A Logical Node for Association Supervision

Grid Innovation Research Laboratory
Central Research Institute of Electric Power Industry

Dr. Koki Ryono

IEC 61850-80-6 TF Meeting

Oct. 20th, 2021

CRIEPI
Central Research Institute of Electric Power Industry

© CRIEPI 2021

Background and Purpose

Background

- If association is lost between Proxy/Gateway and an external IED, the values of quality in proxy and mirror LNs are set to questionable/oldData.
- However, the reason of quality change is unclear for control center because quality change could be happened by other failures.
- We need to define an information model for association supervision to make clear the occurrence of association lost.

Purpose

- Define an information model for association supervision.

© CRIEPI 2021

Requirements and Survey

- Requirements for information model
  - To be able to show association is established or unestablished.
  - To be able to identify associations.
- Survey
  - LCCH (IEC 61850-7-4, Ed. 2.1, P. 127)
    - LCCH.ChLiv.stVal = true if channel is receiving telegrams within a specified time interval.
    - In other words, even if one of associations established through the channel is lost, ChLiv.stVal keeps true because the channel is still receiving telegrams for other associations.

✓ <u>As a result of survey, there is no required information model.</u>

© CRIEPI 2021

Approach and Matters to be considered

- Approach
  - Make a new logical node for association supervision.
- Matters to be considered
  - New logical node shall satisfy the requirements.
  - Instances of new logical node or instances of data objects in new logical node should be able to be assigned to associations
    - manually and statically from the viewpoint of use in substation,
    - automatically from the viewpoint of use in DER system
      - because IEDs connected to DER systems may change at every moment.

© CRIEPI 2021

Outline

- Design of New Logical Nodes
- Use Cases
  - Assigning instances manually and statically from the viewpoint of use in a substation.
  - Assigning instances automatically from the viewpoint of use in a DER system.

© CRIEPI 2021

Design of New Logical Node

© CRIEPI 2021

Design of New Logical Node

◆ LASC: Association Supervision

- This logical node supervises states of associations.
- Data objects of this logical node:

DO name	CDC	Explanation	M/O
AscLiv	SPS	If true, the association is established, otherwise unestablished. TCP Keep-Alive shall be used to detect association lost.	Mmulti
IedNam	VSS	Name of an external IED with which association is established. This value shall be identical to the value in SCL file. This value is set manually in advance, or automatically at a time when association is established.	Mmulti
ApNamServ	VSS	Name of an access point of an external IED with which association is established. This value shall be identical to the value in SCL file. This value is set manually in advance, or automatically at a time when association is established.	Omulti
AscId	VSS	Association ID of this association. This value is set manually in advance, or automatically at a time when association is established.	Omulti

© CRIEPI 2021

Design of New Logical Node

- LASC: Association Supervision
  - Other information about data objects
    - If instance numbers of IedNam, ApNameServ and AscId are the same, they are assigned to the identical association.
    - Data objects Beh/Health/Mod/Mir/InRef are inherited from DomainLN.
  - A feature of this design
    - Automatic assigning of instances to associations is executed inside one logical node instance.
    - Conversely, in the design of assigning one logical node instance to one association, processing among logical node instances is needed to determine which instance is responsible for which association.

© CRIEPI 2021

Use Case 1

Assigning DO instances manually and statically from the viewpoint of use in a substation.

