Summary of results

We report the result of using the tool on the set of examples included. The examples are taken from [2], and described in [3, 4]. We have also adapted the Bounded Retransmission Protocol from [1]. All examples are supplied in the form of `xml`-files in the `examples` directory of this repository. The source is also supplied in the directory `util` as `csv` files together with the `csv2xml` script, allowing modification of the protocols in a simple manner. All experiments were performed on a 3.1 GHz Intel Core i5 with 4 GB of RAM, running OS X 10.7.5. In Table 1, the results of running the tool on the examples from [1, 2] are reported. In Table 2, we show the results of running our tool where we intentionally modified the programs to cause an error. Finally, Table 3 shows the results of trying to reach the state named "Completing" in the protocols as they are presented in the `examples` directory.

The tables should be interpreted as follows. The column **P/B** lists the protocol under analysis together with the name of the process in that protocol whose bad state we are trying to reach. S stands for Sender, R for Receiver, P for Participant and C for Coordinator. The column **Sem** lists the channel semantics used for the specific test, the column **SMT** lists the time the SMT solver requires to analyze the formula, the column **Time** lists the total time of the analysis, the column **Assert** lists the number of assertions fed to the SMT solver, the column **Al** lists the bound on the number of phase alternations, **Aut** lists the number of states and the number of transitions of our constructed automata, and finally **Res** lists the result of the analysis. The results are listed as U for Unsafe of S? for possibly safe.

References

[1] Parosh Aziz Abdulla, Aurore Collomb-Annichini, Ahmed Bouajjani, and Bengt Jonsson. Using forward reachability analysis for verification of lossy channel systems. *FMSD*, 25(1):39–65, 2004.

[2] Abinoam P. Marques Jr., Anders Ravn, Jiri Srba, and Sallem Vighio. csv2uppaal. `https://github.com/csv2uppaal`.

[3] Abinoam P. Marques, Anders Peter Ravn, Jiri Srba, and Saleem Vighio. *Tool Supported Analysis of Web Services Protocols*, pages 50–64. University of Oslo, 2011.

[4] Anders P. Ravn, Jirí Srba, and Saleem Vighio. Modelling and verification of web services business activity protocol. In Parosh Aziz Abdulla and K. Rustan M. Leino, editors, *TACAS*, volume 6605 of *Lecture Notes in Computer Science*, pages 357–371. Springer, 2011.

Table 1: Verification results of examples from [2, 1]

P/B	Sem	SMT	Time	Assert	Al	Aut	Res
ABP/S	M-set	2.8	19.1	13266	80	1922/5258	S?
ABP/S	SLCS	6.5	22.0	61948	10	1442/3028	S?
ABP/S	LCS	6.4	21.9	61948	10	1442/3028	S?
ABP/R	M-set	0.03	0.13	1314	8	194/506	U
ABP/R	SLCS	21.2	23.2	19764	6	578/1232	S?
ABP/R	LCS	20.5	22.5	19764	6	578/1232	S?
BRP/R	M-set	1.2	3.3	5050	12	722/1970	U
BRP/R	SLCS	12.0	57.9	217544	6	2522/5264	S?
BRP/R	LCS	11.7	57.0	217544	6	2522/5264	S?
STP/A	M-set	0.11	0.23	1195	12	171/421	U
STP/A	SLCS	20.5	22	126096	8	1011/2273	S?
STP/A	LCS	14.7	17.5	126096	8	1011/2273	S?
STP/B	M-set	2.25	22.8	5175	150	2103/5389	S?
STP/B	SLCS	10.5	16.8	248763	10	1543/3474	S?
STP/B	LCS	18.3	25.4	431342	12	2187/4927	S?
STP/C	M-set	2.1	21.0	14329	144	2019/5173	S?
STP/C	SLCS	10.4	16.7	248763	10	1543/3474	S?
STP/C	LCS	10.4	16.7	248763	10	1543/3474	S?
CCv2/Co	M-set	1.4	3.8	4237	8	490/2165	U
CCv2/Co	SLCS	28	193	35721	2	1222/2675	S?
CCv2/Co	LCS	26	187	35721	2	1222/2675	S?
CCv2/P	M-set	10.5	18	8525	16	978/4389	S?
CCv2/P	SLCS	4.5	168	35721	2	1222/2675	S?
CCv2/P	LCS	4.3	165	35721	2	1222/2675	S?
PCv2/Co	M-set	12.7	18.0	7362	18	830/3808	S?
PCv2/Co	SLCS	16.5	79.5	22511	2	784/1749	S?
PCv2/Co	LCS	20.4	84.5	22511	2	784/1749	S?
PCv2/P	M-set	7.8	13.3	6540	16	738/3380	S?
PCv2/P	SLCS	2.3	65.8	22511	2	784/1749	S?
PCv2/P	LCS	2.3	63.6	22511	2	784/1749	S?
CC/Co	M-set	0.35	1.16	2632	6	308/1316	U
CC/Co	SLCS	12.9	85.5	23988	2	818/2020	S?
CC/Co	LCS	11.3	81.2	23988	2	818/2020	S?
CC/P	M-set	1.4	3.8	4237	6	1922/5258	U
CC/P	SLCS	2.7	74.5	23988	2	818/2020	S?
CC/P	LCS	2.6	73.1	23988	2	818/2020	S?
PC/Co	M-set	0.31	0.85	1985	6	230/987	U
PC/Co	SLCS	25.5	1.6	14186	2	496/1278	S?
PC/Co	LCS	25.2	1.7	14186	2	496/1278	S?
PC/P	M-set	0.29	0.78	1985	6	230/987	U
PC/P	SLCS	1.3	25.5	14186	2	496/1278	S?
PC/P	LCS	1.3	24.7	14186	2	496/1278	S?

Table 2: Buggy Examples

P/B	Sem	SMT	Time	Assert	Al	Aut	Res
Alternating Bit/R	SLCS	5.1	5.8	7104	4	290/720	U
Alternating Bit/R	LCS	4.7	5.7	7104	4	290/720	U
Sliding Window/R	SLCS	0.59	1.2	2701	2	290/699	U
Sliding Window/R	LCS	0.69	1.7	2701	2	290/699	U
Synchronous/R	SLCS	0.12	0.2	1506	6	86/192	U
Synchronous/R	LCS	0.14	0.22	1506	6	86/192	U

Table 3: Reachability results

P/B	Sem	SMT	Time	Assert	Al	Aut	Res
PC/C	SLCS	7.4	32.4	14186	2	496/1278	Reachable
PC/C	LCS	6.5	30.8	14186	2	496/1278	Reachable
PC/P	SLCS	12.8	38.5	14186	2	496/1278	Reachable
PC/P	LCS	4.8	28.9	14186	2	496/1278	Reachable
CC/C	SLCS	44.4	119	23988	2	818/2020	Reachable
CC/C	LCS	23.9	98.5	23988	2	818/2020	Reachable
CC/P	SLCS	26.8	135	23988	2	818/2020	Reachable
CC/P	LCS	26.8	98.4	23988	2	818/2020	Reachable