Layer 2 power management proposal

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Requirements of stateful management

State definitions

Should be small # of states

Power mode – consists of set of operating information

States define how to set or change power mode

Robust state change mechanism

Need to control state changes…

… and be sure of partner's state

Needs data transfer protocol

Prefer defined and well-known protocol

Compatibility or similarity to other standards (TR41) a plus

Should allow simplifications

Trade cost vs optimization

Communication protocol

802.3ah OAM

    Slow protocol frames

        Very small impact on data b/w

        Not forwarded by bridges

    Clause 57 definition

    Define a new OAMPDU code (Table 57-4)

    Allow reduced, passive function for PoE

Use a heart-beat communication mechanism…

    Periodically send state

    Mode change via request and acknowledge states

… supplemented with alarms for sudden changes

    Can speed emergency mode transitions (e.g. dying gasp)

How to use .3ah OAM

Normative references

- Require support for OAM (reduced minimum for PoE only)

- Define objects for power mode

- Define PDUs & codes for state communications

Also include informative

- Annex showing entire OAM frames for mode change communications

Other consideration

- Whether to allow operation using alternate state communication?

- MIB gives standardized external view of power mode & states

States & communication mechanism first priority

- Focus on states first – collect power mode objects later

Power mode objects (PSE & PD)

Some suggestions for discussion…

  Not necessary for state & communication definition

Power mode (actual and requested)

  actualPeakPower; actualAveragePower; remainingPowerMargin; requestedPeakPower; requestedAveragePower
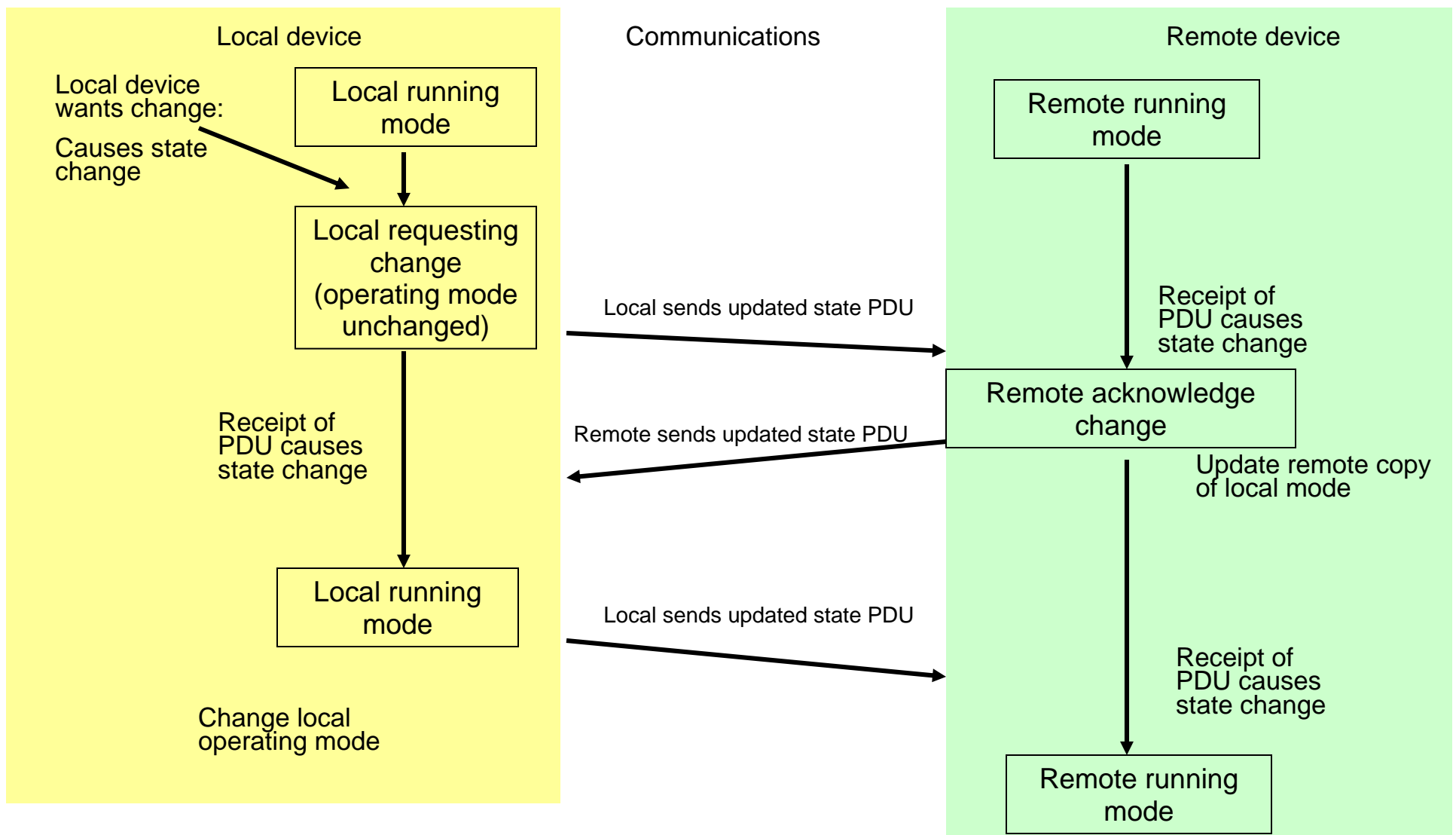
  (average could be defined as 10 second moving average)

