A New Approach to Hybrid IT Infrastructure Management

VI 2.0 – Cloud Migration Readiness – Wie mache ich die Entscheidung messbar.

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Agenda

- Virtual Instruments – Überblick
- Cloud Migration Readiness (CMR) - Übersicht
- Kunden Beispiel
Who are we?

Founded in 2008, Virtual Instruments is the leading provider of App Centric Infrastructure Performance Management Solutions.

We Re-invent Infrastructure Performance Monitoring around a core understanding of Applications and their relationship to the Infrastructure: App-Centric IPM

Virtual Instruments enables customers, to increase performance, availability, utilisation and drive down risks significantly.

We do this by monitoring the SAN and NAS Infrastructure “Real Time“, using Correlation of 1000s of metrics and our “Intelligent Analytics“ allows the customers to pinpoint every Problem or Performance issue, down to the root cause.

100% successful trackrecord, while executing emergency troubleshooting service

European Customers:
- Coop, Bosch, REWE, Porsche Informatik, Lloyds Bank, Morrisons, Energie AG, IVV...

International Customers:
- Paypal, Salesforce, T-Systems, T-Mobile, LinkedIn, AT&T, Sprint, MetLife, SouthernCompany, E-Trade…..

Technology Partners:
- DellEMC, HPE, Hitachi Vantara, Pure, Nutanix, IBM, NetApp, CISCO, Intel, Oracle….
The Virtual Instruments Hybrid IT Infrastructure Management Platform

- Full Stack, Application-Centric View of Your Infrastructure
- Highly Granular, Heterogeneous, Agentless Monitoring
- Massive Ingest Capability of Both Machine and Wire Data
- Cross-Silo Correlation and Machine Learning-Based Analytics
- Guided Analytics to solve problems /optimize performance

Cloud Migration
- Migration Readiness
- Cost Analysis
- Monitoring and Analytics
Introducing the Virtual Instruments Cloud Migration Readiness (CMR) Service
The Goal of the CMR Service:
Utilize VI Products and IP to provide a more informed cloud migration

Help our customers use performance analytics and cloud simulation to determine which installed workloads can be migrated to which IaaS cloud at what cost while ensuring acceptable performance.

- **VirtualWisdom**: Assure Performance & Uptime, De-risk Changes/Transformations, Optimize Utilization/Costs
- **WorkloadWisdom**: Evaluate Products/Limits, Validate Changes, Align Costs to Performance
- **Cloud Migration**: Migration Readiness, Cost Analysis, Monitoring and Analytics
Cloud Migration Types

- **Rehost ("Lift and Shift")**
  - Application is effectively a clone of the existing data center implementation (simple lift and shift, 1:1 host/vm to cloud vm migration)

- **Refactor**
  - Application is similar to the existing data center implementation, but individual services are replaced with cloud-native services

- **Rearchitect**
  - Significant redesign of the application to make use of cloud services and capabilities

- **Rebuild**
  - Application rewritten to be cloud-native, often using PaaS features

- **Replace**
  - Leverage New SaaS application designed to replace the existing application
Common Lift-and-Shift Migration Risks

• Cloud cost savings are reduced or eliminated by over-provisioned cloud infrastructure

• Cloud performance of migrated applications does not meet service level requirements / on-premise performance

• Dependencies of cloud migrated applications back to on-premise applications impacts cost and performance
CMR answers the key question to help eliminate cloud migration risks

How do you know which workloads to migrate and which to retain in the data center?

How do you choose the most cost effective cloud service providers for your application?

How do you determine if migrated workloads are performing adequately and what you can do if they aren’t?
CMR is broken into four phases

1. **Discovery**
   - Discover workload characteristics and identify dependencies between compute, networking and storage elements.

2. **Profiling**
   - Distillation of hundreds or thousands of workloads into small set of representative synthetic workloads that accurately characterize performance.

3. **Playback**
   - Accurate playback of representative synthetic workloads in the cloud to select cost-optimal configurations and placements without compromising workload performance.

