

*Enhancing Network
Reliability and Sustainability
with Surge Protection*



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Bourns

This session will discuss

***Power and Communications Line Surge Protection
for a Reliable and Sustainable
Network Infrastructure at Customer Premises
(CPE applications)***

Why is the Telco infrastructure reliable?

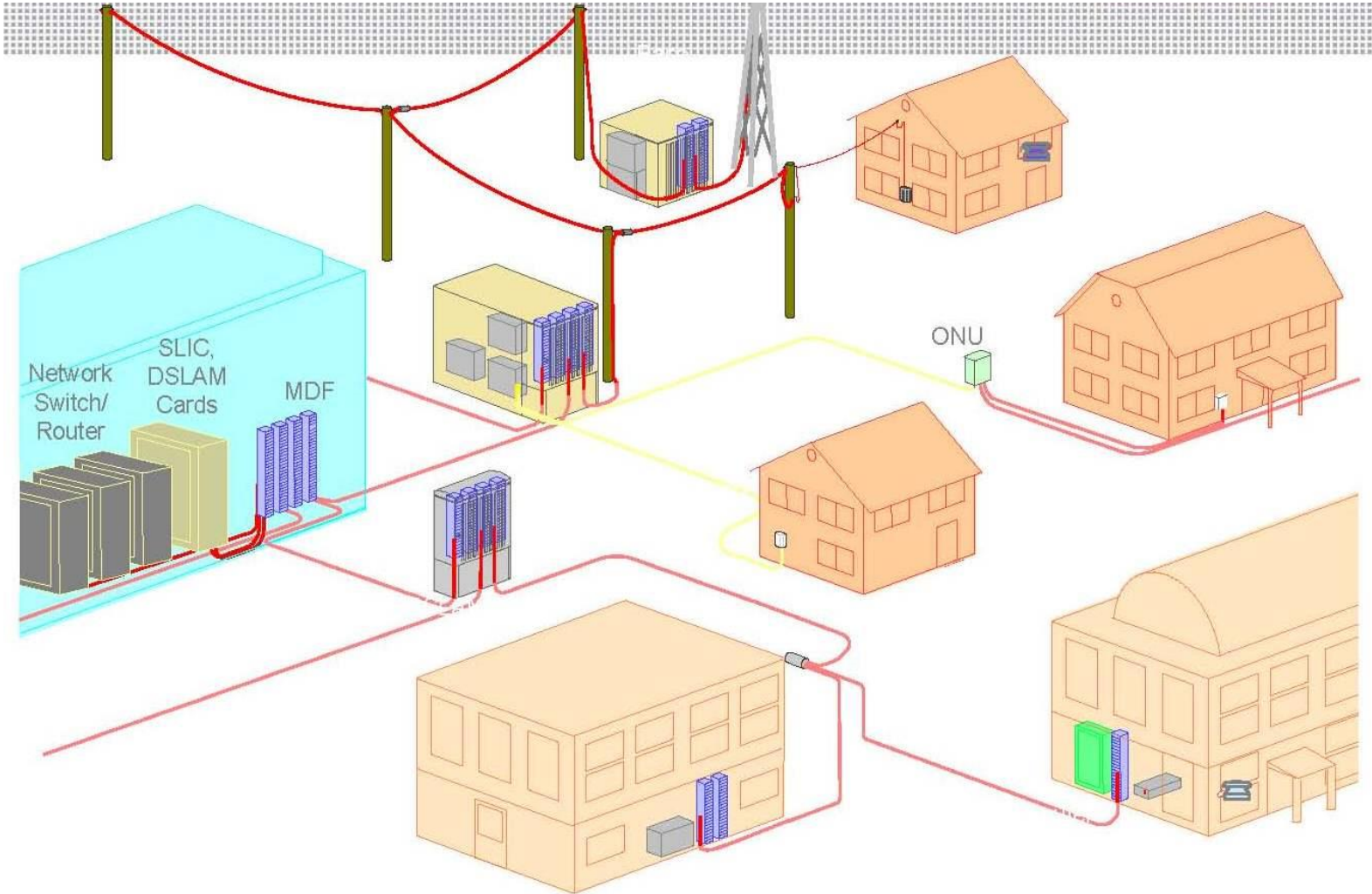
The creation of rigid standards through years of experience have yielded impressive levels of reliability and predictive repeatability in the performance of the Protected Infrastructure.

Strict enforcement of Grounding.

