CodeMatch

We propose to reach out to students, researchers, and the open-source community, both in order to increase participation within the IETF in communities not yet well represented, as well as to increase the quality and quantity of available implementations of IETF protocols. The core of this proposal is CodeMatch, an outreach program built on top of future enhancements to the datatracker for tracking implementations of drafts or sets of drafts, and tracking those drafts for which working groups would like to see additional implementations. Existing sites and tools used by the developer and open source community, such as GitHub are planned for use, connected to the CodeMatch datatracker site.

Reaching out to students and educators

Students in computer science and engineering can implement IETF protocols; these implementations would result in open source code that lives on beyond the project cycle. Using this code, developers may have the opportunity to participate in interoperability tests with other developers. The other participants in such interop tests could include large companies, small companies, funded projects, researchers, or other students, etc. Participating developers may identify issues with the drafts and RFCs as they code or test to the specification. Discoveries of issues provide developers the opportunity to articulate these issues on the appropriate IETF working group mailing list and see them resolved through an update to the draft. Significant technical contributions are typically acknowledged in drafts, which will provide opportunities for the developer to include their acknowledgements in publications on their resume. The code and story behind the development and testing will provide excellent discussion points for interviews after graduation.

While some students may see this as a useful part-time or side exercise, others may benefit from more direct support from their institutions. To this end, outreach to professors and teaching assistants responsible for defining student projects within their groups will assist in raising awareness of this program and how to participate. For some in academia, there is often a desire for a research problem to be solved, so this approach might be not be suited to all working groups.

A possibility for larger coding efforts could include Capstone projects, possibly sponsored by industry, working with an undergraduate or graduate level course. This structure could enable students to learn better coding practices, including code reviews and quality assurance, introducing them to software engineering practices used in industry. Capstone projects typically involve critical analysis in solving a problem, allowing students to innovate. This opportunity may only apply to certain working groups with the ability to extend the work or those in an early phase that could benefit from innovative ideas.

Guidelines for students contributing to existing source code projects (Google Summer of Code, etc.) that may be linked to working group efforts through CodeMatch is outside the scope of this effort. Participation and guidelines for contributions in any such existing open source effort would need to follow the practices required within those efforts that may be established to ensure quality of code, etc. Participation in open source efforts may be constrained by the open source effort and may or may not be an option available to students, but is still an opportunity for CodeMatch and the IETF where the open source and standards communities could work together more closely.

Motivation for students to participate :

- gain experience creating useful open source code that lives on beyond the student project
- may be acknowledged in RFCs for significant technical contribution made during implementation and interoperability testing
- participate in interoperability events, gaining experience interacting with industrial and research
- make a contribution to the improvement of the Internet, and learn about IETF processes
- can make contacts with people in the industry that could provide job opportunities

Reaching out to the open-source community

Reaching out to folks in the open source community is a bit more involved. Doing so is much easier when there is already an open source ecosystem in a related area. e.g. Security area working group proposal related to TLS can easily reach out to the developers of openssl. In case such an ecosystem does not exist, one can be kickstarted through the contribution of open source code to CodeMatch with an open source license granted by the submitter or their sponsoring organization. The open source code is then linked via CodeMatch to tie the implementation to the appropriate the draft/RFC for the requesting working group.

Guidelines for plugfests will be developed and improved over time with important considerations to improve participation from the open source, research, and student communities. Initial feedback includes important considerations for advanced planning to ensure participants have adequate time to secure funding and plan travel (if necessary). Invitation letters may be necessary for some and others may require time to secure travel funds. Plugfests that align with IETF meetings should be planned far enough in advance of a meeting to avoid travel plan conflicts for participants (existing reservations, etc.).

Adoption within the IETF

The “match” in “CodeMatch” refers to matching interested implementers with protocols / drafts / features requiring implementation. Here, we intend to reach out to working groups, to allow them to list drafts for which they’d like to see additional implementation. This functionality would be provided by a website and a set of datatracker modifications described below. Once an implementor is matched to a given draft/protocol feature, this match is assigned a match shepherd (much like a document shepherd). The match shepherd may, but need not be, one of the document authors or WG chairs. This role ensures that there is always a point of contact within the IETF for a given CodeMatch.

