

## Powering-Protecting-Connecting The Last Frontier Home Automation-Integration-AV Systems



## What is Home Automation-Integration-AV Systems



### From Boardroom to entire Building From Livingroom to entire House Hospitality, Telemedicine/Telehealth, Energy Management etc...





### Why.....The Last Frontier

### From the (Telco) Providers Perspective:

Because of the challenges and opportunities to deliver reliable service to an extreme combination of high tech customer premises equipment and systems, supported by a "<u>Non-Regulated"</u> AC Power and Communications infrastructure.



## What is the supporting infrastructure

### **Electrical**

- AC Panels & Circuit breakers
- Wiring and Outlets
- Grounding

## **Communications**

- Service Entrance with its Primary protection
- Connectivity methods and wiring
- Secondary protection
- Grounding



The demand on the Electrical and Communications infrastructure

Today's Fully Automated Home and High End AV installation is supported by an array of Sophisticated Equipment/Technologies and Systems which are fully Integrated and connected to High Speed Networks.

The Sensitivity and custom installation of these systems requires a <u>Pure, Quiet</u> <u>and Stable AC Power and Communications Environment</u>, where all equipment operates in the same virtual conditions as specified by their Manufactures, Architects, Systems Integrators and Installers.

AC and Communications Infrastructures are forced to be interconnected by the equipment connected to them, thus requiring equal attention.



## The implications of a faulty and unreliable Electrical and Communications Infrastructure

- \$\$\$
- Unhappy customers
- Helpless customers
- Non-operational structures (not livable)
- Integrators, Installers lose money and future customers
- Manufacturers and Technology providers lose sales and market position
- Blame goes around with no end
- Warranty and Insurance implications



## Home Automation/Integration/AV Systems







## Home Automation/Integration/AV Systems (continued)





## Home Automation/Integration/AV Systems (continued)





## Home Automation/Integration/AV Systems (continued)



#### **Indoors and Outdoors**





## Home Automation/Integration/AV Systems (continued)





## Home Automation/Integration/AV Systems (continued)





## The Boardroom





## Home Automation/Integration/AV Systems (continued)







## Home Automation/Integration/AV Systems (continued)







## Home Automation/Integration/AV Systems (continued)





## Home Automation/Integration/AV Systems(continued)









## Home Automation/Integration/AV Systems.. the ugly side!









Non-existent

Codes lightly enforced and vary state by state

**Conflicts between Architects and Automation Integrators** 

**Conflicts between manufacturers** 



### Why is the Telco infrastructure reliable?

The creation of rigid standards through years of experience have yielded impressive levels of reliability and predictive repeatability in the performance of the Protected Infrastructure.

Strict enforcement of Grounding

Complete control of Powering by running equipment on DC.

"Off course I'm not advocating to run customer premises equipment on DC power, but rather taking some good fundamentals from the Telco infrastructure and apply them to manage and control the supporting infrastructures for Home Automation/Integration AV Systems and their communications networks"



### **Example: Primary/Secondary Communications Line Protection**



### Inside the customer premise





## The ideal Electrical Infrastructure/Distribution



- Stable AC Power, wired per NEC, low Impedance Ground, Balanced loads, No Harmonics
- Normal Mode Noise\* (L to N or L to L) less than 10 Volts
- <u>Common Mode</u> Noise\* (N to G) less than 1 volt
- Only One Service Entrance

\*Resulting from Surges, Transients, Harmonics etc.

### The ideal Communications Infrastructure

- Protected Service Entrance(s) (Telco, Cable, Satel.) entering at the same area and near low Impedance Ground
- Primary/Secondary Surge Protection coordination
- Secondary Surge Protection protecting all equipment
- Non-exposed data cables
- The Goal is to Isolate the interior from abnormal or excessive energy.





### **Exterior AC Power threats**

ANSI/IEEE C62.41 Combination Wave (1.2/50us open circuit, 8/20us short circuit) ANSI/IEEE C62.41 Ring Wave (.5us risetime, 100KHZ frequency) Quality and Continuity of AC Voltage and Frequency

### **Interior AC Power threats**

Grounding, AC Sine wave, AC Crest Factor, Harmonics, Power Factor, Transients.

Connected equipment through their "Current Hungry" high performance switching mode power supplies create their own electrical noise which compromises the entire system.

Non Linear Loads draw current that is not sinusoidal and cause waveform distortion.





### **Exterior Communications threats**

### ANSI/IEEE C62.41 Impulse wave (10x1000us)

### **Interior Communications threats**

Grounding, Transients, Exposed cables, AC Induction, Unplanned Campus deployment.



## AC Surge Protection Strips and <u>All in One</u> Protection Devices

### When Equipment was Basic and not Part of a system

### When Equipment was Not Networked

### When Equipment was Not constantly Connected and Integrated



## AC Surge Protection Strips and <u>All in One</u> Protection Devices







### AC Surge Protection Strips and <u>All in One</u> Protection Devices

The <u>Nice Coiled</u> Power Cord Syndrome Minimum AWG??? Ground Impedance??? Questionable Surge and overall Protection Performance



The Ground Loop Eliminator! NEVER – NEVER – NEVER use this combination





Providing a Protected/Controlled AC and Communications Infrastructure







### **Generator and Large Centralized UPS**





## Large UPS and Service Entrance AC Surge Protection





## Large UPS and Service Entrance AC Surge Protection







Ideal Parameters for the Electrical and Communications Infrastructures to support reliably Home Automation/Integration/AV systems:

- AC Power with less than 2% Total Harmonic Distortion (THD)
- AC and Communication Protection Grounding (Low Impedance) <1 Ohm
- AC Surge Let-Through Performance: Less than 10V Normal mode (L-L, L-N) Less than 1V Common Mode (N-G)
- Secondary Communications Line protection that actively controls the Let-through energy before it reaches the protected equipment.
- Audit Infrastructure parameters before installation and Remote monitoring for trouble sites.



Today's Home Automation/Integration and AV systems requires an Electrical and Communications Infrastructure that:

- Provides stable, controlled and repeatable parameters
- Allows it to operate at its maximum performance levels without degradations
- Transparent to the installers/operators/owners
- Allows for Superior High-Speed Data Performance
- Increases reliability and enhances owners experience
- Lowers maintenance and contracts costs for owners and installers



# Questions

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