To instantiate the given safety case pattern for a General Purpose Computing Apparatus (GPCA) system and display it in a hierarchical tree format, we will replace placeholders according to a hypothetical scenario and operational hazards. Let's consider a primary operational system focus on patient intravenous infusion management.

### Instantiated Safety Case

#### Goal/Subgoal Structure

- \*\*G1\*\* Operational safety is verified in GPCA.

- \*\*S1\*\* Argument over the satisfaction of all specs over GPCA \*(Assume undeveloped)\*

- \*\*G2\*\* All operational hazards are mitigated.

- \*\*S3\*\* Argument over operational hazards.

- \*\*G3\*\* Drug overdose is mitigated.

- \*\*S4\*\* Argument over the applied scenarios of drug overdose.

- \*\*G4\*\* Drug overdose is mitigated under wrong dosage entry scenario.

- \*\*S5\*\* Argument over all specs related to wrong dosage scenario.

- \*\*G5\*\* Dosage limit checking is appropriate for wrong dosage scenario.

- \*\*S6\*\* Argument the appropriateness of dosage limit checking over properties.

- \*\*G6\*\* Real-time alarm system is appropriate for dosage limit checking.

- \*\*S7\*\* Argument over the source of the alarms property definition.

- \*\*G7\*\* Alarm system source is appropriate and trustworthy.

- \*\*Sn1\*\* Certificate of compliance and manufacturer safety audit results.

- \*\*G8\*\* Real-time nature property definition is sufficient.

- \*\*Sn2\*\* Technical specification and operational test results.

- \*\*S2\*\* Argument over reliability in all suitable levels of GPCA \*(Assume undeveloped)\*

#### Contexts and Additional Information

- \*\*C1\*\* All specs are given by dosage limit checking, alarm system.

- \*\*C2\*\* Operational hazards are given by potential for drug overdose.

- \*\*C3\*\* All related scenarios are given by manual entry of dosage.

- \*\*C4\*\* All related specs are given by real-time monitoring and automated checks.

- \*\*C5\*\* Properties are given by alarm responsiveness and system reliability.

- \*\*C6\*\* Source is given by manufacturer and system validations.

### Hierarchical Tree Representation

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- G1: Operational safety is verified in GPCA

- S1: Argument over the satisfaction of all specs over GPCA (Undeveloped)

- G2: All operational hazards are mitigated

- S3: Argument over operational hazards

- G3: Drug overdose is mitigated

- S4: Argument over the applied scenarios of drug overdose

- G4: Drug overdose is mitigated under wrong dosage entry scenario

- S5: Argument over all specs related to wrong dosage scenario

- G5: Dosage limit checking is appropriate for wrong dosage scenario

- S6: Argument the appropriateness of dosage limit checking over properties

- G6: Real-time alarm system is appropriate for dosage limit checking

- S7: Argument over the source of the alarms property definition

- G7: Alarm system source is appropriate and trustworthy

|-> Sn1: Certificate of compliance and manufacturer safety audit results

- G8: Real-time nature property definition is sufficient

|-> Sn2: Technical specification and operational test results

- S2: Argument over reliability in all suitable levels of GPCA (Undeveloped)

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In this hierarchical tree, each level of depth is denoted by hyphens (“-”), representing the structure of goals, strategies, and solutions. The context and additional descriptions added to the respective strategies or goals are noted but not visualized in the hierarchy for clarity purposes. Each relation (e.g., "SupportedBy") and instantiation are explicitly considered within each respective goal or strategy's detail.