了解在无线局域网控制器(WLC)上的调试客户端

目录

简介

本文档提供了有关无线 LAN 控制器上的 **debug client** 命令输出的详细信息。

本文档涉及以下主题：

- 如何处理无线客户端
- 基本关联和认证问题故障排除

所分析的输出涉及 WPA 预共享密钥 (WPA-PSK) 网络方案。

先决条件

要求

Cisco 建议您了解以下主题：

- 如何针对基本运行来配置无线 LAN 控制器 (WLC) 和轻量接入点 (LAP)

- 轻量接入点协议 (LWAPP) 和无线安全方法
- 802.11 认证和关联过程的工作方式

使用的组件

本文档中的信息基于以下软件和硬件版本：

- 运行固件 4.1 或 4.2 的 Cisco 2000/2100/4400 系列 WLC
- 基于 LWAPP 的接入点

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

Debug Client

命令 **debug client <MACADDRESS>** 是一个可启用 8 个 debug 命令的宏，此外还提供了一个 MAC 地址过滤器，以便仅显示包含指定 MAC 地址的消息。8 个 debug 命令显示了关于客户端关联和认证的最重要详细信息。在有多个无线客户端的情况下，该过滤器十分有用。例如，如果未使用该过滤器，在启用调试后可能会生成过多输出或使控制器超载。

所收集的信息涉及关于客户端关联和认证的重要详细信息（有两个例外情况，本文后面会进行介绍）。

已启用的命令显示在以下输出中：

```
(Cisco Controller) >show debug

MAC address ................................ 00:00:00:00:00:00

Debug Flags Enabled:
  dhcp packet enabled.
  dot11 mobile enabled.
  dot11 state enabled.
  dot1x events enabled.
  dot1x states enabled.
  pem events enabled.
  pem state enabled.
```

这些命令涉及地址协商、802.11 客户端状态机、802.1x 认证、策略执行模块 (PEM) 和地址协商 (DHCP)。

Debug Client 的变化形式

对于大多数情况，使用 **debug client <MACAddress>** 便足以获取所需信息。不过，有两种需要其他调试的重要情况：

- 移动性（客户端在控制器之间漫游）

- EAP 认证故障排除

移动性

在这种情况下，需要在引入 **debug client <MACAddress>** 命令之后启用移动调试，以便获取有关控制器之间的移动协议交互的附加信息。

注意： 以后会有文档介绍此输出的详细信息。

为了启用移动调试，可使用 **debug client <MACAddress>**，然后使用 **debug mobility handoff enable** 命令：

```
(Cisco Controller) >debug client 00:00:00:00:00:00

(Cisco Controller) >debug mobility handoff enable

(Cisco Controller) >show debug

MAC address ................................ 00:00:00:00:00:00

Debug Flags Enabled:
  dhcp packet enabled.
  dot11 mobile enabled.
  dot11 state enabled
  dot1x events enabled.
  dot1x states enabled.
  mobility handoff enabled.
  pem events enabled.
  pem state enabled.
```

EAP 认证故障排除

为了对 WLC 与认证服务器（外部 RADIUS 或内部 EAP 服务器）之间的交互进行故障排除，可使用命令 **debug AAA all enable**，此命令将显示所需的详细信息。此命令应在 **debug client <MACAddress>** 命令的后面使用，并且可根据需要与其他 debug 命令（例如，**handoff**）结合使用。

```
(Cisco Controller) >debug client 00:00:00:00:00:00
(Cisco Controller) >debug aaa all enable
(Cisco Controller) >show debug
MAC address ................................ 00:00:00:00:00:00
Debug Flags Enabled:
  aaa detail enabled.
  aaa events enabled.
  aaa packet enabled.
  aaa packet enabled.
  aaa ldap enabled.
  aaa local-auth db enabled.
  aaa local-auth eap framework errors enabled.
  aaa local-auth eap framework events enabled.
  aaa local-auth eap framework packets enabled.
  aaa local-auth eap framework state machine enabled.
  aaa local-auth eap method errors enabled.
  aaa local-auth eap method events enabled.
  aaa local-auth eap method packets enabled.
```

```
aaa local-auth eap method state machine enabled.
aaa local-auth shim enabled.
aaa tacacs enabled.
dhcp packet enabled.
dot11 mobile enabled.
dot11 state enabled
dot1x events enabled
dot1x states enabled.
mobility handoff enabled.
pem events enabled.
pem state enabled.
```

客户端连接

在本文档中，*客户端连接* 就是无线客户端完成以下步骤的过程：

802.11 部分

1. 探测以发现要关联的有效 AP。
2. 验证：可以是 Open (null) 或 Shared。通常选择 Open。
3. 关联：向 AP 请求数据服务。

L2 策略部分

1. 无;根据具体配置，进行 PSK 或 EAP 认证。
2. 密钥协商，如果选择了加密方法。

L3 策略部分

1. 地址识别。
2. Web 认证，如果已选择。

注意： 这些步骤代表完整过程的一个子集或摘要。本文档介绍了一个涉及 802.11 和 L2 策略并使用 WPA-PSK 和地址识别的简化情况。未使用外部 AAA 或 L3 认证策略。

控制器进程

在每个部分中，控制器都使用多个分隔的进程，以便跟踪客户端在每个时刻的状态。各个进程相互进行交互，以确保将客户端添加到连接表中（根据配置的安全策略）。为了了解客户端到控制器的连接步骤，下面提供了最相关过程的简短摘要：

- **策略执行模块 (PEM)** — 控制客户端状态，并强制客户端根据 WLAN 配置执行每个安全策略。
- **接入点功能 (APF)** — 基本上是 802.11 状态机。
- **Dot1x** — 实现 802.1x 的状态机、PSK 认证和无线客户端的密钥处理。
- **移动性** — 跟踪与同一移动组中其他控制器的交互。
- **数据转换层 (DTL)** — 位于软件组件与网络硬件加速 (NPU) 之间；控制 ARP 信息。

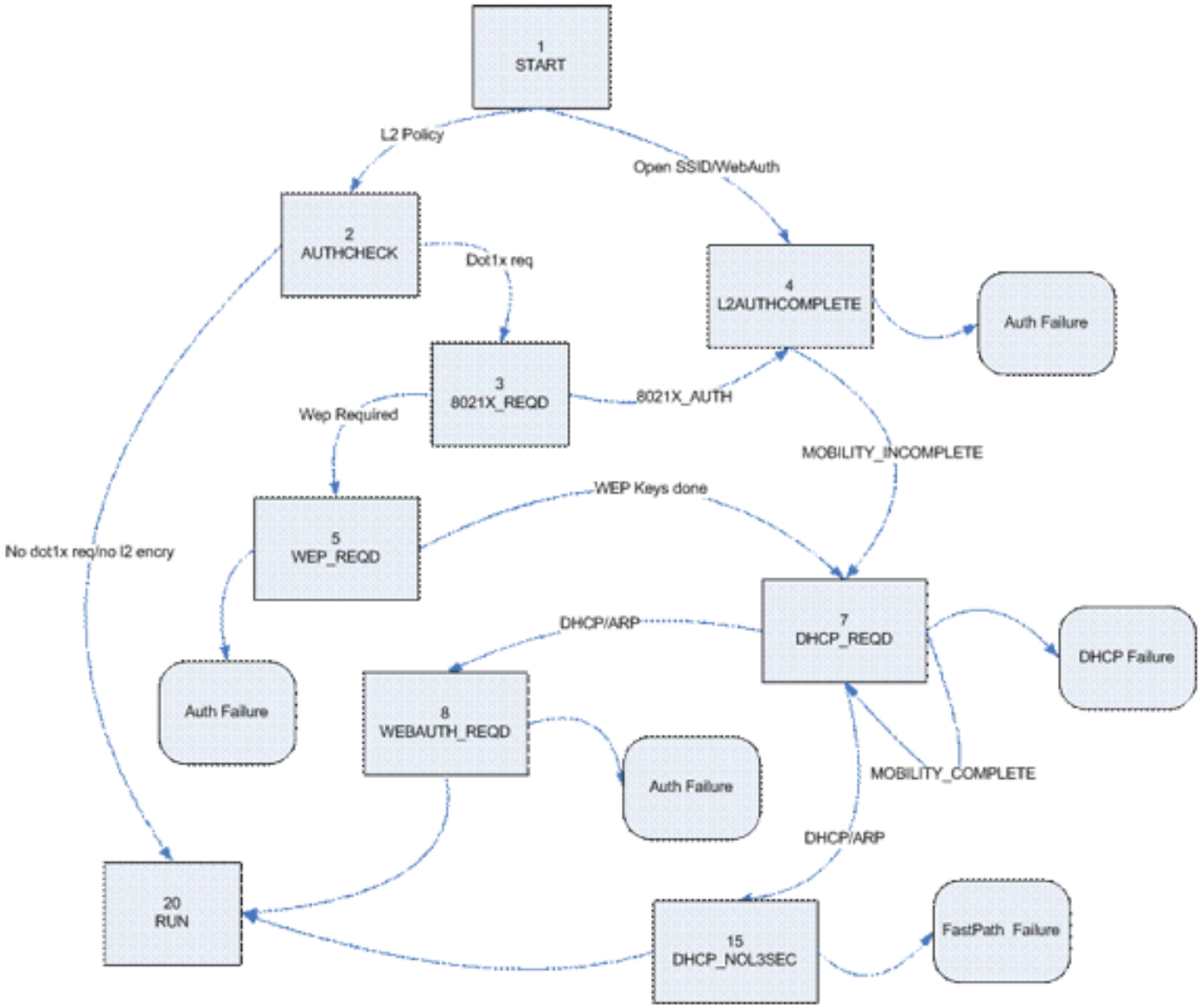
策略执行模块 (PEM)