4. **Monitor**
   - Monitor actual workloads post migration to the cloud to identify any unforeseen performance or capacity issues.

Pre-Migration
Post-Migration
CMR Instrumentation and Analytics by Phase

- VirtualWisdom Virtualization & Host Performance Monitoring
- VirtualWisdom Netflow Monitoring

- CMR Workload Profiling Analytics

- CMR Cloud Workload Playback Engine

- VirtualWisdom Cloud Performance Monitoring
Sample Information Captured:

**VM:**
- Memory MB
- # CPU
- # Ethernet Cards
- # Virtual Disks
- OS

**Host**
- Power State
- IP Address
- CPU Mhz
- CPU Model
- Memory

**Datastores**
- Consumed/Available
Sample Application Network Overview – All

<table>
<thead>
<tr>
<th>VMs Traffic</th>
<th>Total Mb/s</th>
<th>VM incoming Mb/s</th>
<th>VM outgoing Mb/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>vm to external</td>
<td>1.26</td>
<td>1.16</td>
<td>0.1</td>
</tr>
<tr>
<td>vm to internal</td>
<td>952.91</td>
<td>187.89</td>
<td>765.02</td>
</tr>
<tr>
<td>vm to vm</td>
<td>8.56</td>
<td>8.56</td>
<td>8.56</td>
</tr>
<tr>
<td>Total Traffic to VMs</td>
<td>962.73</td>
<td>197.61</td>
<td>773.68</td>
</tr>
</tbody>
</table>
Machine learning algorithms are applied across compute, network and storage metrics to categorize VMs into affinity groups and identify representative workloads.

Circles represent different VMs. Each color corresponds to different affinity group.
## CSP Azure Cloud Configuration and Cost

<table>
<thead>
<tr>
<th>VM Name</th>
<th>Azure VM Type</th>
<th>Azure Disk Name</th>
<th>Azure Disk Size</th>
<th>All SIX VMs</th>
<th>Five VMs</th>
<th>Four VMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>EAIPRD01</td>
<td>Standard_DS11_v2</td>
<td>Premium SSD P15</td>
<td>256</td>
<td>$228.10</td>
<td>$228.10</td>
<td>$228.10</td>
</tr>
<tr>
<td>INFX001</td>
<td>Standard_DS13_v2</td>
<td>Premium SSD P40</td>
<td>2048</td>
<td>$1,019.37</td>
<td>$1,019.37</td>
<td>$1,019.37</td>
</tr>
<tr>
<td>ORDB01</td>
<td>Standard D64_v3</td>
<td>*Ultra SSD</td>
<td>4000</td>
<td>$6,152.68</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>CUACC01</td>
<td>Standard_F4s_v2</td>
<td>Standard SSD E10</td>
<td>128</td>
<td>$239.20</td>
<td>$239.20</td>
<td>$239.20</td>
</tr>
<tr>
<td>INFX002</td>
<td>Standard_DS13_v2</td>
<td>Premium SSD P40</td>
<td>2048</td>
<td>$1,019.37</td>
<td>$1,019.37</td>
<td>$1,019.37</td>
</tr>
<tr>
<td>SQL001</td>
<td>Standard DS15_v2</td>
<td>**Premium SSD P50</td>
<td>1024</td>
<td>$2,350.64</td>
<td>$2,350.64</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Network Cost**

- $9,952.85
- $8,447.57
- $355.92

**Monthly Cost**

- $20,962.21
- $13,304.25
- $2,861.96

**Total per year**

- $251,546.47
- $159,651.00
- $34,343.52

* Preview in East US 2
Cloud Workload Playback and Performance Validation

*Initial cloud configuration recommendations are tested against synthetic workloads to confirm or update recommended configurations*

1. Stress Test
2. Measure
3. Select Best configuration

**Verified Synthetic Workload Profiles**

- Synthetic Workload Generation
- Playback Engine

**Candidate Compute/Storage**

- Performance Report
- Monitor

- No
- Yes

**Select different compute**

**Cost Analysis for Candidate Computes/Storage**
ORDB001 was unfit to run in the Azure cloud due to the following reasons:

- The released “managed disk” cloud services offered by Azure are unable to respond and sustain the throughput MB/s and IO demands for virtual machine ORDB001.
- Tested with the “Ultra SSD” managed disk with inconclusive results. The Ultra SSD is only available in Preview mode in the East US 2 region.

