Capacity Management
For Your Entire Infrastructure
Physical, Virtual & Cloud
Computer History 101

- When was the first computer invented?
  - Some people say it was the abacus around 500BC.
That’s One Big Machine!

- The first mechanical computer was created by Charles Babbage in 1822.
- The Difference Engine was capable of computing several sets of numbers and making hard copies of the results.
Here Comes the Z1

- The first programmable computer was created by Konrad Zuse in his parents living room between 1936 and 1939 called the Z1.
- It is considered to be the first electro-mechanical binary programmable computer.
Who Knew?

- The first Digital computer was invented by John Vincent Atanasoff and Cliff Berry in 1937.
- The computer was named ABC for Antanasoff, Berry, Computer.
- It was the first computer to use vacuum tubes and included binary math and boolean logic. It had no CPU.
The ENIAC began construction in 1943 and was completed in 1946 by J. Presper Eckert & John Mauchly.

ENIAC weight over 50 tons had more than 18,000 vacuum tubes.

A judge ruled the ABC to be the first computer, the ENIAC is considered to be the first real digital computer because it was fully functional.
Mainframe Computers

- In 1949 Electronic Control Company was founded.
- The company was renamed EMCC and sold mainframe computers under the name of UNIVAC.
• IBM introduced their first computer the 701 Scientific Computer in 1953.

• MIT introduced the Whirlwind machine in 1955. It was the first revolutionary computer with magnetic core RAM.
Those Smart Guys at MIT

- The first transistor computer was introduced in 1956 by MIT.
- Digital Equipment Corporation released the PDP-1 in 1960, the first MINI computer.
$1,750 in 1973

- The first workstation was sold in 1974 the Xerox Alto. It included a functional computer, display and a mouse.
- In 1973 the first Micro-Computer was sold for $1,750. It had a 8008 Intel processor.
- In 1975 Ed Roberts coined the term “Personal Computer” with the introduction of the Altair 8800.
  - It relied on a series of switch's for inputting data.
Can You Really Call a 55lb Machine “Portable?”

- The IBM 5100 was the first portable or laptop computer.
- It was introduced by IBM in 1975.
- The computer weighed 55 pounds, had a 5” CRT display, a tape drive and 64KB of RAM.
I Have to Buy WHAT to Make It Work?

- In 1976 the first Apple I computer was sold as a kit for $666.66.
- It had a 6502 8-bit processor, 4KB of memory expandable to 48KB.
- The kit required a power supply, display, keyboard and a case to be operational.
Everyone's Getting Personal

- In 1981, the Osborne I was released.
- IBM released its first PC the Acorn.
- In 1982 Sun Microsystems was founded later to be sold to Oracle in 2010.
- Compaq Portable was released in 1983 and is considered to be the first PC Clone.
- In 1984 IBM released a portable computer that weighed 30 pounds.
- Dell was introduced in 1985.
My how things have changed...
# Capacity Management Technology

<table>
<thead>
<tr>
<th>TECHNOLOGY TYPES</th>
<th>TIME IT TAKES TO USE</th>
<th>CAPACITY PLANNING ACCURACY</th>
<th>AUTOMATED CAPACITY PLANNING</th>
<th>SCALABILITY (10s - 1,000s OF SERVERS)</th>
<th>ANSWERS</th>
<th>SIMPLIFIED COMPREHENSIVE REPORTING</th>
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<tbody>
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<td>PERFORMANCE MONITORING</td>
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<td>-</td>
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<td>1000s</td>
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<td>ADDITIVE RESOURCE ALLOCATION</td>
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<td>-</td>
<td>+</td>
<td>1000s</td>
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<td>-</td>
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<tr>
<td>SIMULATION MODELING</td>
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<td>+</td>
<td>-</td>
<td>10s</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>ANALYTIC MODELING (W/O AUTOMATION)</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>10s</td>
<td>+</td>
<td>-</td>
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<tr>
<td>AUTOMATED ANALYTIC MODELING</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>1000s</td>
<td>+</td>
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</table>
IT Maturity Assessment

**Level 1: Chaotic**
- Ad hoc
- Notifications via user calls
- No centralized help desk
- No infrastructure management

**Level 2: Reactive**
- Component view
- Firefighting
- Alert & event monitoring
- Formalized incident reporting
- Siloed responsibility for technology

**Level 3: Proactive**
- Workload view
- Predict, prevent performance problems
- Trending
- Availability management
- Standardized toolset across technologies

**Level 4: Service**
- Service view
- Monitor & report on services
- Service level agreements
- Scenario-based capacity planning
- Influence usage through chargeback

**Level 5: Value**
- Business process view
- Link IT services to business processes
- Report in business terms
- Measure process efficiency & effectiveness
- Weigh costs against benefits & risks
- Continuous service improvement
The State of Enterprise IT Maturity in 2016

- Conducting business in chaos
- Experiencing cloud outages
- Avoidable with more mature processes and understanding of health and risk
### IT Service Optimization Self-Assessment

On a scale from 1-5, where would you rate your organization’s current IT optimization processes?

