SQL Server dans un conteneur Docker

Christophe LAPORTE
SQL Server MVP / MCM

SQLSaturday Montreal 2017

@conseilit

Christophe Laporte

Microsoft SQL Server

~ since 1997
6.5 <= SQL Server <= 2016

MVP Microsoft Most Valuable Professional

Microsoft CERTIFIED Master

@conseilit

christophe_laporte@hotmail.fr

http://conseilit.wordpress.com/

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@conseilit

christophe_laporte@hotmail.fr

http://conseilit.wordpress.com/

- Migrations
- Formations
- Remote DBA
- Hébergement BDD

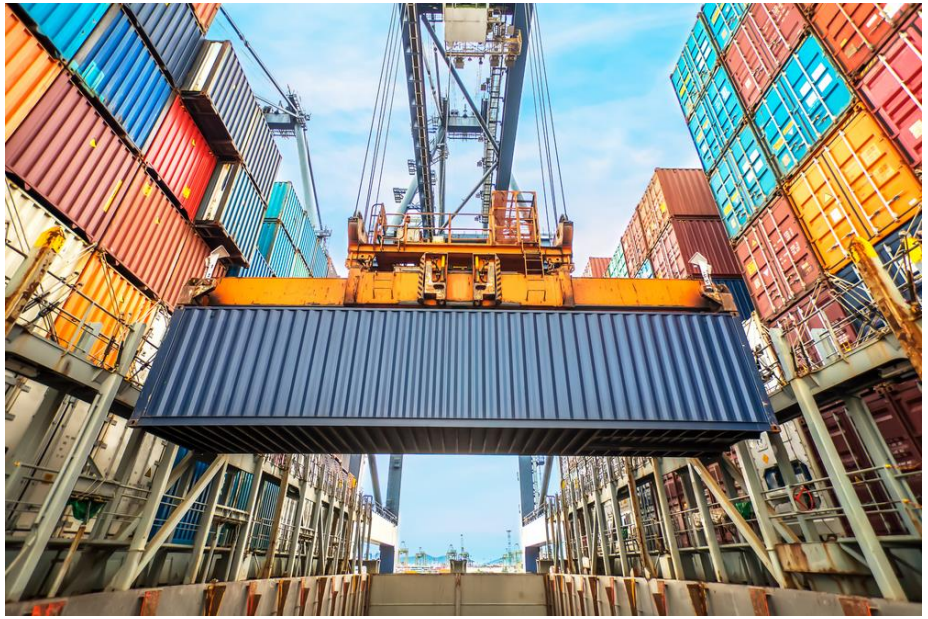
- Conseil
  - Infrastructure / Architecture
  - Virtualisation / Cloud
  - Haute disponibilité / Montée en charge
  - Optimisation / Dépannage
- Audit

Agenda

- Micro services et conteneurs
- Installation de Docker
- Création d'un conteneur
- Exécution d'un conteneur
- Scenarii SQL Server
- Q/A

Micro services et conteneurs

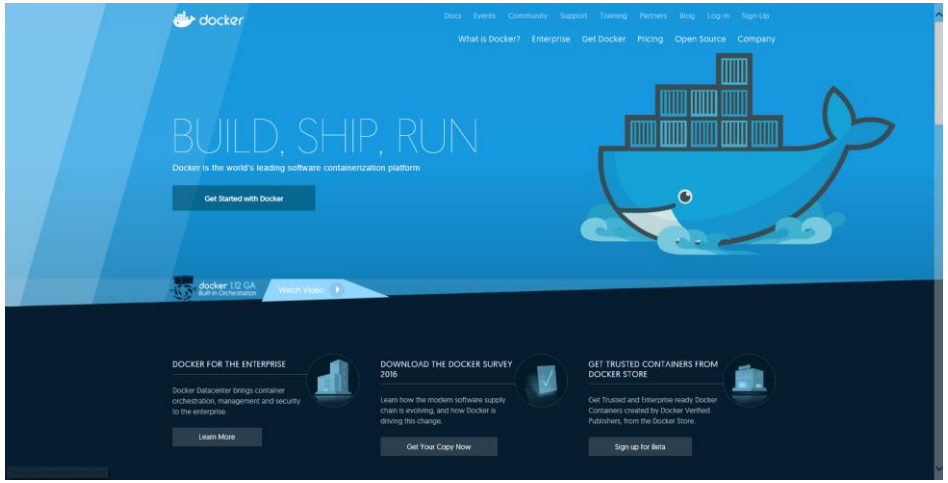
- Fin des applications monolithiques
- Nouvelle approche du développement
  - Ensemble de processus rendant des services simples
  - Briques légères pouvant évoluer de manière indépendante
- Pourquoi des containers
  - Emprunte système faible, efficacité des serveurs hôtes
  - Une seule création d'image, puis exécution multiples (dev / test / prod)
  - Démarrage rapide pour supporter une montée en charge
  - Complexité globale résolue par des sous tâches simples
  - Sans état
  - Eviter «cela fonctionne sur ma machine»
- Déploiement
  - Déploiement granulaire
  - Mode DevOps
  - Déploiement à large échelle
  - Déploiement rapide
  - Hautement automatisable

