

IEEE 802 Connectivity Fault Management / ITU-T Ethernet OAM Overview

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CFM and Ethernet OAM

- Parallel projects started in 2004 in IEEE 802.1 and ITU-T Q.3/13.
- Common membership, frequent liaison messages, and most importantly, **a will to cooperate**, between IEEE 802.1 and Q.3/13, resulted in compatible pair of standards.
- IEEE Std 802.1ag-2007 has since been integrated into IEEE 802.1Q-2011, (free from <http://standards.ieee.org/about/get/802/802.1.html>).
- ITU-T Y.1731(2007) is now ITU-T G.8031/Y.1731 (2013), (free from <http://www.itu.int/rec/T-REC-G.8013-201311-I/en>).

Principles of CFM/EtherOAM

1. Layering

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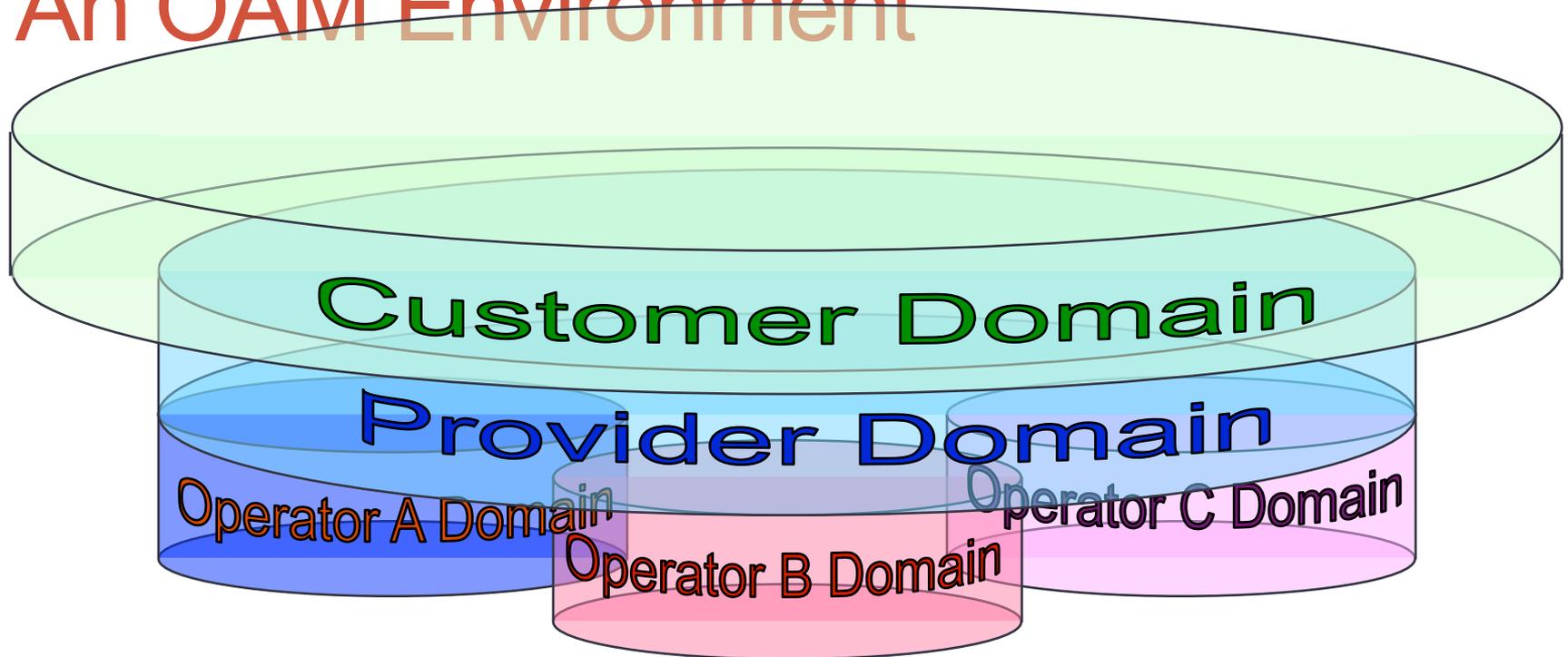
- Abstracted network view
- Information hiding
- Stepwise fault isolation
- Alarm indication and suppression

