Echo frames new options

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New options

- Time tag optional fields
  - Add fields for round trip calculation between any two stations
  - Normative location, optional use
- Reply service class
  - Use reserved bits in *responseControl* Field to indicate desired service class for echo response
  - Add flexibility to echo request/response mechanism

Echo payload

D2.2

1	res	pm	rr
n	userData		

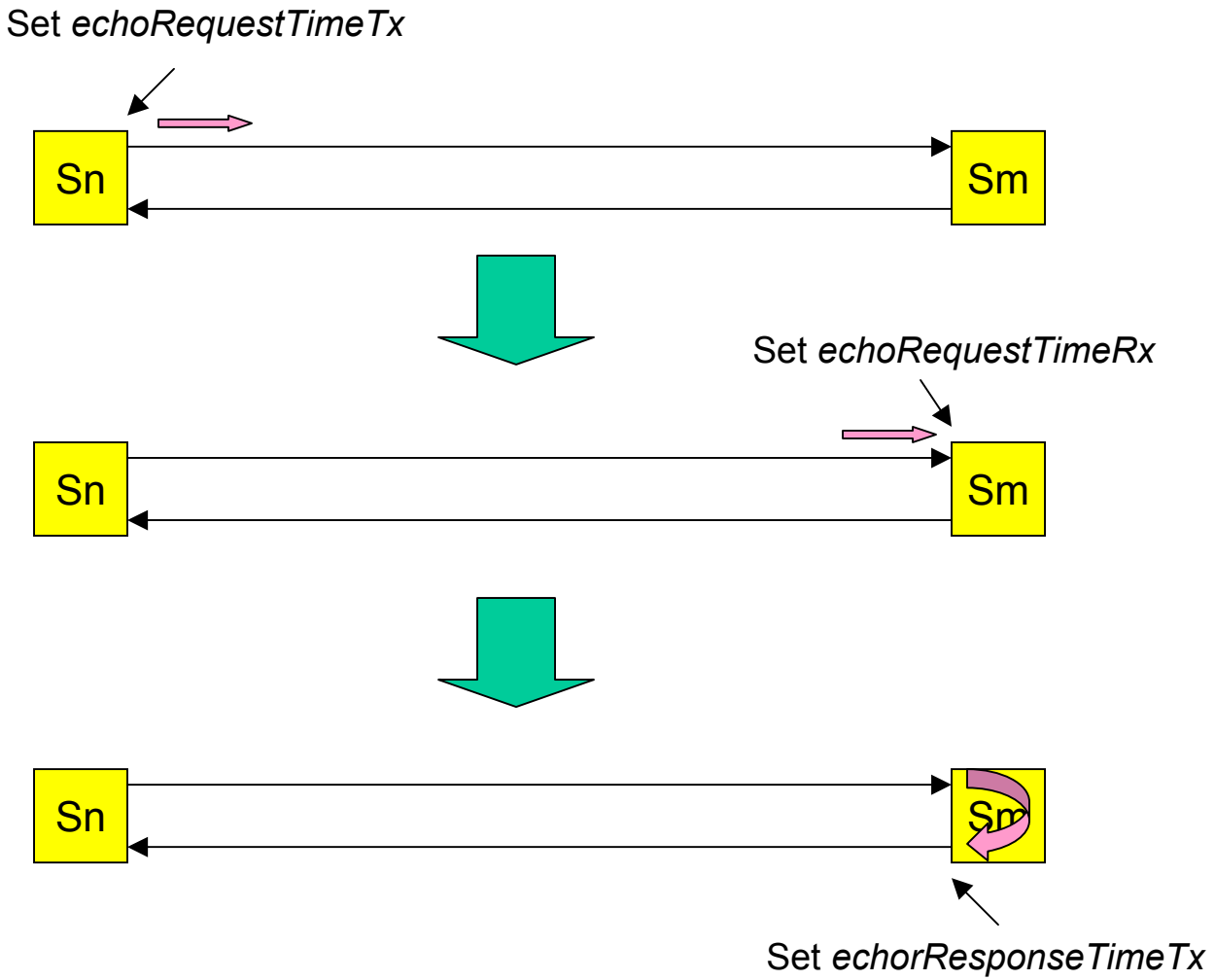
New

1	res	rsc	pm	rr
4	echoRequestTimeTx			
4	echoRequestTimeRx			
4	echoResponseTimeTx			
n	userData			

rsc field

- Response Service Class = *rsc*
- *rsc* coding same as *sc* in RPR frame format
- There are another 3 bits still reserved in the *responseControl* byte for future use

Timing tags


Set *echoRequestTimeTx*
Sn
Sm
Set *echoRequestTimeRx*
Sn
Sm
Sn
Sm
Set *echorResponseTimeTx*

Timing tags - example

- At echo request Tx
  - Sn timing counter = 367898
- At echo request Rx
  - Sm timing counter = 203
- At echo response Tx
  - Sm timing counter = 154907
- At echo response Rx
  - Sn timing counter = 5458909
- RTT[Sn-Sm] = 5458909 – 367898 –(154907 – 203) = 4936307
- Assuming link rate = 2.5G – RTT[Sn-Sm] ~ 1.97 msec

Round trip time

- No need to synchronize stations
- MAC will provide the 3 echo response tags + *echoReplyTimeRx* as optional parameters to client
- Echo request source calculates round trip time as follows:
  - RTT[Sn,Sm] = *echoReplyTimeRx* – *echoRequestTimeTx* – (*echoReplyTimeTx* – *echoRequestTimeRx*)
- Station sourcing echo request may set *echoRequestTimeTx* = 0 and ignore time tag fields
- Target station may not set *echoRequestTimeRx* and *echoresponseTimeTx,* in that case the round trip time will include the echo request/response processing time

Round trip time - issues

- Each MAC (implementing the round trip measurements) should have a 32 bit rolling counter for time stamps
- Counter rollover should be taken into consideration
- Counter frequency should be the same (nominal) between stations
  - Use link rate normalized by *rateCoef*
  - Counter will rollover once every ~1.7 seconds worst case (2.5G link rate)
  - Quantization error is ~7 nsec worst case (155M link rate)

Conclusions

- The *rsc* field will add flexibility to the echo scheme
- Timing tags provide a mechanism to measure round trip time between any two stations
  - Stations not implementing the tags may ignore them.
- Comments against D2.2 have been sent