

NFL Super Bowl XL Uses RuggedCom Equipment to Ensure High Reliability Sound System

Objective: Provide a Highly Reliable Live Sound Reinforcement Audio Distribution System for Game Day Entertainment and Half Time Show

Since 1998, ATK AUDIOTEK has been supplying audio production services to the National Football League Super Bowls for game day entertainment and half time shows. At this year's Super Bowl XL in Detroit, ATK called on RuggedCom to provide the communications infrastructure (transport backbone) for the real-time distribution of live audio throughout the stadium and to the TV truck compound for world wide broadcast. Considering RuggedCom's products are used in a multitude of mission critical applications where uptime and reliability are of paramount importance (eg. electric grid automation, intelligent transportation systems, industrial automation, real-time process control, military infrastructure), it was an easy choice for ATK to choose RuggedCom for this "unique" mission critical application.

ATK designed two separate gigabit fiber Ethernet networks, one each to distribute the live sound throughout the stadium and one to the TV truck compound. These networks were deployed in a ring topology, and utilized the RuggedSwitch™ RSG2100 19 port Modular Ethernet switch with gigabit fiber options.

The key reliability feature of the RSG2100 is the enhanced Rapid Spanning Tree Protocol (eRSTP™) that is designed to ensure up to 5ms fault recovery in cases where there is a failure in the communication link (such as a broken fiber connection). RuggedCom's industry leading fail-over time ensures virtually no disruption in audio during the live broadcast.



RuggedSwitch™ RSG2100

The other key reliability feature is the integrated dual redundant power supplies that can be powered by two independent sources. Doubling up on the power supply, typically one of the weakest points in any electronic device, virtually eliminates any risk in a switch becoming inoperable due to problems with powering the unit.

ATK was so confident in using the RSG2100 that they decided to design a one ring architecture instead of the dual redundant ring architectures they typically deploy. The combination of fast recovery time and dual power supplies gave ATK the confidence to use a simplified network architecture and still maintain the reliability needed. ATK also used RuggedCom products in a similar setup for the 2006 Grammy Awards.

When it was all said and done, the live audio distribution system for the game day entertainment and half time show at Super Bowl XL went uninterrupted. That is, except for ABC censoring a few lyrics of the Rolling Stones songs! ATK plans to use RuggedCom products in many future "mission critical" productions.



Solution: RuggedSwitch™ RSG2100 with eRSTP™, dual redundant power supplies, and gigabit fiber, deployed in a ring topology.



KEY FEATURES

- ▶ Enhanced Rapid Spanning Tree (eRSTP™)
- ▶ Fast fault recovery time (<5ms / hop)
- ▶ Integrated industrially rated power supplies
- ▶ Independent dual power supplies (can be powered from different sources)
- ▶ Gigabit fiber ports
- ▶ Rugged construction

BENEFITS

- ▶ High reliability
- ▶ Fast fault recovery time
- ▶ Simplified network architecture

Look for more product information on our website:
www.RuggedCom.com



Enhanced Rapid Spanning Tree Protocol Fast Network Fault Recovery

KEY BENEFITS

- ▶ High Speed Fault Tolerant Ring Architectures
- ▶ Network Redundancy
- ▶ Fast Fault Recovery (<5ms/hop)
- ▶ Large Ring Configurations (up to 80 switches)
- ▶ Compatible with STP (IEEE 802.1d) and RSTP (IEEE 802.1w)

For Ethernet networks used as part of a high reliability system, some form of redundancy is required to ensure uptime and high availability. With redundancy, if one link or switch fails, another link or switch can take over. A common network topology that is used to provide redundancy is a “loop” architecture, however, special protocols are needed to make this work and to prevent what are known as “broadcast storms”. This is when a single broadcast frame (eg. data packets) will circulate endlessly and consume all available bandwidth on the loop making the network unusable. Special protocols, such as the IEEE 802.1d Spanning Tree Protocol (STP), and the next generation IEEE802.1w Rapid Spanning Tree Protocol (RSTP), are used to prevent this situation.

The STP and RSTP link management protocols provide network path redundancy while preventing undesirable loops in the network. This is achieved by having all switches in the network supporting STP/RSTP communicate to one another using a process which will identify any loops that may exist. Once a loop is identified, it is logically broken by having one of the switches “block” communications from the port which creates the loop (see figure). When a fault is detected, the blocking port is opened, thus re-establishing a path for the network traffic. STP’s performance in terms of fault recovery time is very slow (100’s of seconds). RSTP greatly improves the fault recovery time (10’s of seconds) but is still too slow for many real-time applications. Another limitation with STP and RSTP is that they do not support large ring sizes that exceed 31 switches. A situation commonly encountered.

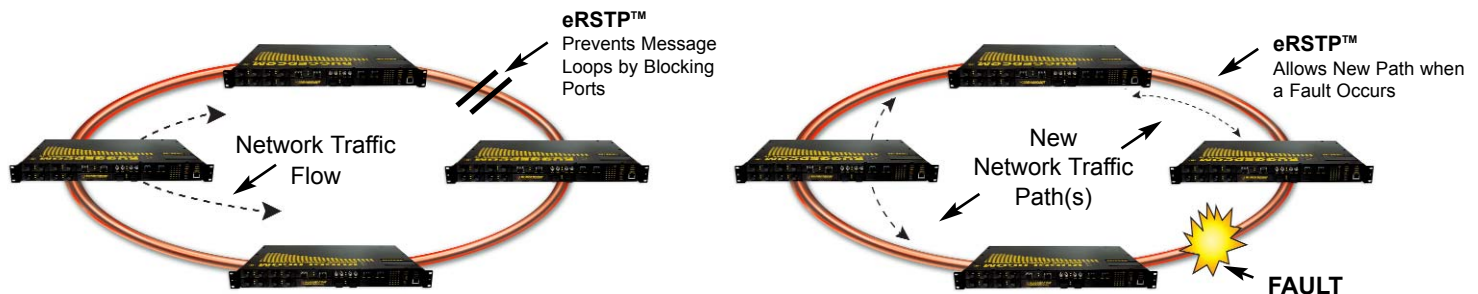
RuggedCom’s solution to these issues was to enhance the RSTP protocol, while at the same time maintaining compatibility for interoperability with commercial switches. The two key enhancement goals were:

- 1 – Improve the fault recovery time performance
- 2 – Improve performance for large ring network topologies

The result - RuggedCom’s enhanced RSTP (eRSTP™) which provides fault recovery times of less than 5ms per hop and which can handle rings with up to 80 switches.

Performance in real-world applications typical show much better results than 5ms per hop. For example, in a network that was comprised of 15 RuggedSwitch™ Ethernet switches in a ring topology, the expected worst case fault recovery time was 75ms. Actual test results showed typical fault recovery time of less than 26ms! The 5ms/hop recovery time is a very conservative number which can be used to estimate the worst case upper bound recovery time.

eRSTP™ is just one of many features within the RuggedSwitch™ family of Ethernet switches that makes them ideally suited for many real-time mission critical applications found in such industries as electric utilities, intelligent transportation systems, military, industrial automation, and process control.



Look for more product and application information on the RuggedCom website www.RuggedCom.com