



PT. Langgeng Cipta Solusi (LCS)

Future Bridge Health Monitoring and Alerting System

RnD TEAM



Prof. Ir. Iswandi Imran, M.A.Sc., Ph.D.

Prof. Iswandi Imran graduated with bachelor degree in Civil Engineering Department, Institut Teknologi Bandung, in 1987. Postgraduate education, Master of Applied Science (MAsc.) and Ph.D., acquired in structural engineering, Civil Engineering department, University of Toronto, Canada, respectively, in 1990 and in 1994.

Prof. Iswandi is currently active in teaching civil engineering, Institut Teknologi Bandung, and serves as a professor in the field of materials and concrete structure, faculty of Civil and Environmental engineering, ITB. In addition, Prof. Iswandi is also involved in bridge design activities and other elevated structures. He also join as a member of the Komisi Keamanan Jembatan dan Terowongan Jalan (KKJTJ) and the Construction Safety Committee of the Kementrian PUPR.



Dr. Ir. Agung Harsoyo, M.Sc., M. Eng.

Lecturer from Electronic Engineering, ITB. His Bachelor's Degree is in Telecommunication, Department of Electrical Engineering, ITB. His Master's Degree is in Optoelectronics From Université de Bretagne Occidentale (UBO), France. He has an Doctoral Degree in Optical-Electromagnetic Systems, Université de Bretagne Sud (UBS), France. He has speciality in Optical system-electromagnetism, signal processing, telecommunication network, System and information technology. He has Two ICT Awards (Ina-Icta) 2009 for Open Source and e-Government Category.



Farianza Yahya Ali, B.Comp. & Info. Sci., Dip. Elec. Eng.

Researcher, Laboratory of Control System and Computer – ITB. His Bachelor's degree is in Computer & Information Science from University of South Australia. He has an Advanced Diploma in Electronic Engineering from TAFE South Australia. He is a registered Australian Computer Society and has Dean's Merit List and Golden Key International Honor. Experience more than 16 years as Embedded System Engineer and Software Developer. For the past 6 years he has been working with Ministry of Defense (Indonesia) on KFX/IFX project and Passive Radar research.



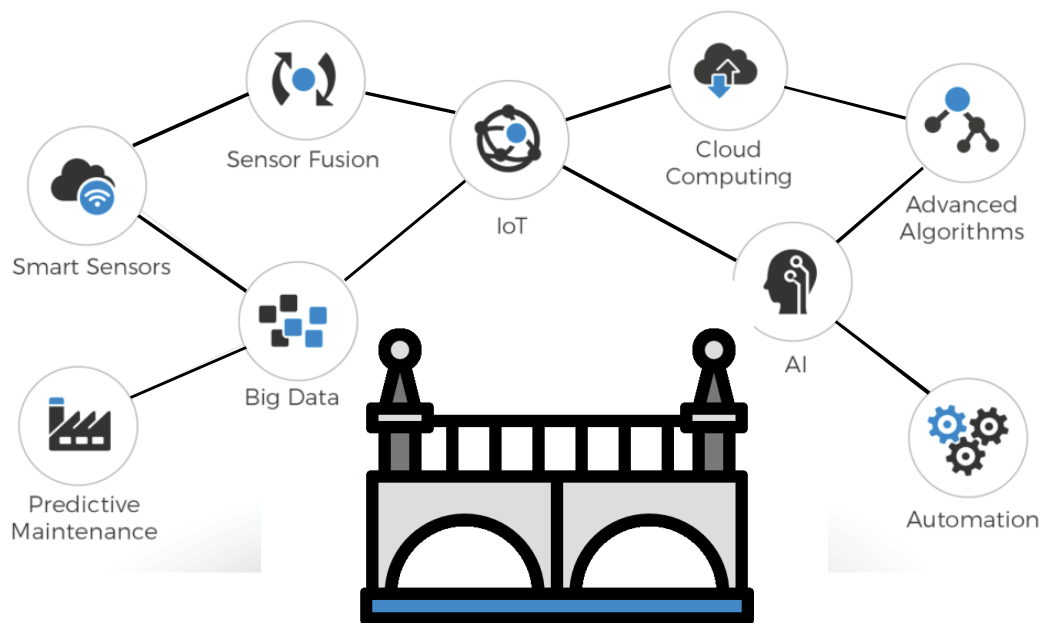
Sapto Adi Nugroho, S.T.

