OASIS

Usability Review Presentation

Submitted by Broadcom Corporation
Agenda

• Introduction to OASIS
• OASIS Common Mode Protocol
• Primary Usage Models
  – Out-of-the-Box Configuration/Adding a Client
• Secondary Usage Models
  – Expanding a network (Adding a Router/Access Point)
  – Resetting the network/Removing a Client
  – Adding legacy devices
• Rich UI Device Configuration Storyboard – Add PC
• Headless Device Configuration Storyboard – Add Printer
• Error Reporting and Recovery
  – Rich UI Devices
  – Headless Devices
• Demonstration Equipment
Introduction to OASIS

• OASIS offers multiple configuration options
  — OASIS common mode (configuration mode common to all headless and rich UI devices) utilizes a simple push button approach to initiate and complete the configuration of a Wi-Fi network or device
    • Automatic configuration of network SSID and security credential (WPA Passphrase, WPA2 Passphrase and, if supported, WEP Key)
    • User not required to enter and remember a complex alphanumeric string – the achilles of today’s manual configuration utilities
  — OASIS protocol may support future vendor implemented optional configuration processes
    • Manual PIN entry
    • Near Field Communications

• OASIS Common Mode is the focus of the storyboard and demonstration equipment provided
• Implementation of the user interface is the responsibility of vendor product development
OASIS Common Mode Protocol

- User interaction is limited to two (2) simple push button steps
  - Step 1 – User pushes OASIS button on the Router/Access Point (referred to as the configurator) S times (1<=S<=32)
  - Step 2 – User pushes OASIS button on client S times
- OASIS push button sequence authenticates the configuration process by introducing a secret (S), known only by the user, into the configuration protocol
- 3rd party critique of OASIS proposal has asserted that the majority of users will use a low S value (e.g. 1 to 5)
  - Users prioritize the ease of completing a task over security
- Simple variations of push button action enable different usage models
  - Short button press (0 to 4.99 secs.) initiates device configuration
  - A long button press (5 secs. or greater) resets a network
- Placement of configurator and client devices in residential environments afford convenient device access (on top of furniture such as desks, cabinets)
  - Scenarios of devices being inconveniently located in locked closets/ mounted in the attic are enterprise deployment scenarios
OASIS Common Mode Protocol

- OASIS common mode technology is based on SecureEasySetup™ (SES) push-button configuration technology that is commercially-available in brand name products today.
Primary Usage Models – Out-of-the-Box Device Configuration/Adding a Client

• **Step 1:** User pushes OASIS button on the Router/Access Point $S$ times ($1 \leq S \leq 32$)
Primary Usage Models – Out-of-the-Box Device Configuration/Adding a Client

- Step 2: User presses OASIS button on the client S times

- User monitors configuration status & completion via Wizard screens (Rich UI devices) or LEDs (Headless devices)
Notes

- OASIS determines if valid network configuration settings (Network SSID and WPA/WPA2 Pre-Shared Key) exist
  - If not (as would be the case with the Out-of-the-Box device/network configuration), OASIS establishes valid Network SSID and WPA/WPA2-Pre-Shared Key
  - If valid network configuration settings are present, OASIS utilizes existing SSID and Pre-Shared Key

- OASIS has been designed to accommodate process variances such as the reverse order of the button presses (the button press sequence on the client is completed prior to the button press sequence on the configurator)

- The proposal stipulates that Step 2 must be completed within Two (2) minutes/120 seconds of the user completing Step 1 (or vice versa)
  - This timeframe, which was felt to allow sufficient time to reach a client/AP device “in-place” in a typical residence, can be modified
Secondary Usage Models – Expanding a Network (Adding a Router/Access Point)

• Expanding a network by adding a Router/Access Point follows the same procedure as the Primary Usage Model “Adding a Client”

• Step 1: User pushes OASIS button on the Router/Access Point S times (1<=S<=32)
Secondary Usage Models – Expanding a Network (Adding a Router/Access Point)

- Step 2: User presses OASIS button on the additional Router/Access Point S times
Secondary Usage Models – Resetting a Network/Removing a Device

