AGENDA

• The Software-Defined Datacenter
• Nano Server
• Storage
• Hyper-V
• Containers
• Servicing
• One More Thing...
More than 1M instances of @WindowsServer 2016 already deployed. This is the fastest uptake of a new version of Windows Server EVER.

YOU KNOW WHAT THIS MEANS...

PARTY TIME!
SOFTWARE-DEFINED DATACENTER
NANO SERVER
TODAYS DATACENTER CHALLENGES

- **Reboots impact my business**
  - Why do I have to reboot because of a patch to a component I never use?
  - When a reboot is required, the systems need to be back in service ASAP

- **Server images are too big**
  - Large images take a long time to install and configure
  - Transferring images consumes too much network bandwidth
  - Storing images requires too much disk space

- **Infrastructure requires too many resources**
  - If the OS consumes fewer resources, I can increase my VM density
  - Higher VM density lowers my costs and increases my efficiency & margins
SECURITY IMPACT

Experts: Sony Hackers Were Inside Company Network for a Long Time

Staples breach may have affected over a million credit cards

Target cyber breach hits 40 million payment cards at holiday peak

Now at the Sands Casino: An Iranian Hacker in Every Server

A Cyberattack Has Caused Confirmed Physical Damage for the Second Time Ever

Five out of every six large companies targeted by cyber attacks in 2014
What’s Nano Server?
THE NEXT STEP IN THE JOURNEY...

- Nano Server: A new headless, 64-bit only, deployment option for Windows Server
- Deep refactoring with cloud emphasis
  - Cloud fabric & infrastructure (clustering, storage, networking)
  - Born-in-the-cloud applications (PaaS v2, ASP.NET v5)
  - VMs & Containers (Hyper-V & Docker)
- Extend the Server Core pattern
  - Roles & features live outside of Nano Server
  - No binaries or metadata in OS image
  - Standalone packages install like apps
  - Full driver support
  - Antimalware
NANO SERVER IN WINDOWS SERVER 2016

- An installation option, like Server Core
- Not listed in Setup because image must be customized with drivers
- Separate folder on the Windows Server media
DEMO: NANO SERVER
NANO SERVER: LET’S TALK NUMBERS!
SERVICING IMPROVEMENTS*

* Analysis based on all patches released in 2014
NANO KEY WINS

• Easy to deploy
• Lightweight
• Easily integrates with our automated approach
• Works with our existing deployment workflows; WDS and boot from VHDX
• Reduces operational costs
• Highly stable
• Key for fabric deployments
• Delivers on scale and performance
STORAGE
SOFTWARE DEFINED STORAGE V3

Storage Spaces Direct
Use standard servers with local storage to build highly available and scalable software-defined storage

Storage Replica
Create affordable business continuity and disaster recovery among datacenters

Storage QoS
Prevent noisy neighbors from impacting high priority workloads with a Storage QoS policy
Storage Spaces Direct at a glance

Industry-standard servers with internal drives
No shared storage, no fancy cables – just Ethernet
Create Failover Cluster
Software-defined “pool” of storage
We're ready to create volumes!
Scale-Out File Server (SoFS)
Hyper-Converged
Add new node to cluster
SCENARIOS

Hyper-converged
- Compute and Storage resources together
- Compute and Storage scale and are managed together
- Typically small to medium sized scale-out deployments

Converged (Disaggregated)
- Compute and Storage resources separate
- Compute and Storage scale and are managed independently
- Typically larger scale-out deployments
SCALE OUT TO MAX

2 node minimum
2+ cache drives
4+ capacity drives
Up to 16 servers
Up to 416 disks
DEMO: STORAGE SPACES DIRECT
DEMO EQUIPMENT

- 4x Quanta D51 PH Servers
  - 2x Intel Xeon E5-2620v3, 12 Cores
  - 64 GB RAM
  - 2 x 800 GB HGST NVMe SSDs (Caching Devices)
  - 12 x 960 GB Samsung Pro SATA SSDs (Performance / Capacity Tier)
  - LSI 3008 SAS3 Controller
  - Dual-port Mellanox ConnectX-3 Pro, 40GbE

