IOP-EC – Statement of Purpose

The Internet of Production Alliance Electronic Components Standard – Statement of Purpose

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Introduction

The Internet of Production Alliance and Kitspace are bringing together interested parties to draft a new standard for open electronics design-data: IOP-EC. This standard will focus on design information and documentation of electronics components, assemblies and sub-assemblies with the goals of:

1. **Repair** - To aide ease of repair of electronics through documentation.
2. **Reuse** - To aide the adaptation and repurposing of electronics hardware through study of design information and to promote interoperability of software tooling.
3. **Replication** - To aide sharing of standardised design documentation for manufacturing leading to more reproducable hardware.
4. **Reach** - To allow mapping of the availability of required components, tools and skills for production and repair through compatibility with the Open Know-Where Specification (IOP-OKW).

Motivation

53.6 million metric tonnes of electronic waste was generated worldwide in 2019 according to the UN's Global E-waste Monitor report. The UN also predicts global e-waste will effectively double within 16 years making e-waste the world's fastest-growing domestic waste stream.

This increase in waste is fueled by higher consumption rates, shorter life cycles, and fewer options for repair; ever more electronic items that could be repaired or re-purposed go to waste. E-waste has considerable negative impacts on public health and the environment. Increased production of new products, requiring increasing resources, only exacerbates this.

Reversing the tide of increasing consumption rates requires a cultural shift. We can see the seedlings of this shift today and decentralized infrastructure can form a substrate for more thoughtful and ethical manufacturing. Through sharing of design information and documentation we can encourage products that are more appropriate to their context, products that allow local production, repair and reuse. We want electronics that are designed in response to careful consideration of locality and demand and thus are less likely to break, are easier to repair and less likely to become waste.

Scientific research is in a replication crisis. Science and innovation is slowed by the lack of sharing and interoperability of hardware designs. We need new data standards that allow innovators, researchers, citizen scientists and instrumentation manufacturers to more easily publish replicable and repairable hardware required for experimentation and discovery.

We don't expect the electronics industry to adopt these standards out of the goodness of their hearts. An open decentralized ecosystem of shared electronics designs could be a great boon to an industry that's constantly reinventing the wheel. This open data standard will increase data interoperability and thus improve software and machinery for increased productivity and efficiency in the product design and manufacturing space.

Use Cases

We hope our standard can be part of enabling a future where the following scenarios are common place:

1. An independent repair technician has a broken electronic device in front of her. She can easily pull up the relevant IOP-EC data to identify the broken component and order a replacement.
2. An e-waste recycling centre receives a shipment of broken printers that are beyond repair. A worker can easily assess and log the recoverable components: motors, chips and passives in their database since it is available in IOP-EC format.
3. A product designer needs a power supply in her device. She can search a database of IOP-EC compatible designs to quickly drop a schematic and layout into her PCB design.
4. New funding to promote the Circular Economy is put into place. Manufacturers that want to take advantage of the scheme must provide data in an IOP-EC compliant format.

Initiators

Andrew Lamb / Internet of Production Alliance

Andrew commissioned this proposal. Andrew is a systems engineer focused on improving the efficiency and effectiveness of humanitarian relief efforts. As part of his Shuttleworth Fellowship he has been testing the viability of open production to provide a future where supplies are made in the field faster, better and cheaper, relief workers have immediate access to vital equipment, and struggling communities can rebuild sustainably.

Kaspar Emanuel / Kitspace.org

Kaspar will be the lead on this standardisation effort. Kaspar is a consultant on user interfaces for electronics CAD and is passionate about making open source hardware work in practice. He is the creator of Kitspace.org, a platform for sharing electronics projects in a truly replicable way and works at the University of Bath on the Openflexure project: a novel open source 3d-printable microscope and precision positioning system.

Related Standards

- **EN 45554:2020** - General methods for the assessment of the ability to repair, reuse and upgrade energy-related products.
- **IEEE 1874 / oManual** - Documentation schema for repair and assembly of electronic devices
- **DIN SPEC 3105** - Open Source Hardware: Requirements for technical documentation and community-based assessment.
- **IPC-D-325** - Documentation requirements for printed boards, assemblies and support drawings.
- **IPC-2581B** - Generic requirements for printed board assembly products manufacturing description data and transfer methodology.
- **ODB++** - Data exchange formats covering design, process and manufacturing information flows.

- **ORDS** - Open Repair Data Standard - Standard for the collection and sharing of open data on electronics repair.
- **Gerber RS274X/X2/X3/Job** - The industry standards for printed circuit board manufacturing data.
- **IOP-OKH** - The Open Know-How Manifest Specification for improving the open-ness of know-how for making hardware by improving the discoverability, portability and translatability of knowledge.
- **IOP-OKW** - The Open Know-How Open Know-Where Specification for documenting and sharing information about and locality of manufacturing cabilities.
- **BS 8001:2017** - Framework for implementing the principles of the circular economy in organizations.