Principles of CFM/EtherOAM

1. Layering

- Abstracted network view
- Information hiding
- Stepwise fault isolation
- Alarm indication and suppression
- <end of list>

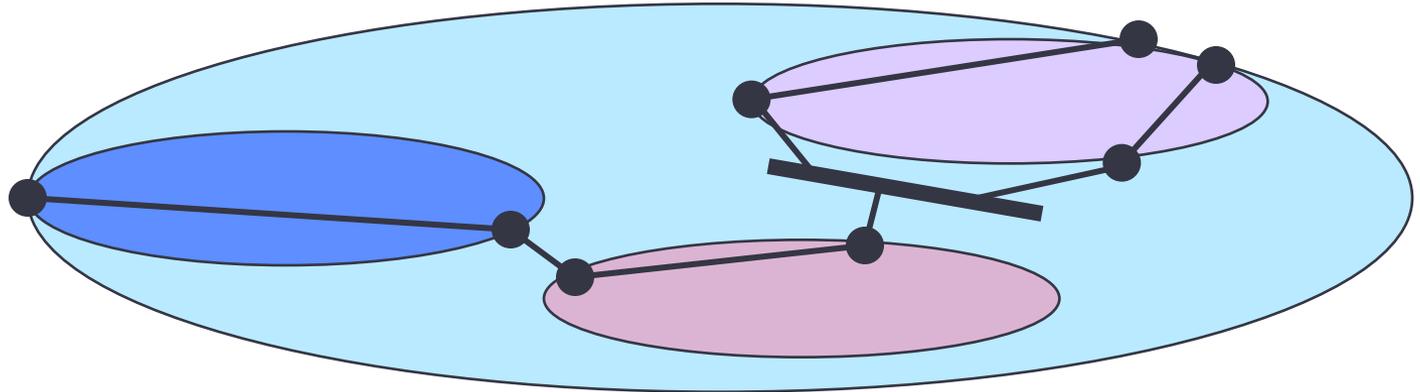
An OAM Environment



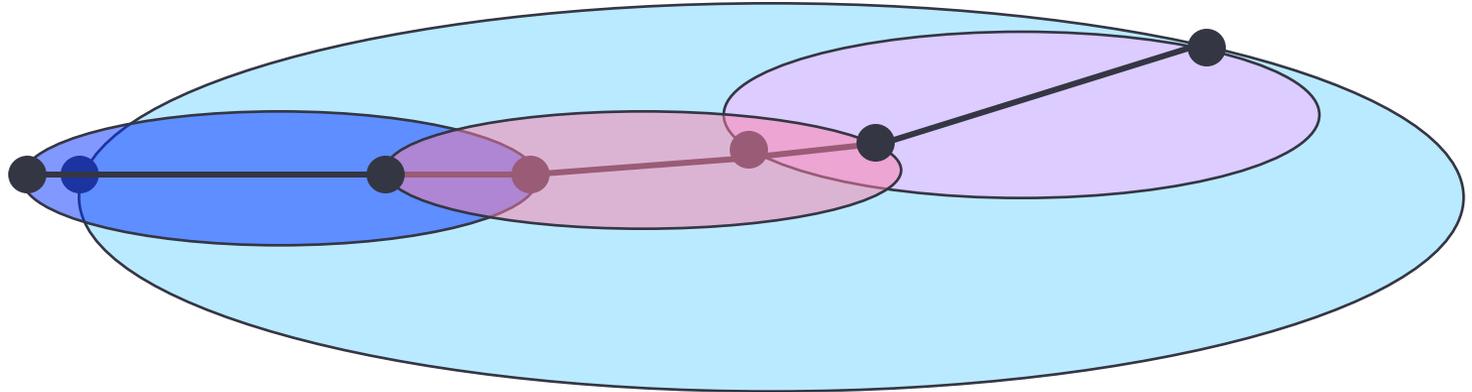
- Customer contracts with Provider for end-to-end service.
- Provider contracts with Operator(s) to provide equipment and networks.
- Provider and Operator(s) may or may not be the same company or same division.

