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# 9.584640 GigE In the WAN

## IEEE 802.3 Higher Speed Study Group
## July 6-7, 1999

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# Agenda

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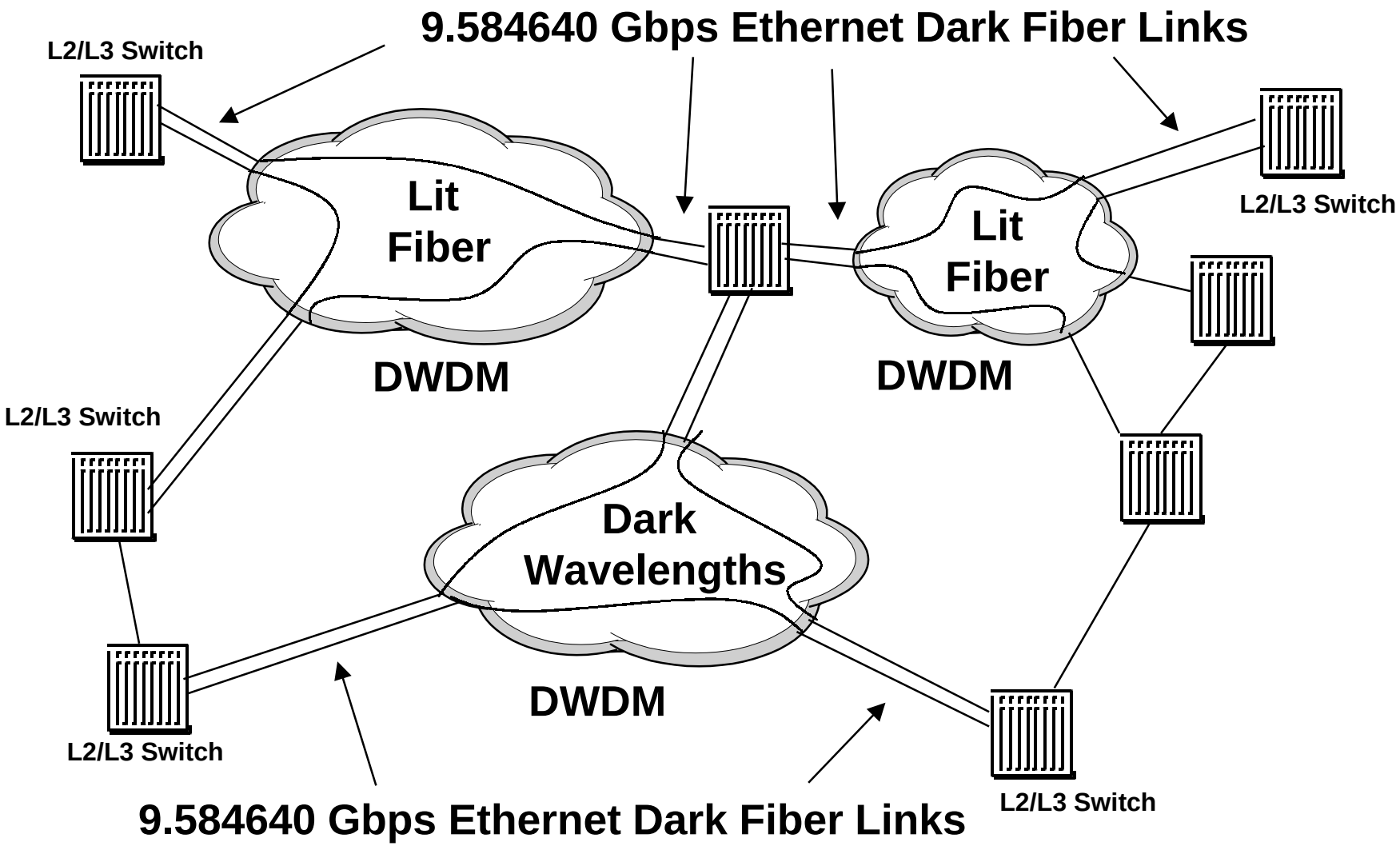
- **Typical Wide Area Application**
- **Dark Fiber, Dark Wavelength, Lit Fiber**
- **Requirements for DWDM Networks**
- **Summary & Recommendations**

