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DETERMINING WHEN A CYBER ATTACK BEGINS AND SIZE INSURANCE

Cyberattack is a situation where the number of Internet access (IS) requests that serve customers' requests via the Internet is increasing dramatically. In this case, the IP server starts to slow down, trying to satisfy all requests until it stops working [1].

Determining the starting point of a cyber-attack is very important as it will reduce the loss of compensation for its effects.

We find the criterion for the beginning of cyberattacks by statistical calculations.

To do this, let's break down the entire time span of an information system that handles external ecommerce requests at a time interval. They can be: hour, day, week, but in working conditions over the Internet, it is better to set these intervals no more ΔT = 20-30 min.

Next, you need to set up a constant check on the number of incoming requests.

After determining the number of queries in each interval of at least 40, you need to calculate the average number of hits Mx.

We use the hypothesis that the flow of events is most often characterized by an exponential distribution law. It is characterized by the function of species distribution

$$F(x) = \int_0^x \lambda \cdot e^{-\lambda x} dx = 1 - e^{-\lambda x}, \text{ with } x \geq 0,$$

$$F(x) = 0, \text{with } x < 0$$

The mathematical expectation is known to be equal

$$M_x = \int_0^\infty \lambda x e^{-\lambda x} dx = \frac{1}{\lambda} .$$

The median can be found as M_e=-Ln0.5/λ≈0.69/λ.

From where, $$\left.\begin{aligned} \lambda &= \frac{1}{\mathrm{M}_{\mathrm{x}}}, \\ \lambda &= -\frac{Ln0.5}{Me} \end{aligned}\right\} \qquad (1)$$

Expression (1) allows you to find the relationship between the median and the mean

$$Me = -\frac{M_x}{Ln0.5}.$$

We set the confidence probability *β*, which will determine the permissible level of incoming hits in the interval [*Me; K*], where *K* – the real number of hits per interval *ΔT.* Obviously, the probability of hitting this interval should be half the confidence probability

$$\frac{\beta}{2} \geq P(Me < x < K) = \mathrm{EXP}(-\lambda Me)\text{-}\mathrm{EXP}(-\lambda K). \qquad (2)$$

Substitute a value *λ* from (1) to (2)

$$\frac{\beta}{2} \geq \mathrm{EXP}(-\frac{Me}{M_x})\text{-}\mathrm{EXP}(-\frac{K}{M_x}), \qquad (3)$$

From expression (3) we transform the median through the mean

$$\frac{\beta}{2} \geq \mathrm{EXP}(\frac{Me}{M_x \mathrm{Ln}0.5})\text{-}\mathrm{EXP}(-\frac{K}{M_x}). \qquad (4)$$

Bring expression (4) to the form

$$\beta \geq 2 \cdot \mathrm{EXP}(\frac{1}{\mathrm{Ln}0.5})\text{-}\mathrm{EXP}(-\frac{K}{M_x}) = 0{,}47258018\text{-}2 \cdot \mathrm{EXP}(-\frac{K}{M_x}). \qquad (5)$$

Now let us find the permissible excess of the number of incoming calls of the information system above their average value

$$\frac{\beta - 0{,}47258018}{2} \geq \text{-}\mathrm{EXP}(-\frac{K}{M_x})$$

from where

$$M_x \cdot \mathrm{Ln}\left(\frac{\beta - 0{,}47258018}{2}\right) \geq K \qquad (6)$$

Therefore, if the number of hits to IP *K* exceeds the value of the expression on the right (6), we can assume that the cyberattack has already started.

Understanding that attitude $\frac{K}{M_x}$ is an excess of the average in relative units, let's calculate the correspondence of some popular confidence values to the extent that the number of incoming calls exceeds the average. The results of the calculations are presented in table. 1.

Table 1

Calculation of the fit of the confidence probability and the measure of the number of incoming calls at their average value

β	$\frac{K}{M_x}$
0,6	2,753415
0,75	1,975370
0,8	1,809659
0,85	1,667544
0,9	1,543136
0,95	1,432506
0,98	1,371564
0,99	1,352048
0,999	1,334803
0,9999	1,333095

From the table. 1 we can conclude that in case of exceeding the number of requests for IP above their average number only one and a half times, it is possible to more than 0.9 probably assume that the cyber-attack has already started.

When applying to insurance companies, e-commerce business owners may get a significantly inflated rate offer or even a waiver. The reason for this is the lack of reliable statistics on the possible losses during such operations.

Therefore, before concluding an insurance contract, it is advisable to conduct a study on the number of (n) cybercrime incidents. The following statistics will be:

N – the total number of organizations working in the field of e-commerce;

n – the total number of e-commerce organizations that have suffered losses;

$\overline{b}$ – average damage from cybercrime (degree of business destruction) for each organization;

B – the total amount of contracts executed by these organizations in the framework of e-business.

Next, you need to determine the average (M_b) and the mean squared deviation (σb) for the cybercrime loss by the formulas.

To calculate the net tariff rate, you must use a confidence probability (β) and the inverse of the Laplace function ($L^{-1}(\beta)$).

Then the e-commerce insurance net rate will be found as

$$T_n = \frac{n}{N}\left(1 + L^{-1}(\beta)\frac{\sigma_b}{M_b}\right). \tag{7}$$

For example, determine the size of the net rate for cybercrime insurance if the number of negative cases n = 13 with the total number of organizations working in the field of e-commerce is N = 12456, the average value of the destruction of the object is equal $\overline{b}$ = 0,5, *Л*(β) = 1,68, a σ_b = 1235 UAH, M_b = 1235478 UAH.

According to formula (7), the value of the tariff net rate will be

$$T_n = \frac{13}{12456}\left(1 + 1{,}68\frac{1235}{12345478}\right) = 0{,}0010438$$

The result of the calculation suggests that with business insurance worth UAH 1 million, the net rate will be UAH 1,043.8.

Keep in mind that insurance companies add a load to the net rate that is several times greater than the net rate itself.

But in all cases, if the proposed insurance rate exceeds the net rate more than the order of magnitude, it is necessary to refuse such insurance services and look for another insurer.

References

1. Pistunov IM Ecommerce Security [E-resource]: Educ. manual / I.M. Pistunov, EV Kochura; Nat. mines Univ. - An electron. text. data. - D.: NSU, 2014. - 125 p. Ministry of Education and Science of Ukraine (№1 / 11-6641 from 05/06/14)