

# A1

## **Integrating Current Differential Relaying Communications into a Modern IP Based Communications Infrastructure**

Solveig Ward, Emmanuel Duvelson, William Higinbotham, RFL Electronics, Inc.

Speaker

Solveig Ward, RFL Electronics, Inc.

### Abstract

What started out as a network primarily made for voice communications has today evolved into extensive data communications such as internet, email and e-commerce. The trend of increased data communications versus voice communications is influencing development of New Generation Networks which favor Ethernet technology over T1/SONET synchronous access networks.

In general, Ethernet networks are less costly to build and handle data transfer more efficiently than the traditional circuit-switched, time-division-multiplexed (TDM) networks. In addition, they are less costly to maintain due to the “self-configuration” nature of IP networks where the data packet automatically will be routed over the network without any channel allocation having to be engineered.

With telecommunications inevitably moving towards Ethernet, conventional synchronous pilot relaying channels may quickly become obsolete.

It is clear that relay manufacturers will have to address the need for new communications solutions for relaying, providing native Ethernet protective relay devices.

There already are working solutions for teleprotection over Ethernet; either via TDMoIP (Time Division Multiplexing over Internet Protocol) converters or using IEC 61850 GOOSE messaging. However, current differential relaying still presents a challenge and all existing designs require synchronous 64 kbps (or nx64kbps) communications channels.

This paper presents a current differential protection operating over an Ethernet network. The algorithm has been adapted to communicate over a packet switched network with varying delays. Issues such as end-to-end delays, security and dependability are discussed.

In addition, the paper illustrates how the current differential relay, IP-based substation IED's and legacy devices can all be integrated into an IP based communications infrastructure.