基于 WLAN 配置，客户端执行一系列步骤。PEM 确保按顺序执行这一过程，以便符合必需的 L2 和 L3 安全策略。

下面是与客户端调试分析相关的 PEM 状态的一个子集：

- **开始**—新的客户端条目的最初的状态。
- **AUTHCHECK** — WLAN 具有要强制执行的 L2 认证策略。
- **8021X_REQD** —客户端必须完成802.1x验证。
- **L2AUTHCOMPLETE** —客户端顺利地完成L2策略。该进程现在可继续执行 L3 策略（地址识别、Web 认证等）。此时，控制器发送移动声明以从其他控制器获得 L3 信息（如果这是位于同一移动组中的漫游客户端）。
- **WEP_REQD** —客户端必须完成WEP身份验证。
- **DHCP_REQD** —控制器需要了解从客户端的L3地址，由ARP请求完成， DHCP请求或由从在移动组的其他控制器了解的信息更新，或者。如果 WLAN 上标记有 DHCP Required，则仅使用 DHCP 或移动信息。
- **WEBAUTH_REQD** —客户端必须完成Web验证。（L3 策略）
- **RAN** —客户端顺利地完成需要的L2和L3策略，并且能当前传输流量到网络。

下图显示了一个简化的 PEM 状态机，它带有客户端转换，直到达到 RUN 状态，在此状态下，客户端可向网络发送流量：



注意： 此图未包括所有可能的转换和状态。为清楚起见，某些中间步骤已删除。

客户端流量转发

在 START 状态和最终 RUN 状态之间，客户端流量不会转发到网络，而是传递到控制器上的主

CPU 以进行分析。所转发的信息取决于状态和现有策略；例如，如果启用了 802.1x，则将 EAPOL 流量转发到 CPU。另一个例子是，如果使用了 Web 认证，则 HTTP 和 DNS 将被允许，并由 CPU 拦截以执行 Web 重定向并获取客户端认证凭证。

当客户端达到 RUN 状态时，客户端信息将发送到 NPU，以便启用 FastPath 交换，这会将用户流量以线速转发到客户端 VLAN，并解除中央 CPU 的用户数据转发任务。

所转发的流量取决于应用于 NPU 的客户端类型。下表描述了最相关的类型：

类型	说明
1	正常客户端流量转发。
9	IP 识别状态。为了识别所使用的 IP 地址，将从此客户端向 CPU 发送一个数据包。
2	ACL 直通。当 WLAN 是一个已配置为通知 NPU 的 ACL 时使用。

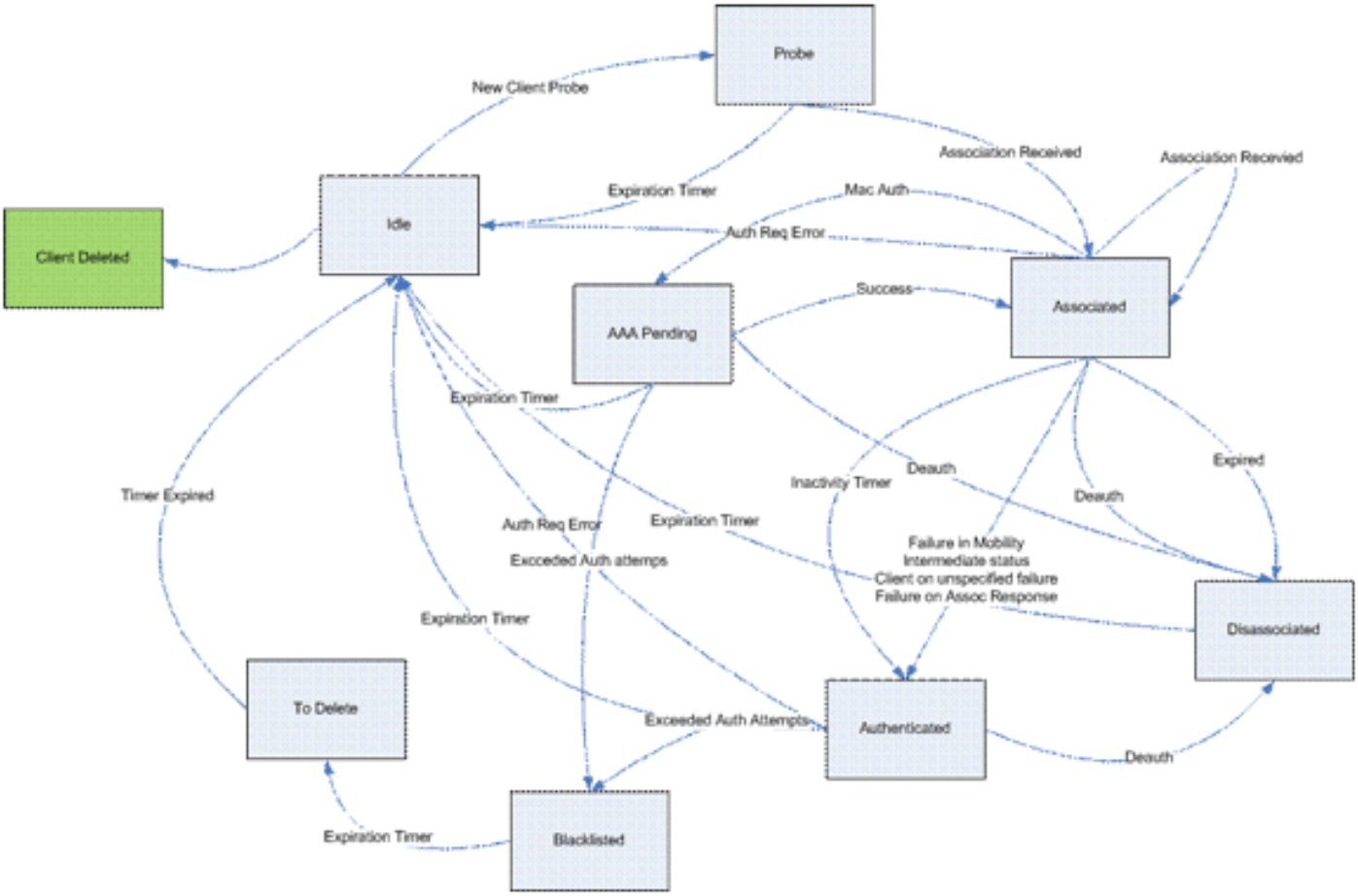
接入点功能 (APF)

