Real-Time Systems Lecture 17

These were some of the more important things written out during the class. Please note that these notes are not meant to be comprehensive: they are simply what was written down during the lecture.

Byzantine Failure: Arbitrary failed-system behavior.

Interactive Consistency

IC1: All functional receivers agree on the same sensor value.

IC2: If the sensor is functional, all functional receivers agree on the value transmitted by the sensor.

To maintain IC under up to m failures, we need a total of

\[ n \geq 3m + 1 \]

units participating in the agreement algorithm.
OM(m):

\underline{OM(0)}

1) Sensor (or originator) distributes the value to each receiver.

\underline{OM(m)} \quad m > 0

1) Sensor distributes value to each receiver.

2) Each receiver uses alg. OM(m-1) to distribute the value it received in Step 1 (each receiver is acting as a sensor, disseminating its received value).

3) Each receiver votes (e.g. majority, median) on the values it received as a result of Steps 1 and 2. Missing messages are assumed to carry a default value.
R1: 0, 1, 0 : maj = 0
R2: 1, 0, 0 : maj = 0
R3: 0, 1, 0 : maj = 0

Value direct from sensor: 0
Value forwarded by R2: 0
Value forwarded by R3: 1

majority = 0
Drift: $\rho = \frac{dc(t)}{dt} - 1$

A max. drift rate is specified for all good clocks.
An incorrect sync. alg.

1) Each clock receives clock "ticks" from every other clock.
2) It calculates the median of the signals.
3) It attempts to align itself to this median.

1,000,000 good clocks
3 bad clocks.