

Appendix

Table 13 lists all 90 DSML projects from which design decisions have been extracted—ten are our own developments (#1–#10), the rest has been retrieved via the SLR (#11–#90). The first column consecutively numbers and names each DSML (a name either specified by the authors themselves or—when no explicit name was mentioned—one chosen by us) and references corresponding publication(s). In the second column, the DSML application domain(s) are encoded according to the 2012 ACM Computing Classification System (CCS).²³ We have extracted the UML diagram type(s) tailored by a DSML as classified by the UML superstructure itself (shown in the third column of Table 13). The last column lists the decision-option set representing a DSML’s design as encoded according to our catalog.

Table 13: Application domains, tailored diagram types, and decision-option set for each of the 90 DSML projects.

DSML	Application domain(s)	Diagram type(s)	Option set
#1 ConcernActivities * ²⁴ [A 1]	Access control, Software design engineering	Activity	{1.1, 2.2, 2.3, 3.1, 3.4, 4.1, 4.2, 4.6, 5.5, 6.6}
#2 BusinessActivities [A 2]	Access control, Business process modeling, Software security engineering	Activity, Class	{1.1, 1.2, 1.4, 2.3, 3.1, 3.4, 4.2, 5.5, 6.1, 6.4}
#3 UML-PD * [A 3, 4]	Access control, Business process modeling, Software security engineering	Activity, Class	{1.1, 1.2, 1.4, 2.2, 2.3, 3.1, 3.4, 4.1, 4.2, 4.6, 5.1, 5.3, 6.6}
#4 UML-DEL [A 4, 5]	Access control, Business process modeling, Software security engineering	Class	{1.1, 1.2, 1.4, 2.3, 3.1, 3.4, 4.2, 5.5, 6.6}
#5 SOF [A 6]	Business process modeling, Software security engineering	Activity	{1.1, 2.3, 3.1, 3.4, 4.2, 5.5, 6.6}
#6 UML-PD [A 7]	Access control, Business process modeling, Software security engineering	Activity, Class	{1.1, 2.3, 3.1, 3.4, 4.7, 5.5, 6.6}
#7 SOFServices * [A 8, 9]	Business process modeling, Service-oriented architectures, Software security engineering, Web services	Activity, CompositeStructure	{1.1, 1.2, 1.4, 2.2, 2.3, 3.1, 3.3, 3.4, 4.1, 4.6, 5.5, 6.1, 6.3}
#8 UML-CC [A 10]	Access control, Business process modeling, Software security engineering	Class	{1.1, 1.2, 1.4, 2.3, 3.1, 3.4, 4.2, 5.5, 6.6}
#9 SecurityAudit * [A 11]	Publish-subscribe / event-based architectures, Software security engineering	* ²⁵	{1.1, 2.2, 2.3, 3.1, 3.4, 4.1, 4.3, 4.5, 4.6, 5.5, 6.2}
#10 MTD * [A 14]	Object oriented languages, Software architectures	Activity, Class, Object, StateMachine	{1.1, 2.2, 2.3, 3.1, 3.4, 4.1, 4.2, 4.6, 5.5, 6.6}
#11 ADModel [A 15]	Business process modeling	Activity	{1.1, 2.3, 3.5, 4.7, 5.5, 6.3}
#12 AspectSM * [A 16]	Robustness, Software development techniques, Software testing and debugging	StateMachine	{1.1, 1.4, 2.2, 3.1, 4.1, 4.6, 5.5, 6.2}
#13 UML4SPM * [A 17]	Software development process management	Activity, Class	{1.1, 2.3, 3.5, 4.6, 5.5, 6.6}
#14 MDATEC * [A 18]	Reusability, Software development techniques, Software product lines	Activity, Package	{1.1, 2.3, 3.5, 4.6, 5.5, 6.6}
#15 TLM * [A 19]	Model verification and validation, System on a chip	Class	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.2}
#16 UPSS * [A 20]	Service-oriented architectures	Class, CompositeStructure	{1.1, 1.4, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#17 BIT * [A 21]	Software testing and debugging	Class	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.1, 6.2, 6.5}
#18 UML4PF * [A 22, 23]	Design patterns, Model checking, Requirements analysis, Security requirements	Class	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.6}
#19 UP4WS * [A 24]	Service-oriented architectures, Web services	Class	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.2}
#20 CB * [A 25]	Reusability, Software development techniques	Class, Component	{1.1, 1.4, 2.2, 3.4, 4.1, 4.6, 5.5, 6.1, 6.3, 6.5}
#21 AbstractSet * [A 26]	Model verification and validation	Class, Package	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#22 C2style * [A 27]	Architecture description languages, Systems analysis and design	Component, Sequence	{1.1, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#23 MARTE-DAM * [A 28, 29]	Embedded systems, Fault tree analysis, Real-time systems, Software fault tolerance, Transportation	Component, Sequence, StateMachine, UseCase	{1.1, 1.4, 2.2, 3.1, 4.1, 4.6, 5.5, 6.3, 6.5}