此进程通过 802.11 状态机来处理客户端的状态，并与移动代码交互以验证不同的漫游方案。本文档不涉及移动性详细情况或其状态。

下表显示了在客户端与控制器关联期间进入的更多相关客户端状态：

名称	说明
空闲	新客户端，或某些情况下的临时状态。
AAA 挂起	客户端正在等待 MAC 地址认证。
已验证	开放式认证成功，或某些情况下的中间状态。
已关联	客户端成功通过 MAC 认证和开放式认证进程。
不相关	客户端发送了解除关联/取消认证，或关联计时器已过期。
删除	已将客户端标记为删除（通常在排除计时器过期之后）。
探测器	已收到新客户端的探测请求。
已排除/列入黑名单	已将客户端标记为排除。通常与 WPS 策略有关。
无效	客户端状态存在错误。

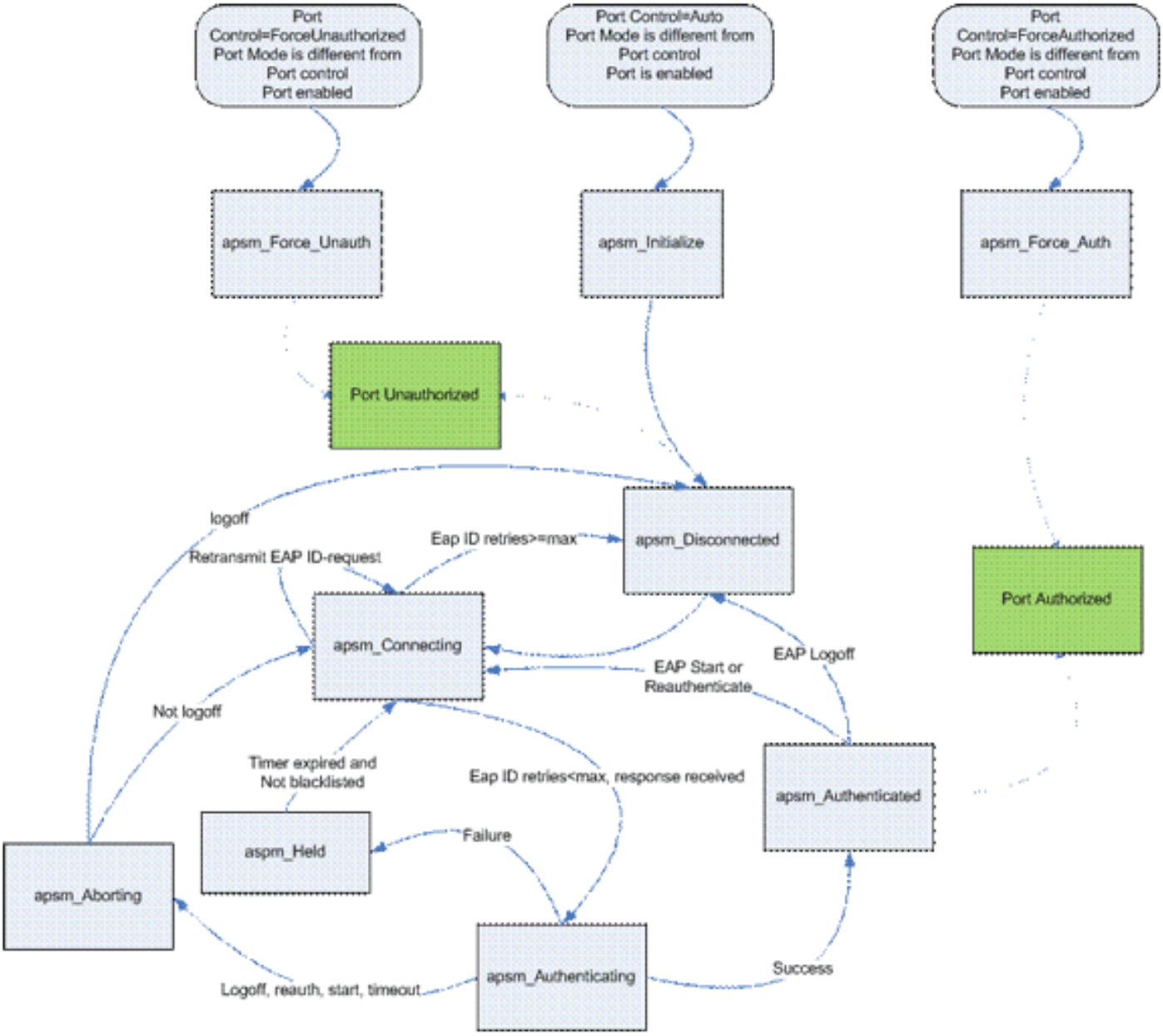
下图表示一个状态机转换，它仅显示出最相关的状态和转换：



802.1x 认证 (Dot1x)

Dot1x 进程负责 802.1x 认证以及客户端的密钥管理。这意味着，即使在不具有需要 802.1x 的 EAP 策略的 WLAN 上，Dot1x 也会参与处理密钥创建和与客户端的协商，并且还进行缓存密钥处理（PMK 或 CCKM）。

此状态机显示完整 802.1x 转换：



Debug Client 分析

APF Process

```
Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Adding mobile on LWAPP AP
    00:1c:0j:ca:5f:c0(0)
!--- A new station is received. After validating type, it is added to the !--- AP that received
it. This can happen both on processing association !--- request or probe requests Wed Oct 31
10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 23) in 5
seconds !--- Sets an expiration timer for this entry in case it does not progress !--- beyond
probe status. 5 Seconds corresponds to Probe Timeout. This message !--- might appear with other
time values since, during client processing, !--- other functions might set different timeouts
depending on state. Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 apfProcessProbeReq
(apf_80211.c:4057) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Idle
to Probe !--- APF state machine is updated. Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69
Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds !--- New Probe request update
sent AP about client. IMPORTANT: !--- Access points do not forward all probe requests to the
controller; they !--- summarize per time interval (by default 500 msec). This information is !--
- used later by location and load balancing processes. Wed Oct 31 10:46:14 2007:
```

00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Association received from mobile on AP 00:1c:0j:ca:5f:c0 *!--- Access point reports an association request from the client. !--- When the process reaches this point, the client is not excluded and not !--- in mobility intermediate state* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 STA - rates (8): 140 18 152 36 176 72 96 108 0 0 0 0 0 0 0 0 *!--- Controller saves the client supported rates into its connection table. !--- Units are values of 500 kbps, basic (mandatory) rates have the Most Significant bit (MSb) set. !--- The above would be 6mbps basic, 9, 12 basic, 18, 24 basic, 36, 48, 54* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Processing WPA IE type 221, length 24 for mobile 00:1b:77:42:07:69 *!--- Controller validates the 802.11i security information element.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Deleted mobile
    LWAPP rule on AP [00:1c:0j:ca:5f:c0]
!--- As the client requests new association, APF requests to PEM to delete the !--- client state and remove any traffic forwarding rules that it could have. **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Updated location for station old
    AP 00:00:00:00:00:00-0, new AP 00:1c:0j:ca:5f:c0-1
!--- APF updates where this client is located. For example, this client is !--- a new addition; therefore, no value exists for the old location. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Initializing policy *!--- PEM notifies that this is a new user. Security policies are checked !--- for enforcement.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Change state
    to AUTHCHECK (2) last state AUTHCHECK (2)
!--- PEM marks as authentication check needed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 AUTHCHECK (2) Change state to 8021X_REQD (3) last state 8021X_REQD *!--- After the WLAN configuration is checked, the client will need either !--- 802.1x or PSK authentication* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM notifies the LWAPP component to add the new client on the AP with !--- a list of negotiated capabilities, rates, Qos, etc.* **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfPemAddUser2 (apf_policy.c:209)
    Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from
    Probe to Associated
!--- APF notifies that client has been moved successfully into associated !--- state. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping deletion of Mobile Station: (callerId: 48) *!--- The expiration timer for client is removed, as now the session timeout !--- is taking place. This is also part of the above notification !--- (internal code callerId: 48).* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending Assoc Response to station on BSSID 00:1c:0j:ca:5f:c0 (status 0) *!--- APF builds and sends the association response to client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfProcessAssocReq (apf_80211.c:3838) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Associated to Associated *!--- The association response was sent successfully; now APF keeps the !--- client in associated state and sets the association timestamp on this point.* **Dot1x Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Creating a new PMK Cache Entry
    for station 00:1b:77:42:07:69 (RSN 0)
!--- APF calls Dot1x to allocate a new PMK cached entry for the client. !--- RSN is disabled (zero value). Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Initiating WPA PSK to mobile 00:1b:77:42:07:69 *!--- Dot1x signals a new WPA or WPA2 PSK exchange with mobile.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 dot1x - moving mobile 00:1b:77:42:07:69 into Force Auth state *!--- As no EAPOL authentication takes place, the client port is marked as !--- forced Auth. Dot1x performs key negotiation with PSK clients only.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Skipping EAP-Success to mobile 00:1b:77:42:07:69 *!--- For PSK, CCKM or RSN,*

