Senior Project, Fall 2016

Virtual Machine Administration with Xen (VMAX) 1.0

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Problem

The Xen hypervisor platform does not have a robust, open-source, Windows based application for virtual machine management. In addition, available commercial management applications require expensive licenses and proprietary closed-source versions of the hypervisor.

Solution

VMAX makes use of the open-source Xen hypervisor management library Libvirt and provides the following solutions:

- Control of the virtual machine lifecycle (start, stop, resume etc.)
- Cost effective, open-source implementation of the Xen hypervisor
- Targeted application that runs on Windows
- Reduced function set that can be extended as necessary

Current System

Status

- Manages virtual machines at the Applied Research Center FIU
- Integrated into cyber defense research project
- Code base planned for future open source community release
- Performs all common virtual machine management tasks

Core Features

- Implements host level Golang, native C bindings
- Client runs on any Windows version that supports .NET 3.5+
- Core C# library supports Web and Windows Application interface
- Secures host super user terminal console
- Reduces the need to physically interact with the host machine

Requirements

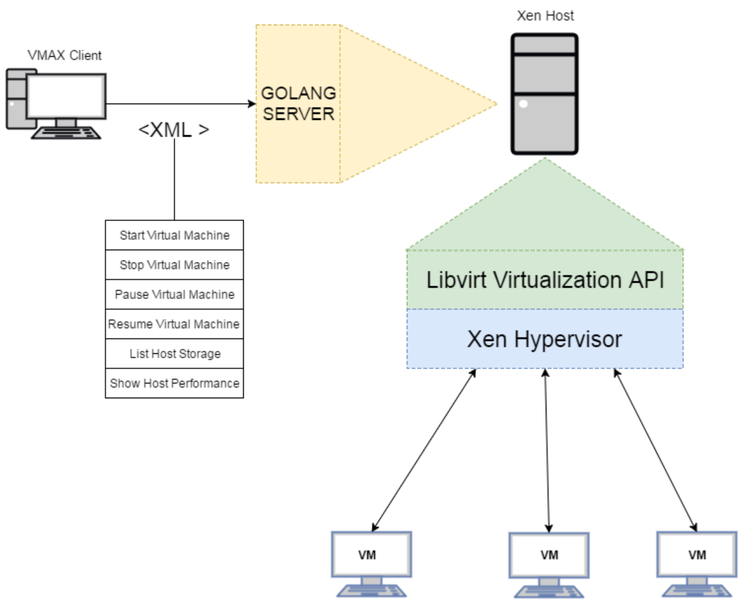
The system allows the administrator to manage a remote host and it's virtual machines including the following capabilities :

- Start virtual machine
- Stop virtual machine
- Pause virtual machine
- Resume virtual machine
- Force virtual machine shutdown
- Create a New virtual machine
- Delete virtual machine
- Display virtual machine statistics
- Display host server disk usage
- Display host server CPU performance
- Display host server settings

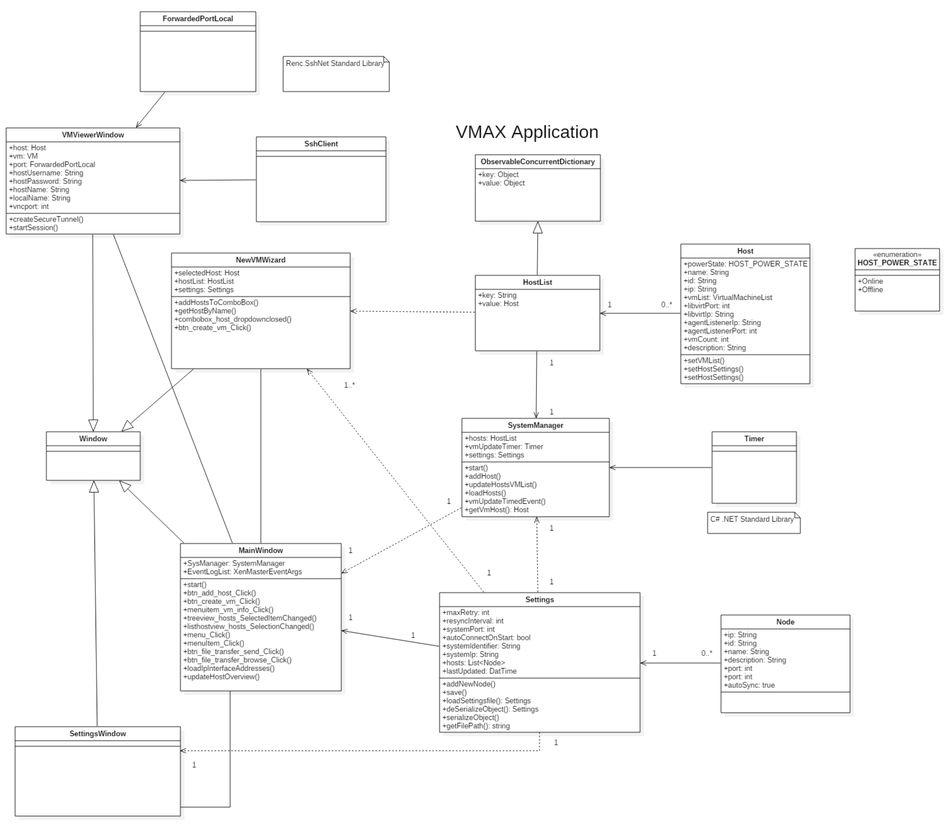
System Design

The VMAX client connects to a Go server running on the host and sends custom XML API commands that allow an administrator to manage a virtual machine's lifecycle (start, stop, resume etc.) as well as retrieve relevant usage and performance statistics from the host server.