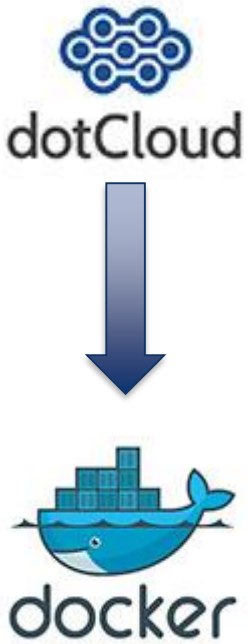


Comment ?
- Azure
- AWS
- Red Hat OpenShift
- Windows containers & Hyper-V containers
- Docker

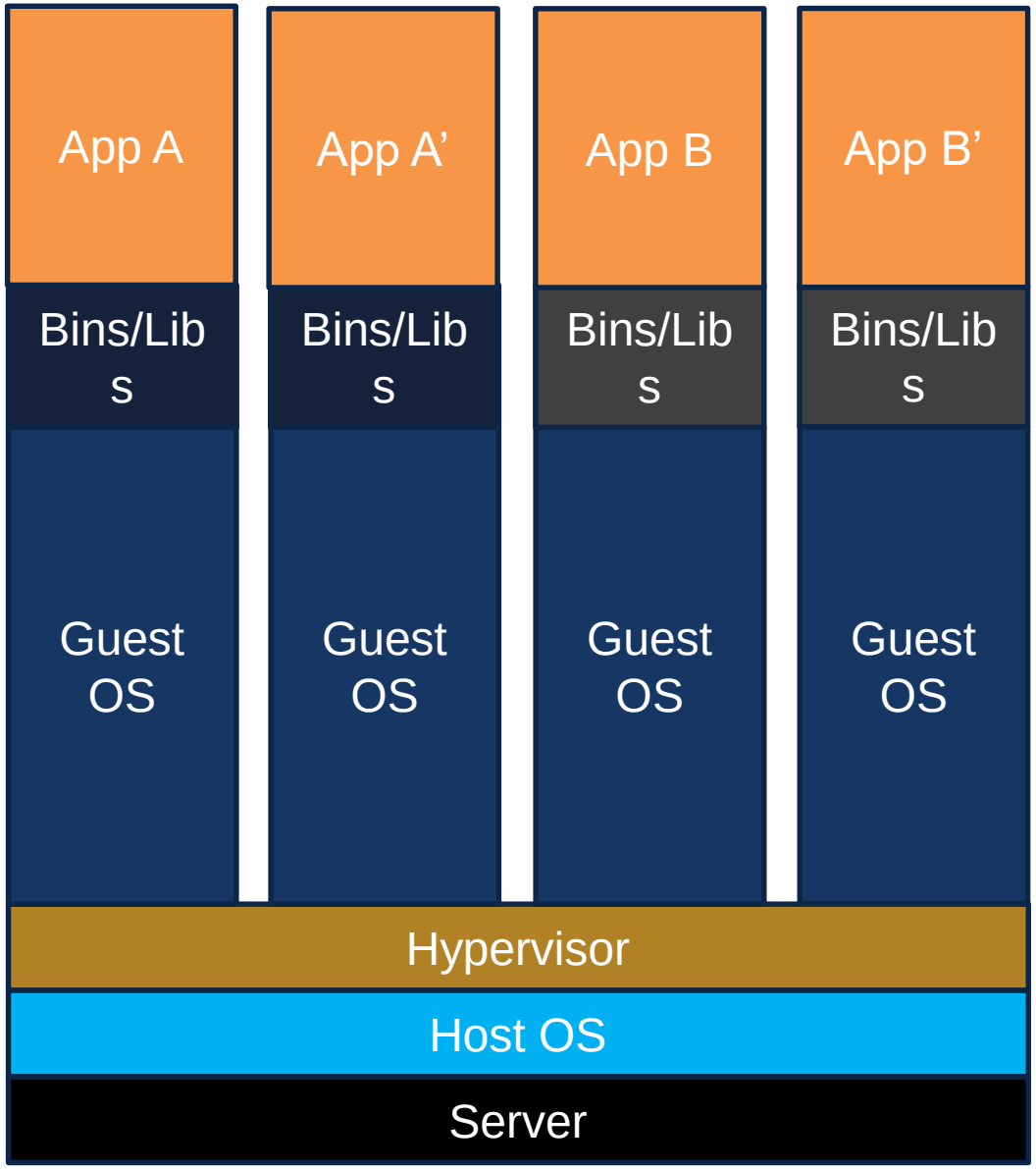
Docker

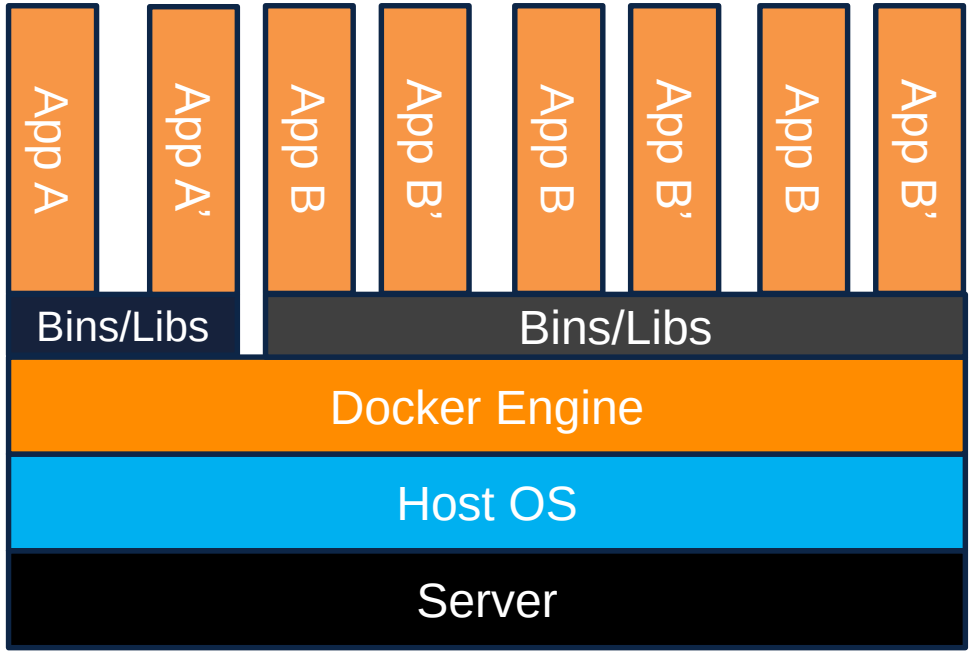
- Société
  - dotCloud
    - » Créée en 2008 à Montrouge par Solomon Hykes et Sébastien Pahl
  - 2010 : mise en avant du concept de conteneur
  - 2011 : dotCloud s'implante dans la Sillicon Valley
  - 2013 : Passage en mode open-source