- User presses the OASIS button on the Router/Access Point for a duration of 5 seconds or greater. This resets the network (devices are no longer connected)
Secondary Usage Models – Resetting a Network/Removing a Device

• To establish a new network (new SSID and PSK), the user undertakes the Out-of-the-Box Device/Adding a Client configuration process

• User reconnects all desired devices by completing the Out-of-the-Box Device/Adding a Client configuration process for each device
  – User does not go through this process for devices that were to be removed from the network
Secondary Usage Models – Adding Legacy Devices

- Network configuration information can be saved to disk or printed out for use during manual configuration of legacy devices.
Rich UI Device Configuration Storyboard – Add PC to Network

• User launches OASIS Wizard from Start menu or desktop

Note: Storyboard is based on an OASIS reference design that supports multi-button push functionality. Vendors may modify the user interface to meet specific implementation requirements.
Rich UI Device Configuration Storyboard – Add PC to Network

• User views Welcome Screen, Clicks Next to Continue
Rich UI Device Configuration Storyboard – Add PC to Network

• User views information presented on screen

– User may consult AP/Router set-up poster/user manual for additional information including location of OASIS button
Rich UI Device Configuration Storyboard – Add PC to Network

- **Step 1** - User locates OASIS button on Router/Access Point and executes OASIS button press sequence (presses button S times)

- User clicks Next on client wizard to continue to Step 2
Rich UI Device Configuration Storyboard – Add PC to Network

- **Step 2** – User views information presented on screen and executes OASIS button click sequence (clicks the button S times). User Clicks Next to Continue.
• Wizard presents the “Configuration Status” screen - updates user on status of the configuration process
  – Green dots (left) and text (right) indicate status is OK
  – Red dots (left) and text (right) indicate an error
Rich UI Device Configuration Storyboard – Add PC to Network

• “Congratulations Screen” informs the user that configuration is complete
  – The user is given the option to save or print the network configuration information (to be used later during manual configuration of legacy devices)
Headless Device Configuration Storyboard –
Add Printer to Network

• Simplicity of the push button process is ideal for headless devices – a simple device set-up poster is all the user needs

Secure Easy Wireless Networking

OASIS

Setting up a secure wireless connection between your new wireless printer and your wireless network has never been easier. Why? Because your printer is OASIS ready.

What is OASIS?
OASIS is a program that has been already installed on your notebook that helps you easily set up a secure wireless network.

Why do you want a secure network?
The answer is simple. You do not want people using your network without your knowledge. You want to make sure that personal information is safe and secure.

What do you need to set up a secure wireless printer connection?
To set up your secure wireless printer connection, you need:
• A router or access point that is OASIS compatible. Look for the OASIS logo OASIS when purchasing your router or access point.
• Your new OASIS ready printer

How do you set up your secure wireless printer connection?

Follow these two easy steps
1) Press the OASIS button on the front of your router
2) Press the OASIS button on the front of the printer. The software automatically configures your router and sets up a secure wireless connection.

When the LEDs go from blinking to solid your printer is securely connected.

That’s it.
Headless Device Configuration Storyboard – Add Printer to Network

- **Step 1** - User locates OASIS button on Router/Access Point and executes OASIS button press sequence
Headless Device Configuration Storyboard – Add Printer to Network

• **Step 2** - User locates OASIS button on the printer (or in the printer control menu) and executes OASIS button press sequence (within 2 minutes of button press sequence on Configurator)
Headless Device Configuration Storyboard – Add Printer to Network

• The LED blinks during the configuration process
Headless Device Configuration Storyboard – Add Printer to Network

• LEDs go solid when configuration is complete to indicate that the printer is connected

LEDs “ON”
Headless Device Configuration Storyboard – Add Printer to Network

- Manufacturer-defined LEDs provide status and error indication
- Default LEDs required by all OASIS devices are:

<table>
<thead>
<tr>
<th>State</th>
<th>LED Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconfigured</td>
<td>LED OFF</td>
</tr>
<tr>
<td>Passphrase Configured</td>
<td>LED ON</td>
</tr>
<tr>
<td>Open Registration/Configuration</td>
<td>LED BLINK</td>
</tr>
<tr>
<td>Error</td>
<td>FAST BLINK</td>
</tr>
</tbody>
</table>
Error Reporting and Recovery