²³See <http://www.acm.org/about/class>; last accessed: Sep 9, 2015.

²⁴The DSML’s option set contains (at least) one of the seven prototype option-sets shown in Table 11.

²⁵The DSML does not tailor a UML diagram type specifically; for example, a stereotype extension of a UML element applicable in all diagram types, such as, Element (see, e.g., [A 11, 12]) or Constraint (see, e.g., [A 13]).

DSML	Application domain(s)	Diagram type(s)	Option set
#24 UMM-Local-Choreographies * [A 30]	Business process modeling, Orchestration languages	Activity	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.6}
#25 RichService * [A 31]	Service-oriented architectures, Web services	Class, Component, StateMachine	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#26 UML-PMS * [A 32]	Performance, Ubiquitous and mobile computing	Activity	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#27 SOA * [A 33]	Service-oriented architectures	Class, Component, Deployment	{1.1, 1.4, 2.2, 3.1, 4.1, 4.2, 4.6, 5.5, 6.6}
#28 SWS * [A 34]	Semantic web description languages, Web services	Activity	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#29 eSPEM * [A 35]	Software development process management	Activity, StateMachine	{1.1, 2.3, 2.4, 3.5, 4.6, 5.5, 6.6}
#30 RCSD * [A 36]	Transportation	Class, Object	{1.1, 2.2, 3.1, 3.4, 4.1, 4.3, 4.6, 5.2, 6.6}
#31 UML-SOA-Sec [A 37]	Business process modeling, Security requirements, Service-oriented architectures, Web services	Activity	{1.1, 2.2, 3.5, 4.1, 4.2, 4.6, 5.5, 6.6}
#32 UML2Alloy * [A 38]	Model verification and validation	Class, Package	{1.1, 1.4, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.1, 6.2, 6.5}
#33 ExSAM * [A 39]	Avionics, Embedded systems, Engineering	CompositeStructure	{1.1, 1.4, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#34 UACL * [A 40]	Availability, Telecommunications	Class, Component	{1.1, 1.4, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#35 SECTET [A 41]	Service-oriented architectures, Software security engineering, Web services	Class	{1.1, 2.1, 3.5, 4.7, 5.5, 6.2, 6.5}
#36 UML4SOA * [A 61, 43]	Service-oriented architectures	Activity, Class, Component	{1.1, 2.2, 2.3, 3.1, 4.1, 4.2, 4.6, 5.5, 6.1, 6.3, 6.5}
