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Telecommunications and information exchange between systems — Wireless LAN access control —

Part 1: Networking architecture

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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Telecommunications and information exchange between systems — Wireless LAN access control —

Part 1: Networking architecture

1 Scope

This document specifies a cloud AC based wireless local area network (WLAN) networking architecture, defines the cloud access controller dispatch platform (CADP) operating mechanism and the interaction between the network elements such as CADPs, access points (APs), cloud access controllers (ACs) and the WLAN network management system (NMS), and specifies the main functional requirements of each network element.

This document applies to public WLAN networking scenarios.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC/IEEE 8802-11, *Telecommunications and information exchange between systems — Specific requirements for local and metropolitan area networks — Part 11: Wireless LAN medium access control (MAC) and physical layer (PHY) specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC/IEEE 8802-11 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
access controller
AC
network entity that provides AP access to the network infrastructure in the data plane, control plane, management plane, or a combination therein

[SOURCE: IETF RFC 5415:2009, 1.4, modified — "wireless termination point" has been replaced with "access point".]

3.2
cloud access controller
cloud AC
access controller entity deployed in the core network, which is coordinated and implemented by *cloud access controller dispatch platform* (3.5) for control and management of specific access points

3.3
cloud access controller pool
cloud AC pool
set of *cloud access controllers* (3.2)

3.4
wireless local area network network management system
WLAN NMS
application system that manages WLAN network devices, which provides configuration management, performance management, fault diagnosis and alarm management, security management, log management, operation and maintenance management

Note 1 to entry: The function of selecting cloud access controllers (ACs) for access points (APs) is added in this document.

3.5
cloud access controller dispatch platform
CADP
scheduling entity that assigns a specific cloud *AC* (3.1) to access points (APs) for optimal scheduling and control of AP access

4 Abbreviated terms

The following abbreviated terms apply to this document.

AP	access point
AC	access controller
CADP	cloud AC dispatch platform
CAPWAP	control and provisioning of wireless access points
CPU	central processing unit
HTTP	hyper text transfer protocol
MAC	media access control
NMS	network management system
WLAN	wireless local area network

5 Network architecture and operating mechanism

5.1 Network architecture

The network contains the following components. CADP, cloud AC pool, WLAN NMS and the authentication platform are deployed in the core network and APs are deployed in the local network.

a) AP: APs access a cloud AC through a dedicated line, Internet or mobile network, which makes WLAN deployment more flexible. APs communicate with a cloud AC and CADP through a CAPWAP protocol.

b) Cloud AC pool: Cloud ACs are deployed in a centralized mode to form a pool for unified resource management and scheduling.

c) WLAN NMS: WLAN NMS maintain all load parameters for cloud ACs, including the number of users, number of APs, traffic throughput, CPU usage and network latency.

d) Authentication platform: Authentication platform, including portal server and AAA server, provide WLAN user authentication and accounting features.

e) CADP: CADP obtains the association between APs and cloud ACs from WLAN NMS and issues the IP address of cloud ACs to APs.

5.2 Operating mechanism

As shown in Figure 1, the operating mechanism of cloud ACs is as follows:

The cloud ACs are deployed in centralized mode to form a cloud AC pool. The cloud ACs and APs are decoupled, and no cloud ACs need to be specified for the APs. Instead, a CADP domain name or IP address is pre-configured for APs. When an AP tries to associate with a cloud AC, it obtains the cloud AC's IP address assigned by the WLAN NMS from CADP through the pre-configured domain name or IP address and then the AP associates with the cloud AC at this IP address. This mechanism can address the issue of unbalanced cloud AC loads in different regions in traditional WLANs and can provide flexible AC assignment capabilities.

When selecting a cloud AC for an AP, WLAN NMS assigns different weights to load parameters, such as the number of access users, the number of APs, traffic throughput, CPU usage, and network latency for dynamic load balancing. Then it issues the association between the AP and the cloud AC to CADP and the cloud AC.

If a cloud AC is added or replaced in the network, the WLAN NMS updates the association between APs and cloud AC and issues it to AP through CADP, without any further configuration of APs.

