

**ADAPTIVE COMPUTING MODEL FOR
DISTRIBUTED AND REAL-TIME APPLICATIONS**

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The distributed computing systems as based on real-time applications provide advantageous solutions for complex process control. Such systems are a multitude of heterogeneous nodes that are integrated into data processing and

create a multicast communication network, where each node settles a part of a complex model, which is defined for the purpose of process control. The efficiency and performance of these systems are evident for distributed computing systems with a limited number of data processing nodes. However, in the context of the development of IoT technologies and Industry-4.0, which provides for the integration into a global network of all data processing nodes, delays in the communication process are possible, which will reduce the quality of the control process [1, 2]. In order to partially solve the above-mentioned problem, it is proposed to apply an adaptive calculation model. This model will reconfigure the interconnection topology of the data processing nodes which will reduce the delay time in the data transfer process. The process is defined as follows:

$P(t) = \{X(t), U(t), Q(t), M(t), \Delta t\}$, where

$$\begin{cases} X(t) \xrightarrow{F(t)} U(t + \Delta t), \\ M(t) \xrightarrow{Q(t)} M(t + \Delta t), \\ F(t) \xrightarrow{M(t)} F(t + \Delta t), \\ Q(t) \xrightarrow{F(t)} Q(t + \Delta t), \end{cases}$$

$X(t)$ is the process state at a point of time t ; $U(t)$ is the action on the process; $Q(t)$ is the system quality model; $F(t)$ is the system control model; $M(t)$ is the matrix of configuration of the topology of the network where data processing nodes interact; $t \rightarrow t + \Delta t$ is the dynamics of the process of adaptation of the system control model.

References:

1. O. Vermesan, P. Friess. *Digitising the Industry. IoT Connecting the Physical, Digital and Virtual Worlds*. River Publishers. 2016. 264p. ISBN: 978-87-93379-82-4.
2. M.P. Kumar, P. Sahithi, S.S. Revanth. Industry of Quality (IoQ) – An Industry 4.0 Perspective. *International Journal of Applied Research*, 6(4) (2020), 109-114. ISSN: 2394-5869.