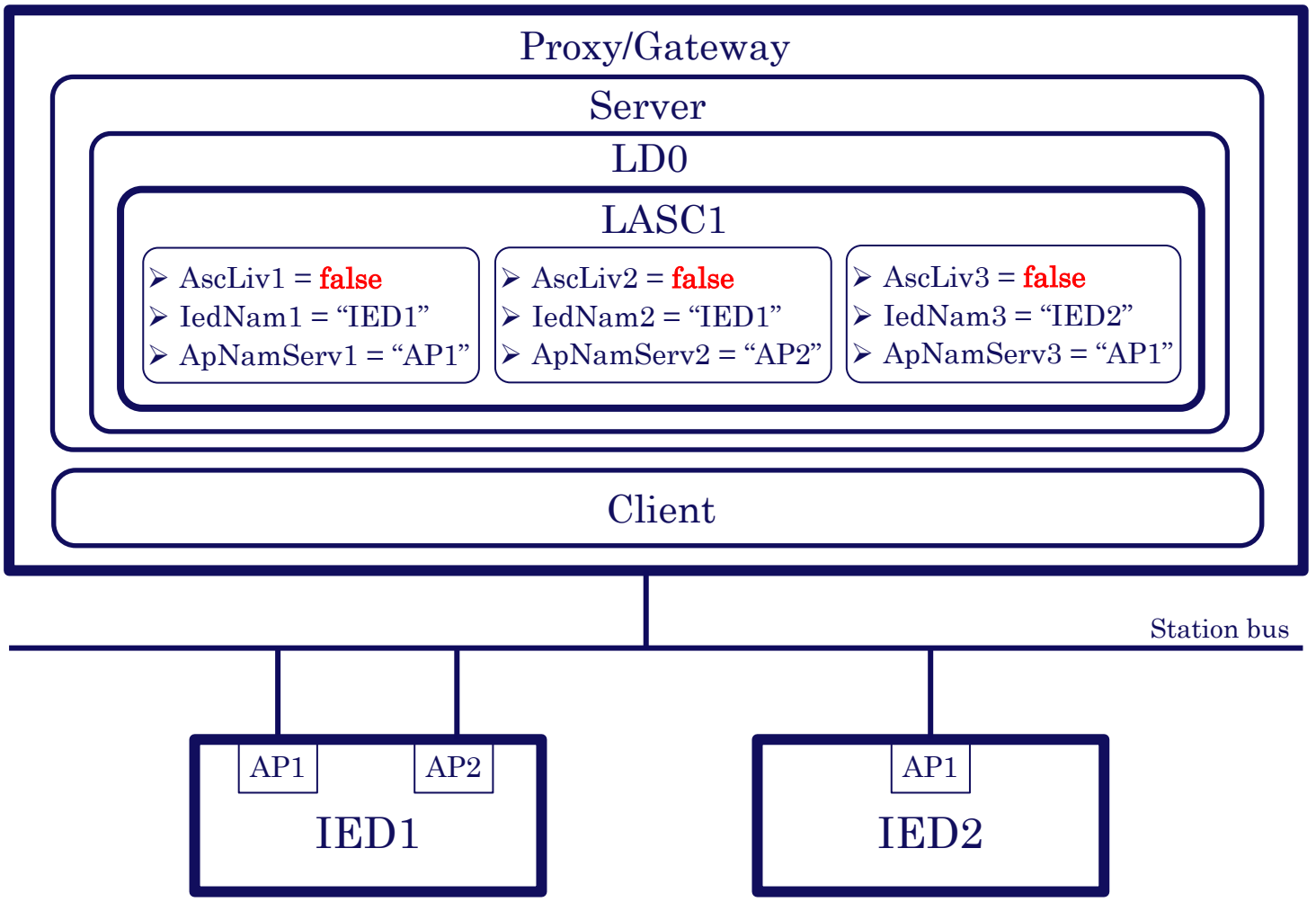
© CRIEPI 2021

Assumptions in this use case

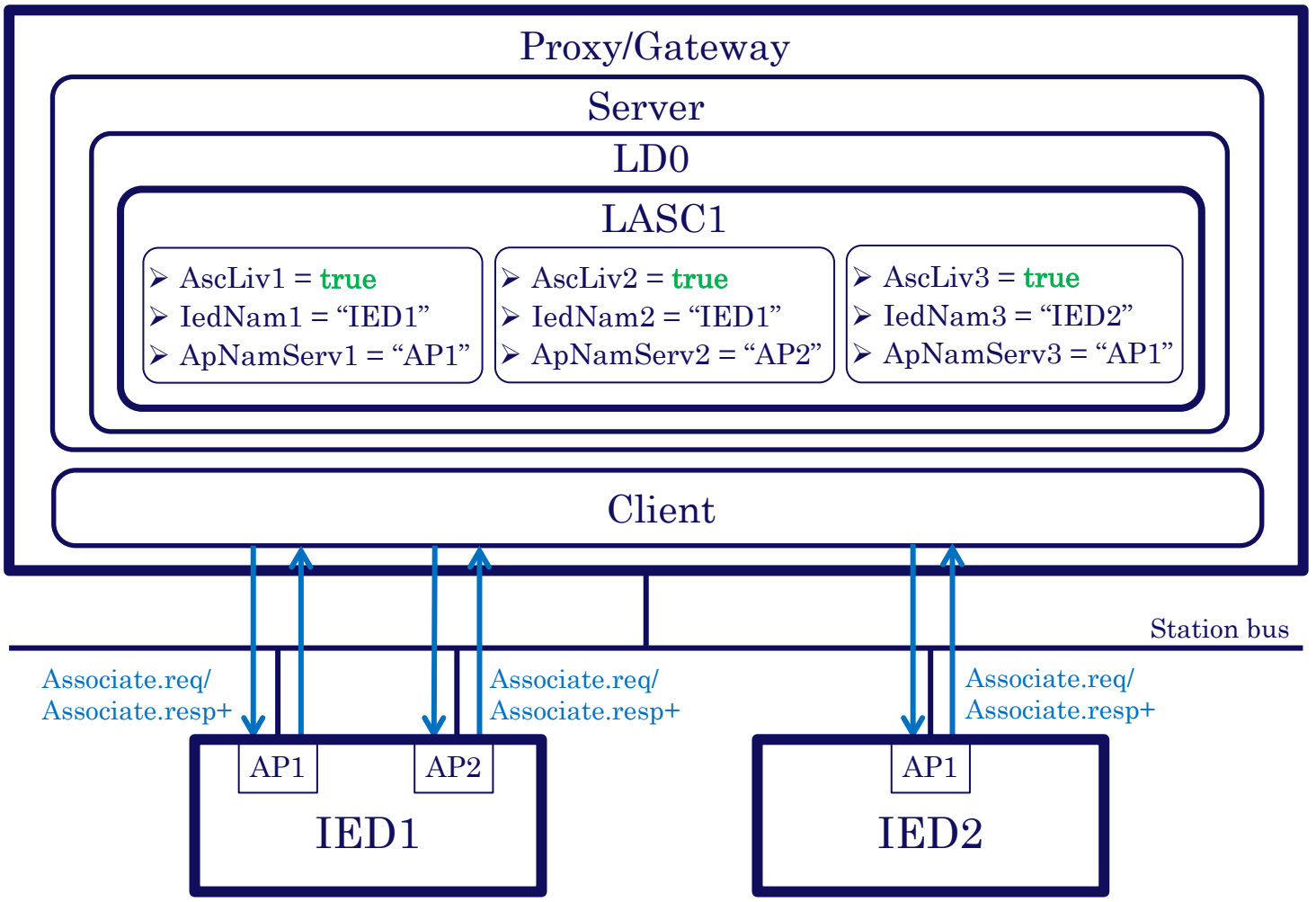
- The number of established associations is just one for each access point of bay IED.
  - Associations to be supervised can be identified only using IedNam and ApNamServ.
- Values of IedNam and ApNamServ are set manually in advance.

