0.0.1 Append

The operation *append* will return a Collection with a Value added at a specified numeric Index.

$$
\begin{array}{|l}
\textit{append}[\textit{Collection}, V, \mathbb{N}] \\
\textit{coll}?\,, \textit{coll}!: \textit{Collection} \\
v?: V \\
\textit{idx}?: \mathbb{N} \\
\textit{append}: \textit{Collection} \times V \times \mathbb{N} \rightarrow \textit{Collection} \\
\hline
\textit{coll}! = \textit{append}(\textit{coll}?\,, v?\,, \textit{idx}?\,) \bullet \\
\quad \textit{let}\ \textit{coll}' == \textit{front}(\{\, i : \mathbb{N} \mid i \in 0 \,..\, \textit{idx}?\,\} \upharpoonright \textit{coll}?\,) \frown v? \\
\quad\quad \textit{coll}'' == \{\, j : \mathbb{N} \mid j \in \textit{idx}? \,..\, \# \textit{coll}?\,\} \upharpoonright \textit{coll}? \bullet \\
\quad = \textit{coll}' \frown \textit{coll}'' \Rightarrow \textit{front}(\textit{coll}') \frown v? \frown \textit{coll}'' \ \wedge\ v? \mapsto \textit{idx}? \in \textit{coll}! \wedge \# \textit{coll}! = \# \textit{coll}? + 1 \\
\hline
\end{array}
$$

where $\textit{coll}'$ is the items in $\textit{coll}?$ up to $\textit{idx}$ but the value at $\textit{idx}?$ is replaced with $v?$ and $\textit{coll}''$ is the items in $\textit{coll}?$ from $\textit{idx}$ to $\# \textit{coll}?$ and is inclusive of $\textit{coll}?_{\textit{idx}?}$. The composition of the two Collections results in $\textit{coll}!$ which contains $\textit{idx}? \mapsto v?$ and all subsquent $\textit{idx} \mapsto v \in \textit{coll}?$ are now $\textit{idx} + 1 \mapsto v_{\textit{idx}}$. The following example illustrates these properties.

$$
\begin{aligned}
X &= \langle x_0, x_1, x_2 \rangle \\
&\quad x_0 = 0 \\
&\quad x_1 = foo \\
&\quad x_2 = \langle a, b, c \rangle \\
&\quad v? = bar \\
\textit{append}(X, v?\,, 0) &= \langle bar, 0, foo, \langle a, b, c \rangle \rangle \\
\textit{append}(X, v?\,, 1) &= \langle 0, bar, foo, \langle a, b, c \rangle \rangle \\
\textit{append}(X, v?\,, 2) &= \langle 0, foo, bar, \langle a, b, c \rangle \rangle \\
\textit{append}(X, v?\,, 3) &= \langle 0, foo, \langle a, b, c \rangle, bar \rangle
\end{aligned}
$$