Annotate where needed and prove partial correctness of $\{P\}\ S_1 \parallel S_2\ \{Q\}$:

$\{P\} \equiv \{x = 5 \wedge y = 7 \wedge v = 0\}$

$\{P_1\}$

S_1 :

$(\langle x \geq 1 \rightarrow y := x + 2y\rangle$

$\square$

$\langle x < 1 \rightarrow y := x \rangle)$; $\{P_{11}\}$

$\langle E!\ y + 5\rangle$; $x := y - 1$; $\{P_{12}\}\langle C\ ?\ y\rangle$; $z := x + y$

$\{Q_1\}$

$\parallel$

$\{P_2\}$

S_2 : $\langle E?\ u\rangle$; $v := u - 3$; $\{P_{21}\}$ $\langle C!\ v + 3\rangle$

$\{Q_2\}$

$\{Q\} \equiv \{z > 9\}$

$P \equiv x = 5 \wedge y = 7 \wedge v = 0$

$P_1 \equiv x = 5 \wedge y = 7$

$P_2 \equiv v = 0$

$Q_1 \equiv z > 9$

$Q_2 \equiv u > 10$

$P_{11} \equiv y = 19$

$P_{12} \equiv y = 19 \wedge x = 18$

$P_{21} \equiv v = 21$

$Q \equiv z > 9$

From cooperation tests

Coop(E) : $\{P_{11} \wedge P_2\}\ u = y + 5\ \{P_{12}[y - 1/x] \wedge P_{21}[u - 3/v]\}$

Coop(C) : $\{P_{12} \wedge P_{21}\}\ y = v + 3\ \{Q_1[x+y/z] \wedge Q_2\}$

we extract local axioms for S_1 and S_2 about correct communication actions

$A_1 = \{\{P_{11}\}\ \langle E!\ y + 5\rangle\ \{P_{12}[y - 1/x]\}, \{P_{12}\}\langle C\ ?\ y\rangle\{Q_1[x+y/z]\}\}$

$A_2 = \{\{P_2\}\langle E?\ u\rangle\ \{P_{21}[u - 3/v]\}, \{P_{21}\}\ \langle C!\ v + 3\rangle\{Q_2\}\}$

For entire parallel program we use the rule

DML parallel composition

$$\frac{A_1 \mid\!- \{P_1\} S_1 \{Q_1\} \quad A_2 \mid\!- \{P_2\}\ S_2\ \{Q_2\} \quad P \Rightarrow P_1 \wedge P_2 \quad Q_1 \wedge Q_2 \Rightarrow Q \quad Coop(A_1\ A_2)}{\vdash \{P\}[\{P_1\}\ S_1\ \{Q_1\} \parallel \{P_2\} S_2\ \{Q_2\}]\{Q\}}$$

And for proving A_1 |- $\{P_1\}$ S_1 $\{Q_1\}$ we use the rule

DML non-deterministic coice

$$\frac{\forall i = 1, l:\ A_i \mid\!- \{P\}\ S_i\ \{Q\},}{A \vdash \{P\}\ [\Box^{l}_{i=1} S_i]\ \{Q\}} \qquad A =_{def} \cup^{l}_{i=1} A_i$$