already running/Proxy remains up after failure. If you see a similar error message when the
firmware update is launched, open the task manager (ctrl-alt-del) and kill the process that is named
‘ProxyFWUpdateServer.exe’ and re-send the set request.

5.2.5 QF4A512 Configuration
When the QF4A512 Configuration command is sent to the node, it will send a tftp read request to the
server sitting on the same host as the Data Collector Daemon for a file composed of its nodeid/MAC
address in capital followed by the '.hex' extension. E.g. for node with MAC address 00-1d-c9-02-ff-ff, it
would request 001DC902FFFF.hex. The provided ADC Filter Server will look for these files in the folder
named data in your installation path. By default, this would be C:\Program
Files\OceanaSensorModule\WSeMToolkit\data.

5.3 Wired mode
For configuration and troubleshooting, the configuration tool can communicate with the WSeM™ node via
a serial (UART) interface. In order to do this, you will need to attach and install the provided USB to UART
interface onto your computer, install and configure a VirtualNDIS interface to give an IP to your serial
connection and configure a provided utility, WildServer to bridge your NDIS interface to your serial link.
5.3.1 USB to UART Cable

First assemble the two pieces of the serial device together by joining the two C-shaped connectors. Next attach the USB extension cable at the USB connector on this serial device. Finally, the larger end of the USB cable can be connected into your Windows XP PC.

Verify that your system can see the serial connector by navigating to the Device Manager (Start-&gt;ControlPanel-&gt;System-&gt;Hardware-&gt;DeviceManager). Once in there, under "Ports", you should be able to see one entry that reads "USB Serial Port (COM#)", where # is which com port was assigned to the serial interface. This value will be used to configure the WildServer in a few moments.
5.3.2 VirtualNDIS interface

Communication between the configuration utility and the node over the serial connection must be done through a VirtualNDIS interface. To install one, follow these instructions:

5.3.2.1 VirtualNDIS Installation

1. Navigate to the ‘Add Hardware’ wizard (Start->ControlPanel->AddHardware).

2. Click on ‘Next’

3. Select the ‘Yes I have already connected the hardware’

4. Select ‘Add a new hardware device’ at the bottom of the selection

5. Select ‘Install the hardware that I manually select from a list (Advanced)’

6. Select ‘Network Adapters’

7. Click on the ‘Have Disk’ button

8. Browse to WSeM bin folder (C:\Program Files\OceanaSensorModule\WSeMToolkit\bin by default)

9. Select ‘netvirtual.inf’
10. Click on ‘Open’, then on ‘Next’, and ‘Next’ again.

11. If there is a popup that says that your driver has not been certified by Microsoft and urges you to reconsider, click on ‘Continue Anyway’

12. ‘Finish’

Now if you navigate to your Network Connections (Start->Control Panel->Network Connections), there should be a new Local Area Connection with ‘Virtual Network Adapter’ as its description.

5.3.2.2 Virtual NDIS Configuration

1. Right click on the new Local Area Connection icon and select ‘Properties’

2. In the middle window, select ‘Internet Protocol (TCP/IP)’, then click on ‘Properties’ below

3. Select ‘Use the following IP address:’ and enter the following
   a. IP Address : 192.168.240.2
   b. Netmask : 255.255.255.0
   c. Leave the other fields empty.

4. Select ‘Ok’

5. Select ‘Close’
5.3.3 WildServer Configuration

For the last element, you will need to configure the WildServer application to use the com port assigned to your USB Serial Port (see 5.3.1 – USB Serial Cable).

1. Open the WildServer configuration file by selecting it from the startup menu inside the WSeM folder. Start->All Programs->OSM WSeM Demo->WildServer->WildServer Configuration

2. Find the line that begins with ‘<interface name="UART1” and change the value of the “ident” property to that of your com port (5.3.1). i.e. ident="COM3" if your com port is COM3 (as in our usb serial port configuration examples)

5.3.4 Launching WildServer

The last step to enable communication over the serial port is to launch the WildServer application.