CADP can provide 1+1 backup, N+1 backup, N+M backup and port-based backup of cloud ACs where 1+1 backup is one active CADP and one backup CADP, N+1 backup is the N active CADPs and one backup CADP, and N+M backup is the N active CADPs and M backup CADPs.

NOTE This is a type of backup mechanism. For N+M backup, if one of the active N CADPs is no longer usable, then one of the backup CADPs from the M backup CADPs can be chosen to replace the unusable CADP for operation.

When a cloud AC fails, the standby cloud AC takes over to provide services. CADP also provides active-active cloud AC backup. When a cloud AC fails, APs associated with that cloud AC move to other active cloud ACs with a light load. This active-active backup mode does not require an additional standby cloud AC, thereby saving costs.

The weighting assigning policies of load parameters and the load balancing policies are determined by the network operators and are not within the scope of this document.

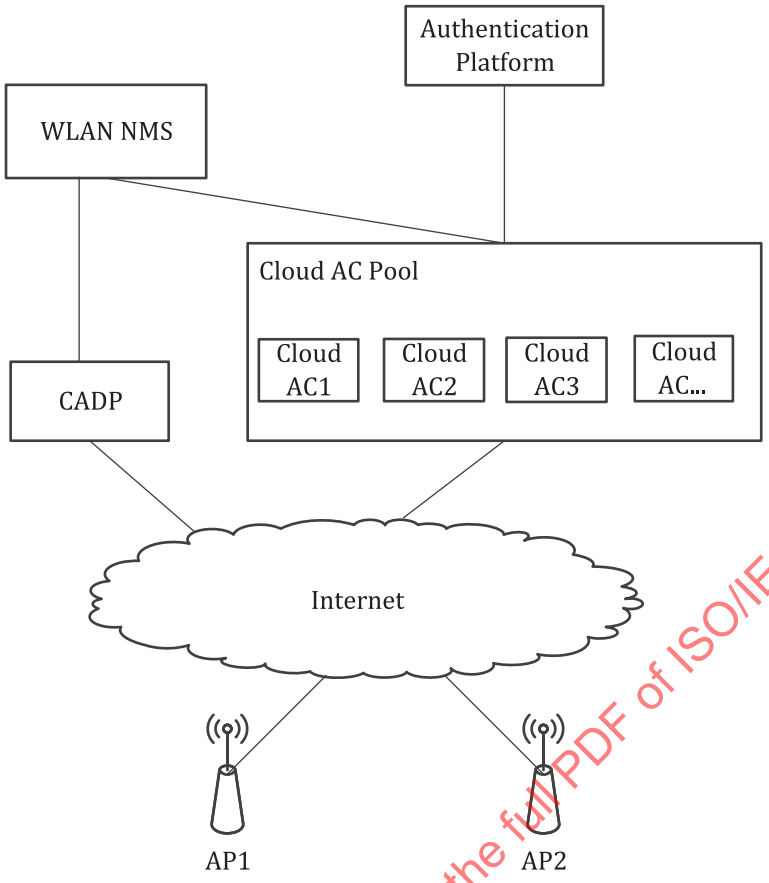

Figure 1 — Cloud AC network diagram

6 First association of an AP with a cloud AC

6.1 Procedure

The procedure for the first association of an AP with a cloud AC is as follows:

a) The WLAN NMS selects an optimal cloud AC for the AP based on AP information and the load of each cloud AC in the cloud AC pool.

b) The WLAN NMS issues AP information (e.g. MAC address and serial number) and the association between the AP and cloud AC to CADP and issues AP information to the cloud AC.

6.2 Cloud AC selection

The WLAN NMS selects an optimal cloud AC for APs based on locations of APs and loads of cloud ACs for seamless roaming of clients between APs and load sharing of cloud ACs.

Figure 2 is AC allocating flow chart before a new AP accessing.

