The TLA⁺ Foundation

https://foundation.tlapl.us/

created on 21 April 2023
under the umbrella of the Linux Foundation

TLA⁺ Community Meeting
April 22, 2023

What TLA⁺ is About

- Describe how a system functions and verify its properties

- Some bugs are costlier than others

  - difficult to reproduce during development

  - design flaws whose fix requires significant work

  - cause downtime, data loss or security vulnerabilities

  **concurrent and distributed systems
  are prone to these problems**

- TLA⁺: a high-level specification language

  - precise and concise description of the system and its properties

  - tools check if properties hold and, if not, how they may break

Use of TLA⁺ in Industry

- Applicable to concurrent and distributed systems

  - unique focus on costly design bugs

  - independent of implementation language

- Scales to arbitrarily complex systems, yet easy to learn

  - harnesses the power of mathematical abstractions

  - automatic verification using model checking is accessible to engineers

- Industrial success stories

Community Governance

- From benevolent dictatorship …

    - Leslie Lamport (Turing award 2013) designed TLA$^+$ in the 1990s

    - Lamport has been the steward of language evolution, Microsoft provided most funding

- … to a community effort

    - Lamport wishes to entrust TLA$^+$ to a foundation to ensure its relevance and growth

    - governance independent from any single entity, financially and technically

    - continue open-source tool development, extend the range of applications

Mission Statement

The TLA$^+$ Foundation (TLAF) is a directed fund of the Linux Foundation.

TLAF is focused on supporting the TLA$^+$ specification language and related tooling (the "TLA$^+$ Project"), with the overall goal of advancing mathematical thinking in software engineering.

TLAF supports development related to TLA$^+$ to broaden its use and facilitate a thriving TLA$^+$ community, encouraging cooperation among members of that community.

Goals of the TLA$^+$ Foundation

- Establish specification-driven software development as a best practice

- Facilitate the adoption of the TLA$^+$ specification language in industry

- Govern the evolution of the TLA$^+$ specification language

- Provide a neutral home for TLA$^+$ community assets

- Foster collaboration across the TLA$^+$ ecosystem

Anticipated Activities

- Encourage research collaboration around the TLA$^+$ language

- Support long-term maintenance and interoperability of the TLA$^+$ tools

- Enable development of new tools relevant for industry and academia

- Safety certification of TLA$^+$ tools

- Create education and training materials, including certification programs

- Organize TLA$^+$ events to promote contribution to projects and use of TLA$^+$
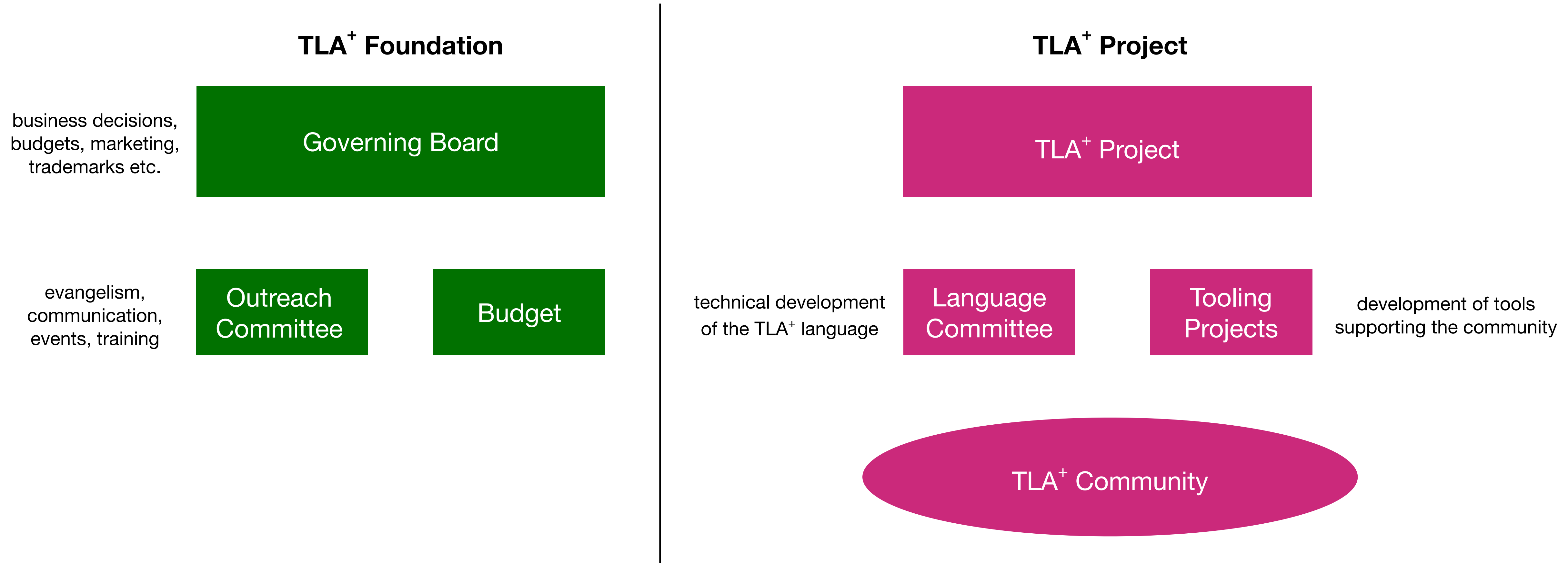
Member Benefits