  - 2013 : fondation d'une nouvelle société Docker Inc
- Terminologie
  - Image
  - Conteneur





Machines virtuelles versus conteneurs





Démo – Installation de Docker

Windows Server 2016

```
Install-Module -Name DockerMsftProvider -Repository PSGallery -Force
Install-Package -Name docker -ProviderName DockerMsftProvider
Restart-Computer -Force
```

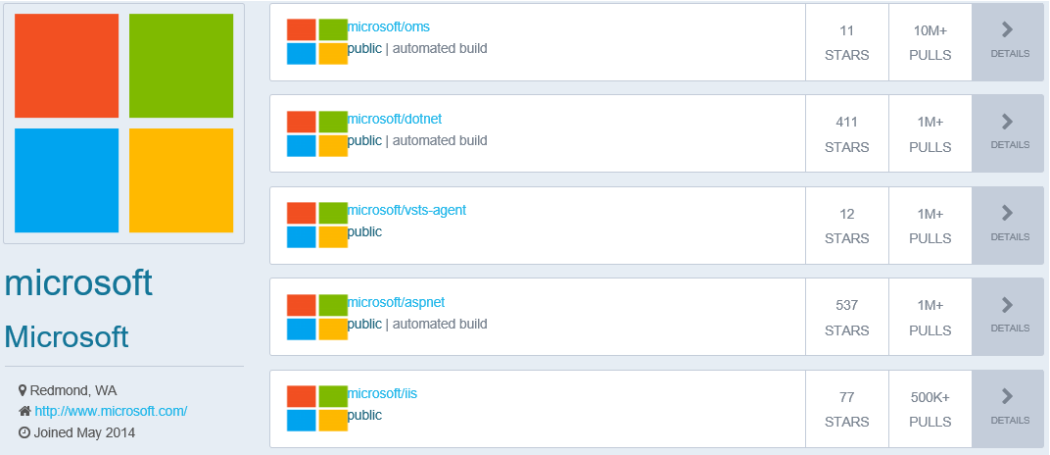
Xenial Xerus
(Ubuntu 16.04)

