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Envisioning the Future of Moore's Law, More than Moore & Beyond for Global Semiconductor Industry – Part 1 of 3

By Apek Mulay

Business Continuity Planning Software: Two Features You Must Use to Achieve Resiliency

By Brandon Tanner

Contents

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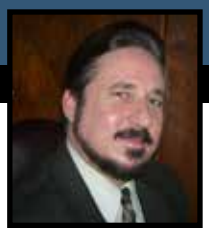

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Four Simple Steps to Transform Legacy Datacenters Part 2: Cloud Sandboxing

By Hans Ashlock, Quali Technical Marketing Manager

This article is Part 2 in our series on transforming legacy datacenters to embrace DevOps and agile practices by employing modern, cloud-based, and automated solutions while at the same time evolving critical legacy applications and processes. In Part 1, (Nov./Dec. 2015) we discussed the importance of addressing cultural changes, starting with the simple idea of a "sit together" approach. In this Part 2 of our series, we'll discuss the importance of providing better access to IT infrastructure by getting a cloud sandbox platform in place.

To start – what do we mean by getting access to infrastructure? For this article we mean giving end users on-demand, self-service, automated access to spinning up virtual machines (or applications or containers), installing applications, getting permission to use and have exclusive access to physical resources (compute, network, storage, custom), and possibly having those resources configured to a certain state (with software, firmware, networking, or configurations properly provisioned).

Giving your IT users access to infrastructure in a timely manner is one of the biggest roadblocks to modernizing IT. A recent survey performed at VMWorld 2015 found that 75% of enterprise organizations still take over a week to deliver the infrastructure that IT users need to get their work done. This is because in many organizations today, the processes that are in place for allocating infrastructure to developers, testers and other business stakeholders are slow-paced, non-standardized, serialized, and based on manual, personnel-driven ticketing systems.

Unfortunately, it is not uncommon to hear stories of user requests for individual VMs (for, say, development or testing purposes) taking an entire day, simply because the process requires submitting a request (often via email or a support system) to a single person who is responsible for fielding the requests of hundreds of end users. In many cases, it's not that the actual work required to spin up a VM is difficult or time-consuming, but the serial and personnel-oriented nature of the process causes the single request to sit in a queue for hours, yielding a net request time that is very long. Simply adding more personnel is an extremely costly and inefficient way to solve this kind of problem.

On the other hand, solving this problem can seriously jumpstart an organization's journey to a more agile and efficient business, because solving the problem will benefit users and teams across the entire DevOps lifecycle. Any improvements will have an exponential positive impact on agility.

Let's consider an enterprise organization that's developing an application, product, or service. Developers need access to infrastructure for developing the application. Test and QA needs access to infrastructure for testing the application. Certification teams need infrastructure for performing security and certification analysis on the application. Support teams need access to infrastructure in order to troubleshoot customer problems related to that application; even sales and marketing need access to infrastructure in order to perform PoC and demos of the application, product, or service. The list goes on. So when you step back and look at the broader product/DevOps lifecycle, you can see that infrastructure-as-a-service is needed at far more places in the cycle than just the point that an application or service is deployed to production.

So a cloud sandboxing platform is important to get in place because it goes beyond the "production deploy" orientation of most cloud management or IaaS platforms to address the overall user needs across the DevOps lifecycle. In terms of deployments, a production deployment might last months or years; a user cloud sandbox environment, on the other hand, will typically be deployed for just hours or days. A cloud sandbox platform will therefore have capabilities like auto-reclamation, teardown automation, configuration save/restore automation, and physical resource lock/unlock to facilitate this shorter deployment cycle. This approach will both limit resource overconsumption (ex: VM sprawl), as well as limit the tendency for teams to hoard critical shared

resources (like specialized costly gear or prototyping equipment) for long periods of time.

With a production cloud management platform, resources are typically allocated to applications; with a cloud sandbox, resources are allocated to users. This allows IT organizations to track usage, optimize utilization and access to resources, and generate chargeback/showback capabilities, which is not possible unless the system is able to track users or teams based on consumption of infrastructure. Furthermore, with production cloud platforms, there is little or no control over the infrastructure resources; but with a cloud sandbox platform the user has control over the resources or is given special access or provisioning support.

Production-oriented tools will typically rely on pre-defined blueprints, whereas cloud sandbox platforms will support blueprinting but also allow users to design, interact, and collaborate with those blueprints. For example – a support team might bring up and deploy the application or service blueprint that corresponds to a particular customer problem. But they may also need to invite other support team members to get access to the environment, and modify the deployment in real time to, for example, deploy, configure, and connect a load or traffic generator to simulate a certain real-world scenario.

Here is where cloud sandboxing platforms really begin to show just how different it looks to enable automation across the entire DevOps lifecycle rather than just for pushing to production. Sandboxing platforms are built to provide infrastructure-as-a-service to the wide range of tools, equipment, resources, and data center infrastructure (both on-prem and cloud based) that are required to meet the needs of all the various stakeholder teams. Take, for example, a sales engineer who needs to give demos of a product or service. The sandbox environment might require a mix of VMs, physical network gear, and specialized infrastructure required to show key aspects of a product capability, as well as the custom orchestration workflows for configuring the demo end-to-end environment.

While some cloud sandboxing solutions are offered as SaaS cloud-based solutions (which can be a way to quickly get started with cloud sandboxing), most are offered as on-prem hybrid solutions. This is because moving IT workloads to the public cloud can only work for limited software development and test use cases and it runs the risk of creating "virtualization silos." An on-prem hybrid solution will better address the needs of the vast number of users and teams that need access to resources bound by security and governance policies, or that reside in on-prem data centers and labs.

To further this point – an effective cloud sandbox platform will typically provide a means of easily extending and creating open integrations with custom and legacy infrastructure. One of the primary ways this is done is with visual based tools for creating high level automation workflows, as well as for modelling infrastructure and service blueprints. An effective cloud sandbox platform will include these visual-based tools for empowering non-programmers, as well as API or code-based (ex: Python) integration mechanisms to support developers. This way, the cloud sandbox platform can enable creating a consistent and sustainable library of integrations and automation across the entire organization.

Lastly, it's important to understand that unlike putting in place a production cloud management platform, getting a cloud sandbox platform in place doesn't have to be an "all or nothing" effort. Organizations can take a progressive approach, starting with low-hanging fruit. For example, beginning by providing simple VM request resources to a specific group of users, then moving to providing storage or networking resources to another team, and from there adding support for more complex environments.

Putting in place a cloud sandboxing platform to give users on-demand, self-service access to IT infrastructure is a key second step in modernizing your legacy data center and embracing agile and DevOps methodologies. From the start, a cloud sandboxing platform will provide immediate agility benefits. Once in place, cloud sandboxing also enables your organization to transcend ad hoc testing by automating, systematizing and consolidating tests into a unified, launchable certification. In Part 3 of our series, we'll explore how doing so helps move quality "to the left" and leads to more successful outcomes upon deployment.

ABOUT THE AUTHOR

Hans Ashlock *joined QualiSystems in 2013 and heads Quali's worldwide technical marketing. Hans has over 15 years of software engineering, product management, marketing and sales experience in automation software solutions addressing, cloud, networking, telcom, data center, federal, and semiconductor industries. Before Quali – Hans was a founding member of a global engineering services company, developing products and services for enabling adoption of automation technologies. Though he only holds one patent, he's just glad he didn't have to pay for it. An engineer at heart, Hans is passionate about the transformation to software defined everything and its impact on business and technology. Connect with him on LinkedIn, Twitter, and SlideShare.*

IT leaders: make process improvement a sunny reality with advice from Axios Systems at HDI16 in Orlando

Washington, D.C. – April 05, 2016: One of the world's leading innovators of service management technology, Axios Systems, is a Platinum sponsor and featured presenter of the HDI 2016 Conference and Expo.

An estimated 2,500 IT professionals are expected to attend 'the industry's leading technical service and support conference' from April 12-15 at the Rosen Shingle Creek Resort in Orlando, Fla.

Featured speakers include Joshua Smith, ITSM Consultant at Axios Systems, who will jointly present a session with Jason Bosely, IT Operations Center Manager for Avera Health, an Axios Systems customer.
Participants attending the Axios-Avera session will take away actionable tips for overcoming organizational inertia through continual process improvement. Attendees will learn how to:

- Secure stakeholder support
- Create an efficiency-oriented culture
- Build a business case for continual process improvement

The conference also features five keynote speeches and 80 workshops offering advice on improving metrics, service management and desktop support.
Markos Symeonides, Executive Vice President at Axios Systems, said: "As a longstanding partner of HDI, we are delighted to be a platinum sponsor at HDI16. We look forward to delivering a joint presentation with one of our exceptional customers, Avera Health. That session in particular is one you must attend if you are serious about turning up the dial on your process improvement strategy."
To register for the conference or learn more, visit http://www.hdiconference.com/default

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Network Routing Protocols and Methods, Part 2

By Sean Wilkins

In the conclusion of this series, Sean Wilkins, co-author of CCNA Routing and Switching 200-120 Network Simulator, explains how to untangle the detailed network information provided by two popular network routing protocol.

Overview

This article takes the theory of how a dynamic routing protocol should work, bringing it into reality with two walkthroughs. The first walkthrough focuses on how Routing Information Protocol (RIP) works as a dynamic vector protocol. The second walkthrough shows how the Open Shortest Path First (OSPF) protocol works as a link-state protocol.