OAM Domains

OK

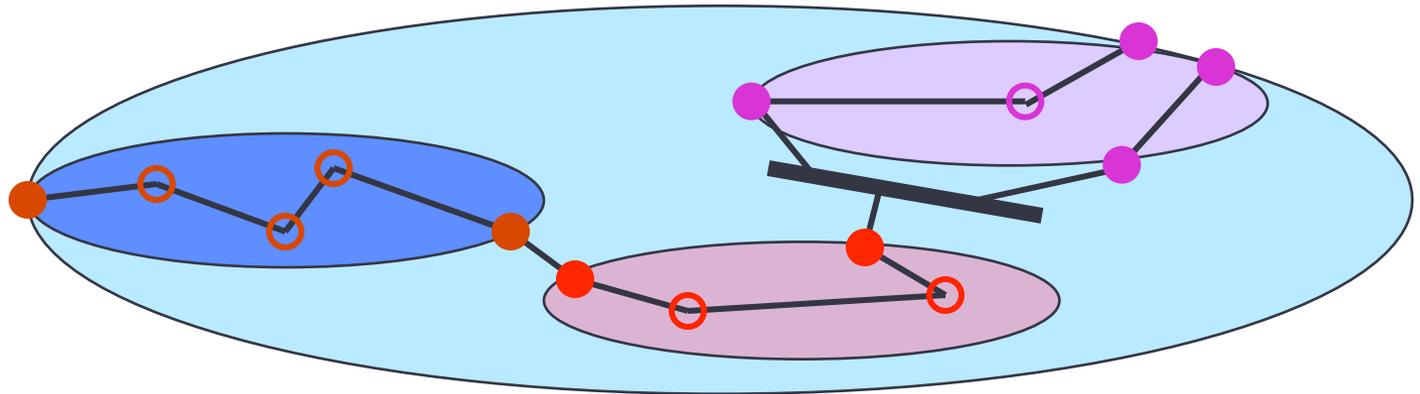


NO



- OAM Domains **may nest or touch**, but must **never intersect**.

OAM Domains



● ● ● Maintenance End Points ○ ○ ○ Intermediate Points

- Maintenance End Points (**MEPs**) are always at the **edges** of Domains.
- Maintenance Intermediate Points (**MIPs**) are always **within** domains.
- Each Level's MEPs are the next-higher-level's MEPs or MIPs.
- Each Level's MIPs are **invisible** to all higher levels.