- Mellanox 40GbE Switch
  - SX1012 12 x 40Gbps / 48 x 10Gbps

70k$
21TB
Netto
EXTEND S2D CLUSTERS

- 16x HPE DL380 G9
- 2x Intel Xeon 16 Core
- 768 GB RAM
- 2x 1.6 TB NVMe
- 16x 1.6 TB SSD
- 2x Mellanox ConnectX-4 100GbE
- 280 TB Usable Flash Only Storage
WHEN YOUR CUSTOMER TELLS YOU

THEY FOUND A CHEAPER OPTION
REFS FILESYSTEM
Resilient File System

It maximizes data availability, despite errors that would historically cause data loss or downtime.

Taking advantage of an intelligent file system for:

- Rapid fixed disk creation
- Rapid disk merge operations
STORAGE REPLICA
STORAGE REPLICA
PROTECTION OF KEY DATA AND WORKLOADS

Synchronous replication
Storage agnostic mirroring of data in physical sites with crash-consistent volumes ensuring zero data loss at the volume level.

Increase resilience
Unlocks new scenarios for metro-distance cluster-to-cluster disaster recovery and stretch failover clusters for automated high availability.

Complete solution
End-to-end for storage and clustering, including Hyper-V, Storage Replica, Storage Spaces, cluster, Scale-Out File Server, SMB3, deduplication, Resilient File System (ReFS), NTFS, and Windows PowerShell.

Streamlined management
Graphical management for individual nodes and clusters through Failover Cluster Manager and Azure Site Recovery.
**Stretch cluster**
- Single cluster
- Automatic failover
- Synchronous

**Cluster-to-cluster**
- Two separate clusters
- Manual failover
- Synchronous or asynchronous

**Server-to-server**
- Two separate servers
- Manual failover
- Synchronous or asynchronous

**Server-to-self**
- A single server replicating to itself (one volume to another)
- Seed data onto storage for shipment
STORAGE REPLICA AT A GLANCE

• Volume based block-level storage replication
• synchronous or asynchronous
• HW agnostic (any type of source / destination volume)
• SMB3 as transport protocol
• Leverages RDMA / SMB3 Encryption Multichanneling
• I/Os pre-aggregated prior transfer
HYPER-V
High performance live migration
(compression/RDMA)
Zero downtime upgrades
Automatic VM Activation
Live VM export
Guest backup improvements
Enhanced VMConnect
Dynamic memory host balancing
First class Linux support – Dynamic memory, file
system consistent host based backup
RemoteFX over WAN
Generation 2 Virtual Machines
Secure boot in a VM
User defined meta data for VHDX
PowerShell for all Hyper-V operations
Hyper-V Metrics
Shared nothing live migration

High performance auto tiered storage spaces
Write back cache with spaces
Storage QoS
Shared VHDX for guest clustering
VHDX online resize
Storage deduplication with live VMs for VDI
Hyper-V Recovery Manager (Microsoft Azure Site recovery)
Azure Backup
Inbox multi-tenant site-to-site VPN gateway for physical & virtual networks
Protected VM Networks/Virtual RSS
Enhanced LBFO performance with NIC teaming
Hyper-V Extensible Switch
4K Sector support

Hyper-V over SMB
Hyper-V over Spaces & ReFS
64 VP, 1 TB VMs
SR-IOV for 10+GB networking
64TB VHDX
Hyper-V Replica
Network Virtualization
USB redirection over RemoteFX vGPU
Hot add/remove of storage
VHDX resiliency
Dynamic & differencing VHDX performance improvements
384 LP, 4TB physical system
2+ Million IOPS to a single VM
Resource Pools
NUMA in a VM
1024 running VMs on a host
Windows Server 2016 Hyper-V

High performance live migration (compression/RDMA)
Zero downtime upgrades
Automatic VM Activation
Live VM export
Guest backup improvements
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Shielded VM support
vTPM
Key Storage Drive for Gen 1 VM
Guest VSM (enable Device Guard & Credential Guard in a VM)
VM Isolation
Linux Secure Boot
RemoteFX improvements
Discrete Device Assignment of GPU
Headless mode support
Distributed Storage QoS
REFS Block
REFS Fast Fixed Disk Creation