Graduate from ITB as Mechanical Engineer on 2000. Specialized in Mechatronic, Electronic, Control & Instrumentation. More than 15 years experience as senior engineer on Mechanical, Oil and Gas, Mining, Defense, Energy, Infrastructure, Public Transportation, Electricity and Agriculture Technology Project Area. Still active as Research Project Manager on Center for Unmanned System Studies ITB. Adviser on some Technology Company. Senior researcher on some advanced industry – University research collaboration.

JembatanKu (MyBridge)

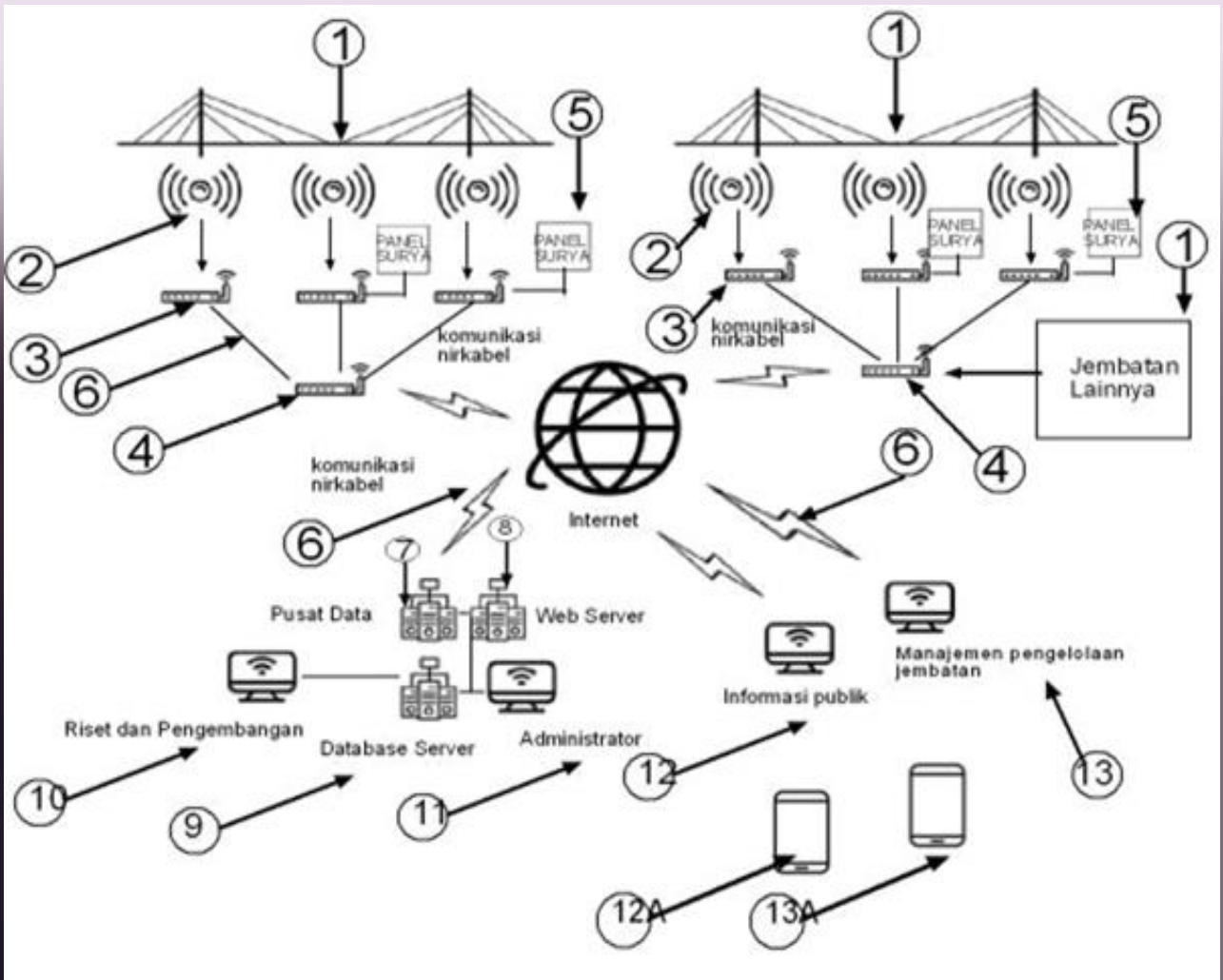
- Real time Early warning & Bridge Health Monitoring
- Predictive , Accurate , and low cost Bridge Maintenance
- Integrated Embedded and Communication System
- Multi Sensitive & Precision Sensors (Accelerometer, strain transducer,etc)
- Sensor fusion algorithm
- Ultra Low power system
- Integrated, Centralized data monitoring
- IP 68 Rating For All Sensors Enclosure