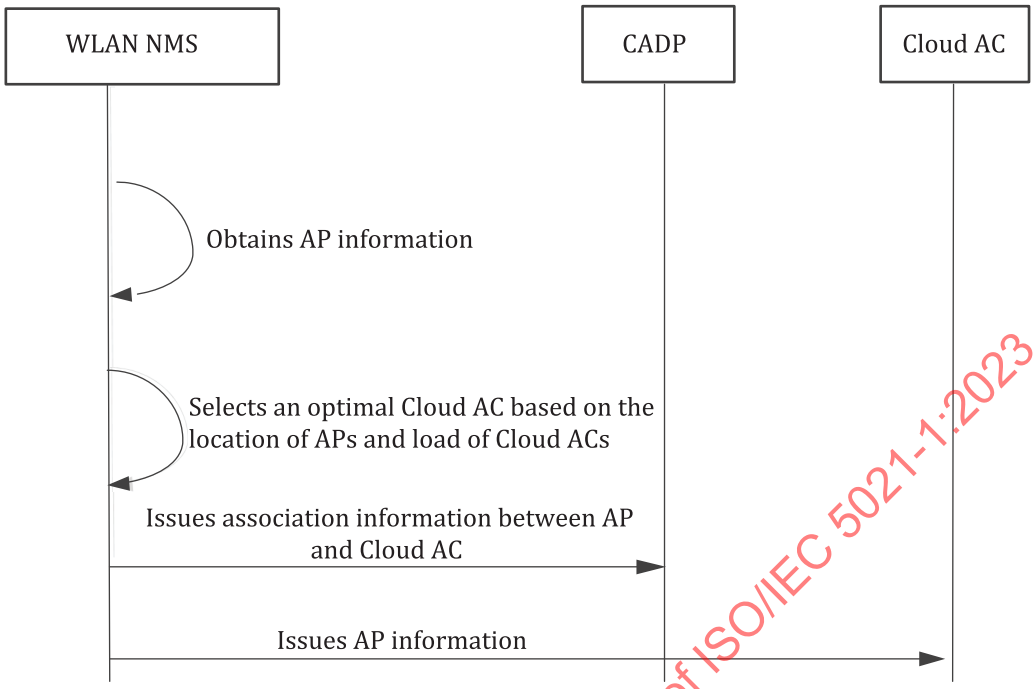

Figure 2 — Cloud AC selection

6.3 AP association

For an AP to associate with a cloud AC, a CADP domain name shall be pre-configured in the cloud AC domain name field for that AP. Every time the AP tries to associate with the cloud AC, it sends an association request to CADP through domain name resolution, obtains the IP address of the cloud AC and then registers to the cloud AC, as shown in Figure 3.

