OpenStack Board Briefing - Condorcet

Context

The OpenStack Board of Directors wishes to consider a resolution to call a special meeting of members to amend the bylaws of the OpenStack Foundation to remove the “cumulative voting” defined process for election of the 8 individual member Directors, and provide for an “order of preference” voting system using either the Condorcet method or the Single Transferable Vote (STV) method of voting.

This briefing paper is intended to brief the Board on the Condorcet voting system, to support the consideration and discussion of the Board resolution when made.

Condorcet Voting

The Condorcet method is an “order of preference” or “ranked” voting system that is used in certain international government, not-for-profit, and other association elections. By definition:

> “A Condorcet method is a voting system that will always elect the Condorcet winner; this is the candidate whom voters prefer to each other candidate, when compared to them one at a time.”

Each voter ranks the candidates in order of preference (the voter may be allowed to rank candidates as equals, to express indifference between them). For each pairing of candidates, the Condorcet algorithm counts how many votes rank each candidate over the other candidate. If a given candidate beats every other candidate, he is the Condorcet winner and wins the election. In a multiple winner election, once a winner is determined, the Condorcet algorithm is run again on the remaining candidates to come up with the ranked set of winners.

It is possible for a candidate to be the most preferred overall without being the first preference of *any* voter. In a sense, the Condorcet method yields the "best compromise" candidate, the one that the largest majority will find to be least disagreeable, even if not their favorite.

Completion methods

In most cases, comparing results pairwise is sufficient to determine and rank the Condorcet winners. However, in some cases there is no Condorcet winner in a set (A beats B, B beats C and C beats A). To handle those cases, Condorcet uses a pre-determined completion method to determine the winner, of which the Schulze method is the recommendation. Simply put, in the Schulze method, one repeatedly removes the weakest defeat until ambiguity is removed.

Schulze Completion Method

Each voter's ballot ranks the candidates being voted on. Not all candidates need be ranked. Ranked candidates are considered preferred to all unranked candidates. Voters may rank candidates equally. Unranked candidates are considered to be ranked equally with one another.

1 From the list of candidates, we generate a list of pairwise defeats.
1.1 Candidate A defeats Candidate B, if the number of voters who ranked A higher than B is strictly greater than the number of voters who ranked B higher than A
2 From the list of pairwise defeats, we generate a set of transitive defeats.

2.1 Candidate A transitively defeats Candidate C if A defeats C or if there is some other Candidate B where A defeats B AND B transitively defeats C.
3 We construct the Schwartz set from the set of transitive defeats.
3.1 Candidate A is said to be in the Schwartz set if for all Candidates B, either A transitively defeats B, or B does not transitively defeat A.
4 If the Schwartz set has just one candidate, that candidate wins.
5 If there are defeats between candidates in the Schwartz set, we drop the weakest such defeats from the list of pairwise defeats, and return to step 4.
5.1 A defeat (A,X) is weaker than a defeat (B,Y) if the number of voters who ranked A higher than X is less than the number of voters who ranked B higher than Y. Also, (A,X) is weaker than (B,Y) if the number of voters who ranked A higher than X is equal to the number of voters who ranked B higher than Y and the number of voters who ranked X higher than A is greater than the number of voters who ranked Y higher than B.
5.2 A weakest defeat is a defeat that has no other defeat weaker than it. There may be more than one such defeat.
5.3 If there weren't any defeats left to drop, then there is a tie between the candidates remaining in the Schwartz set.

Ties

Even using completion methods, there can still be pure ties in case of symmetrical ballots. In the unlikely case where ties need to be broken, a pre-determined tie-breaking method should be used. This is not specific to Condorcet. Any election system is likely to produce ties, therefore a fair tie-breaking method must be designated beforehand.

Together with Condorcet/Schulze the OpenStack Technical Committee and PTL elections use the following pre-determined method to break any tie: https://wiki.openstack.org/wiki/Governance/TieBreaking. Alternatives (like giving someone a casting vote) could be considered.

Use by others

Software in the Public Interest (SPI) is a New York 501(c)(3) that uses it for their board elections.
The Wikimedia Foundation is a Florida 501(c)(3) that uses it for their Board of Trustees. Wikimedia is similar in size to the OpenStack Foundation – in their June 2008 they had 26,000 eligible voters and 15 candidates.
The XBMC Foundation is a Delaware 501(c)(3) that uses it for their board elections.
The Gentoo Foundation is a New Mexico 501(c)(6) that uses it for their board elections.

In government, a Condorcet method known as Nanson's method was used in city elections in the U.S. town of Marquette, Michigan in the 1920s, and the Pirate Party uses it for its primary elections.

On the technical side, the OpenStack Technical Committee, the OpenStack PTL elections and the Debian Project all use it.

Legal Considerations

There is nothing in Delaware Law that affirms or denies the use of Condorcet as a voting method – it is effectively a legal unknown, which could carry risk. The largest concern is being able to describe the method specifically enough that, should it be challenged, a judge could determine that we have or have not complied with the mechanics of the system as we have described it.

Design intent

Condorcet favors consensus candidates and "natural" winners (the Condorcet winner), at the expense of giving each bloc its representative.

STV is designed for proportional representation of blocs. It favors candidates coming from those blocs at the expense of consensus candidates.

OpenStack has long favored community consensus at the expense of a potentially superior but potentially polarizing extremes. Additionally, OpenStack has long eschewed sense of bloc affiliation and has repeatedly done what it can to minimize the effects of such external groupings.

Benefits of Condorcet

Like every other ranking election system, Condorcet lets you express a preference, and the number of candidates does not affect the ability of the voters to express that preference. It is therefore vastly superior to cumulative voting.

Condorcet is designed to find consensus candidates.

Condorcet is being used by the OpenStack Technical Committee to elect its members, and by OpenStack Programs to elect their PTL. This strengthens the likelihood that the members of the OpenStack Foundation would consider, understand and adopt it as an alternative to cumulative voting. The data and results from a Condorcet election can be published in full to members, enabling verification and analysis by members of where voter preferences were allocated in the end result.

Compared to other ranking election systems like STV, the main benefit of Condorcet voting is its ability to always elect the Condorcet winner, whereas STV presents no such guarantee.

Drawbacks of Condorcet

Like STV, there are choices in implementation of Condorcet - and complex math to calculate results - that can lead to confusion and uncertainty among members.

Compared to other ranking election systems like STV, Condorcet presents no guarantee of proportional representation in the end results. A controlled bloc of voters representing 51% of the electorate can decide the full results of the election. It is therefore inappropriate if representing blocs is the main goal of the election. However, a controlled bloc representing 51% may be hard to beat with any method.

Conclusions

Condorcet is a broadly implemented preference or ranking voting system that is in use by other similar Open Source organizations. It has been in use by OpenStack since before the Foundation existed to good result. It is designed to find consensus from amongst several choices. It is also not easily gamed.

Because of its ranked-voting design, its aim towards consensus and its history inside of OpenStack, unless there is overhwhelming evidence to indicate specific unsuitabilty for some reason, the board should reaffirm the currently standing practice within the project and select the Condorcet voting with Schulze completion as the mechanism for selecting the individual member Directors.

References

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