  Other objects TBD; e.g. support for statistical oversubscription

Plus, of course state definitions PSE & PD

  State: running; requestingNewMode; aknowledgeChange – maybe some others

General state change procedure

Local device

Communications

Remote device

Local device wants change:

Causes state change

Local running mode

Local requesting change (operating mode unchanged)

Local sends updated state PDU

Receipt of PDU causes state change

Remote sends updated state PDU

Local running mode

Local sends updated state PDU

Change local operating mode

Remote running mode

Receipt of PDU causes state change

Remote acknowledge change

Update remote copy of local mode

Receipt of PDU causes state change

Remote running mode

Detailed state behavior (1)

Periodically send state summary PDU (constantly)

    i.e. once per second send PDU & process received

If in running state and remote state changes to requesting state

    Observe remote requestedPower objects

    Change to acknowledge or non-acknowledge state

    (depending on acceptance of change)

    If acknowledge, change local copy of remote requestedPower objects

    Send PDU reflecting new state

If remote state changes to running

    Change to running state

    Send PDU reflecting new state

Detailed state behavior (2)

If in running state and local device wishes to change

(most recent remote PDU indicates running state)

Set local requestedPower objects

Change to requesting state

Send PDU reflecting new state

If remote state changes to acknowledge

Change operating power mode; update local actualPower objects; change to running state

Send PDU reflecting new state

Else if remote state changes to non-acknowledge

Do not change operating power mode; change to running state

Send PDU reflecting new state

Detailed state behavior (3)

Collision event

> In requesting state, remote changes to requesting state
>
> Do not change operating power mode; change to running state
>
> PD waits before repeating request (PSE does not need to wait)

Initial state

> After power up, use L1 classification as first actualPower mode (both local and remote)

Loss of communication

> NB – L1 classification has precedence (for connect & disconnect)
>
> If PDU received after TBD time assume dead partner
>
> Procedure TBD if partner dead – to define explicitly for PSE & PD
>
> Also need behavior for unexpected state change

Persist or vacillate

State definitions require that each request must be acknowledged or denied before returning to running state

>> The requestor must not de-assert request until ack/non-ack

>> The partner must respond to request as soon as it is seen

The requestor may persist or vacillate after non-ack

>> Simply re-assert request – after TBD delay

>> Or decide not to persist

NB some offers cannot be refused!

>> PSE might withdraw power if necessary

More stuff…

Do we need a "deep sleep" mode

    PD does not communicate, maybe link down

    PSE allocates enough power to restart

Graceful power withdrawal

    PSE request change to 0 power

    Allows PD to indicate controlled power-down

Minimal PD behavior TBD – less than OAM slave definition

    No support for OAM = always stick in initial state

    (Equivalent to .3af for lower power)

    Only respond to OAM = request 1 operating mode & stick there

    (no possibility of PSE requested change)

Simplified PD behavior (i.e. < passive DTE)

Table 57–1 : Active and passive mode behaviour

Capability	Active DTE PSE	Passive DTE	PD
Initiates OAM Discovery process	Yes	No	No
Reacts to OAM Discovery process initiation	Yes	Yes	Yes
Required to send Information OAMPDUs	Yes	Yes	Yes
Permitted to send Event Notification OAMPDUs	Yes	Yes	Yes
Permitted to send Variable Request OAMPDUs	Yes	No	No
Permitted to send Variable Response OAMPDUs	Yes	Yes	Yes
Requires the peer DTE to be in Active mode	Yes	Yes	Yes
Permitted to send Loopback Control OAMPDUs	Yes	No	No
Reacts to Loopback Control OAMPDUs	Yes	Yes	**No**
Permitted to send Organization Specific OAMPDUs	Yes	Yes	Yes

Projected - PoE mode PDU frame

PDU frame – detailed contents (suggestion…)

Bytes	Content	Value	Description
6	MAC DA	01-80-C2-00-00-02	Slow protocols DA
6	MAC SA		Sender address
2	Ethertype	8809	Slow protocols type
1	subtype	03	OAM subtype
2	flags		See 57.4.2.1
1	code	10	PoE PDU (assuming just 1 new code)
2	state		State code
TBD	Power mode		Power mode objects TBD
40 - TBD	PAD		
4	FCS		

Next steps

Turn this into a complete normative definition

Not feasible in PowerPoint

Write informative descriptions of frames

Based on Clause 57

Make list & definitions for power mode objects

actualPeakPower; actualAveragePower; remainingPowerMargin; requestedPeakPower; requestedAveragePower

Address TBDs

Loss of communication (PSE & PD) behavior; deep sleep mode; simplified PD behavior; etc.

Questions…

… or comments