Emergency IT Capacity for EHR

March 24, 2020

Advisors / Contacts:
Vik Nagjee, Director of Healthcare (Vik.Nagjee@siriuscom.com)
Josh Peacock, Healthcare Solutions Advisor (Josh.Peacock@siriuscom.com)
Marty Momdjian, Healthcare Solutions Advisor (Marty.Momdjian@siriuscom.com)

Authors: Kyle Quinby, Jim Ryland, David Evans
Contents

Overview ........................................................................................................................................ 3
  Summary ......................................................................................................................................... 3

High-Level Design .......................................................................................................................... 4
  Description of Components ........................................................................................................... 4
  Design Principles ......................................................................................................................... 5

Cloud Readiness ............................................................................................................................. 6
  Azure Scenario 1 .......................................................................................................................... 6
  Azure Scenario 2 .......................................................................................................................... 6
  AWS Scenario 1 ............................................................................................................................. 6
  AWS Scenario 2 ............................................................................................................................. 6

Citrix Preparation Scenarios for Azure ............................................................................................. 7
  Citrix on Azure Scenario 1 .......................................................................................................... 7
  Citrix on Azure Scenario 2 .......................................................................................................... 7

Citrix Preparation Scenarios for AWS ............................................................................................... 8
  Citrix on AWS Scenario 1 ........................................................................................................... 8
  Citrix on AWS Scenario 2 ........................................................................................................... 8

Cloud UAT ....................................................................................................................................... 9
  Deploy MCS-based UAT Machine Catalog in Azure ................................................................... 9
  Deploy MCS-based UAT Machine Catalog in AWS ................................................................... 9

Cloud Publishing – Azure or AWS .................................................................................................... 10
  Deploy MCS-based Production Machine Catalog ................................................................... 10

Assumptions .................................................................................................................................... 10
  Bandwidth ....................................................................................................................................... 10
  Licensing ....................................................................................................................................... 10
  Citrix Storefront ............................................................................................................................ 10
  Cloud (Hyperscaler) Costs & Monitoring .................................................................................... 10
Overview

Summary
In response to the increased need for clinical care resulting from the COVID-19 pandemic, healthcare organizations are working tirelessly to increase the number of available beds for critical patients, and to support additional caregiver capacity. These both require additional IT resources for EHR and other clinical applications.

There are four components to an emergency capacity increase:

- **Cloud readiness**: Ensures that the targeted landing zone in Azure or AWS is prepared to accept workloads and has network connectivity back to the healthcare provider’s data center.
- **Citrix readiness**: Ensures that the master image for the application is prepared in Citrix Machine Creation Services (MCS), a resource pool is created in the targeted hyperscaler, and the image is deployed to the desired capacity.
- **User acceptance testing**: Ensures that the performance characteristics of the application are validated, and that all core functions are working as expected.
- **Publishing**: New application instances in the targeted hyperscaler are published to hospital staff.

This document looks at a few scenarios, and offers strategies to help provider organizations quickly increase their IT capacity to sustain additional clinical users in response to the COVID-19 pandemic.
High-Level Design

Description of Components

A. Represents the primary data center (DC) where ODB and existing published application (Citrix) farm resides.

B. Depending on whether the client already has an established Azure or AWS presence, would determine if a new site-to-site VPN would need to be established.

C. This would likely be the Azure or AWS region nearest to the primary DC to reduce latency between application session hosts residing in the cloud and the application components continuing to reside on-premises.
Design Principles

- Traffic flow
  - Any traffic will be egressed through the client’s primary data centers to allow for security monitoring protocols to be followed

- The network bandwidth may be the biggest concern/risk
  - Will the client have enough bandwidth?
  - Can they get their ISP to increase bandwidth fast enough?
  - What is the current internet capacity and usage? Identify if this is sufficient, and make getting additional bandwidth a priority early in the process
  - If we cannot get increased bandwidth, is there traffic that can be safely reduced? Like egress internet for guest wifi.

- Limit Latency
  - Normally the EHR would target for 10ms or less between Citrix components and ODB
  - Under the emergency considerations we could go higher probably up to 30ms based on some other clients Sirius has running Active/Active Citrix farms
  - Potential exists that we could prioritize clinical staff to be tied to on-prem gear and other users could be pointed to the cloud session hosts with the higher latency

- Any additional web and other service servers that need to be expanded would/could likely need to be in the primary DC to increase complexity around load-balancing needs.

