

Appendix B

Symbols used in the Thesis

In this Chapter, we provide an overview of the symbols and acronyms used within the thesis. The items are ordered according to context; some items are referred to in several contexts. If available, we give references to the symbols' definitions.

General Symbols

Symbol	Meaning/Description
\mathbb{N}	set of natural numbers
\mathbb{N}^+	set of positive natural numbers
\mathbb{R}	set of real numbers
\mathbb{R}^+	set of non-negative real numbers
$(.)$	open interval
$[.]$	closed interval
$(.]$ and $[.)$	half-open interval

Acronyms and Abbreviations

Symbol	Meaning/Description
ENS	Event Notification Service / System
CDF	Channel Definition Forma
CBB	Commercial Big Buildings
EIB	European Installation Bus
LON	Local Operating Network
NTP	Network Time Protocol

Symbols used for General Event Modelling

Symbol	Meaning/Description	Definition
e, e_1, \dots	event instances	Def. 3.3
E, E_1, \dots	event classes	Def. 3.9
\mathbb{E}	set of all events (event space)	Def. 3.6
\mathbb{P}	profile set	
$t(e)$	occurrence time of event e	Def. 3.3
\mathbb{E}_t	set of all time events	Def. 3.6
\mathbb{E}_P	set of all primitive events	Def. 3.6
\mathbb{E}_C	set of all composite events	Def. 3.6
$\{\dots\} \succ e$	operator for composition contribution	Def. 3.7
q_{exp}	event query with accompanying expression	Def. 3.8
exp	expression as part of event query	Def. 3.8
tr	trace	Def. 3.10
tr_{t_1, t_2}	trace with time restrictions	Def. 3.10
p, p_1, \dots	profiles	Def. 3.11
$p \sqsubset e$	operator for event–profile matching	Def. 3.13
T^{obs}	observation schedule	
t^{obs}	observation time	
Δ^{not}	notification period	
T^{not}	notification period	
t^{not}	notification time	
Δ^{obs}	observation period	
t_0	start time of service / schedule	
$freq_{events}$	event frequency	
$freq_{filter}$	filter frequency	

Symbols used for Event Modelling (Algebra)

Symbol	Meaning/Description	Definition
$(E_1 E_2)$	binary operator: temporal disjunction of event classes	Def. 5.5
$(E_1, E_2)_T$	binary operator: temporal conjunction of event classes	Def. 5.6
$(E_1; E_2)_T$	binary operator: temporal sequence of event classes	Def. 5.7
\overline{E}_T	unary operator: negation	Def. 5.9
$E^{[i]}$	unary operator: selection	Def. 5.8
$E_1 \wedge E_2$	binary operator: logical conjunction of event classes	
$E_1 \vee E_2$	binary operator: logical disjunction of event classes	

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Symbol	Meaning/Description	Definition
EIS	parameter for Event Instance Selection	
EIC	parameter for Event Instance Consumption	
EET	parameter for Event Evaluation Time	
T	time span	
$first_dup(.)$	event instance selection: first duplicate	
$last_dup(.)$	event instance selection: last duplicate	
$all_dup(.)$	event instance selection: all duplicates	
$i_dup(.)$	event instance selection: i^{th} duplicate	
all_pairs	event instance consumption: all pairs	
$unique_pairs$	event instance consumption: unique pairs	
$repeated_pairs$	event instance consumption: repeated pairs	
$D_{E_1 \setminus E_2}$	duplicate list	Def. 5.2
$tr(.)$	trace view	Def. 5.3
$tr[.]$	trace sublist	Def. 5.4
$tr[.,.]$	element of trace sublist	Def. 5.4
P_{EIC}	auxiliary parameter for EIC in algebra definition	Table 5.2
v_{min}	auxiliary parameter for EIS in algebra definition	Table 5.3
v_{max}	auxiliary parameter for EIS in algebra definition	Table 5.3
w_{min}	auxiliary parameter for EIS in algebra definition	Table 5.3
w_{max}	auxiliary parameter for EIS in algebra definition	Table 5.3

