

**PROJECT TITLE:** PoE-LPI48 (Power-Over-Ethernet Local Power Infrastructure 48VDC nominal)

**TEAM MEMBERS:** Keith W. Parker, BS programs: Computer Engineering and Architecture (Built Environment) mechanical engineering student collaborator to be actively sought, others (computer science, civil/environmental etc.)

**POINT OF CONTACT:** Keith W. Parker <kwp@pdx.edu> 503-449-7379, ECE-401 Prof. Raj Solanki

**STATEMENT OF PROBLEM:** Modern solid-state electronic devices are intrinsically low voltage DC devices. A PoE-LPI48 low voltage DC local power infrastructure, where applicable, has many advantages over using the local flavor (voltage, frequency, connectors) of AC mains power. The conversion of energy between low voltage DC and high voltage AC mains (compared to converting between one low voltage DC and another) is very inefficient, expensive, complex, unreliable, varies from country to country, dependent on an operational AC mains power system and dangerous. There are significant issues about operation when AC mains power is not operational/available. The existing Power-Over-Ethernet (IEEE-802.3.af(.at)) is ideal, except that it is limited to 12(24) watts by the plastic RJ-45 connector. What is needed is a PoE-LPI48 standard (using shells, pins, sockets, and tooling of existing ISO-IEC circular connectors ) to provide PoE with managed low-voltage, high-current DC circuits in a single connector. The only new components are 3D printed insulating inserts that hold the correct combination of signal and power pins in the shells. However, for PoE-LPI48 to be an effective solution, it must be defined as an international standard. A proprietary implementation is, relatively speaking, worthless. Also, the implementation of an international standard will not be initiated by a "push" from engineers or other advocates. The initiation of an official standard development process must be "pulled" by Architects (Built Environment, not computer engineering), from around the world, publishing papers and lecturing on the potential for significant quality of life improvement, for hundreds of millions of people, if an ISO-IEC international standard for PoE-LPI48 is enacted.

**SOLUTION TO PROBLEM:** Precipitate an ISO-IEC international standard for PoE-LPI48 by:

- 1.) design/fabricate a POC (Proof of Concept) prototype set of PoE-LPI48 connectors;
- 2.) develop a "strawman" draft standard for PoE-LPI48, following the ISO-IEC standard creation protocol to the letter;
- 3.) design/fabricate an Alpha prototype set of PoE-LPI48 connectors, following the "strawman" draft standard;
- 4.) develop a set of prototype conversions of AC-mains powered architectural plug loads into PoE-LPI48 devices;
- 5.) develop a set of prototype original devices that become practical with the existence of a PoE-LPI48 standard;
- 6.) School of Architecture uses prototypes to furnish BEES (Built Environment Embedded System) laboratory/studios (as alternative/adjunct student housing) in order to evaluate the viability of the PoE-LPI48 concept;
- 7.) based on the results of the BEES laboratory/studio student housing experiments, Architects will be able to publish experimental data based papers on the value of the existence of an official ISO-IEC standard for PoE-LPI48;
- 8.) with enough "pull" from Architects around the world, publishing papers and lecturing on the advantages of an ISO-IEC standard, the appropriate authorities will form an ISO-IEC Technical Committee (TC), beginning the official standard development process, using the PSU "strawman" draft standard as a starting point.

**WORK TO BE DONE (grand scale):** Implement all steps of the solution to problem described above.

**WORK TO BE DONE (this proposal):** Implement step 1 of the solution to problem described above.

**END PRODUCT: (this proposal):** A documented, functional set of POC prototype PoE-LPI48 connectors

**MILESTONES:** 1.) learning necessary 3D printing skills; 2.) fabricating set of POC prototype connectors

**ULTIMATE OBJECTIVE:** Portland State University precipitating an ISO-IEC international standard for a PoE-LPI48 (Local Power Infrastructure 48VDC nominal).

**REQUESTED RESOURCES:** Continuation of my 84-Lab space, assistance finding a mechanical engineering student collaborator, 3D printing support.

**BRIEF BUDGET SUMMARY:** \$1000. **First priority** is components for full set of prototype PoE-LPI48 connectors. **Second priority** is upgrading my equipment rack in 84-Lab to function as both an engineering/test system for PoE-LPI48 system components (and their AC mains powered equivalents) and as a fully operational PoE-LPI48 local infrastructure application (completely operational using its internal sealed lead-acid batteries that can be recharged by both AC-mains power and low voltage DC alternate energy sources; solar, exercise machines, etc.).

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