Industry 4.0 Trend



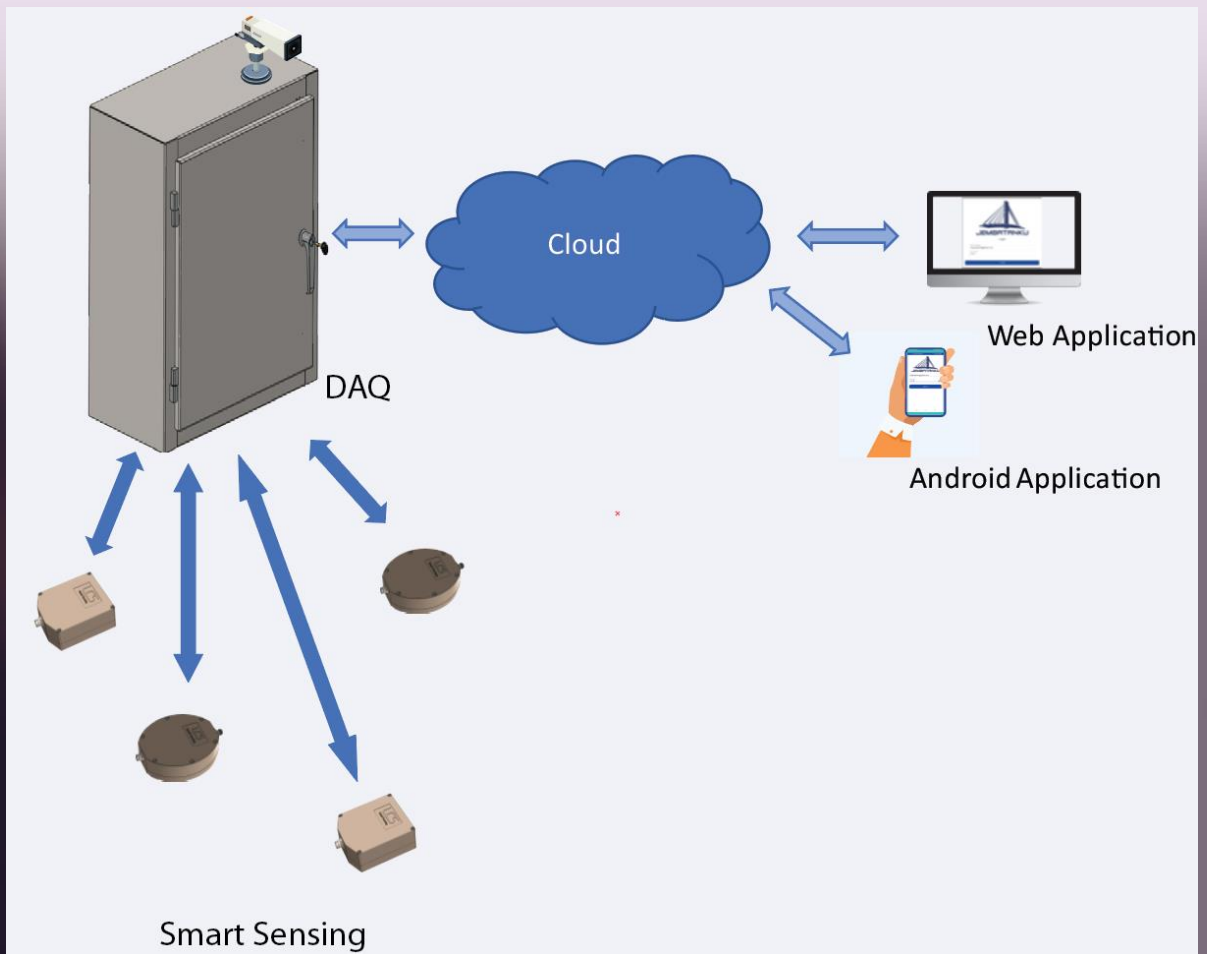
- Data obtained from sensors is sent to a Cloud in realtime
- Supports Cloud Computing & Deep learning for further data processing