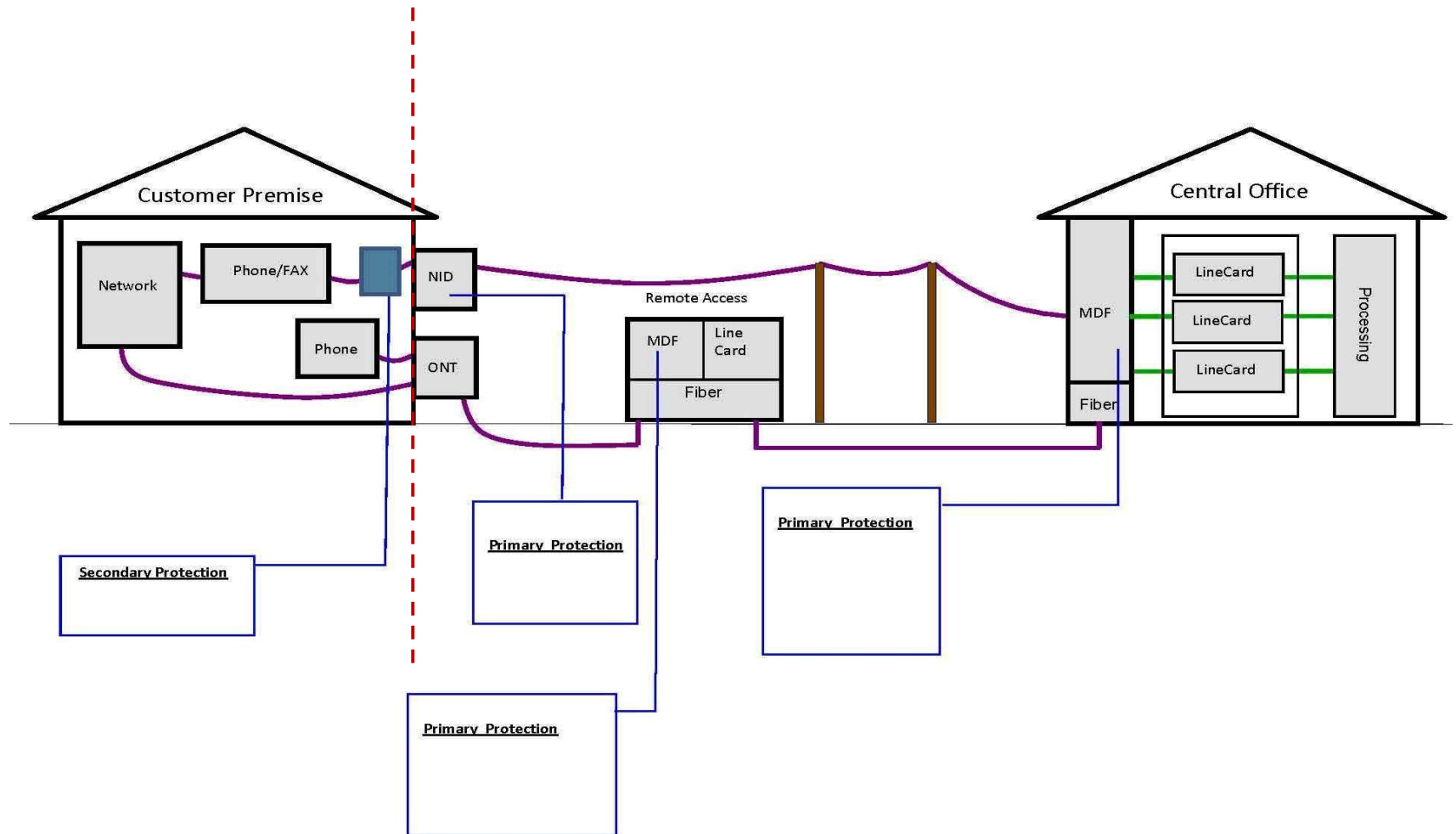
Complete control of Powering by running equipment on DC.

“But.....this stops at the Service Entrance of Today’s CPE installations”

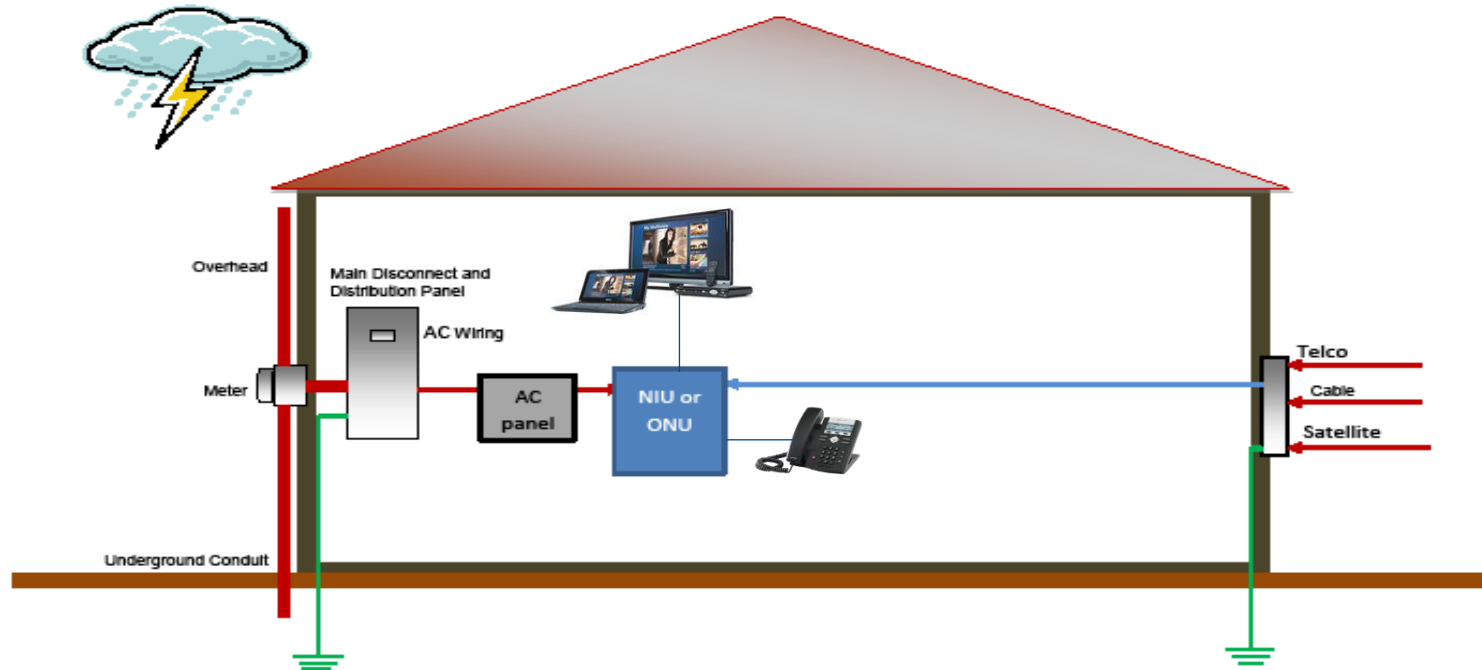
Traditional Telecommunications infrastructure planning and deployment



