

# Energy Efficient Ethernet and 802.1

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# High level overview

- **We're looking at a couple of ways to operate PHYs in low power modes**
  - Don't want to get into the details of either approach here
  - Do have a lot of questions for you ...

# Questions - 1

- **in one of the proposals being considered, there is a sensitivity to IPG on the operation in EEE mode. To mitigate, a buffer and burst approach can be used. To what extentant in your markets / applications, would this be an issue with respect to**
  - traffic mishshaping
  - impact on congestion
  - impact on QoS
  - jitter increase and variation
  - implementation of a buffer flush to deal with orphan packets when traffic is extremely low at the lower layers
- **we would like to discuss the impact of EEE on command-reasponse type protocols**
- **at our last interaction, you expressed a preference for a short transition time in the order of usecs. Is there any preference and/or implication of having this negotiated and to what extent can you tolerate variance.**
- **can you give us a better feeling for the market size of data center, avb and switch to switch markets**
- **following up to the above, what percentage is latency sensitive, has cbr type traffic and/or both. How much buffering can you deal with for each on a per hop and an end-to-end basis**
- **asymmetry: assuming the phy and/or mac can do asymmetric operation. Do you have any concerns with a link that can operate in an asymmetric fashion during EEE**
- **do you have any traffic models you can share with us?**

# Questions - 2

- **DATA-CENTER:**
- **What is the IPG Length probability distribution function in a data-center or equivalent?**
- **What are there load-profiles of a data-center over days, weeks, months, years? Are there day/night time loads?**
- **What is the potential power-saving on PHY and SYSTEM level, respectively, assuming ideal Low-Power transitions without latency penalty?**
- **AVB:**
- **What is the update frequency within an AVB network with regards to 1588 time-sync packets?**
- **What is the frequency synchronization requirement for AVB in ppm? (3) What is the required time-resolution for the IEEE 1588 time-stamping to operate AVB properly? (4) Does AVB use and support Jumbo-Frames, e.g. for HDTV video? If yes what size? (5) Does AVB support 100baseTX and 10baseT?**

# More Questions

- **Do we need more than two control modes**
  - Performance mode
  - Energy Saver mode
  - Others?
- **Can/Should the control be dynamic?**
  - If so, what level of time granularity is needed?

# Backup

# 10GBASE-T PHY

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D  
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CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

CHANNEL RESOURCES  
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CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

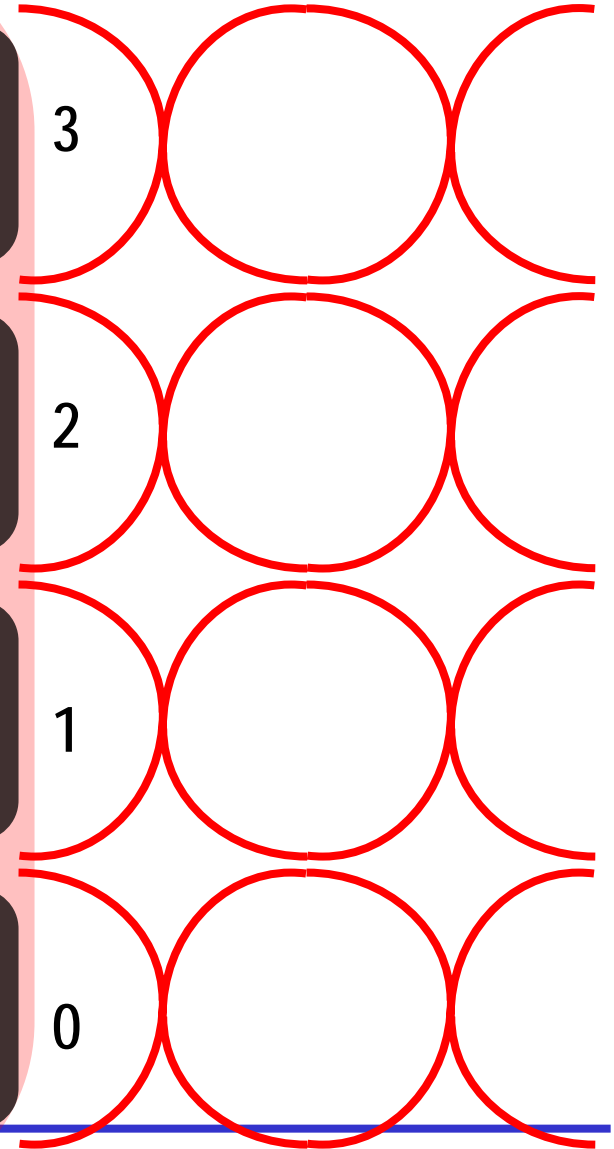
CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

3

2

1

0



# Simple 10GBASE-T Subset PHY

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CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

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CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