- This is the most simplistic (and quickest) design to add a cluster of compute to the existing Citrix farm. Alternatively, additional components could be stood up in the cloud to make it an independent farm, if needed.
Cloud Readiness

Azure Scenario 1

- Current situation: No Azure or Office 365 only
- Steps to procure:
  - Register a Microsoft Azure tenant (if no O365 presence).
  - Create a subscription.
  - Allocate a sufficiently large, unused network range for the desired number of Citrix Virtual Apps session hosts.
  - Deploy a preconfigured landing zone blueprint.
  - Ensure VPN gateway SKU is sufficient for desired bandwidth (up to 10 Gbps).
  - Connect VPN gateway to healthcare provider’s data center.
- Time estimate: 1 day

Azure Scenario 2

- Current situation: Existing Azure subscription/landing zone (for any level workloads)
- Steps to procure:
  - Allocate a sufficiently large, unused network range for the desired number of Citrix Virtual Apps session hosts.
  - Deploy a new VNet/subnet for this network range and peer it with the existing VNet containing the virtual network gateway.
  - Ensure VPN gateway SKU is sufficient for desired bandwidth (up to 10 Gbps). Resize if needed.
- Time estimate: 4 hours

AWS Scenario 1

- Current situation: No AWS account
- Steps to procure:
  - Register an AWS account.
  - Allocate a sufficiently large, unused network range for the desired number of Citrix Virtual Apps session hosts.
  - Deploy a preconfigured landing zone CloudFormation template.
  - Create virtual private gateway and the Sirius client’s gateway.
  - Connect VPC to healthcare provider’s data center.
- Time estimate: 1 day

AWS Scenario 2

- Current situation: Existing AWS account/landing zone (for any level workloads)
- Steps to procure:
  - Allocate a sufficiently large, unused network range for the desired number of Citrix Virtual Apps session hosts.
  - Deploy a new VPC/subnet for this network range and peer it with the existing transit VPC containing the virtual private gateway.
  - Create the Sirius client’s gateway
  - Create VPN connection.
- Time estimate: 4 hours
Citrix Preparation Scenarios for Azure

Citrix on Azure Scenario 1

- Current situation: PVS in use for all Citrix Virtual App Hosts
- Steps needed:
  - Create a general-purpose v2 storage account in Azure to store the master image VHD.
  - Create a clone of the master image in PVS and put in private mode for editing.
  - Follow the steps in the following document to prepare the image for Azure (a script is provided to accelerate this process).
  - Convert VHDX file to VHD – Fixed. This can be done from a HyperV host. Any Windows Server can have the HyperV role added to it to accomplish this.
  - Upload the VHD master disk to the storage account created in the Azure subscription.
  - The disk is now available to be used to create a machine catalog in Azure.
- Time estimate: 2 days

Citrix on Azure Scenario 2

- Current situation: MCS in use for all Citrix Virtual App Hosts
- Steps needed:
  - Create a general-purpose v2 storage account in Azure to store the master image VHD.
  - Create a clone of the master VM in MCS.
  - Follow the steps in the following document to prepare the image for Azure (a script is provided to accelerate this process).
  - Convert the VM to VHD on Azure using Microsoft Virtual Machine Converter; ensure you upload to the storage account created.
  - The disk is now available to be used to create a machine catalog in Azure.
- Time estimate: 1 day
Citrix Preparation Scenarios for AWS

Citrix on AWS Scenario 1

- Current situation: PVS in use for all Citrix Virtual App Hosts
- Steps needed:
  - Create an Amazon S3 bucket (general-purpose SSD) in AWS to store the master image VHD.
  - Create a clone of the master image in PVS and put in private mode for editing.
  - Convert VHDX file to VDH – Fixed. This can be done from a HyperV host. Any Windows Server can have the HyperV role added to it to accomplish this.
  - Follow the steps in the following document to prepare the image for AWS.
  - Import the VHD master disk to the storage account created in the AWS subscription.
  - The VM is now available to be used to create a machine catalog in AWS.
- Time estimate: 2 days

Citrix on AWS Scenario 2

- Current situation: MCS in use for all Citrix Virtual App Hosts
- Steps needed:
  - Create an Amazon S3 bucket (general-purpose SSD) in AWS to store the master image VHD.
  - Create a clone of the master VM in MCS.
  - Follow the steps in the following document to prepare the image for AWS.
  - The disk is now available to be used to create a machine catalog in AWS.
- Time estimate: 1 day
Cloud UAT