# A 9.584640 GigE WAN Application



# 3 Types Of Media

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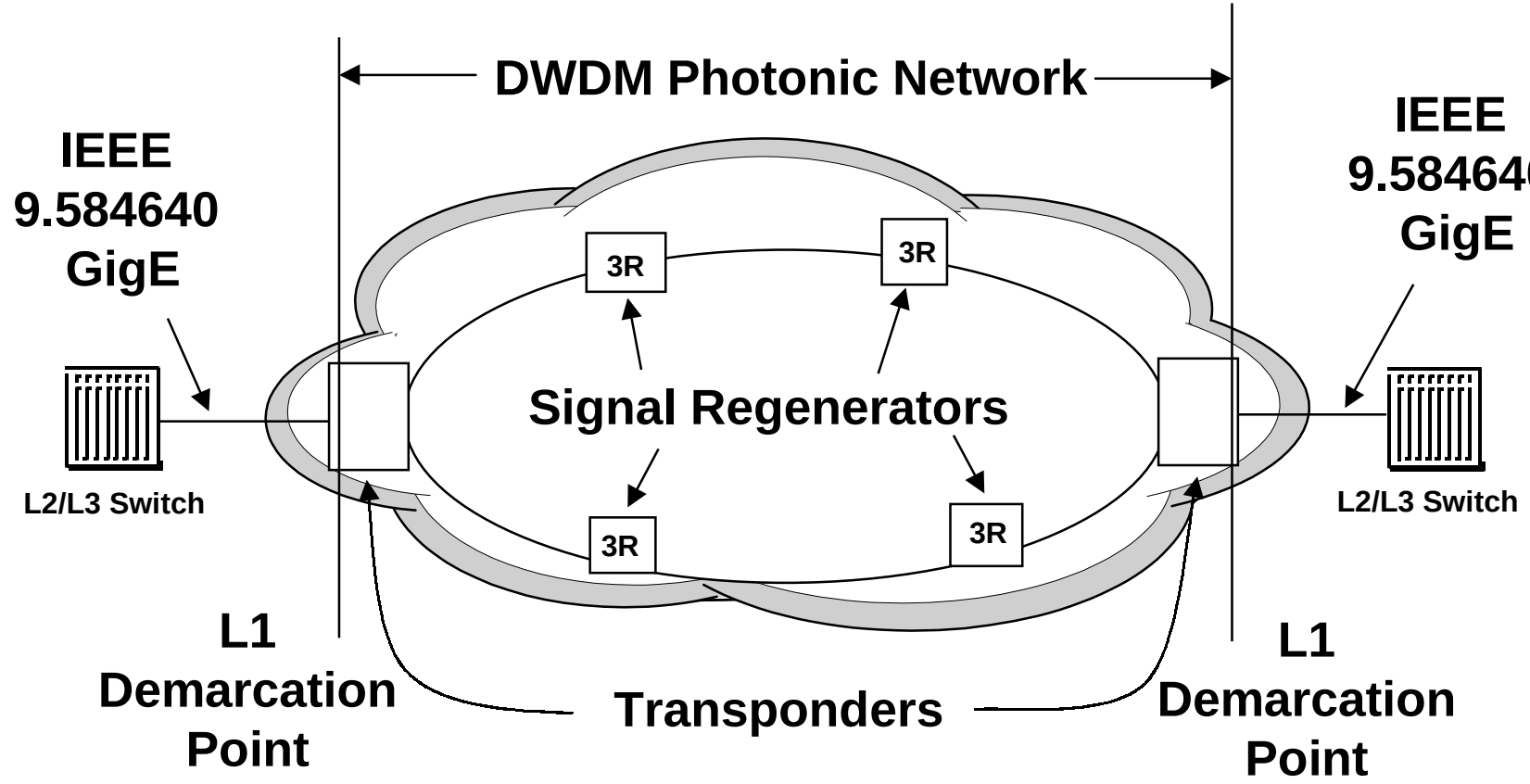
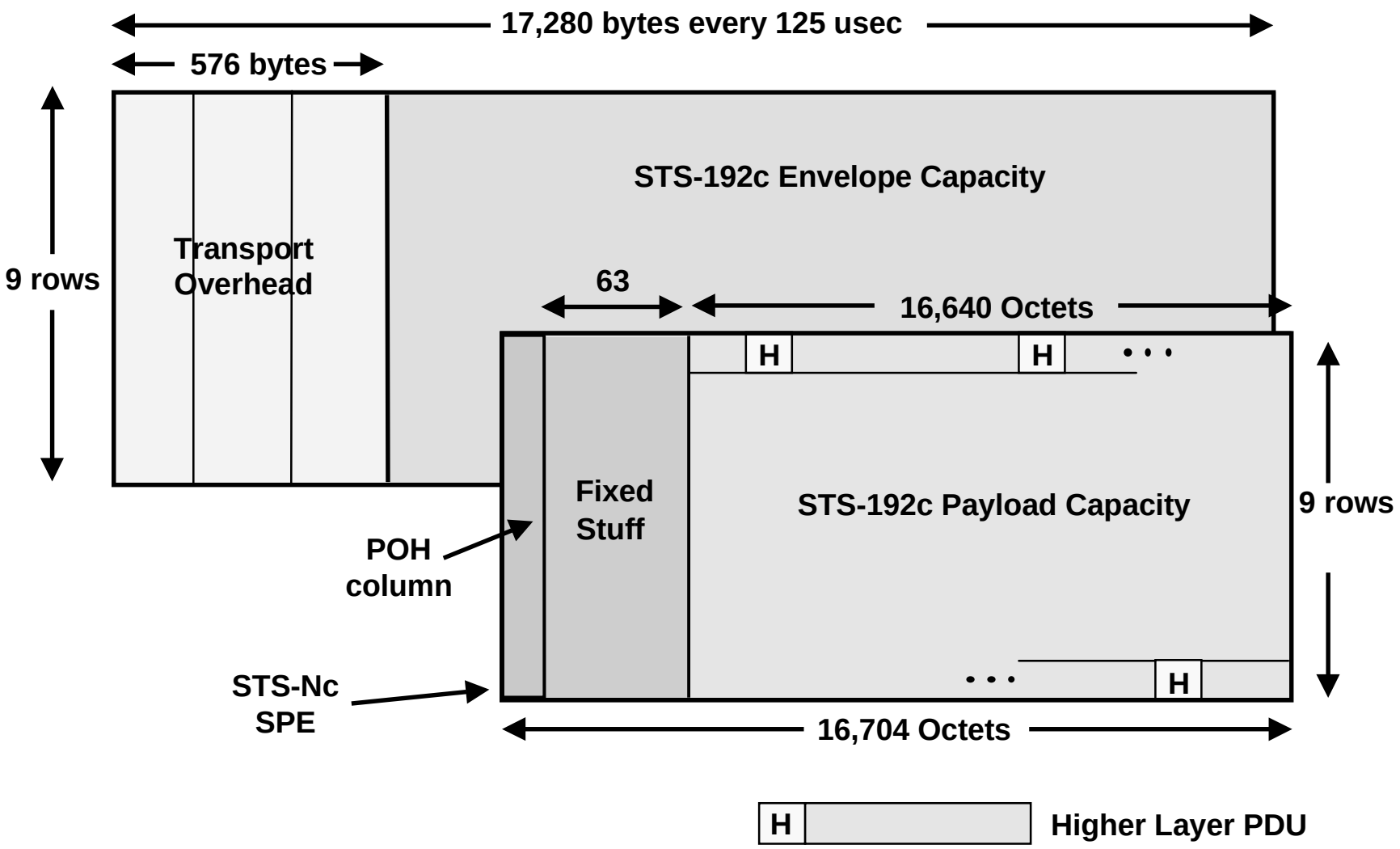
- **Dark Fiber**
  - Available to Carriers, ISP, utilities, etc.
  - Various types all single mode
  - May not be able to support DWDM or long reaches
- **Dark Wavelengths**
  - Service provided by a DWDM photonic network
  - Some photonic networks are code independent others aren't
  - All photonic networks have an upper limit on data rates
  - Boundary device is a transponder
- **Lit Fiber**
  - Existing DWDM OC-192 multiplexer installed base
  - Speed and code sensitive at mux and regenerators
  - Boundary device is a multiplexer

