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example of a proof using nets

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In this entry we will give a simple example of how nets can be used to prove topological theorems. The proof will make use of some of the basic properties of nets listed in the <http://planetmath.org/Netparent> entry.

Theorem. *The <http://planetmath.org/GroupCentre> of a Hausdorff topological group is closed.*

Proof. Let Z be the centre of a Hausdorff topological group G . Let $x \in \overline{Z}$. Then there is a net (x_δ) in Z such that $x_\delta \rightarrow x$. Let $g \in G$. By continuity we have $gx_\delta g^{-1} \rightarrow gxg^{-1}$. But $gx_\delta g^{-1} = x_\delta$, so $gx_\delta g^{-1} \rightarrow x$. As G is Hausdorff, these two limits must be the same. So $gxg^{-1} = x$, that is, $gx = xg$. Thus $x \in Z$, and we have shown that $\overline{Z} = Z$, as required.