Example: Primary/Secondary Communications Line Protection



A basic Installation?



CPE installations are Digital Structures



What is the supporting infrastructure of a CPE installation?

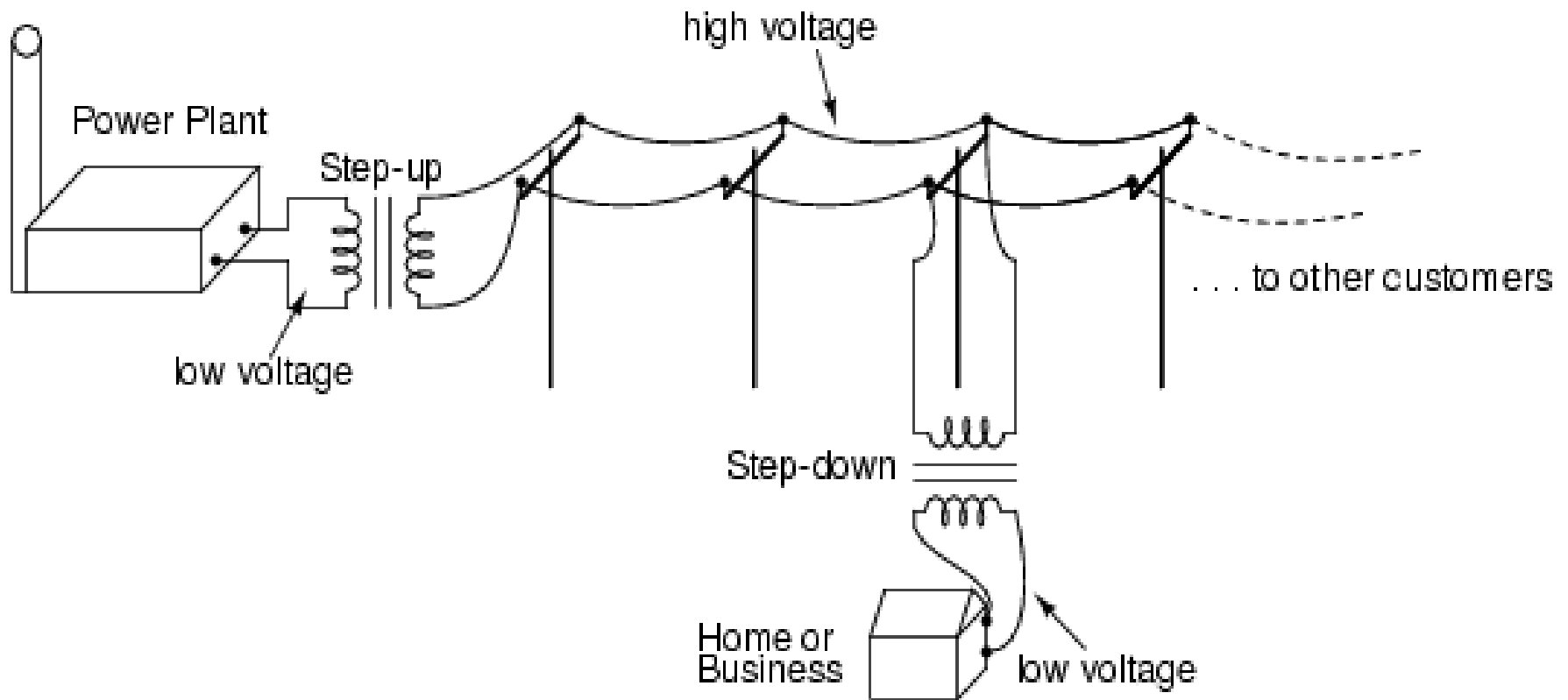
Electrical

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

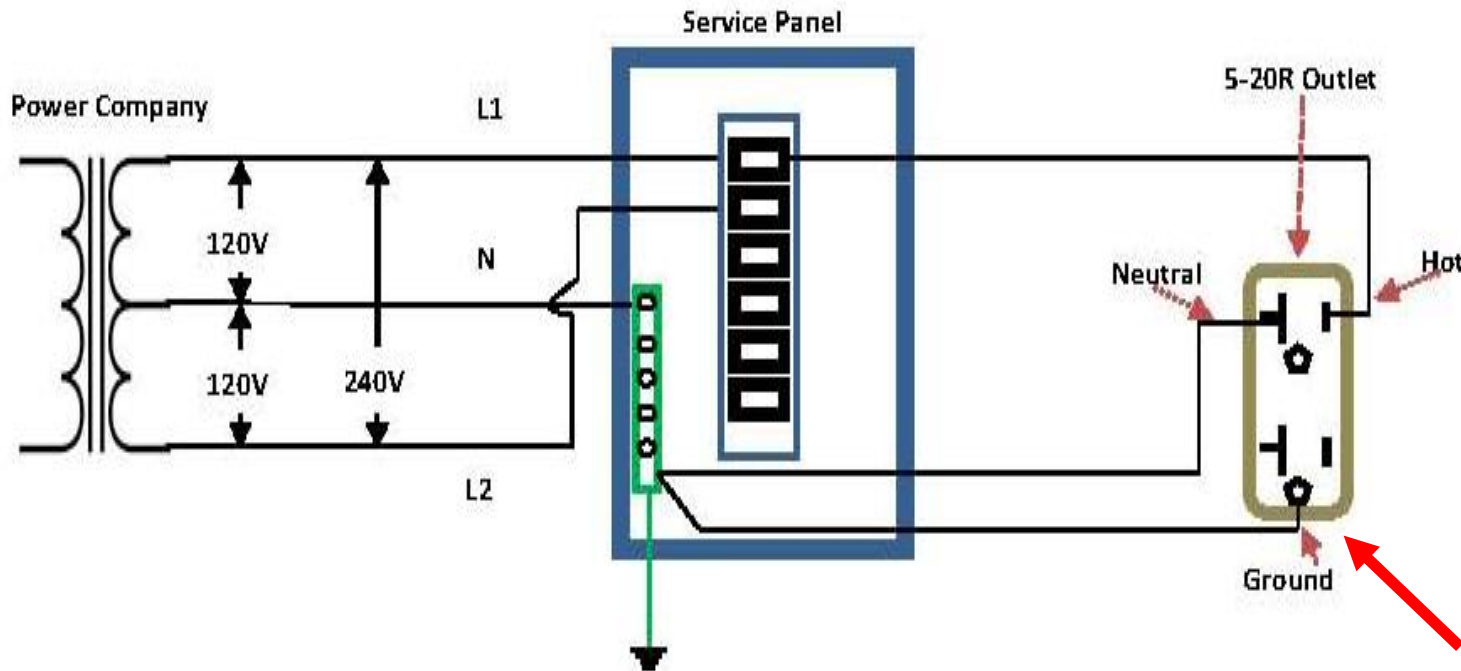
Communications

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

AC Power Distribution



AC Power Distribution at the Home or business...



It's All about this AC branch & outlet that delivers Electricity to Equipment

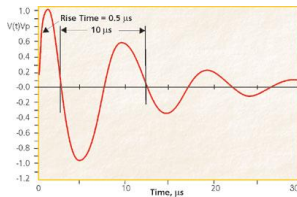
Exterior AC Power threats

ANSI/IEEE C62.41 Combination Wave (1.2/50 μ s open circuit, 8/20 μ s short circuit)

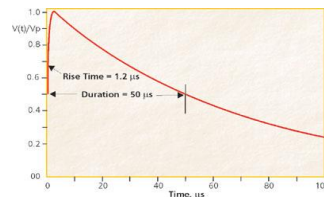
ANSI/IEEE C62.41 Ring Wave (.5 μ s risetime, 100KHZ frequency)

