Syllabus
«Free & Open Source for Network Monitoring & Control»

Lecturer: *Krainyk Yaroslav Mykhailovych*
Cand. Sc. (in Engineering), Associate Professor,
Department of Computer Engineering,
Petro Mohyla Black Sea National University

Expected learning outcomes

As a result of studying the discipline, the student

must know:

– steps in to run troubleshooting to get to the root of the problem;

– methods of keeping the network online and eliminating the risk of becoming a victim of unnecessary downtime;

– means of regular maintenance of the network;

– analyze open source network monitoring tools to identify those that best meet the need to ensure network uptime.

must be able to:

– autodiscover devices connected to your network;

– view live and historic performance data for a range of devices and applications;

– configure alerts to notify you of unusual activity;

– generate graphs and reports to analyze network activity in greater depth.

Purpose:

The purpose of teaching the discipline «Free & Open Source for Network Monitoring & Control» is to give students a systematic knowledge of mastering the skills of developing real-time network support systems to ensure that the network is not vulnerable to attackers. Open source network monitoring tools help monitor individual nodes and applications for signs of poor performance.

The scope of the discipline: 3 ECTS credits (10 hours of lectures, 20 hours of practice), 60 hours of self-study, exam).

Originality of the academic discipline:

Author's course

The content of the discipline

Topic 1. The graphing solutions that acts as an addition to RRDTool

Windows and Linux Network Management Protocol (SNMP) support for graphing traffic data. Cacti application for Linux and Windows.

Checking hosts on the network. Data storage in the MySQL database. Creating graphs. Data source templates. Monitoring schedules.

Topic 2. Automatic detection and control of devices connected to the network

Nagios Core open source monitoring tool. Creating performance graphs. Nagios V-Shell as a PHP web interface built in AngularJS, searchable tables and a RESTful API designed with CodeIgniter.

Topic 3. Enter custom configurations and view real-time performance data

Visualization using Icinga 2 dashboards for Windows, Debian, DHEL, SLES, Ubuntu, Fedora, and OpenSUSE. Built-in support for Graphite and InfluxDB to convert performance data into full-featured graphs for deeper performance analysis.

Track real-time and historical performance data. Send alerts about performance issues.

Topic 4. Monitoring time-series data

Prometheus an open source network monitoring tool. Identification time-series data by metric name or key-value pairs. Storing time-series data on local disks to access in an emergency.

Viewing notifications every time it raises an event. Sending notifications via email, PagerDuty, or OpsGenie. Silencing alerts. Switching from the browser to the template language and Grafana integration. Integration various third-party data sources into Prometheus from Docker, StatsD, and JMX to customize Prometheus experience..

Topic 5. Intelligent Platform Management Interface (IPMI)

Zabbix an open source application from Dell for network, server, cloud, application and service monitoring. Zabbix for CentOS, Debian, Oracle Linux, Red Hat Enterprise Linux, Ubuntu and Raspbian platforms.

Prerequisites

Disciplines "Computer Networking", "Physics", "Sensors and transducers", "Distributed systems with cloud architecture and data storage".

Consequences

The knowledge gained during the study of the discipline can be used for the preparation of a qualification work (dissertation) and professional activity.

Semester control: exam

Evaluation:

Evaluation of student's performance during semester: 60 points
Exam: 40 points

Types of work

Practical works – 50 points
Doing homework – 10 points

University Attendance Policy

A student enrolled in a course is expected to attend all scheduled classes. The teacher of each course informs the students about the rules regarding the absence of students. Students should be aware of this policy. The final decision on whether or not to excuse a student's absence is made by the teacher.

Attendance or participation is also expected in online courses. Participation in online courses can take different forms; it is the teacher who determines what form of attendance or participation is expected.

The teacher reserves the right to give a failing grade to a student for excessive absences.

Technical support

Lectures on " Free & Open Source for Network Monitoring & Control " are held in classes equipped with the necessary multimedia tools (projector, laptop).

Practices on the discipline are carried out in computer classes using Microsoft Office, Internet connection, free network monitoring tools https://opensource.com/article/19/2/network-monitoring-tools.

Deadline policy

Works that are submitted in violation of deadlines without good reason are evaluated at a lower grade.

Academic Integrity Policy

Provides independent performance of practices. Write-off (including using mobile devices) is prohibited. The work is not credited in case of detection of plagiarism or writeoff.

Criteria for assessing knowledge

A student's answer is evaluated with a score of 9–10 points and 31–40 points on the exam (A on the ECTS scale and 5 on the national scale) if it demonstrates deep knowledge of all theoretical principles and ability to apply theoretical material for practical analysis and has no inaccuracies.

A student's answer is assessed with a score of 7–8 points and 21–30 points on the exam (B and C on the ECTS scale and 4 on the national scale) if it shows knowledge of all theoretical principles, ability to apply them in practice, but some inaccuracies are allowed.

The student's answer is evaluated with a score of 5–6 points and 11–20 points on the exam (D and E on the ECTS scale and 3 on the national scale), provided that he knows the basic theoretical principles and can use them in practice.