DTE Power over MDI:
Discovery process proposal

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Scenarios

- No Cable: No Cable connecting Power Source and DTE
- X Cable, No PSR: Cross Cable, No **P**ower **S**upply **R**equired
- X Cable, No PSR DTE off: Cross Cable, Remote DTE Powered off
- X Cable, PSR: Cross Cable, **P**ower **S**upply **R**equired
- Cable, No PSR: Normal Cable, No **P**ower **S**upply **R**equired
- Cable, No PSR, DTE off: Normal Cable, Remote DTE Powered off
- Cable, PSR: Normal Cable, **P**ower **S**upply **R**equired
- Loop Back: A connection between each wire of TX and RX of pair 1
  and   2, and connection between discrete wire of pairs 3 and 4
- Full Short: Connections between all 8 wires
- Partial Short: Connection between a few of the 8 wires in any
  combination
- Legacy: Connection from a legacy device PSR device
- Power Hub: Connection from a powering device to another powering
  device

- Random Plug: Randomly plugs or unplugs during operation

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TDK PHY Discovery Process
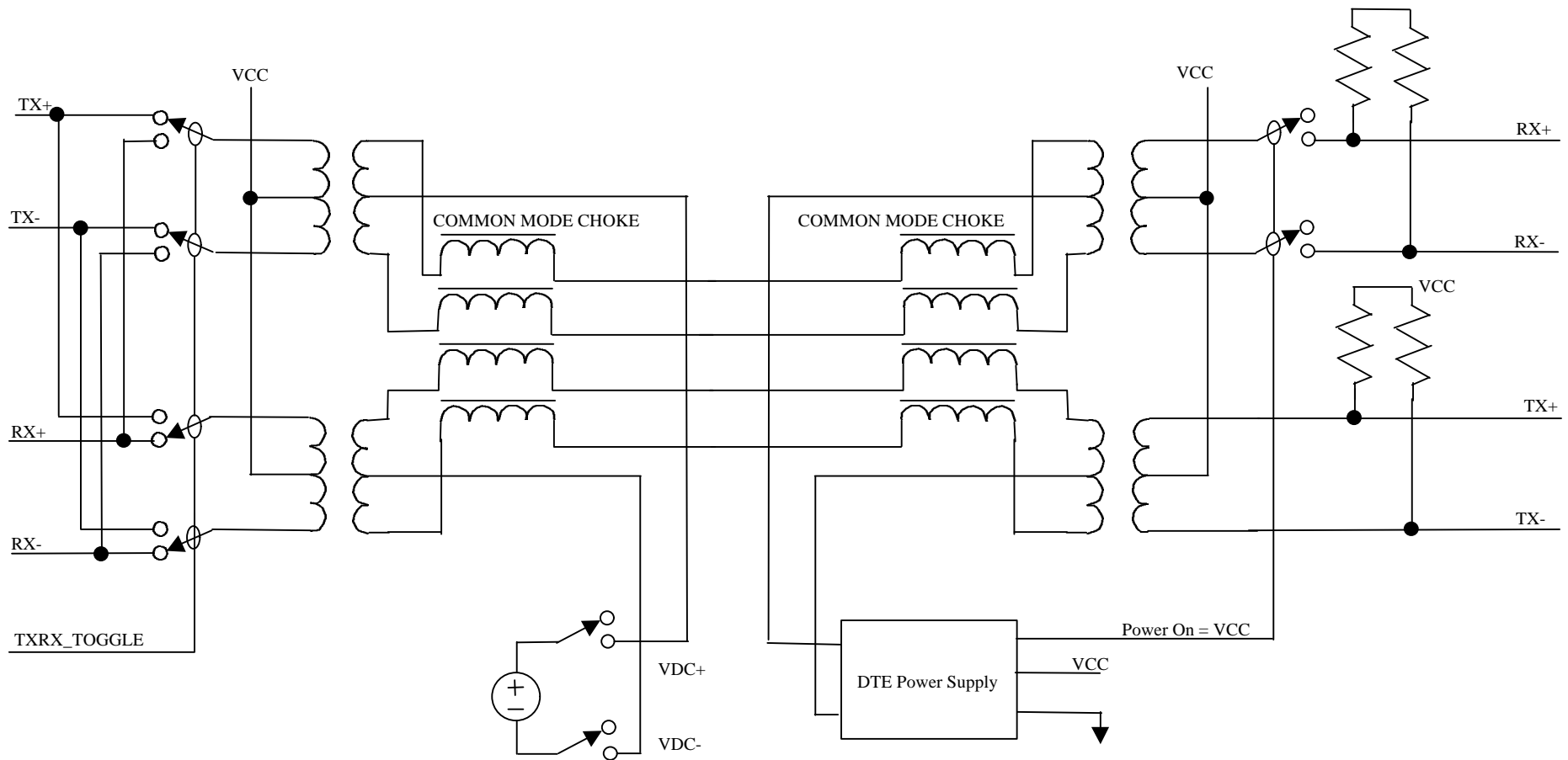
Overview

Architecture:

- Transmitter on the Power Source side transmits link pulses and monitors levels of the differential levels across the TX pair
- Receiver monitors for link pulses as per usual

Startup:

- TXRX_Toggle reset
- Transmit link pulse and monitor for level
- TXRX_Toggle set
- Transmit link pulse and monitor for level

Results

- No Cable:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	High	N/A
1	High	N/A

- X Cable, No PSR:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal	Normal / Async
1	Normal / Async	N/A

- X Cable, No PSR, DTE Off:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal	N/A
1	Normal	N/A

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Results

- X Cable, PSR:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	High	N/A
1	Normal	N/A

- Cable, No PSR:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal / Async	N/A
1	Normal	Normal / Async

- Cable, No PSR, DTE off:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal	N/A
1	Normal	N/A

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Results

- Cable, PSR:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal	N/A
1	High	N/A

- Loop Back:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal	Normal / Sync
1	Normal	Normal / Sync

- Full Short:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Low / Ref	Low / Sync
1	Low / Ref	Low / Sync

Results

- Partial Short :

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	?	?
1	?	?

- Legacy:

Cable	TX differential amplitude	RX differential amplitude
Cross	N/A	N/A
Straight	N/A	N/A

- Power Hub:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal /Async*	Normal /Async*
1	Normal /Async*	Normal / Async*

* Not deterministic due to asynchronous switching on each side

Results

- Random Plug:

TXRX_Toggle	TX differential amplitude	RX differential amplitude
0	Normal Startup & Operation	Normal Startup & Operation
1	Normal Startup & Operation	Normal Startup & Operation

Conclusions

- Can uniquely identify (and report via management interface) the following line conditions:
    - No Cable
    - X Cable & Straight Cable for Non PSR Devices
    - X Cable & Straight Cable for PSR Devices
    - Loop Back
    - Full Short and Partial Shorts (Line Fault)
    - Power Source to Power Source (Power Hub)
- Can Identify but can not distinguish:
    - X and nonX, with no PSR, DTE off
- Legacy to PSR Device OK
- Random Plug OK
- This can be built and bench tested now with today's silicon
- The TXRX_Toggle function can be implemented in silicon. Receive and Transmit amplitude measurement represent a minor change to silicon and can be implemented using MDIX technology
- Does not require filters to added to the powered device
- Architecture is relatively insensitive to cable attenuation differences
- Does not require changes to IEEE 802.3 section 14 or 28 to implement

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