# SONET Definition for WIS

## (some nits worth picking)

IEEE 802.3ae
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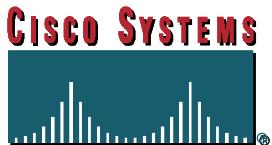hfrazier@cisco.com

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# Overview

**Agree with WIS specification proposal contained in:**

http://www.ieee.org/3/ae/public/may2000/bottorff_1_0500.pdf

**Need to consider three issues**

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# Issues for Consideration

- **Clock tolerance**

- **Overhead definition**

- **Jitter**

# Clock Tolerance

- **Currently available SONET reference oscillators have +/- 20 ppm tolerance**

- **Cost difference between +/- 20 ppm and +/- 100 ppm oscillators is a tiny fraction of the total cost of a 10 GigE interface**

- **+/- 20 ppm ensures compatibility with all installed SONET regenerators and transponders**
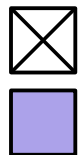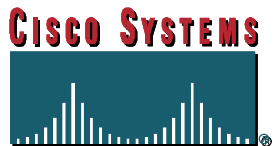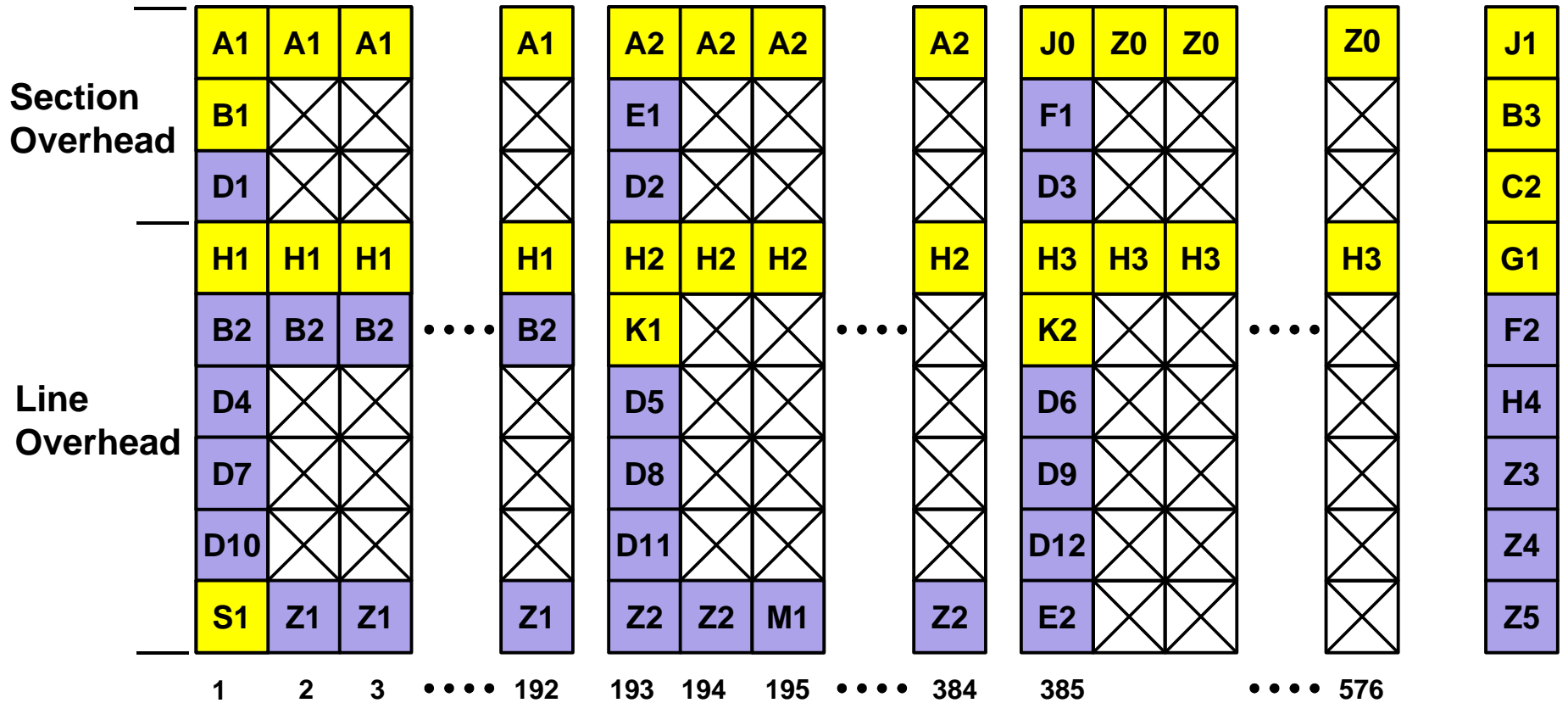
# Clock Tolerance