© CRIEPI 2021

Status: Associations unestablished

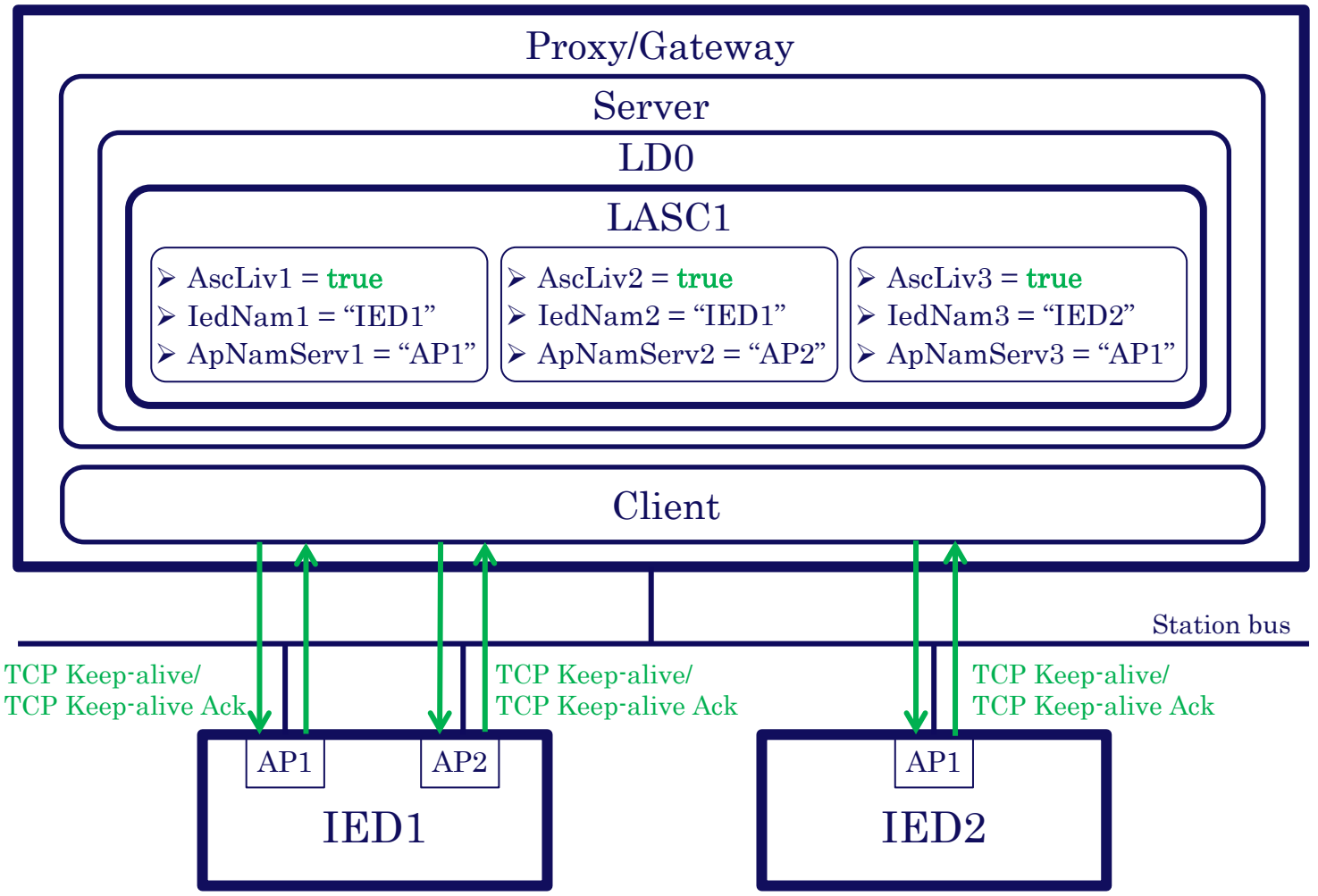


Status: Associations establishing



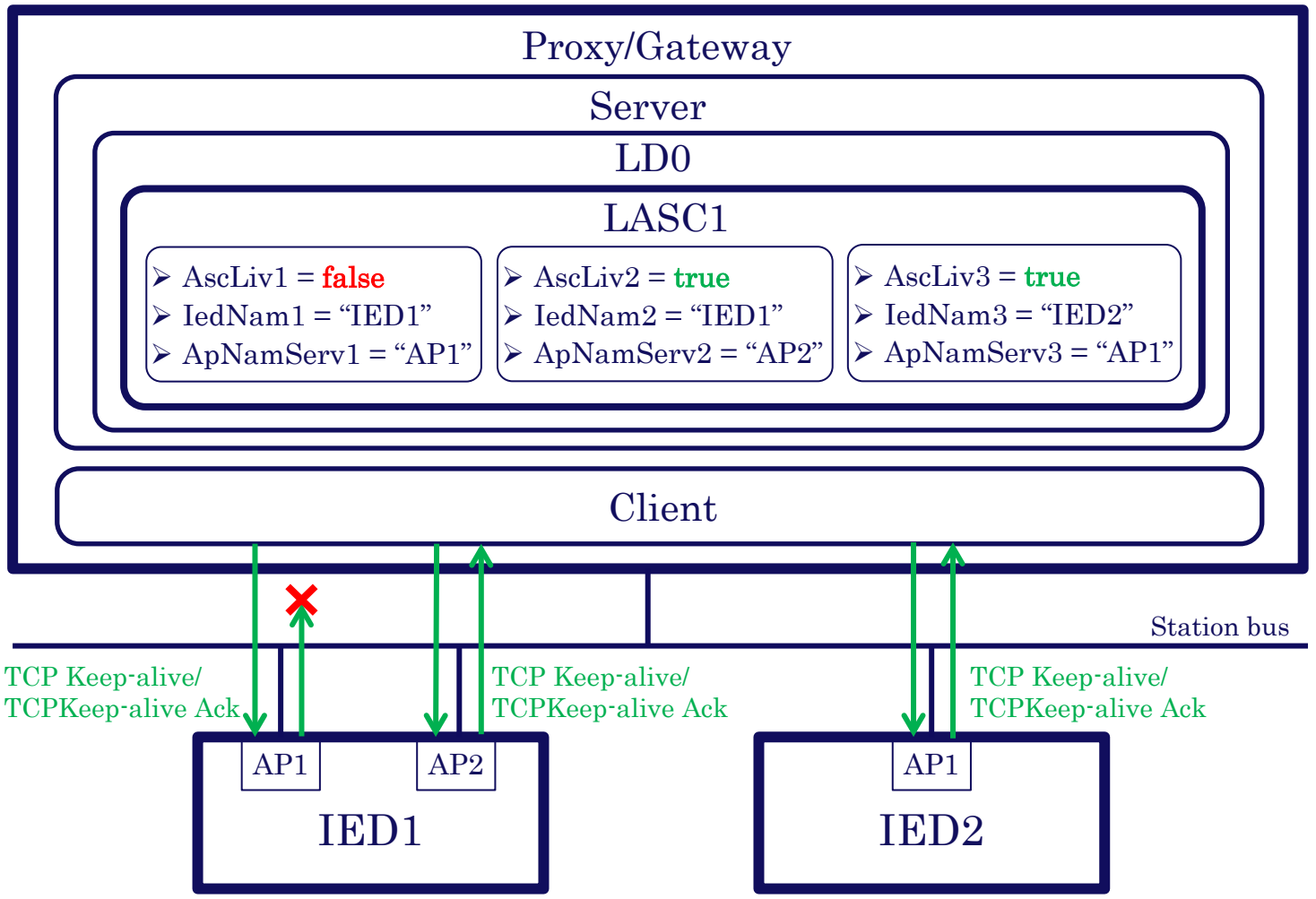
