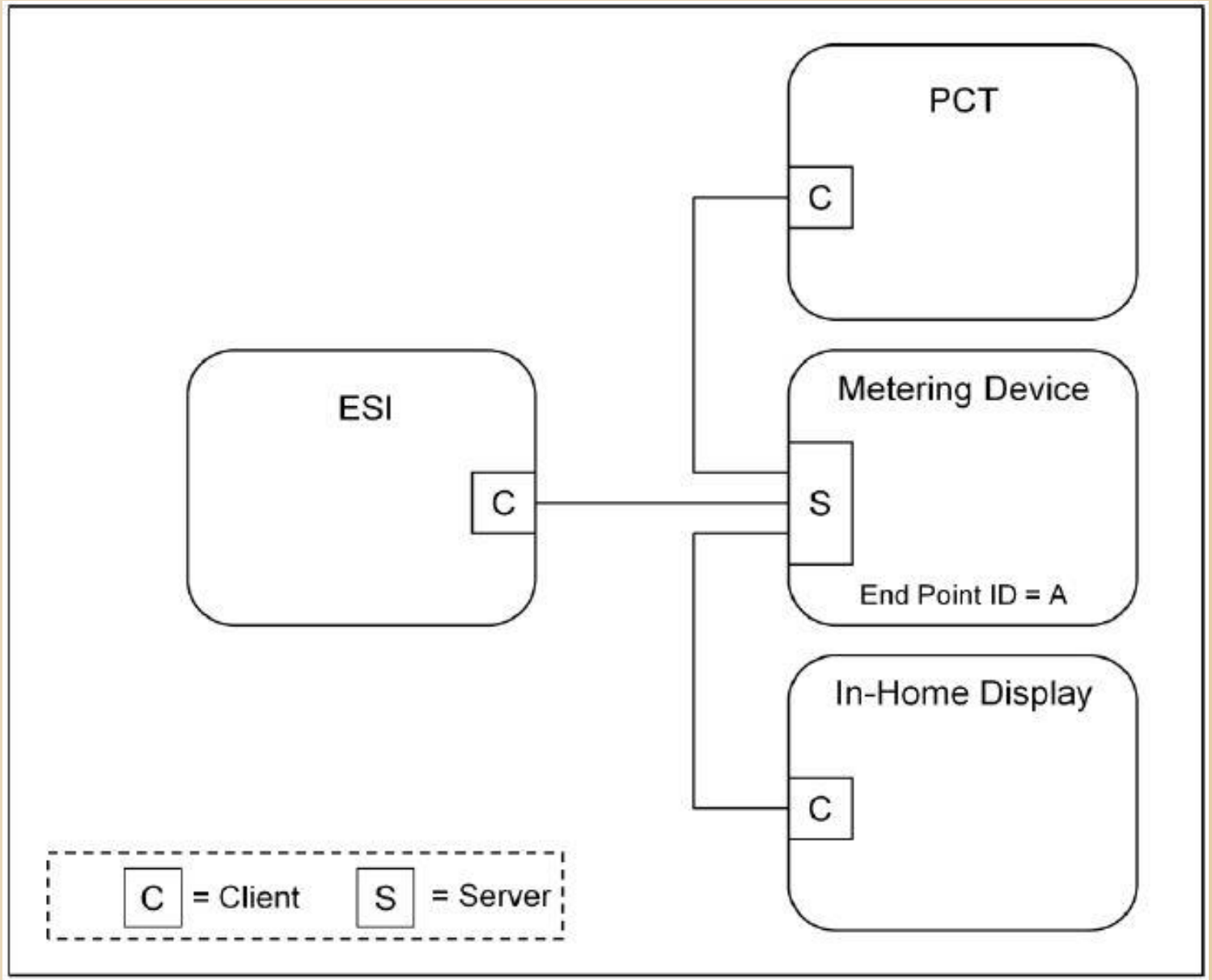
Metering Cluster

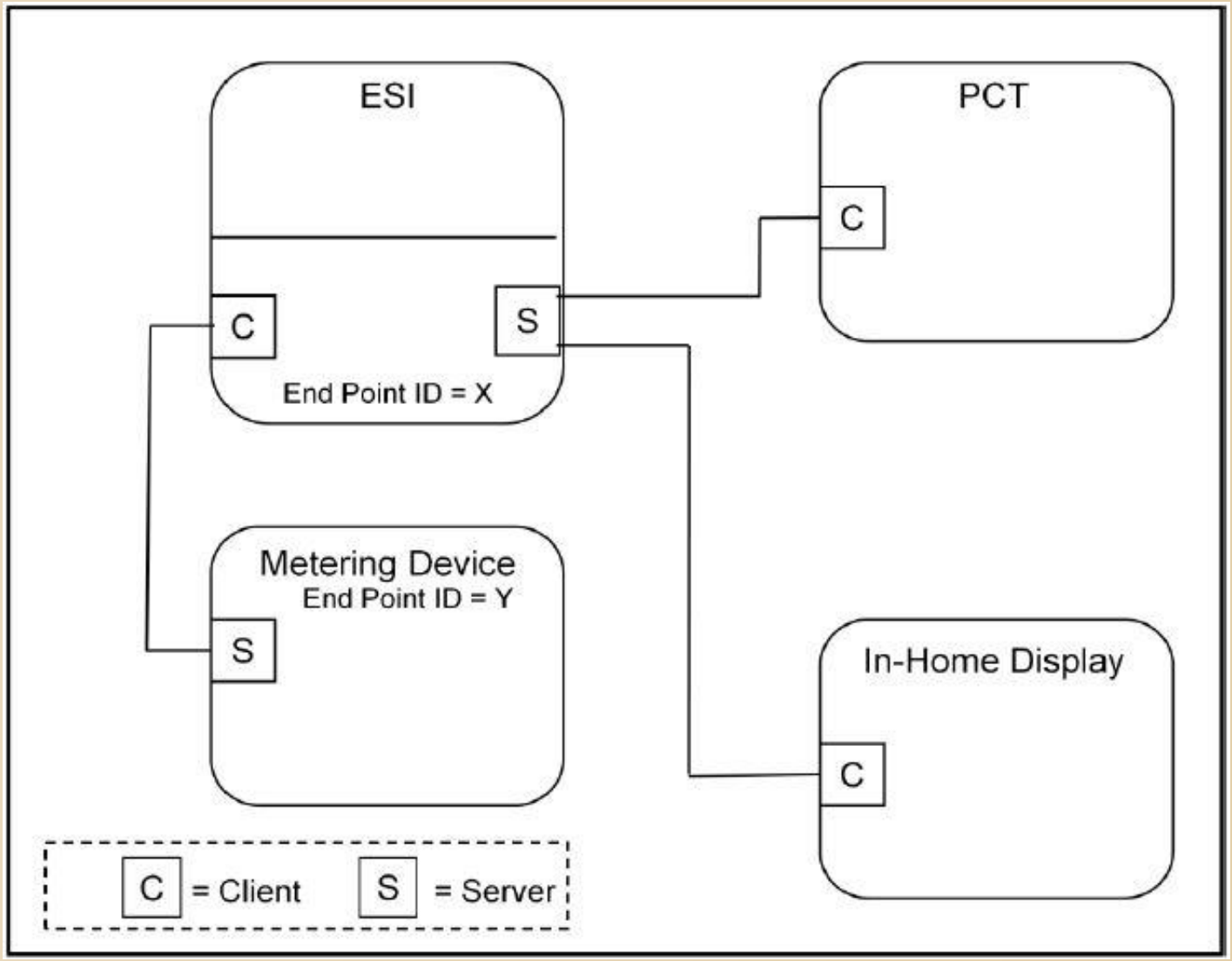
- **The Metering Cluster provides a mechanism to retrieve usage information from Electric, Gas, Water, and potentially Thermal metering devices.**