How a given protocol is to be implemented is protocol-specific, and best left to the responsible WG: application and management protocols are likely to be implemented directly; enhancements to transport and network layer protocols (e.g. from the 6man and tcpm WGs) are likely to be implemented in an operating system kernel and/or an existing user space stack; routing protocols atop existing open-source routing platforms, etc.

IETF working groups:

- benefit from additional testing and feedback on drafts before they become RFCs
- can demonstrate clear connections between standards efforts and open source code
- get increased feedback from research and open source communities.
- introduce the IETF to possible new participants, globally.

Datatracker modifications

As part of CodeMatch, we propose adding features similar to the following to the Datatracker:

- Ability to associate a set of Implementations with a draft or set of drafts. This Implementation class would list public source repository, issue tracking, and documentation URLs (if available), as well as basic naming, licensing, and point-of-contact information for the implementation.
- Ability to associate a *desired* Implementation with a draft or set of drafts. This provides the basic data from which code matches can be made.
- Ability to associate interoperability test schedules and/or reports (by URL) with a set of Implementations, to track subsequent interop testing for better information to advance drafts to Standards Track.
- Ability to associate implementations with drafts and RFCs to automate notification of approved errata.

The CodeMatch site

Built on top of the Datatracker (or in parallel until required changes can be made thereto), the CodeMatch website lists both implementors and sets of drafts, as well as current and completed matches. This allows WGs to advertise projects (sets of drafts / features to be implemented) to potential implementers, and vice versa.

The site is divided by area and working group, where there is overlap between working groups, a connection from each working group will be provided. Within these categories:

- Pending projects are shown with links to the draft(s) and a wiki for discussion of the details of the project, and how the new work fits into the context of existing protocol(s).
- Existing implementations of the same draft(s) are shown, important for eventual interoperability testing of new work.
- Any scheduled interoperability tests for these implementations are shown, to facilitate planning of participation by CodeMatch implementers

The codematch site would ideally be hosted within the ietf.org domain.

Support structure

The working group chairs and/or authors that request implementation of a draft would need to provide some form of support to the implementers in case they run into issues during implementation of a specification. The preferred mechanism for the implementers to communicate such issues would be the working group mailing list. However, in case there is no response on the WG list or if the issues are met with hostile behavior the “CodeMatch shepherds” may need to intervene.

An IETF mailing list for researchers and students participating in CodeMatch can be established. This might be used by students to collaborate on development questions as well as to discuss possible findings prior to posting on an IETF working group mailing list. In some cases, students may be hesitant to post to an IETF mailing list if they are unsure of their question. This mailing list would provide a comfortable place for them to vet ideas with peers, possibly improving them prior to posting on a mailing list.

CodeMatch Shepherd Role

- Provide guidance to code developers, ensuring answers are provided in a timely fashion. Students may have deadlines to meet with class projects. Students may be working within a group in a class on a development effort as well and run into hurdles with explanations in drafts or have a need for clarification.
- Provide status reports on results from interoperability testing or plugfests. This could include compliance to a draft for each implementation.

Incentives

While most of the implementers participating in the code match are expected to do so without the expectation of any additional monetary incentives, it may be a good idea to offer some form of award for the top results. This could as simple as providing an opportunity for a selected implementer to attend an IETF meeting in person and get a chance to present the implementation feedback at a WG meeting (Something like the ANRP with a selection committee would work fine). The IRTF and ISOC through its Fellows program may provide connections to this type of incentive. Awards for top implementations might consider quality of code, compliance to the draft or standard, security, and other factors. Awards will be an important incentive for students to participate in CodeMatch. The opportunity to develop against a draft and be acknowledged in an RFC for significant contributions already exists, however CodeMatch is intended to better organize and incentivise such efforts.

Additional incentives may be established through corporate sponsorship or other funding options such as research grants or partnerships with industry for Capstone projects. The additional incentives will require additional research to determine if these types of incentives are possible and how they can be facilitated.

Incentives and existing or possible sponsorship opportunities could be advertised on the CodeMatch site.