Quality and Continuity of AC Voltage and Frequency

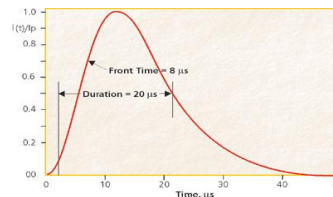
**100-kHz Ring
Waveform**



**Combination Wave
Open-Circuit Voltage**



**Combination Wave Short-
Circuit Current**



Interior AC Power threats

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

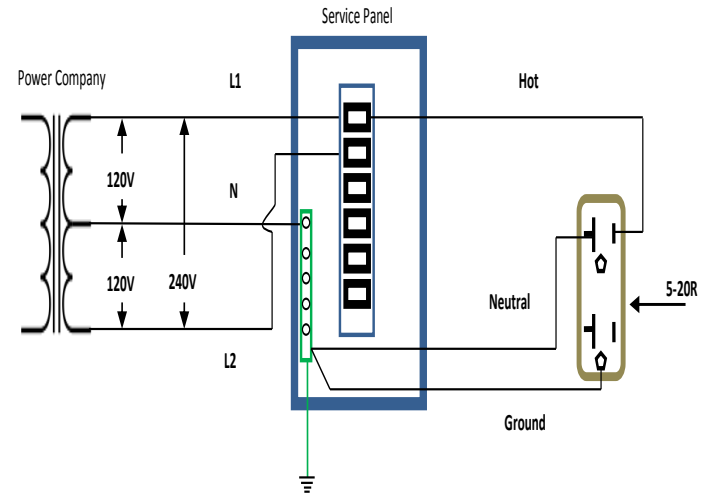
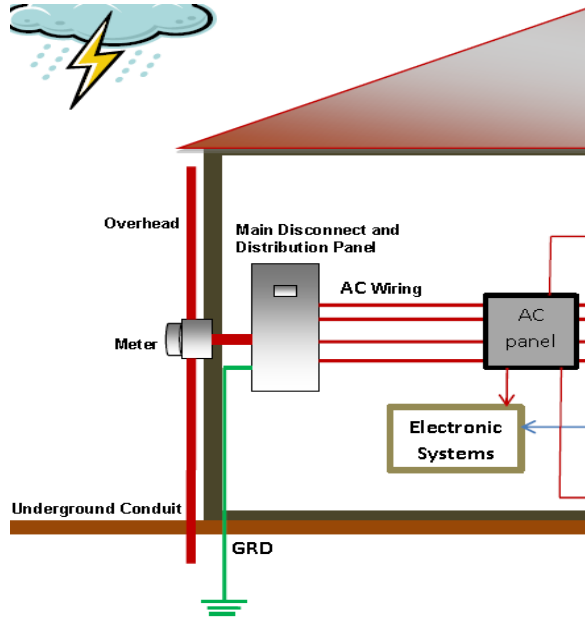
Connected equipment through their “Current Hungry” high performance switching mode power supplies create their own electrical noise which compromises the entire system.

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

Where do Surges Come From?

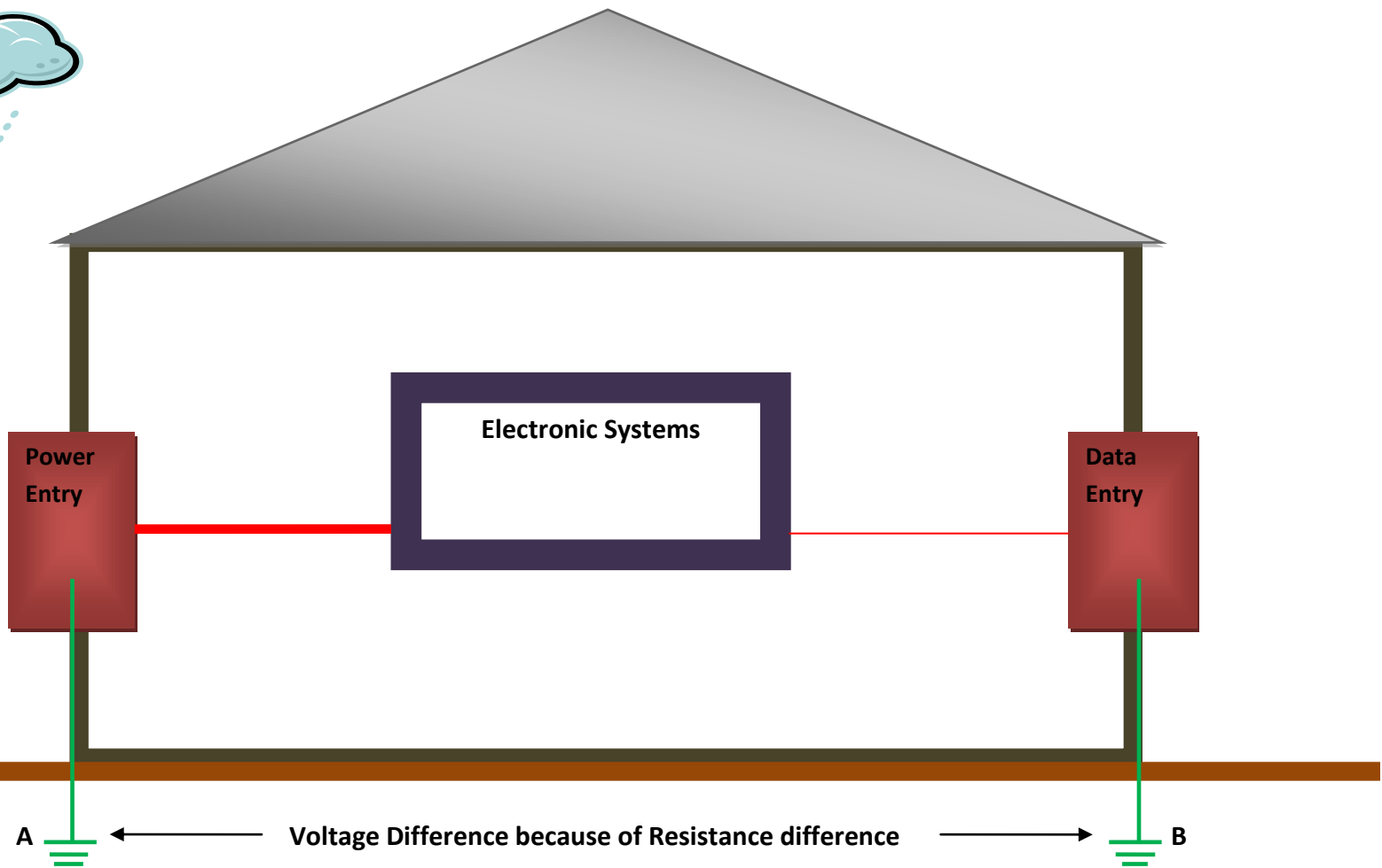
- **External Surges** come from outside the structure due to lightning and power utility equipment operation.
- **Internal Surges** are generated within the structure by power being switched on or off in the middle of the sine wave.
- Both external and internal surges are present inside the structure. Internal surges are both smaller and more frequent than external surges.