• Error reporting and recovery instructions provided are consistent with errors that may occur
  – OASIS’s simplicity (user understanding and execution) results in few errors - each with simple recovery instructions
  – Effectiveness of error reporting and recovery instructions is supported by feedback from commercially-shipping SES products

• Potential errors fall into 2 categories
  – System Errors – errors that prevent OASIS configuration from starting
    • Wi-Fi Card not found,
    • incorrect software
    • Client OASIS button not pressed in 2 minute window
  – OASIS Errors – errors that prevent completion of OASIS configuration (device location, connection and negotiation errors, security warnings)
    • Poor Wi-Fi connectivity
    • OASIS button pressed different number of times on Router/AP and Client
    • Security warnings such as multiple devices attempting to connect
Error Reporting and Recovery - Rich UI Devices

- OASIS defines detailed error reporting and recovery instructions for Rich UI devices
  - Error screens provide a description of the error
  - User can access additional information on the error including recovery instructions by clicking on “Next” at bottom right hand of the error screen
Error Reporting and Recovery - Rich UI Devices

• A common error preventing the configuration process from starting is the inability of the client device to locate a Wi-Fi card - *No Wi-Fi network card has been found* error

![Error Message](image)

• Clicking “Next” provides additional information on the error including recovery instructions
Error Reporting and Recovery - Rich UI Devices

- Once the configuration process has started, the “Configuration Status” screen identifies any OASIS errors if they occur.
  - Red dots (left) and text (right) indicate an error has occurred.
- By clicking Next, user is provided more detailed information on the error as well as appropriate error recovery instructions.
Error Reporting and Recovery  
- Rich UI Devices

• **Unable to locate a Proper OASIS AP error** - the following is the complete error message/security warning:

The OASISTM Wizard was unable to locate an OASIS Wireless Router/Access Point that is in configuration mode. Check the following possible causes and click NEXT to run the wizard again or CANCEL to stop the configuration process.

1) The Wireless Router/Access Point did not go into OASIS configuration mode.
   Ensure that the each OASIS button press on the Wireless Router/Access Point lasts one full second.

2) The OASIS button in this wizard was not pressed within the two minute configuration window.
   The OASIS configuration window is open for a two-minute period. You must complete the OASIS button press sequence on the OASIS Wireless Router/Access Point and the Wi-Fi client within two minutes of each other.
   Restart the process and make sure that button press sequence is completed within two minutes of each other.

3) The Wireless Router/Access Point you are using is not enabled for OASIS. See your router's documentation for the appropriate manual setup procedure.

4) Two or more OASIS Wireless Router/Access Points in configuration mode have been identified. The OASIS Wizard can be used with only one Wireless Router/Access Point in OASIS configuration mode at a time.
   If you have two or more Wireless Router/Access Points in OASIS configuration mode, power off all but the one you are attempting to connect to or wait two minutes for the OASIS configuration window to close. Restart the OASIS configuration process.

5) Two or more wireless computers or devices have connected to the OASIS Wireless Router/Access Point during the two minute configuration window.
   OASIS can configure only one wireless computer or device at a time. If you are attempting to run OASIS on more than one wireless computer or device, wait two minutes between the start of the configuration session of each wireless device.

6) There may not be a good, consistent signal between the OASIS Wireless Router/Access Point and the Wi-Fi client you are attempting to configure.
   If there is not a good, consistent wireless connection between the client device and wireless Router/Access Point, OASIS may not be able to communicate between the two devices to properly complete the configuration process.
   Move the Wireless Router/Access Point and client device to a location with where there is a good, consistent signal and run OASIS again.
Error Reporting and Recovery - Rich UI Devices

• *Unable to Establish a Connection to OASIS AP* error - the following is the complete error message:

There may not be a strong signal between this Wi-Fi client and the OASIS Wireless Router/Access Point. If the Wi-Fi client does not have a good connection to the Wireless Router/Access Point, OASIS may fail.