© CRIEPI 2021

Status: Associations established

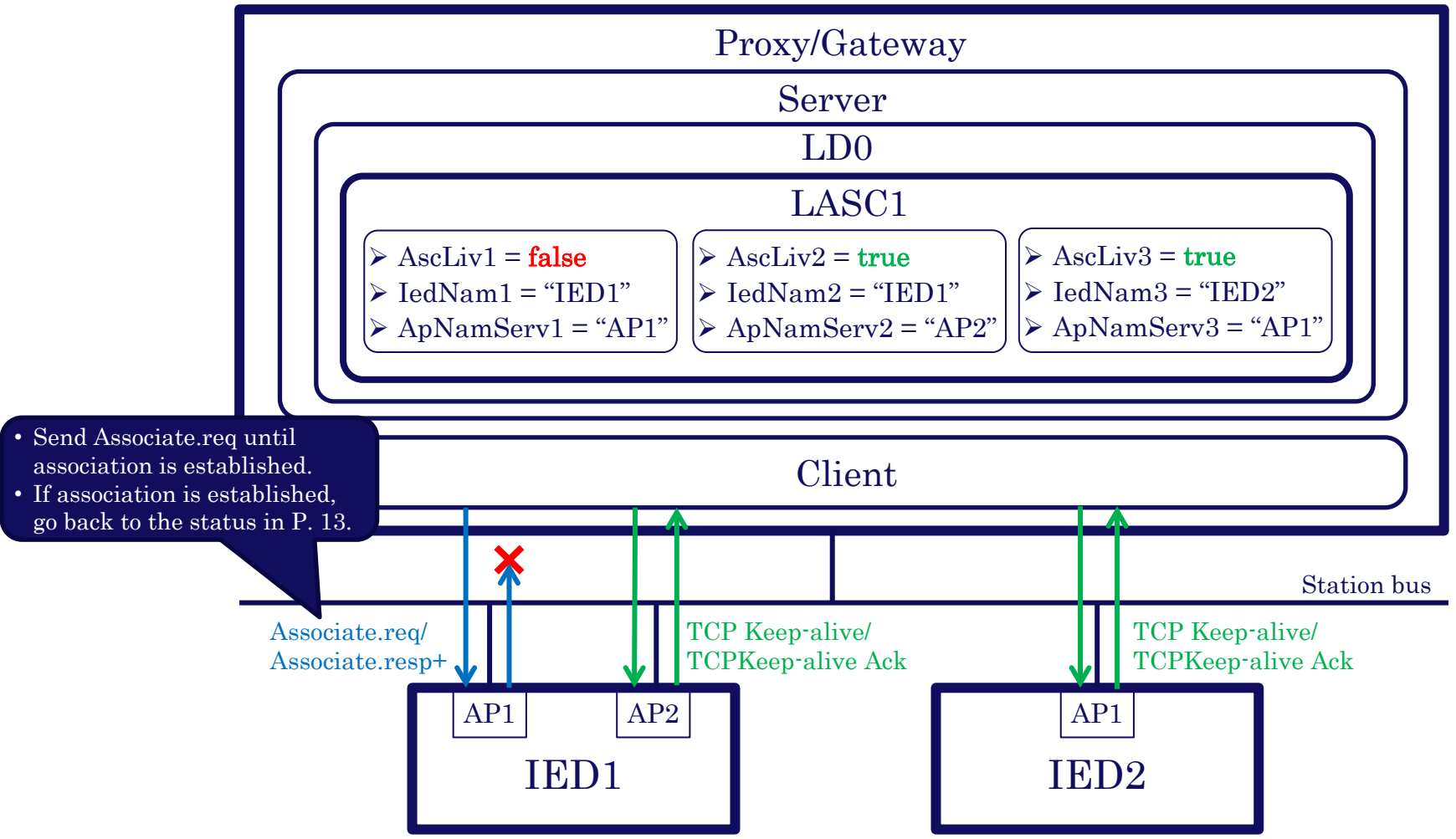


© CRIEPI 2021

Status: An association lost causing



Status: An association reestablishing

