Memo on Collecting Metadata from VLA observations for COSMIC

(Savin Shynu Varghese, November 9, 2021)

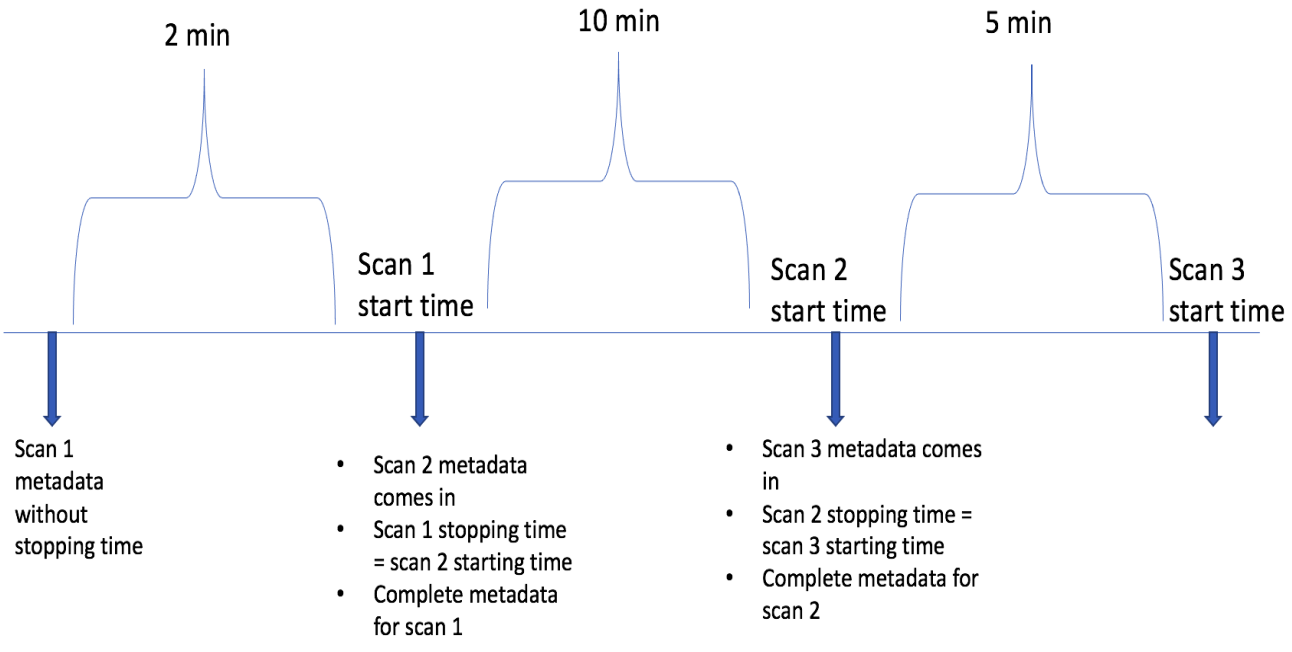
This memo will focus on collecting the metadata from VLA observations in real time and transferring it to the commensal COSMIC compute cluster using a Redis server. Typical metadata of VLA observations include the source name, right ascension, declination, frequency of observations, starting time, stopping time, flagged antennas, etc.

Collection of VLA metadata -- evla_mcast written by Paul Demorest (see https://github.com/demorest/evla_mcast)

The evla_mcast continuously receives and parses multicast messages from the WIDAR correlator and converts them into various metadata required for the user. Using evla_mcast we can get the metadata of the ongoing observations, however there are some limitations as well.

Limitations of evla_mcast:

- Most of the metadata except stopping time and flagged antennas are received, let's say t1 minutes, before the starting time of the observations. This t1 time depends on the length of the ongoing observations and can vary from 30 seconds to a couple of minutes or more.
- The complete metadata except antenna flags received at the starting time of each observation. The schematic shows how VLA metadata is received.



- For VLA observations, the scan time of each observation includes the time antennas take for slewing towards the source direction and time the antennas spend on the source. The WIDAR correlator outputs a list of flagged antennas at each time during the observations. For example while slewing, all the antennas will be flagged. The list of flagged antennas can be obtained during the observations or after the observations. The list can be obtained with a dataset ID of the observation along with the starting and stopping MJD time of the observation. For normal WIDAR operation, the flagged antenna info is applied to the data set after the data collection.
    a. Collect antenna flags every second (other time intervals as well) during the observation and decide whether to record the data depending on the availability of the antennas. Several requests for antenna flags within a second might introduce some issues (Not clearly known).
    b. Record the data from all antennas during observations irrespective of the flagging. Obtain a list of flagged antennas at every second (other preferable time interval) and then apply that flagging to the data before sending it to further processing. More of a WIDAR way.
- Complete metadata (stopping time + list of flagged antennas) during/after observations.

Sending Metadata to GPU processing nodes - Redis Server

Redis is a database server which can hold different key value pairs. These key value pairs can be modified and accessed by different clients attached to the redis server. Also, different clients can subscribe to particular channels and listen to the messages published in that channel.

- In this case of COSMIC, after metadata collection from VLA, they can be published over some channels in the redis server.
- The processing nodes subscribed to the metadata channels can collect the metadata and decide on the next step such as data recording, upchannelization, beamforming, etc.
- This is where hashpipe pipeline comes in. At this point we have the bridge between evla_mcast and Redis. Need development on how hashpipe can be used to collect data on processing nodes after the metadata is received.