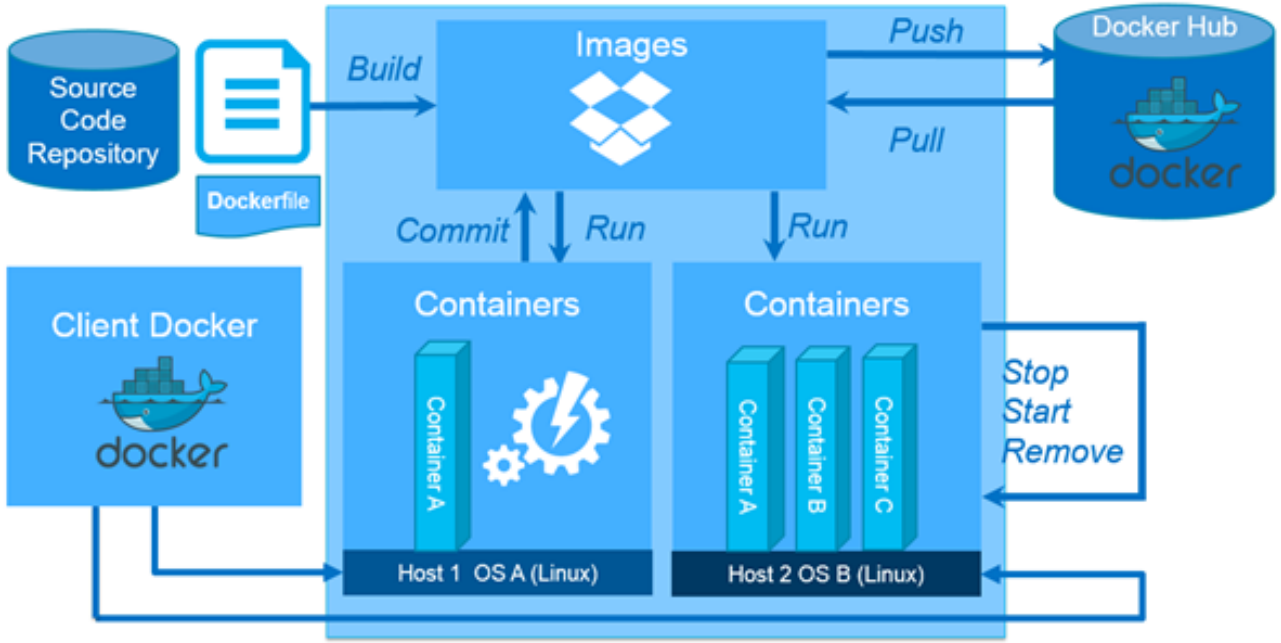
```
sudo apt-get install linux-image-extra-$(uname -r) linux-image-extra-virtual
sudo apt-get install docker.io
sudo service docker start
```

Docker --help

- Docker hub
  - Recherche d'images (IIS, SQL Server, MongoDB, MySQL, ...)
- Docker engine
  - Exécution des conteneurs
- Docker client
  - Ligne de commande
  - 45 instructions (v1.13.0-dev)

Logiciel "traditionnel"	Commande Docker
Trouver le logiciel …	Docker search
Télécharger, monter l'ISO	Docker pull
Créer un ISO / Zip	Docker build
Installer un logiciel	Docker create
Exécuter un logiciel	Docker start
Télécharger, installer et executer un logiciel	Docker run
Stopper un logiciel	Docker stop
Désinstaller un logiciel	Docker rm





