PREFACE

This book is designed to meet the needs of UNIX architects and administrators working in data centers. While it will be useful for the computer science student or the newcomer who has been attracted to volume management by Symantec's release of a free version of its Volume Manager software its focus is on the data center. Most data center applications nowadays handle amounts of data that had been unconceivable at the time when the most commonly used storage media - the hard disk - was developed. As a consequence, the design of the hard disk simply cannot match the requirements posed by current applications. Its physical attributes and limits need to be overcome by additional layers of hardware or software. These layers, if properly designed and thoughtfully applied, convert a set of physical disks to a supply of storage space whose properties better match application requirements. Instead of physical disks with their physical limitations, logical entities known as volumes are now commonly used. These volumes can be fault tolerant, accelerated to the limits, replicated to remote locations, and made almost infinitely large. Additionally, volumes can even be reshaped and their features changed while they are in use, enabling the data center administrator to adapt to changing requirements without suffering an application downtime.

The technical term for this is software or hardware layer is "volume management".

Veritas Volume Manager® is the most widely used software for volume management. It is used in data centers all over the world and has proven to be stable and deliver high performance under most circumstances. While there are other volume management software products on the market (e.g. AIX LVM, Sun microsystems' SunVM, or several Linux LVMs), most of them suffer from one or more limitations that hamper their widespread deployment. They are either limited to the manufacturer's operating system or they have less to offer than the Veritas product. In most cases, both is true at the same time. This has led to Veritas Volume Manager, or VxVM in short, being the most widely deployed product on the market, which in turn led to most administrators learning at least the basic skills required for its administration.

However, mastering the basic skills is something quite different from fully understanding a product and making full use of the available power. In data center operations it is imperative that the operators know precisely how things are supposed to work, rather than apply the skills of "experimental computer science". Even today's personal computers are too complex for any kind of experimental approach to solving a problem or finding a solution. This is much more true in data centers, where the motto must be: "If you do not know it, then learn it or leave it, but don't fumble it".

In my time as both an independent data center consultant and an independent trainer for the Veritas product suite I have tried to educate people enough so that they would at least realize what is possible if they could harness VxVM to its full extent. Staying in close

contact with my clients, it dawned on me that what they need is a written guide they can rely on when they actually try some of the more advanced features. If you are responsible for a mission critical application then the last thing you want is to incur a downtime. And with only some diffuse background knowledge and elementary skills left over from the last VxVM training, most of you would rather stick to established procedures than try something new.

My first attempt at writing down what I knew was a training companion book called "Veritas Storage Foundation" published by Springer in 2006 (ISBN: 3-540-34610-4) and endorsed by Switzerland's biggest Symantec partner, Infoniqa SQL AG (www.sql.ch) as their official training material. This book had been written together with Albrecht Scriba, one of the most respected Veritas trainers in Europe. It covered Veritas Volume Manager (VxVM) and Veritas Cluster Server (VCS) and was received very well by the administrators. However, its drawback was that it was written in German, our native tongue, so its distribution was severely limited by the language barrier. Having been approached numerous times by international colleagues I decided to take the next step and write a new, English book that concentrates on VxVM and the Veritas File System (VxFS), again with Albrecht acting as the co-author for some of the toughest chapters. It is not a training companion like the first one but uses a more classical approach. There are many walkthroughs to make you understand what you can do, how you can do it and what exactly is going on inside VxVM and VxFS so you can understand it and repeat it step by step on your own systems. It also holds a large section on troubleshooting that points out how problems can be found and fixed.

So here is your guide that helps you understand - in detail - the principles and the problems of mass storage, volume management, and file systems and how to manage them. It also tries to correct some common misconceptions about storage and UNIX, and highlights the most limiting factors in today's data center environments: anachronistic thinking and the sluggish speed of light!

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