NOTE

Part 1 of this series provides the background information needed for understanding the routing protocols discussed in this article. You should be thoroughly familiar with the information in Part 1 before reading this article.

The RIP discussion in this article is based on version 2.

For these walkthroughs, we'll use the simple three-router topology shown in Figure 1.

Figure 1 Topology for the walkthroughs

NOTE

The loopback interfaces in the figure represent extra LAN connections used to fill the routing tables.

The following table shows the IP addresses assigned for this topology. This information is common to the walkthroughs for both RIP and OSPF.

Router	Interface	IP Address/Network
R1	Loopback0	10.0.0.1/24
	GigabitEthernet0/1	192.168.1.1/24
R2	GigabitEthernet0/1	192.168.2.1/24
	GigabitEthernet0/2	192.168.1.2/24
R3	GigabitEthernet0/2	192.168.2.2/24
	Loopback0	20.0.0.1/24

RIP Walkthrough

Since RIP is a distance vector protocol, it learns about routes when its neighbors advertise a copy of their routing tables. After receiving the routing tables, RIP combines this information with its own interfaces to form its own routing table. This information for RIP is initially stored inside the RIP database that can be viewed on each respective device. Listing 1 shows an abbreviated version of this database for R1:

Listing 1–R1 RIP Database.

```
10.0.0.0/24    directly connected, Loopback0
20.0.0.0/24
    [2] via 192.168.1.2, 00:00:25, GigabitEthernet0/1
192.168.1.0/24    directly connected, GigabitEthernet0/1
192.168.2.0/24
    [1] via 192.168.1.2, 00:00:25, GigabitEthernet0/1
```

Here, R1 is showing that the 10.0.0.0/24 (Loopback0) and 192.168.1.0/24 (GigabitEthernet0/1) networks are directly connected, and two additional networks are located out the GigabitEthernet0/1 interface (toward R2). The routing table of R1 reflects this same information, as shown in Listing 2:

Listing 2–R1 Routing Table.

```
      10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.0.0.0/24 is directly connected, Loopback0
L        10.0.0.1/32 is directly connected, Loopback0
      20.0.0.0/24 is subnetted, 1 subnets
R        20.0.0.0 [120/2] via 192.168.1.2, 00:00:17,
      GigabitEthernet0/1
      192.168.1.0/24 is variably subnetted, 2 subnets,
       2 masks
C        192.168.1.0/24 is directly connected,
       GigabitEthernet0/1
L        192.168.1.1/32 is directly connected,
       GigabitEthernet0/1
R     192.168.2.0/24 [120/1] via 192.168.1.2, 00:00:17,
       GigabitEthernet0/1
```

Keep in mind that neither of these tables tells you about the devices connected to the 192.168.2.0/24 or 20.0.0.0/24

networks. The same details are shown on R2 and R3 when viewing their RIP databases and routing tables in Listings 3–6.

Listing 3–R2 RIP Database.

```
10.0.0.0/24
    [1] via 192.168.1.1, 00:00:21, GigabitEthernet0/2
20.0.0.0/24
    [1] via 192.168.2.2, 00:00:22, GigabitEthernet0/1
192.168.1.0/24    directly connected, GigabitEthernet0/2
192.168.2.0/24    directly connected, GigabitEthernet0/1
```

Listing 4–R2 Routing Table.

```
     10.0.0.0/24 is subnetted, 1 subnets
R       10.0.0.0 [120/1] via 192.168.1.1, 00:00:09,
          GigabitEthernet0/2
     20.0.0.0/24 is subnetted, 1 subnets
R       20.0.0.0 [120/1] via 192.168.2.2, 00:00:11,
          GigabitEthernet0/1
     192.168.1.0/24 is variably subnetted, 2 subnets,
      2 masks
C       192.168.1.0/24 is directly connected,
          GigabitEthernet0/2
L       192.168.1.2/32 is directly connected,
          GigabitEthernet0/2
     192.168.2.0/24 is variably subnetted, 2 subnets,
      2 masks
C       192.168.2.0/24 is directly connected,
          GigabitEthernet0/1
L       192.168.2.1/32 is directly connected,
          GigabitEthernet0/1
```

For R2, the only networks that are not directly connected are the Loopback0 interfaces of R1 and R3.

Listing 5–R3 RIP Database.

```
10.0.0.0/24
    [2] via 192.168.2.1, 00:00:23, GigabitEthernet0/2
20.0.0.0/24    directly connected, Loopback0
192.168.1.0/24
    [1] via 192.168.2.1, 00:00:23, GigabitEthernet0/2
192.168.2.0/24    directly connected, GigabitEthernet0/2
```

Listing 6–R3 Routing Table.

```
     10.0.0.0/24 is subnetted, 1 subnets
R       10.0.0.0 [120/2] via 192.168.2.1, 00:00:10,
          GigabitEthernet0/2
     20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/24 is directly connected, Loopback0
L       20.0.0.1/32 is directly connected, Loopback0
R    192.168.1.0/24 [120/1] via 192.168.2.1, 00:00:10,
       GigabitEthernet0/2
     192.168.2.0/24 is variably subnetted, 2 subnets,
     2 masks
C       192.168.2.0/24 is directly connected,
          GigabitEthernet0/2
L       192.168.2.2/32 is directly connected,
          GigabitEthernet0/2
```

The R3 tables look like a mirror version of R1, with the R1 Loopback0 interface and the link between R1 and R2 being advertised by RIP. R3 is not aware of which device(s) are connected to these other networks—only that they can be located out its GigabitEthernet0/2 interface.

OSPF Walkthrough

Unlike RIP, which is a distance vector protocol, , OSPF is a link-state protocol. OSPF makes its routing decisions based on a database that provides a picture of which networks are located off of every router in the same link-state domain. As with RIP, this information is stored initially in a local OSPF database, which is used to determine the best path for each specific destination, based on Dijkstra's shortest path first (SPF) algorithm.

NOTE

It's important to remember that the link-state database for R1, R2, and R3 is exactly the same because they're all in the same area (this article doesn't cover multiple-area concepts). Therefore we don't need to look at the individual contents of each router's OSPF database.

The first part of the OSPF database we'll examine is the overview. Listing 7 shows a high-level view of the entries in the database; it doesn't show the specific advertised networks.

Listing 7–OSPF Database Overview.

```
OSPF Router with ID (1.1.1.1) (Process ID 10)
                Router Link States (Area 0)
Link ID    ADV Router    Age    Seq#       Checksum Link count
1.1.1.1    1.1.1.1       95     0x80000002 0x0076C0 2
2.2.2.2    2.2.2.2       96     0x80000003 0x00025C 2
3.3.3.3    3.3.3.3       102    0x80000002 0x0076A2 2
                Net Link States (Area 0)
Link ID        ADV Router    Age    Seq#       Checksum
192.168.1.2    2.2.2.2       96     0x80000001 0x0009B0
192.168.2.2    3.3.3.3       102    0x80000001 0x003478
```

Listing 7 shows that three different OSPF routers are in the network, advertised as router link states using the router-ID

(RID): 1.1.1.1 (R1), 2.2.2.2 (R2), and 3.3.3.3 (R3). The entry also shows two network link entries that advertise two transit networks. Transit networks are links where multiple OSPF devices exist; in this case, the link between R1 and R2 and the link between R2 and R3 are transit networks.

Listing 8 shows the router link-state entry for R1:

Listing 8–R1 Router Link-State Entry.

```
        OSPF Router with ID (1.1.1.1) (Process ID 10)
            Router Link States (Area 0)
LS age: 165
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 1.1.1.1
Advertising Router: 1.1.1.1
LS Seq Number: 80000002
Checksum: 0x76C0
Length: 48
Number of Links: 2

  Link connected to: a Stub Network
    (Link ID) Network/subnet number: 10.0.0.0
    (Link Data) Network Mask: 255.255.255.0
    Number of MTID metrics: 0
    TOS 0 Metrics: 1
  Link connected to: a Transit Network
    (Link ID) Designated Router address: 192.168.1.2
    (Link Data) Router Interface address: 192.168.1.1
    Number of MTID metrics: 0
    TOS 0 Metrics: 1
```

This entry contains some useful information. It shows that R1 is connected to a stub network (not a link with another OSPF router), which is connected to the 10.0.0.0/24 network. It's also connected to a transit network. The information for the network connected to this transit network is shown in a separate linked network link-state entry shown in Listing 9 (To find the correct link, look at the advertising router and link ID.)

Listing 9–R1 Linked Network Entry.

```
LS age: 248
Options: (No TOS-capability, DC)
LS Type: Network Links
Link State ID: 192.168.1.2 (address of Designated
Router)
Advertising Router: 2.2.2.2
LS Seq Number: 80000001
Checksum: 0x9B0
Length: 32
Network Mask: /24
    Attached Router: 2.2.2.2
```

Attached Router: 1.1.1.1

This entry shows that R1 is connected to a transit network that's connected to the 192.168.1.0/24 network.