Commandes : docker --help

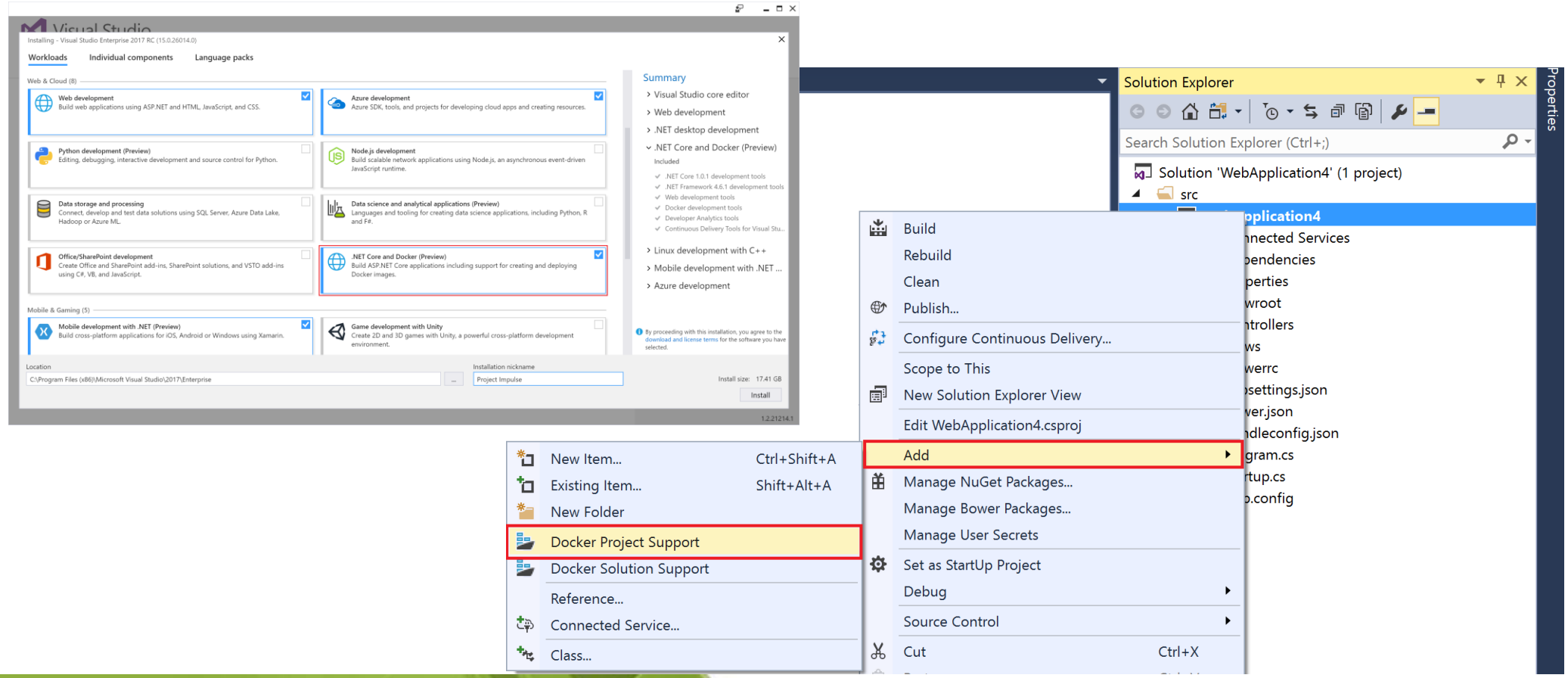
- attach Attach to a running container
- build Build an image from a Dockerfile
- commit Create a new image from a container's changes
- cp Copy files/folders between a container and the local filesystem
- create Create a new container
- diff Inspect changes on a container's filesystem
- events Get real time events from the server
- exec Run a command in a running container
- export Export a container's filesystem as a tar archive
- history Show the history of an image
- images List images
- import Import the contents from a tarball to create a filesystem image
- info Display system-wide information
- inspect Return low-level information on a container, image or task
- kill Kill one or more running containers
- load Load an image from a tar archive or STDIN
- login Log in to a Docker registry.
- logout Log out from a Docker registry.
- logs Fetch the logs of a container
- network Manage Docker networks
- node Manage Docker Swarm nodes
- pause Pause all processes within one or more containers
- port List port mappings or a specific mapping for the container
- ps List containers
- pull Pull an image or a repository from a registry
- push Push an image or a repository to a registry
- rename Rename a container
- restart Restart a container
- rm Remove one or more containers
- rmi Remove one or more images
- run Run a command in a new container
- save Save one or more images to a tar archive (streamed to STDOUT by default)
- search Search the Docker Hub for images
- service Manage Docker services
- start Start one or more stopped containers
- stats Display a live stream of container(s) resource usage statistics
- stop Stop one or more running containers
- swarm Manage Docker Swarm
- tag Tag an image into a repository
- top Display the running processes of a container
- unpause Unpause all processes within one or more containers
- update Update configuration of one or more containers
- version Show the Docker version information
- volume Manage Docker volumes
- wait Block until a container stops, then print its exit code