Topology



- One or more bridges (1) monitored with sensors (2) placed on bridge elements
- The types of sensors used are vibration sensors, acceleration, slope, strain, voltage, gas, humidity, corrosion, movement, deformation of sensor data using both wired and wireless (6) sent using an acquisition data (3) and communication module (4) to one data center (7) in the data center in the form of database server (9), web server (8) conducted evaluation and analysis process that will be informed to interested parties (13) to the behavior data of bridge structure

Configuration System



- Installed sensors transmit data wirelessly and are read by the Data Acquisition System (DAQ)
- Data from DAQ will be sent to the server via Cellular Network
- The data in the server can be accessed through Mobile Version & Web Version

Current sensors

1. Accelerometer

Used to measure detect vibrations

2. Inclinator

Used to measure tilt of the angle

3. Temperature

Used to measure temperature changes

4. Humidity

Used to calculate the humidity level

5. Displacement

Used to calculate position change values

6. Strain Gauge

Used to measure stress values

7. Anemometer

Used to measure wind speed levels

8. Weight In Motion

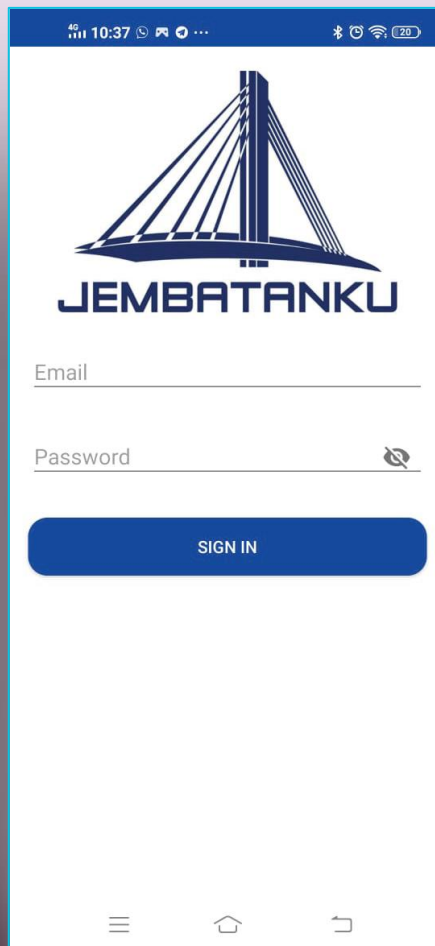
Used to calculate the load weight

9. IP Camera

Used to capture an image of an object

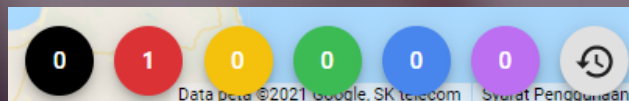
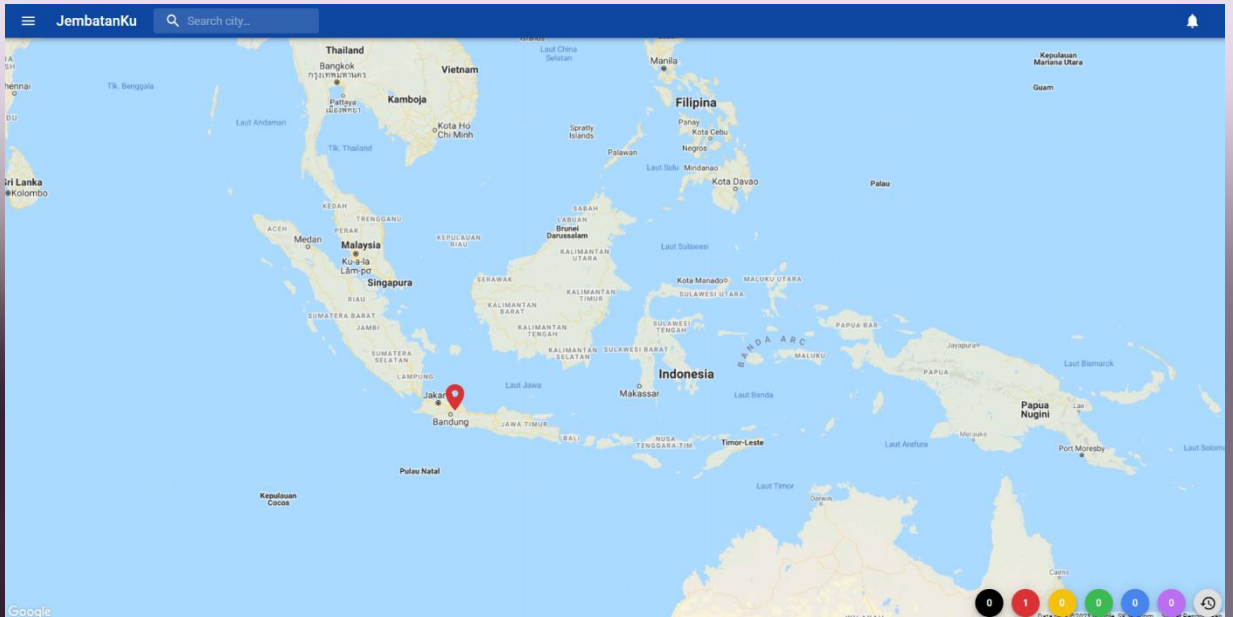


User Authentication



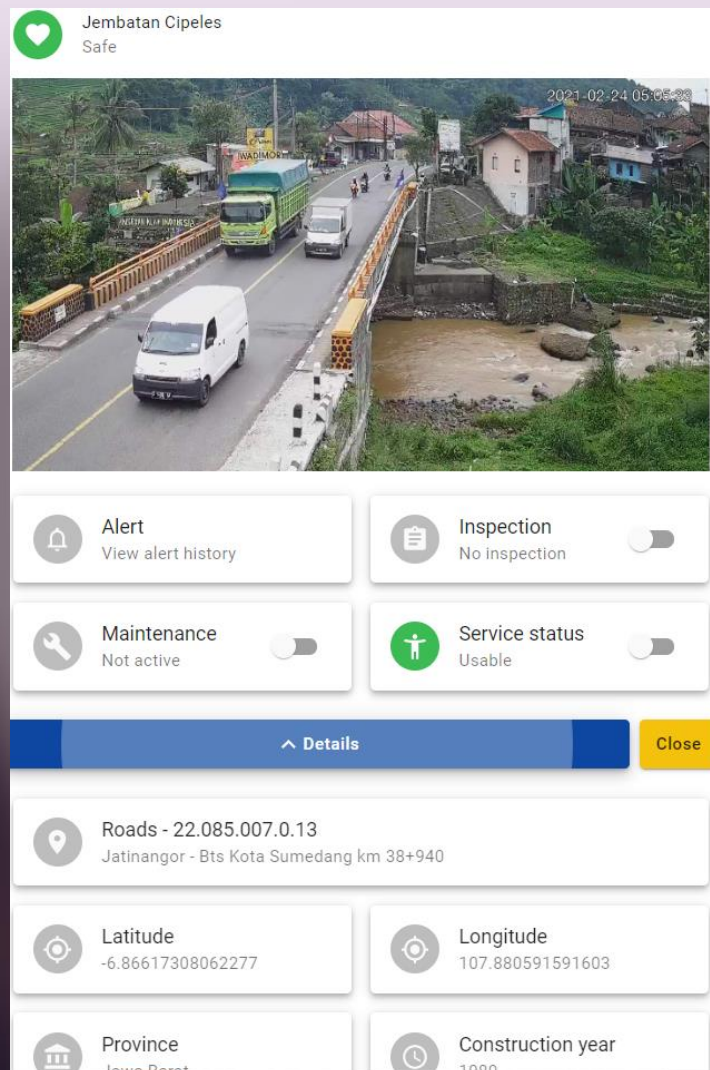
- This feature provides authentication of users who will be recognized based on their email address and password
- There are three levels of users: Superadmin, Engineer and Common User
- This is intended so that the system can only be accessed in accordance with the predetermined permissions (Security Level).