- **These devices can operate on either battery or mains power, and <u>can have a wide variety of sophistication.</u>**

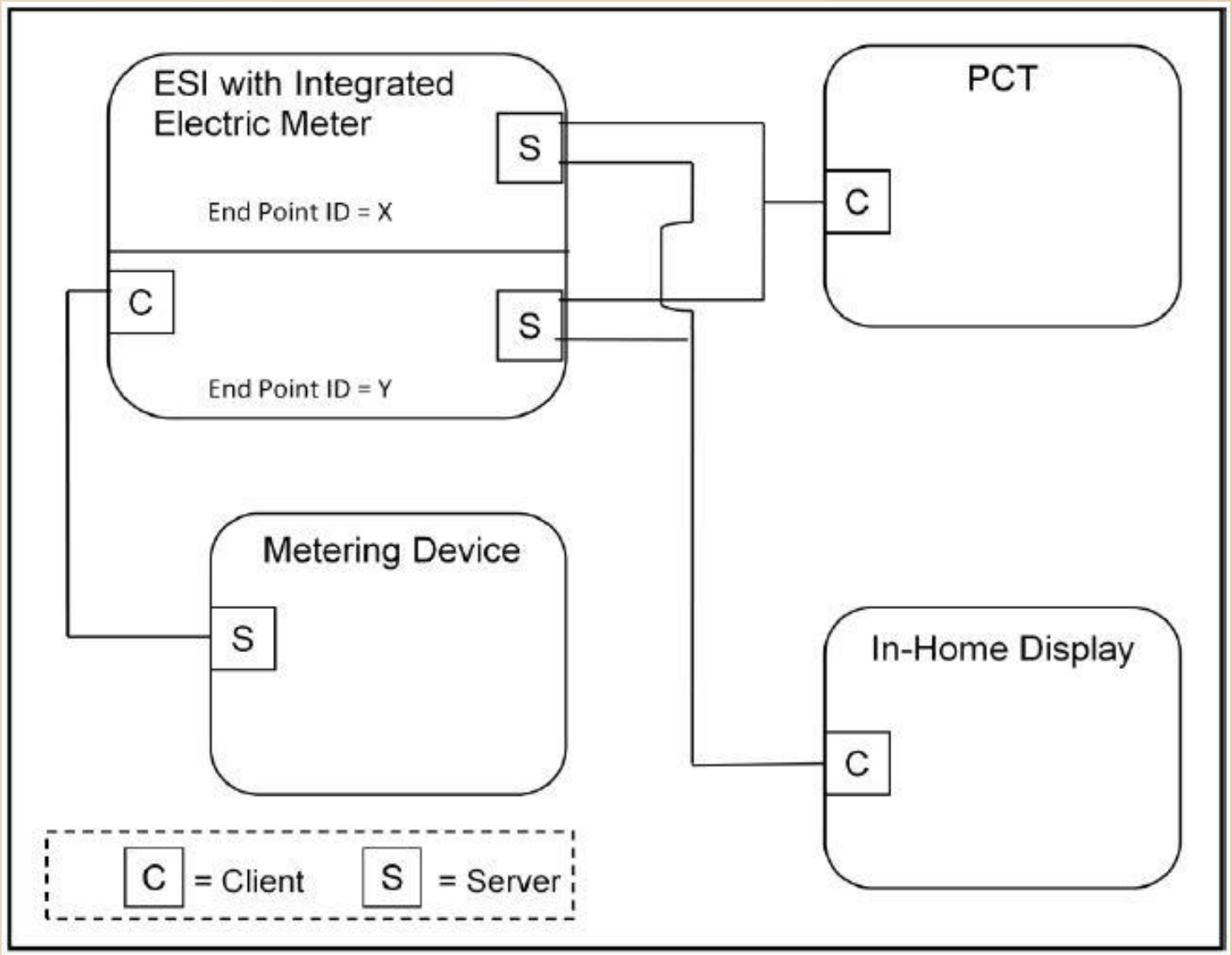
Standalone ESI Model with Mains Powered Metering Device



Standalone ESI Model with Battery Powered Metering Device



ESI Model with Integrated Metering Device



Mirroring

- The SE Profile specifies Mirror support in the Metering cluster to store and provide access to data from metering devices on battery power.
- Devices with resources to support mirroring advertise the capability using the Basic Attribute Physical Environment.

