Introduction

The STAR Trigger system has been designed with the following features:

- Ability to examine every RHIC crossing for possible trigger
- Ability to trigger on charged particle multiplicities between $-2<\eta<2$
- Ability to trigger on energy from fragment neutrons in Zero Degree Calorimeters
- Ability to issue triggers for calibration events, such as lasers and pulsers
- Ability to issue triggers to individual detector systems
- Ability to issue triggers within 1.4 μs of the interaction
- Ability to trigger p–p collisions as well as Au–Au
- Flexibility to include upgrade detector systems
- Each event is accompanied by one of 4095 tokens for the lifetime of the event

STAR Trigger Detectors

- Central Trigger Barrel: 240 scintillator slats in region of $-1<\eta<1$
- Multiwire Proportional Chamber: 7680 anode wires from TPC in regions $\pm2<\eta<\pm1$
- Zero Degree Calorimeter: Located ±15 m from interaction

Trigger Level 0

- Trigger detector data is digitized at every RHIC clock cycle
- Data moved from digitizer boards to DSM boards in lock–step with RHIC clock
- Trigger data stored in 65k long buffers on DSM boards
- DSM boards perform simple computation (summing) within one RHIC cycle
- Compare summed multiplicities with configured threshold values
- Input physics information with 6 detector LIVE/BUSY bits into last DSM
- TCU compares output from last DSM with configured bit pattern for the run

Trigger Level 1

- Level 1 analysis is performed during the TPC drift time
- The data input for analysis are the output of the first layer of the DSM tree, known as the Course Pixel Array (an 8 x 4 $\eta-\phi$ digital sum from the CTB and MWC detectors)
- After analysis, the Level 1 CPU can issue an abort to the TCU to abort the event.

Trigger Level 2

- Level 2 analysis is performed during the TPC digitization time
- The data input are the digitized data from each detector as stored on the DSM boards
- Level 2 CPU will issue either an accept or abort to the TCU to send to the detector systems
- Upon an accept, the event is sent to the DAQ.