What is the Network Model

The Network Model is a geospatial representation of the rail network. The model is managed in ArcGIS and is split into links and nodes. Each link is indicative of the centreline of the tracks not the railheads. These links are split between intersections or to a buffer stop/end block.

Figure 2 below is illustrative of how the model is viewed from a top down view. Here it is outlined against an excerpt taken from a CAD plan.
How it is represented

In the model the network consists of 4 main layers (Network Waymarks, Network Nodes, Network Links and Reference lines) then an additional 8 layers which are used alongside for analysis purposes (see Figure 3). Below is some further information about the layers:
- **FE TrackNodes** and **FE TrackLinks** are line and point data which is from feature extraction to give an automatically generated centreline and node information on the network based upon aerial imagery.

- **NetworkWaymarks** are indicated by purple points in close proximity to the tracks. This marks mileposts for each ELR and are used in tandem with the Network ReferenceLines to give a mileage to specific assets or areas of plain line.

- **NetworkNodes** are used for intersections where track ends (Buffer End), an ELR changes designation but there is no significant intersection (Pseudo Node), at an S&C and then a diamond crossing. Each of these nodes have a set number of links which must be connected for example a diamond crossing will have four connected links representing the two tracks crossing each other (please see figure 2).

- **ReferenceLine** is placed as background line data, and each ELR has 1 line, which sits in the middle of a set of tracks in which the mileage can be determined for an ELR (this will be discussed in more detail below).

- **NetworkLinks** shows the centreline of the tracks between the intersections connecting to the NetworkNodes as mentioned above. They are defined by Track Code designating them as Fast (TRCODE 11/21), Slow (TRCODE 12/22), Reversible or Other.

- **RL_220_LR_Check_Results** is a layer which gives a coloured layer broken into 220 yard blocks which show whether a Network Waymark is more, less or within a tolerance of 5 yards to being 440 yards of the previous and next waymark.

- **OP_Stations_Point** and **OP_Stations_Polygon** is a layer to indicate the location of any stations and the approximate area covered by this station by the polygon on the model.

- **OSImagery** and **WMS** are the aerial imagery layers which can be used to determine location on the ground of assets and is used for geo-referencing CAD/AFC’s onto the model for any layout changes. Generally WMS is used as this is higher definition imagery.
**Network Model – Attribution:**

Any layer which is edited or amended from each model post to the next has a background attribution table linked to that object. This is updated by the editor when they have completed work and it is imperative it is correctly updated so it changes can be checked and tracked into the next model and this attribution in the NetworkLinks layer gives a visual representation to the link when the TRCODE attribute is completed.

Figure 4 shows an example of the attribution table of an individual link showing what information is used for each of the 50,000 individual links in the Network Model.

**Linear Referencing in the Network Model:**

The linear referencing tool is essential to be able to determine a miles and yards measurement for assets or areas of plain line in the model. It is an accessible tool in GRV and INM as well as the Network Model in ArcGIS. However the reference line is not visible in GRV or INM.

The linear referencing tool uses the waymarks and their mileage measurement to run a line straight to the corresponding ELR reference line to give a waymark value at that point. Then the tool works from those waymark values at each end of that 440 yard stretch to determine a miles and yards measurement within that area.

As an example if you click on a node 100 yards down the track from a 1 mile 440 yard waymark the tool will run a straight line from that node up/down to the reference line and take a measurement from the calibrated reference line.
Figure 6 shows more complicated situations where additional tracks (sidings, depots or tracks classified as other) are further away from the reference line will have a greater likelihood of the mileage offset due to a curve or distance from a reference line. The pink lines represent if the tracks away from the reference line are selected at that point how the reference line will provide a mileage.
**Why is the Network Model important?**

- The Network model is used by Track Recording Vehicles to locate faults.
- As mentioned earlier, it is the source of link geometry, ELR mileage and node location for INM and GRV.
- It also provides a geospatial location for different assets when the only available information is an ELR and mileage.

The Network Model has a number of users actively or through as a supplying data source:

- Geo-RINM Viewer
- Underground Services
- RTPS (Uses on track recording vehicles) – Journey Files – PLPR
- LADS
- ADIP
- TRAIL
- The ‘Where am I?’ app
- The routes
- Most recently the addition of INM.

The data which is held in the Network Model is owned by the different routes to be collaboratively worked on to provide an accurate model for downstream systems.