Given S, a finite set of security groups, the language our mechanism operates on can be generated by a context free grammar. Because the language is dependent on the security groups S, this grammar must be generated based on it. This is done in two steps:

First, we define the base grammar:

$$\begin{array}{lr} G^1 = (V^1, \Sigma^1, R^1, \mathcal{A}), \text{ where} & \\ V^1 = \{\mathcal{A}, W\} & \text{non-terminal symbols} \\ \Sigma^1 = \{\emptyset\} & \text{terminal symbols} \\ R^1 = \{ \quad \mathcal{A} \rightarrow \varepsilon, & \text{rules of production} \\ \qquad\quad \mathcal{A} \rightarrow W\mathcal{A}|W\} & \end{array}$$

This base grammar, through the non-terminal symbols and production rules, establishes a means of generating the base language form of unordered windows ($W \in V^1$) in an arbitrary length such as WW or $WWWWWW$.

Next, we generate the S specific definitions:

$$\begin{array}{l} G^2 = (V^2, \Sigma^2, R^2, \emptyset), \text{ where} \\ V^2 = \{W\} \\ \Sigma^2 = \{[o_{s,i}, a_{s,i}] : \forall i \in \forall s \in S\} \\ R^2 = \{[W \rightarrow \left(\prod_{i=1}^{\forall i \in s} o_{s,i} \prod_{j=1}^{\forall j \in s} a_{s,i} \right)] : \forall s \in S\} \end{array}$$

These definitions add new terminal symbols and the necessary production rules to generate them.

The terminal symbols are of the form $o_{s,i}$ and $a_{s,i}$. $o_{s,i}$ represents an open command issued to a compute node i within security group s. $a_{s,i}$ represents a corresponding acknowledgement.

The production rules are slightly more complex to generate.

With these symbols and the production rule $W_s \rightarrow o_s W_s a_s$ the grammar is now capable of filling the windows W with open and acknowledgement messages that allow a single security group to communicate within a windows.

Finally, the language our mechanism accepts for security group S can be formed using the union of the previous two grammars:

$$\begin{array}{l} G = (V, \Sigma, R, \mathcal{A}), \text{ where} \\ V = V^1 \cup V^2 \\ \Sigma = \Sigma^1 \cup \Sigma^2 \\ R = R^1 \cup R^2 \end{array}$$