# Inside a DWDM Network




- **Transponders serve as a demarcation point between the IEEE L1 and the DWDM photonic network**
- **Transponders perform mapping to DWDM wavelengths plus signal regeneration and retiming**

# Regenerators Use OC-192 Frame



# Regenerator Data Rate = 9.584640

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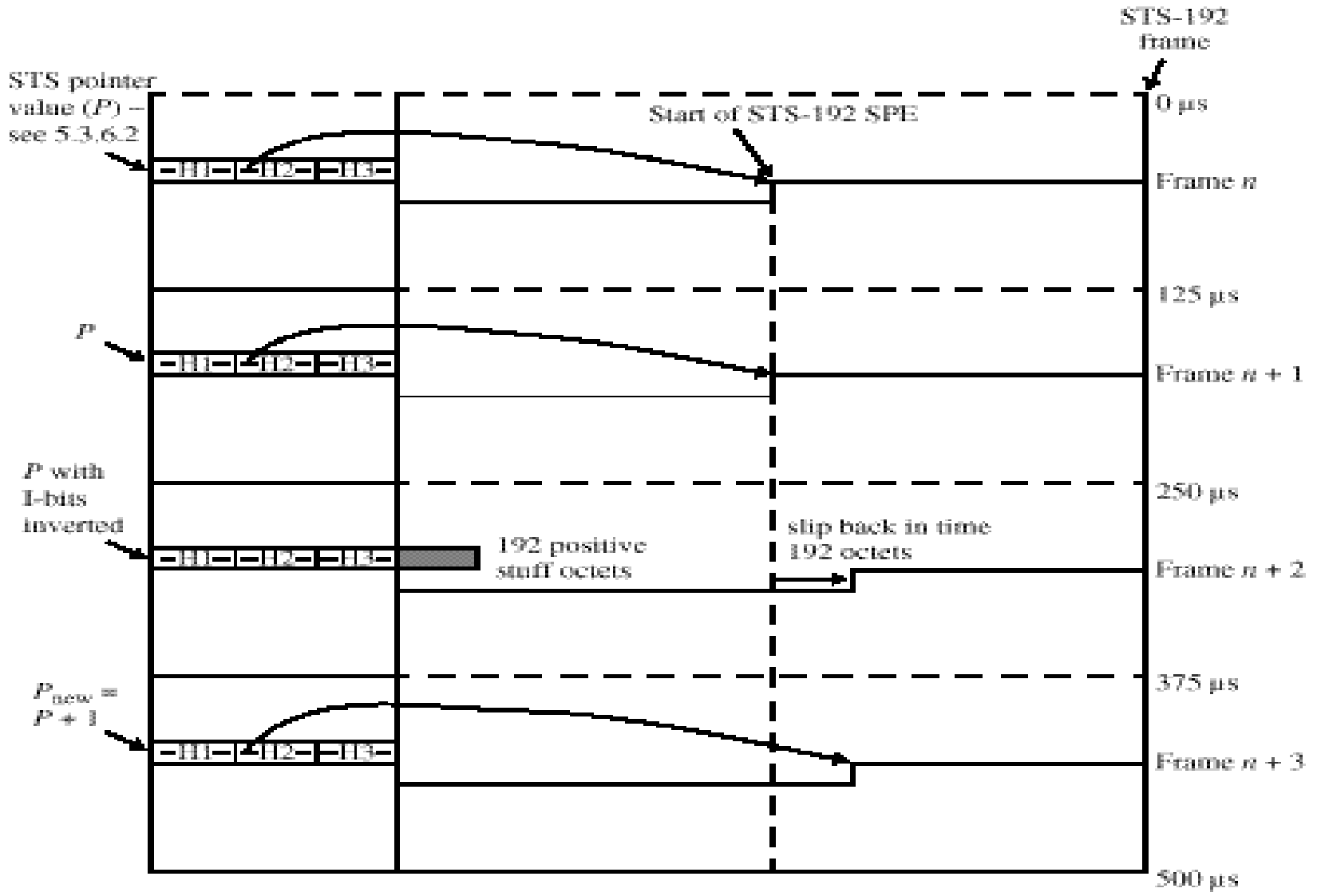
- **Payload Rate Calculation**
  - –(16,640 bytes/row * 9 rows/frame * 8 bits/byte) / 125 usec/frame = 9.584640 Gbps
- **Line Baud Rate Calculation**
  - –(17,280 bytes/row * 9 rows/frame * 8 bits/byte) / 125 usec/frame = 9.953280 Gbps