Now take a look at the R2 router link entry in Listing 10:

Listing 10–R2 Router Link Entry.

```
        OSPF Router with ID (1.1.1.1) (Process ID 10)
                Router Link States (Area 0)
LS age: 482
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 2.2.2.2
Advertising Router: 2.2.2.2
LS Seq Number: 80000003
Checksum: 0x25C
Length: 48
Number of Links: 2

Link connected to: a Transit Network
  (Link ID) Designated Router address: 192.168.1.2
  (Link Data) Router Interface address: 192.168.1.2
   Number of MTID metrics: 0
   TOS 0 Metrics: 1

 Link connected to: a Transit Network
  (Link ID) Designated Router address: 192.168.2.2
  (Link Data) Router Interface address: 192.168.2.1
   Number of MTID metrics: 0
    TOS 0 Metrics: 1
```

This entry shows that R2 is connected to two different transit networks. As with the R1 entry, these transit networks can be linked to their respective entries, as shown in Listing 11:

Listing 11–R2 Linked Network Entries.

```
    OSPF Router with ID (2.2.2.2) (Process ID 10)
            Net Link States (Area 0)
Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 551
Options: (No TOS-capability, DC)
LS Type: Network Links
Link State ID: 192.168.1.2 (address of Designated Router)
Advertising Router: 2.2.2.2
LS Seq Number: 80000001
Checksum: 0x9B0
Length: 32
Network Mask: /24
   Attached Router: 2.2.2.2
   Attached Router: 1.1.1.1

Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 558
Options: (No TOS-capability, DC)
LS Type: Network Links
Link State ID: 192.168.2.2 (address of Designated Router)
Advertising Router: 3.3.3.3
LS Seq Number: 80000001
Checksum: 0x3478
Length: 32
Network Mask: /24
     Attached Router: 3.3.3.3
     Attached Router: 2.2.2.2
```

These entries show that the two R2 connected transit networks are connected to the 192.168.1.0/24 and 192.168.2.0/24 networks, respectively.

Finally, let's take a look at the R3 router link entry in Listing 12:

Listing 12–R3 Router Link Entry.

```
        OSPF Router with ID (1.1.1.1) (Process ID 10)
                Router Link States (Area 0)
LS age: 720
Options: (No TOS-capability, DC)
LS Type: Router Links
Link State ID: 1.1.1.1
Advertising Router: 1.1.1.1
LS Seq Number: 80000002
Checksum: 0x76C0
Length: 48
Number of Links: 2

 Link connected to: a Stub Network
   (Link ID) Network/subnet number: 10.0.0.0
   (Link Data) Network Mask: 255.255.255.0
    Number of MTID metrics: 0
     TOS 0 Metrics: 1

  Link connected to: a Transit Network
   (Link ID) Designated Router address: 192.168.1.2
   (Link Data) Router Interface address: 192.168.1.1
    Number of MTID metrics: 0
     TOS 0 Metrics: 1
```

Like the R1 router entry, this entry shows that R3 is connected to a stub network and a transit network. The stub network connects to the 20.0.0.0/24 network, and the transit entry can be linked to the entry shown in Listing 13:

Listing 13–R3 Linked Network Entry.

```
Routing Bit Set on this LSA in topology Base with MTID 0
LS age: 779
Options: (No TOS-capability, DC)
LS Type: Network Links
Link State ID: 192.168.2.2 (address of Designated Router)
Advertising Router: 3.3.3.3
LS Seq Number: 80000001
Checksum: 0x3478
Length: 32
Network Mask: /24
   Attached Router: 3.3.3.3
   Attached Router: 2.2.2.2
```

This entry shows that R3 is connected to a transit network that is connected to the 192.168.2.0/24 network.

When you combine all of this information, you get a view of how the network is seen by OSPF. The protocol is able to get a complete list of all the networks that are inside the OSPF domain and make forwarding decisions based on this full view. (This view can be restricted as well, with other features not discussed in this article.)

Obviously, walking through the OSPF database is quite a bit more confusing then walking through the RIP database. The way that OSPF organizes information is intended to be efficient for the protocol—not necessarily for the viewing engineer. Although this article picks out the specific linked entries that match with the specific devices in the network, it's important to remember that all of these entries exist in the OSPF database of all routers in the OSPF domain (by default). Differentiating which entry links with which router is a matter of tracing the RIDs and networks, which is well outside the scope of this article.

To bring the OSPF portion of this article together, let's look at the routing tables of the routers in Listings 14–16, to see how this information contained within their databases is translated once OSPF has a chance to calculate the best routes to insert.

Listing 14–R1 Routing Table.

```
    10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       10.0.0.0/24 is directly connected, Loopback0
L       10.0.0.1/32 is directly connected, Loopback0
    20.0.0.0/24 is subnetted, 1 subnets
O       20.0.0.0 [110/3] via 192.168.1.2, 01:04:32,
        GigabitEthernet0/1
    192.168.1.0/24 is variably subnetted, 2 subnets,
    2 masks
C       192.168.1.0/24 is directly connected,
        GigabitEthernet0/1
L       192.168.1.1/32 is directly connected,
        GigabitEthernet0/1
O    192.168.2.0/24 [110/2] via 192.168.1.2, 01:08:50,
     GigabitEthernet0/1
```

Listing 15–R2 Routing Table.

```
    10.0.0.0/24 is subnetted, 1 subnets
O       10.0.0.0 [110/2] via 192.168.1.1, 01:04:07,
        GigabitEthernet0/2
    20.0.0.0/24 is subnetted, 1 subnets
O       20.0.0.0 [110/2] via 192.168.2.2, 01:04:07,
        GigabitEthernet0/1
    192.168.1.0/24 is variably subnetted, 2 subnets,
    2 masks
C       192.168.1.0/24 is directly connected,
        GigabitEthernet0/2
L       192.168.1.2/32 is directly connected,
        GigabitEthernet0/2
    192.168.2.0/24 is variably subnetted, 2 subnets,
    2 masks
C       192.168.2.0/24 is directly connected,
        GigabitEthernet0/1
L       192.168.2.1/32 is directly connected,
        GigabitEthernet0/1
```

Listing 16–R3 Routing Table.

```
    10.0.0.0/24 is subnetted, 1 subnets
O       10.0.0.0 [110/3] via 192.168.2.1, 01:04:39,
        GigabitEthernet0/2
    20.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       20.0.0.0/24 is directly connected, Loopback0
L       20.0.0.1/32 is directly connected, Loopback0
O    192.168.1.0/24 [110/2] via 192.168.2.1, 01:09:23,
     GigabitEthernet0/2
    192.168.2.0/24 is variably subnetted, 2 subnets,
    2 masks
C       192.168.2.0/24 is directly connected,
        GigabitEthernet0/2
L       192.168.2.2/32 is directly connected,
        GigabitEthernet0/2
```

Summary

While this article (especially the OSPF portion) could be a bit confusing, you must remember that this is how the databases look in a very simple network. Imagine what they look like in a larger network! Keep in mind that many network engineers don't completely understand the contents of these tables; they're able to get through their work by using this information combined with network documentation and other observed configuration on the devices.

In reading through this article (possibly multiple times), you should get an idea of how distance vector and link-state protocols differ in their view of the network and how they make their decisions.

ABOUT THE AUTHOR

Sean Wilkins *is an accomplished networking consultant for SR-W Consulting (http://www.sr-wconsulting.com) and has been in the field of IT since the mid 1990s, working with companies like Cisco, Lucent, Verizon and AT&T as well as several other private companies. Sean currently holds certifications with Cisco (CCNP/CCDP), Microsoft (MCSE) and CompTIA (A+ and Network+). He also has a Masters of Science in Information Technology with a focus in Network Architecture and Design, a Masters of Science in Organizational Management, a Masters Certificate in Network Security, a Bachelors of Science in Computer Networking, and Associates of Applied Science in Computer Information Systems. In addition to working as a consultant, Sean spends a lot of his time as a technical writer and editor for various companies.*

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Siemon Announces Acquisition of the Gigaduct Fiber Containment System

March 9, 2016. Watertown, CT — Siemon, a leading global network infrastructure specialist, today announced its acquisition of the Gigaduct Fiber Containment System from UK-based Gigacom Ltd. Under this definitive agreement, Siemon will acquire all existing Gigaduct assets, inventory, tooling and customer base.

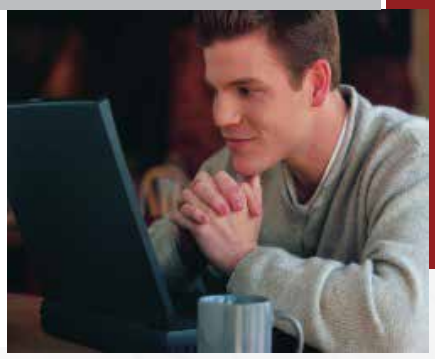
Gigaduct is a flexible raceway system for routing, managing and protecting fiber optic cables in data centers, colocation centers, service provider hosting and other fiber computing environments. Manufactured from halogen-free, flame-retardant plastics, the Gigaduct System features easy-to-assemble ducts, fittings, bends and tees in various sizes to meet a wide range of fiber deployment needs. The system is designed to maintain bend radius and protect fiber from the most rigorous conditions, while easy-access covers enable fiber installation or removal without disconnecting the entire pathway system.

The transaction will expand Siemon's existing portfolio of WheelHouse™ Advanced Data Center Solutions that includes the company's established line of copper and fiber cable and connectivity systems, high-speed interconnect assemblies, cabinets, cable management, power distribution and comprehensive data center design services that support any size and type of data center, from large super computing environments and colocations, to small-to-mid size enterprise data centers.

