BULETINUL Universităţii Petrol – Gaze din Ploieşti	Vol. LXI No. 3/2009	395 - 398	Seria Tehnică

The Optimization of Data Transfer in Industrial Networks: a Point of View

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Abstract

Industrial networks are used in process control, ensuring connections between simple industrial devices (for example: sensors) and also more complex (as PC, controllers, PLCs). Theoretically, the data transfer optimization involves the selection values for a multitude of inter-relations through the focusing on a maximum or minimum objective with possible limits for choosing the variable values.

Key words: *industrial networks, network communication, data transfer optimization.*

Introduction

Industrial networks broke into the monitoring domain quite remarkably, the supervision and leading of the industrial process being influenced in a decisive way by the needs in requests social communication and information.

The main objective could be highly expressed as the multitude of the networks offers with a high standard of cover area and a very good access, accomplishing a lot of requests as previously mentioned above, taking into account special requirements and restrictions due to the nature of the contact processes alongside with the ways of communication.

Industrial Networks at Present

Industrial networks use of industrial communication networks is relatively new, the great results concerning the last decade. The development of this domain is driven by the actual accomplishment of a more complex system that involving the interconnection of a great automatic devices number.

Industrial Networks Characteristics

Industrial networks types were first designated to the applications of acquisition data domain, the control of the sensors and of the process elements execution within industrial domain [2].

From the author point of view it is better to replace the traditional cabling with industrial networks because all the sites of the networks can be interconnected to the same way of

communication, and it is less probably that a disposal set of data during another disposal is getting the same set of data but with other values.

Also, the author considers it is very important to ensure a great immunity increase to any noise, because the signal is digital and the report signal/noise could be better using more bits for analogical signal representation.

Industrial Networks Use: an Argument

Studying the industrial networks the author noticed some advantages, as the simple installation and easy protection, because there is only one cable, for detecting and facile localization of breaking-down and also expanding over to modular nature.

The main arguments for industrial networks are that they are able to get the communication through a magisterial bus thus, theoretically, a way to change the data not able to be transferred or could be done hardly by the standard procedure.

Data Transfer Features

The data transfer is described by a series of characteristics like delay, lost, lockout, rejections, which depend on communication due to capacity, availability, need of information changing as to frequency or quantity [1].

Analyzing all these features one could say there is a common support, the quality supports the dependability, the dependability supports the flexibility, and the flexibility supports the costs.

The quality of data service transfer is expressed through the avoiding of situations as waiting to a free way of access to the destination, the lost or spoiling information and the transfer with non-acceptable variable delays.

This is where from the author sets the major objectives, to sustain constantly in a reasonable limits of lockout/rejection probability to a data transfer and the optimization transfer which has a series of qualitative indicators of noise, echo, lost and delays.

Data transfer should be done in due time, the quality of the transfer depending on a series of factors (imperfections) that result from the operation conditions and mood of architecture entices of networks communication [1].

Data Transfer Security

The data come from the measure module than must be sent to the center of rebuilding the local elements and the commands emitted or the procedures initiated by the central system which is due to get to the execution elements.

Data transfer can be spoiled partially or totally thus we use encryption data, ensuring confidentiality and integrity.

From the author’s point of view absolute security cannot be sustained but only a resilient one according to the risks and work conditions. Hence, the author considers a balance must be ensured between what is compulsory and what is likely to be acquired.

Data Transfer Optimization

The success of data transmission depends on the nature and the quality of the sent signal and on the medium communication features as to ensure data intelligibility to the receptors. For a greater efficiency information flow quantity should be evaluated, given by the source and the possibilities of the channel in order to make a reliable transmission way to the destination.

The useful signal is spoilt by a series of other foreign signals, named noises. There are four kind of noises: the thermal noise, that is able to put an inferior limit of the sensitive reception system, the intermodulation noise which appears because of the high level of signals to entering devices and their passing in a condition of non-linear regime and the right non-synchronization to the system of transmission, the noise of an impulse that appears randomly , being made by lightning, flashes, or by the bad working of some devices, the diaphony caused by the electric coupling of the transmission media, the weak control of frequency, the weak control of answering frequencies through filters, weak performance, non-linear performance of multiplex analogical system, etc [1].

Data transfer optimization is influenced by the route (selected from a set of possible access routes). The chosen way is based on these basic criteria: righteuosness, simplicity, rehabilitation and stability.

Data transfer analysis involving datagrams set up the optic parameters: the number of the transferred packets per second and the medium delay per packet. The sooner the networks are charged the busier the routes get and that involves a larger memory of the packets, thus also a long time wait.

The author noticed that for the modulation, simulation and the optimization of data transfer there could be used calculation elements which take into consideration the data flow. The network is characterized by a transfer capacity, but regarding an overflow a congestion phenomenon could emerge (the knot resources are thought for a maximum data flow. When there comes up an overflow the data buffers get stuck). Lockout prevention needs a good control of data flow. The congestion is given by the rhythm difference between the number of the sent and received packets. It is necessary that the emission be stopped to feed the buffer until is starts working.

Congestion prevention could be realized by one of these methods: resources allocation in advance, useless packets deletion, packets number control within the network; the flow control of packets to preview the lockout and charged networks no entry. The buffers are very important for the reserve mechanism. A measure of congestion is that of filling of the buffer. A reservation in advance of the resources should take into consideration another buffer as a reserve. Launching without allocated resources is forbidden. The application is limited by the bandwidth and describes the situation when the receiver starts receiving the data before the sender finishes sending them while the applications are delayed [1].

If the efficiency measures the way in which a canal is fully used, the right way indicates how available resources are divided between the rival flows The parameters of the network could be adjusted to get a high utility according to the equitable repartition of resources.

Packets loss hits directly the application band width. It could be noticed the packets loss due to any kind of failures could turn disastrously against the networks [1].

The presence of a dead timing leads to troubles in the optimal control projection which can be prevented by technical predictions (as Smith method) [1].

Also, for optimal control projection must be taken into consideration the imperfections of the communication media: the distortion of amplitude or attenuation phase which leads to the limitation of the bit rate.

The author sustains that the efficiency of optimization method is appreciated by the convergence type, the convergence speed which is better to be bigger, the calculation volume and running time of the system processing. The convergence speed gets higher information flow according to its functions and its derivations.

Conclusions

From the author's point of view, the user is not generally interested into the implementation of a certain service but it compares an offer with another, in universal terms of performance, which apply to any type of service. Also, the optimization of data transfer networks is expressed through parameters that take into consideration only the aspects that can be measured objectively. These parameters are made in terms of effects perceptible to the user, their definition being made without an internal network conception.

References

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Un punct de vedere asupra optimizării transferului de date în reţelele industriale

Rezumat

Articolul prezintă o abordare de ansamblu a parametrilor care intervin în optimizarea transferului de date în cadrul reţelelor industriale. Comparând valorile unor identificatori cantitativi cum ar fi, de exemplu, costul, disponibilitatea, flexibilitatea, performanţa, este de subliniat faptul că în optimizarea transferului de date trebuie luate în calcul nu numai natura şi calitatea semnalului, ci şi fluxul de date, respectiv ruta urmată. Practic, acestea din urmă permit creşterea vitezei şi siguranţei traficului, optimizându-se în consecinţă transferul de date.