All other virtual machines:

- For the remaining virtual machines, Azure was able to successful meet the resource requirements.
- It is important to note that for virtual machine SQL001, the disk throughput slightly exceeded published performance specification of the Premium SSD P50 managed disk.
Customer Example
Cloud Migration Readiness (CMR) Service
Customer History with VI to Date

• H2-13 – Software Proof of Value
  - No tooling in place, software solution demonstrated the value of VirtualWisdom for Health & Utilisation

• H2-14 Initial 5-year Contract to Aug-19
  - Primary Use Case: Migration Assurance from Line of Business silo’d storage infrastructure to shared services storage

• H1-16 – Expansion to cover additional LOB infrastructure

• H2-16 – Expansion of shared service infrastructure

• H1-19 – Extension to Nov-22
  - Use Case: Migration Assurance from On-Prem to the Cloud
  - Value Add Use Case: Accelerate journey to the cloud through CMR
Customer Requirements

- Cloud/co-lo migration assurance to satisfy the business (prove performance is the same or better)
- Optimise the target end-state delivering best price/performance
- Migrate all applications to Co-lo or Cloud by Datacenter exit at end of 2022

- Cloud 1st strategy (~70% of hosts to be migrated to Public Cloud Provider); remaining 30% to migrate to a Co-lo facility
- Co-lo expected to be a ‘lift and shift’ with a technology refresh
- Infrastructure and application discovery and dependency mapping expected to take 18 months into early 2020
- Cloud migrations planned for 2020-2022 categorised by simple, medium, complex
- Discovery/dependency mapping has started slowly – risk of delays to migration project
- Maintain LOB dashboards/reports and Application Service Assurance no matter where the Application lives
Customer Cloud Journey
A Five Year Plan to the Cloud

On-Prem

Today: 100%

Initial Analysis

Rehost (est. 80%)

Re-platform (est. 16%)

TBD (est. 4%)

Data Centre’s: 2

Compute: ~2,400

Physical: ~ 1,000

Virtual: ~ 1,400

HyperV

Linux: 9%

UNIX: 7%

Windows: 84%

SAN: Cisco MDS (8Gb)

Storage: 3PAR (block), NetApp (NAS)

Co-location

Future: ~30%

Compute

SAN

Storage

Azure

Future: ~70%
Application Service Assurance – De-risking the Customer Cloud Journey

The VI Solution & Services – what was sold?

Current Monitoring:
- ~140 HyperV Host Monitoring
- ~1,500 Cisco SAN Switch Ports
- 192 3PAR Storage Array 8Gb ports through Performance Probes
- ~2,410 Operating System Monitoring (Windows & Linux)
- NetFlow Monitoring through Xangati Flow Summariser (XFS) software for HyperV environment
- NetFlow Monitoring of physical IP networks

Future Monitoring:
- ~720 Operating System Monitoring (30%)
- HyperV Monitoring
- NetFlow Monitoring
- Cisco SAN Monitoring
- SAN Telemetry Monitoring

2018

On-Prem

Today: H/W & S/W

Cloud Migration Readiness

VI Services

Discovery – full environment ✓
Profiling – full environment ✓
Playback – 30 Applications ✓
Monitor – full environment ✓

Infrastructure Monitoring & Application Assurance ✓
Proactive Event Management & Monitoring ✓
LOB Engagement ✓
Infrastructure Optimisation ✓

Continued & Extended Managed Service

2022

Co-location

Future: S/W

Cloud Migration Readiness

Future Monitoring:
- ~1,690 Operating System Monitoring (70%)