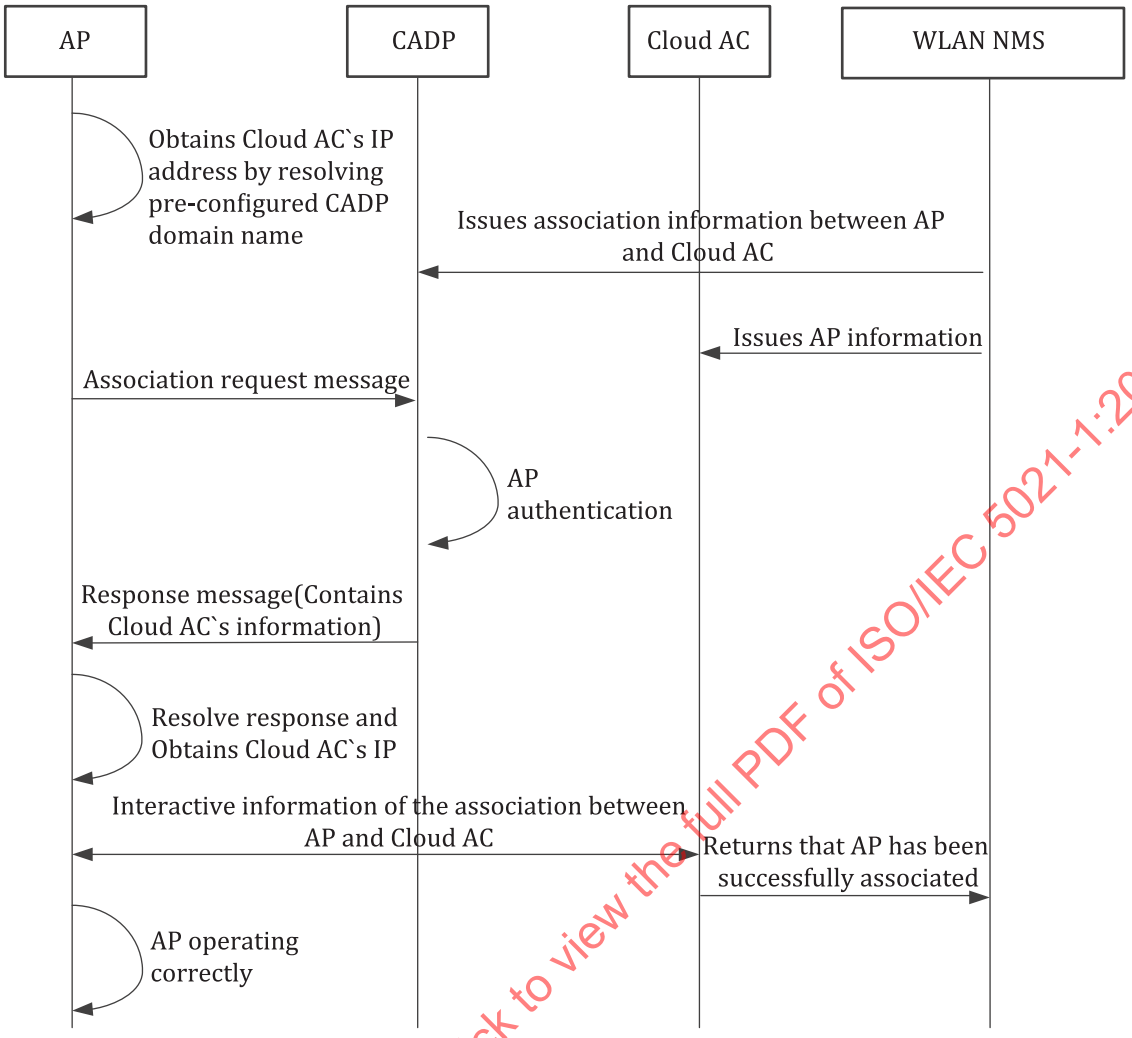

Figure 3 — AP access to cloud AC flow chart

7 CADP-based cloud AC switchover

7.1 Cloud AC switchover for optimization or replacement

This cloud AC switchover applies to scenarios where APs on a heavily-loaded cloud AC need to be moved to a light-weight cloud AC for load sharing, and where APs must be moved to another cloud AC because of performance degradation or end-of-use of the original cloud AC.

As shown in Figure 4, the cloud AC switchover uses the following procedure:

a) The WLAN NMS issues the association between the AP and new cloud AC (cloud AC2) to CADP.

b) CADP removes the association between the AP and the original cloud AC (cloud AC1) and adds information about cloud AC2 and then issues the AP information to cloud AC2.

c) The WLAN NMS notifies AC1 to delete AP information and then sends a reboot command to the AP.

d) The AP reboots and sends an association request to CADP through domain name resolution.

e) CADP notifies the AP of cloud AC2's IP address.

f) The AP initiates the association to cloud AC2. It can operate correctly after associating with cloud AC2 successfully.