the EAP success is not sent to client, as there !--- was no EAPOL authentication taking place.
Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state INITPMK (message 1), replay counter 00.00.00.00.00.00.00.00 *!--- Dot1x starts the exchange to arrive into PTK. PMK is known, as this !--- is PSK auth. First message is ANonce.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PKT_START state (message 2) from mobile 00:1b:77:42:07:69 *!--- This signals the start of the validation of the second message !--- from client (SNonce+MIC). No errors are shown, so process continues. !--- Potential errors at this point could be: deflection attack (ACK bit !--- not set on key), MIC errors, invalid key type, invalid key length, etc.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Dot1x got an answer for message 1, so retransmission timeout is stopped.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITNEGOTIATING (message 3), replay counter 00.00.00.00.00.00.00.01 *!--- Derive PTK; send GTK + MIC.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PTKINITNEGOTIATING state (message 4) from mobile 00:1b:77:42:07:69 *!--- This signals the start of validation of message 4 (MIC), which !--- means client installed the keys. Potential errors after this message !--- are MIC validation errors, invalid key types, etc.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Change state to L2AUTHCOMPLETE (4) last state L2AUTHCOMPLETE (4)
!--- PEM receives notification and signals the state machine to change to L2 !--- authentication completed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM pushes client status and keys to AP through LWAPP component.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Change state to DHCP_REQD (7) last state DHCP_REQD (7) *!--- PEM sets the client on address learning status.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 4238, Adding TMP rule *!--- PEM signals NPU to allow DHCP/ARP traffic to be inspected by controller !--- for the address learning.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Adding Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built for client and prepared to be forwarded to NPU. !--- Type is 9 (see the table in the Client Traffic Forwarding section of !--- this document) to allow controller to learn the IP address.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the client !--- to the NPU.* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69
!--- Dot1x received message from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITDONE (message 5 - group), replay counter 00.00.00.00.00.00.00.02 *!--- Group key update prepared for client.* **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9
!--- NPU reports that entry of type 9 is added (learning address state). !--- See the table in the Client Traffic Forwarding section of this document. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so the controller sends only XID frame !--- (destination broadcast, source client address, control 0xAF).* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent EAPOL-Key M5 for mobile 00:1b:77:42:07:69
!--- Key update sent. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Key received.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-key in REKEYNEGOTIATING state (message 6) from mobile 00:1b:77:42:07:69 *!--- Successfully received group key update.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Group key timeout is removed.* **DHCP Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 308, port 1, encap 0xec03)
!--- First DHCP message received from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP dropping packet due to ongoing mobility handshake exchange, (siaddr 0.0.0.0, mobility state = 'apfMsMmQueryRequested' **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) mobility role update request from Unassociated to Local

Peer = 0.0.0.0, Old Anchor = 0.0.0.0, New Anchor = 192.168.100.11
!--- NPU is notified that this controller is the local anchor, so to !--- terminate any previous mobility tunnel. As this is a new client, !--- old address is empty. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) State Update from Mobility-Incomplete to Mobility-Complete, mobility role=Local *!--- Role change was successful.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 3934, Adding TMP rule *!--- Adding temporary rule to NPU for address learning now with new mobility !--- role as local controller.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Replacing Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the !--- client to the NPU.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9 *!--- Client is on address learning state; see the table in the !--- Client Traffic Forwarding section of this document. Now mobility !--- has finished.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so controller sends only XID frame (destination !--- broadcast, source client address, control 0xAF).* **DHCP Process**

Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 308, port 1, encap 0xec03)
!--- DHCP request from client. Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 0.0.0.0 VLAN: 0 *!--- Based on the WLAN configuration, the controller selects the identity to !--- use to relay the DHCP messages.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- Interface selected.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP DISCOVER (1) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 350, port 1, vlan 100) *!--- DHCP request forwarded.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No secondary server configured, so no additional DHCP request are !--- prepared (configuration dependant).* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP setting server from OFFER (server 192.168.100.254, yiaddr 192.168.100.105) *!--- DHCP received for a known server. Controller discards any offer not on !--- the DHCP server list for the WLAN/Interface.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA (len 416, port 1, vlan 100) *!--- After building the DHCP reply for client, it is sent to AP for forwarding.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP OFFER (2) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 192.168.100.105 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP server id: 1.1.1.1 rcvd server id: 192.168.100.254 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 316, port 1, encap 0xec03) *!--- Client answers* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block

settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- DHCP relay selected per WLAN config* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP REQUEST (3) Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP requested ip: 192.168.100.105 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP server id: 192.168.100.254 rcvd server id: 1.1.1.1 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 358, port 1, vlan 100) *!--- Request sent to server.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No other DHCP server configured.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) *!--- Server sends a DHCP reply, most probably an ACK (see below).* **PEM Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 DHCP_REQD
(7) Change state to RUN (20) last state RUN (20)
!--- DHCP negotiation successful, address is now known, and client !--- is moved to RUN status.
Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Reached PLUMBFASTPATH: from line 4699 *!--- No L3 security; client entry is sent to NPU.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Replacing Fast Path rule type = Airespace AP Client on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Successfully plumbed mobile rule (ACL ID 255) **DHCP Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Assigning Address
192.168.100.105 to mobile

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA
(len 416, port 1, vlan 100)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP ACK (5)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
chaddr: 00:1b:77:42:07:69

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
ciaddr: 0.0.0.0, yiaddr: 192.168.100.105

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
siaddr: 0.0.0.0, giaddr: 0.0.0.0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
server id: 1.1.1.1 rcvd server id: 192.168.100.254

PEM Process

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 Added NPU
entry of type 1

!--- Client is now successfully associated to controller. !--- Type is 1; see the table in the Client Traffic Forwarding !--- section of this document. Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Sending a gratuitous ARP for 192.168.100.105, VLAN Id 100 *!--- As address is known, gratuitous ARP is sent to notify.*

故障排除示例

客户端密码配置错误

此示例显示了一个具有不同 AP 功能的客户端。该客户端正在探测 SSID，但由于探测请求显示了一些不受支持的参数，该客户端不会进入到认证/关联阶段。具体而言，所产生的问题是使用 WPA 的客户端与通告仅支持 WPA2 的 AP 之间存在不匹配：