Reference Diagram

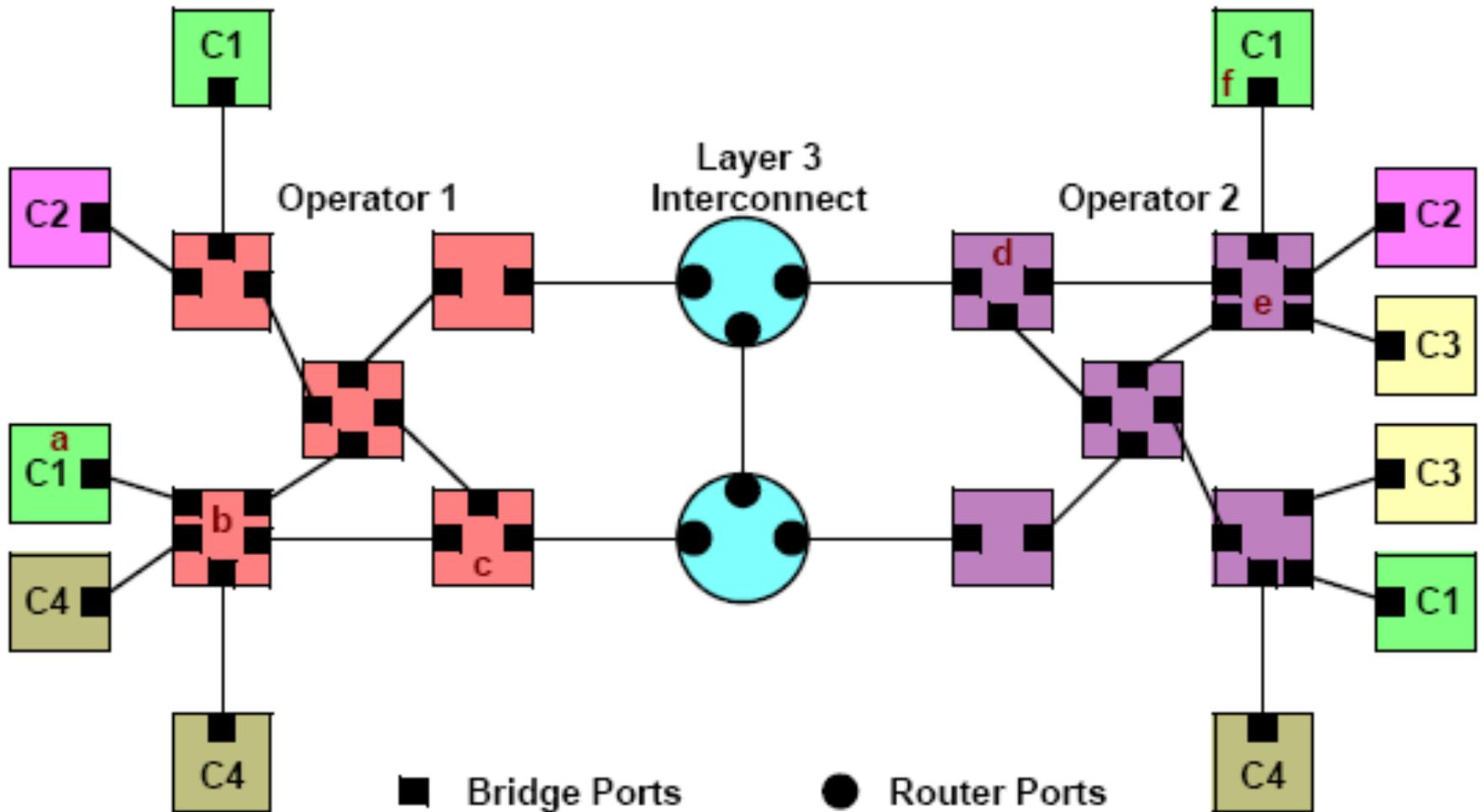


Figure 18-1—Reference Diagram: Provider Network with Four Customers

