Axon Technical Specification
Draft 1

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Abstract

This is a technical reference for the Axon decentralized communications library.

Contents

Chapter 1

Introduction

Axon is a development platform for decentralized communications software. [Bar64]

Appendix A

Formal semantics

$$
\begin{array}{lcll}
t & ::= & \texttt{start}\ t\ t\ t \mid \texttt{wait}\ t \mid \texttt{stop}\ t \mid \texttt{kill}\ t \mid \texttt{quit} \mid \texttt{die} \mid \texttt{yield} \mid & \text{concurrent} \\
 & & \texttt{filter}\ t\ t\ t \mid \texttt{give}\ t\ t \mid \texttt{take} \mid \texttt{emit}\ t \mid \texttt{recv}\ t \mid & \text{message} \\
 & & \texttt{commanded}\ t\ t \mid \texttt{command}\ t\ t \mid \texttt{bind}\ t \mid & \text{processing} \\
 & & \texttt{codec}\ t\ t \mid \texttt{encode}\ t\ t \mid \texttt{decode}\ t\ t \mid & \text{serial} \\
 & & \texttt{serve}\ t\ t\ t \mid \texttt{connect}\ t\ t & \text{communication} \\
v & ::= & \pi \mid a &
\end{array}
$$

Concurrency

$$\Pi = \{\pi_i \mapsto (t_{start}, t_{stop}, t_{die})\}_{i<|\Pi|}$$

$$\frac{\text{choose } \pi \notin \mathrm{Dom}(\Pi)}{\Pi, \pi_0 \vdash \texttt{start}\ t_1\ t_2\ t_3 \rightsquigarrow [\pi \mapsto (t_1, t_2, t_3)]\Pi, \pi_0 \vdash \pi}\ \textsc{Start}$$

$$\frac{\Pi(\pi_0) = (v_1, t_2, t_3) \qquad t_2 \neq \varnothing}{\Pi, \pi_0 \vdash v_1 \rightsquigarrow \Pi, \pi_0 \vdash \texttt{quit}}\ \textsc{End} \qquad \frac{\Pi(\pi_0) = (\texttt{quit}, t_2, t_3)}{\Pi, \pi_0 \vdash \texttt{quit} \rightsquigarrow [\pi_0 \mapsto (t_2, \varnothing, t_3)]\Pi, \pi_0 \vdash t_2}\ \textsc{Quit}$$

$$\frac{\Pi(\pi_0) = (v_1, \varnothing, t_3) \qquad t_3 \neq \varnothing}{\Pi, \pi_0 \vdash v_1 \rightsquigarrow \Pi, \pi_0 \vdash \texttt{die}}\ \textsc{Quited} \qquad \frac{\Pi(\pi_0) = (\texttt{die}, \cdot, t_3)}{\Pi, \pi_0 \vdash \texttt{die} \rightsquigarrow [\pi_0 \mapsto (t_3, \varnothing, \varnothing)]\Pi, \pi_0 \vdash t_3}\ \textsc{Die}$$

$$\frac{\begin{array}{c}\Pi(\pi_k) = (v_{1k}, \varnothing, \varnothing) \\ \Pi(\pi_j) = (t_{1j}, \cdot, \cdot) \qquad \pi_j \neq \pi_k\end{array}}{\Pi, \pi_k \vdash v_{1k} \rightsquigarrow \Pi \setminus \pi_k, \pi_j \vdash t_{1j}}\ \textsc{Died} \qquad \frac{\Pi(\pi_j) = (t_{1j}, \cdot, \cdot) \qquad \pi_j \neq \pi_k}{\Pi, \pi_k \vdash \texttt{yield} \rightsquigarrow \Pi, \pi_j \vdash t_{1j}}\ \textsc{Yield}$$

$$\frac{\pi \in \mathrm{Dom}(\Pi)}{\Pi, \pi_0 \vdash \texttt{wait}\ \pi \rightsquigarrow \Pi, \pi_0 \vdash \texttt{wait}\ \pi}\ \textsc{Wait} \qquad \frac{\pi \notin \mathrm{Dom}(\Pi)}{\Pi, \pi_0 \vdash \texttt{wait}\ \pi \rightsquigarrow \Pi, \pi_0 \vdash \varnothing}\ \textsc{Waited}$$

$$\frac{\Pi(\pi) = (\cdot, t_2, t_3)}{\Pi, \pi_0 \vdash \texttt{stop}\ \pi \rightsquigarrow [\pi \mapsto (\texttt{quit}, t_2, t_3)]\Pi, \pi_0 \vdash \texttt{wait}\ \pi}\ \textsc{Stop}$$

$$\frac{\Pi(\pi) = (\cdot, \cdot, t_3)}{\Pi, \pi_0 \vdash \texttt{kill}\ \pi \rightsquigarrow [\pi \mapsto (\texttt{die}, \varnothing, t_3)]\Pi, \pi_0 \vdash \texttt{wait}\ \pi}\ \textsc{Kill}$$

Appendix B

Glossary

Bibliography

[Bar64] Paul Baran. On Distributed Communications I: Introduction to Distributed Communications. *The RAND Corporation, Memorandum RM-3420-PR, Defense Documentation Center*, 1964.