"We are excited to expand our data center offering with the Gigaduct Fiber Containment System, which fits well into our WheelHouse with expert data center design services that will now include layout of this fiber ducting system," says Tony Veatch, Director of Product Management for Siemon. "With this acquisition and Siemon's existing global footprint, we will have significant opportunity to expand Gigaduct's reach and better serve our data center customers around the world with a more comprehensive portfolio."

To learn more about Siemon's WheelHouse Advanced Data Center Soluitons, visit:
www.siemon.com/wheelhouse





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Members! Here is Your Special "Sneak Preview" of Upcoming New Jobs, posting soon on the NaSPA Job Site

The following is a sample of the awesome jobs posted by employers in just the last 30 days on the NaSPA Job Site. NaSPA sincerely appreciates all the people who think of NaSPA first when they are looking for the ideal Information Technology candidate. They find the best people, and help NaSPA at the same time. These jobs have not hit our site yet so now you can have a "sneak preview" ahead of other applicants by Site right now and see what else is new!

Position Title **Comp Prof**
Location(s) **New Jersey, United States**
Description
Comp Prof, Plainsboro, NJ & Other Client Locations (multiple openings): Involve in all phases of SDLC, analyze, design, develop, implement, configure, customize, & maintain applications & systems. BS/MS (BS + 5yrs Exp) in CS, MIS, CIS, Eng (any), or related in any one of the skill set:1. ASP.Net, Servlets, JSP, ASP, XML, Cold Fusion, C#, VB.Net, Java, SQL Server Reporting Services, Dot Net Framework, MVC, J2EE, SQL Server, Oracle, DB2, MySQL, MS Dynamics CRM, Share point server, Web Sphere Commerce Suite, Pro-Engineer, Unigraphics, IDEAS, Visio, Rational Rose, VSS, CVS, Win, Linux, & Unix W/1yr exp & ref DK1060. 2. Oracle 11g/10g/9i/8i, SAP Max DB's, Exadata X-4, ODA, V Block, manage 10g/11g R1/R2 RAC, OS Clusters, APEX,clients, OEM Agents, Shell Scripting, RMAN, SQL*Loader, SQL Dev, DB Artisian, OEM Grid, Linux , AIX, Solaris, Win & Unix W/1yr exp & ref PSKR1040. 3. SQL Server, SQL Developer, Quality Center, VSS, Rational Clear Case, Rational Clear Quest, Share Point, JIRA, Office Tools, Eroom, STLC, Agile, Waterfall, V-Model, PowerPoint, SRS/FRD verification, Win & Unix W/1yr exp & ref PRS1030. 4. CVS, SVN, ANT, Maven, Unix, Perl, JavaScript, CSS3, Jquery, Jquery Mobile, Ajax, Nutch, Jira, Liferay, Java, J2EE, JSF, Icefaces, Liferay Portal, JSR, Liferay Studio, Service builder, Liferay Plugins, Oracle, MySQL, Tomcat web server, glassfish server, Java Web Server, Websphere, Weblogic, Eclipse, my Eclipse, Xcode 4, Spring, Struts, Hibernate, Angular.js, Windows, Mac OS X Web, Unix, Linux, and LDAP & ref KA1070. 5. VB.NET, VB Script, T-SQL, XMLA, SQL Server, SSIS, SSRS, SSAS, VSTF, MOSS, SQL BI, Data Warehousing, ETL, OLAP, Test Track Pro, Bugzilla, VSTF, Clear Quest, ALM, C#, T-SQL, Oracle 11g, IIS, Win & Unix W/1yr exp & ref APR1010. 6. Exchange Server, Active Directory, Right Management Service, Office 365, AirWatch, Mobile Device Management, Proofpoint, Secure Email Gateway, Ironport, Email Security Appliances, SQL, Load Balancers, Windows Clusters, Network Load Balancers, Powershell, VB Script, C, C++, IMAP, POP3, Oracle, Windows Serve r 2008/2012. BS/Equi (3Yrs college+2Yrs of Exp) & ref BVP1020. Mail resumes Smart IMS, 103 Morgan Ln, Plainsboro, NJ 08536 or email resumes@smartims.com.

Position Title **Senior Software Engineer**
Location(s) **Raleigh, North Carolina, United States**
Description
Sr. Software Engineer (Raleigh, NC) Build and implement innovative new software solutions and services to power Bandwidth.com's republic wireless brand. Resumes to: Kellie Sigmon, HR, Bandwidth.com, 900 Main Campus Drive, 5th Floor, Raleigh, NC 27606 OR apply online at www.bandwidth.com

Job Name **SOFTWARE ENGINEER**
Position Title **SOFTWARE ENGINEER**
Location(s) **Palo Alto, California, United States**
Description
Laserlike, Inc. in Palo Alto, CA seeks Software Engineer. The job involves applying cutting edge machine learning and artificial intelligence technologies to internet scale data including web pages, news, social feeds and other private data sources and implementing high performance real time predictive analytics systems. The responsibilities include system design, implementation, documentation and tuning of these systems. The systems need to be built inline with the best practices in the industry for security and privacy.

Education requirements: Masters in Computer Science. 3 years of experience as a Software Engineer.

Special skills required:
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• 1 years of work experience building software that works on web scale data
• 2 years of programming experience in Java or C++
• 1 year experience processing millions of HTML documents from Internet using MapReduce / Hadoop
• 1 year experience with extraction of entity and relationship data from documents

Worksite Location: 755 Page Mill Road, Suite A-200, Palo Alto, CA 94304.

Multiple Positions Available.

Resumes can be sent to: jobs@laserlike.com.

Job Name **OPB Seeks an IT Director**
Position Title **OPB Seeks an IT Director**
Location(s) **Portland, Oregon, United States**
Description
OPB is looking for an IT Director. This is a full time, regular status, salaried, exempt position with benefits. OPB is an Equal Opportunity Employer.

Job Name **Senior Consultant/Developer (Level II)**
Position Title **Senior Consultant/Developer (Level II)**
Location(s) **Chicago, various unanticipated locations throughout the U.S., United States**
Description
ThoughtWorks Inc. seeks Senior Consultant/Developer (Level II) in Chicago, IL & various unanticipated U.S. locations to perform the following duties: Working on large-scale, custom-designed, enterprise-level software development projects that use object-oriented technologies, such as Java, Ruby, or .NET. The position will include analysis, development and testing on full life-cycle software development projects using Agile methodologies, including Extreme Programming, Continuous Integration, Continuous Delivery, Test-Driven Development and pair programming. The position also includes automation test frameworks, including writing unit, functional and integration tests. The project team may be distributed and require coordination across countries and time zones. There will also be opportunities to coach and mentor developers on Agile Best Practices and various languages and technologies. The position will also utilize technologies such as Java, Ruby, JUnit, J2EE, JavaScript, Spring, MySQL, Selenium and Oracle. Willingness to travel at least 80% across the U.S.

Job Position supervise work of other employees? No

Send resume to ijobs@thoughtworks.com referencing job #RP-SCD-0216

Job Name **Systems Analyst**
Position Title **Systems Analyst**
Location(s) **North Carolina, United States**
Description
Systems Analyst, Cary, NC & other client locations: Work on Oracle Fin Sol Fit & Gap Analysis in Global Roll-outs which Oracle EBS co-existed W/Legacy Systems. Dsgn sol for integrating Oracle GL W/multiple legacy GL's like BAAN, Solomon, Lease plus, 1C to reduce the Closing Cycle. SME in designing Oracle GL Global Consolidation footprint for disparate GL source systems. Work on

EBS Financials for Oracle Utilities integration with Oracle Work & Asset Management (WAM), Oracle Customer Care & Billing (CC&B). Manage Implementation Partner Teams for successful Project Delivery. Work with EBS Cross-functional Teams, DBA, EBS Release Mgmt, Testing (Automation, Manual, & Performance), EBS Change Mgmt Team for Code Deploy Cycles & patching using Fusion Middleware (FMW) architecture (ADF, APM, BPEL, BPM, Web center, WebLogic) & Identity Management (OIM). Configure Fusion Fin R9, Fusion A/cing Hub (FAH) for Customer Demo's. Involve in Oracle EBS R12/Fusion Fin 11g integrations W/Hyperion Planning & Hyperion Fin Mgmt. Duties entail working W/Oracle 9i/11g, Oracle Financials, Oracle modules such as GL, AP, AR, FA, CM, INV, PO, OM, PJC, PJB, i-Exp, & GHG, HP PPM, HFM, PVCS, Toad, Remedy. Web ADI, HP Quality Center, Safe Central, CVS, Unix, Linux, & Win. MS (BS + 5yrs exp) in CS, CIS, MIS, Eng (any), Bus, or related W/1yr exp. Travel required for other client locations within the U.S. Mail resume ST Tech Inc., 1000 Centre Green Way, Ste # 200, Cary NC 27513 or email resume@sttechinc.com.

Job Name **IT Manager**
Position Title **IT Manager**
Location(s) **Seattle, Washington, United States**
Description
COMPANY: Univera, Inc.
POSITION: IT Manager
WORK LOCATION: Seattle, WA
JOB DETAILS AND DUTIES: The IT Manager is a hands-on contributor who is responsible for the development, design, implementation, and support of applications software implemented and supported throughout the ECONET Family of companies. The IT Manager supervises up to two subject matter experts who are individual contributors. This is a "working" manager position with an estimated 95% / 5% distribution of duties (95% technical "hands-on" development, design, implementation, and support of systems and applications and 5% team supervision and management). The technical work is split between 45% Oracle programming, 30% Oracle EBS Suite administrator duties, and 10% Business Intelligence Discoverer reporting tool activities.