APF Process

Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Adding mobile on LWAPP AP 00:1c:0j:ca:5f:c0(0)
!--- A new station is received. After validating type, it is added to the !--- AP that received it. This can happen both on processing association !--- request or probe requests Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 23) in 5 seconds *!--- Sets an expiration timer for this entry in case it does not progress !--- beyond probe status. 5 Seconds corresponds to Probe Timeout. This message !--- might appear with other time values since, during client processing, !--- other functions might set different timeouts depending on state.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 apfProcessProbeReq (apf_80211.c:4057) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Idle to Probe *!--- APF state machine is updated.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client. IMPORTANT: !--- Access points do not forward all probe requests to the controller; they !--- summarize per time interval (by default 500 msec). This information is !--- used later by location and load balancing processes.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Association received from mobile on AP 00:1c:0j:ca:5f:c0 *!--- Access point reports an association request from the client. !--- When the process reaches this point, the client is not excluded and not !--- in mobility intermediate state* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 STA - rates (8): 140 18 152 36 176 72 96 108 0 0 0 0 0 0 0 0 *!--- Controller saves the client supported rates into its connection table. !--- Units are values of 500 kbps, basic (mandatory) rates have the Most Significant bit (MSb) set. !--- The above would be 6mbps basic, 9, 12 basic, 18, 24 basic, 36, 48, 54* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Processing WPA IE type 221, length 24 for mobile 00:1b:77:42:07:69 *!--- Controller validates the 802.11i security information element.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Deleted mobile LWAPP rule on AP [00:1c:0j:ca:5f:c0]
!--- As the client requests new association, APF requests to PEM to delete the !--- client state and remove any traffic forwarding rules that it could have. **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Updated location for station old AP 00:00:00:00:00:00-0, new AP 00:1c:0j:ca:5f:c0-1
!--- APF updates where this client is located. For example, this client is !--- a new addition; therefore, no value exists for the old location. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Initializing policy *!--- PEM notifies that this is a new user. Security policies are checked !--- for enforcement.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Change state to AUTHCHECK (2) last state AUTHCHECK (2)
!--- PEM marks as authentication check needed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 AUTHCHECK (2) Change state to 8021X_REQD (3) last state 8021X_REQD *!--- After the WLAN configuration is checked, the client will need either !--- 802.1x or PSK authentication* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM notifies the LWAPP component to add the new client on the AP with !--- a list of negotiated capabilities, rates, Qos, etc.* **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfPemAddUser2 (apf_policy.c:209) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Probe to Associated
!--- APF notifies that client has been moved successfully into associated !--- state. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping deletion of Mobile Station: (callerId: 48) *!--- The expiration timer for client is removed, as now the session timeout !--- is taking place. This is also part of the above notification !--- (internal code callerId: 48).* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending Assoc Response to station on BSSID 00:1c:0j:ca:5f:c0 (status 0) *!--- APF builds and sends the association response to client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfProcessAssocReq (apf_80211.c:3838) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Associated to Associated *!--- The association response was sent successfully; now APF keeps the !--- client in associated state and sets the association timestamp on this point.* **Dot1x Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Creating a new PMK Cache Entry for station 00:1b:77:42:07:69 (RSN 0)
!--- APF calls Dot1x to allocate a new PMK cached entry for the client. !--- RSN is disabled (zero value). Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Initiating WPA PSK to mobile 00:1b:77:42:07:69 *!--- Dot1x signals a new WPA or WPA2 PSK exchange with mobile.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 dot1x - moving mobile 00:1b:77:42:07:69 into Force Auth state *!--- As no EAPOL authentication takes place, the client port is marked as !--- forced Auth. Dot1x performs key negotiation with PSK clients only.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Skipping EAP-Success to mobile 00:1b:77:42:07:69 *!--- For PSK, CCKM or RSN, the EAP success is not sent to client, as there !--- was no EAPOL authentication taking place.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state INITPMK (message 1), replay counter 00.00.00.00.00.00.00.00 *!--- Dot1x starts the exchange to arrive into PTK. PMK is known, as this !--- is PSK auth. First message is ANonce.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PKT_START state (message 2) from mobile 00:1b:77:42:07:69 *!--- This signals the start of the validation of the second message !--- from client (SNonce+MIC). No errors are shown, so process continues. !--- Potential errors at this point could be: deflection attack (ACK bit !--- not set on key), MIC errors, invalid key type, invalid key length, etc.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Dot1x got an answer for message 1, so retransmission timeout is stopped.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITNEGOTIATING (message 3), replay counter 00.00.00.00.00.00.00.01 *!--- Derive PTK; send GTK + MIC.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PTKINITNEGOTIATING state (message 4) from mobile 00:1b:77:42:07:69 *!--- This signals the start of validation of message 4 (MIC), which !--- means client installed the keys. Potential errors after this message !--- are MIC validation errors, invalid key types, etc.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Change state to L2AUTHCOMPLETE (4) last state L2AUTHCOMPLETE (4)
!--- PEM receives notification and signals the state machine to change to L2 !--- authentication completed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM pushes client status and keys to AP through LWAPP component.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Change state

to DHCP_REQD (7) last state DHCP_REQD (7) *!--- PEM sets the client on address learning status.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 4238, Adding TMP rule *!--- PEM signals NPU to allow DHCP/ARP traffic to be inspected by controller !--- for the address learning.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Adding Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built for client and prepared to be forwarded to NPU. !--- Type is 9 (see the table in the Client Traffic Forwarding section of !--- this document) to allow controller to learn the IP address.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the client !--- to the NPU.* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer
for mobile 00:1b:77:42:07:69
!--- Dot1x received message from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITDONE (message 5 - group), replay counter 00.00.00.00.00.00.00.02 *!--- Group key update prepared for client.* **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9
!--- NPU reports that entry of type 9 is added (learning address state). !--- See the table in the Client Traffic Forwarding section of this document. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so the controller sends only XID frame !--- (destination broadcast, source client address, control 0xAF).* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent EAPOL-Key M5 for mobile
00:1b:77:42:07:69
!--- Key update sent. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Key received.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-key in REKEYNEGOTIATING state (message 6) from mobile 00:1b:77:42:07:69 *!--- Successfully received group key update.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Group key timeout is removed.* **DHCP Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST
(1) (len 308, port 1, encap 0xec03)
!--- First DHCP message received from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP dropping packet due to ongoing mobility handshake exchange, (siaddr 0.0.0.0, mobility state = 'apfMsMmQueryRequested' **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) mobility
role update request from Unassociated to Local

Peer = 0.0.0.0, Old Anchor = 0.0.0.0, New Anchor = 192.168.100.11
!--- NPU is notified that this controller is the local anchor, so to !--- terminate any previous mobility tunnel. As this is a new client, !--- old address is empty. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) State Update from Mobility-Incomplete to Mobility-Complete, mobility role=Local *!--- Role change was successful.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 3934, Adding TMP rule *!--- Adding temporary rule to NPU for address learning now with new mobility !--- role as local controller.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Replacing Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the !--- client to the NPU.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9 *!--- Client is on address learning state; see the table in the !--- Client Traffic Forwarding section of this document. Now mobility !--- has finished.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so controller sends only XID frame (destination !--- broadcast, source client address, control 0xAF).* **DHCP Process**

Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 308, port 1, encap 0xec03) *!--- DHCP request from client.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 0.0.0.0 VLAN: 0 *!--- Based on the WLAN configuration, the controller selects the identity to !--- use to relay the DHCP messages.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- Interface selected.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP DISCOVER (1) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 350, port 1, vlan 100) *!--- DHCP request forwarded.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No secondary server configured, so no additional DHCP request are !--- prepared (configuration dependant).* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP setting server from OFFER (server 192.168.100.254, yiaddr 192.168.100.105) *!--- DHCP received for a known server. Controller discards any offer not on !--- the DHCP server list for the WLAN/Interface.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA (len 416, port 1, vlan 100) *!--- After building the DHCP reply for client, it is sent to AP for forwarding.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP OFFER (2) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 192.168.100.105 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP server id: 1.1.1.1 rcvd server id: 192.168.100.254 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 316, port 1, encap 0xec03) *!--- Client answers* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- DHCP relay selected per WLAN config* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP REQUEST (3) Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP requested ip: 192.168.100.105 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP server id: 192.168.100.254 rcvd server id: 1.1.1.1 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 358, port 1, vlan 100) *!--- Request sent to server.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No other DHCP server configured.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) *!--- Server sends a DHCP reply, most probably an ACK (see below).* **PEM Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 DHCP_REQD (7) Change state to RUN (20) last state RUN (20) *!--- DHCP negotiation successful, address is now known, and client !--- is moved to RUN status.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Reached PLUMBFASTPATH: from line 4699 *!--- No L3 security; client entry is sent to NPU.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Replacing Fast Path rule type = Airespace AP Client on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P

