UGovOps SYBL Language

The ***initial*** BNF description of SYBL language is shown below:

```
Constraint := constraintName : CONSTRAINT ComplexCondition
Monitoring := monitoringName : MONITORING varName=MetricFormula
Strategy := strategyName : STRATEGY CASE ComplexCondition :
action(parameterList)| strategyName : STRATEGY WAIT
ComplexCondition|
                strategyName : STRATEGY STOP ComplexCondition|
                strategyName : STRATEGY RESUME ComplexCondition
MetricFormula := metric | number | metricFormula MathOperator metric
| metricFormula MathOperator number
ComplexCondition := Condition | ComplexCondition BitwiseOperator
Condition|(ComplexCondition BitwiseOperator Condition)
Condition := metric RelationOperator number| number RelationOperator
metric | Violated(name)|Fulfilled(name)
MathOperator := + | - | * | /
BitwiseOperator := OR | AND | XOR | NOT
RelationOperator := <|>|>=|<=|==|!=
```

We introduced governance directive for specifying the governance scope, with all the necessary details for governing the IoT cloud (e.g., governance query, or governance operations uncertainty details).

```
GovernanceID: GOVERNANCE_SCOPE query := govQuery
            CONSIDERING_UNCERTAINTY: govOpsUncertaintyDetails

StrategyID: STRATEGY CASE Condition: Capability FOR GovernanceID
CONSIDERING_UNCERTAINTY: uncertainty_parameter1 AND
uncertainty_parameter2 AND … uncertainty_parametern

ConstraintID: CONSTRAINT Condition WHEN Condition
CONSIDERING_UNCERTAINTY: uncertaintyCondition.
```

The BNF form for ***GovOps SYBL*** is shown below:

```
Constraint := constraintName : CONSTRAINT
ComplexCondition|CONSTRAINT ComplexCondition UncertaintyDetails
Monitoring := monitoringName : MONITORING varName=MetricFormula
Strategy := strategyName : STRATEGY CASE ComplexCondition :
action(parameterList)| STRATEGY CASE ComplexCondition :
action(parameterList) FOR GovName UncertaintyDetails| strategyName :
STRATEGY WAIT ComplexCondition|
                strategyName : STRATEGY STOP ComplexCondition|
                strategyName : STRATEGY RESUME ComplexCondition
GovernanceScope:= govName: GOVERNANCE_SCOPE Query UncertaintyDetails
MetricFormula := metric | number | metricFormula MathOperator metric
| metricFormula MathOperator number
ComplexCondition := Condition | ComplexCondition BitwiseOperator
Condition|(ComplexCondition BitwiseOperator Condition)
Condition := metric RelationOperator number| number RelationOperator
metric | Violated(name)|Fulfilled(name)
UncertaintyDetails:= CONSIDERING_UNCERTAINTY UncertaintyParameter
```

```
UncertaintyParameter:= String| String BitwiseOperator
UncertaintyParameter
Query := query:= QueryParameter
QueryParameter= paramType=paramValue|paramType=paramValue AND
QueryParameter
MathOperator := + | - | * | /
BitwiseOperator := OR | AND | XOR | NOT
RelationOperator := <|>|>=|<=|==|!=


Examples
  G1:GOVERNANCE_SCOPE
   query:= location=buildingX AND type=JACE-545
   CONSIDERING_UNCERTAINTY:
    missing_data = "location<='?',type<='*'" AND
    selection_strategy = optimistic AND
    use_cache = false

S1:STRATEGY CASE Fulfilled(CND1):
   setUpdateRate(5s) FOR G1
  CONSIDERING_UNCERTAINTY:
     run_in_isolation = true AND
     keep_alive = 5min AND
     degree_parallelism = 200 AND
     tolerate_fault_percentage  = 20% AND
     fallback_count = 2 AND
     time_to_next_fallback = 500ms

  C1:CONSTRAINT responseTime<150ms WHEN nrOfUsers<900
   CONSIDERING_UNCERTAINTY:decision_confidence >=20%

S2:STRATEGY CASE Violated(C1):scaleOut()
S3:STRATEGY CASE Fulfilled(C1):maximize(throughput)
   CONSIDERING_UNCERTAINTY: considering_strategies = S2
```