A Slice through Reference Diagram

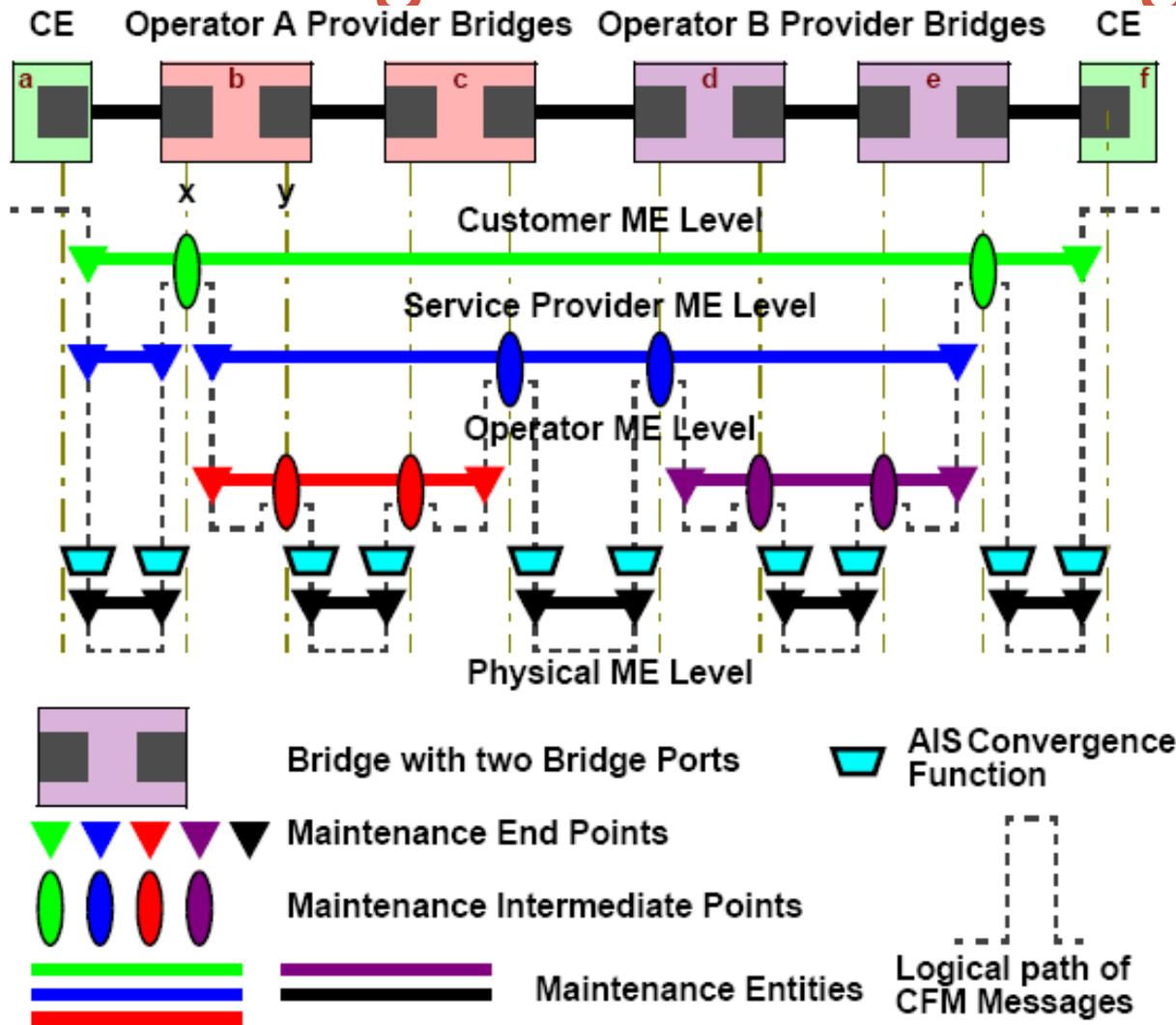


Figure 18-2—MEPs, MIPs, and ME Levels

Operator ME Level