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**
- **Common Mode Noise* (N to G) less than 1 volt**
- **Only One Service Entrance**

*Resulting from Surges, Transients, Harmonics etc.

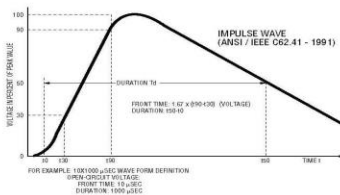


Ohm's law Voltage = Current x Resistance

Exterior Communications line threats

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

Communications Surge
Waveform 10x1000us

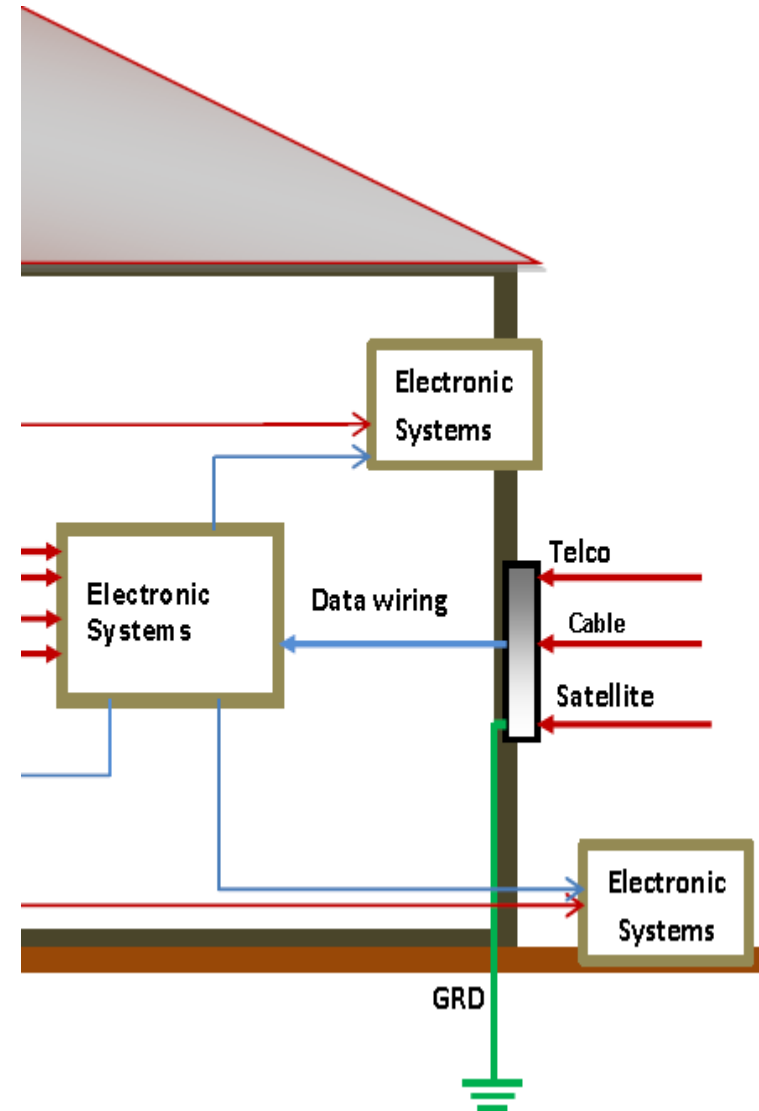


Interior Communications line threats

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

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 for all equipment, that actively controls Surge energy levels.**
- **Non-exposed data cables**
- **The Goal is to Isolate the interior from abnormal or excessive energy.**



Why Powering and Protecting today's digital structures (CPE installations) is difficult.

Because of the challenges to deliver reliable service to an extreme combination of high tech customer premises equipment and systems, supported by a “Non-Regulated” AC Power and Communications infrastructure.

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

What is Surge Protection at a CPE installation?

The strategic application of AC/DC protection modules (Plug-In or Hardwired) designed to eliminate electrical threats* that can destroy the network or degrade its performance.

*** Lightning, induced lightning, AC Power cross, AC power industrial induction, AC power transients, harmonics, AC or DC power interruption, Solar flares/Storms.**

Why we need protection?

Today all Customer premises (Digital Structures) are filled with sensitive electronic equipment connected to the communications network and AC power lines at the same time.

Without protection, a lightning strike or AC power cross can cause power line surges and arcing, electrical fires and electrical/electronic or structural damage.

Today's equipment and systems are extremely sensitive!

Who sets Protection Standards?

NEC, CEC, IEEE, ANSI, Telcordia, UL

What happens without surge protection? **The 3 D's**

Destruction

Is the most easily identified of unwanted electrical energy. By definition, it means a component has been destroyed and must be replaced to restore service.

Disruption

A momentary interruption during system operation and no-continuity of communications transmission. Ordinarily, disruptions are brief and considered minor service problems by customers, installers and service companies. But as the reliance on “always connected systems” becomes a standard so the need to eliminate such problems.

Degradation or Deterioration

Repeated electrical interference on a system or communications channel has a deleterious effect on many of its components. The resulting wear and tear eventually causes a service outage. The effect of degradation is insidious because it builds up slowly and is seldom isolated or diagnosed as the result of electrical interference.

