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Autonomic Computing

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Abstract: *Autonomic computing is a steadily emerging and promising research field. It aims at simplifying interoperability to diminish the management complexity in several industries. "Autonomic Computing" is a new vision of computing initiated by IBM. This new paradigm shifts the fundamental definition of the technology age from one of computing, to one defined by data. Access to data from multiple, distributed sources, in addition to traditional centralized storage devices will allow users to transparently access information when and where they need it. At the same time, this new view of computing will necessitate changing the industry's focus on processing speed and storage to one of developing distributed networks that are largely self-managing, self-diagnostic, and transparent to the user.*

Ironically, complexity itself has become part of the problem. It's a problem that's not going away, but will grow exponentially, just as our dependence on technology has. The solution may lie in automation, or creating a new capacity where important computing operations can run without the need for human intervention. In Autonomic Computing we build computer systems that regulate themselves much in the same way our nervous systems regulates and protects our bodies.

Keywords: *Autonomic*

I. Introduction

As enterprises strive to meet their current challenges, they require an IT infrastructure that supports their business goals. An IT infrastructure that enables business to be more responsive, variable, focused, and resilient. Autonomic systems are such systems that are self-configuring, self-healing, self-protecting and self-optimizing. They are Intelligent open systems that manage complexity, know themselves, continuously tune themselves, adapt to unpredictable conditions, prevent and recover from failures and provide a safe environment. They let enterprises focus on business, not on IT infrastructure.

The term 'autonomic' comes from an analogy to the autonomic central nervous system in the human body, which adjusts to many situations automatically without any external help[1]. A possible solution could be to enable modern, networked computing systems to manage themselves without direct human intervention. The Autonomic Computing Initiative (ACI) aims at providing the foundation for autonomic systems. It is inspired by the autonomic nervous system of the human body. This nervous system controls important bodily functions (e.g. respiration, heart rate, and blood pressure) without any conscious intervention.

II. Preliminaries

In IBM's perspective , the system will be acting like a perfect automatic machine like a human being responds in real world.[1]. Now a day's all the browsers are under a kind of activities that are dealing with autonomic computing. In the evolution of humans and human society automation has always been the foundation for progress. If human can handle one of his needs automatically, then he has free mind and resources to concentrate on another task. So step by step he can get ability to concentrate on more complex problems. In fact, the growing complexity of the IT infrastructure threatens to undermine the very benefits information technology aims to provide. Until now the computer systems relied mainly on human intervention and administration to manage this complexity. When considering about current rates of expansion, there will not be enough skilled IT people to keep the world's computing systems running. Even in uncertain economic times, still have high demand for skilled IT workers. Even if people could somehow come up with enough skilled people, the complexity is growing beyond human ability to manage it. As computing evolves, the overlapping connections, dependencies, and interacting applications call for administrative decision-making and responses faster than any human can deliver. Identifying root causes of failures becomes more difficult, while finding ways of increasing system efficiency generates problems with more variables than any human can hope to solve. Without new approaches, things will only get worse. To solve the problem people need computer systems with autonomic behavior.[5].

A variety of autonomic computing capabilities are already in use throughout IBM products, and these products are already helping companies succeed. IBM Self-

Managing Autonomic Computing capabilities are present in all IBM software product families; Information Management, Lotus, Tivoli, Rational, Web sphere, Ö .

Now it is clear that Autonomic Computing is a need rather than a demand. But we can propose something more than this. That is now a day's these technologies are available on a wider scope or Autonomic computing scope is nearly not possible to reach by normal people. We discussed about its global usage. And it doesn't say that there is no need of an administrator. But if we have this technology then it will be easy for him/her to follow the tasks to be implemented more easily. How it will be if we will have a Computer system that automatically check for updates , which performs automatic operations ,…. Even in the absence of administrator. That's what our proposition is.

IBM defined the following four functional areas:

1. **Self-configuration**: Automatic configuration of components;
2. **Self-healing**: Automatic discovery, and correction of faults;
3. **Self-optimization**: Automatic monitoring and control of resources to ensure the optimal functioning with respect to the defined requirements;
4. **Self-protection**: Proactive identification and protection from arbitrary attacks

The image given explains the characteristics shown and explained above.[1][2][4][6]

Some More Characteristics…

- Reflexivity: An autonomic system must have detailed knowledge of its components, current status, capabilities, limits, boundaries, interdependencies with other systems, and available resources. Moreover, the system must be aware of its possible configurations and how they affect particular nonfunctional requirements.

