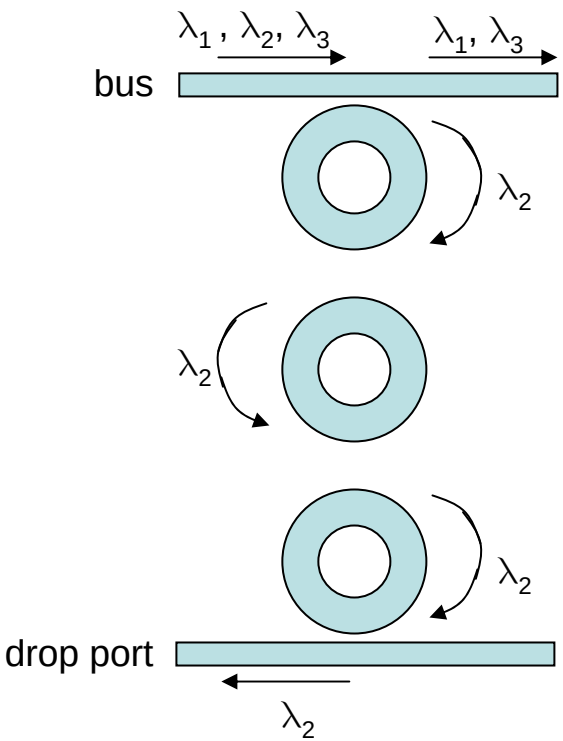
Coupled Ring Resonators



- Ring Width
  - a ring is a curved waveguide; the waveguide mode displaces towards the outer edge (this is the source for radiative loss: easy coupling into free space cladding modes)
  - more of the mode is evanescently present in the cladding n_1; n_{eff} for a curved waveguide will will be lower than n_{eff} for a straight waveguide
  - in order to mode-match the n_{eff} of a ring to a waveguide bus/drop port, the ring's core is designed with larger width
- Coupled Rings Spacing
  - want to design same coupling strength amongst all ring resonators
  - for a given gap distance, evanescent coupling between two curved waveguides will be stronger than evanescent coupling between a straight waveguide and a curved waveguide (more of the mode displaces towards outer edge in a curved waveguide)
  - gap distance between ring 1 and ring 2 will larger than gap distance between bus waveguide and ring 1
  - gap distance between ring 2 and ring 3 will be larger than gap distance between ring 3 and drop port waveguide
- Coupling Rings in Series
  - the extinction of resonant channel λ_2, in the bus waveguide, downstream from ring 1, depends on the amount of resonant power build-up in ring 1, ring 2 and ring 3. If τ is the response time of one ring resonator, the response time of this coupled ring resonator will be $\tau + \tau + \tau = 3\,\tau$.