Specific job duties include the following:

Leads day-to-day requirements of the Applications Development and Support team, including planning and scheduling projects/workload ensuring acceptable support levels are maintained
Ensures complete documentation of all Applications Development and Support procedures
Provides systems and applications problem analysis and resolution, recovery, monitoring, configuration and installation
Ensures the creation and update of all system documentation and system problem resolution
Serves as Oracle DBA including creating, configuring, setting-up, monitoring, maintaining, installing patches, troubleshooting/problem resolution and performance tuning
Maintains proactive, consistent communication with the management team on system, project status, and other issues
Investigates new and innovative technologies that could be used to improve the stability and efficiency of company systems
Plans and tests new systems, software, applications and development of system rollout/implementation strategies
Plans, directs, coordinates, and reviews the work plan and progress for applications team.

Job Name **48949**
Position Title **Software Engineer, Analytical Product Engineering**
Location(s) **Austin, Texas, United States**
Description
Software Engineer, Analytical Product Engineering: FactSet Research Systems, Inc., Austin, TX:
Develop & support new applications, calculation engines, & underlying infrastructure for portfolio construction, portfolio analysis, portfolio reporting, quantitative model building, risk analysis, & fixed income analysis. Min. Reqs: BA, or higher, or for. equiv., in CS, CE or rel. tech. field & 2 yrs software engineering industry exper. working w/: Windows, Linux, VMS, C, C++/STL/Boost, C#, Java, Bash, Python, Perl, Javascript, Jquery, AngularJS, Visual Studio, Eclipse, Profiling tools (Valgrind, etc), MySQL & SQL Server. Must have exper. w/ source control & review software, like Perforce, Git, Review Board. Must have proven profficieny in Object Oriented Programming, Multi-threaded Programming, Parallel & Distributed Systems & Agile/ Scrum, full life cycle development, development & support of new applications, calculation engines, & underlying infrastructure for portfolio construction, portfolio analysis, portfolio reporting, quantitative model building, risk analysis, & fixed income analysis, front-end application development, diagnosis & resolution of client bugs & issues, implementation of financial models, & loading of client & third-party data. Qualified applicants should mail resumes to Melissa Manna, HR, FactSet Research Systems, Inc., One Sansome Street, San Francisco, CA 94104 with reference to Job Code: FSSWE8.

Job Name **Director of the Office of Diversity and Inclusion**
Position Title **Director of the Office of Diversity and Inclusion**
Location(s) **Bloomington, Illinois, United States**
Description
Illinois Wesleyan University's Division of Student Affairs invites applications for the position of Director of the Office of Diversity and Inclusion. The Director of the Office of Diversity and Inclusion serves as a member of the Division of Student Affairs by supporting MALANA students (multi-racial, African American, Latino/a, Asian, Native American), LGBTQ+ students, first generation students, women and all diversity by helping to develop and sustain a welcoming, inclusive, multicultural campus where all community members appreciate and respect diversity. Since 2008, IWU has increased our diverse student population to 25% Students of Color. We are looking for a dynamic professional who can support students and provide leadership for campus diversity initiatives (race/ethnicity, gender, GLBTQ, nationality, faith, etc).

The Director of Office of Diversity and Inclusion provides support and challenge for MALANA students through the development of programs/ initiatives focused on student success related to retention, academic excellence, and graduation. The Director works with all students, staff, and faculty to enhance appreciation and understanding of diversity issues and experiences including, race, ethnicity, gender identity and expression, sexual orientation, and ability. The Director also facilitates trainings and workshops for residence life staff, orientation programs, and others as needed. Supervision includes an Assistant Director and four student employees. The Director of the Office of Diversity and Inclusion develops orientation programs for MALANA students and families. Community outreach includes connecting students with internship and volunteer opportunities in Bloomington/Normal, support of University/community programs including MLK programming, and Minority Academic Achievement Recognition program. Campus service includes membership on the University Council for Diversity, student success team, campus on-call duty group, and new student orientation committee. Some weekend and evening work will be required.

Illinois Wesleyan is an elite private co-educational university with an enrollment of about 1,850 and a student/faculty ratio of 11 to 1. The University consists of the College of Liberal Arts, with 17 academic departments; the College of Fine Arts, comprising professional Schools of Art, Music, and Theatre Arts; and the School of Nursing. The University's 80-acre campus has undergone remarkable growth in the past decade and features such new facilities as the five-story Ames Library, the Center for Natural Sciences and the Shirk Center for Athletics and Recreation.

Illinois Wesleyan University is accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools. Our commitment to diversity is articulated most clearly at www.iwu.edu/diversity.

Job Name **SYSTEMS ANALYST**
Position Title **SYSTEMS ANALYST**
Location(s) **Alexandria, United States, United States**
Description
SYSTEMS ANALYST - Analyze & design solutions for approved projects for fed. gov. contracts; ID & validate s/w and infrastructure components req'd to implement tech. solutions; Unit test codes independently or as part of a dev't team; Prep design docs & alternatives to present better solutions & participate in design reviews; ID tech. options, consult w/hw & sw technicians on options & strategies.

MS in Comp. Sci. Knowledge of &/or exp in ASP.NET, C# including LINQ, ADO.NET, VC++, JQuery, AJAX, SSRS, XML, XSLT, XPATH, source control, team foundation server; relational database design & development using Microsoft SQL Server, Oracle.

$89,669/yr. 40 hrs/week. 9am-5pm. Mon-Fri.
Job loc: UNIVERSOLUTIONS, LLC, Alexandria, VA.
Resume to: Recruitment and Employment Office, UNIVERSOLUTIONS, LLC, Attn: Job Ref #: UNI41446, P.O. Box 56625, Atlanta, GA 30343.

Job Name **Systems Analyst**
Position Title **Systems Analyst**
Location(s) **Westlake Village, California, United States**
Description
Systems Analyst–Nations Info Corp in Westlake Village. Dev system design procedures/perform quality assurance reviews. Req's MBA/MA in Digital Innovation/Info Sys, Mgmt Info Sys or rltd; or BA in above field+5yrs rltd exp. Resume: NIC_HR05@yahoo.com.

Job Name **SOLUTION ARCHITECT**
Position Title **SOLUTION ARCHITECT**
Location(s) **Mystic, Connecticut, United States**
Description
SOLUTION ARCHITECT
MResult Corporation an opening in Mystic, CT for a Solution Architect. Provide deep HW/SW tech. arch. expertise to ensure proper sol. design. Use tech. acumen to i/f w/ technologists, understand complex concepts & translate in way that businesses/industry can understand. Use prob. solving & creative skills, ability to exer. sound jdmt. & make decisions based on mkt. & customer trends. Develop sol. arch. f/w to support sol. selling on an enterprise level. Drive changes in the methods, processes & guidelines w/n customer org. or internally. Acts as leader/mentor in DTD operations to provide insights for less experienced colleagues. Provide vision, define sys. & application arch., problem anticipation & problem solving ability across landscape. Support pre-sales activities i/c cust. engagements, RFx responses & proof-of-concepts design/execution. Must possess at least a master's or equiv. in C/S or rltd. field & at least 3 yrs of work exp. w/ comp. systems. In the alt., a bachelor's degree or equiv. in C/S or rltd. field & at least 5 yrs of prog. work exp. w/ comp. systems is acceptable. Must also have exp. w/ tech. comp. i/c SharePoint server, workflow, webparts & 3rd party sys. integrations; info. models i/c TOGAF & Business process modeling; logical comp. that includes logical data, service & tech. model; topology & environments using Microsoft tech.; & Cloud computing concepts & solutions i/c Office 365 & Azure. Must also demonstrate following knowledge/capabilities: collaboration platforms i/c Microsoft SharePoint; operatingsystems i/c Windows 10.x & Windows Server; sys. security measures i/c integrated windows authn., 2 form authn. & biometric challenges; d/b mgmt. platforms i/c Oracle & Microsoft SQL; web platforms i/c Microsoft IIS; business intelligence tools i/c Microsoft BI stack; hdw. processes such as Infrastructure/Platforms-as-a-service; & communicating tech. info. to lay persons, especially in mgmt. Forward resume to Wynn B. Schoolnik, President, KardasLarson, 2842 Main Street, Suite 117, Glastonbury, CT06033.

Job Name **48910**
Position Title **Project Manager**
Location(s) **Morrisville, North Carolina, United States**
Description
Project Manager (Morrisville, NC and unanticipated locations throughout the US) (Multiple Positions)– Develop and manage the Work Breakdown Structure (WBS) of information technology projects. Develop or update project plans for Information technology projects including information such as project objectives, technologies, systems, information specification, schedules, funding's and staffing. Travel required to unanticipated locations throughout the US. Send resumes to: Recruitment, SunTechPros, Inc., 5920 S. Miami Blvd, Suite 205-B, Morrisville, NC 27560 or apply at www.suntechpros.com. Must reference Project Manager position.

