



White Paper

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How the OpenPOWER Foundation works with its members to enhance the capabilities of POWER™ ISA

David Calderwood, RED Semiconductor's chairman, recently elected onto the OpenPOWER Foundation executive board shares some thoughts on submitting RFCs to the ISA Working group of the OpenPOWER Foundation.

As it is approaching a year since the OpenPOWER Foundation revised and simplified its process to submit RFC (Requests for Change) to the POWER ISA, this is a good time to review the process and look at how it will go forward.

The remit to the ISA Working Group, charged with assessing and approving changes to the POWER ISA, originates from the Open Licencing of the POWER ISA to members OpenPOWER Foundation. This was done to promote market and user engagement in the ISA and allows it to evolve with credible market needs, whilst maintaining a formal and rigorous process to ensure, across the market, ISA standards. These standards are keenly recognised as being part of decades-long stability and interoperability that POWER users rely on.

Given that historically the RFC process was internal to IBM, it was decided to develop and road test a WEB based process for RFCs open to Foundation members and to non-members alike, though it should be noted that to attain the many benefits described in the EULA including one of the largest long-established Patent indemnification portfolios of any ISA, membership of the OpenPOWER Foundation is required. Any organisation that has a conflict of interest with the Commercial Confidentiality required of the OPF Membership may still contribute to the Power ISA in a meaningful way. This WEB portal is now fully functional and triggered the timing of this commentary.

Standards are tricky. To achieve the expected long-term stability there is a huge amount of responsibility. One innocuous mistake once ratified cannot be reverted. Thus, what looks from the outside like a slow process is in fact indicative of considerable care and diligence. The foundation of the new process is communication, tracking and technical rigour.



On the face of it the submission process is now relatively straight forward, is WEB based, intuitive and well documented. In addition, advice is relatively easy to get and members of the ISA Working Group are more than willing to hand-hold applicants. Having said that there are a number of points RFC applicants must keep in mind, as unlike other open ISAs, the POWER ISA is not and never will be a free-for-all.

Firstly, the POWER ISA is long established and still commercially addresses the needs of IBM. A thorough understanding of why the ISA is structured the way it is, and the reason why proposed changes must be evolutionary not revolutionary is essential. Deliberately or even unintentionally introducing backwards-incompatibility is out of the question; new instructions need to be thought through in the context, "Will this instruction still be useful in two decades?" I say that knowing that the new vector instruction set we as LibreSOC and RED Semiconductor Ltd are currently submitting as RFCs are definitely in the middle ground.

A good familiarity of the style, formatting, and presentation of the existing ISA is also necessary and whilst the final version of the ISA is edited in Latex, convertible documentation reflecting this end point is essential, as the ISA working group do not have the time or resource to figure out what is meant – it must be clear and obvious and laid out in the established style.

Be prepared to be scrutinised and also remember that the decision tree extends into IBM and the ISA and hardware teams of the ongoing POWER chip development task.

The process is confidential, however those submitting RFC (Requests for Change) are able to interact and participate in the review process. Bear in mind only members of the ISA Working Group may vote on the proposal, and only OPF Members may request to join the ISA Working Group.

It is important to keep in mind that there is commercial sensitivity, and submitters must be prepared to adhere to the ISA working groups confidentiality terms, in particular to the "Anti-trust" provisions which ensure all RFCs are treated in a safe and fair manner, regardless of the size, and tenure of the contributor.

In the event that, all factors taken into consideration, if a proposal is rejected, there is always the Sandbox. Major Opcode EXT022 has been specially put aside for private use, where interoperability is neither guaranteed nor



even expected. Power ISA implementors adding custom instructions are encouraged to come forward with RFCs, particularly if the instructions could benefit other Power ISA users.

As it stands the new process is working, although it is evolving with use and familiarity, however it is not a path to take by anyone who does not have a firm foundation in the POWER ISA, and this is something that is not going to change.

As OpenPOWER Members will now be aware I am now the Board representative for the Silver membership class of members and I would be happy to make introductions to the ISA working group members as appropriate.

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