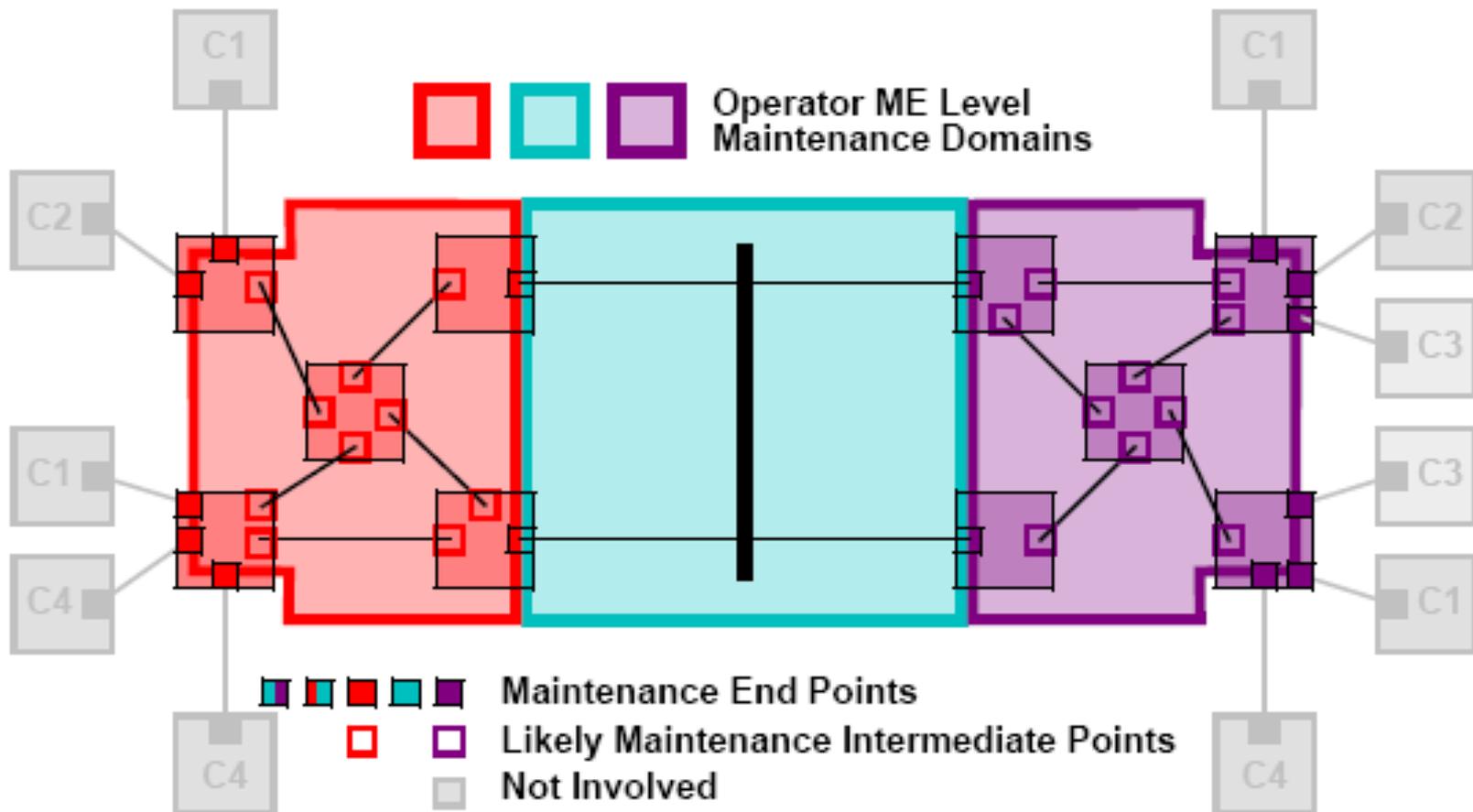


Figure 18-3—Operator Maintenance Domains in Provider Network with Four Customers

Provider ME Level

