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Special Issue on Data Dissemination for Large scale Complex Critical Infrastructures
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Call for Papers
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We are witnessing a gradual increase in the scale of current critical infrastructure. Therefore, their architecture is evolving from a "closed world" prospective (i.e., a set of computing devices interconnected by dedicated networks with limited, or even no connection to the outside world) to a "cooperative world" prospective (i.e., several critical systems are federated, i.e., forming the so-called system of systems, and brought to interoperate in order to carry out some critical functionalities). In fact, several research and industrial projects plan to build future critical infrastructures as federations of several, sometimes preexistent, systems, called Large-scale Complex Critical Infrastructures (LCCI). Practical examples are the next-generation Air Traffic Management (ATM) framework that is under development in Europe, where all the ATM actors are seamlessly integrated over wide-area networks in order to overcome the fragmented current situation of flight en-route control, or Intelligent Transportation Systems (ITS), where vehicle control systems cooperate with each other and with devices deployed along transport infrastructures to support drivers and improve safety. In addition, also several Cyber Physical Systems (CPSs), i.e., those characterized by a tight combination and coordination between the system's computational and physical elements, fall within the category of LCCI, e.g., smart ambients, such as an entire skyscraper or a complex of buildings, autonomically manage heating, ventilation and air conditioning and are in charge of detecting emergencies, such as fire, triggering alarms and performing proper countermeasures, such as turning on sprinklers to douse the flames.
Such systems present multi-point cooperative patterns carried out by a middleware solution that focus on how to manage data exchanges in order to fit system non-functional requirements and to handle its large scale. In fact, any middleware solution adopted to address these requirements should satisfy the requirement of reliable, timely and scalable communication over large-scale wireless/wired networks:

1. Assuring message deliveries despite omissions occurring in the adopted networks since lost messages can have disastrous consequences, e.g., losses of human lives and money;
2. Exhibiting a predictable latency, even in case of network failures, since the right answer delivered too late may be unacceptable;
3. Providing a seamless message distribution among heterogeneous networks;
4. Scaling up several receivers without causing strong performance fluctuations.

One solution is to adopt a data-centric approach for data dissemination based on content-based subscriptions and data aggregation techniques. On one hand, information will be delivered only if there are interested destinations, leading to a reduction in network traffic. On the other hand, raw data will be aggregated in order to obtain high-level application-specific information that may be used for immediate action or learning.
Typically, the adopted data dissemination solution has also to provide autonomic capabilities to 1) adapt to the heterogeneous network conditions by choosing the right strategy to provide the desired quality-of-strategy, 2) self-heal when connectivity in the system is compromised by the occurrence of several failures, and 3) reconfigure upon variations in the network conditions.

The objective of this special issue is to envision new trends and ideas about theoretical and practical aspects of designing, implementing, and evaluating future data distribution platforms for the next generation critical networked infrastructures. Topics of interest include, but are not limited to:

- Reliable Group communication solutions, such as Publish/subscribe services or Application-Level Multicast, over large-scale wired and/or wireless networks;
- Scalable and real-time information dissemination;
- Adaptive and Autonomic Data dissemination;
- Reliable Data Aggregation;
- Use cases of Future Critical Networked Systems
- Secure Event Dissemination over large-scale wired and/or wireless networks.

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