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Reliable service provisioning in converged multimedia network environment

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ABSTRACT

For new service provisioning and flexible network management, diverse heterogeneous networks are converged to a packet-based network with the help of service and control platforms. These platforms, which are shared with several services, perform service provisioning-related functions and manipulate network resources on transport systems to provision services requested from users. Under the converged network circumstance, even a single control system failure affects all services supported by the failed system. It is obvious that a convergence environment requires higher level of reliability than legacy service networks. Previous studies on reliability most focus on how to improve reliability of systems or how to compute reliability of services. The purpose of this paper, instead, is to present a way to compute the required reliability of systems with redundancy policy for satisfying the target reliability of services under the converged network circumstance. Using the proposed method we exemplified the required reliability of control systems and their redundancy ratio for satisfying certain level of reliability of services. The proposed method is expected to give a guideline for planning service and control platforms in consideration of economic efficiency that leverages the level of reliability.

1. Introduction

Demands for various multimedia contents and convenient use of communications have been pushing to develop new services in the Internet world. Unified communication service providing voice, video, and short messages begins to be prevailing (Minifie, 2007). Internet Protocol Television (IPTV) is a new form of converged multimedia service which provides real-time TV service, Video on Demand (VoD) service, home shopping, home banking, and so on (Volk et al., 2008). These convergence trends come from the result of packet-based network integration (Agrawal et al., 2008). Network convergence enables ubiquitous communication environment where users can enjoy multimedia services with any device, anywhere, and any time. A packet-based network convergence environment is embodied with shared service and control platforms, which perform specific tasks for service provisioning and network resources control (Modarressi and Mohan, 2000). While legacy service networks have their own service platforms, shared service and control platforms exist to support a variety of services in a converged network.

Since service and control platforms perform common control functions for several services, even a single system failure affects all services that the failed system supports. Therefore, reliability issue should be taken much care of in a converged network design for reliable service provisioning. Apparently, the reliability of service and network much rely on the reliability of network elements. Reliability can be considered in viewpoint of availability and survivability. Availability is defined as a probability that a system or service is available at a specific time, or a ratio that it is available over specific time duration in a steady state. Service survivability implies the ratio of the unaffected number of subscribers who can consistently use the service over all subscribers in case of a failure. Both are affected by the reliability of individual systems and their redundancy, but the latter is also affected by the distributed level of system positioning. Much attention is paid to the former both academia and industry, but relatively less attention to the latter that is regarded in charge of network operators. The most critical limitation of improving reliability is in the aspect of economic efficiency. It is because the series efforts to improve network reliability that requires higher reliability of individual systems or system redundancy consequently increase CAPEX and OPEX. Thus, reliable service provisioning should need to be considered not only reliability but also economical efficiency.

Earlier studies on reliability mostly focus on how to improve reliability of systems (Bennett, 2001; Gurbani et al., 2005) or how to compute the reliability of service based on dedicated modeling efforts (Vogt et al., 2003; Wang and Trivedi, 2005; Asthana et al., 2006). The purpose of this paper, instead, is to present a guideline to provide the required level of system reliability for satisfying the target service reliability in a converged network environment. We intend to answer network operators with how to design system reliability and to decide the redundancy policy in building NGN platforms when they are requested to support service providers' demand for highly reliable service provisioning. For doing this, we first present the basic concept to compute service reliability with

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