Client Server Architecture



Object Design



Implementation

User Interface

Windows Presentation Foundation
XAML

XML API Library

Microsoft Visual C#
Microsoft .net

Server

Go Programming Language
Google Developers

Hypervisor API

libvirt
libvirt-go

Hypervisor

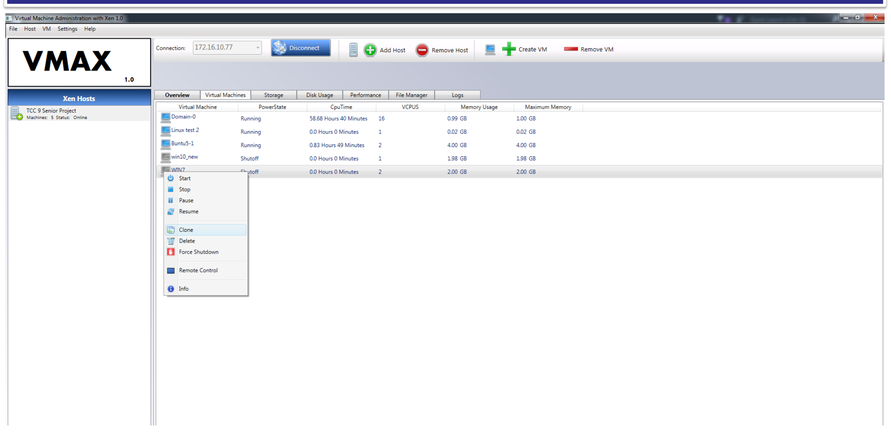
Xen Project

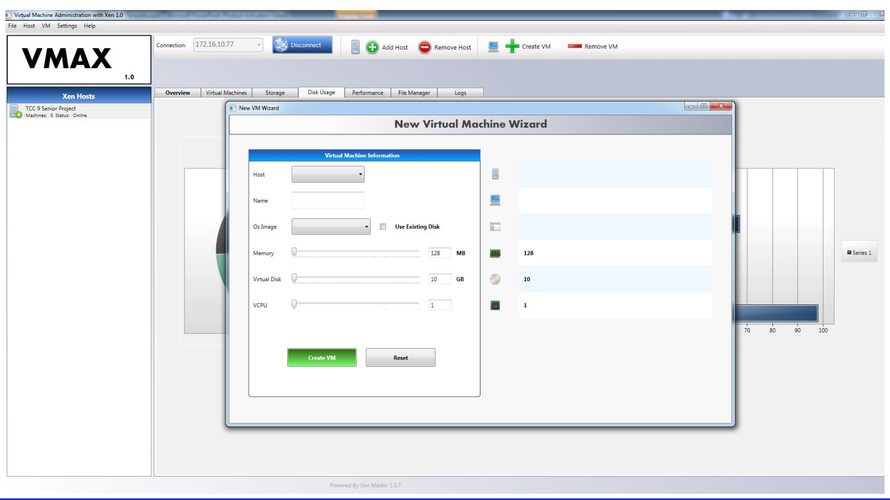
Verification

Test ID: I-232-1 (Create New Virtual Machine)	
Purpose:	Test the VMAX create new virtual machine wizard
Preconditions:	• VMAX application has started successfully and host list has been automatically updated • There is at least one host in the list • The host has pre-loaded OS ISO images
Input:	1. Click "Create VM" from the toolbar 2. Select TCC-9-SENIOR-PROJECT 3. Required Params: • Name = SeniorBuntu • OS Image = Ubuntu14-04 • Memory = 2048 • Virtual Disk = 21 • VCPU = 2 4. Click "Create VM" from the New Virtual Machine Wizard
Expected Output:	• The pop up message "The creation of virtual machine 'SeniorBuntu' has been completed successfuly" is displayed • The virtual machine "SeniorBuntu" shows up in the host list

Test ID: U-143-1 (Start Virtual Machine)	
Purpose:	Test the VMAX start virtual machine function
Preconditions:	• VMAX application has started successfully and host list has been automatically updated • There is a vm that is shutdown
Input:	1. Select a host from the host list 2. Right click the virtual machine name 3. Select "Start"
Expected Output:	• The virtual machine icon turns to a blue color • The PowerState of the virtual machine is "Running"

Screenshots





Summary

Virtual Machine Administration with Xen (VMAX) is a client server system that allows the management of a remote host and virtual machines that operate on the Xen Hypervisor platform.

The system uses the extensive Libvirt Application Programming Interface and a Go programming language server to communicate with the Xen Hypervisor and manage virtual machine life cycles remotely.

Administrators interact with the system through a Windows Presentation Foundation (WPF) client developed for the Microsoft .NET 4.6 framework.

VMAX 1.0

Acknowledgement

The material presented in this poster is based upon the work supported by D'Mita Anthony Levy. I am thankful to the help that I received from my group members, Dennis Obando and Qixiu Xin.