# Survivability Analysis of Two Specific 16-Node, 24-Link Communication Networks

**Shahbaz Nazrul**

**Thesis submitted to the Faculty of the**
**Virginia Polytechnic Institute and State University**
**in partial fulfillment of the requirement for the degree of**

**Master of Science**

**in**

**Electrical Engineering**

**Dr. Ira Jacobs, Chairman**

**Dr. S. F. Midkiff**

**Dr. N. J. Davis**

**July 23, 1998**

**Blacksburg, Virginia**

# Survivability Analysis of Two Specific 16-Node, 24-Link Communication Networks

Shahbaz Nazrul

Committee Chairman: Dr. Ira Jacobs

Bradley Department of Electrical Engineering

(ABSTRACT)

A highly survivable communication network is desirable, as service disruption is usually not tolerated. In this thesis we mainly investigate and discuss the survivability of two specific communication networks, termed topology 1 and 2, under usual network failures. The survivability of the networks mainly comes from their structure. Both topologies have different routes between all source-destination pairs, which gives the networks high route diversity. In fact, both topologies considered are regular networks with connectivity 3. Discussion starts by defining several network properties, such as average route-length and link and node utilization, for the fault-free condition. Alterations of these properties are investigated when a network failure takes place. Using the results for fault-free and faulty situations, a comparison is made between the topologies. Topologies 1 and 2 are also compared with other standard topologies like full ring, square grid and star topologies. Another regular network topology called the star-ring topology is also introduced and investigated for the same properties. Enough insight is given to devise an optimal re-routing strategy when a network failure takes place. A new idea of static routing strategy called the *Static Disjoint Routing Strategy* is introduced. This disjoint routing strategy is proven to be close in performance to that of traditional *Dynamic Shortest Routing* with a considerable gain in ease of operation. The disjoint routing table is used to investigate whether any link or node becomes over utilized in faulty situations. On the whole both topologies were found to be highly survivable structures with reasonable cost.