Hyper-V over SMB
Hyper-V over Spaces & ReFS
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VM configuration version & upgrade
Runtime Memory Resize
Hot / add remove of NICs
Production Checkpoints
Storage Resiliency - All Paths Down
Online Resize for Shared VHDX
Hot add / remove of replicated VHD
Rolling Cluster Upgrade
Cluster Compute Resiliency
Cluster Node Quarantine
Device Naming of NIC
512LP, 24TB Host
Direct Device Assignment

High performance auto tiered storage spaces
Write back cache with spaces
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Shared VHDX for guest clustering
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Nested virtualization
VMCX configuration file
Nano Server Host Support
Multi-host management (WMI)
Hypervisor Power Management (connected standby works)
Virtual machine grouping
IC Upgrade via Windows Update
HvSocket (Guest-Host)
TimeSync improvements
240 VP, 16TB VMs
Support for Containers
Resilient Change Tracking (RCT)
Backup improvements
Backup of Shared VHDX

Shielded VM support
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REFS Block
REFS Fast Fixed Disk Creation
## WINDOWS SERVER 2016 HYPER-V SCALE LIMITS

<table>
<thead>
<tr>
<th>Capability</th>
<th>Windows Server 2012/2012 R2 Standard and Datacenter</th>
<th>Windows Server 2016 Standard and Datacenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical (Host) Memory Support</td>
<td>Up to 4 TB per physical server</td>
<td>Up to 24 TB per physical server (6x)</td>
</tr>
<tr>
<td>Physical (Host) Logical Processor Support</td>
<td>Up to 320 LPs</td>
<td>Up to 512 LPs</td>
</tr>
<tr>
<td>Virtual Machine Memory Support</td>
<td>Up to 1 TB per VM</td>
<td>Up to 16 TB per VM (16x)</td>
</tr>
<tr>
<td>Virtual Machine Virtual Processor Support</td>
<td>Up to 64 VPs per VM</td>
<td>Up to 240 VPs per VM (3.75x)</td>
</tr>
</tbody>
</table>
Any seized or infected host administrators can access guest virtual machines.

Impossible to identify legitimate hosts without a hardware-based verification.

Tenants VMs are exposed to storage and network attacks while unencrypted.
# Zero-Trust Environments

## Hardware-rooted Technologies
- **Virtual Secure Mode**
  - Process and Memory access protection from the host

## Guarded Fabric
- **Host Guardian Service**
  - Enabler to run Shielded Virtual Machines on a legitimate host in the fabric

## Virtualized Trusted Platform Module (vTPM)
- **Shielded VM**
  - BitLocker enabled VM

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[Diagram showing the relationship between Host Guardian Service, Guest VMs, and Trust the Host process]
• Operational
  • Hot Add / Remove Network Adapters
  • Online Memory Resize
  • PowerShell Direct
  • Cluster Rolling Upgrades
  • Software Defined Networking Stack
  • Backup and Checkpoints
  • ...

IMPROVEMENTS
DEMO: HYPER-V
CONTAINERS
WHAT ARE CONTAINERS

- LXC (Linux Containers) is an operating-system-level virtualization environment for running multiple isolated Linux systems (containers) on a single Linux control host. Containers provide operating system-level virtualization through a virtual environment that has its own process and network space, instead of creating a full-fledged virtual machine.
CONTAINERS: A NEW APPROACH

Physical

Applications traditionally built and deployed onto physical systems with 1:1 relationship
New applications often required new physical systems for isolation of resources

Virtual

Higher consolidation ratios and better utilization
Faster app deployment than in a traditional, physical environment
Apps deployed into VMs with high compatibility success
Apps benefited from key VM features i.e., live migration, HA

