



Progress towards the Development of Digital Calibration Certificate for High Voltage PT burden calibration

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Abstract

The Digital Calibration Certificate (DCC) aims to modernize and enhance the efficiency of calibration certificates by transitioning from traditional paper-based methods to a fully digital system. This paper encompasses the development of several core components, each serving a distinct function within the application. The main components of DCC are administration information, technical data and information from the customers. All these information are merged together using several frameworks like, React, React Router, CSS, JavaScript, HTML, Express, MongoDB etc. to form a complete certificate. In order to check the validity of the developed model, a digital certificate has been generated for PT burden calibration data. In-house calibrations are performed on the PT burden system for generation of data

Methods and Materials

A homepage, comprising of buttons for Administration, Technical and Customer users, are developed with sign-in and sign-up options. Different user-interface components, HomePage login, Template.jsx, Admin.jsx, TechnicalCalibrationForm.jsx, Results.jsx, Ctrb.jsx. have been developed. Template.jsx provide information on organization information, certificate details, environmental conditions, standards used, calibration methodology. Admin.jsx serve as the primary component, to inputs like, dates, text inputs, and a division selector. Result.jsx will generate uncertainty budget using HTML framework in a structured A4 format. Ctrb.jsx page will collect information of customers and their instruments.

Experimental Setup

Experimental results are used to develop uncertainty budget using XML framework. 110 V source connected in series with a PT burden, power analyser. Measurements taken at different VAs and power factors. Based on the experimental results, an uncertainty budget is calculated. A sample DCC developed for the experimental dataset with a particular parameter (Volt-Amp). Two basic cryptographic algorithms viz. RSA and ECC are developed for security purposes

Results

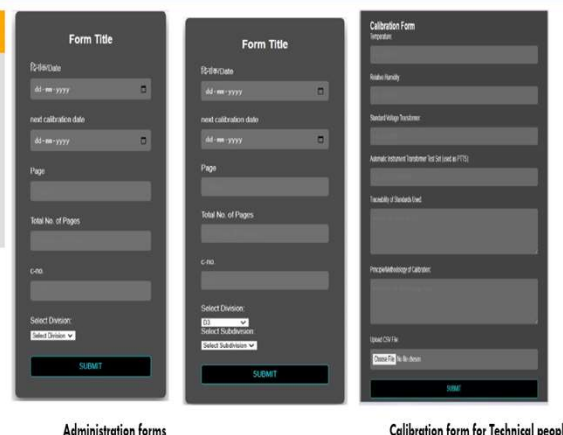
Log in pages for the laboratory and customers are developed. Calibration and administration pages are developed. A DCC has been developed for PT burden calibration data. The digital format is validated with the manual calculations. Encryption and decryption times are calculated for different cryptographic algorithms.



Experimental setup: PT burden calibration



Log-in Pages

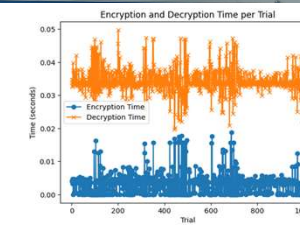


Administration forms

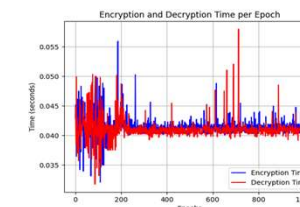
Calibration form for Technical people

1. Calibrated for		1. (Temperature) (25 ± 2)°C
2. Description & Identification of item under calibration		2. (Standard Voltage Transformer) (50 ± 10%)
3. Environmental Conditions		3. (Standard Voltage Transformer) (50 ± 10%)
4. Standards used		4. (Standard Voltage Transformer) (50 ± 10%)
5. Traceability of Standards used		5. (Standard Voltage Transformer) (50 ± 10%)
6. Principle/Methodology of calibration		6. (Standard Voltage Transformer) (50 ± 10%)
7. Calibration Procedure		7. (Standard Voltage Transformer) (50 ± 10%)

Digital certificate for PT burden calibration



Encryption and decryption times for RSA and ECC algorithms



Conclusions

In this paper, a digital calibration certificate for a potential transformer burden is developed. An experiment has been performed to obtain the propagated uncertainties for this setup. In order to represent the outputs of the burden experiments systematically, a homepage has been developed. The homepage consists of sign-in and sign-up options for administration, technical and customer personnel. Once the instrument is received by the calibration laboratory, it is assigned to a suitable division for calibration. After performing the experiments, the uncertainty budgets are developed using .XML frameworks. The data is passed to the Admin portal from the Technical portal for generation of calibration certificates in digital format. The frameworks, like, React, React Router, CSS, HTML etc. are used to develop these portals and finally the certificate. This work may be considered as a basic yet significant step towards modernization and improved efficiency in the calibration process, offering a robust and reliable solution for generating digital calibration certificates. As a future work, incorporation of digital signature on the DCC is under progress.

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