







Channel \approx road

pot holes \approx atten. & noise

lane division \approx wavelength division multiplexing (WDM)

- variables / parameters
- size of lane (bandwidth)
- speed of vehicle (data rate)

spectral efficiency = $\frac{\text{data rate}}{B/W}$

= $\frac{\text{bit/s}}{\text{Hz}}$

Source \approx LED / laser = bit/s / (Hz)

distance

Hz

how fast?

spreading (ISI)

noise

$BW_1 \gg B.W_2$

So the criterion is attenuation

- 0.2 dB/km

amplifier or repeater

km

$\sim 30 \text{ dB/}$

$20 \log_{10} \left(\frac{P_{\text{out}}}{P_{\text{in}}} \right)$ [decibels]

3 dB \approx 2x power \downarrow

Devices

- Source
- Receiver
- amplification? (attenuation problem)
- equalization (ISI)

$x \rightarrow [h] \rightarrow y = h \cdot x + n$

$x \rightarrow [h(\cdot)] \rightarrow y = h \cdot x + n$

$\hat{x} \leftarrow [h^{-1}(\cdot)]$



