Multilingual valency dictionaries provide helpful information about correspondence of valency frames (verbs and their arguments) across various languages. This work aims at developing a program that automatically creates a multilingual valency dictionary, based on parallel treebanks annotated according to Universal Dependencies. This task includes monolingual extraction of valency frames and their cross-lingual linking. Various methods for solving the task are analysed and implemented. The work includes both general, language-independent approach and additional language-specific extensions, provided in particular for English, Czech and Slovak. The methods for linking the valency frames include using word alignment, morphological and syntactic information contained in the UD annotation or similarity of verbs between related languages. The quality of the solution is evaluated by multiple established metrics on manually annotated data or by comparison with an existing valency dictionary.