Middleware for Best-Effort Third-Party Monitoring

No Author Given

No Institute Given

1 Monitoring Specifications

There is a basic type system for event streams:

$$\text{Event Data Type } \tau^E \supseteq \texttt{int} \mid \texttt{bool} \mid \texttt{byte} \mid \texttt{string} \mid \tau^E[] \mid \tau \times \tau \mid \tau + \tau$$

We assume a language with the following constructs:

$$\begin{array}{ll} \text{Type} & \tau \supseteq \tau^E \\ \text{Expression} & e \supseteq x \mid n \mid \texttt{true} \mid \texttt{false} \mid e + e \mid e \wedge e \ldots \\ \text{Statement} & s \supseteq \{\overline{s}\} \mid x \ : \ \tau \ = \ e; \mid x \ = \ e; \mid e; \mid \texttt{if}(e)\ s\ \texttt{else}\ s \end{array}$$

$$\begin{array}{llll} \text{T Param} & \circ ::= \tau \mid \tau^E & & \\ \text{Field Decl} & F^\circ ::= f : \circ & \text{Field Name} & f \\ \text{Event Decl} & \mathcal{E}^\circ ::= E(\overline{F^\circ}) & \text{Event Name} & E \\ \text{Stream Type} & \mathbb{S}^\circ ::= \texttt{stream type}\ \mathcal{S}\ \{\ \overline{\mathcal{E}^\circ}\ \} & \text{Stream Type Name} & \mathcal{S} \end{array} \Big\} \in \text{Distinct sets of names}$$

Fig. 1. Event Streams

$$\begin{array}{ll} \text{Event Source Name} & S \\ \text{Connection Kind} & C ::= \texttt{autodrop}(n) \mid \texttt{infinite} \mid \texttt{blocking}(n) \\ \text{Performance Action} & a ::= \texttt{drop} \mid \texttt{forward}\ E(\overline{e}) \\ \text{Performance Match} & c ::= a \mid \texttt{if}(e)\ \texttt{then}\ c\ \texttt{else}\ c \\ \text{Performance Layer Rule} & r ::= \texttt{on}\ E(\overline{x})\ c \\ \text{Event Source} & \mathbb{E} ::= \text{event source}\ S\ :\ \mathcal{S} \to C\ \mathcal{S}\ \{\ \overline{r}\ \} \end{array}$$

Fig. 2. Performance Layer Specification

Buffer Match Exp $b ::= S \texttt{ : } n \mid S \texttt{ : } \overline{E^H(\overline{x})}\ [\overline{E^H(\overline{x})}] \mid S \texttt{ : nothing} \mid S \texttt{ : done}$
Arbiter Rule Stmt $s^{R^{\mathcal{A}}} ::=$ like s, without `return`, but with `drop` n `from` $S \mid$ `yield` $E(\overline{e}) \mid$ `switch to` $\mathcal{R}^A$
Arbiter Rule $R^{\mathcal{A}} ::=$ `on` $\overline{b}$ `where` $e\ \{\overline{s^{R^{\mathcal{A}}}}\}$
Arbiter Rule Set $\mathbb{R} ::=$ `rule set` $\mathcal{R}^A\ \{\overline{R^{\mathcal{A}}}\}$
Arbiter Definition $\mathbb{A} ::= \texttt{arbiter} : \mathcal{S}\{\overline{\mathbb{R}}\}$

Fig. 3. Arbiter Specification

Monitor Rule $R^{\mathcal{M}} ::=$ `on` $E(\overline{x})$ `where` $e\ \{\overline{s}\}$
Monitor Definition $\mathbb{M} ::= \texttt{monitor}\{\overline{R^{\mathcal{M}}}\}$

Fig. 4. Monitor Specification

An overall monitoring program looks as follows:

$\mathbb{S}^{\tau^E}$
...

$\mathbb{S}^{\tau}$

$\mathbb{E}$
...

$\mathbb{A}$

$\mathbb{M}$

$x : \tau$
...

```
startup{
  s
  ...
}

cleanup{
  s
  ...
}
```

Bibliography