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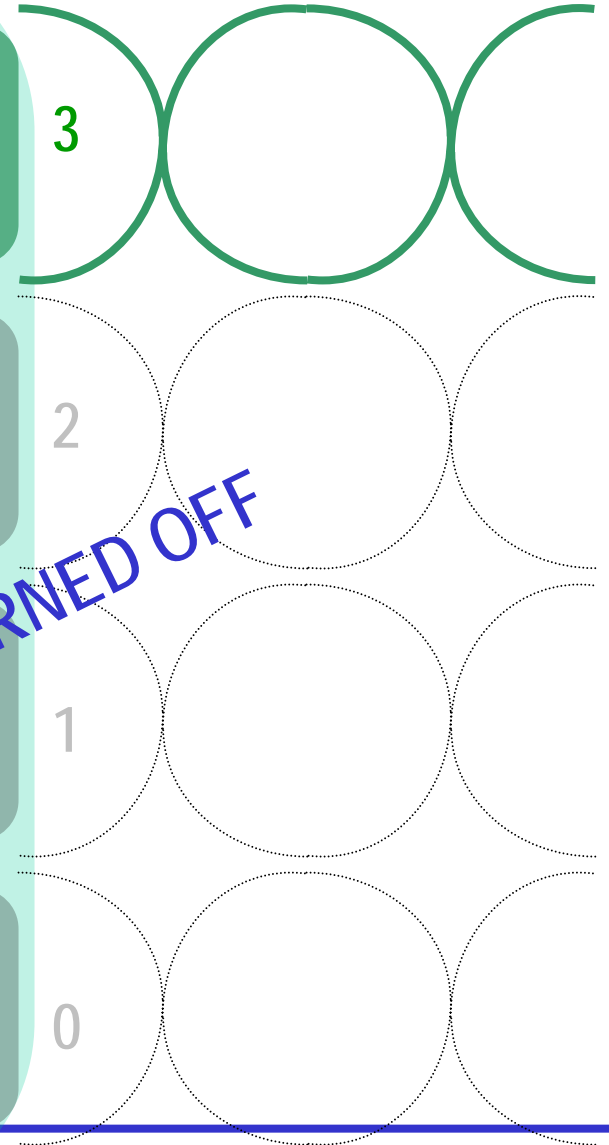
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(ANALOG AND DIGITAL)

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CHANNEL RESOURCES  
(ANALOG AND DIGITAL)

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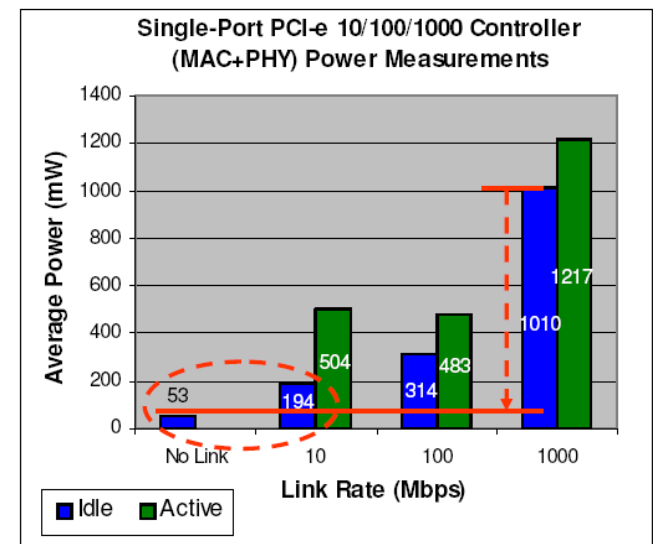
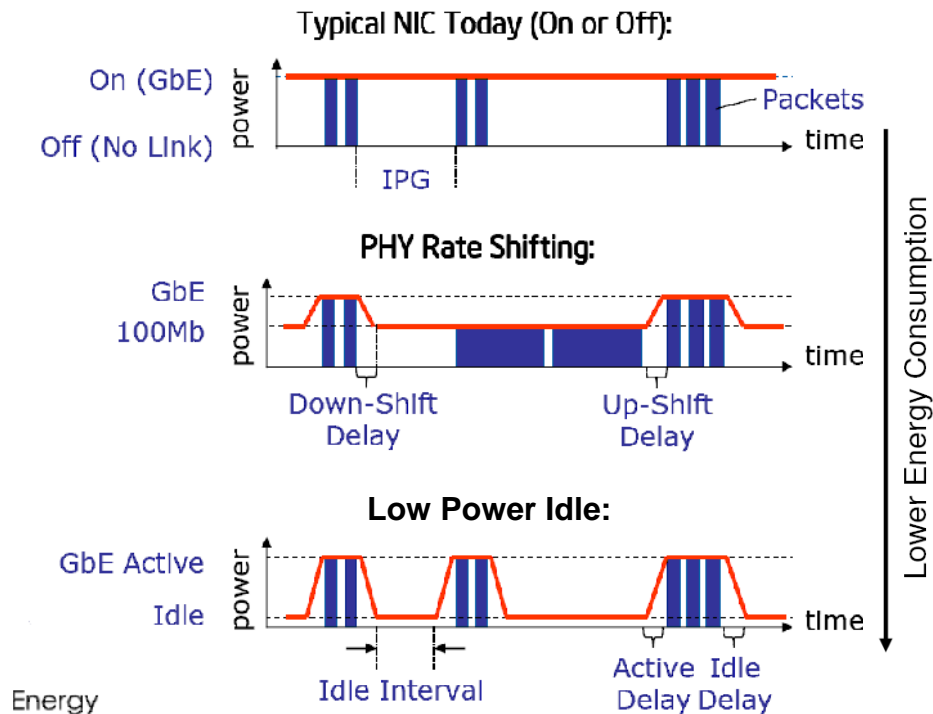
CHANNELS 0, 1, 2 TURNED OFF





# Low Power Idle

- Energy use is lower than typical NIC and RPS (rate shifting)
  - Transition time in the order of microseconds feasible



Source: Intel labs. Intel® 82573L Gigabit Ethernet Controller, 0.13µm, "Idle" = no traffic, "Active" = line-rate, bi-directional