- **Using +/-100 ppm clock tolerance in WAN PHY may require pointer processing in the transponder**

    - **added cost and complexity**

    - **incompatibility with the installed base**

- **Recommend +/- 20 ppm clock tolerance rather than +/-100 ppm**

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# OC-192c WIS - Overhead

**From Bottorff, et al**

Path Overhead

# OC-192c WIS - Overhead

**Our Recommendation**

**Path Overhead**

**Section Overhead**

**Line Overhead**

| 1 | 2 | 3 | ... | 192 | 193 | 194 | 195 | ... | 384 | 385 | ... | 576 | | Path |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A1 | A1 | | A1 | A2 | A2 | A2 | | A2 | J0 | Z0 | Z0 | Z0 | J1 |
| B1 | | | | | E1 | | | | | F1 | | | | B3 |
| D1 | | | | | D2 | | | | | D3 | | | | C2 |
| H1 | H1 | H1 | | H1 | H2 | H2 | H2 | | H2 | H3 | H3 | H3 | H3 | G1 |
| B2 | B2 | B2 | | B2 | K1 | | | | | K2 | | | | F2 |
| D4 | | | | | D5 | | | | | D6 | | | | H4 |
| D7 | | | | | D8 | | | | | D9 | | | | Z3 |
| D10 | | | | | D11 | | | | | D12 | | | | Z4 |
| S1 | Z1 | Z1 | | Z1 | Z2 | Z2 | M1 | | Z2 | E2 | | | | Z5 |

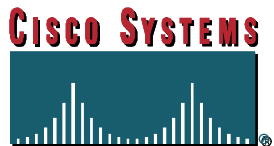**Legend:**
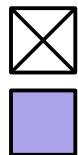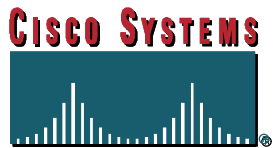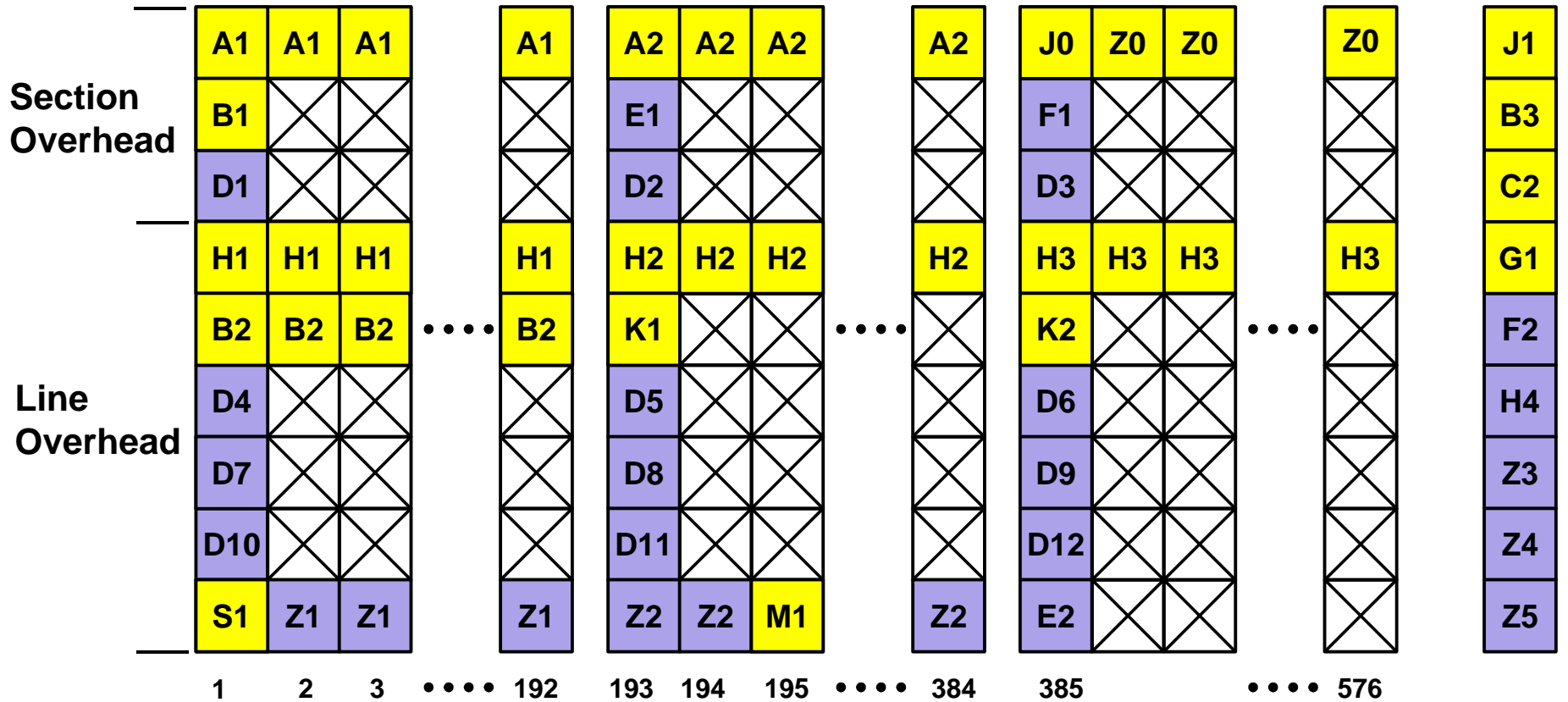
- ☒ Undefined bytes (set to zero)
- ▨ Defined but not used (set to zero)
- ▨ (yellow) Defined and used by WIS