Deploy MCS-based UAT Machine Catalog in Azure

- Steps needed:
  - In Citrix Studio, add an Azure Hosting connection.
  - Create an Azure Virtual Machine using the unmanaged disk uploaded previously. This will be the update VM going forward.
  - Ensure the update VM boots normally and is accessible via RDP.
  - Shut down the update VM and ensure it is in “Stopped/Deallocated” state in Azure.
  - In Citrix Studio, create MCS Catalog:
    - Decide on a VM SKU for the Azure VMs running Citrix VDAs.
    - Select the master VHD file as the source image.
    - Add new Catalog to new or existing Delivery Group.
    - Configure Delivery Group Power Management.
    - Create a minimal UAT Machine Catalog from the master image VHD file and add to a UAT delivery group.
    - Provision test users to UAT delivery group.
    - Begin UAT tests.
      - Document difference in performance characteristics to be socialized with hospital staff
      - Ensure all application functionality works as expected
      - Document any gaps and address any that are blockers to go-live
    - If any changes are needed to the image, boot up the master VM, make required changes, and shut down the master.
      Then update the UAT machine catalog and re-test.
  - If any changes are needed to the image, boot up the master VM, make required changes, and shut down the master VM so that it is in a “Stopped/Deallocated” state. Then update the UAT machine catalog and re-test.

- Time estimate: 6 hours

Deploy MCS-based UAT Machine Catalog in AWS

- Steps needed:
  - In Citrix Studio, add an AWS Hosting connection
  - Create an AWS AMI using the disk uploaded previously. This will be the update VM going forward.
  - Ensure the update VM boots normally and is accessible.
  - Shut down the update VM
  - In Citrix Studio, create MCS Catalog:
    - Decide on a machine type for the AWS EC2 instances running Citrix VDAs.
    - Select the converted AMI as the master.
    - Add new Catalog to new or existing Delivery Group.
    - Configure Delivery Group Power Management.
    - Create a minimal UAT Machine Catalog from the master image VHD file and add to a UAT delivery group.
    - Provision test users to UAT delivery group.
    - Begin UAT tests.
      - Document difference in performance characteristics to be socialized with hospital staff
      - Ensure all application functionality works as expected
      - Document any gaps and address any that are blockers to go-live
    - If any changes are needed to the image, boot up the master VM, make required changes, and shut down the master.
      Then update the UAT machine catalog and re-test.

- Time estimate: 6 hours
Cloud Publishing – Azure or AWS

Deploy MCS-based Production Machine Catalog

- Steps needed:
  - Create a production Machine Catalog from the master VHD file/AMI
  - Create a production Delivery group with the above Machine Catalog and add cloud-based production user groups to it
  - Production Citrix cloudburst is now complete
- Time Estimate: 2 hours

Assumptions

Bandwidth

VPN tunnel should support an additional 80 Kbps/user added to the Azure-based delivery groups. This includes HDX and application traffic.

- Citrix HDX: 30 Kbps/User
- Application to ODB: 50 Kbps/User

Licensing

Additional Citrix licenses may need to be added if in a concurrent licensing model to support additional concurrent users.

Citrix Storefront

Depending on total number of users deployed concurrently, Storefront sizing may need to be addressed to accommodate the number of users logging on per minute.

Cloud (Hyperscaler) Costs & Monitoring

The additional costs associated with cloud usage will be dependent on the contract between the client and the hyperscaler. Similarly, monitoring of usage would be specific to the hyperscaler.

Proprietary Notice:

This document and the information contained in it is proprietary and confidential information of Sirius Computer Solutions, Inc. (Sirius) and may not be reproduced, copied in whole or in party, adapted, modified, disclosed to others, or disseminated without the prior written permission of Sirius’ Legal Department. Use of this document and the information contained in it is strictly reserved for Sirius’ customers. Use of this document by unauthorized persons is strictly prohibited.

Warranty Disclaimer:

Sirius provides this document without warranty of any kind, implied or expressed, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Limitation of Liability:

Sirius has taken care to ensure the accuracy of the information provided in this document. Sirius, however, assumes no liability for errors or omissions and reserves the right to make changes to the information provided in this document.