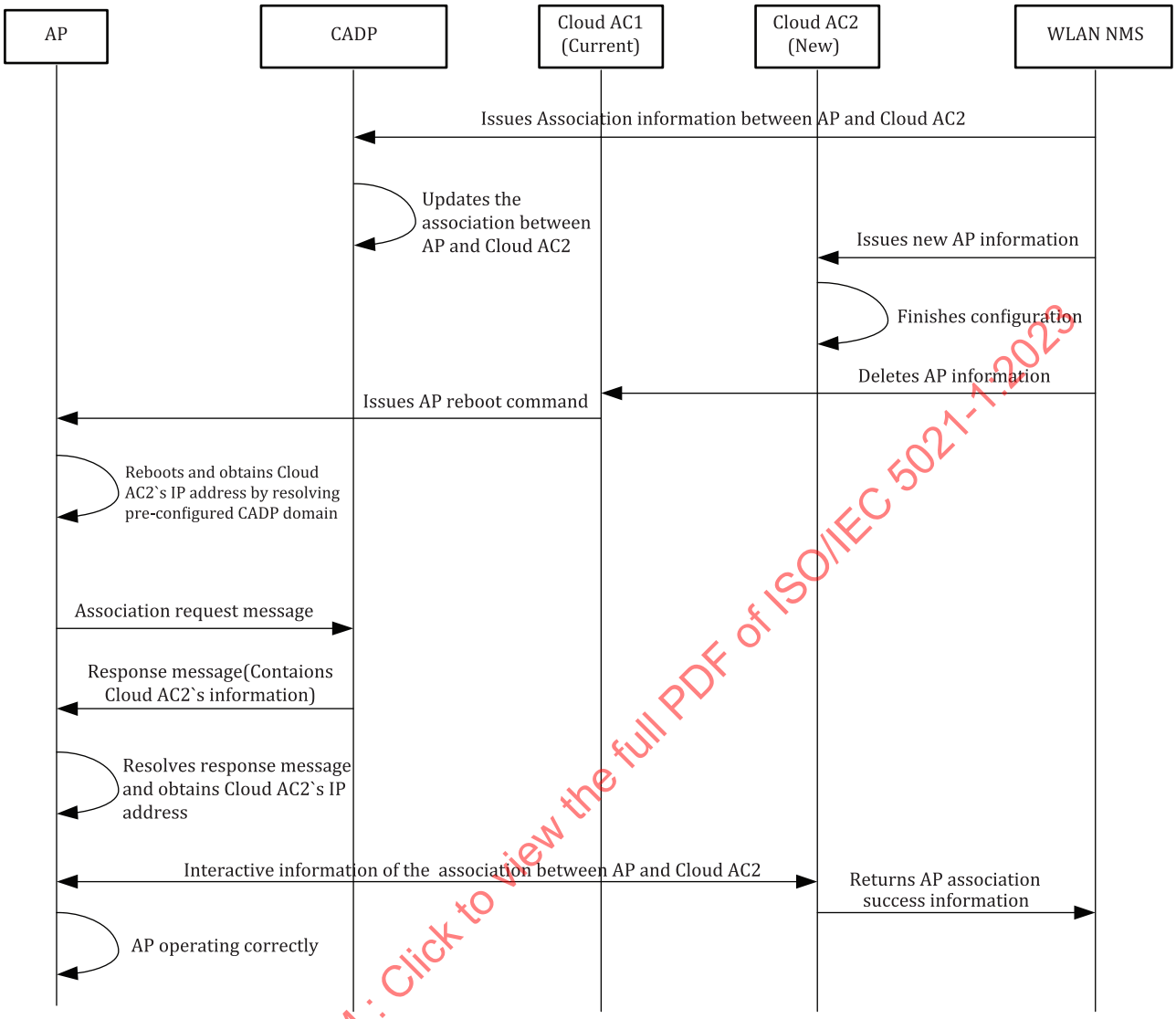

Figure 4 — Cloud AC switchover for optimization or replacement

7.2 Active/standby cloud AC switchover

As shown in Figure 5, the active and standby cloud AC switchover uses the following procedure:

a) The WLAN NMS sends probe packets to cloud AC1 periodically. If it cannot receive response packets before the retry threshold is reached, it determines that the cloud AC has failed.

b) The WLAN NMS selects a new cloud AC (cloud AC2) for the AP.

c) The WLAN NMS sends the association between the AP and cloud AC2 to CADP and cloud AC2.

d) The AP obtains the IP address of CADP through the pre-configured domain name and obtains the IP address of the new cloud AC (cloud AC2) from CADP. After associating with cloud AC2 successfully, the AP can operate correctly.

