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# System Management for Enterprise – A linear approach leading to ROI improvement

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***Abstract*— Today Information Technology (IT) is tangled in every organization and is day by day getting more complex. This gives the need for managing IT, in other words we want System management for Enterprise to function 24X7. Currently deployment of IT tools i.e. Software and hardware does employ System management tools to maintain the productivity. There are standard groups such as Distributed management task force (DMTF) who are working full time to monitor, research and implement new system management standards. In this paper, we will detail the basics of System management in a typical organization where IT plays a key role as back bone and discuss the improvement of Return of investment (ROI) starting from engaging man-power and then software followed by embedded and then silicon level.**

***Index Terms*—ROI, System Management, Distributed computing, Information technology.**

## I. INTRODUCTION

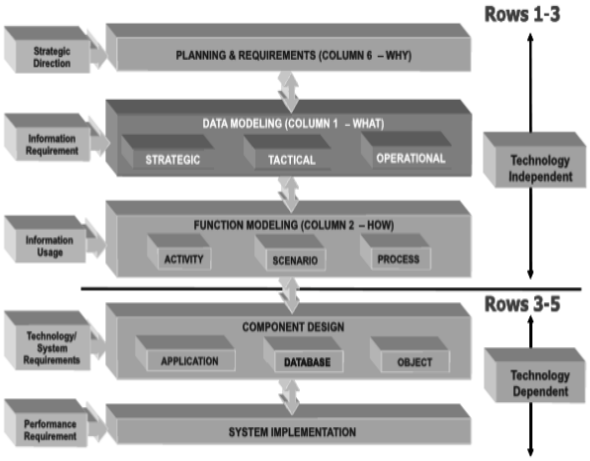
In a typical business environment the network of intelligence is growing day by day and data from every source is fed in, to get the process efficiency, performance improvements linked to business. The power house for these fundamental elements relies in the back bone infrastructure which constitutes of Server, Storage, networking equipments and applications which run 24x7 and zero downtime. Now to manage, monitor these infrastructure we need eyes, ears and hands so that any challenges can be observed, reported and rectified not impacting the downtime. This gives the need for system management from managing few to thousands of systems. Today Industry has many system management solutions say from each vendor who operates in this environment but to narrow down to each requirement needs expert adivce that drives a tailored solution for each customer. In the following sections lets discuss the solutions and ROI factor.

## II. ENTERPRISE ARCHITECTURE

Enterprise by definition is an organization of systemic elements that enables & drives people, culture, process, products and markets. With reference to Zachman framework [2] for Enterprise Engineering architecture basics starts by identifing a matrix of elements as stated below. Enterprise architecture with reference to Zachman model

| | What Data | How Function | Where Location | Who People | When Time | Why Future |
|---|---|---|---|---|---|---|
| PLANNER Objectives/Scope | List of Things | List of Processes | List of Locations | Organization Structure | List of Events | List of Goals Objectives |
| OWNER Conceptual | Enterprise Model | Activity Model | Business Logistics | Work Flow | Master Schedule | Business Plan |
| DESIGNER Logical | Logical Data Model | Process Model | Distributed Architecture | Human Interface | Process Structure | Business Rules |
| BUILDER Physical | Physical Data Model | System Model | Technology Architecture | Presentation Interface | Control Structure | Rule Design |
| SUBCONTRACTOR Out-of-Context | Data Definition | Program | Network Architecture | Security Interface | Timing Definition | Rule Specifications |
| FUNCTIONING ENTERPRISE | Data | Function | Network | Organization | Schedule | Strategy |

Each of these elements can be binded by the process & actions. The next flow shows the techology indendependant versus dependant view




The technology dependent areas (rows 3-5) drives the IT requirements where internet, object-oriented methods for application designs, database designs are deployed on enterprise environment. The technology independent areas drive inputs for the above requirement.

The IT requirement here translates to Servers, storage, software, networks, power i.e. scalable datacenter based on Enterprise needs. To manage these systems we need System management.

## III. MANAGING ENTERPRISE SYSTEMS

Enterprise system needs management considering the complexity of operations serving the organizational productivity. Management tools does monitor, manage and update the relevant software for managing enterprise systems with less human activity. The objectives being [3]

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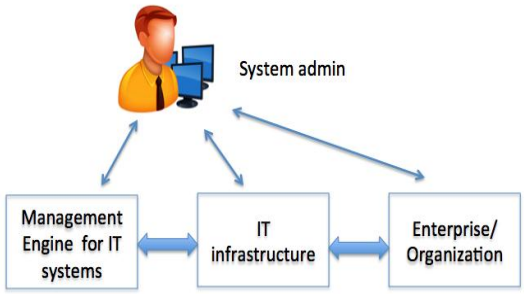
- Reducing the overhead of managing systems i.e. engaging less manpower to manage more systems.
- Creating improvement in system availability and the productivity of users.
- Consolidating information for proactive decision-making.
- Achieving low maintenance cost for managing the system itself.




A centralized monitoring of enterprise system is achievable using the system management tools. This in turn facilitates the IT managers to take informed decision proactively with lesser down time and not impacting the productivity of the organization by creating back up systems.