#37 SafeUML * [A 44]	Avionics, Software safety	Class, Package	{1.1, 1.4, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#38 IStarDW * [A 45]	Data warehouses, Security requirements	Class, Package	{1.1, 2.2, 3.1, 3.4, 4.1, 4.2, 4.6, 5.5, 6.5}
#39 TestOracle * [A 46]	Software testing and debugging	StateMachine	{1.1, 2.2, 3.5, 4.1, 4.3, 4.6, 5.5, 6.2}
#40 MOCAS [A 47]	Model checking, Model verification and validation	Object	{1.1, 2.3, 3.1, 3.4, 4.7, 5.5, 6.4}
#41 CCFG [A 48]	Model verification and validation	Activity	{1.1, 2.3, 3.5, 4.2, 5.5, 6.6}
#42 TimeSeriesAnalysis * [A 49]	Data mining, Data warehouses	Class, Object	{1.1, 2.2, 3.1, 4.1, 4.2, 4.6, 5.5, 6.6}
#43 ADOM-UML [A 50]	Model verification and validation, Requirements analysis, Software design engineering	*	{1.1, 1.2, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#44 Predefined-Constraints * [A 13]	Model checking	*	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#45 TAM-PM * [A 51]	Graphical user interfaces, Web interfaces	Activity, Class	{1.1, 1.4, 2.2, 3.1, 4.1, 4.6, 5.5, 6.2}
#46 SPEM4MDE [A 52]	Software development process management	Activity, StateMachine	{1.1, 2.3, 3.1, 3.4, 4.2, 5.5, 6.5}
#47 CSSL [A 53]	Collaborative and social computing	Class, StateMachine	{1.1, 2.3, 3.1, 3.4, 4.5, 5.5, 6.6}
#48 SystemC [A 54]	Embedded systems, System on a chip	CompositeStructure, StateMachine	{1.1, 2.2, 3.5, 4.1, 4.2, 4.6, 5.5, 6.6}
#49 UML2Ext * [A 55]	Requirements analysis, Software product lines	UseCase	{1.1, 2.3, 3.5, 4.6, 5.5, 6.6}
#50 HM ³ * [A 56]	Hypertext languages	Class, UseCase	{1.1, 2.2, 2.3, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#51 WCAAUML * [A 57]	Web applications, Web interfaces	Class, Deployment, Package	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.2}
#52 IEC61508 * [A 58, 59]	Model verification and validation, Safety critical systems	Class, Package	{1.1, 1.4, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#53 UCDDM * [A 60]	Use cases	UseCase	{1.1, 2.3, 3.1, 3.4, 4.4, 4.6, 5.3, 6.6}
#54 SPArch * [A 61]	Software architectures, Software development process management	Class, Component, Package	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#55 MoDePeMART * [A 62]	Measurement, Metrics, Software performance	Class, StateMachine	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#56 UPCC [A 63]	Enterprise data management, Service-oriented architectures, Web services	Class	{1.1, 2.1, 3.5, 4.7, 5.5, 6.6}