Azure

Future: S/W

2018

Future Monitoring:
Where VI Helps

Inventory
- Real-time Inventories
- Application & Infrastructure Discovery
- Cloud Right-sizing
- Co-located Infrastructure Right-sizing

Discovery & Planning
- Application & Infrastructure Discovery
- Cloud Spend Optimisation
- Co-located Infrastructure Spend Optimisation
- Infrastructure & Cloud Resource Management & Forecasting

Business Case & Spend Analysis
- Cloud Spend Optimisation
- Co-located Infrastructure Spend Optimisation
- Infrastructure & Cloud Resource Management & Forecasting

Application Dependency Mapping
- Dependency Mapping & Topologies
- Cloud Migration Complexity Analysis
- Application Migration Risk Mitigation (Pre-migration validation)

Workload & Data Migration
- Cloud Migration Acceleration
- Application Migration Risk Mitigation (Pre-migration validation)
- Co-located / Cloud & On-prem

Validation
- E2E Infrastructure Monitoring (On-prem → Co-located & Cloud)
Today VI Delivers Application Service Assurance
- During the last 4½ years, there have been zero infrastructure related issues (no business impacting events)
- VirtualWisdom has been a ‘non-negotiable’ solution and will continue for the next 4 years to ensure continued Application Service Assurance to the business on the future infrastructure

De-risk the migration to a co-lo Datacenter and show the business improved performance

Right sizing end state configurations for best price/performance
- At the same time, the future co-location infrastructure will be right-sized based on detailed understanding of how the applications are utilised and perform today O/P with VI monitoring. Costly over-provisioning can be eliminated and avoidance of unnecessary spend in the co-location
- Identified that 40% of VMs in DC1 are over configured in terms of CPU (roughly 500 vCPU configured that aren’t required)

Cloud Migration Readiness services de-risk and accelerate the customer migration to the cloud
- Reduce Application & Infrastructure Discovery phase from an estimated 18 month duration minimising the risk of a DC exit date overspill saving potential leasing payment
- CMR is the only solution that de-risks the migration by testing identical application workloads beforehand. Problematic migrations burn time in fixing/regressing so having the confidence that it will perform before you actually move it has a significant cost impact

Questions?
CMR Phases: Deliverables and Timeline

**Discovery**
- Confirm migration objectives, scope and approach
- Instrument target workloads or applications
- Measure workload characteristics
- Measure workload dependencies
- Baseline Assessment

**Profiling**
- Machine learning to reduce actual workloads to representative synthetic workloads based on:
  - CPU
  - Memory
  - Network
  - Storage
- Identify and fine-tune candidate cloud configurations

**Playback**
- Replay workloads in candidate cloud configuration
- Monitor performance
- Tune candidate configuration
- Verify performance

**Monitor**
- Monitor migrated workload
- Compare to on premise performance
- Recommend further tuning as needed

**Deliverables**
- Target Workload Inventory (VMs, Hosts, Datastores)
- Target Workload Dependency Matrices
- Baseline assessment

**Deliverables**
- Target workload profiles
- Workload Affinity Group Definitions
- Synthetic Workloads
- Candidate Cloud Configurations
- Candidate Cloud Configuration Costs

**Deliverables**
- Synthetic workload cloud performance report
- Updated candidate cloud configurations
- Updated candidate cloud configuration costs

**Deliverables**
- Cloud workload performance report
- Cloud configuration report and post migration recommendations
CMR Deliverables

Pre-Migration: Provides insight into cloud migration dependencies, cost and performance without moving the actual production workloads.

Post-Migration: Once the migration has been completed, CMR offers on-going monitoring and analysis of the cloud performance versus service level expectations.

Pre-Migration Deliverables

- Workload Inventory
- Dependency Mapping
- Workload Profiling
- Cloud Simulation / Playback
- Right-Sized Cloud Configuration
- Estimated Cloud Costs

Post-Migration Deliverables

- On-going cloud performance monitoring
- Cloud workload performance report
- Post migration recommendations