= 0, DSCP = 0, TokenID = 5006 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Successfully plumbed mobile rule (ACL ID 255) **DHCP Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Assigning Address 192.168.100.105 to mobile

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA (len 416, port 1, vlan 100)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP ACK (5)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 192.168.100.105

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 0.0.0.0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP server id: 1.1.1.1 rcvd server id: 192.168.100.254

PEM Process

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 Added NPU entry of type 1

!--- Client is now successfully associated to controller. !--- Type is 1; see the table in the Client Traffic Forwarding !--- section of this document. Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Sending a gratuitous ARP for 192.168.100.105, VLAN Id 100 *!--- As address is known, gratuitous ARP is sent to notify.*

APF Process

Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Adding mobile on LWAPP AP 00:1c:0j:ca:5f:c0(0)
!--- A new station is received. After validating type, it is added to the !--- AP that received it. This can happen both on processing association !--- request or probe requests Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 23) in 5 seconds *!--- Sets an expiration timer for this entry in case it does not progress !--- beyond probe status. 5 Seconds corresponds to Probe Timeout. This message !--- might appear with other time values since, during client processing, !--- other functions might set different timeouts depending on state.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 apfProcessProbeReq (apf_80211.c:4057) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Idle to Probe *!--- APF state machine is updated.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client. IMPORTANT: !--- Access points do not forward all probe requests to the controller; they !--- summarize per time interval (by default 500 msec). This information is !--- used later by location and load balancing processes.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update*

sent AP about client. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Association received from mobile on AP 00:1c:0j:ca:5f:c0 *!--- Access point reports an association request from the client. !--- When the process reaches this point, the client is not excluded and not !--- in mobility intermediate state* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 STA - rates (8): 140 18 152 36 176 72 96 108 0 0 0 0 0 0 0 0 *!--- Controller saves the client supported rates into its connection table. !--- Units are values of 500 kbps, basic (mandatory) rates have the Most Significant bit (MSb) set. !--- The above would be 6mbps basic, 9, 12 basic, 18, 24 basic, 36, 48, 54* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Processing WPA IE type 221, length 24 for mobile 00:1b:77:42:07:69 *!--- Controller validates the 802.11i security information element.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Deleted mobile LWAPP rule on AP [00:1c:0j:ca:5f:c0]
!--- As the client requests new association, APF requests to PEM to delete the !--- client state and remove any traffic forwarding rules that it could have. **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Updated location for station old AP 00:00:00:00:00:00-0, new AP 00:1c:0j:ca:5f:c0-1
!--- APF updates where this client is located. For example, this client is !--- a new addition; therefore, no value exists for the old location. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Initializing policy *!--- PEM notifies that this is a new user. Security policies are checked !--- for enforcement.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Change state to AUTHCHECK (2) last state AUTHCHECK (2)
!--- PEM marks as authentication check needed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 AUTHCHECK (2) Change state to 8021X_REQD (3) last state 8021X_REQD *!--- After the WLAN configuration is checked, the client will need either !--- 802.1x or PSK authentication* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM notifies the LWAPP component to add the new client on the AP with !--- a list of negotiated capabilities, rates, Qos, etc.* **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfPemAddUser2 (apf_policy.c:209) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Probe to Associated
!--- APF notifies that client has been moved successfully into associated !--- state. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping deletion of Mobile Station: (callerId: 48) *!--- The expiration timer for client is removed, as now the session timeout !--- is taking place. This is also part of the above notification !--- (internal code callerId: 48).* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending Assoc Response to station on BSSID 00:1c:0j:ca:5f:c0 (status 0) *!--- APF builds and sends the association response to client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfProcessAssocReq (apf_80211.c:3838) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Associated to Associated *!--- The association response was sent successfully; now APF keeps the !--- client in associated state and sets the association timestamp on this point.* **Dot1x Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Creating a new PMK Cache Entry for station 00:1b:77:42:07:69 (RSN 0)
!--- APF calls Dot1x to allocate a new PMK cached entry for the client. !--- RSN is disabled (zero value). Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Initiating WPA PSK to mobile 00:1b:77:42:07:69 *!--- Dot1x signals a new WPA or WPA2 PSK exchange with mobile.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 dot1x - moving mobile 00:1b:77:42:07:69 into Force Auth state
!--- As no EAPOL authentication takes place, the client port is marked as !--- forced Auth. Dot1x performs key negotiation with PSK clients only. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Skipping EAP-Success to mobile 00:1b:77:42:07:69 *!--- For PSK, CCKM or RSN, the EAP success is not sent to client, as there !--- was no EAPOL authentication taking place.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state INITPMK (message 1), replay counter 00.00.00.00.00.00.00.00 *!--- Dot1x*

starts the exchange to arrive into PTK. PMK is known, as this !--- is PSK auth. First message is ANonce. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PKT_START state (message 2) from mobile 00:1b:77:42:07:69 *!--- This signals the start of the validation of the second message !--- from client (SNonce+MIC). No errors are shown, so process continues. !--- Potential errors at this point could be: deflection attack (ACK bit !--- not set on key), MIC errors, invalid key type, invalid key length, etc.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Dot1x got an answer for message 1, so retransmission timeout is stopped.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITNEGOTIATING (message 3), replay counter 00.00.00.00.00.00.00.01 *!--- Derive PTK; send GTK + MIC.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PTKINITNEGOTIATING state (message 4) from mobile 00:1b:77:42:07:69 *!--- This signals the start of validation of message 4 (MIC), which !--- means client installed the keys. Potential errors after this message !--- are MIC validation errors, invalid key types, etc.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Change state to L2AUTHCOMPLETE (4) last state L2AUTHCOMPLETE (4)
!--- PEM receives notification and signals the state machine to change to L2 !--- authentication completed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM pushes client status and keys to AP through LWAPP component.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Change state to DHCP_REQD (7) last state DHCP_REQD (7) *!--- PEM sets the client on address learning status.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 4238, Adding TMP rule *!--- PEM signals NPU to allow DHCP/ARP traffic to be inspected by controller !--- for the address learning.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Adding Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built for client and prepared to be forwarded to NPU. !--- Type is 9 (see the table in the Client Traffic Forwarding section of !--- this document) to allow controller to learn the IP address.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the client !--- to the NPU.* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69
!--- Dot1x received message from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITDONE (message 5 - group), replay counter 00.00.00.00.00.00.00.02 *!--- Group key update prepared for client.* **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9
!--- NPU reports that entry of type 9 is added (learning address state). !--- See the table in the Client Traffic Forwarding section of this document. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so the controller sends only XID frame !--- (destination broadcast, source client address, control 0xAF).* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent EAPOL-Key M5 for mobile 00:1b:77:42:07:69
!--- Key update sent. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Key received.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-key in REKEYNEGOTIATING state (message 6) from mobile 00:1b:77:42:07:69 *!--- Successfully received group key update.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Group key timeout is removed.* **DHCP Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 308, port 1, encap 0xec03)
!--- First DHCP message received from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP

dropping packet due to ongoing mobility handshake exchange, (siaddr 0.0.0.0, mobility state = 'apfMsMmQueryRequested' **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) mobility role update request from Unassociated to Local

Peer = 0.0.0.0, Old Anchor = 0.0.0.0, New Anchor = 192.168.100.11
!--- NPU is notified that this controller is the local anchor, so to !--- terminate any previous mobility tunnel. As this is a new client, !--- old address is empty. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) State Update from Mobility-Incomplete to Mobility-Complete, mobility role=Local *!--- Role change was successful.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 3934, Adding TMP rule *!--- Adding temporary rule to NPU for address learning now with new mobility !--- role as local controller.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Replacing Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the !--- client to the NPU.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9 *!--- Client is on address learning state; see the table in the !--- Client Traffic Forwarding section of this document. Now mobility !--- has finished.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so controller sends only XID frame (destination !--- broadcast, source client address, control 0xAF).* **DHCP Process**

Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 308, port 1, encap 0xec03)
!--- DHCP request from client. Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 0.0.0.0 VLAN: 0 *!--- Based on the WLAN configuration, the controller selects the identity to !--- use to relay the DHCP messages.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- Interface selected.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP DISCOVER (1) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 350, port 1, vlan 100) *!--- DHCP request forwarded.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No secondary server configured, so no additional DHCP request are !--- prepared (configuration dependant).* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP setting server from OFFER (server 192.168.100.254, yiaddr 192.168.100.105) *!--- DHCP received for a known server. Controller discards any offer not on !--- the DHCP server list for the WLAN/Interface.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA (len 416, port 1, vlan 100) *!--- After building the DHCP reply for client, it is sent to AP for forwarding.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP OFFER (2) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 192.168.100.105 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP server id: 1.1.1.1 rcvd server id: 192.168.100.254 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 316, port 1, encap 0xec03) *!--- Client answers* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!---*

DHCP relay selected per WLAN config Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP REQUEST (3) Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP requested ip: 192.168.100.105 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP server id: 192.168.100.254 rcvd server id: 1.1.1.1 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 358, port 1, vlan 100) *!--- Request sent to server.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No other DHCP server configured.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) *!--- Server sends a DHCP reply, most probably an ACK (see below).* **PEM Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 DHCP_REQD
(7) Change state to RUN (20) last state RUN (20)
!--- DHCP negotiation successful, address is now known, and client !--- is moved to RUN status.
Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Reached PLUMBFASTPATH: from line 4699 *!--- No L3 security; client entry is sent to NPU.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Replacing Fast Path rule type = Airespace AP Client on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Successfully plumbed mobile rule (ACL ID 255) **DHCP Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Assigning Address
192.168.100.105 to mobile

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA
(len 416, port 1, vlan 100)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP ACK (5)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
chaddr: 00:1b:77:42:07:69

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
ciaddr: 0.0.0.0, yiaddr: 192.168.100.105

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
siaddr: 0.0.0.0, giaddr: 0.0.0.0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
server id: 1.1.1.1 rcvd server id: 192.168.100.254

PEM Process

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 Added NPU
entry of type 1

!--- Client is now successfully associated to controller. !--- Type is 1; see the table in the Client Traffic Forwarding !--- section of this document. Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Sending a gratuitous ARP for 192.168.100.105, VLAN Id 100 *!--- As address is*

known, gratuitous ARP is sent to notify.

预共享密钥错误

以下输出显示客户端正在尝试通过 WPA-PSK 向基础设施进行认证，但因客户端与控制器之间的预共享密钥不匹配而失败，从而造成将该客户端最终列入黑名单：

APF Process

Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Adding mobile on LWAPP AP 00:1c:0j:ca:5f:c0(0)
!--- A new station is received. After validating type, it is added to the !--- AP that received it. This can happen both on processing association !--- request or probe requests Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 23) in 5 seconds *!--- Sets an expiration timer for this entry in case it does not progress !--- beyond probe status. 5 Seconds corresponds to Probe Timeout. This message !--- might appear with other time values since, during client processing, !--- other functions might set different timeouts depending on state.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 apfProcessProbeReq (apf_80211.c:4057) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Idle to Probe *!--- APF state machine is updated.* Wed Oct 31 10:46:13 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client. IMPORTANT: !--- Access points do not forward all probe requests to the controller; they !--- summarize per time interval (by default 500 msec). This information is !--- used later by location and load balancing processes.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:14 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Scheduling deletion of Mobile Station: (callerId: 24) in 5 seconds *!--- New Probe request update sent AP about client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Association received from mobile on AP 00:1c:0j:ca:5f:c0 *!--- Access point reports an association request from the client. !--- When the process reaches this point, the client is not excluded and not !--- in mobility intermediate state* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 STA - rates (8): 140 18 152 36 176 72 96 108 0 0 0 0 0 0 0 0 *!--- Controller saves the client supported rates into its connection table. !--- Units are values of 500 kbps, basic (mandatory) rates have the Most Significant bit (MSb) set. !--- The above would be 6mbps basic, 9, 12 basic, 18, 24 basic, 36, 48, 54* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Processing WPA IE type 221, length 24 for mobile 00:1b:77:42:07:69 *!--- Controller validates the 802.11i security information element.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Deleted mobile LWAPP rule on AP [00:1c:0j:ca:5f:c0]
!--- As the client requests new association, APF requests to PEM to delete the !--- client state and remove any traffic forwarding rules that it could have. **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Updated location for station old AP 00:00:00:00:00:00-0, new AP 00:1c:0j:ca:5f:c0-1
!--- APF updates where this client is located. For example, this client is !--- a new addition; therefore, no value exists for the old location. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Initializing policy *!--- PEM notifies that this is a new user. Security policies are checked !--- for enforcement.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 START (0) Change state to AUTHCHECK (2) last state AUTHCHECK (2)
!--- PEM marks as authentication check needed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 AUTHCHECK (2) Change state to 8021X_REQD (3) last state 8021X_REQD *!--- After the WLAN configuration is checked, the client will need either !--- 802.1x or PSK authentication* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Plumbed mobile LWAPP rule on AP

00:1c:0j:ca:5f:c0 *!--- PEM notifies the LWAPP component to add the new client on the AP with !--- a list of negotiated capabilities, rates, Qos, etc.* **APF Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfPemAddUser2 (apf_policy.c:209)
Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from
Probe to Associated
!--- APF notifies that client has been moved successfully into associated !--- state. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping deletion of Mobile Station: (callerId: 48) *!--- The expiration timer for client is removed, as now the session timeout !--- is taking place. This is also part of the above notification !--- (internal code callerId: 48).* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending Assoc Response to station on BSSID 00:1c:0j:ca:5f:c0 (status 0) *!--- APF builds and sends the association response to client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 apfProcessAssocReq (apf_80211.c:3838) Changing state for mobile 00:1b:77:42:07:69 on AP 00:1c:0j:ca:5f:c0 from Associated to Associated *!--- The association response was sent successfully; now APF keeps the !--- client in associated state and sets the association timestamp on this point.* **Dot1x Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Creating a new PMK Cache Entry
for station 00:1b:77:42:07:69 (RSN 0)
!--- APF calls Dot1x to allocate a new PMK cached entry for the client. !--- RSN is disabled (zero value). Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Initiating WPA PSK to mobile 00:1b:77:42:07:69 *!--- Dot1x signals a new WPA or WPA2 PSK exchange with mobile.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 dot1x - moving mobile 00:1b:77:42:07:69 into Force Auth state *!--- As no EAPOL authentication takes place, the client port is marked as !--- forced Auth. Dot1x performs key negotiation with PSK clients only.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Skipping EAP-Success to mobile 00:1b:77:42:07:69 *!--- For PSK, CCKM or RSN, the EAP success is not sent to client, as there !--- was no EAPOL authentication taking place.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state INITPMK (message 1), replay counter 00.00.00.00.00.00.00.00 *!--- Dot1x starts the exchange to arrive into PTK. PMK is known, as this !--- is PSK auth. First message is ANonce.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PKT_START state (message 2) from mobile 00:1b:77:42:07:69 *!--- This signals the start of the validation of the second message !--- from client (SNonce+MIC). No errors are shown, so process continues. !--- Potential errors at this point could be: deflection attack (ACK bit !--- not set on key), MIC errors, invalid key type, invalid key length, etc.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Dot1x got an answer for message 1, so retransmission timeout is stopped.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITNEGOTIATING (message 3), replay counter 00.00.00.00.00.00.00.01 *!--- Derive PTK; send GTK + MIC.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Message received from client.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 Received EAPOL-key in PTKINITNEGOTIATING state (message 4) from mobile 00:1b:77:42:07:69 *!--- This signals the start of validation of message 4 (MIC), which !--- means client installed the keys. Potential errors after this message !--- are MIC validation errors, invalid key types, etc.* **PEM Process**

Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 8021X_REQD (3) Change
state to L2AUTHCOMPLETE (4) last state L2AUTHCOMPLETE (4)
!--- PEM receives notification and signals the state machine to change to L2 !--- authentication completed. Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Plumbed mobile LWAPP rule on AP 00:1c:0j:ca:5f:c0 *!--- PEM pushes client status and keys to AP through LWAPP component.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 L2AUTHCOMPLETE (4) Change state to DHCP_REQD (7) last state DHCP_REQD (7) *!--- PEM sets the client on address learning status.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 4238, Adding TMP rule *!--- PEM signals NPU to allow DHCP/ARP traffic to be inspected by controller !--- for the address learning.* Wed Oct 31 10:46:15 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Adding Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built for client and prepared to be forwarded to NPU. !--- Type is 9 (see the table in the Client Traffic Forwarding section of !--- this document) to allow controller to learn the IP*

address. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the client !--- to the NPU.* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer
for mobile 00:1b:77:42:07:69
!--- Dot1x received message from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sending EAPOL-Key Message to mobile 00:1b:77:42:07:69 state PTKINITDONE (message 5 - group), replay counter 00.00.00.00.00.00.00.02 *!--- Group key update prepared for client.* **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9
!--- NPU reports that entry of type 9 is added (learning address state). !--- See the table in the Client Traffic Forwarding section of this document. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so the controller sends only XID frame !--- (destination broadcast, source client address, control 0xAF).* **Dot1x Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent EAPOL-Key M5 for mobile
00:1b:77:42:07:69
!--- Key update sent. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-Key from mobile 00:1b:77:42:07:69 *!--- Key received.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Received EAPOL-key in REKEYNEGOTIATING state (message 6) from mobile 00:1b:77:42:07:69 *!--- Successfully received group key update.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Stopping retransmission timer for mobile 00:1b:77:42:07:69 *!--- Group key timeout is removed.* **DHCP Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST
(1) (len 308, port 1, encap 0xec03)
!--- First DHCP message received from client. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 DHCP dropping packet due to ongoing mobility handshake exchange, (siaddr 0.0.0.0, mobility state = 'apfMsMmQueryRequested' **PEM Process**

Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) mobility
role update request from Unassociated to Local

Peer = 0.0.0.0, Old Anchor = 0.0.0.0, New Anchor = 192.168.100.11
!--- NPU is notified that this controller is the local anchor, so to !--- terminate any previous mobility tunnel. As this is a new client, !--- old address is empty. Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) State Update from Mobility-Incomplete to Mobility-Complete, mobility role=Local *!--- Role change was successful.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) pemAdvanceState2 3934, Adding TMP rule *!--- Adding temporary rule to NPU for address learning now with new mobility !--- role as local controller.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Replacing Fast Path rule type = Airespace AP - Learn IP address on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 *!--- Entry is built.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 DHCP_REQD (7) Successfully plumbed mobile rule (ACL ID 255) *!--- A new rule is successfully sent to internal queue to add the !--- client to the NPU.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 0.0.0.0 Added NPU entry of type 9 *!--- Client is on address learning state; see the table in the !--- Client Traffic Forwarding section of this document. Now mobility !--- has finished.* Wed Oct 31 10:46:19 2007: 00:1b:77:42:07:69 Sent an XID frame *!--- No address known yet, so controller sends only XID frame (destination !--- broadcast, source client address, control 0xAF).* **DHCP Process**

Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST
(1) (len 308, port 1, encap 0xec03)
!--- DHCP request from client. Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 0.0.0.0 VLAN: 0 *!--- Based on the WLAN configuration, the controller selects the identity to !--- use to relay the DHCP messages.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254,

VLAN 100, port 1) *!--- Interface selected.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP DISCOVER (1) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 350, port 1, vlan 100) *!--- DHCP request forwarded.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 0.0.0.0, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No secondary server configured, so no additional DHCP request are !--- prepared (configuration dependant).* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP setting server from OFFER (server 192.168.100.254, yiaddr 192.168.100.105) *!--- DHCP received for a known server. Controller discards any offer not on !--- the DHCP server list for the WLAN/Interface.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA (len 416, port 1, vlan 100) *!--- After building the DHCP reply for client, it is sent to AP for forwarding.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP OFFER (2) Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 192.168.100.105 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 0.0.0.0 Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP server id: 1.1.1.1 rcvd server id: 192.168.100.254 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:21 2007: 00:1b:77:42:07:69 DHCP received op BOOTREQUEST (1) (len 316, port 1, encap 0xec03) *!--- Client answers* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 1 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 1 - 192.168.100.254 (local address 192.168.100.11, gateway 192.168.100.254, VLAN 100, port 1) *!--- DHCP relay selected per WLAN config* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP REQUEST (3) Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP op: BOOTREQUEST, htype: Ethernet, hlen: 6, hops: 1 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP xid: 0xd3d3b6e9 (3553867497), secs: 1024, flags: 0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP chaddr: 00:1b:77:42:07:69 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP ciaddr: 0.0.0.0, yiaddr: 0.0.0.0 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP siaddr: 0.0.0.0, giaddr: 192.168.100.11 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP requested ip: 192.168.100.105 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP server id: 192.168.100.254 rcvd server id: 1.1.1.1 *!--- Debug parsing of the frame sent. The most important fields are included.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REQUEST to 192.168.100.254 (len 358, port 1, vlan 100) *!--- Request sent to server.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selecting relay 2 - control block settings: dhcpServer: 192.168.100.254, dhcpNetmask: 0.0.0.0, dhcpGateway: 0.0.0.0, dhcpRelay: 192.168.100.11 VLAN: 100 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP selected relay 2 ? NONE *!--- No other DHCP server configured.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP received op BOOTREPLY (2) (len 308, port 1, encap 0xec00) *!--- Server sends a DHCP reply, most probably an ACK (see below).* **PEM Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 DHCP_REQD
(7) Change state to RUN (20) last state RUN (20)
!--- DHCP negotiation successful, address is now known, and client !--- is moved to RUN status.
Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Reached PLUMBFASTPATH: from line 4699 *!--- No L3 security; client entry is sent to NPU.* Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Replacing Fast Path rule type = Airespace AP Client on AP 00:1c:0j:ca:5f:c0, slot 1, interface = 1, QOS = 0 ACL Id = 255, Jumbo Frames = NO, 802.1P = 0, DSCP = 0, TokenID = 5006 Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 RUN (20) Successfully plumbed mobile rule (ACL ID 255) **DHCP Process**

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Assigning Address
192.168.100.105 to mobile

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP sending REPLY to STA

```
    (len 416, port 1, vlan 100)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP transmitting DHCP ACK (5)

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    op: BOOTREPLY, htype: Ethernet, hlen: 6, hops: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    xid: 0xd3d3b6e9 (3553867497), secs: 0, flags: 0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    chaddr: 00:1b:77:42:07:69

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    ciaddr: 0.0.0.0,  yiaddr: 192.168.100.105

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    siaddr: 0.0.0.0,  giaddr: 0.0.0.0

Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 DHCP
    server id: 1.1.1.1  rcvd server id: 192.168.100.254
```

PEM Process

```
Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 192.168.100.105 Added NPU
    entry of type 1
```

!--- Client is now successfully associated to controller. !--- Type is 1; see the table in the Client Traffic Forwarding !--- section of this document. Wed Oct 31 10:46:25 2007: 00:1b:77:42:07:69 Sending a gratuitous ARP for 192.168.100.105, VLAN Id 100 *!--- As address is known, gratuitous ARP is sent to notify.*

相关信息

- 轻量接入点常见问题
- 无线 LAN 控制器 (WLC) 故障排除常见问题
- Cisco 无线 LAN 控制器模块问题与解答
- 无线局域网控制器(WLC)常见问题
- 统一无线网络中的无线电资源管理
- 无线 LAN (WLAN) 技术支持
- 技术支持和文档 - Cisco Systems