DSML	Application domain(s)	Diagram type(s)	Option set
#57 SELinux [A 64]	Access control, Operating systems security, Security requirements	Class	{1.1, 1.3, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#58 UML-GUI [A 65]	Graphical user interfaces	Class, Component	{1.1, 1.2, 2.1, 3.5, 4.7, 5.5, 6.3}
#59 SHP * [A 66]	Software security engineering	Class, Package	{1.1, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#60 SMF * [A 67]	Fault tree analysis, Safety critical systems, Software safety	Class, Component, UseCase	{1.1, 1.3, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#61 DMM/UCMM * [A 68]	Graphical user interfaces	Class, UseCase	{1.1, 1.4, 2.3, 2.4, 3.5, 4.6, 5.5, 6.6}
#62 CUP 2.0 * [A 69]	Graphical user interfaces	Activity, Class, Package	{1.1, 2.2, 3.4, 4.1, 4.2, 4.6, 5.5, 6.2}
#63 REMP * [A 70]	Embedded systems, Real-time systems, Software testing and debugging	Class, StateMachine	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.6}
#64 DPL * [A 71]	Web services	Activity	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.2}
#65 WebRE * [A 72]	Requirements analysis, Web applications	Activity, UseCase	{1.1, 1.4, 2.2, 3.5, 4.1, 4.2, 4.6, 5.5, 6.6}
#66 AOM-AD * [A 73]	Software development techniques	Activity	{1.1, 1.2, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#67 Reliability * [A 74]	Software reliability	InteractionOverview, Sequence	{1.1, 1.4, 2.2, 3.4, 4.1, 4.6, 5.5, 6.2}
#68 UML-AOF * [A 75]	Software development techniques	Class, Package	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#69 CompSize [A 76]	Embedded systems, Estimation, Measurement, Metrics	Class, Component	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#70 Architectural-Primitives * [A 77]	Design patterns, Software architectures	Component	{1.1, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#71 CUP * [A 78]	Error detection and error correction, Model checking	CompositeStructure, Sequence	{1.1, 2.2, 3.1, 4.1, 4.6, 5.5, 6.6}
#72 GWFm-Sec * [A 79]	Orchestration languages, Software security engineering, Web services	Activity	{1.1, 2.2, 2.3, 3.4, 4.1, 4.6, 5.5, 6.6}
#73 SoC * [A 80]	Hardware description languages and compilation, System on a chip	Activity, Class, CompositeStructure, Deployment	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#74 UMLtrust * [A 81]	Scenario-based design, Software development techniques, Trust frameworks	Class, Package, UseCase	{1.1, 2.2, 3.4, 4.1, 4.2, 4.6, 5.5, 6.6}
#75 HERM * [A 82]	Database design and models	Class	{1.1, 1.2, 1.4, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.6}
#76 WebML * [A 83]	Web applications, Web interfaces	Class, Component, CompositeStructure	{1.1, 1.4, 2.2, 3.1, 4.1, 4.2, 4.6, 5.5, 6.6}
#77 ODP [A 84]	Distributed architectures	Class, Component, Object, Sequence	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.6}
#78 EIS * [A 85]	Enterprise information systems	Activity, Component	{1.1, 2.2, 3.4, 4.1, 4.2, 4.6, 5.5, 6.6}
#79 SPTEExt * [A 86]	Embedded systems, Real-time systems	Activity	{1.1, 1.2, 1.3, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#80 CAV * [A 87]	Software architectures, Software evolution	Class	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.6}
#81 SOA-NF * [A 88]	Service-oriented architectures	CompositeStructure	{1.1, 2.2, 3.4, 4.1, 4.6, 5.5, 6.2}
#82 SECRDW [A 89]	Data warehouses, Security requirements	Class, Package	{1.1, 2.3, 3.5, 4.7, 5.5, 6.6}
#83 SECDW * [A 90]	Data warehouses, Security requirements	Class, Object	{1.1, 2.2, 3.1, 3.4, 4.1, 4.2, 4.6, 5.5, 6.6}
#84 EM [A 91]	Electronic commerce, Web applications	Class, StateMachine, UseCase	{1.1, 2.1, 3.1, 3.4, 4.7, 5.1, 5.3, 6.6}
#85 WS-CM * [A 92]	Web applications, Web services	Class, StateMachine	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.2}
#86 aspectJ * [A 93]	Software development techniques	Class, Package	{1.1, 2.2, 3.1, 3.4, 4.1, 4.6, 5.5, 6.2}
#87 ContextUML * [A 94]	Service-oriented architectures, Web services	Class	{1.1, 2.2, 3.5, 4.1, 4.6, 5.5, 6.2, 6.3}
#88 DifferenceMM * [A 95]	Software evolution	Class	{1.1, 2.3, 3.5, 4.6, 5.5, 6.6}
#89 Versioning * [A 12]	Software evolution, Version control	*	{1.1, 1.4, 2.2, 3.5, 4.1, 4.6, 5.5, 6.3}
#90 NFA [A 96]	Avionics, Model checking	Class	{1.1, 2.3, 3.5, 4.3, 5.5, 6.5}

DSML Paper Corpus

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