Assignment 6

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Problem 2

The carry calculation is the critical path of adder. In the case of 32 bits carry lookahead adder, the steps are below:

1. First, and (generator and propagator) are calculated in PFA. The calculation for and are done concurrently for the whole 32 bits, therefore the gate delay is **1**. gi and pi then act as inputs in the 4 bit CLU.
2. Afterward, inside the 4 bit CLA, and are calculated as follow,

To find, the delay is 2, while to find , the delay 1. Since both are done concurrently, the longer delay applies to both and, which is **2**.

1. To calculate the carryout from the lower 16 bits CLA,

the gate delay is also **2.**

1. The from the lower 16 bits is then used to calculate the carry in for each 4 bit CLA in the higher 16 bits CLA. The delay for this is the same as the delay to find , which is **2**.
2. Afterward, the carry in into each PFA is calculated, which gate delay is also **2**.

As total, it takes it takes 9 gate delays to calculate the carry for each digit.

The most important advantage that CLA has over RCA is the ability to calculate the carry in for each digit concurrently with only the inputs. In RCA, to find the next carry in, the previous carryout (output) has to be completed first, resulting in more delays.