Automation of all monitoring is possible by creating customized consoles, which can provide overall activity summary of the organization with less human interaction. Thus system management gives increased level of service availability to the business as desired by the IT managers. The capabilities also include filtering events & error messages, dealing with routing issues, responding to alarms and escalation based on pre-programmed requirements. Today the events can reach operators via mobile text messages and remote configurations are viable.

## IV. Solutions – Systems to Silicon

System management solutions are availabe from different vendors for organizations that needs tailored solutions. The table below has the details of different system mangement solutions in brief and each has their benefits/ features towards managing systems in organization. In general following classifications apply

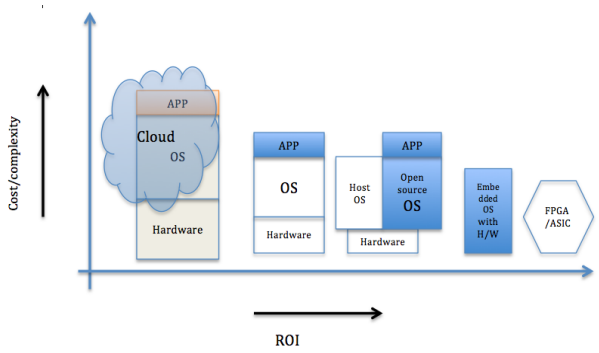
- In band system management solution – In this solution, the hardware, OS and app and integrated or fully dependent on the host machine which also serves the client with their applications. Typical example is running a System management application on a Window workstation OS with Intel or AMD CPU server.

- Out of band system management solution – In this solution the hardware, OS and app and independent. The hardware will have a co-processor or SOC apart from the host system CPU. OS is an open source for management apart from host OS and app is running on Open source OS managing the Host systems.

| System management solutions | Details |
|---|---|
| Hybrid - Cloud based system management solutions | Operates with Cloud deployed system management software that remotely manages the Data centre infrastucture. This is a pay as you go model and is available from many vendors. Large scale deployments are managed using such solutions; disadvantage is if the cloud based vendor moves to closure/bankruptcy without data migration. |
| In band - Application level management suites that are dependant on Host OS | In house management solution where a typical software application is deployed in a mangement server which in turn manages the infrastructure. The software vendor charges usage per year/user licenses apart from the OS licenses charges and varies from vendor to vendor. Medium to small scale data centres benefit from this solution requires in house manpower to manage these solutions. |
| In band - Application level management suites are not dependant on Host OS | In house management solution where the software solution is not dependent on OS. This way it prevents vendor dependency on OS license charges along with the software. One time fee during purchase of H/W with open source solution helps to manage the host. Medium to small scale data centres benefit from this solution requires in house man power to manage these solution. |
| Out of band - Bare metal system management solutions dependant on embedded stacks. | Box dependant solutions, typically operates with a Co-processor enviroment with its OS solutions not dependant on host OS. Its advantage is power on bare metal severs at customer site is immediate without the need for CDs or web based authentication. Helps to remotely manage and deploy systems. |
| Out of band - Bare metal system management solution which are build in CPU core. | Box dependant solutions, operates from a CPU silicon core direclty with basic support of BIOS. Efficient in terms of cost as there is no extra h/w or OS with vendor dependency or license charges. However the risk is CPU is the only functional h/w that could operate which increases the risk of availability. Doesn't need a CD or web based authentication. Helps to remotely manage and deploy systems. |
| Out of band - FPGA/ASIC based solution | Box dependant solutions, operates independant of CPU, host OS and does have a custom hardware solution limited to few sensors and not host OS dependant. Cost is covered with one time purchase of hardware. Sends alerts using standard Ethernet or dedicated port to remote users. Doesn't need a CD or web based authentication. |

## V. ROI Analysis

From Cloud to silicon the investment made on Enterprise system management related tools has a variance in ROI with reference to number of systems, complexity of systems deployed to address different types of workloads. Here cost savings [1] is defined by the amount of task completed or work done in any organization by system/man-power in a time which is lesser than the expected. Process improvements also contribute to the productivity in an organization and some of the parameters such as cost saving, skilled labor, technology can be added as contributors. Organization does engage workloads at different levels some are targetted for long term data collection, monitoring activities and some are required for immediate processing such as SMBs. Here in this context we will limit the ROI analysis scope to the cost/complexity of infrastructure and its related sustanenance.




With reference to the graph illustrated above based on work loads different system management solutions are offered. However if we have to consider the cost & complexity, the available infrastructure silicon solutions are better compared to Host OS dependent. The disadvantage would be increase in variety of applications as we move towards silicon solution considering light weight technical solution. At the same time cloud based solutions offers application support for wider range of requirements which comes with a cost and complexity. SMBs move towards light weight technical solutions and large business corporations go to cloud based solutions.

## VI. Conclusion

System management tools remain operational to drive the Enterprise system availability, performance and ROI improvement. It reduces the human capital cost and gives opportunity for automation thus improving the productivity of the organization. It provides data for trends on system behavior, organizational data thus enabling managers to take informed decisions avoiding down time. In an increasingly competitive market place, system management for enterprise is a vital tool to execute the next steps of any business aligning to strategies & goal.

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