The implications of Non protected Electrical and Communications Infrastructures

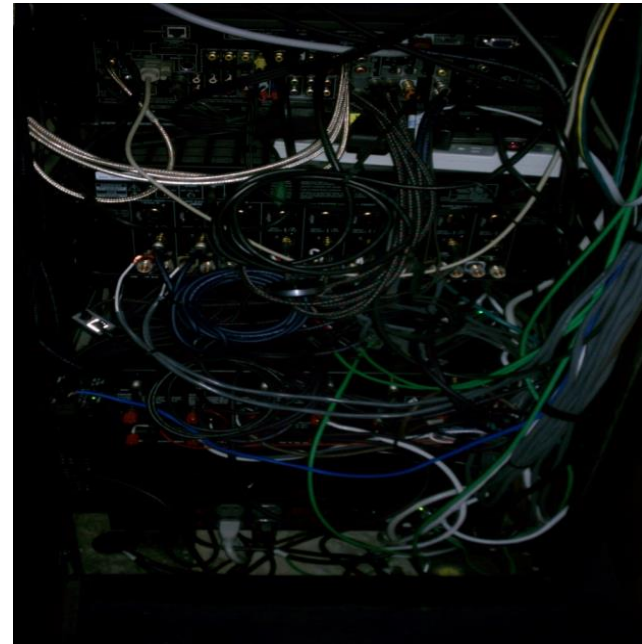
- **\$\$\$**
- **Unhappy customers**
- **Helpless customers**
- **Non-operational structures (not livable)**
- **Integrators, Installers lose money and future customers**
- **Manufacturers and Technology providers lose sales and market position**
- **Blame goes around with no end**
- **Warranty and Insurance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

AC Power Surge Protection

Apply Heavy Duty Hybrid AC Surge protection at Service Entrance of building/Structure.

If Equipment are located further than 30 feet from Service Entrance apply additional AC Surge protection at the nearest Sub-panel.

Avoid utilizing Surge Protected outlet strips.



AC/DC Power supply and UPS (battery back up)

- **Must be able to sustain prolonged exposure to AC Surges.**
- **Must have low let-through Surge performance (attenuate Surges before they reach DC output).**
- **Remote diagnostics capability by Telco and integrator/customer.**
- **Battery must be easily accessible to be changed by customer.**
- **Battery back up capacity must be easily added as needed by customer.**
- **Must be able to sustain and survive a wide range of temperatures.**

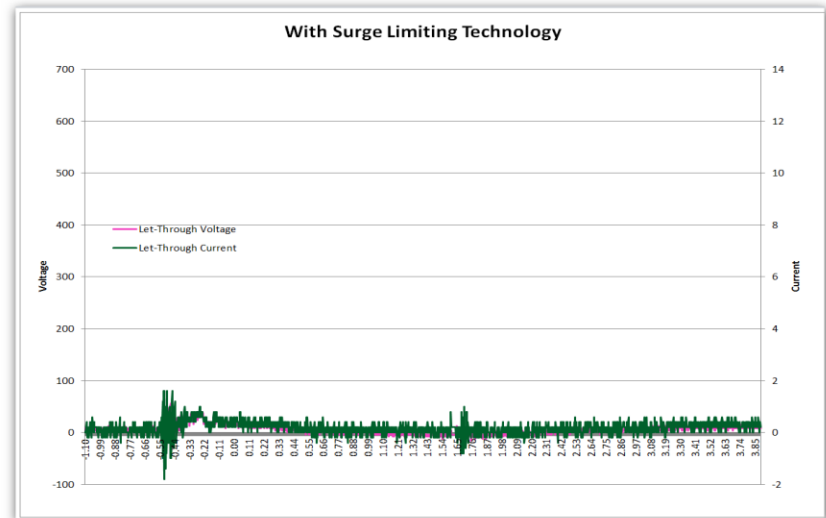
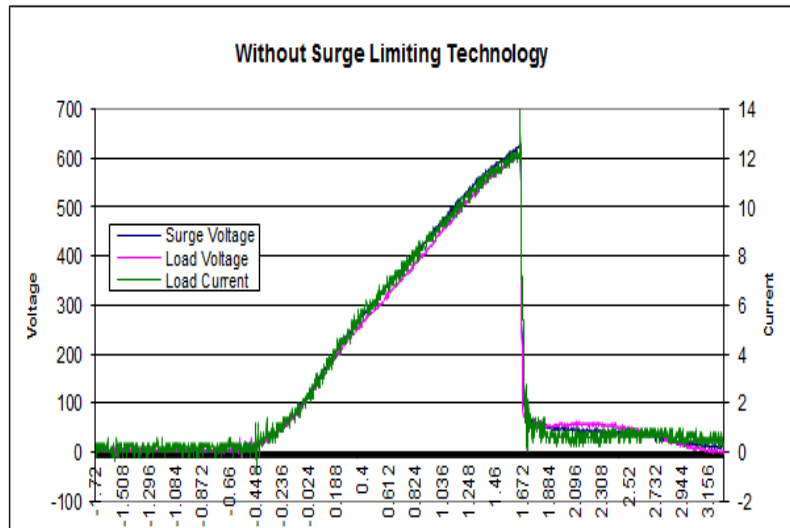
AC/DC Power supply and UPS (battery back up) continued

Li-ion battery technology must be the preferred method due to its proved capability in millions of critical and demanding applications such as (Laptop, Tablet, Mobile phones, Wearable devices, Power Tools, Garden Tolls, Cars, Ignition Systems, Medical Devices etc.)