Docker & SQL Server

- Support natif du multi instance -> pourquoi containeriser ?
- Vitesse
  - Instanciation en quelques secondes
    - Parfait pour du dev, du support (durée de vie courte)
  - Economie
    - Instances de dev, moins de ressources car 1 seule VM partagée (réduction 1-10x)
    - Coût de licence réduits (Windows …)
  - Portabilité
    - Docker Windows, Mac, Linux, public cloud
- Tendance du marché
  - Etape suivante de la virtualisation

Intégré à Visual Studio 2017

https://blogs.msdn.microsoft.com/pakistan/2017/01/20/visual-studio-2017-brings-docker-home/



Docker & SQL Server

Docker Pull

- Images officielles Microsoft
  - SQL Server 2016 SP1
  - SQL Server v.Next

```
# Pull SQL Server Express 2016 SP1 from Docker Hub
docker pull microsoft/mssql-server-windows-express

# Pull SQL Server Developer 2016 SP1 from Docker Hub
docker pull microsoft/mssql-server-windows-developer

# Pull SQL Server developper v.Next from Docker Hub
docker pull microsoft/mssql-server-windows
```

Fichier Dockerfile

- Docker build
  - Image personalisée

```
## Custome SQL Server Express
docker.exe build -t sqlexpress .
```

Docker & SQL Server

Docker Pull

- Images officielles Microsoft
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```
# Pull SQL Server Express 2016 SP1 from Docker Hub
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# Pull SQL Server Developer 2016 SP1 from Docker Hub
docker pull microsoft/mssql-server-windows-developer

# Pull SQL Server developper v.Next from Docker Hub
docker pull microsoft/mssql-server-windows
```

Fichier Dockerfile

```
FROM microsoft/dotnet35

MAINTAINER Christophe Laporte

ENV sqlinstance SQL
ENV sqlsapassword Password1
ENV sql c:\\sql
ENV sqldata c:\\sql\\data
ENV sqlbackup c:\\sql\\backup

COPY . /install

WORKDIR /install

RUN  /install/sqlexpr_x64_enu.exe /q /x:/install/setup \
  && /install/setup/setup.exe /q /ACTION=Install /INSTANCENAME=%sqlinstance%
/FEATURES=SQLEngine /UPDATEENABLED=0 \
     /SECURITYMODE=SQL /SAPWD=%sqlsapassword% /SQLSVCACCOUNT="NT
AUTHORITY\System"  /SQLSYSADMINACCOUNTS="BUILTIN\ADMINISTRATORS" \
     /INSTALLSQLDATADIR=%sqldata% /SQLUSERDBLOGDIR=%sqldata%
/SQLBACKUPDIR=%sqlbackup% \
     /TCPENABLED=1 /NPENABLED=0 /IACCEPTSQLSERVERLICENSETERMS \
  && powershell ./Set-SqlExpressStaticTcpPort %sqlinstance% \
  && powershell ./Move-dirs-and-stop-service %sqlinstance% %sql% %sqldata% %sqlbackup% \
  && del sqlexpr_x64_enu.exe \
  && rmdir .\setup /s /q

CMD powershell ./start detached %sqlinstance% %sqldata% %sqlbackup%
```

Création d'un conteneur


```
# Pull SQL Server Express 2016 SP1 from Docker Hub
docker pull microsoft/mssql-server-windows-express

# Pull SQL Server Developer 2016 SP1 from Docker Hub
docker pull microsoft/mssql-server-windows-developer

# Pull SQL Server developper v.Next from Docker Hub
docker pull microsoft/mssql-server-windows
```


```
## SQL Server v.Next on Docker Linux
sudo docker pull microsoft/mssql-server-linux
```

Exécution du conteneur : Docker run

Exécute le conteneur En tâche de fond

Redirection de volume Host:Guest

Nom de l'image

```
docker run -d -p 40001:1433 -v c:\mssql:c:\data -e ACCEPT_EULA=Y -e sa_password=Password1! microsoft/mssql-server-windows-express
```

Redirection de ports : Host:Guest

Variables d'environnement

Exécution d'un conteneur


```
docker run --name sqldocker01 -d -p 40001:1433 -e sa_password=Password1! -e ACCEPT_EULA=Y microsoft/mssql-server-windows
docker logs sqldocker01
docker exec -it sqldocker01 powershell.exe
```