Realtime Bridge Health Monitoring



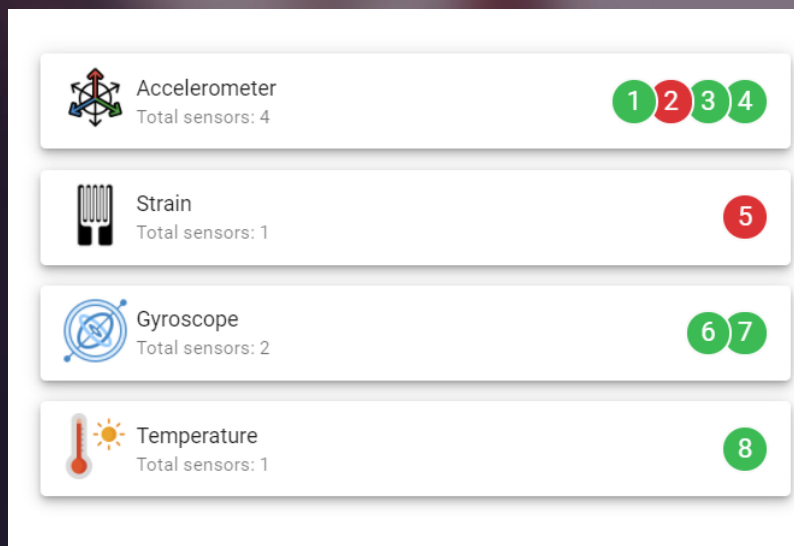
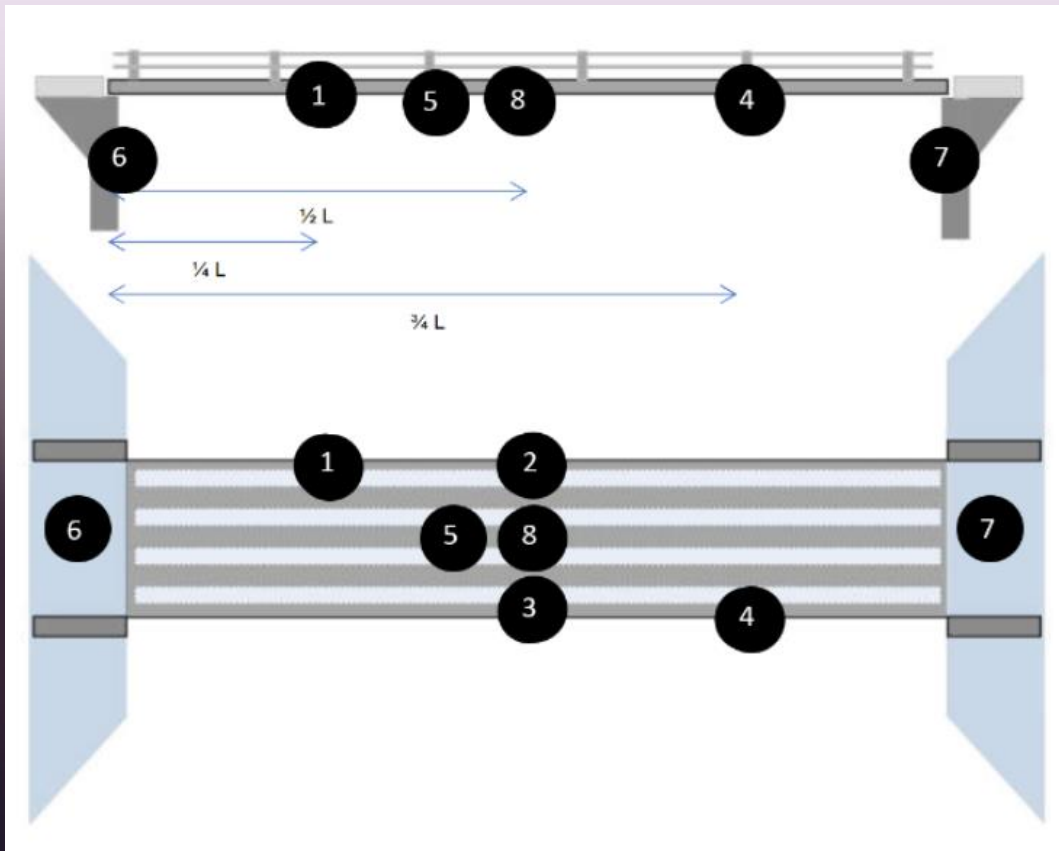
- This feature see the status of bridges in realtime which is covered by colored pins where the color represents the status of the bridge
- If there is a change in the condition of the bridge then the color of the pin will change color in realtime.

