Day 1

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| 09:00 | Welcome and Logistics |
| 09:20 | Introduction to Windows Azure |
| 10:30 | Windows Azure Websites Lab \* |
| 11:30 | Windows Azure Virtual Machine Lab |
| 12:05 | Lunch and Group Discussions |
| 01:00 | Virtual Machine Applications Lab \* |
| 02:30 | Windows Azure Storage \* |
| 03:45 | Consuming Cloud Services using Service Bus Lab |
| 04:45 | Discussion |
| 05:15 | Day 1 Concludes |

**Day 2**

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| 09:00 | Recap for Day 1 |
| 09:15 | Use Scenarios and Design Patterns \* |
| 10:15 | Windows HPC Server 2012 Cluster \* |
| 11:30 | Linux cluster Lab |
| 12:00 | Lunch and discussions |
| 01:00 | Linux cluster Lab Continued \* |
| 02:00 | Excel and Data visualization \* |
| 03:10 | Big Data analytics using HDInsight, advanced topic SPARK/SHARK \* |
| 04:00 | Kafka and STORM interactive demo |
| 04:45 | Discussion |
| **05:15** | Day 2 concludes |

**Note: \* These sessions include a 10 or 15 min break at the end.**

**Prerequisite:**

* List of requisite software including get two browsers, Azure Explorer, Cygwin (optional).
* course content Pre-downloaded including Scripts, Data, and Code
* Instructions for installing CLI, Azure SDK on computer with pointers to technical papers.

**Agenda: Day 1**

Learning objectives – what you will learn:

* Windows Azure Overview
* Windows Azure Websites
* Windows Azure VMs
* Windows Azure Storage
* Windows Azure Cloud Services

Examples for research scientists

Outline of Use Scenarios and Design Patterns for researchers (Day 1).

* VM: A Work environment in the cloud
* Manual workstation burst, R Matlab
* Blog Storage: Store and share your Data in the Cloud
* Use persistent queue and table to scale embarrassingly parallel workload
* Publish Simulations in the Cloud

1. 09:00 Welcome 20 minutes, accounts logistics.
2. 09:20 Introduction to Windows Azure:  [60 min] No more than 30 slides and a portal tour.

Learning objectives for this hour: understanding the basics of cloud computing with Azure

* Patterns and terminology – IaaS, PaaS, SaaS
* Windows Azure basics
  + - Virtual machines
    - Web sites
    - Cloud services
    - Building blocks for applications – storage, messaging, identity, etc.
* Cloud patterns for research scientists

10:20 break

1. 10:30 Windows Azure Website intro.

Learning objectives for this hour: understanding how azure can make some tasks extremely easy.

* How to create a simple blog site using Windows Azure
* An example using the Django (a Python framework), and Bing Maps

1. 11:30 Windows Azure Virtual Machine

Learning objectives: How to create virtual machines using Windows Azure

* The wide variety of pre-configured virtual machines available from the gallery
* How to make your own virtual machine from an existing installation
* An example using Windows and Visual Studio
* An example using Linux and IPython notebook

Class activity:

Start fetching the class Linux VM from the VM Depot. This has pre-installed tools, IPython notebook pre-configured, run command to start at port 8080 private public 443.

1. 12:00 Lunch and discussions
2. 01:00 VM lab continued.

Learning objectives for this lab:

* Further exploration of Python tools typically used in scientific applications, e.g. clustering with Pandas and Scikit-learn
* Demo: How to install and use R and Matlab in Windows Azure.
* More advanced and realistic examples of using Windows Azure for research purposes

Lab detiails

* 1. Deploy the Windows Visual Studio VM.
  2. Deploy the class Linux VM and bring up IPython.
  3. Run through data clustering, pandas, and other scientific examples [1 hour] Clustering, Pandas.
  4. Attach Disks exercise.

02:15 break

1. 02:30 Windows Azure Storage

Learning objectives:

* Windows Azure storage basics
* Core concepts:
  + - Blobs
    - Tables
    - Queues
* Azure explorer and the Cerebrata tools
* Storage commands from the command line
* When to use the various types of storage for research applications

Discussion and Lab

* 1. Introduction to storage concepts (20 min)
  2. Azure explorer, cerebarata tools.
  3. [Python] mostly. Reuse their existing IPython notebook to try out the storage Commands in Linux console CLI.
  4. Learn to use AzCopy (Windows VM).

03:45 break

1. 04:00 Understanding and consuming cloud services with Weather demo, Blast demo.  <http://blaster.cloudapp.net/>

Learning objectives: the architecture of a multitier cloud service

* Cloud services basics
* Core concepts:
  + - Web roles
    - Worker roles
* Combining web roles and worker roles to make cloud services
* Service bus queues
* An example cloud service consumption
* Cloud services for research application

Discussion and Lab

* 1. Introduction to Cloud Services.
  2. Introduction to Service Bus Queues.
  3. Explain: How to take an existing binary exe, using persistent SB Queue, and Table storage for scale out.

Lab

Using the existing Linux VM: Run a Python **Service Bus** client with Blast worker. The lab will ask students to join the class blast cluster by adding a service bus key, create a new topic and run python.exe worker.py.  Call Send () Receive () message. Then, submit jobs through the blaster.cloudapp.net portal.

1. 05:00 Conclusion and discussions.
2. 05:15 End of Day1.

Day 2:

1. 09:00 Recap for Day 1

Learning objectives: summary of day 1:

* Windows Azure Overview
* Windows Azure Websites
* Windows Azure VMs
* Windows Azure Storage
* Windows Azure Cloud Services

Learning objectives and design patterns for Day 2:

* Windows Azure – Scenarios and Patterns
* Windows Azure – High Performance and Scale-Out Computing
* Windows Azure – Data Analytics (2 parts)
* Windows Azure – Interactive Devices
* Wrap-up and summary

Way forward and next steps

1. 09:15 Use Scenarios and Design Patterns for Day 2

Ask students about their typical scale out workload

Scientific Design patterns for

* + Scale out with HPC Server
  + Data visualization
  + Big Data
  + Devices and data streaming

1. 09:40 **Windows** HPC Server 2012 Cluster in the Cloud with R and Matlab.

Learning objectives for this half hour:

* A design pattern for scaling parameter sweep/map reduce for scientific analysis using standard tool with Windows HPC
* Examples of when this is useful for research scientists

1. 10:15 break
2. 10:30 Lab of Deploying **Linux** IPython Cluster running R

Learning objectives:

* How to use IPython clusters to do scale-out data analysis.
* Use R as an example of this design pattern.

12:00 Lunch and discussions

1. 01:00 Data Analytics using Excel (demo from data market, azure, power tools) and Layerscape

Learning objective design patterns

* Designing data analysis services that can be viewed from Excel or the browser

02:30 Break

1. 02:45 Big Data analytics using Hadoop with HDInsight, HDP and SQL and no-SQL

Learning objectives: A deeper understanding of how MapReduce is used on data analytics

* Big data analytics using HD Insight and Hortonworks HDP
* Azure SQL and no-SQL concepts.
* Examples of when this is useful for research scientists

1. 03:45 Streaming data from instruments and the Internet of things.

Learning objectives: a design pattern for collecting streaming data into the cloud

1. 04:45 Conclusion and discussions