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# B2

- **B1 - Bit Interleaved Parity is a single 8 bit value which is used to measure bit error rate**

- **At OC-192, B1 saturates so quickly that you cannot distinguish between BERs higher than $10^{-7}$**

- **B1 is useful for fault isolation, <u>but not</u> for performance monitoring**

# B2

- **B2 is calculated per STS-1**

- **Since there is a separate B2 for each STS-1, there is a constant ratio of parity bits to data bits, regardless of the line rate**

- **The saturation point is constant at $10^{-4}$**

- **Therefore, B2 is useful for performance monitoring**
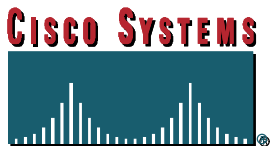
# B2

- **Need to support B2 to maintain**

    - Compatibility with other OC-192 interfaces (i.e. TDM, POS, etc)

    - Familiarity and consistency for crafts persons

    - Compatibility with existing test equipment

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# B2
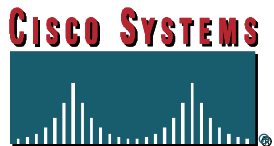
- **Cost of supporting B2 entails:**

  - 192 8 bit registers in TX and RX

  - 8 bit parity checker/generator can be shared across all 192 STS-1s

  - Also need a 32 bit accumulating counter in RX to report statistic to management system
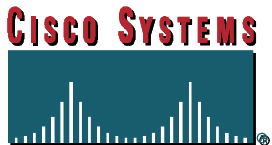
# M1

- **M1 provides remote error monitoring**

- **Reflects remote value of B2**

- **Cost of supporting M1 entails:**
  - **One 8 bit register in RX**

- **Provides same compatibility benefits**
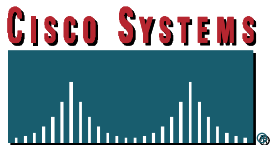
# K1/K2

K1 and K2 are used on the protection line for automatic protection switching signaling.
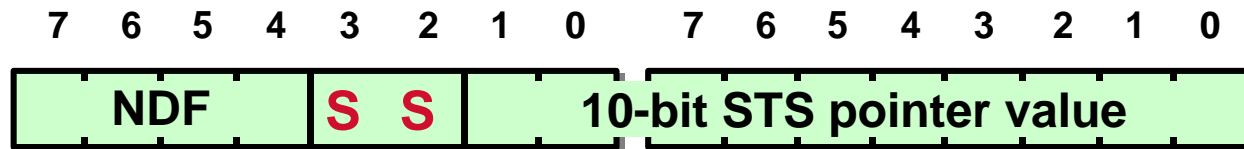
Recommend providing management (software) access to K1 and K2 to allow implementation of APS

Cost: Two eight bit registers

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# H1 Pointer
# SONET/SDH Compatibility

**Need the ability to provision the SS bits in H1 for compatibility with SONET <u>and</u> SDH**

**SONET H1 =**       **01100010 and H2 = 00001010**
**SDH H1 =**       **01101010 and H2 = 00001010**

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NDF | | | S | S | | | | | 10-bit STS pointer value | | | | | |

**NDF (new data flag) field**

# Jitter Requirements

- **What are the jitter specs for the UniPHY ?**

- **We could adopt the SONET jitter specs**
  - **May add considerable cost to the interface**

- **We could use the LAN PHY jitter specs**
  - **May require jitter reduction FIFO in transponder**

- **Recommend using LAN PHY jitter specs**

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# Summary

- **We need a SONET compatible UniPHY**

- **We need to specify the minimal subset of SONET functionality to reduce cost**

- **We need to maintain compatibility with**

  - **Installed OC-192 infrastructure**

  - **Existing component specifications**

  - **Existing test equipment**

  - **Existing installation and maintenance practice**

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