Move the Wireless Router/Access Point and Wi-Fi client closer together, verify that there is a strong signal, and run OASIS again.
Error Reporting and Recovery
- Rich UI Devices

• Another client device joined the network during this configuration session error
  - the following is the complete error message/security warning:

Another Wi-Fi wireless client joined the network during this configuration session. For security reasons, only one wireless device is allowed to join a network during each configuration session.

If you are trying to configure more than one client device, please configure each one by pressing the OASIS button sequence on the Wireless Router/Access Point followed by the OASIS button sequence on the client using this wizard. Repeat the process for each additional device.

If you were trying to configure only one device, there is a possibility that someone outside your network joined ahead of you. Please press the Wireless Router/Access Point button for a long button press (greater than 5 seconds) to reset (rekey) your network and start the process again. If you are presented with this error message again, consider completing the OASIS configuration process using an Ethernet connection between the Wireless Router/Access Point and this client device (if available) or using a manual configuration utility to connect this client to the network.
Error Reporting and Recovery
- Rich UI Devices

• **Unable to Negotiate Security with OASIS AP error**– the following is the complete error message/security warning:

OASIS requires that you press the OASIS configurator button the same number of times on the Router/Access Point and client. This error may have resulted from the OASIS button on the Router/Access Point and client being pressed a different number of times. Please run OASIS again, ensuring that you press the OASIS buttons on the Router/Access Point and Client device the same number of times.

More than one wireless client may have attempted to negotiate the security level with the OASIS Wireless Router/Access Point. OASIS can configure only one wireless client at a time. If you attempting to run OASIS on more than one wireless client, wait two minutes and complete OASIS on one client and then run it on the second client.

Alternatively, this error may have resulted from another device (AP or client) attempting unsuccessfully to join your network. Please run OASIS again.

• Note the above error messages will be part of a future OASIS software release. Demonstration products include an error message from current SES products.
**Error Reporting and Recovery**

- **Rich UI Devices**

• *Successive Failure of Device Configuration* error – the following is the complete error message/security warning:

  The configuration exchange has failed 3 times in succession. This may be the result of an external party attempting to gain access to your network. It is recommended that the configuration process be completed over an Ethernet (wired) connection, if available, or completed manually.

• Note: the above error message will be part of a future OASIS software release. It is not included in the demonstration products.
Error Reporting and Recovery
- Rich UI Devices

• *Unable to Establish a Secure Connection* error– the following is the complete error message:

OASIS successfully registered all the settings on your Wireless Router/ Access Point as well as your Wi-Fi client and successfully tested the connection. However, the Wi-Fi client failed to join the network. There may not be a strong signal between this Wi-Fi client and the OASIS Wireless Router/ Access Point. If the Wi-Fi client does not have a good connection to the Wireless Router/ Access Point, the connection may fail.

Move the Wireless Router/ Access Point and Wi-Fi client closer together, verify that there is a strong signal, and see if the Wi-Fi client connects. Alternatively, you may run OASIS again.
Error Reporting and Recovery
- Headless Devices

- OASIS defines minimum LED error indication – see slide 26
- Manufacturers may define additional LED error indicators (example given below) with error explanations and recovery instruction included in setup poster/user manual

<table>
<thead>
<tr>
<th>State</th>
<th>LED Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Error</td>
<td>FAST BLINK YELLOW</td>
</tr>
<tr>
<td>OASIS Error</td>
<td>FAST BLINK GREEN</td>
</tr>
<tr>
<td>Network Error</td>
<td>FAST BLINK ORANGE</td>
</tr>
<tr>
<td>Security Warning</td>
<td>FAST BLINK RED</td>
</tr>
</tbody>
</table>

- Devices with alternative output capabilities may provide more detailed error explanation and recovery procedures
  - E.g. - a printer may print out the error explanation and recovery instructions
Demonstration Equipment

• Equipment Provided
  – OASIS Router Reference Design
  – OASIS Rich UI Device Reference Design (Laptop)

• Usage Models Supported
  – Out-of-the-Box Device Configuration/Adding a Client
  – Resetting the Network/Removing a Device
  – Adding Legacy Devices (via save/print output for use with manual configuration utility)