Job Name **ORA02518**
Position Title **Technical Analyst-Support**
Location(s) **Redwood Shores, California, United States**
Description
Technical Analyst-Support position available at Oracle America, Inc. in Redwood Shores, CA. Analyze user rqmnts, procedures and problems to automate or improve existing sys. and review comp. sys. capabilities, workflow and scheduling limitations. Resolve tech issues re: use of and troubleshooting of Oracle software products. Deliver support and solutions to Oracle customer base while serving as an advocate for customer needs. Function as primary point of contact for customers. Resolve tech problems related to the installation, configuration, implementation, recommend maintenance and use of Oracle products. Apply knowledge and understanding of all Oracle products in their competencies and in-depth knowledge of several products and/or platforms in all instances incl. a complete down production scenario. Apply in-depth exp. in multiple platforms and be able to complete assigned duties. Research and develop solutions to customer issues. Create fully reproducible test cases and contribute to the Knowledge Manager database. Multi-task several deadline driven issues concurrently. Requires Master's degree in Comp. Sci., Engin., Business or in a related tech field plus 2 yrs of work exp. in job offered or in a computer-related occupation. Exp. must include 1) identifying, analyzing, and resolving tech problems related to comp. software sys. With regards to Oracle Forms and Oracle Reports (now incorporated within Oracle Fusion Middleware software products); 2) installing, configuring, troubleshooting, writing test cases, and writing documents for software products; 3) setting up test cases, analyzing data setups, applying patches and finding workaround solutions; 4) performing network, Unix and Windows administration; 5) Oracle Application Server products; and 6) provide tech training and mentoring to tech staff. Exp. may be gained concurrently. May telecommute from home. 8:00AM – 5:00PM, Mon-Fri; $90,389.00 to $111,448 / year, stndrd company benefits. To apply, submit resumes to: Recruitment and Employment Office, Oracle America, Inc., Attn: Job Ref #: ORA02518, P.O. Box 56625, Atlanta, GA 30343.

Job Name **48850**
Position Title **Senior Test Automation Engineer**
Location(s) **Morrisville, North Carolina, United States**
Description
Senior Test Automation Engineer (Morrisville, NC and various unanticipated locations through the US) (Multiple Positions) – Support Automation Test Script development and execution for the testing on regression, functional and any automated testing needs. Travel Required to various unanticipated worksites throughout the US. Send resumes to: Recruitment, SunTechPros, Inc., 5920 S. Miami Blvd, Suite 205-B, Morrisville, NC 27560 or apply at www.suntechpros.com. Must reference Senior Test Automation Engineer position.

CLICK HERE FOR MORE

Business Continuity Planning Software: Two Features You Must Use to Achieve Resiliency

By Brandon Tanner, senior manager at Rentsys Recovery Services

The business continuity and disaster recovery (BC/DR) software market is flooded with business continuity management software that can all perform roughly the same tasks. As a business, this can be in your favor due to supply and demand paving the way for better prices and enhanced competitive features.

However, with so many options, it can be overwhelming to sort through the available software until you find one that suits your company. The effort is well worth it — software is more effective than static planning templates when it comes to ensuring business resiliency. For maximum effectiveness, though, make sure you look for and take advantage of these two functions.

A Continuous BIA

A business impact analysis (BIA) is necessary to establish parameters within your organization so that if there were an incident, you can better estimate what solutions are required to keep your business operational.

A continuous BIA can be updated regularly so you can ensure compliance with your industry's regulations and maintain a well-developed plan to coincide with your business's growth and expansion. It will retain the data from your last update, never resetting or deleting. The interaction that software provides can far outweigh that of a one-time-use planning template.

How Does a Continuous BIA Keep You Compliant?

No matter the industry, regulations exist to ensure quality, safety and best practices. These guidelines are also associated with large penalties and fees for not meeting minimum compliance requirements. A continuous BIA, unlike simple template forms, allows you to keep your BC/DR plan up-to-date on compliance and government regulations.

By having software that can track the completion of your plan, you are better able to see your progress toward being compliant. Also, because of the control users are given to update and revise continuity goals, you'll be able to easily incorporate new regulations as they arise.

How Does a Continuous BIA Accommodate Growth and Expansion?

Profit and customer growth are universal business goals. To expand their reach into new territories, businesses are constantly evolving along with the trends of their consumers' markets.

By having software that can track the completion of your plan, you are better able to see your progress toward being compliant.

These expansions could mean new software applications, upgraded tools and equipment or even an increase in employees. To keep up with the movement of your business and maintain a well-developed and up-to-date BC/DR plan, having the capability to continually update your business's BIA is crucial.

Business continuity manager software that includes an adaptable and accessible BIA provides the most effective impact on preparing and implementing your BC/DR plan. At a minimum, you should update your BIA once a year.

Dependency Mapping

Process dependency mapping involves creating a blueprint of all critical business processes and assessing how they're interrelated. For example, at a high level, payroll depends on time tracking and benefits.

Involving multiple business units in the dependency mapping process is key. This is because IT's perception of what processes are critical to the business doesn't always align with what other business units consider their essential processes and resources.

How Granular Does Process Dependency Mapping Need to Be?

By familiarizing yourself with the sophisticated inner workings of your business infrastructure, you can better gauge your most critical dependencies, your vulnerabilities and the costs associated with downtime at a departmental level. This comprehensive look into your organization can expose not only the weaknesses within your walls but also opportunities for improvement. But how granular should your dependency mapping be?

It's easy to identify certain dependencies, such as specialized employees or exclusive vendors, because they stand alone. Unfortunately, it's harder to sequence critical dependencies such as information systems, software and applications, which can vary departmentally.

For an effective dependency map, you need to recognize your critical processes and identify the resources required to support those processes. Then scale these resources from most to least crucial for survival. Key resources could include:

- Vendors
- Personnel
- Hardware
- Information systems
- Applications

When analyzing where to scale critical business software and application systems, determine who is using them, how often and at what locations.

How Does Dependency Mapping Get IT and Other Business Units on the Same Page?

The IT department and the rest of the business units comprising your organization are two completely different, yet equally valuable, sides of your organization speaking two different languages: technology and business. It can be hard at times to fully justify a need or difficulty to one another.

Process dependency mapping visually breaks down what your IT department sees, helping management better understand any difficulties that arise in ensuring the availability of critical resources. Similarly, IT can gain a better understanding of why certain software and applications are critical to the business.

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ABOUT THE AUTHOR

Brandon Tanner *is a successful entrepreneur with a technology background that spans software, hardware and service solutions for financial institutions and other regulated industries. He is the senior manager for Rentsys and its sister organization, UK-based ITS. In his role, he is the key, driving force behind both companies' business continuity and disaster recovery products and services, including the next generation of cloud and recovery products, BlackCloud and BlackVault Managed Recovery Platform. The combination of Brandon's technology and regulatory expertise has led to several innovative cloud strategies that have helped customers maintain compliance more cost-effectively.*

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5 Steps to Maximizing Meeting and Event ROI

By Mark A. Vickers

Businesses invest heavily in meetings and events; yet often have no concrete plan to help increase their return on investment.

Research compiled by PriceWaterHouseCoopers for 2012 looked at meetings or events that:

- were at least 4 hours long
- had 10 or more attendees
- were held in rented venues

and determined that there were:

- 1.8 million meetings
- 225 million attendees
- $280 billion in costs

Add to this the meetings and events held at corporate facilities plus salaries for all attendees, and the total cost of meetings and events easily exceeds a half trillion dollars annually.

Are you maximizing the ROI for your meetings and events?

A Google search shows thousands of articles on the importance of calculating meeting and event ROI, however, there is little guidance on how to improve event effectiveness.

In order for your next meeting or event to produce a positive ROI your attendees need to leave the event motivated to do something different long-term.

Events like All-Employee Meetings or multi-day conferences require special planning. ROI will be created when you are able to build value for the attendees through a well-defined intent and objectives delivered through clear and compelling presentations.

The Event Presentation Life Cycle

The Event Presentation Life Cycle is a formal process designed to help improve speaker skill and presentation quality therefore improving event effectiveness and ROI.

1. Theme/Topic Selection

The first step in preparing a high value event is to determine the main objective, theme, and desired results of the event. Once the theme of the event has been identified, topic selection and sequencing can begin.

Topics should be sequenced to build on previous topics, creating a storyline that runs through the event. By utilizing a variety of presentation styles and audience interactions, audience engagement will be further supported.

Never underestimate the importance of this step, as poor topic selection and sequencing will result in a disjointed program, a loss of audience engagement and reduced ROI.

2. Speaker Assignment

Selecting who will be addressing your participants is often the most important set of decisions impacting the ROI of your event.

Each speaker has various characteristics that will impact the energy, flow and effectiveness including:

- Area of expertise
- Area of passion
- Energy level
- Presentation skill level
- Creativity and theatrical ability
- Ability to motivate vs. train

Caution: Don't make the mistake of assigning topics solely based on job title or role within the organization versus who is going to be most effective.

As part of your speaker selection process, you may consider hiring external speakers to add content expertise to your event. While this expertise is valuable, it can create additional risk.

Through awareness and mitigation of three primary risks associated with hiring external speakers you should protect your ROI.

#1 - Inconsistent Messaging

In step 1 above, you defined intent and desired result. A quality external speaker should always begin their discussions with you by learning your intent and objectives. Depending on the situation the external speaker will also offer to mold their message to your intent.

In the early stages of working with a potential keynote speaker make sure:

- They understand your intent and audience
- You receive a detailed outline of their content

Keynote Speaker Risk #2 - Lack of Control

You might assume that since you are paying for a speaker that you have control over the delivery of the message. However, when you put them on stage, they are in control.