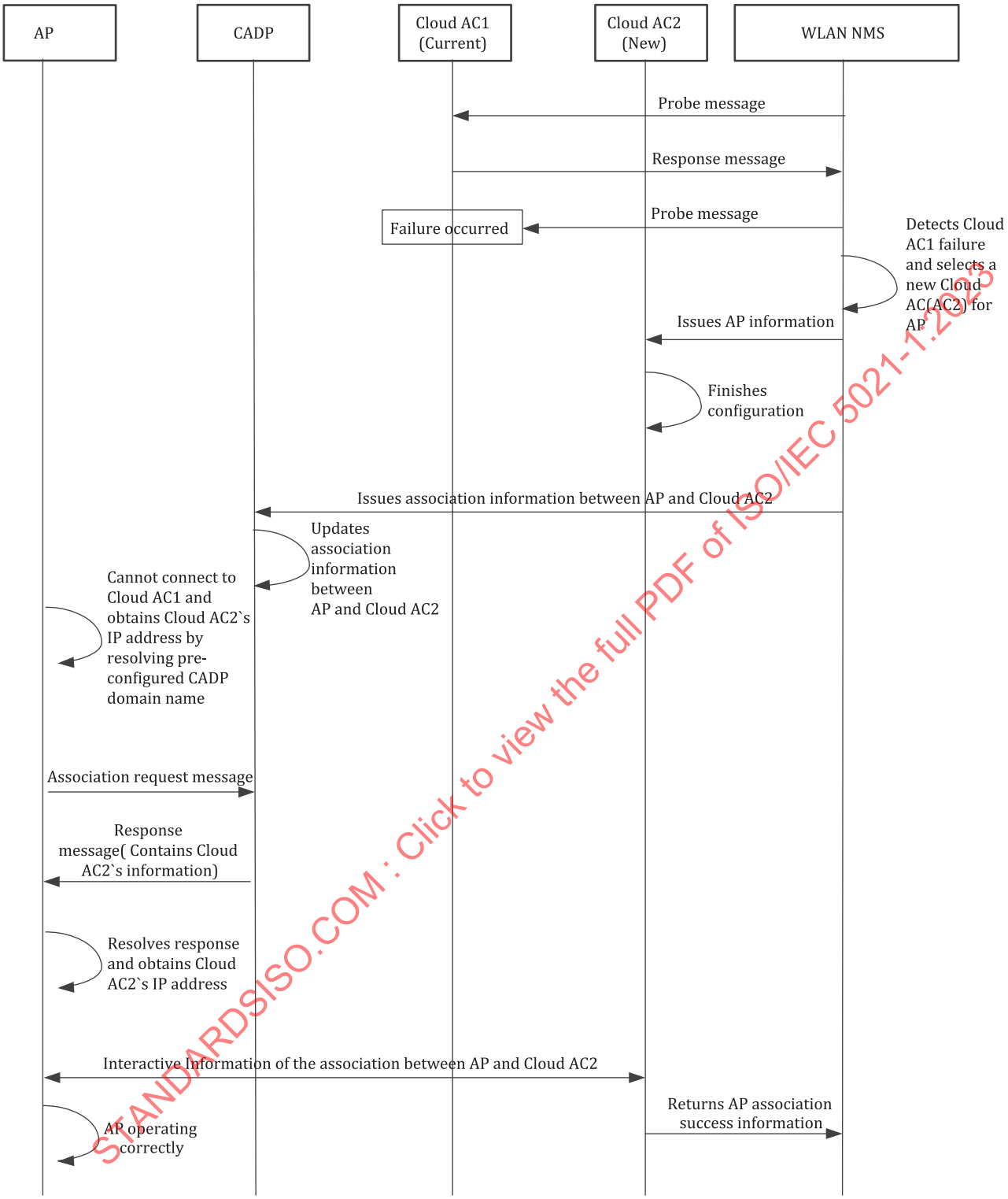

Figure 5 — Active/standby cloud AC switchover

8 CADP hot backup

As shown in Figure 6, two CADPs are deployed for CADP reliability.