Range to Tower Introduction

- Range To Tower or RTT records show an estimation of the phone location
- Each cellular operator has their own name for these records
  - Verizon calls them RTT
  - AT&T calls them NELOS
  - T-Mobile/Sprint calls them Truecall
- These records provide similar information, mainly an estimate of the phone location and some error factor

Phone Location Estimation

- Cellular Network Operators do not provide algorithm for phone location estimates
- General technology used it based on time it takes for a radio signal to travel between the tower and the phone – sometimes called “Range to Tower”

$D=(T*c)/2$

D=distance traveled

T=Time radio signal travels

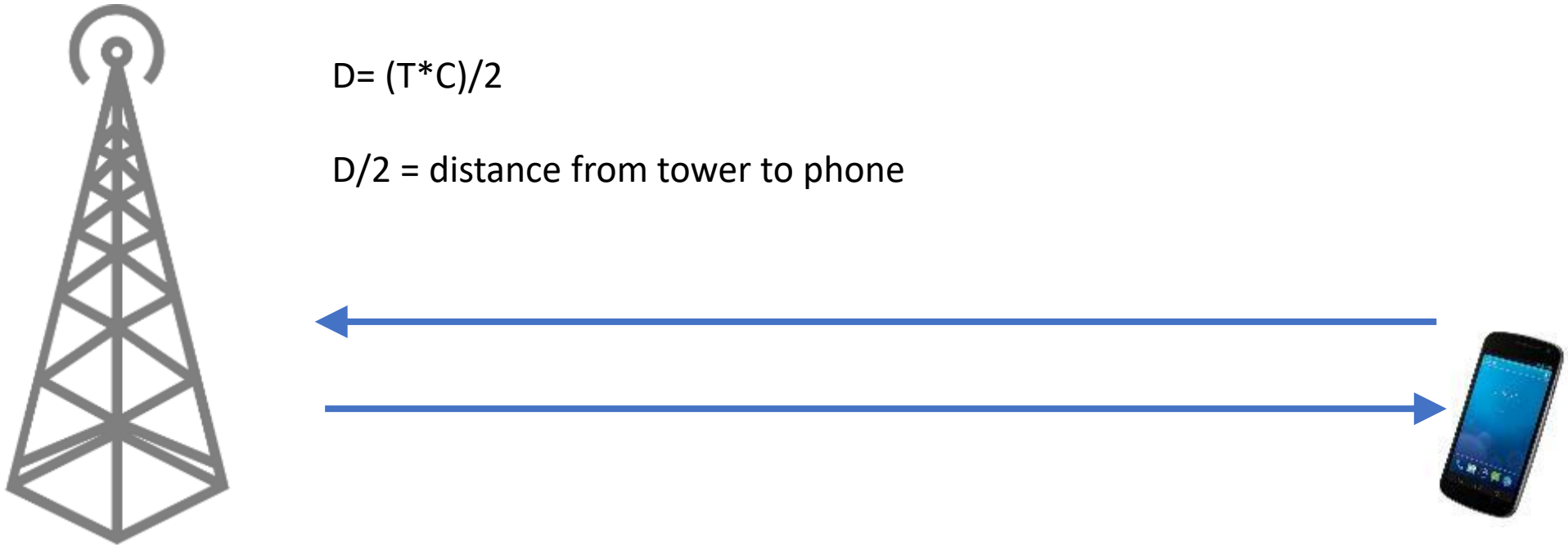
c=speed of light

Range To Tower (RTT) calculation theory

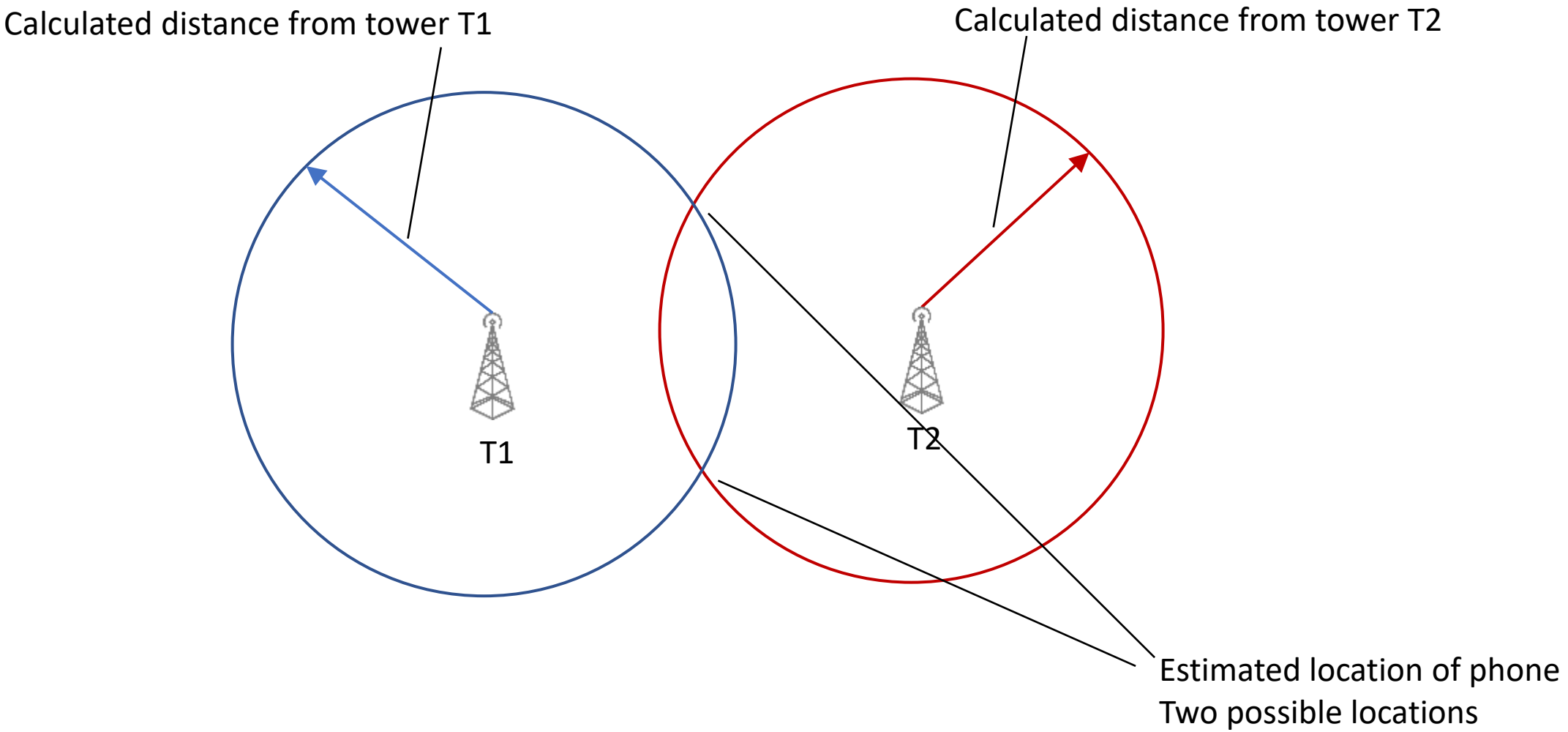
T=time from tower to phone and back to tower
D=distance from tower to phone and back to tower
C=speed of light