- Help shape the strategy and the budget for the TLA$^+$ Foundation

- Grow the resources available to the TLA+ specification language and tools in order to strengthen the TLA$^+$ ecosystem

- Participate in project events

- Marketing display opportunities (membership page, press releases etc.)

Governance Structure

TLA⁺ Foundation

business decisions, budgets, marketing, trademarks etc.

Governing Board

evangelism, communication, events, training

Outreach Committee

Budget

TLA⁺ Project

TLA⁺ Project

technical development of the TLA⁺ language

Language Committee

Tooling Projects

development of tools supporting the community

TLA⁺ Community

- Separating business and technical decision making is best practice for open source projects
- Head of specification language committee attends governing board meetings

Membership

- The foundation is funded through membership dues

- Premier and General membership levels

- Associate members: government entities, academic and nonprofit organizations

- Members must also adhere to the Linux Foundation

- Non-members may fully participate in the TLA$^+$ project

Premier members

- $ 100,000 annual membership due, plus Linux Foundation membership

- appoint one representative to the governing board

  - including one voting representative in any subcommittee or activity

- most prominent placement in display of membership

- access to Linux Foundation's Open Source Leadership Summit

- prime support by LF staff

General members

- $ 5,000 to $ 20,000 annual membership due, plus LF membership

  < 500 employees: $ 5,000   500-1,999 employees : $ 10,000

  2,000-4,999 employees : $ 15,000   > 5,000 employees: $ 20,000

- one governing board member per 5 general members

- membership displayed on TLAF page

- support by LF staff

Associate Membership

- Government entities, academic, non-profit organizations

- No membership dues

- No seat on the governing board

- Membership displayed on TLAF page

Amazon support statement

AWS is committed to delivering high-quality services to our customers, which is why our Automated Reasoning team has relied on techniques like formal specification and model checking for years to solve difficult design problems in critical systems. TLA+ is a powerful tool in our toolbox that helps us to verify the correctness of our software systems under assumptions. By joining the TLA+ Foundation, we aim to support the advancement of TLA+ tooling and further improve the state of the art in distributed systems design.

Byron Cook, VP and Distinguished Scientist

Microsoft support statement

Across Microsoft, a growing number of engineering teams have been relying on TLA+ for specifying and validating the correctness of their algorithms and software systems. The engineering teams using TLA+ have reported tremendous value in precisely defining the systems and validating them earlier in the engineering lifecycle. The TLA+ tools have helped identify issues with their designs before writing a single line of code. By joining the TLA+ Foundation, we aim to foster a community of TLA+ practitioners who care deeply about designing correct distributed systems.

Dharma Shukla, Technical Fellow

Oracle support statement

High scale distributed cloud services form the backbone of all hyperscalar cloud platforms, including Oracle Cloud Infrastructure (OCI). When we launched in 2016, OCI was the first cloud designed using formal methods from the start to deliver high quality cloud services. At OCI, we use TLA+ on more than 25 of our most critical services, including block storage and file storage services, to verify the correctness of complex design scenarios including distributed replication, failover and live re-sharding. We are excited to join TLA+ Foundation as a founding member with the goal of furthering the TLA+ toolkit and improving the quality of distributed cloud services in the years to come.

Pradeep Vincent, SVP and OCI Chief Technical Architect

More support statements

The TLA+ Foundation is timely in so many ways. Thinking systemically and analytically about software development is more needed now than ever. The complexity of often-networks software systems is going up and we need tools like TLA+ to cope.

Vint Cerf, VP and Chief Internet Evangelist

NVIDIA actively uses formal methods in the development of safety/security critical software and hardware, including TLA+, which we use to formalize our designs and requirements. We see the TLA+ Foundation filling an important gap by providing a professionally managed platform to share contributions, experiences, and best practices.

Tom McReynolds, Senior Director DRIVEOS SW

Next steps

- Appoint representatives in governing board

- Set up Technical Steering Committee

  - monthly meetings have started since January

  - Webinar on June 14, 8am PT / 5pm CEST

- Consider convincing your organization to join the foundation

- Consider contributing to the technical project

Let's make ours the foundation and the project

https://foundation.tlapl.us/

Questions?