  - ✓ Mirror Discovery
  - ✓ Mirror Attributes
  - ✓ Two way Mirror for BOMD

Mirror Discovery

✓ The SE standard does not prescribe how Mirroring is implemented. Devices may query the Basic Cluster attribute *Physical Environment* to determine Mirrored device capacity prior to CBKE.

✓ Once a device has joined the network and performed CBKE, it can then request set-up of a mirrored metering cluster.

✓ ZDO Discovery should be supported to allow HAN devices to discover the mirror endpoints; only active mirror endpoints shall be discoverable.

✓ This process may need to be repeated in the case of a Trust Center swap-out

Mirror Attributes

✓The mandatory *Basic*, *Metering*, and (where applicable) *Prepayment* attributes shall be supported.

✓The Basic Cluster *Physical Environment* attribute shall be supported on ESI's supporting mirroring functionality; an enumerated value of 0x01 would indicate that the device has the capacity to mirror an end device; a value of 0x00 would specify an "Unspecified environment" per the ZCL specification.

✓Only the Basic cluster for devices capable of providing a mirror shall have the *Physical Environment* attribute set to 0x01.

✓The *ZCL Report Attribute* command shall be used to push data to the mirror. Only the metering device that has been granted a mirror on a certain endpoint is allowed to push data to that endpoint.

Server attributes

- ✓ The attributes defined in this specification are arranged into sets of related attributes.
- ✓ Each set can contain up to 256 attributes.
- ✓Attribute identifiers are encoded such that the most significant Octet specifies the attribute set and the least significant Octet specifies the attribute within the set.

Attribute Set Identifier	Description
0x00	Reading Information Set
0x01	TOU Information Set
0x02	Meter Status
0x03	Formatting
0x04	Historical Consumption
0x05	Load Profile Configuration
0x06	Supply Limit
0x07	Block Information (Delivered)
0x08	Alarms
0x09	Block Information (Received)
0x0A	Meter Billing Attribute Set
0x0B	Supply Control Attribute Set
0x0C	Alternative Historical Consumption
0x0D to 0xFF	Reserved

- ✓ *Current Summation Delivered (0x0000)*
- ✓ *Supply Status (0x0014)*
- ✓ *Current Tier N Summation Delivered N=1 to 48*
- ✓ *Status*
- ✓ *Remaining Battery Life in Days*
- ✓ *Current Meter ID*
- ✓ *Unit of Measure*
- ✓ *Multiplier*
- ✓ *Divisor*
- ✓ *Summation Formatting*
- ✓ *Metering Device Type*
- ✓ Supply Tamper State
- ✓ Supply Depletion State
- ✓ Current Tier Block N Summation Delivered
- ✓ Bill To Date Delivered
- ✓ Bill Delivered Trailing Digit
- ✓ Current Day Alternative Consumption Delivered
- ✓ Attribute Reporting Status (0xFFFE)

Server commands

Command Identifier Field Value	Description	Mandatory / Optional
0x00	*Get Profile Response*	O
0x01	*Request Mirror*	O
0x02	*Remove Mirror*	O
0x03	*Request Fast Poll Mode Response*	O
0x04	*ScheduleSnapshot Response*	O
0x05	*TakeSnapshotResponse*	O
0x06	*Publish Snapshot*	O
0x07	*GetSampledData Response*	O
0x08	*ConfigureMirror*	O
0x09	*ConfigureNotification Scheme*	O
0x0A	*ConfigureNotification Flag*	O
0x0B	*GetNotifiedMessage*	O
0x0C	*Supply Status Response*	O
0x0D	*StartSamplingResponse*	O
0x0E – 0xff	Reserved	

Client Commands

Attribute Set Identifier	Description
0x00	Notification Attribute Set
0x01 to 0xFF	Reserved

✓ The Notification Attribute Set is used to notify battery operated mirrored devices (BOMDs) that the ESI or other HAN device has pending information which should be fetched.

