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A characterization of frames as suplattices without the use of the tensor product

A characterization of frames in terms of suplattices is given in [1] as certain commutative monoids. It is not internal to the tensored category of suplattices in that the diagonal map, which is not part of the structure, is employed. It is used therein in the proof of their main theorem, namely, that open surjections of locales and toposes are of effective descent.

I will give an alternative characterization of frames that is internal to the category $\mathbf{sl}$ of suplattices and sup-preserving maps—in particular, without the use of the tensor product. The key ingredient is a construction [3] of the lower power locale along the lines of that of the symmetric topos [2]. I shall argue that this alternative characterization can equally well be employed in the proof of the main descent theorem of [1].

The entire discussion is done relative to an arbitrary base topos $\mathcal{S}$.

References

[1] A. Joyal and M. Tierney, *An extension of the Galois theory of Grothendieck*. Mem. Amer. Math. Soc. **309**, 1984.

[2] M. Bunge and A. Carboni, *The symmetric topos*. J. Pure Appl. Algebra **105**(1995), 233–249.

[3] M. Bunge and J. Funk, *Constructive theory of the lower power locale*. Math. Str. Comp. Science **6**(1996), 1–15.