Bridge Control Panel



- This feature change the status of the bridge to be under repair, under check, and set the usability status of a bridge
- With the repair mode enabled, the bridge status will automatically change to being repaired

Pointing Sensor Placement



- This feature see the laying of sensors on a bridge.
- Each point on the bridge layout represents one sensor unit
- Sensor laying on layout adapted to actual laying in the field

Setting Threshold Parameters

Threshold setting

Alert Threshold

Danger Limit (High) g

Danger Limit (Low) g

Caution Limit (High) g

Caution Limit (Low) g

Offset

The second value only applies to sensors with 2 axis

First value

Second value

Gain

The second value only applies to sensors with 2 axis

First value

Second value

Data Recording Activation

Activation Trigger (High) g

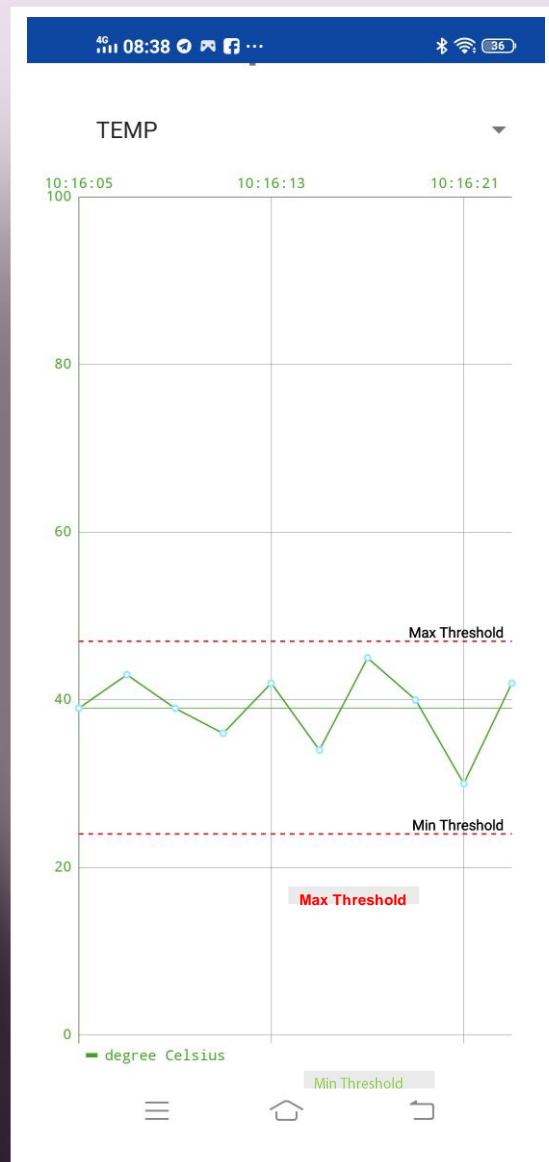
Activation Trigger (Low) g

Apply

Close

- This feature set a threshold consisting of a maximum limit and a minimum threshold
- This aims to set reasonable value limits for a sensor, so that if it passes then the system will give a warning

Realtime Graph



- This feature view the data presented in the form of graphs from a sensor in realtime.
- In the Graph there are two red lines that indicate the minimum threshold and the maximum threshold that is the limit of a sensor threshold.