✓ Only clients on a mirror endpoint shall support this attribute set.

✓ When commands / attributes are received into the ESI from the HES or other HAN devices, the ESI will store the corresponding information and set the appropriate bits in the Notification Flag attributes (BitMaps).

✓ The ESI shall reset the bit as soon as a '*Get'* command with the corresponding message type is received and all commands of the appropriate type have been retrieved.

Notification Attribute Set

Identifier	Name	Type	Range
0x0000	FunctionalNotificationFlags	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0001	NotificationFlags2	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0002	NotificationFlags3	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0003	NotificationFlags4	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0004	NotificationFlags5	32 Bit BitMap	0x00000000 - 0xFFFFFFFF
0x0005	NotificationFlags6	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0006	NotificationFlags7	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0007	NotificationFlags8	32 bit BitMap	0x00000000 - 0xFFFFFFFF
0x0008 - 0x00FF	Reserved		

Client Commands

Command Identifier Field Value	Description	Mandatory / Optional
0x00	*Get Profile*	O
0x01	*Request Mirror Response*	O
0x02	*Mirror Removed*	O
0x03	*Request Fast Poll Mode*	O
0x04	*ScheduleSnapshot*	O
0x05	*TakeSnapshot*	O
0x06	*GetSnapshot*	O
0x07	*StartSampling*	O
0x08	*GetSampledData*	O
0x09	*MirrorReport AttributeResponse*	O
0x0A	*ResetLoadLimit Counter*	O
0x0B	*Change Supply*	O
0x0C	*Local Change Supply*	O
0x0D	*SetSupplyStatus*	O
0x0E	*SetUncontrolledFlowThreshold*	O
0x0F-0xFF	Reserved	

Metering Application Guidelines

- ✓ Attribute Reporting
- ✓ Fast Polling or Reporting for Monitoring Energy Savings
- ✓ Metering Data Updates
- ✓ Mirroring
- ✓ An Introduction to Snapshots
- ✓ Supply Control

Fast Polling or Reporting

✓ Client devices, such as an energy gateway, smart thermostat, or in-home displays can monitor changes to energy saving settings within the premises and give users near real time feedback and results.

✓ The Metering cluster can support this by using Attribute Reporting and sending updates at a much faster rate for a short period of time. Client devices can also perform a series of Attribute reads to accomplish the same task.

✓ In either case, requests or updates shall be limited to a maximum rate of once every two seconds for a maximum period of 15 minutes.

✓ These limitations are required to ensure Smart Energy profile based devices do not waste available bandwidth or prevent other operations within the premises.

Snapshot

✓ Where a permanent back-haul connection is not guaranteed, there are occasions when the values of data items need to be frozen for purposes such as consumer billing. The Snapshot mechanism is provided to satisfy this requirement.

✓ Snapshots can be triggered in a number of ways:-

- ✓ Automatically as a result of certain activities (e.g. end of billing period, change of tariff, change of supplier)
- ✓ At pre-defined points using the *ScheduleSnapshot* command (and confirmed via a *ScheduleSnapshotResponse* command)
- ✓ As a manual/one-off action using the *TakeSnapshot* command (and confirmed via a *TakeSnapshotResponse* command)

✓ A *Publish Snapshot* command should be generated whenever a new Snapshot is created. Details of stored Snapshots can be requested using the *GetSnapshot* command; the content(s) of the required Snapshot(s) will then be returned using one or more *Publish Snapshot* commands.

✓ It is recommended that Snapshot data is persisted across a reboot.

Supply Control

✓ The Supply Control functionality allows a Head-end System to remotely control the status of the valve or contactor within a meter.

- ✓ ON
- ✓ OFF
- ✓ ARMED