1. Start->Programs->OSM WSeM Demo->WildServer->WildServer

2. The window that shows up should display information about the serial port driver but not ‘Cannot initialize UART1 on COMx’. If you do have that error message, please make sure that you have the correct com port and that no other application is using your serial port (such as another
instance of the WildServer). To reconfigure the WildServer, simply repeat steps in 5.3.3 - WildServer Configuration.

![Figure 5.6: Misconfigured WildServer](image)

![Figure 5.7: Correctly Configured WildServer](image)

5.3.5 UART Configuration Mode

Once the WildServer application is configured and running, the next step is to put the node into UART Configuration Mode. This is done by pressing the reset button until the green led quickly flashes. After this, the green led should blink on and off every 4 or 5 seconds. During this time, the node is in UART Configuration Mode.

To return to normal mode, follow the same steps. Press the reset button until you see the green led quickly flashing. After that, the red and green lights will turn on indicating that the node is in data acquisition mode.
6 WSeM™ Data Collector Daemon

The WSeM™ Data Collector Daemon is a utility meant to be run as a service or daemon that will listen for incoming WSeM™ sample data from the sensor nodes and store them in csv files or in a database.

6.1 Launching Application

The application will already be registered to run as a service (manual startup). Start->Programs->OSM WSeM Demo->Data Collector->Start in Service Mode (or Launch in Debug Mode). To configure the service to start automatically at startup, choose ‘Configure to start automatically at boot’.

6.2 What does it do?

The application will launch and tell you that it did, then listen for data coming from the sensor nodes on the specified UDP port. When it receives the datagrams, it will validate, parse and export to either a CSV file or to the database. In CSV file mode, it will create or append to a file specific to that node, named nodeid.csv where nodeid is the Node’s ID. i.e. 001DC9020001.csv. The first column will be the timestamp, followed by channels 1-4, the RSSI reading then the battery level reading.
7 WSeM™ PTP Time Server

The WSeM™ Precision Time Protocol (PTP) Time Server can be used to synchronize your WSeM™ Node clocks with your host.

7.1 Server Configuration

The server-side configurations are done through the use of the WSeM™ Toolkit Configuration utility, where you will set which IP address you want the server to bind to. Make sure that this IP is on the same network as your nodes. Also note that the PTP server must reside on the same IP subnet; PTP sync packets are not routable.

7.2 Node Configuration

Two parameters will need to be set on your node, with the use of the WSeM™ Demo Configuration Utility. The first is ‘PTP Server IP Address’. This must be set to the same IP used in step 7.1 (Server Configuration). The second parameter is ‘PTP Server Mac Address’ and must be set to the Physical/Mac address of the Ethernet adapter hosting the IP on your server. You can obtain this information from the command prompt by running the ‘ipconfig /all’ command.

![Figure 7.1: Network settings for PTP Time Server](image-url)
## 8 References

<table>
<thead>
<tr>
<th>Received Signal Strength Indication (RSSI)</th>
<th>In an IEEE 802.11 system RSSI is the received signal strength in a wireless environment, in arbitrary units. (<a href="http://en.wikipedia.org/wiki/Rssi">http://en.wikipedia.org/wiki/Rssi</a>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root Mean Square (RMS)</td>
<td>In mathematics, the root mean square (abbreviated RMS or rms), also known as the quadratic mean, is a statistical measure of the magnitude of a varying quantity. It is especially useful when variates are positive and negative, e.g., sinusoids. (<a href="http://en.wikipedia.org/wiki/Root_mean_square">http://en.wikipedia.org/wiki/Root_mean_square</a>)</td>
</tr>
<tr>
<td>SNMP</td>
<td>The Simple Network Management Protocol (SNMP) forms part of the internet protocol suite as defined by the Internet Engineering Task Force (IETF). SNMP is used in network management systems to monitor network-attached devices for conditions that warrant administrative attention. It consists of a set of standards for network management, including an Application Layer protocol, a database schema, and a set of data objects. (<a href="http://en.wikipedia.org/wiki/Snmp">http://en.wikipedia.org/wiki/Snmp</a>)</td>
</tr>
</tbody>
</table>
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