<table>
<thead>
<tr>
<th></th>
<th>3%</th>
<th>13%</th>
<th>31%</th>
<th>36%</th>
<th>17%</th>
</tr>
</thead>
</table>

1 (least mature): Any efforts to improve service quality is usually triggered by incidents brought to our attention by users or customers complaining.

2: Alerts are deployed as specified thresholds are crossed. We are then able to address incidents quickly and consistently.

3: My organization uses past and incoming data to uncover incident patterns.

4: We bolster decision making by asking hypothetical questions and conducting various “what-if” scenarios.

5 (most mature): My organization has the ability to optimize operations via proactive, automated actions. Every solution is embedded with a profound understanding of business goals and their relationship to its online services.
IT Service Optimization Maturity Assessment Scores

- Chaotic: 56%
- Reactive: 16%
- Proactive: 14%
- Value: 13%
- Service: 1%

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IT departments deal with an average of 6 IT fires each week.

To mitigate, each IT fire takes...

3 hours & 16 minutes

8 staff members
Capacity Management Challenges

- Hours and hours sifting through reports / spreadsheets.
- Where are those under / over utilized resources, on premise or in cloud?
- No health and risk indicators.
- How do I identify and avoid risk?
- No reliable or consistent data.
Capacity Management Should Provide

- Application and Service Visibility
- Out-of-the-Box Analysis & Intelligent Reporting
- Advance Analytics for “What If” Analysis
- Automated Reporting
Health & Risk

- **Automated** - Automatically evaluate thousands of metrics across physical machines, virtual machines, and cloud images.

- **Simplicity** – IT Staff and Service Managers easy to understand single indicators for health & risk and in a second know where to focus.

- **Accuracy Matters** – Algorithms and calculations precision are hugely important.

**Performance Management**
- Identify and resolve performance issues

**Capacity Planning**
- Predict when capacity upgrades/infrastructure is required for service delivery
### Service or Application Watchlist

#### Vityl Adviser Service Watchlists

**Status**
- Unhealthy Services
- All-Risk Services

**Messages**
- Jeffs
  - Feb 9
  - We just started using Vityl Adviser. Now we will be able to react well before we have current risk. My job is going to be fun again!
- Jeffs
  - Feb 9
  - Clm19&20 are virtual systems. The Loans service has been steadily growing. I asked the VMware admin team to add more vCPUs this weekend.
- Johnn
  - Feb 9
  - I see that many of the systems in the Loans service have remediation plans in place but not clm19&20. I asked Jeff to look at these.
- Johnn
  - Feb 9
  - I see that the Loans service is a risk currently. I am investigating this.

#### Service Watchlists

<table>
<thead>
<tr>
<th>Name</th>
<th>risk</th>
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<th>2</th>
<th>3</th>
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<td>3</td>
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<tr>
<td>Personal Banking</td>
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<td>0</td>
<td>3</td>
<td></td>
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<td>Shopping Cart</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>4</td>
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</table>
Shopping Cart Service – Health and Risk

![Shopping Cart Service Diagram](image-url)

- **Unhealthy Services**: 2
- **At-Risk Services**: 3
- **Min Days to Risk**: 0
- **Total Services**: 4

**Service Health**

<table>
<thead>
<tr>
<th>Service</th>
<th>Health History</th>
<th>Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>AppSrv</td>
<td></td>
<td>98</td>
</tr>
<tr>
<td>DataSrv</td>
<td></td>
<td></td>
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<tr>
<td>WebSrv</td>
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<td>54</td>
</tr>
<tr>
<td>AWS</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

**Messages**

- **Jeffs**: February 9th
  - We just started using Viti Adviser. Now we will be able to react well before we have current risk. My job is going to be fun again.

- **Jeffs**: February 9th
  - Clr19&20 are virtual systems. The Loans service has been steadily growing. I asked the VMware admin team to add more vCPUs this weekend.

- **johnn**: February 9th
  - I see that many of the systems in the Loans service are taking a bit longer to respond.
The **Service Health** section displays current and historical health scores for each service in the watchlist. Health is an indication of service performance.

The **Health History** graph displays the health score over the past 30 days. The last point on the graph is the current health score.

