Mahidol University
Faculty of Information and Communication Technology

MARU Mahidol AIST Research Unit AIST-Thailand

AIST

Security Data Visualization on SAGE2

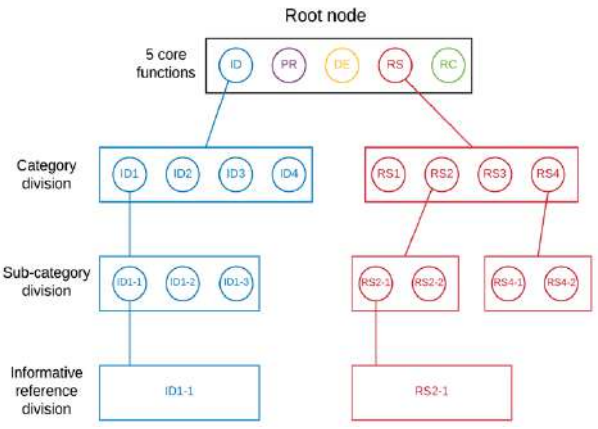
Nasorn Niampradit[1], Wudhichart Sawangphol[1], Assadarat Khurat[1], Jason Haga[2]
nasorn.nia@student.Mahidol.ac.th[1], wudhichart.saw@mahidol.edu[1], assadarat.khu@mahidol.edu[1] , jh.haga@aist.go.jp[2]
Faculty of Information and Communication Technology, Mahidol University, Nakornpathom, Thailand[1]
National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan[2]

Abstract

Cybersecurity has recently become an area of great interest for an organization's infrastructure considering the current importance of data and increase in cybersecurity threats. The cybersecurity risk framework was identified and developed by the National Institute of Standards and Technology (NIST, United States) for voluntary use by critical infrastructure owners and operators in order to assist in managing risk. This risk management relates to all aspects of cybersecurity, including information security, access controls, and resiliency. Although this cybersecurity framework supports managing cybersecurity risk, it is a summary of 6 different security policy standards, with thousands of pages of information that must be understood in order to make informed decisions about what policies are appropriate. To decrease the time for understanding the framework, we designed an interactive visualization of the NIST document by developing an application based on HTML and JavaScript on the SAGE2 middleware for collaborative working, using the WebView application in SAGE2.

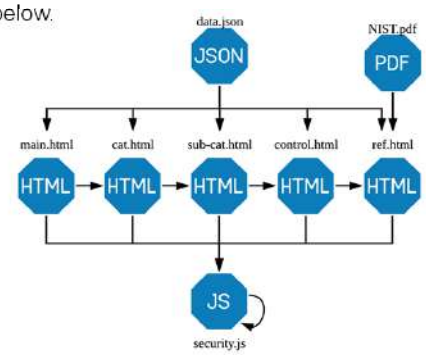
System Architecture

According to NIST document, 5 core functions of the cybersecurity framework which include Identify, Protect, Detect, Respond, and Recover are mapped into a visualization-rich workflow to aid decision makers on choosing security policies. Each core function includes categories and sub-categories and references that are common across critical infrastructure. So that this program use the HTML file to retrieve the information for each layer of cybersecurity framework which is keep in JSON file and show to the screen using JavaScript.

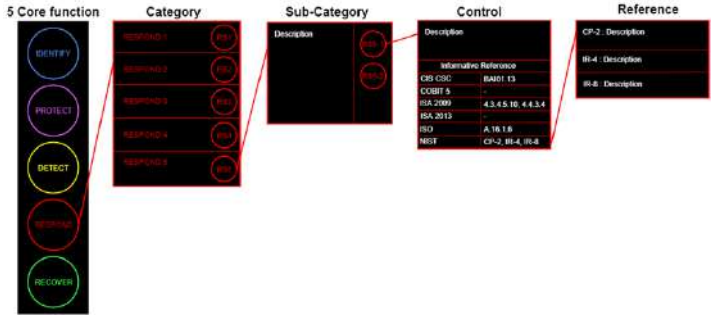


Result

The visualization program use the HTML file to retrieve the information for each layer of cybersecurity framework which is keep in JSON file and pull them out to the SAGE2 screen using JavaScript. The structure of our application is as shown in the hierarchy below.



Each layer is shown as one node that connect to the other nodes. We design this structure to be a hierarchy so that the user can get better understanding at the NIST security framework. The root node contains the 5 core functions that will branch to categories, sub-categories, and references. The color for each node is related to the color of its core function which refers to the color that NIST assign to.



Reference

1. P. Barrett, M. (2018). Framework for Improving Critical Infrastructure Cybersecurity. [ebook] NIST Cybersecurity Framework. Available at: https://www.nist.gov/cyberframework.
2. S. Ross, R. (2013). Security and Privacy Controls for Federal Information Systems and Organizations. [ebook] Special Publication (NIST SP) - 800-53 Rev 4. Available at: http://dx.doi.org/10.6028/NIST.SP.800-53r4.
3. SAGE2. (2014). University of Illinois at Chicago's Electronic Visualization Laboratory (EVL) and University of Hawai'i at Manoa's Laboratory for Advanced Visualization and Applications (LAVA).

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