Based on the information provided and the predicates given, here is the security case for Instant Messaging (IM) software presented in a hierarchical tree structure using Goal Structuring Notation (GSN) elements, considering the domain information:

### Hierarchical Tree Structure for IM Software Security Case

- \*\*Goal (G1, "IM software is acceptably secure in operational environment")\*\*

- \*\*Context (C1, "Definition and description of IM software")\*\*

- \*\*Context (C2, "Definition and description of operational environment")\*\*

- \*\*Context (C3, "Definition of acceptably secure")\*\*

- \*\*Strategy (S1, "Argument of that IM software assets are under protection")\*\*

- \*\*Justification (J1, "Protection of IM software assets supports that IM software is acceptably secure")\*\*

- \*\*Goal (G2, "All identified IM software critical assets are protected")\*\*

- \*\*Context (C4, "List of IM software critical assets includes: Registration information, Registration process, User account information, Authentication information, Login process, Chat logs")\*\*

- \*\*Strategy (S2, "Respective arguments of IM software critical assets")\*\*

- \*\*Justification (J2, "Relationship between assets is clear and can be argued separately")\*\*

- \*\*Goal (G3, "IM software critical asset is protected")\*\*

- \*\*Strategy (S3, "Argument of the type which the IM software critical asset belongs to")\*\*

- \*\*Context (C5, "List of software critical asset types in PEDD includes: Process, Environment Entity, Data Exchange, Data Storage")\*\*

- \*\*Justification (J3, "Types of software assets are according to PEDD")\*\*

- \*\*Goal (G4, "IM software critical asset which belongs to type {type} is protected")\*\*

This security case dissects the broader goal of securing the IM software into strategically compartmentalized sub-goals that focus on the protection of critical software assets and their types. Each step deepens into how the security of each asset is ensured and aligns with defined standards and requirements, like the PEDD classification. The interlinkage of strategies and goals demonstrates a clear pathway and reasoning for achieving top-level security assurances.

Representing these elements in GSN allows clear visual understanding of the logical structure and relationships applied to ensure the overall security of the IM software. The elements are instantiated from a security case pattern, explaining specific aspects of IM software's security requirements.