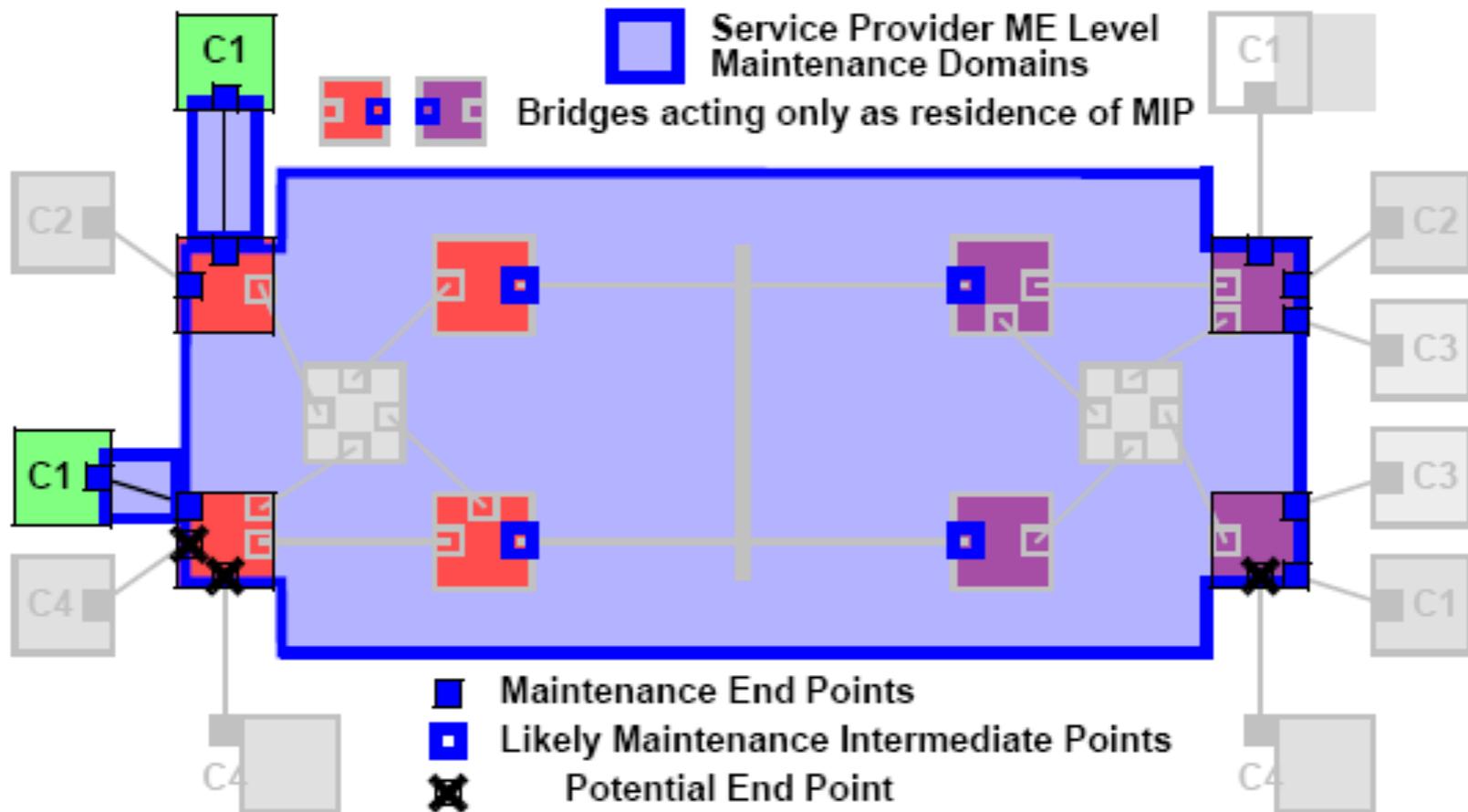


Figure 18-4—3 Service Provider Maintenance Domains Belonging to One Administration