Symbols used for Modelling of Event Observation and Timestamping

Symbol	Meaning/Description	Definition
$t(e)$	occurrence time of event e	Def. 3.3
$ts(e, p)$	timestamp on event e by process p	Def. 6.2
$ta(e)$	timestamp accuracy of event e	Def. 6.2
$t dl(e, p)$	timestamp delay of of event e at process p	Def. 6.2
$pc(e, p)$	perception time of event e at process p	Def. 6.2
$p dl(e, p)$	perception delay of event e at process p	Def. 6.2
I_{det}	detection interval	Def. 6.2
p	process (general)	
ip	invoker process	
op	observer process	

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Symbol	Meaning/Description	Definition
t_i^{obs}	scheduled observation time	
$t_i^{det}(e)$	scheduled detection time	
$odl(t_i^{obs})$	observer delay for active observation	
$maxOdl(p)$	maximum observation delay for process p	
$dll(t^{inv}(e))$	detection delay of certain event invocation	
$maxDdl(p)$	maximum message delay	
$mdl(t)$	message delay in passive observation	
$maxMdl(ip, op)$	maximum message delay between two processes	
RT	reference time	Def. 6.1
$C(t)$	point in virtual clock time	Def. 6.1
CT	clock time	Def. 6.1
ρ	clock drift	
g	clock granularity	
α	time system accuracy	
Π	time system precision	
C_{inv}	local invoker time	
$\underline{\Delta}$	reference between local time and real time	
t_{start}	starting time of the system	

Symbols from Petri Net Performance Model

Symbol	Meaning/Description	Definition
C	coverage	
$E[T]$	expectation for event processing time (complete system)	
$E[T_{obs}]$	expectation for event processing time (observer)	
$E[T_{filter}]$	expectation for event processing time (filter)	
$E[T_{notif}]$	expectation for event processing time (notifier)	
L	network traffic noise (noise/event)	
L_1, L_3	network loads for network N_1, N_3	
λ_{prov}	mean event generation rate (events/sec)	Table 7.2
$\lambda_{observeevent}$	mean event observation rate (observed events/sec)	Table 7.2
$\lambda_{filtering}$	mean filtering rate (events/sec)	Table 7.2
$\lambda_{process}$	mean forwarding rate for matched events (events/sec)	Table 7.2
$\lambda_{createmessage}$	mean rate for message creation (message/sec)	Table 7.2
λ_{send}	mean rate for message sending (message/sec)	Table 7.2
λ_{client}	auxiliary: mean rate of message consumption at client site	Table 7.2

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Symbol	Meaning/Description	Definition
n_0	capacity at provider's site	Table 7.2
n_1	network capacity between provider and service	Table 7.2
n_2	network capacity between filter and notifier	Table 7.2
n_3	network capacity between service and client	Table 7.2

Symbols from filter algorithms

Symbol	Meaning/Description	Definition
p	number of profiles	
pr	number of predicates	
pr'	number of distinct predicates	
P_p	profile distribution: distribution of values within profile attributes	
P_e	event distribution: distribution of values within event attributes	
A	set of attributes	
D_j	domain of attribute a_j	
D	simplified for D_j	
D_0	zero-subdomain	
d_0	domain-size of D_0	
m	number of attribute values	
$i \in [1, m]$	iterator for attribute values	
n	number of attributes	
$j \in [1, n]$	iterator for attributes	
$a_j : a_1 \dots a_n$	attributes, attribute levels in profile tree	
$b_i : b_1 \dots b_m$	branches in profile tree	
*	don't care edge in profile tree	
X	discrete random variable	
W	domain of X	
x_0	referenced to zero-subdomain D_0	
$E(X)$	expectation of X	
F	filter time	
s_{val}	value selectivity	
o_v	value reordering function	
s_{att}	attribute selectivity	
o_a	attribute reordering function	

Symbols used for Filter Performance Analysis

Symbol	Meaning/Description	Definition
P_e	event distribution: distribution of values within event attributes	Table 10.1
P_p	profile distribution: distribution of values within profile attributes	Table 10.1
N_p	number of profiles regarding primitive events	Table 10.1
N_p^c	number of profiles regarding composite events	Table 10.3
N_e	number of events	Table 10.1
N_a	number of attributes in events / profiles	Table 10.1
P_w	wildcards in profile predicates	Table 10.1
κ	cardinality of contributing events	Table 10.3
g	number of event groups	Table 10.3