Reporting Data

Sensor data

Accelerometer

☒ Accelerometer 1

☐ Accelerometer 2

☐ Accelerometer 3

☐ Accelerometer 4

Strain

☒ Strain 1

Gyroscope

☒ Gyroscope 1

☐ Gyroscope 2

Temperature

☒ Temperature 1

Starting limit

23 February 2021

Final limit

23 February 2021

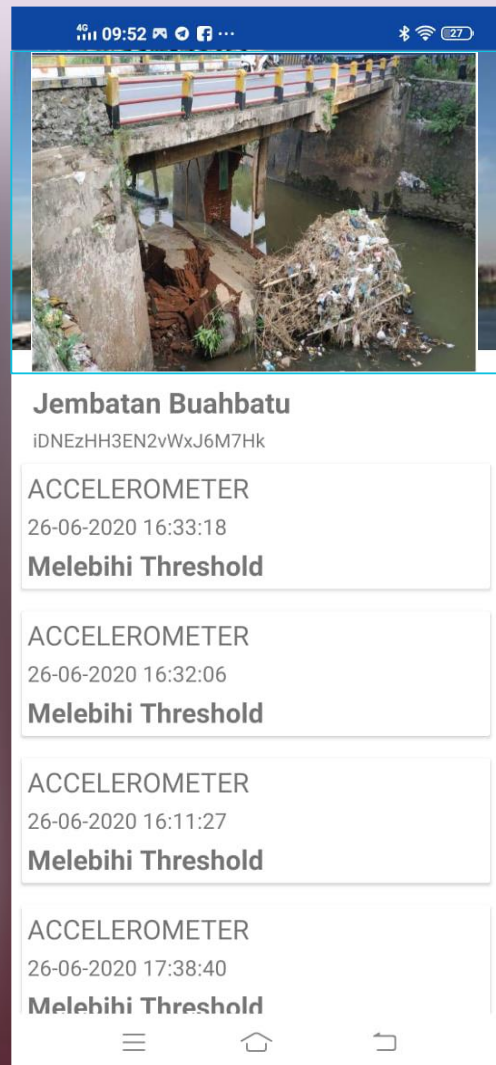
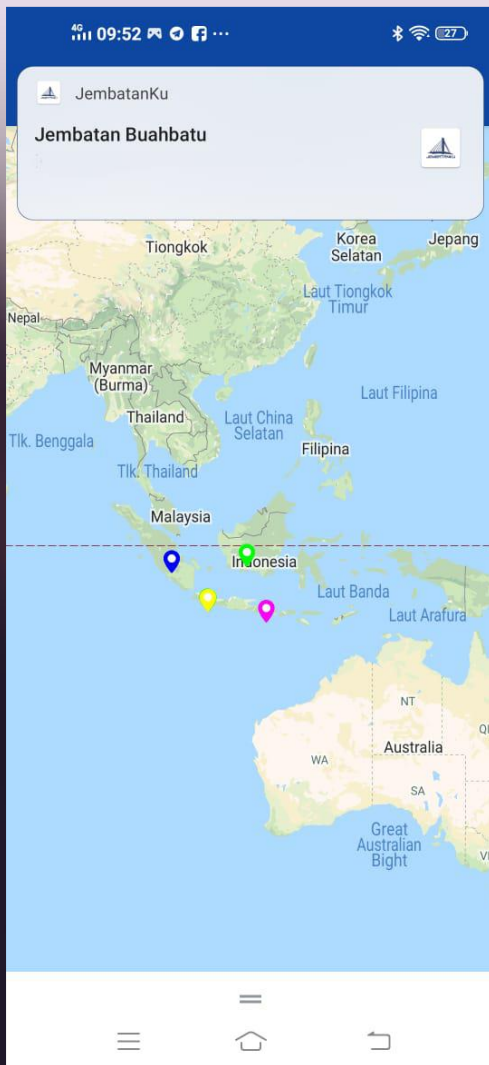
Request

Close

✔ Data sensor ditemukan. Link data akan dikirimkan pada email anda.

- This feature view the report data of a sensor within a certain time range set by the user
- Data will be sent to the user's email

Alert System



- This feature provide notifications sent from the server regarding problems on the bridge.
- This is so that the user can take preventive measures against the health condition of the bridge

"For safety is not gadget but a state of mind."
Eleanor Everet



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