```
sudo docker run -d -e 'ACCEPT_EULA=Y' -e 'SA_PASSWORD=Password1!' -p 40001:1433 microsoft/mssql-server-linux
```

SQL Server Express

- Pourquoi SQL Server Express ?
  - Version légère de SQL Server (200MB pour les sources d'installation)
    - limitée en mémoire
    - Limitée en taille de bases
    - Service simple (seulement le moteur relationnel)
- Cas d'utilisation
  - Développement sur Machines Mac / Linux
  - Tests
  - Montée en charge : Répartition de charge
    - Mise à jour des données
      - /!\ Réplication ne fonctionne pas !
      - Service broker (client seulement)
      - Serveur lié
  - Philosophie typique du micro-service

SQL 2016 SP1

Feature	RTM				SP1			
	Standard	Web	Express	Local DB	Standard	Web	Express	Local DB
Row-Level Security	Yes	No	No	No	Yes	Yes	Yes	Yes
Dynamic Data Masking	Yes	No	No	No	Yes	Yes	Yes	Yes
Change Data Capture	No	No	No	No	Yes	Yes	No	No
Database Snapshot	No	No	No	No	Yes	Yes	Yes	Yes
Columnstore	No	No	No	No	Yes	Yes	Yes	Yes
Partitioning	No	No	No	No	Yes	Yes	Yes	Yes
Compression	No	No	No	No	Yes	Yes	Yes	Yes
In Memory OLTP	No	No	No	No	Yes	Yes	Yes	No
Always Encrypted	No	No	No	No	Yes	Yes	Yes	Yes
PolyBase	No	No	No	No	Yes	Yes	Yes	No
Fine Grained Auditing	No	No	No	No	Yes	Yes	Yes	Yes
Mulitple Filestream Containers	No	No	No	No	Yes	Yes	Yes	No

Surface de programmation similaire entre éditions

SQL Server développeur

- Environnement
  - Dévelopement
  - Test

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Christophe LAPORTE - SQL Server MVP-MCM | Sign out

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SQL Server Database Engine Blog

SQL Server 2016 Developer Edition in Windows Containers

February 21, 2017 by Perry Skountrianos - MSFT // 8 Comments

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We are excited to announce the public availability of SQL Server 2016 SP1 Developer Edition in Windows Containers! The image is now available on Docker Hub and the build scripts are hosted on our GitHub repository. This image can be used in both Windows Server Containers as well as Hyper-V Containers.

SQL Server 2016 Developer Edition: Docker Image | Installation Scripts