D= (T*C)/2

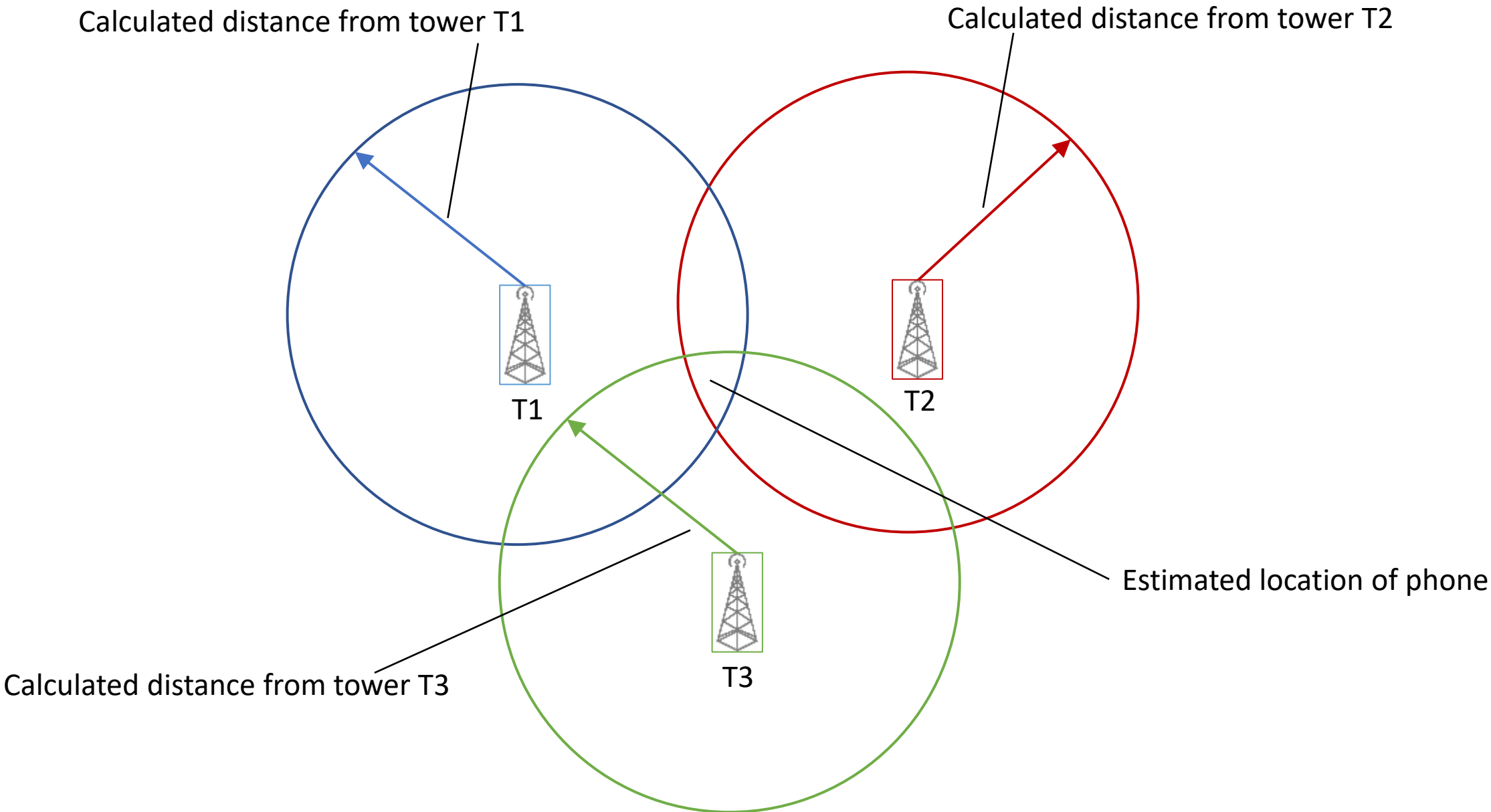
D/2 = distance from tower to phone



Range To Tower (RTT) calculation theory



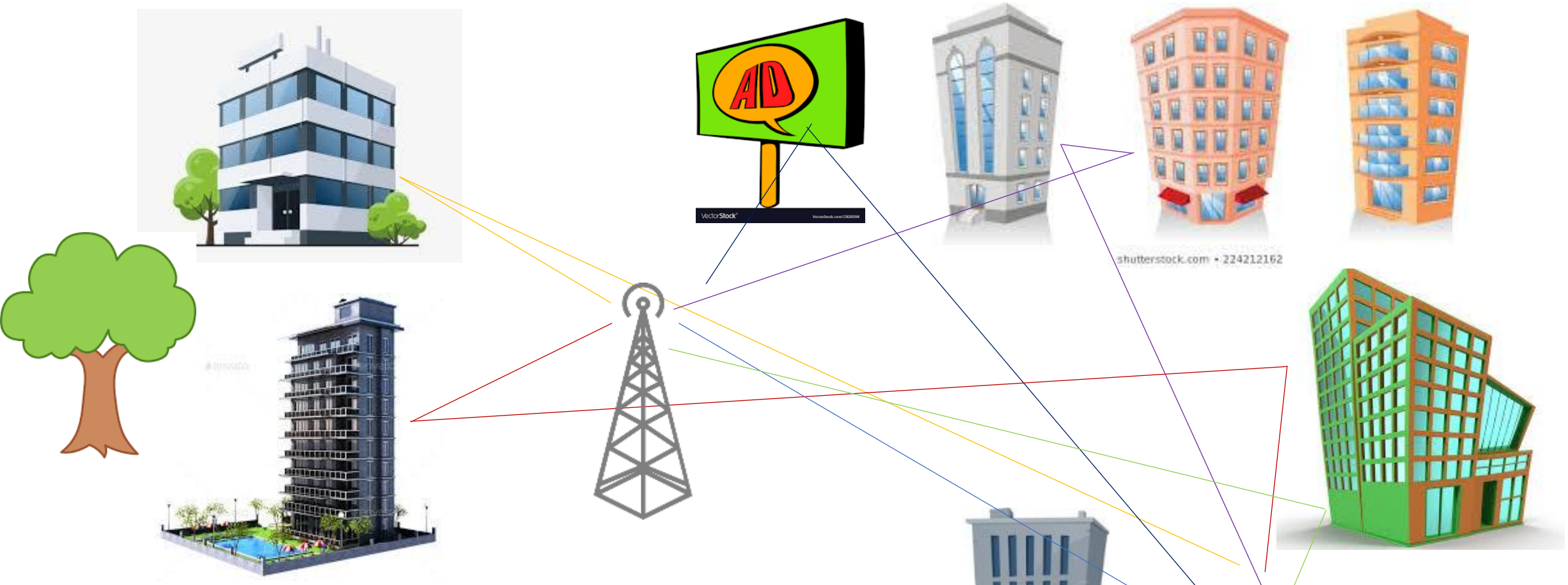
Range To Tower (RTT) calculation theory



Range To Tower (RTT) calculation theory

- Problem comes in the real-world application
  - Radio waves travel in multiple directions from a single point (Multipath)
  - Radio waves bounce off objects
  - Each path of the radio wave takes a different length of time to get to and from the phone

Range To Tower (RTT) calculation Problem



Radio waves takes infinite number of paths
Each taking a different amount of time to reach the phone

Which path do you pick to calculate the distance?

Range To Tower (RTT) calculation problem

- Radio waves bounce off objects
- Each path of the radio wave takes a different length of time to get to and from the phone
- Indirect path takes longer time to reach the phone thus the distance estimate is further away than actual
- The direct path provides the best estimate of distance
- What if there is no direct path? Then the distance estimate will be incorrect
- There is no way to determine if the paths of the radio waves used by Verizon were the direct paths or indirect paths thus there is no way to determine the location of the phone

Exclusion of RTT Records - Daubert

- The specific factors demonstrated by the Daubert Court are:
  (1) whether the expert's theory or technique can be challenged in some objective or in a subjective sense, conclusory approach that cannot reasonably be assessed for reliability;
  (2) whether the technique or theory has been subject to peer review and publication:
  (3) The known or potential rate of error of the technique or theory when applied;
  (4) The existence and maintenance of standards and controls; and
  (5) Whether the technique or theory has been generally accepted in the scientific community.

- Excluding RTT records based on the Daubert case have been successful in recent cases.