Customer 1 ME Level

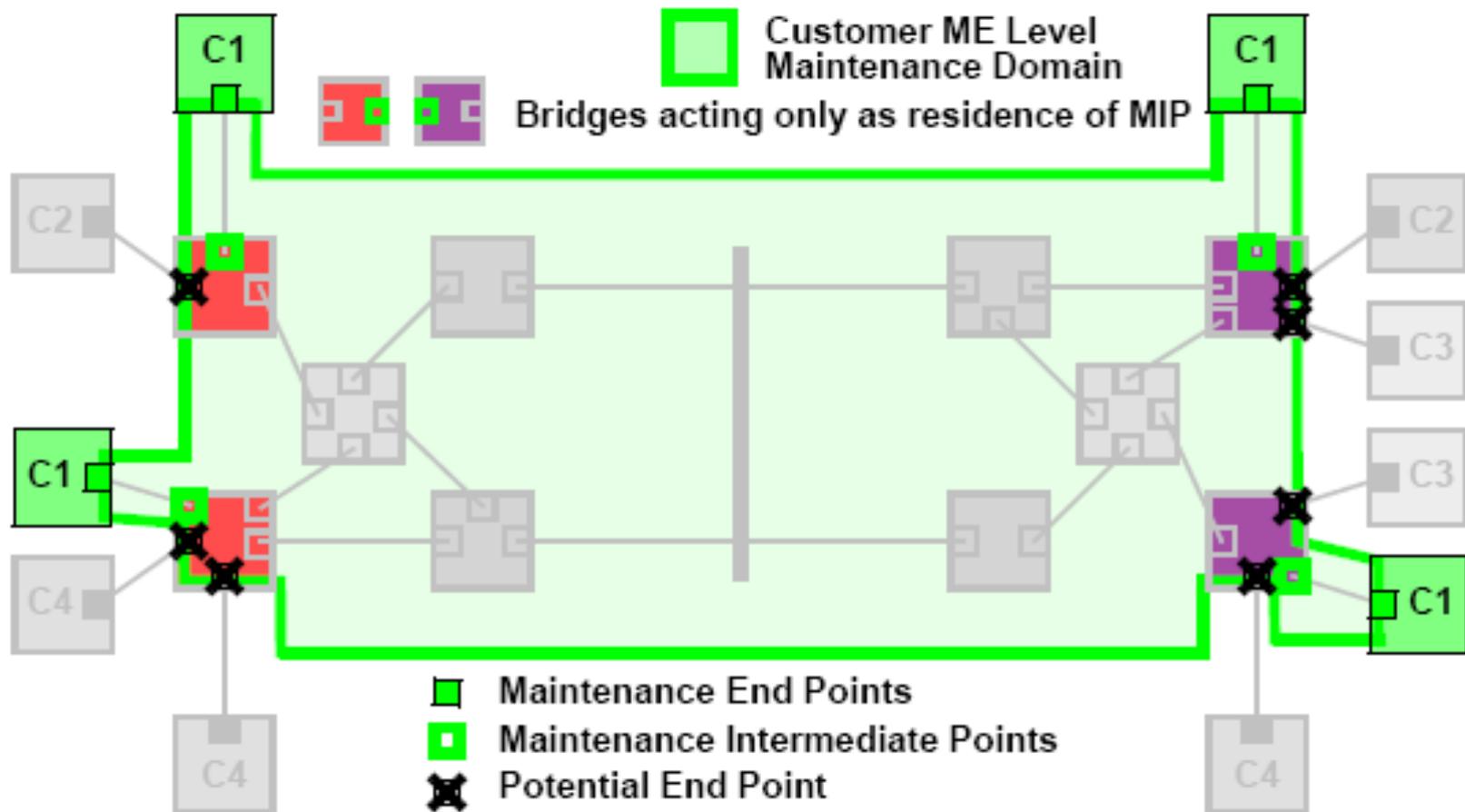


Figure 18-5—One Customer's Maintenance Domain

Abstracted network view

- All control is via MEPs. MEPs are at the edges. MEPs have state and capabilities. MEPs are configured.
- MIPs only respond to MEPs. MIPs have no state, and are created automatically.
- From your level's MEPs, you can see only the MIPs that the next-lower-level makes visible to you.

Information hiding

- From your level's MEPs, you can see only the MIPs that the next-lower-level makes visible to you.
- There may be lower-level MEPs just under your MEPs.
- The MIPs at your level correspond to MEPs at lower levels.
- The MEPs at your level correspond to MEPs or MIPs at the upper levels.
- **The “north-south” management plane interfaces make the level-to-level connections.**

Stepwise fault isolation

- You use the tools offered by your MEPs, at your level, to discover a fault and determine where the fault is relative to your MEPs and MIPs.
- You use the management plane to reach the next-lower level's MEPs.
- Assuming that you have the authority, you isolate the fault to that next-lower-level's MEPs and MIPs, and so on. If not, you notify your next-lower-level carrier of the problem.
- Note that the next-lower or next-higher level may not be Ethernet, and may not use CFM or Ethernet OAM.

Alarm indication and suppression

- A fault detected by the MEPs at a lower level can generate messages from the MIPs at the next-higher level indicating the fault. E.g. a hardware failure of a trunk can generate messages in all the tunnels, and then all the flows, using that trunk.
 - **Good news:** This can give the dependent flows an **early indication** that a fault at their level is imminent.
 - **Bad news:** This can generate a huge number of fault messages.
 - **Good news:** These messages can be used to **suppress** the huge number of **operator notifications** that would normally follow from the failure.