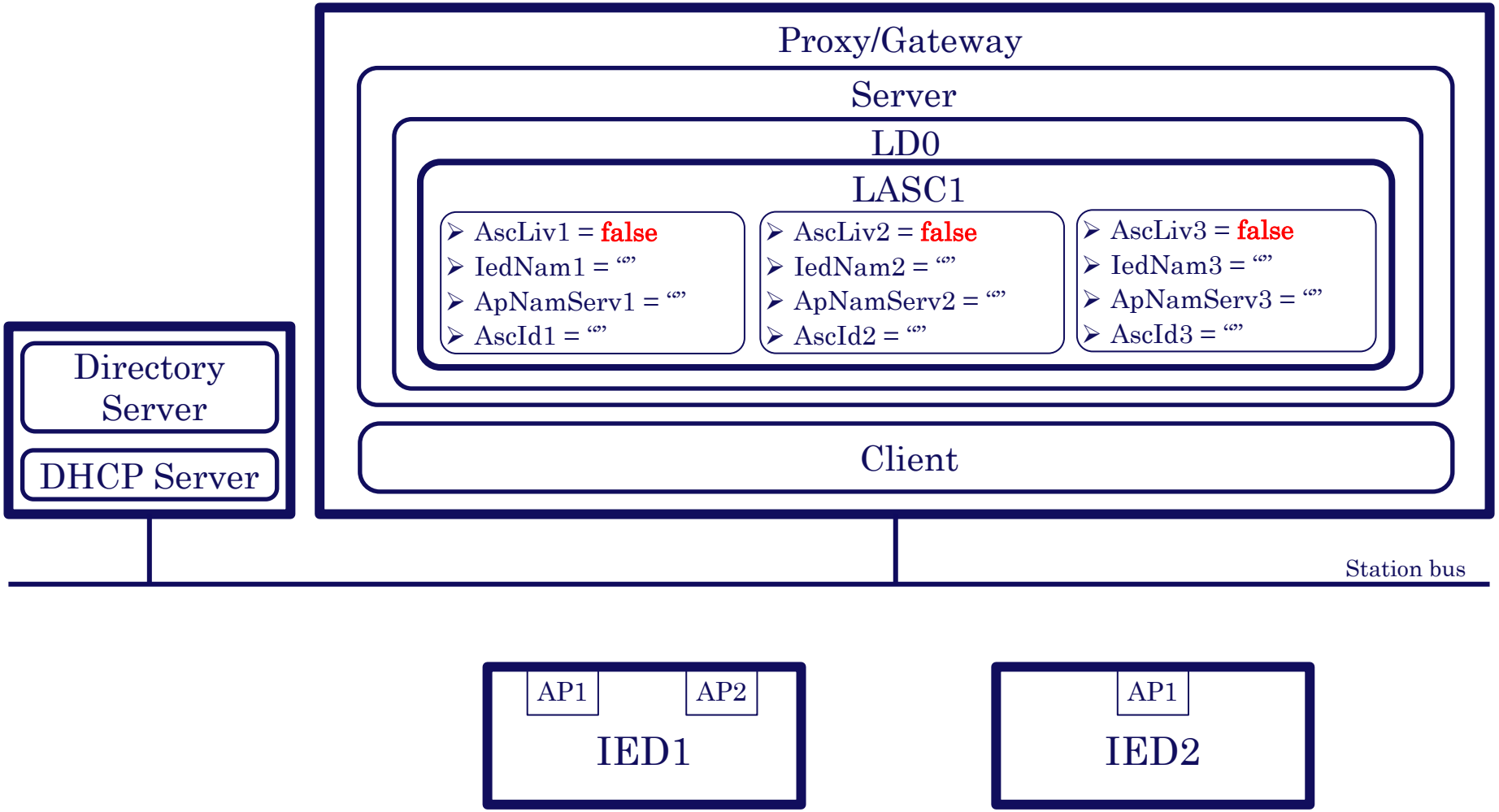


Use Case 2

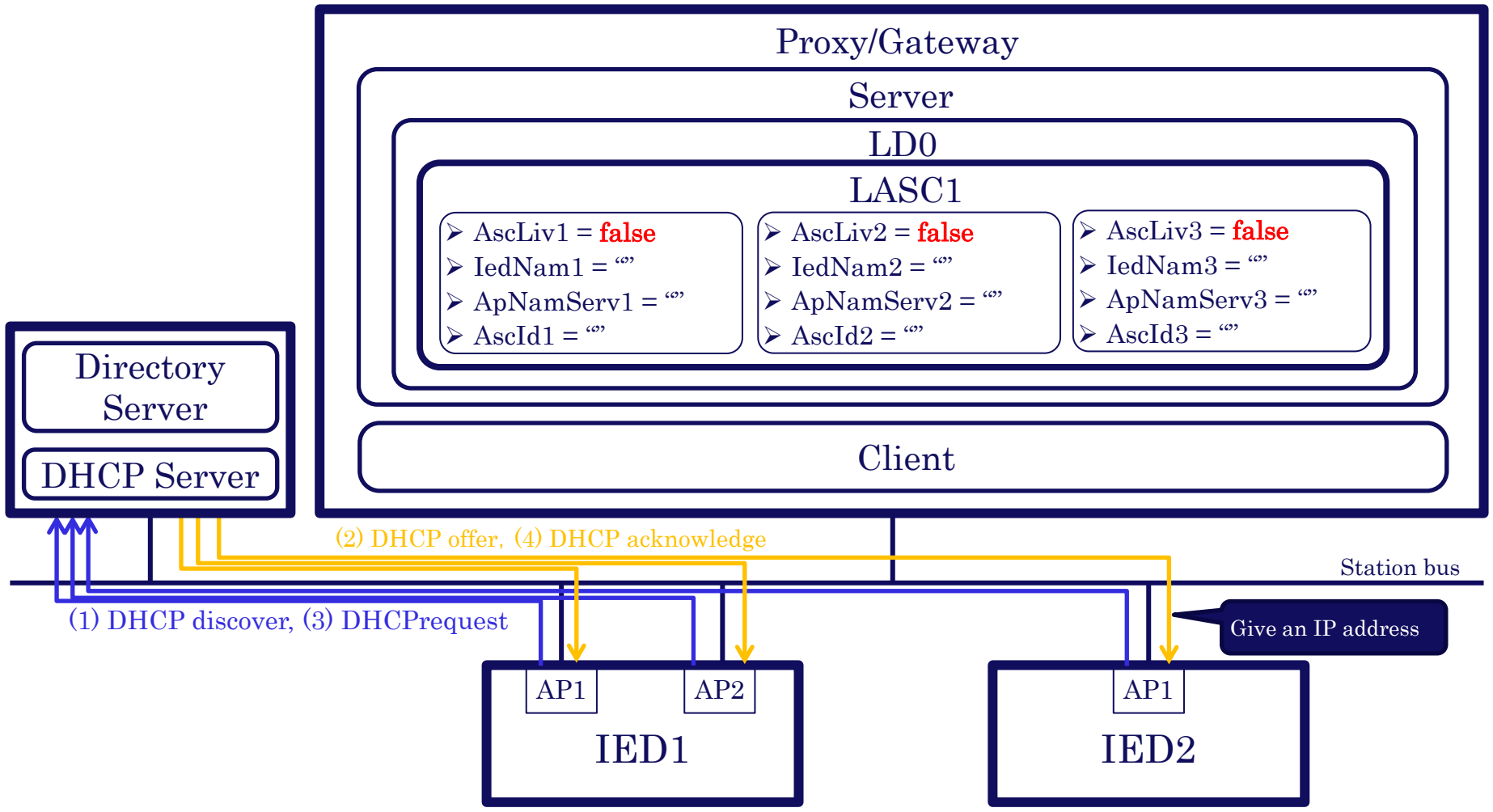
Assigning DO instances automatically from the viewpoint of use in a DER system.