- Adapting: At the core of the complexity problem addressed by the AC initiative is the problem of evaluating complex tradeoffs to make informed decisions. Most of the characteristics listed above are founded on the ability of an autonomic system to monitor its performance and its environment and respond to changes by switching to a different behavior. At the core of this ability is a control loop. Sensors observe an activity of a controlled process, a controller component decides what has to be done, and then the controller component executes the required operations through a set of actuators. The adaptive mechanisms to be explored will be inspired by work on machine learning, multi-agent systems, and control theory.[6]

- Automatic: This essentially means being able to self-control its internal functions and operations. As such, an autonomic system must be self-contained and able to start-up and operate without any manual intervention or external help. Again, the knowledge required to bootstrap the system (Know-how) must be inherent to the system.[3][6]

- Aware: An autonomic system must be able to monitor (sense) its operational context as well as its internal state in order to be able to assess if its current operation serves its purpose. Awareness will control adaptation of its operational behaviour in response to context or state changes.[6]

III. Issues Of Trust

Dealing with issues of trust is critical for the successful design, implementation, and operation of AC systems. Since an autonomic system is supposed to reduce human interference or even take over certain heretofore human duties, it is imperative to make trust development a core component of its design. Even when users begin to trust the policies hard-wired into low-level autonomic elements, it is a big step to gain their trust in higher level autonomic elements that use these low-level elements as part of their policies. Autonomic elements are instrumented to provide feedback to users beyond what they provide as their service. Deciding what kind of feedback to provide and how to instrument the autonomic elements is a difficult problem. The trust feedback required by users will evolve with the evolution of the autonomic system. However, the AC field can draw experience from the automation and HCI communities to tackle these problems.

Autonomic systems can become more trustable by actively communicating with their users. Improved interaction will also allow these systems to be more autonomous over time, exhibiting increased initiative without losing the users' trust. Higher trustability and usability should, in turn, lead to improved adoptability.

IV. Area To Be Experimented

As in "The vision of autonomic computing" by Jeffery 0. Kelhart and David M Chess ;autonomic systems reduces the efforts of administrator without completely avoiding him. But if there is a substantial help from the system side, it will be more easier for the administrator to work with. As an example just take a normal desktop computer of a programmer. As all of us are aware, there will be many changes in the environment of IT; and their area of work. May be his/her environment may change like the platform he is currently working with or even some other components to his platform is needed and so on. And many of the situation requires the attention of a programmer for update operations. It may take a few hours . It will be a great result if the machine can identify the need of change and if the change is done by machine itself without the continuous intervention of programmer ; Thus in terms of effort and human interventions reduced to an extent. At the same time , the large complexity and overheads may make us lean backward from implementing autonomic systems. But definitely it will be an asset. In the coming years it will come in existence even for PC's as the needs are increasing. We have seen many such cases like artificial intelligence and robotics.[1]

It is just an example. We can implement such things in any systems currently running in today's world. It may take some initial expenses and overheads. But definitely it will be a great venture and a complete cost effective operation for companies even personnel.

Vaughn Rokosz, the Lotus software engineer heading up Quality Practices at Lotus commented on benefits of autonomic computing like "In some ways, we hope it's invisible to users. In a sense, users really just want their systems to work. If the autonomic systems are successful, they will just work. It may be visible in one way-it reduces the number of times you have to call your help desk.

For administrators, we think it translates into the need to spend less time micromanaging their machines and more time thinking about what we believe are the real issues of what's going on in the business and what kinds of business policies are in place. So it really shifts where they have to focus. Today there's a focus on the minutiae of configuration and how to tweak this server parameter to get the best performance. If the machines were self-tuning, you wouldn't have to do that. You could take yourself up a level to think about more interesting issues, such as how much benefit to the company this section of my infrastructure is delivering to me."

V. Conclusion

The time is right for the emergence of self-managed or autonomic systems. Over the past decade, we have come to expect that "plug-and-play" for Universal Serial Bus (USB) devices, such as memory sticks and cameras, simply works-even for technophobic users. Today, users demand and crave simplicity in computing solutions.

With the advent of Web and grid service architectures, we begin to expect that an average user can provide Web services with high resiliency and high availability. The goal of building a system that is used by millions of people each day and administered by a half- time person, as articulated by Jim Gray of Microsoft Research, seems

attainable with the notion of automatic updates. Thus, autonomic computing seems to be more than just a new middleware technology; in fact, it may be a solid solution for reining in the complexity problem.

Historically, most software systems were not designed as self-managing systems. Retrofitting existing systems with self-management capabilities is a difficult problem. Even if autonomic computing technology is readily available and taught in computer science and engineering curricula, it will take another decade for the proliferation of autonomicity in existing systems.

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