

On Some Unspecified Aspects of Redriver Simulations in IBIS-AMI

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Outline



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Concerns

Standard should include matrix-like tables with clearly-defined functions to elaborate on the combinations of analytically/statistically or empirically enabled AMIs.

Rationale: Unspecified corners could either be turned into reasonable specifications or be explicitly labeled as unspecified. Secondly, standard will become clearer to understand for at least some of us.

In dual-mode, i.e. when both impulse response (IR) and wave are utilized under empirical signaling, analytically-capable redriver AMIs that have approximate IR should be utilized in a complete upstream IR for the RX AMI.

Rationale: Enable a dual-mode capable RX AMI lock or settle its EQ adaptation with a lot fewer ignore bits. Secondly, reward redriver vendors who have done the extra analytical work.

Solution Proposal - Definitions

Symbol or Function	Definition
IRpostch	Post-channel IR
IRprech	Pre-channel IR
AMlredRX(arg)	Analytical/AMI_Init modification of argument IR by redriver RX, identity operator if either redriver RX AMI or its returned IR does not exist
AMlredTX(arg)	Analytical/AMI_Init modification of argument IR by redriver TX, identity operator if either redriver TX AMI or its returned IR does not exist
AMlredTXRX(arg)	Analytical/AMI_Init modification of argument IR by combined redriver TX-RX, identity operator if either redriver TX-RX AMI or its returned IR does not exist
AMITX(arg)	Analytical/AMI_Init modification of argument IR by redriver TX, identity operator if either TX AMI or its return IR does not exist
IRredRXin	IRprech or AMITX(IRprech) if TX AMI and its returned IR exist

Solution Proposal – Matrix-like Table

Scenario	Pre-channel	Post-channel	Input IR to Redriver RX	Input IR to Redriver TX or TX-RX	Upstream IR for RX
Redriver RX has GetWave/empirical Redriver TX has GetWave/empirical	Original/no change	Original/no change	IRredRXin	IRpostch	AMlredTX(IRpostch) ⊗ AMlRedRX(IRredRXin)
Redriver RX has no GetWave/empirical Redriver TX has no GetWave/empirical	AMlredRX(IRredRXin)	AMlredTX(IRpostch)	IRredRXin	IRpostch	AMlredTX(IRpostch) ⊗ AMlRedRX(IRredRXin)
Redriver RX has no GetWave/empirical Redriver TX has GetWave/empirical	AMlredRX(IRredRXin)	Original/no change	IRredRXin	IRpostch	AMlredTX(IRpostch) ⊗ AMlredRX(IRredRXin)
Redriver RX has GetWave/empirical Redriver TX has no GetWave/empirical	Original/no change	AMlredTX(IRpostch)	IRredRXin	IRpostch	AMlredTX(IRpostch) ⊗ AMlredRX(IRredRXin)
Combined redriver RX-TX has GetWave/empirical	Original/no change	Original/no change	NA	IRpostch	AMlredTXRX(IRpostch) ⊗ IRredRXin
Combined redriver RX-TX has no GetWave/empirical	Original/no change	Original/no change	NA	IRpostch	AMlredTXRX(IRpostch) ⊗ IRredRXin

Discussion 1/2

What is proposed here is a set of imperfect definitions but these are improvements over the status quo and can be updated more readily

You may have different/better ideas about input redriver RX, etc., which can be discussed more readily with such definitions as well

Should the standard discourage combined redriver TX-RX?

- No way dual or statistical mode can EQ-adapt perfectly as only one impulse response is available while there are two sides!

Discussion 2/2

- One proposal tries to fix the redriver RX EQ problem with an extra column to specify post-channel IR to RX AMI Init. (That could also help combined redriver but see the trade-off below.) It also tries to clarify the TX-only AMI-Getwave case to include the RX-AMI IR impact. **The second one is akin to handling analytical-only AMI in redriver AMI pair, which should indeed be in the standard.**
- Another presentation discusses the problem with defining an upstream impulse response in the presence of a redriver when redriver RX has a DFE.
- Some considerations for these two:
 - Tradeoffs between #1 real redriver cost & complexity, #2 why redriver modeling exists in the first place, and #3 standard conformance complexity
 - Real-world focus of redriver modeling would be their nonlinearity, i.e., empirical signaling.
 - As such, the main point of analytical upstream IR for RX is only to decrease the number of ignore bits; and it can be imperfect.
 - If it can be imperfect, is modifying the whole standard with additional IR column worth it?
 - If a redriver RX has DFE (putting aside the current power/cost constraints), it would follow it knows how to recover clock; and by that time, it is a retimer!
 - Retimer problems can be studied in two pieces and could be considered lower priority by some for that reason alone.

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