© CRIEPI 2021

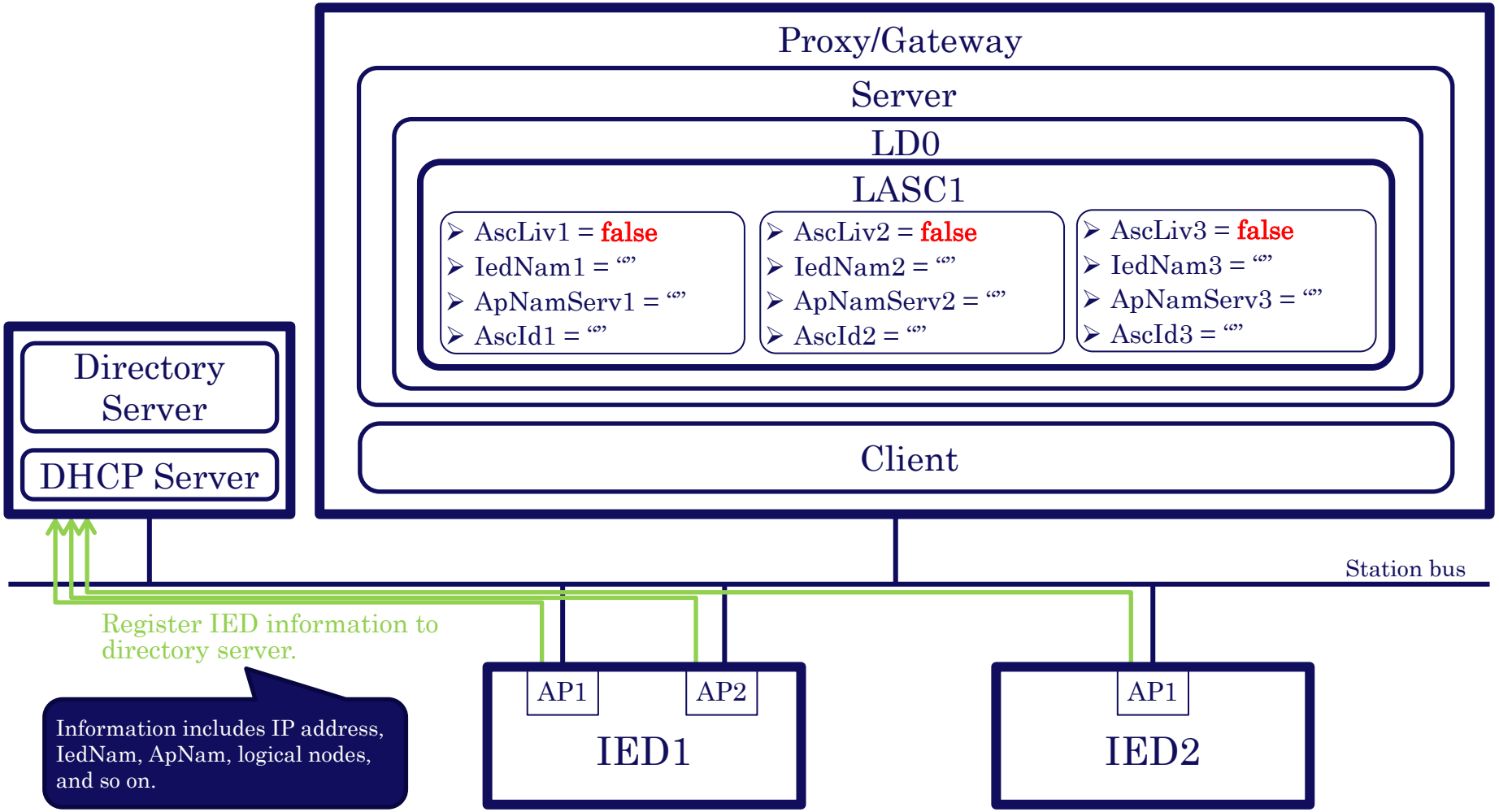
Status: Associations unestablished



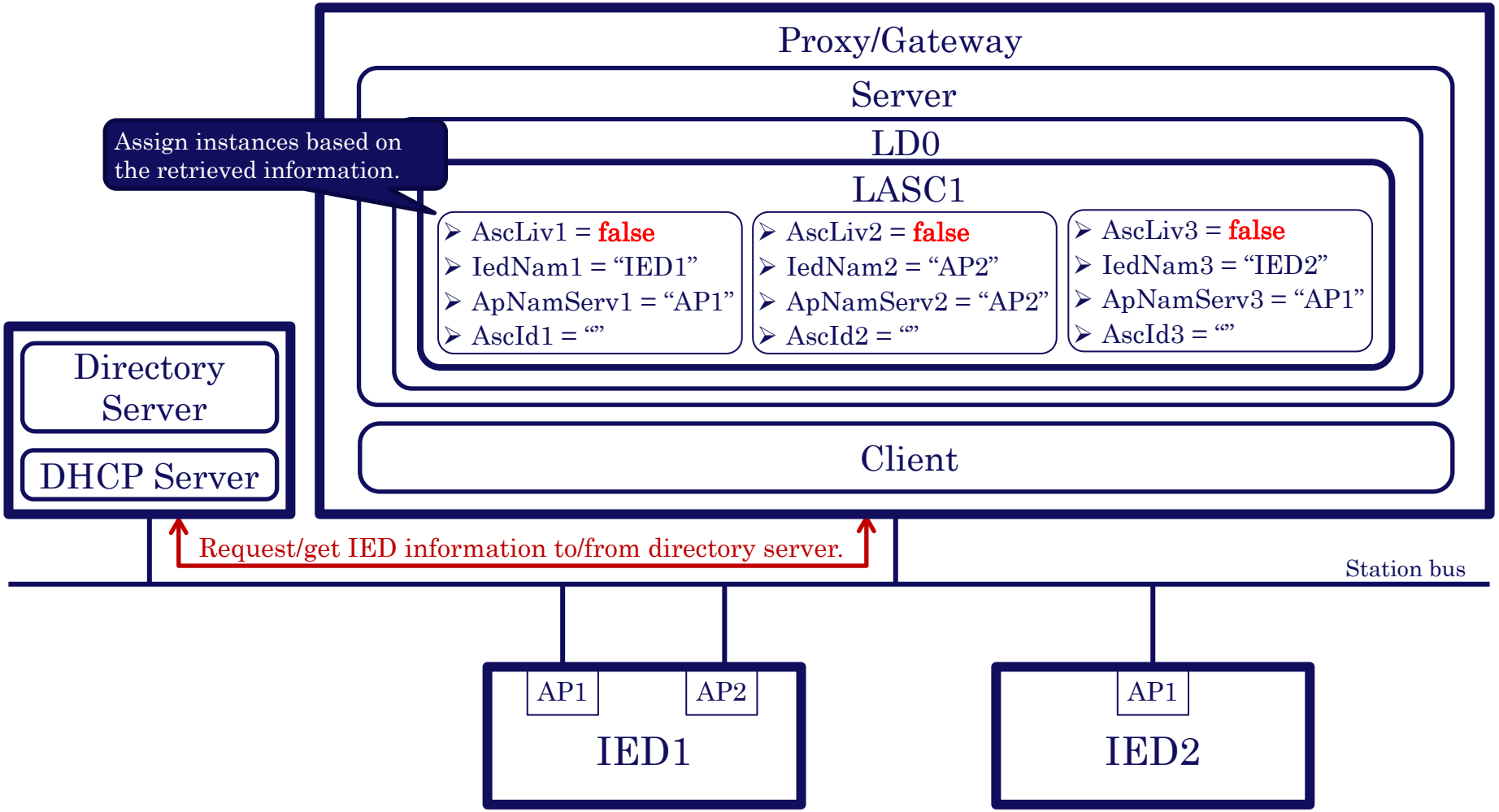
Status: IP addresses given to IEDs



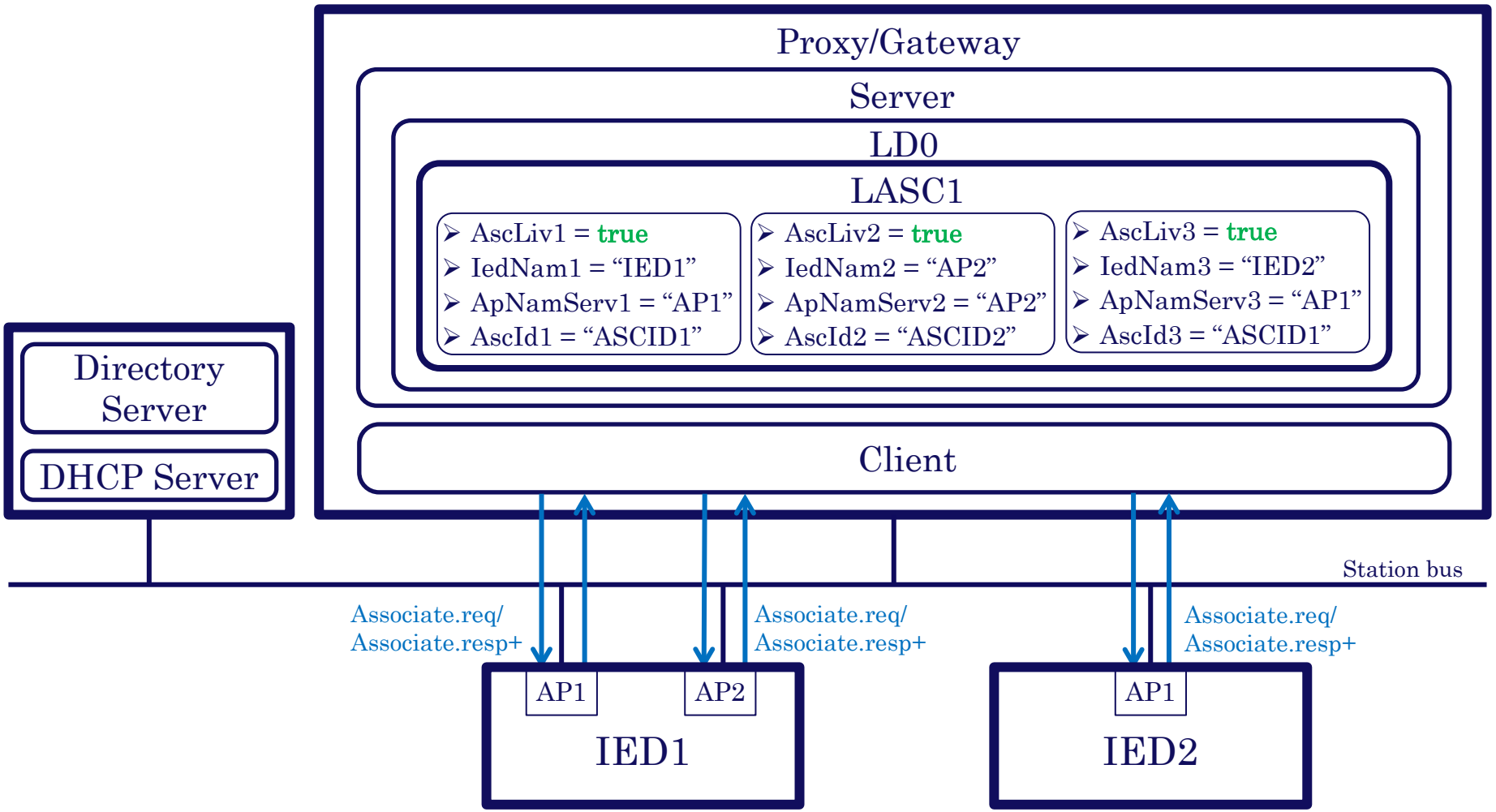
