East Central Railway

Office of the
General Manager
(Signal & Telecomm)
ECR, Hajipur

No.ECR-HQ0SnT(OTH)/7/2024
(CN.: 279747)

Dated:21.10.2024

Principal ED/S&T
IRCON,
C-4 District Center,
Saket,
New Delhi.

Sub: Guidelines for undertaking Centralized Monitoring & logging of Signalling gears in Kiul-Gaya section.

Ref: CSTE/Con/South letter no. CSTE/Con/S/MHX/ECR/Corres./24 Dt.10.07.2024

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Vide above reference IRCON was advised to undertake the work centrally monitor stations in KG section on continuous basis through real time calibrated measurement and alert. A guideline for undertaking this work has been approved by competent authority and the same is enclosed for implementation.

IRCON is advised to take up this work accordingly at the earliest.

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DA: As above

21/10/24

(D.K.Chand)
Dy.CSTE/Sig/HJP
for GM(S&T) ECR/HJP

Copy to:

- CGM/S&T/PNBE/IRCON for kind information and necessary action pls.
- Sr.DSTE/DNR for kind information and necessary action pls. &
- SSE/Sig/2/HJP (Sri Vinay Kumar) for kind information and necessary action.

Alert Based Signal Maintenance at stations in Kiul – Gaya section

(Manpur to Karauta Patner-11 Stations)

1. Scope

1.1. Setting up a central monitoring center(CMC) at Patliputra station.

1.2. Manning of this center on a 24x7 basis along with Railway personnel and ensure proper working of signaling gears at the stations.

1.3. Modular furniture will be installed for seating arrangement of 16 persons at CMC.

1.4. Mini data centre to be installed at CMC for storage of parameters & other central software at Central monitoring Centre.

1.5. Setting up networking infrastructure for transmission of sensor data and logs from the stations to the central monitoring center.

1.6. Provision of sensors for monitoring the working state of various signaling gears at the stations in the section from the central monitoring center.

1.7. Consolidation of logs of HASSDAC at the central monitoring center and monitoring the same.

1.8. Monitoring EI logs from central monitoring center.

1.9. Setting up a monitoring and alerting system that can be interfaced with these systems and provide useful alerts for the purpose of ensuring high availability of signaling system.

1.10. Use of open-source software following open and public scheme/APIs/standard is encouraged for the work.

2. General guidelines

2.1. System for Alert Based Maintenance of the Kiul – Gaya section (11 stations) is to be established in this work.

2.2. Sensors shall be provided for monitoring the points, signals, DC track circuits, Axle counters, UFSBI, power supply, battery condition etc. at the stations/LC gates.

2.3. The system for alert-based maintenance shall be distributed in nature so that the resource requirement for analysis is manageable and can be easily customized based on local conditions at a station.

2.4. Every station shall be provided with an Edge computer that will collect all the data from a station and then shall provide the data to the central server for further analysis/ alerts/ notification. The format of this data shall be decided along with the Engineer in-charge of the work and shall be approved by the division/ECR HQ.

2.5. The network to be used for transmitting this data from Edge computer to the central server shall also be established in this work.

2.6. The OEM designing the sensor-based condition monitoring system for signaling gears must provide interface for this data in the Prometheus format to be collected by central monitoring software for further analysis.

2.7. Monitoring of HASSDAC system logs by consolidation at the central location is also required to be done.

2.8. All the SPDs being used at these stations for the axle counters should be replaced with a new set so that the potential free contact of the same can be used for monitoring the SPDs.

3. Condition Monitoring System

3.1. The condition monitoring system shall be used for alert-based maintenance. No AI/ML analysis and failure forecasting is envisaged in the current project. However, data based on measured parameters as per metrics design shall be generated and disseminated for developing AI/ML algorithms.

3.2. Data acquisition shall be done through properly rated current sensors/ voltage transducers/ potential free contacts/ remote diagnostic ports etc. available for signaling equipment. This data shall be collected on a real-time basis. The accuracy of the sensor should be such that it should not cause any noise in the data being collected. To maintain accuracy and stability, proper safeguards against EMI effects should be taken. The sensors provided shall be in accordance with the IEC standard and immunity test requirement as specified in the RDSO draft FRS.

3.3. Installation of condition monitoring system shall be planned in such a way that any failure in this system does not cause any failure in the signaling installations.

3.4. Power supply extended for condition monitoring system shall be through separate fuse of suitable rating.

3.5. Gear wise parameters that are to be monitored are listed in the Annexure-I. However, in actual field there is expected to be slight variations in the scheme. This shall be approved by the Engineer in-charge of the work.

3.6. The condition monitoring system shall also generate a daily exception report that will be used to decide the maintenance activity of the next day. This activity is to be coordinated from the central monitoring center.