To avoid issues during your event, make sure you discuss particulars related to:

- Information or stories that are not desirable or appropriate
- Reference to external organizations or resources
- Sale or promotion of products or services

High quality professional speakers should pose minimal risks to your event but your job is to make sure nothing unexpected is said from the stage.

Keynote Speaker Risk #3 - Upstaging Your Staff

Corporate executives are typically involved in presenting the majority of the information that is critical for your audience to hear. These executives are qualified in their field, but they do not possess the experience and skills of your external speaker.

Your external speaker will deliver their specialized content as a polished, powerful and dynamic presentation. The quality of the presentation inadvertently upstages your executives, highlighting the skill level difference and diminishing the value of the message delivered by your own team.

You can mitigate the "Upstaging Risk" by creatively scheduling your external speakers to minimize comparisons and by following the rest of the Event Presentation Life Cycle Process to improve the quality of all other presentations.

3. Speaker Coaching

Regardless of the skill level of the speakers you are putting in front of your audience, formalized speech and presentation coaching will help ensure clear, consistent messaging.

By supporting your speakers with a professional speaking coach who is intimately aware of your intent and objectives, you will create an environment that helps prepare each speaker for maximum effectiveness and impact.

Your event speaking coach will work with each speaker focusing on:

- Intent of the talk
- The key point of the talk
- Stories to be used
- Wording and transitions
- Creating an engaging opening
- Crafting a powerful close and transition to the next speaker
- Determining staging and presentation elements

By combining structured coaching with a defined and monitored practice and rehearsal plan, you equip your speakers for maximum impact.

4. Objective Assessment

When it comes to presentation effectiveness, a common mistake made by executives is to rely on anecdotal feedback from staff and coworkers instead of objective feedback.

The use of a structured and objective assessment tool will provide a baseline for ongoing speaker development and a baseline for continual improvement.

A formalized, objective assessment should be based around three main categories including:

- Content
- Vocal Delivery
- Presentation style and engagement

The objective results, combined with subjective feedback like audience engagement and survey results provide a framework for an action plan for future improvement.

5. Coaching Review

The final step in the Event Presentation Life Cycle is the Coaching Review. Your corporate speakers should receive feedback from an expert trained in reviewing presentations incorporating the objective assessment, subjective feedback, and a review of audio or video of the event when available.

The review should focus on the following items:

- Content delivery
- Message effectiveness
- Presentation style

The coaching review and the action plan are then used as the basis for coaching the presentations for the next event.

Through this defined process, not only will you improve your current event, but you will lay the foundation and establish the process for continual Event ROI improvement.

ABOUT THE AUTHOR

Mark A. Vickers *is a Certified Professional Coach, and Certified World Class Speaking Coach. Mark is a communications consultant focused on helping you and your organization improve performance through improved communication and speaking skills. He is known as a creative author and speaker, and for creating the Communications Challenge, an objective way to measure communication effectiveness. For more information about Mark and his programs, please visit:* http://speakingisselling.com/

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The Changing Face of IT Security

By Benny Czarny, CEO and Founder, OPSWAT

As the IT security landscape continues growing and changing rapidly, Benny Czarny, CEO and Founder of OPSWAT, shares his thoughts on the current state of the industry, and what he expects to see in the future.

Protect and Prevent is just as important today as it was 10 years ago

Because traditional protection and prevention methods are not able to detect 100% of threats 100% of the time, the last decade has seen the industry expand to include more technologies focusing on the detection and mitigation of threats. Some companies are choosing to distance themselves from traditional solutions and while we are seeing more marketing around detection and mitigation, it simply cannot replace protection and prevention; the methods must be used in parallel. As an industry we can't suddenly just abandon the protection and prevention methods. If we do, the amount of detection and mitigation to do on any network would be staggering.

Security Expectations Have Changed with the Advent of BYOD

At this point in the data security environment most people are aware that a single installed antivirus system is not enough to protect a given endpoint. Ten years ago, IT security companies were more confident that their single security system would be able to prevent all types of viruses and malware that could pose a threat to the company. Today there is less expectation for IT teams to prevent all threats, with the responsibility of protecting the organisation's cyber security much more on the individual than the IT security pros. BYOD (Bring Your Own Device) is one such example of this shift in responsibility. Ten years ago, BYOD was nowhere near as popular as it is today. We are now the managers of our own devices and, as such, the responsibility for the security of these devices is more on the individuals. The responsibility of IT Security will take on more of a central role, with solutions that provide IT Administrators with central visibility of BYOD and unmanaged devices becoming more important.

Antivirus is not dead

Despite many reports to the contrary, antivirus is definitely not dead. Traditional forms of antivirus are still highly effective at detecting known threats, which continue to be a big problem. If we were to remove all antivirus technologies from all machines, the amount of outbreaks would be catastrophic. We will however see a rise in the use of multiple antivirus engines in order to increase detection rates and thwart attempts to bypass certain antivirus vendors.

The traditional staples of security are still necessary investments for CIO's

Web security, email security and antivirus form the staples of security for all organisations and are just as relevant today for CIO's as they have been in the past. What we are seeing now though is a change in how the CIO's budget is allocated for these technologies. One trend we are seeing is antivirus technologies being included for free; for example the latest Exchange server and Office 365 both come with basic security features that may be sufficient for some CIO's. Looking back 10 years ago, antivirus was not included in most operating systems and therefore organisations had to invest separately in those types of technologies. With typical networks now being made up of roughly 50% Windows, 30% Mac and 20% other BYOD—the homogenous corporate network is largely a thing of the past, so while it is still necessary for the investment of these traditional staples to be there, it just may not be to the magnitude that we have seen in the past.

As an industry we can't suddenly just abandon the protection and prevention methods. If we do, the amount of detection and mitigation to do on any network would be staggering.

IT security providers need to be more innovative to be successful

With traditional security measures becoming more commonplace, and in many cases free, IT security providers need to remain innovative in order to achieve success. Companies that are able to develop innovative technologies will continue to grow and expand the number of organisations adopting their technologies.

High-profile hacks should be used to inspire improvement

The industry has been bombarded with high-profile attacks, over the last 2 years especially. Attacks like the Sony leak serve to emphasize that security systems are still a vital aspect for every organisation. With no single security solution being enough to address all attacks, it has also raised awareness about the importance of defence-in-depth. By emphasising the weaker points within the industry, it serves as inspiration for the market and global IT governance to lift their game and continue improvements across the board.

No system can ever be completely secure

But that doesn't mean we should stop trying! There is always something: a machine being hacked or an employee targeted to exploit a process or human behaviour. As an industry we need to focus more on how to reduce those risks and mitigate them to the lowest point possible.

Targeted attacks will continue to increase over the coming years

Fuelled by an increase in cheap tools to create malware as well as the plethora of personal information that can be found online, we are already beginning to see an influx in targeted attacks which will only continue to grow in the coming years. We should also expect more web security threats, data security threats and mobile attacks, with security companies themselves being targeted more frequently. Attacks on critical infrastructure, such as financial systems and power stations, will also rise.

With the IT industry constantly changing and evolving, it is vital for everyone within the industry to stay ahead of the game in order to prevent hackers from gaining further ground. By using the past as a guide, but continuing to look to the future, everyone from industry experts to end users will be able to keep themselves as safe as possible.

ABOUT THE AUTHOR

Benny Czarny is the Founder and Chief Executive Officer at OPSWAT. As CEO, Benny oversees OPSWAT's day-to-day-operations, as well as leading the company's overall business strategy. Benny has over 20 years of experience in the Computer and Network Security field. From the early days of computer viruses he was interested and involved in the fields of encryption, network operations, security vulnerabilities detection and research. He worked as a programmer, team leader and engineering manager in several companies before founding OPSWAT in 2002. Benny earned a Bachelor's degree in Computer Science from the Technion-Israel Institute of Technology.

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Envisioning the future of Moore's Law, More than Moore & Beyond Moore for Global Semiconductor Industry - Part I

By Apek Mulay, Mulay's Consulting Services

In a presentation by International Technology Roadmap for Semiconductors (ITRS) Chair, Mr. Paolo Gargini, entitled *'ITRS: Past, Present and Future'* published in February 2015, Mr. Gargini has laid out a roadmap for global semiconductor industry for years to come. The ITRS Chair, who is also an IEEE fellow, takes us on a journey of progress of semiconductor industry driven by the progress of Moore's Law from 1959 until recent years.

In 1965, Intel co-founder Gordon Moore, in *"Cramming more components onto integrated circuits"* in Electronics Magazine (April 19, 1965), made the observation that, in the history of computing hardware, the number of transistors on integrated circuits doubles approximately every two years. This law is now used in the semiconductor industry to guide long-term planning and to set targets for research and development.

The capabilities (processing speed, memory capacity, sensors) of many digital electronic devices have been improving at roughly exponential rates and are, thereby, strongly linked to Moore's law. This exponential technological improvement in the electronic devices has dramatically enhanced the impact of digital electronics in nearly every segment of the world economy. Indeed, Moore's law has been behind the technological advancements and socio-economic developments in the late twentieth and early twenty-first centuries.

From International Electron Device Meeting (IEDM) held on December 1975 to Micro Tech 2000 Workshop held in 1991, Moore's Law has been the driver behind the R&D initiatives of the Semiconductor Industry Association (SIA). The most significant trend in this progress of Moore's Law has been the decreasing cost-per-function, which has led to significant improvements in economic productivity and overall quality of life through proliferation of computers, communication, and other industrial and consumer electronics. It was the SIA that initiated the National Technology Roadmap for Semiconductors (NTRS) in 1992 with a basic premise that that continued scaling of electronics would further reduce the cost per function and promote market growth for integrated circuits.

