A Grand Challenge -- a problem that by virtue of its degree of difficulty and the importance of its solution, both from a technical and societal point of view, becomes a focus of interest to a specific scientific community.

The difficulty in developing and implementing autonomic computing is daunting - enough to constitute a Grand Challenge. At the heart of the matter is the need to bring together minds from multiple technical and scientific disciplines as well as differentiated businesses and institutions to share a sense of urgency and purpose. Although IBM is determined to take on this challenge, one company cannot do it alone.

Part of the challenge lies in the fact that autonomic computing has been conceived as a holistic approach to computing. The difficulty is not the machines themselves. Year after year scientists and engineers have brilliantly exceeded goals for computer performance and speed. The problem now lies in creating the open standards and new technologies needed for systems to interact effectively, to enact pre-determined business policies more effectively, and to be able to protect themselves and "heal" themselves with a minimal dependence on traditional I/T support. This broader systems view has many implications:

On a conceptual level, the way we define and design computing systems will need to change:

- The computing paradigm will change from one based on computational power to one driven by data.
- The way we measure computing performance will change from processor speed to the immediacy of the response.
- Individual computers will become less important than more granular and dispersed computing attributes.
- The economics of computing will evolve to better reflect actual usage - what IBM calls e-sourcing.

Based on new autonomic computing parameters the functionality of individual components will change and may include:

- Scalable storage and processing power to
accommodate the shifting needs of individual and multiple autonomic systems.

- Transparency in routing and formatting data to variable devices
- Evolving chip development to better leverage memory
- Improving network-monitoring functions to protect security, detect potential threats and achieve a level of decision-making that allows for the redirection of key activities or data.
- Smarter microprocessors that can detect errors and anticipate failures

These are just some of the implications and resulting challenges that lie ahead.

**We call on our academic colleagues to drive exploratory work in autonomic computing. We propose that the research community recognize it as an important field of academic endeavor. We also call on our partners at government labs to collaborate with us on crucial projects in this area. We plan to fund a regular stream of academic awards and fellowships to support research in this area, and we call on others in the I/T industry to do the same.**

Finally, we call on the entire I/T industry to refocus its priorities on this essential goal. We must cooperate in developing the necessary standards and open interfaces to make this vision a reality.

**QUESTIONS & ANSWERS ›**