# OC-192 Clock Correction



# Payload Clock Tolerance = 320 ppm

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- **The Path structure may slip forward or backward by 192 bytes every 4 frames.**
- **Bytes in 4 frame time**
  - 16,640 bytes/row * 9 rows/frame * 4 frames/time correction = 599040 bytes/time correction
- **The maximum clock correction is**
  - 192 bytes * 1,000,000ppm / 599040 bytes = 320 ppm

# Maximum Small Packet Rate

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| | |
|---|---|
| 1,488,095 | Min Pkts/Gbps |
| x 9.58464 | Gbps |
| 14,262,855 | Min Pkts |

# Recommendations & Conclusions

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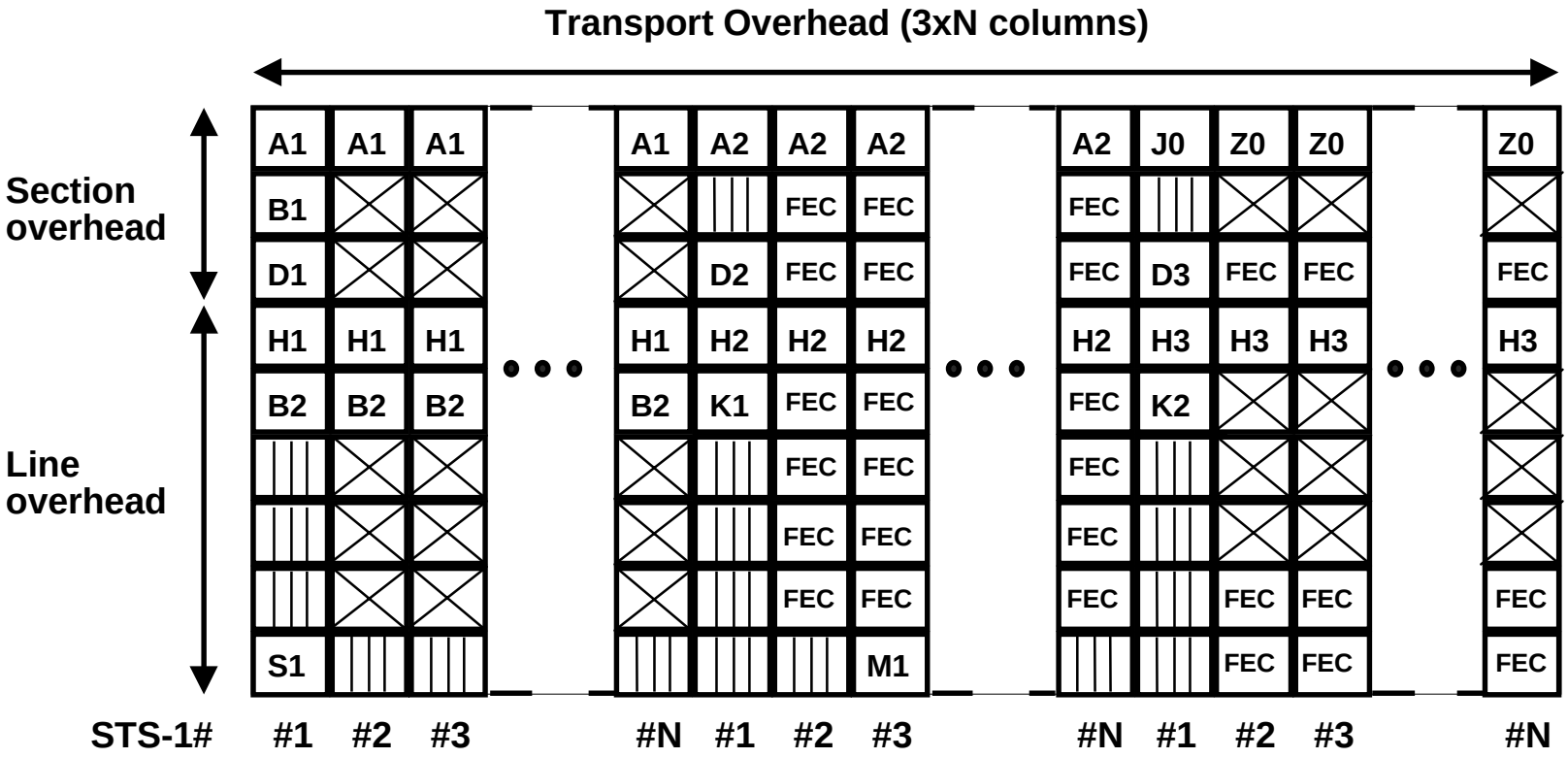
- **Wide area Ethernet data links can be built using OC-192 or DWDM photonic network as media segment**
- **Existing DWDM networks can support a maximum data rate of 9.584640 Gbps**
- **A payload with a source clock 9.584640 +- 100 ppm can be carried over existing DWDM networks**
- **HSSG should use a data rate of 9.584640 +- 100 ppm to allow use of OC-192 or DWDM photonic network data links**