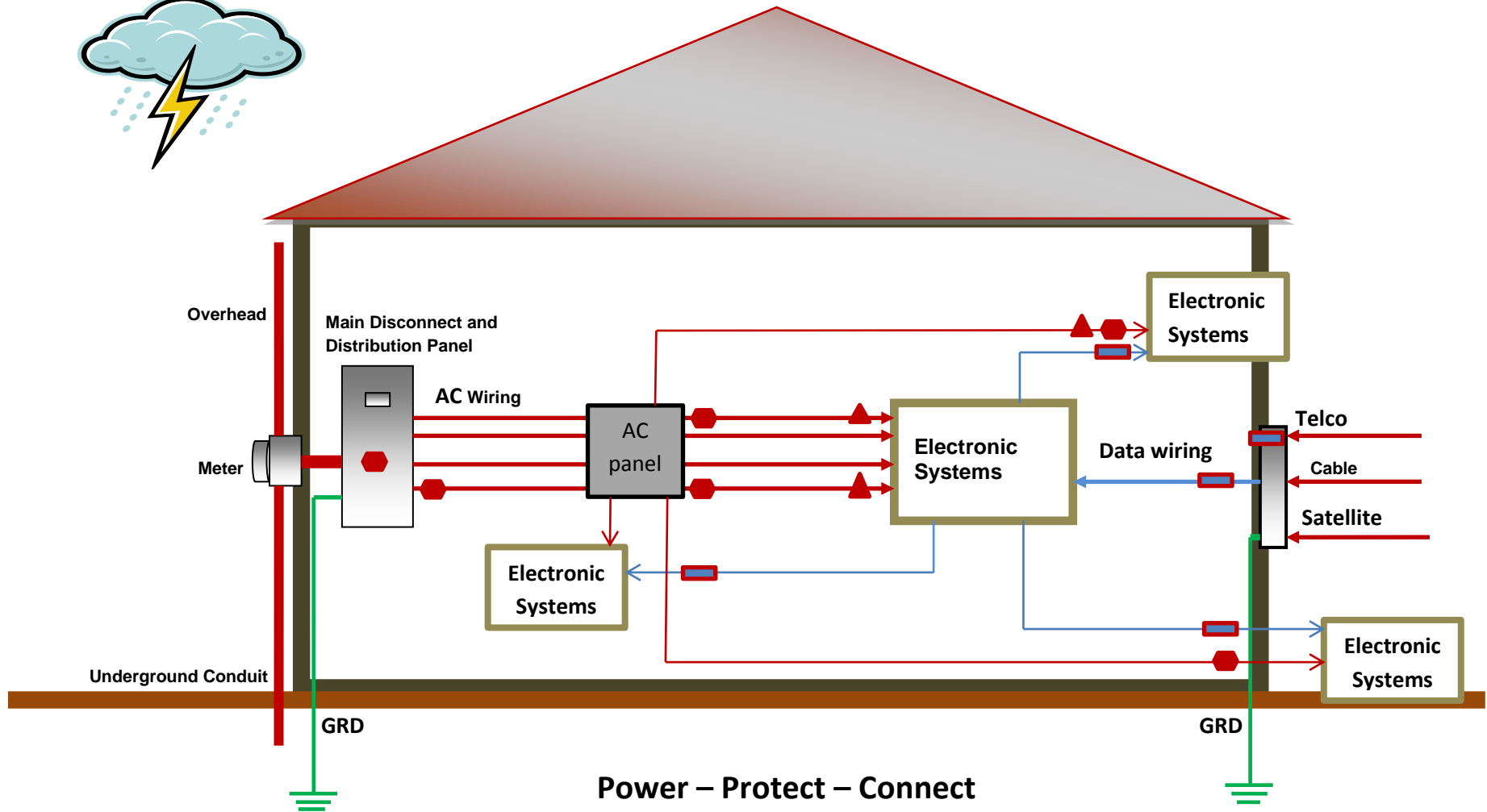
Li-ion batteries allow for effective and safe application of Battery Management System (BMS) to monitor the voltage and temperature of each individual cell to protect them from excessive charging and discharging and if needed to isolate the battery from the charger and/or loads when things get dangerous (voltage or temp are too high or too low).

Communications Line Surge Protection

Utilize protection modules with Surge Limiting Technology
(Voltage and Current let-through performance at the speed of 10/1000us)



Where to install Surge protection



Power – Protect – Connect

UPS AC/DC Power = ▲

SPD AC/DC power = ●

SPD Data/Communications = ■

The 3 Basic Rules for a reliable CPE installation

- 1. All equipment must be protected.**
- 2. All power lines, communications/network/data cables entering or exiting the building must be protected.**
- 3. All protected equipment must be grounded to a single point Ground.**

Today's Customer Premises applications require an Electrical and Communications Infrastructure that:

- **Provides stable, controlled and repeatable parameters**
- **Allows Equipment to operate at their 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**

Thank you!

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