As time progressed, SIA was joined by corresponding industry associations in Europe, Japan, South Korea, and Taiwan to participate in a 1998 update of the Roadmap and to begin work toward the first International Technology Roadmap for Semiconductors (ITRS), published in 1999. The overall objective of the ITRS is to present industry-wide consensus on the "best current estimate" of the industry's R&D needs out to a 15-year horizon. Now, There are more developing economies, such as India and China, about to join the ITRS to drive the progress of Moore's Law as well as to have a larger viable domestic semiconductor industry that provides good paying jobs in their respective economies. In this way, The ITRS has provided a platform to improve the quality of R&D investment decisions made at all levels and has thus helped channel research efforts to areas that most need research breakthroughs.

The 2010 update to the ITRS had growth slowing at the end of 2013, after which transistor counts and densities are to double only every three years. Accordingly, since 2007 the ITRS had addressed the concept of functional diversification under the title *"More than Moore"* (MtM). This concept addressed as an emerging category of devices that incorporate functionalities that do not necessarily scale according to *"Moore's Law,"* but provide additional value to the end customer in different ways. The MtM approach includes the non-digital functionalities (e.g., RF communication, power control, passive components, sensors, actuators) to migrate from the system board-level into a particular package-level (SiP) or chip-level (SoC) system solution. ITRS also hopes that by 2020, it will be possible to augment the technology of constructing integrated circuits (CMOS) by introducing new devices that will realize some *"beyond CMOS"* capabilities. System on Chip (SoC) and System in Package (SiP) technologies are expected to provide a path for continued improvement in performance, power, cost and size at the system level without relying upon

conventional CMOS scaling alone. System in Package (SiP) technology is rapidly evolving from specialty technology used in a narrow set of applications to a high volume technology with wide ranging impact on electronics markets.

Moore's law has had an amazing run for the past several decades with an unmeasured economic impact on the US semiconductor industry. The progress of Moore's law has even transformed the business model of the US semiconductor industry and continues to do so. It is an open secret that, for a variety of reasons, the U.S. manufacturing base has sharply deteriorated over the past three decades, and the US semiconductor industry is no exception to this trend. In fact, this industry may have suffered harder than some other American enterprises. Other nations imported technology from gullible American companies, and, with their low real wages, out-competed U.S. firms all over the world. The rest is history. By now many American industries have disappeared, while most others have shrunk, resulting in a loss of jobs and stagnant wages. When The Great Recession struck in 2007, the lingering weakness of the American economy, so far ignored by experts and the government, came to the surface.

By now many American industries have disappeared, while most others have shrunk, resulting in a loss of jobs and stagnant wages.

Now the immense problems such as lack of skilled workforce, youth unemployment, huge capital investments, unsustainable trade and budget deficits, as well as manufacturing complexities, are contributing to a bankruptcy of economic wisdom and are making it difficult to sustain Moore's law and maintain its economic impact on the semiconductor industry. There is, hence, an urgent need for new ideas to deal constructively with these business and economic issues affecting the very survival of the semiconductor industry and the resulting knowledge based economy. With this in mind, ITRS has incorporated *More than Moore and Radio Frequency (RF) / Analog Mixed Signal (AMS)* chapters in the main body of the ITRS. While ITRS is uncertain as to whether this would be sufficient to encompass the plethora of associated technologies now entangled into modern products, ITRS believes that the multi-faceted public consumer has become an influential driver of the semiconductor industry through an ever increasing demand of custom functionality in commercial electronic products. In other words, the ITRS has realized that the forces driving the supply of silicon for Moore's Law can only be sustained as long as there is an economic demand for them. However, ITRS my research showed that ITRS has not yet proposed any solution as to what the semiconductor industry could do in order to sustain the consumer demand for its products.

The following are the conclusions that ITRS has arrived in their February 2015 meeting-

1. It was *'Geometrical Scaling'* that has led the Semiconductor Industry for three decades.

2. A co-operative and distributive research and manufacturing methodology are a cost-effective means of reducing cost.

3. Organizations like Focus Center Research Program (FCRP), National Research Institute (NRI), SEmionductor MAnufacturing TEchnology (SEMATECH), International Medical Equipment Collaborative (IMEC) and other government organizations have actively co-operated in Advanced Research.

4. It was *'Equivalent Scaling'* that has saved the Semiconductor Industry since the beginning of the previous decade and International Technical Working Group (ITWG) has brought new ideas through international collaboration.

5. The shipments of cell phones and Tablets surpassed PCs in 2010 showing a growing trend towards handheld and portable electronics as compared to PCs.

6. New Architectures have been proposed post CMOS devices to drive the progress of Moore's Law such as 3D scaling, FinFET Scaling, Nanowire/Tunnel FET, etc.

7. The incubation time for any new technological driver is approximately 12 to 15 years.

ITRS also proposes a business model for 2020 and beyond which appears to be very similar to the Integrated Device Manufacturer (IDM) Business Model of the 70s. This

proposal aims to is based on being able to have sufficient capital and deeper collaboration between different *MtM* and *Beyond Moore* drivers when it comes to system integration. There are several new drivers put forth by ITRS for 2020 and beyond as shown in the Figure 1-1 below.

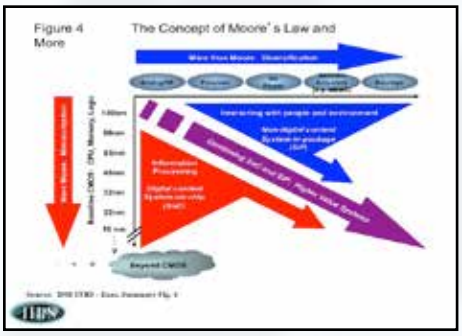

Figure 1-1: More than Moore and Beyond Moore drivers. Source: 2011 ITRS Executive Summary Fig. 4

In addition to the above drivers, ITRS has also provided an assessment of various driving forces for MtM and Beyond Moore while ushering 4th Industrial Revolution in form of Internet of Things as shown in Figure 1-2 below.

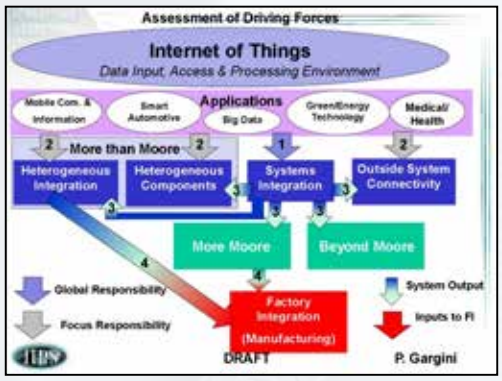

Figure 1-2: An assessment of driving forced for Industry 4.0 through More than Moore and Beyond Moore drivers. Source: ITRS, Feb 2015.

In Part II of this paper, we shall discuss where the semiconductor industry stands as of today and whether ITRS has missed anything in its analysis. Additionally, we shall also look into how to envision these ideas for More than Moore and Beyond Moore in Part III.

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Apek Mulay is Business and Technology Consultant at Mulay's Consultancy Services. He is also a senior analyst and macroeconomist in US Semiconductor Industry. He is author of book Mass Capitalism: A Blueprint for Economic Revival. Mulay has also authored another book Sustaining Moore's Law: Uncertainty Leading to a Certainty of IoT Revolution with Morgan & Claypool publishers. He pursued undergraduate studies in Electronics Engineering (EE) at the University of Mumbai in India and has completed master's degree in EE at Texas Tech University, Lubbock. Mulay authored a patent "Surface Imaging with Materials Identified by Colors" during his employment in Advanced CMOS technology development team at Texas Instruments Inc. He has also chaired technical sessions at International Symposium for Testing and Failure Analysis (ISTFA) for consecutive years. USCIS approved his US permanent residency under the category of foreign nationals with extraordinary abilities in science and technologies even though he did not pursue a PhD degree in engineering or economics. He has been cited as an 'Engineer-cum-Economist' by superstar economist Professor Ravi Batra in his 2015 Volume 'End Unemployment Now: How to Eliminate Poverty, Debt and Joblessness despite Congress'. He has appeared on National Radio shows, made Cover Story for Industry Magazines, authors articles for newspapers as well as several reputed blogs & industry publications, as well as has been invited on several Television shows (because of his accurate macroeconomic forecasts) for his ideas about Mass Capitalism. He is also an investing partner in an ecommerce business Calcuttahandicraft.in which he started to envision his ideas about Mass Capitalism. www.ApekMulay.com

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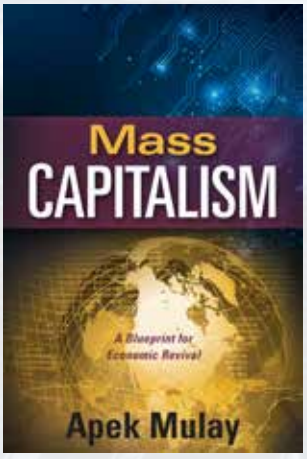

1. *"offers hope for embattled US economy"- Dr. Stanley Wolf*
2. *"an intriguing solution for semiconductor industry" - Dr. Kris Iniewski*
3. *"quite extra-ordinary" - Peter Gasperini*
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