Status: IED information registering



Status: IED information retrieving

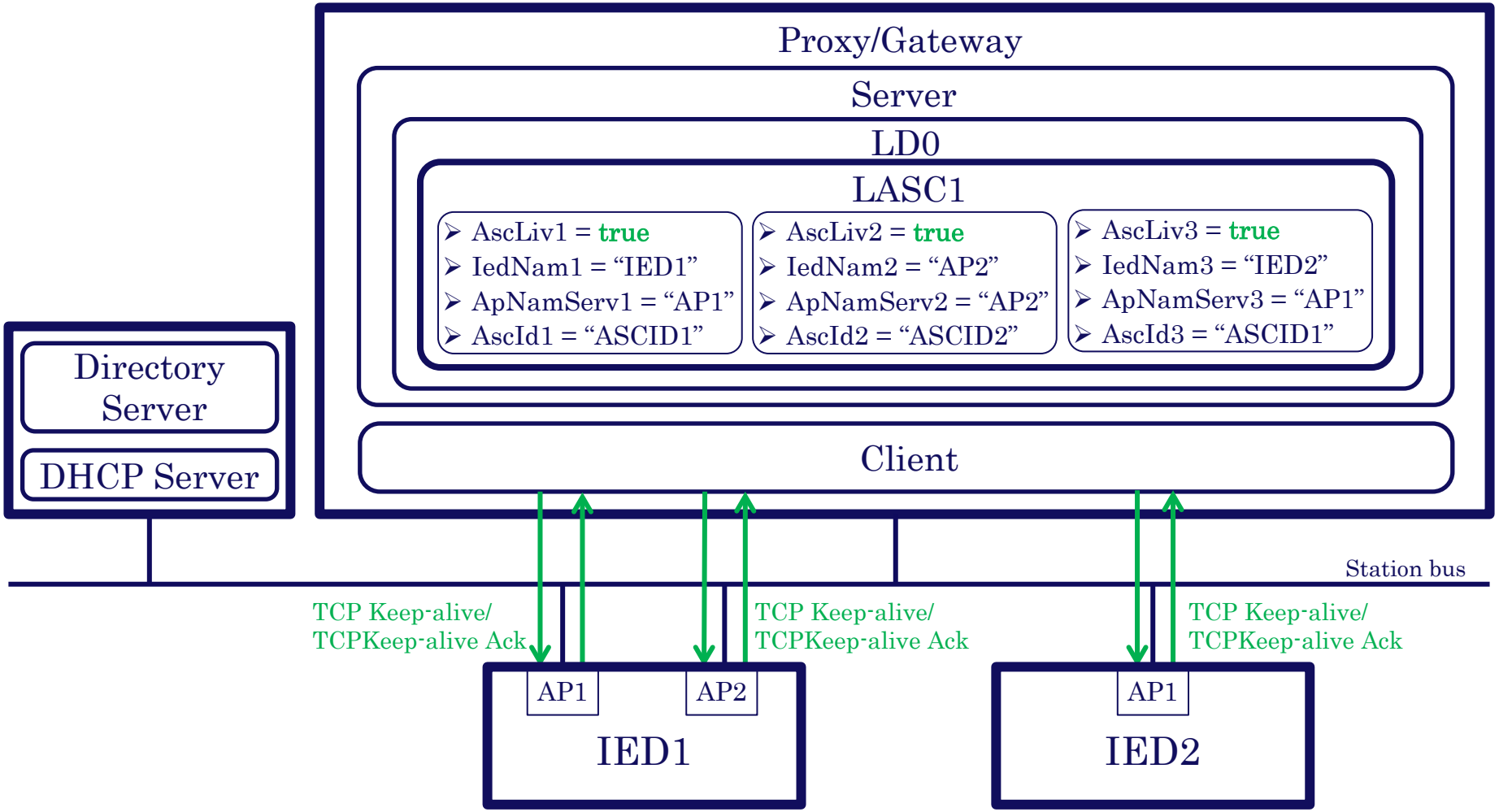


Status: Associations establishing

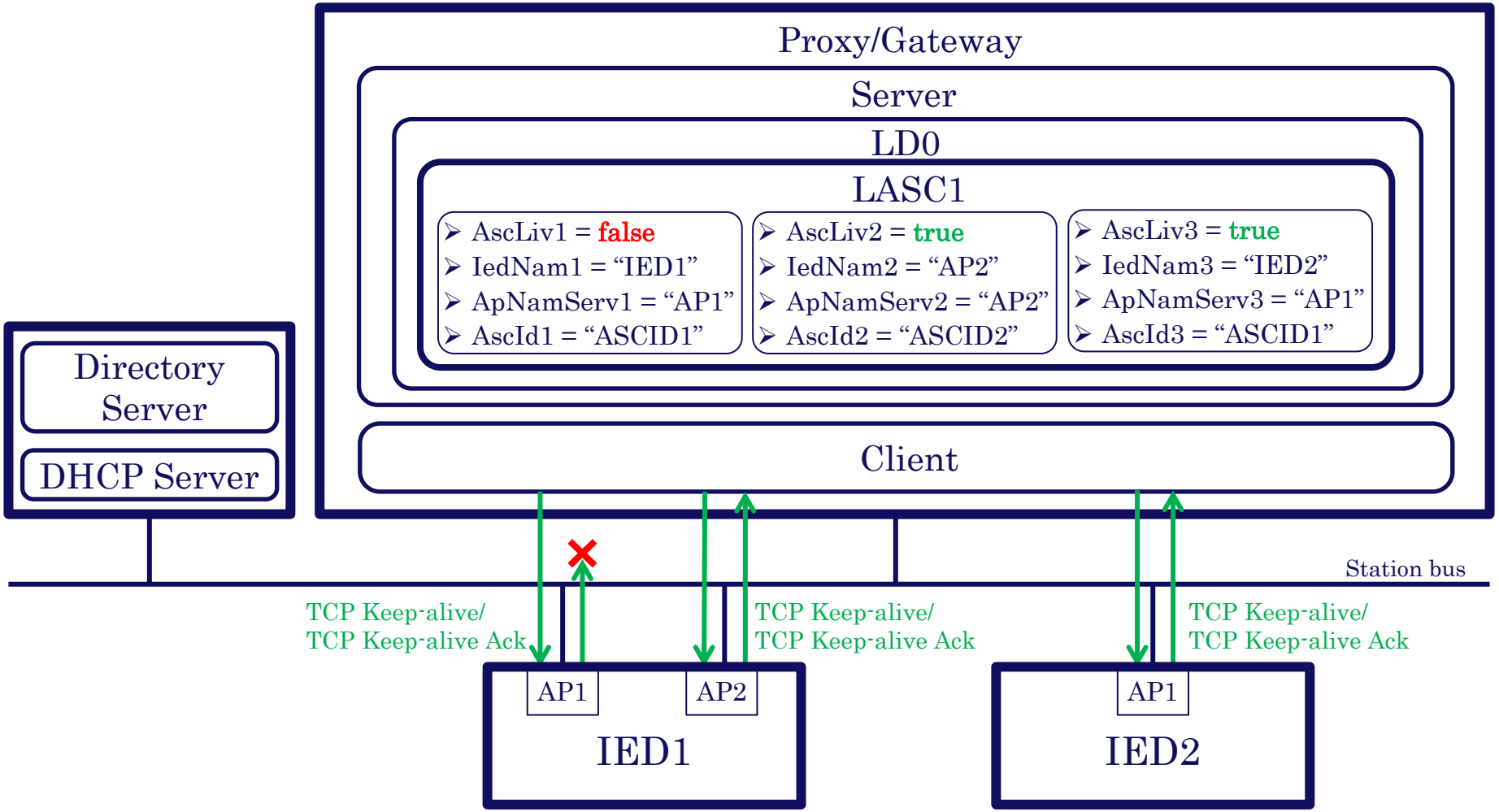