# Backup

# OC-192 Transport Overhead

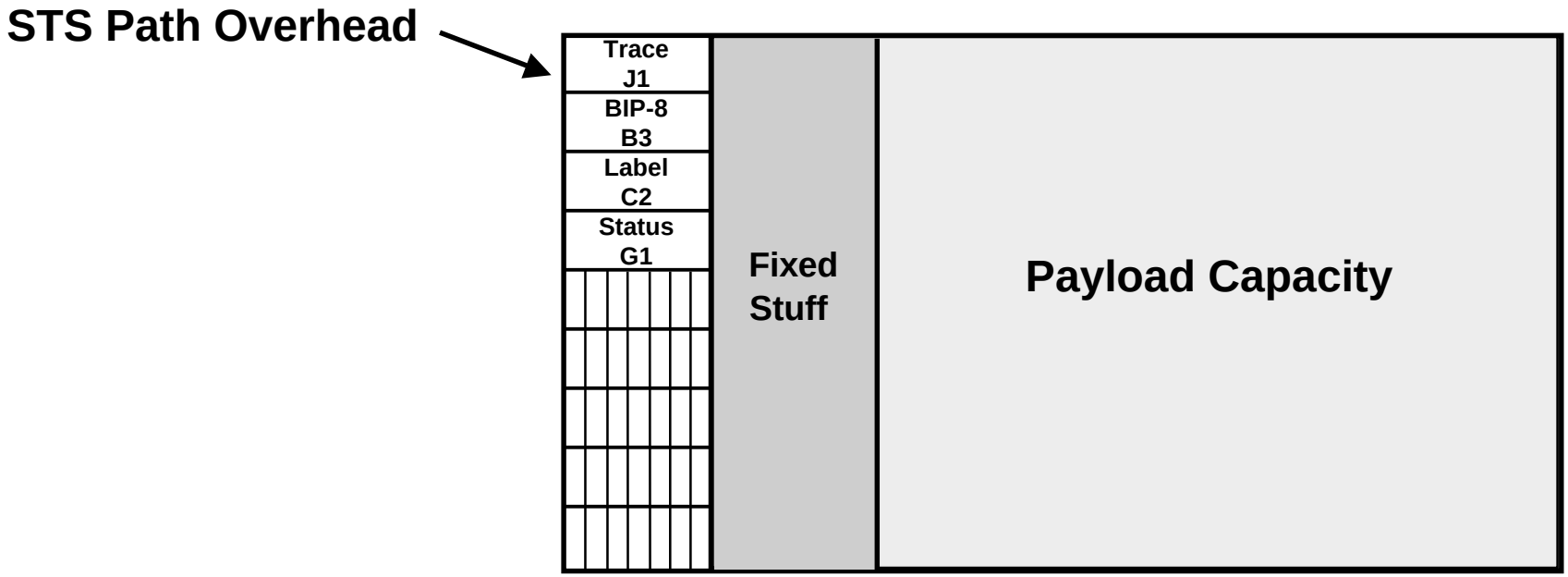



= undefined overhead bytes

= unused, defined overhead bytes (E1-2, F1, D4-12, Z1-2)

No FEC in STS-1#(1+12x), x=0-15

# OC-192 Path Overhead




= unused, defined overhead bytes (F2, H4, Z3-5)