HP *ProCurve* Networking

Signal Pair Analysis

What needs to be done?

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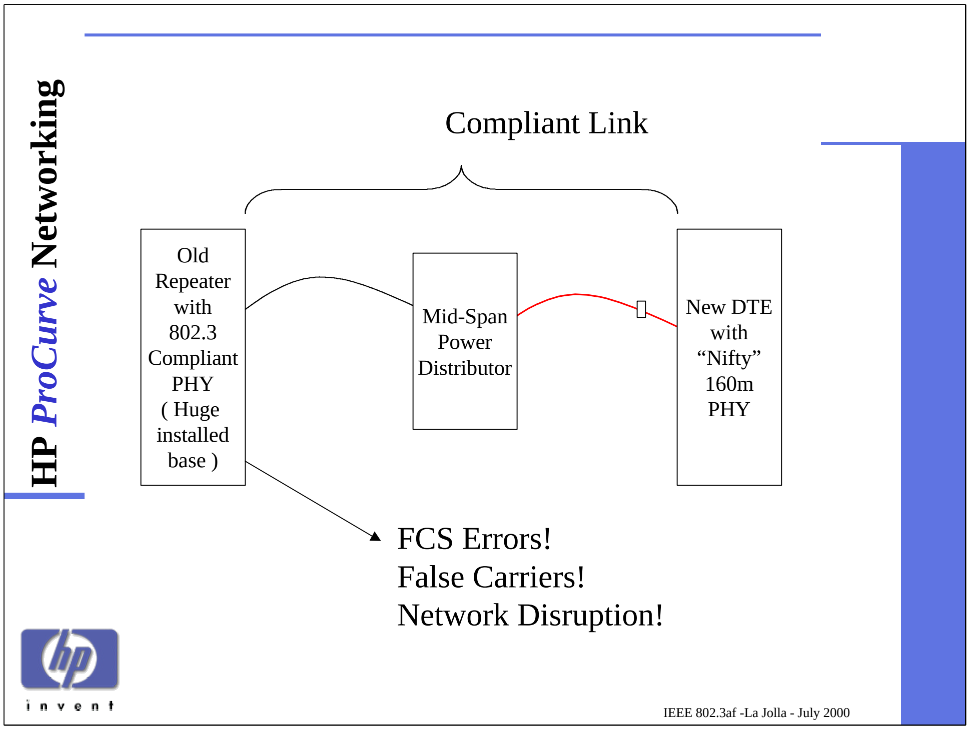
invent

This presentation was developed to address concerns about the lack of attention to important parameters that will impact performance of 100BASE-TX devices when power and noise are inserted onto cables.

The question of whether power is applied to data pairs or non-data pairs becomes secondary if we assume Roger Karam's assertion that CM-CM coupling is high in the frequency ranges of interest.

Roger's assertion was based on measurement of switching noise interference on a DTE and we should pursue that by measuring this parameter very carefully over a number of cable plants using very accurate network analyzers so we can fully understand the mechanism.



While I show a mid-span implementation which suggests that the power/noise is inserted onto the non-data pairs, we must understand whether CM-CM interference will be coupled onto the data pairs and what impact that will have.

Clearly, we must support existing devices for mid-span implementation.

In addition, we should not assume that devices that implement data-pair power will be “super-standard” unless we want to specify just how much better those devices must be to comply with DTE-Power requirements.

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100BASE-TX has no “noise immunity” spec. Many devices in the market are sub-standard.

This creates the dilemma that we can not depend on theoretical analysis of 100BASE-T. Instead we must rely on empirical measurements of the installed base. To gain confidence, we must use devices that are prevalently used in the installed base.

Using a marginal transmitter and a cable plant that barely meets CAT-5 limits;

1) Apply Sinusoidal CM interference to the input port of a broad range of devices and characterize their noise immunity.
   - Capture CM interference voltage pk/pk
   - Capture Differential interference voltage pk/pk
   - Measure for frequencies from 50KHz to 150MHz
   - Capture key input characteristics of the DUTs
   - Define the level of CM impairment allowable from a power device

2) Add mid-span impairments
   - Insertion Loss (0 to .5dB, 250KHz - 100MHz)
   - Return Loss (-15 to -25dB, 250KHz - 100MHz)
   - Next (250KHz - 100MHz)

3) CM - CM coupling

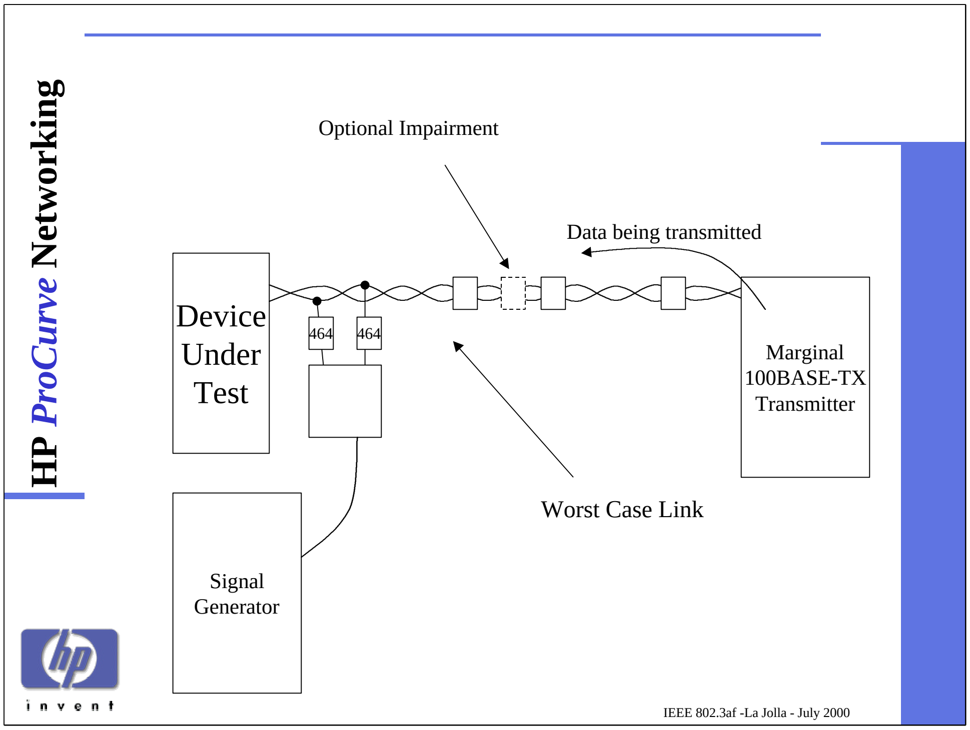
invent

IEEE 802.3af -La Jolla - July 2000

When 10BASE-T was originally developed, developers went through extensive testing of the installed cable plants because those cables were going to be used in a way that they were never intended.

From those parametric measurements, a set of criteria was defined and that formed the basis of requirements for 10BASE-T.

We are now planning to use CAT-5 data pairs in a way that they were never intended to be used. Common-mode application of power/noise demands that we carefully determine the impact that will have on data performance.



This figure demonstrates a method of inserting differential noise into a receiver with low-impairment due to reflections.

A cable clamp like the one specified in the 1000BASE-T spec would be very useful for injecting common-mode onto the cable bundle.

To insert common-mode onto a specific pair, the above method could be used where the balun is removed and common mode voltage is applied to the center-point of the two resistors.