- Healthy with score from 55 - 100
- Warning with score from 45-54
- Unhealthy with score from 0 - 44

**Health** is the lowest health score for any system on the watchlist.

For more information, see [Investigating Service Health and Risk](#).

The **Service Risk** section displays predicted risk scores for each service in the watchlist. Risk is an indication of how services are predicted to perform.

The **Risk Prediction** graph displays the predicted risk score for the next 6 months. It is calculated based on the subsystem that has the soonest Days To Risk.

- Low risk with score from 0 - 45
- Warning with score 46 - 55
- High risk with score 56 - 100

**Risk** is the worst risk score for the system for the next 6 months.

**Days to Risk** is the minimum number of days until the worst system in the service is predicted to be at risk.

For more information, see [Investigating Service Health and Risk](#).
# Shopping Cart – DataSrv Tier

<table>
<thead>
<tr>
<th>System</th>
<th>Health History</th>
<th>Health</th>
<th>Risk Prediction</th>
<th>Risk</th>
<th>Days To Risk</th>
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### WebSvc

<table>
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### AWS

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<th>Days To Risk</th>
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### AppSvc

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<tbody>
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### DataSvc

<table>
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<tr>
<th>System</th>
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<th>Risk Prediction</th>
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<th>Days To Risk</th>
<th>Date of Risk</th>
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<table>
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<th>Health</th>
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<tbody>
<tr>
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### System Risk

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<td>SALESCLW5</td>
<td>49</td>
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</table>
Database Tier – Health Profile
How to Model the Shopping Cart Application

BEFORE

- Unexpected rise in resource utilization!
- Unanticipated workload growth!
- Missed Service Levels!

AFTER

- Accommodate forecasted changes in your business
- Identify and repurpose underutilized servers
- Provide consistent service from applications
- Provision new applications
## Systems for Shopping Cart Model

<table>
<thead>
<tr>
<th>Physical System Name</th>
<th>System Type</th>
<th>System Model</th>
<th>Logical System Name</th>
<th>OS Type</th>
<th>System Settings</th>
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<tbody>
<tr>
<td>1</td>
<td>LINUX_SERIES</td>
<td>Amazon Linux AMI 2015.09 4.1.7-15.23.ami1.x86_64</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>VMWARE_SERIES</td>
<td>VMware ESXi 5.1.0 build-16138005</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>VMWARE_SERIES</td>
<td>Virtual Machine Monitor</td>
<td>clvm19.teamquest.com-vmm</td>
<td>VMWARE_SERIES</td>
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<td>4</td>
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<td>SUSE Linux Enterprise 11 (32-bit)</td>
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<td>Reservation = 0; Limit = 0; Shares = 1000</td>
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<td>Ubuntu Linux (64-bit)</td>
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<td>Ubuntu Linux (64-bit)</td>
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<td>CPUS in Shared Pool = 8</td>
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<td>11</td>
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</tr>
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Multi-Tiered Shopping Cart

Change Systems per Tier

Select Workload

Shopping Cart

Current Number
of Systems
in Tier
New Number
of Systems
in Tier

1 System: SALESCLIv0 2 2
2 System: awoal4.teamquest.com 4 4
3 System: salesclubuntu1 3 3
4 System: salesclair1 2 2

OK
Cancel
Help
## Calibrated Model

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<tr>
<th>System Name</th>
<th>Workload</th>
<th>Measured Population</th>
<th>Measured Response</th>
<th>Measured Throughput</th>
<th>Modeled Throughput</th>
<th>Active Resource</th>
<th>Measured AR %</th>
<th>Modeled AR %</th>
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</thead>
<tbody>
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1. Multi  

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<th>Measured Throughput</th>
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<th>Active Resource</th>
<th>Measured AR %</th>
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Components of Response for Shopping Cart
Stretch factor with Hdisk3 fixed
Components of Response for Shopping Cart
Stretch Factor with 4Qs of Growth
Components of Response for Shopping Cart with Growth
IT Maturity Assessment

**Level 1. Chaotic**
- Ad hoc
- Notifications via user calls
- No centralized help desk
- No infrastructure management

**Level 2. Reactive**
- Component view
- Firefighting
- Alert & event monitoring
- Formalized incident reporting
- Siloed responsibility for technology

**Level 3. Proactive**
- Workload view
- Predict, prevent performance problems
- Trending
- Availability management
- Standardized toolset across technologies

**Level 4. Service**
- Service view
- Monitor & report on services
- Service level agreements
- Scenario-based capacity planning
- Influence usage through chargeback

**Level 5. Value**
- Business process view
- Link IT services to business processes
- Report in business terms
- Measure process efficiency & effectiveness
- Weigh costs against benefits & risks
- Continuous service improvement

Make IT Better.