reflect the restricted flow of information in such organizations: either top-down or bottom-up (Dewan, Seidmann, & Sundaresan 1997; Friebel & Raith 2004; Jensen 2003). Accordingly, agents communicate mostly with their peers, subordinates and their close superiors. Meaning that most communications are held between agents of the same hierarchy levels or between agents in relatively close hierarchical levels.

Taking these characteristics into account and assuming that it is more important to overhear strategic information rather than the operational one, we discovered two effective centralized policies. On one hand, a *value* policy targets agents of higher hierarchy levels. These agents are involved in small amount of highly valuable conversations. On the other hand, a *volume* policy targets agents involved in higher amount of conversations. These are usually agents in lower hierarchy levels, that involved in conversations of a low information value.

The experiments on these centralized policies showed a classical value-volume trade-off. This trade-off was found to be surprisingly robust to many characteristics of the monitored organizations. Further studying centralized policies, we have come to another surprising conclusion: Combining the two types of policies (such that some agents follow the value type policy, while others follow the volume type policy) improves their individual performance. Moreover, the combined policies have been found to be effective unrelated to any characteristic of the monitored organization (even those that influence each policy separately).

Distributed Selective Overhearing

Using the combined value-volume policy as a baseline, we now consider the transition from centralized to distributed policies. In this paper, we gradually decrease the inter-dependence of each overhearing agent on its teammates. In doing so, we evaluate and compare the effectiveness of overhearing policies, thus examining the effects of moving from centralized to distributed selective overhearing. Our goal is to determine what are the factors of teammates' inter-dependency that influence the effectiveness of distributed selective overhearing, and what are the factors whose effect can be ignored.

Centralized vs. Distributed Policies

The baseline centralized policy, i.e. the combined value-volume policy, relies on the three following assumptions: (i) full visibility; (ii) shared memory and (iii) collision avoidance. We explain those in details below.

Visibility is defined as knowledge of where and when conversations take place (without knowing their content). Full visibility assumes knowledge of all conversations in the monitored system.

Knowing the number of conversations that each potential target is involved in, this centralized policy assigns targets to overhearing agents based on a value-volume decision. For each overhearing agent a decision is made whether it is better to overhear x conversations by $agent_i$–the target of value policy–or y conversations by $agent_j$–the target of volume policy. Remember that due to the value-volume trade-off y will usually be greater than x, but the value of conversations by $agent_i$ will be higher than the ones by $agent_j$. Thus, the dilemma.

This value-volume decision is made based on monitored agents' past performance–the average value of conversations in which the agents were overheard earlier. In centralized policies, this memory is assumed to be shared.

Finally, centralized policies assume collision avoidance. Since overhearing agents are centrally coordinated, collisions, i.e. situations where a target is overheard by two or more overhearers, can easily be avoided.

However, the assumptions of full visibility, shared memory and collision avoidance are only possible in centralized selective overhearing. Moving towards distributed policies means breaking these assumptions. Thus, transitioning from centralized to distributed policies, we incrementally decrease the inter-dependence of overhearing agents on their teammates along these three dimensions. This transition is summarized in Table 1.

Dimensions	Centralized	Distributed
Memory	shared	individual
Visibility	full	group/agent
Collision Avoidance	yes	no

Table 1: **Centralized vs. Distributed Policies**

Addressing the memory dimension, we consider the use of an individual memory instead of a shared one. With respect to visibility dimension, group and agent visibilities are examined. Group visibility assumes that overhearing agents are only aware of conversations that are carried out by their targets, while agent visibility assumes that overhearing agent is only aware of conversations committed by its target (but not by the targets overheard by other overhearers). As for collision avoidance, we distinguish between two extremes. On one hand, the case where all collisions are avoided, and, on the other hand, the case where collisions are allowed and there is no collision avoidance mechanism applied.

Obviously, the fully distributed policy assumes agent visibility, individual memory and no collision avoidance. In contrast, we remind the reader that fully centralized policy assumes full visibility, shared memory and collision avoidance. Any other combination is considered to be partially centralized and partially distributed.

Memory Dimension

Exploring overhearing policies with respect to memory dimension, we first assume full visibility and collision avoidance. Later on, we will challenge this assumption.

We introduce two policies–*FullVis-ShrdMem-CollAvd* and *FullVis-IndMem-CollAvd*. The first is in fact the baseline centralized policy discussed earlier. As explained above, it uses shared memory. In contrast, the *FullVis-IndMem-CollAvd* policy uses individual memory. Each overhearing agent has only the memory of conversations it overheard in the past, without any knowledge on conversations overheard by other overhearers. Thus, the basis for the value-volume decision for each overhearing agent lies in its own past experience.

The distinction between the two types of memory is important mainly due to the requirements of their maintenance.