3.7. Data collected from the gears shall be transmitted to the edge computing device at the station using wired media only. As far as possible, wireless media should not be used for this communication. However, in case wired media is not possible, wireless (SIM based) may be used after the approval of engineer in charge of the work. It must be ensured that the data collected from the gears are sent to the edge computing device at the station.

3.8. Railway has provision of 110V AC supply in some of its location box near the tracks that is used for chargers of its DC track circuit batteries. Use of this supply for the condition monitoring service will be allowed. Similarly, one pair omni-bus circuit using a pair from signaling cable for data transfer shall also be provided wherever possible.

3.9. Those Location Boxes where 110V AC supply is not available and condition monitoring equipment are to be installed, 110V AC supply shall be taken from nearby location box where track feed charger supply is available by laying the signaling cable. However, for monitoring of axle counters, 24V DC supply shall be provided in the location box.

3.10. Times synchronization between various devices used for condition monitoring shall be ensured.

3.11. The condition monitoring system is expected to clusters the use of location box duly optimizing the requirement of railway power and data circuits.

3.12. The sensors for condition monitoring system shall be provided such that the sensor wiring to the gear is standardized across all gears for all station. One way to achieve this is by terminating the field wires for sensing current or voltages in a consistent and standardized manner. 2-in-2-out disconnect terminal blocks of reputed make like WAGO etc. may be used for this wiring. Terminal

blocks of different colors may be used for different gears. Such a scheme of uniform wiring shall form part of the solution document.

3.13. As the wiring for condition monitoring system will be done across the stations in the location box or relay rooms, the circuit drawing for these shall be approved by the division. Also, the location box termination and the CTR chart where work will be done shall be updated and approved by the division. Drawings shall follow the IRSEM guidelines in para 8.7.1(f) with green color for deletion and red color for addition in the same sheet. After the commissioning of the system the completion drawing shall be prepared, and a copy of the approved completion drawing shall be kept at the station as well for record. PDF/DWG format of the drawing shall also be provided.

4. Central Monitoring System

4.1. The architecture of the system as envisaged is shown below:

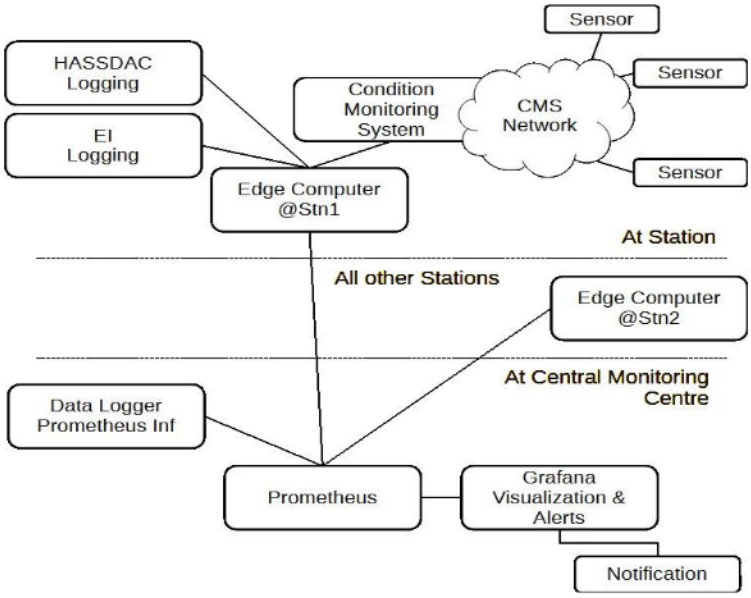

Figure 1 System Architecture

4.2. Open-source standard and software of repute that can work perpetually is preferred in the solution stack. In case, propriety software is used, it must be ensured that the licenses used are perpetual. Use of reputed open source software is encouraged.

4.3. Prometheus software shall be used for the monitoring of the whole solution. The Edge-compute at the station shall be the scrape target for the central Prometheus server to gather metrics of station gears.

4.4. For the purpose of visualization, alerts and notifications, Grafana software shall be used.

4.5. Task tracking software is also envisaged so that alerts can be converted to task-tickets and tracked from the central monitoring facility for their resolution.

4.6. Ubuntu Linux (LTS version) shall normally be used as the operating system for severs.

4.7. The central monitoring center shall be provided access from Railnet using pfSense firewalls. The type od access and the servers that need to be accessed from Railnet shall be planned and shall form part of the solution document to be approved by the division/ECR HQ.

4.8. The detailed design of the Prometheus metrics (aligning it to the Open-metrics standard), the alert generation rule, the visualization required, the notification pipeline and its processing and the ticket flow shall be approved by the division/ECR HQ before implementation.