Physical/virtual

Package and run apps within containers

Key benefits
Further accelerate of app deployment
Reduce effort to deploy apps
Streamline development and testing
Lower costs associated with app deployment
Increase server consolidation
VIRTUAL MACHINES
MODERN APP DEV, FLEXIBLE ISOLATION

Container Runtimes

Hyper-V container

Windows Server container

Windows Server

Application Framework

Window Container Images

Docker

PowerShell

Others

Container Management

Write once, deploy anywhere
SERVICING MODEL
OUR NEW PATCHES ARE THIS BIG
This is the traditional servicing model Windows Server has always used:

- 5 + 5 years of servicing
- Security and quality fixes only
- No new features or functionality

Two Windows Server 2016 installation options use this model:

- Server with Desktop Experience
- Server Core
# CURRENT BRANCH FOR BUSINESS (CBB)

<table>
<thead>
<tr>
<th>Nano Server will be CBB only</th>
<th>What does this change?</th>
<th>What doesn’t this change?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nano Server will be CBB only</td>
<td>Nano Server will not have an LTSB with Windows Server 2016 and therefore not have 5+5 years of servicing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nano Server installations will have to move forward to future CBB releases of Nano Server to continue to be serviced</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Licensing Nano Server will require Software Assurance (SA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The quality, features, and functionality of Nano Server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Installation of new CBBs are always controlled by administrators, no forced upgrades</td>
<td></td>
</tr>
</tbody>
</table>
WINDOWSER SERVER SERVICING

Time

Features

Future CBBs and LTSBs

WS 2012

Nano Server CBB1

WS 2012R2

LTSB

WS 2016

LTSB

CBB1

CBB2

CBB3

CBB4

Servicing for a CBB ends after the release of the 2nd future CBB
LICENSING
<table>
<thead>
<tr>
<th>Feature</th>
<th>Datacenter Edition</th>
<th>Standard Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core functionality of Windows Server</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>OSEs/Hyper-V containers*</td>
<td>Unlimited</td>
<td>2</td>
</tr>
<tr>
<td>Windows Server containers</td>
<td>Unlimited</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Nano Server</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>New storage features including Storage Spaces Direct and Storage Replica**</td>
<td>⬤</td>
<td></td>
</tr>
<tr>
<td>New Shielded Virtual Machines and Host Guardian Service**</td>
<td>⬤</td>
<td></td>
</tr>
<tr>
<td>New networking stack**</td>
<td>⬤</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.thomasmaurer.ch">www.thomasmaurer.ch</a> Licensing Model***</td>
<td>Core + CAL</td>
<td>Core + CAL</td>
</tr>
<tr>
<td>Price+</td>
<td>$6,155</td>
<td>$882</td>
</tr>
</tbody>
</table>

* Windows Server Standard Edition license permits 2 OSEs (operating system environments) when all physical cores are licensed.
** Azure-inspired features for advanced software-defined datacenter scenarios.
*** See Licensing Datasheet for additional detail. Minimum license requirement: 8 cores per processor, 16 cores per server.

+ Pricing represents Core + Level DPS for 16 cores.
## Core Based Licensing

### Number of 2-core pack licenses needed

(Minimum 8 cores/proc; 16 cores/server)

<table>
<thead>
<tr>
<th>Processes per server</th>
<th>Physical cores per processor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>4*</td>
<td>16</td>
</tr>
</tbody>
</table>

- **Licensing costs are same as 2012 R2**
- **Additional licensing required**

*Standard Edition may need additional licensing*
WINDOWS SERVER 2016 LICENSING

- License all the physical cores in the server
- Minimum of 8 core licenses required for each proc
- Minimum of 16 core licenses required for each server
- Core licenses will be sold in packs of two.
- 8 two-core packs will be the minimum required to license each physical server.
- The two-core pack for each edition is 1/8th the price of a two proc license for corresponding 2012 R2 editions.

http://www.thomasmaurer.ch/2015/12/windows-server-2016-licensing-and-pricing/
HOUSE OF TAILS
70 dogs!!!
Safety, food, water, health, blankets, shade, love, fun

$15 = 1 month food

Donation box near registration area and participate in the raffle for huge rewards!

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