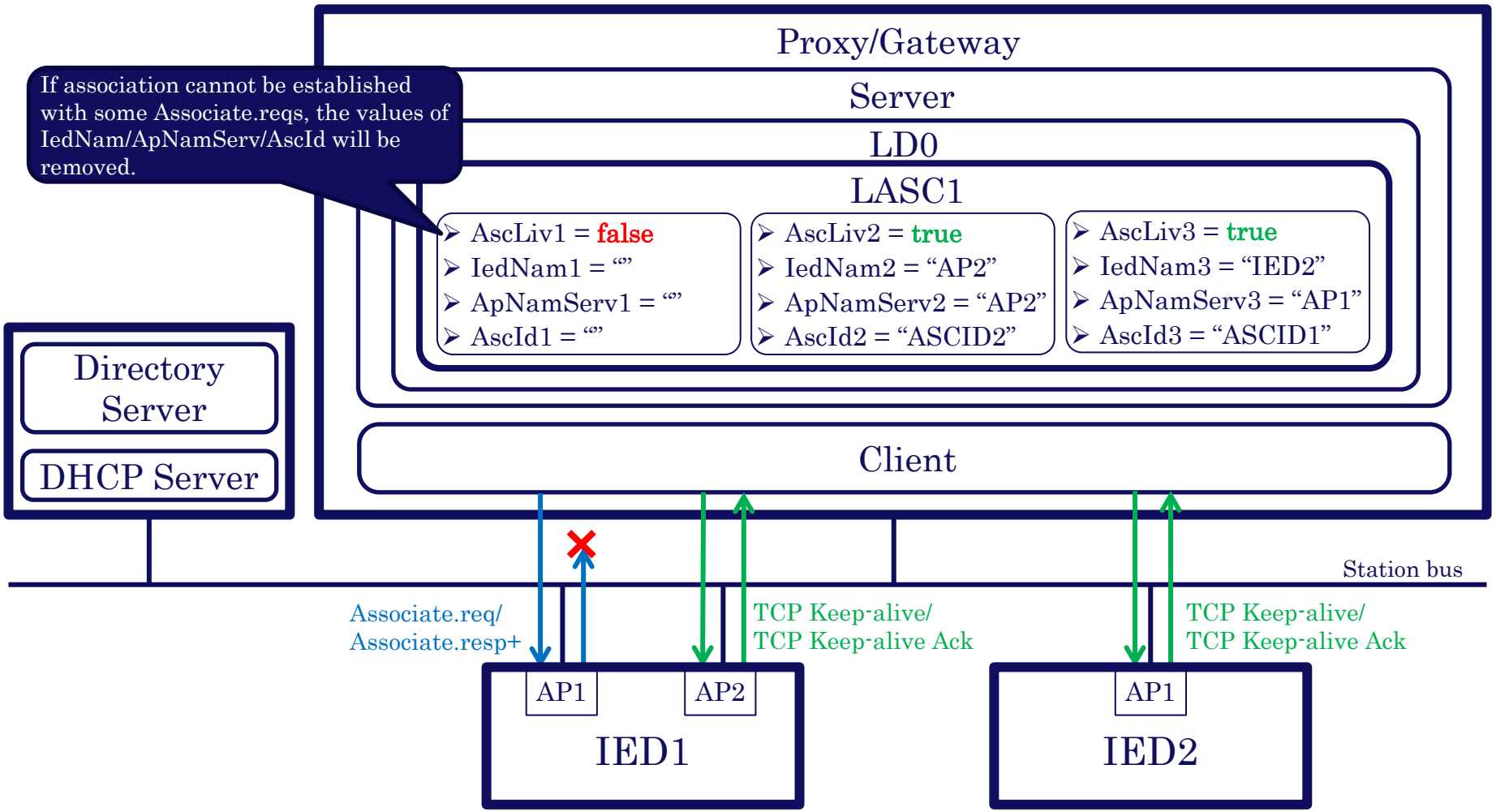
© CRIEPI 2021

Status: Associations established



Status: An association lost causing



© CRIEPI 2021

Status: An association reestablishing