Physical

Service ¶

PHYSICAL (javadoc/org/arl/unet/Services.html#PHYSICAL) – Physical service

Agents offering the *Physical* service are most commonly modem drivers or simulators. They support a set of messages and parameters that are explained below. *Physical* service providers may also provide optional capabilities to send frames triggered at a specified time, or send timestamped frames where the timestamp is embedded in the transmitted frame.

Caution

Agents implementing the `PHYSICAL` service typically directly access the channel, bypassing any medium access protocol that may be in use in the network. It is highly recommended that clients wishing to use the `PHYSICAL` service consult with the Medium Access Control (svc-21-mac.html#macsvc) (MAC) service for advise on when it is safe to access the channel, so as not to adversely affect the network performance.

Capability	Description
TIMESTAMPED_TX (javadoc/org/arl/unet/phy/PhysicalCapability.html#TIMESTAMPED_TX)	Transmissions with timestamp encapsulated in frame
TIMED_TX (javadoc/org/arl/unet/phy/PhysicalCapability.html#TIMED_TX)	Transmissions of frames at specified time

All agents supporting this service also support the Datagram (svc-02-datagram.html#svcdatagram) service.

Implementations

- HalfDuplexModem (javadoc/org/arl/unet/sim/HalfDuplexModem.html) – simulates a half-duplex modem based on specified parameters
- `org.arl.modem.Physical` – driver for the ARL/Subnero generation 2 modems (modems.html)
- `org.arl.yoda.Physical` – driver for the ARL/Subnero generation 3 modems (modems.html)
- `org.arl.modem.evologics.EvoPhysical` – driver for the Evologics S2C modem

Requests and Responses

Request	Possible Responses	Description
DatagramReq (javadoc/org/arl/unet/DatagramReq.html)	AGREE, REFUSE, FAILURE	Transmit a physical layer frame
TxFrameReq (javadoc/org/arl/unet/phy/TxFrameReq.html)	AGREE, REFUSE, FAILURE	Transmit a physical layer frame
TxRawFrameReq (javadoc/org/arl/unet/phy/TxRawFrameReq.html)	AGREE, REFUSE, FAILURE	Transmit a physical layer frame without headers
ClearReq (javadoc/org/arl/unet/ClearReq.html)	AGREE, FAILURE	Abort all transmissions/receptions
ParameterReq (javadoc/org/arl/unet/ParameterReq.html)	ParameterRsp (javadoc/org/arl/unet/ParameterRsp.html)	Get/set/list parameters
CapabilityReq (javadoc/org/arl/unet/CapabilityReq.html)	CONFIRM, DISCONFIRM, CapabilityListRsp (javadoc/org/arl/unet/CapabilityListRsp.html)	Check/list capabilities

Notifications

Notification	Topic	Description
RxFrameNtf (javadoc/org/arl/unet/phy/RxFrameNtf.html)	default	Frame addressed to node arrived
RxFrameNtf (javadoc/org/arl/unet/phy/RxFrameNtf.html)	SNOOP (javadoc/org/arl/unet/phy/Physical.html#SNOOP)	Frame addressed to another node overheard

Notification	Topic	Description
RxFrameStartNtf (javadoc/org/arl/unet/phy/RxFrameStartNtf.html)	default	Frame reception has started
BadFrameNtf (javadoc/org/arl/unet/phy/BadFrameNtf.html)	default	Received frame could not be successfully decoded
CollisionNtf (javadoc/org/arl/unet/phy/CollisionNtf.html)	default	Frame detected during reception of another frame
ParamChangeNtf (javadoc/org/arl/unet/ParamChangeNtf.html)	PARAMCHANGE (javadoc/org/arl/unet/Topics.html#PARAMCHANGE)	Notification about the modified parameter

Tip

`TxFrameReq` extends the more generic `DatagramReq` and offers additional physical layer options. Similarly, `RxFrameNtf` extends `DatagramNtf` and provides additional information for physical layer frames.

Parameters

Parameter	r/w	Description
rxEnable (javadoc/org/arl/unet/phy/PhysicalParam.html#rxEnable)	rw	True if reception is enabled, false otherwise
propagationSpeed (javadoc/org/arl/unet/phy/PhysicalParam.html#propagationSpeed)	rw	Signal propagation speed in m/s
timestampedTxDelay (javadoc/org/arl/unet/phy/PhysicalParam.html#timestampedTxDelay)	rw	Delay in seconds to transmit timestamped frames
time (javadoc/org/arl/unet/phy/PhysicalParam.html#time)	ro	Current physical layer clock time in µs
busy (javadoc/org/arl/unet/phy/PhysicalParam.html#busy)	ro	True if modem is busy transmitting/receiving, false if modem is idle
refPowerLevel (javadoc/org/arl/unet/phy/PhysicalParam.html#refPowerLevel)	ro	Reference power level in dB
maxPowerLevel (javadoc/org/arl/unet/phy/PhysicalParam.html#maxPowerLevel)	ro	Maximum allowable transmission power in dB
minPowerLevel (javadoc/org/arl/unet/phy/PhysicalParam.html#minPowerLevel)	ro	Minimum allowable transmission power in dB

Tip

All physical layer timestamps are in µs as per the clock provided by the `time` parameter. This clock is generally not synchronized with the agent's own clock.

Indexed Parameters

Index range: { CONTROL (javadoc/org/arl/unet/phy/Physical.html#CONTROL), DATA (javadoc/org/arl/unet/phy/Physical.html#DATA) }

Parameter	r/w	Description
MTU (javadoc/org/arl/unet/DatagramParam.html#MTU)	ro	Maximum frame size in bytes
frameDuration (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#frameDuration)	ro	Frame duration in seconds
powerLevel (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#powerLevel)	rw	Transmission power level in dB
errorDetection (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#errorDetection)	rw	Number of bytes used for error detection (CRC/Checksum)

Parameter	r/w	Description
frameLength (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#frameLength)	rw	Frame length in bytes (if modem supports variable frame size)
maxFrameLength (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#maxFrameLength)	ro	Maximum allowable frame length in bytes
fec (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#fec)	rw	Foward error correction (FEC) code (0 = none/default, otherwise 1-base index in fecList (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#fecList))
fecList (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#fecList)	ro	List of available FEC codes in increasing order of robustness (can be null if no FEC change supported)
dataRate (javadoc/org/arl/unet/phy/PhysicalChannelParam.html#dataRate)	ro	Effective data rate in bits/second

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