We hope you will find this image useful and leverage it for your container-based applications!

Why use SQL Server in containers?

SQL Server 2016 in a Windows container would be ideal when you want to:

- Quickly create and start a set of SQL Server instances for development or testing.
- Maximize density in test or production environments, especially in microservice architectures.
- Isolate and control applications in a multi-tenant infrastructure.

Prerequisites

Before you can get started with the SQL Server 2016 Developer Edition image, you'll need a Windows Server 2016 or Windows 10 host with the latest updates, the Windows Container feature enabled, and the Docker engine.

- Quick start for Windows Server 2016
- Quick start for Windows 10

Pulling and Running SQL Server 2016 in a Windows Container

Below are the Docker pull and run commands for running SQL Server 2016 Developer instance in a Windows Container. Make sure that the mandatory sa_password environment variable meets the SQL Server 2016 Password Complexity requirements.

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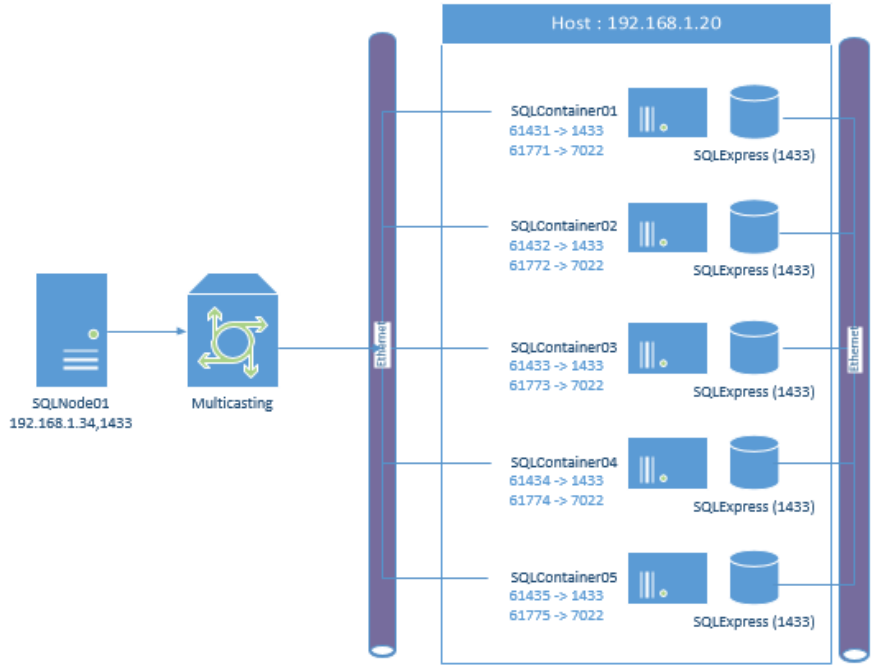
Tags

Azure SQL Database Azure Sql Db Backup Bulk

Scénarii Docker SQL Server

- Instances Developpement
  - Expérience utilisateur identique Windows, Mac, Linux
- Instances de test à la demande
  - Rapidité de déploiement
  - Sans état
- Instances de production (ISV, Cloud, ScaleOut)

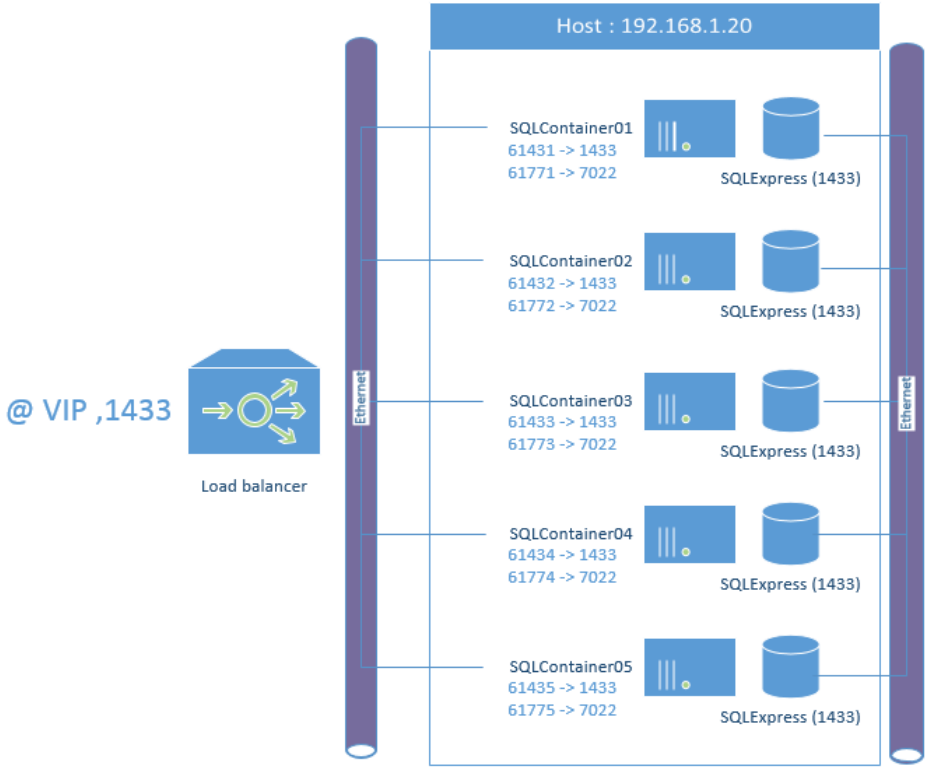
Docker – SSB - Multicasting




```
BEGIN TRANSACTION;

    BEGIN DIALOG @DialogHandleSQL01
     FROM SERVICE InitiatorService
     TO SERVICE   N'TargetServiceSQL01'
     ON CONTRACT  SampleContract
     WITH ENCRYPTION = OFF;

    BEGIN DIALOG @DialogHandleSQL02
     FROM SERVICE InitiatorService
     TO SERVICE   N'TargetServiceSQL02'
     ON CONTRACT  SampleContract
     WITH ENCRYPTION = OFF;

    BEGIN DIALOG @DialogHandleSQL03
     FROM SERVICE InitiatorService
     TO SERVICE   N'TargetServiceSQL03'
     ON CONTRACT  SampleContract
     WITH ENCRYPTION = OFF;

    BEGIN DIALOG @DialogHandleSQL04
     FROM SERVICE InitiatorService
     TO SERVICE   N'TargetServiceSQL04'
     ON CONTRACT  SampleContract
     WITH ENCRYPTION = OFF;

    BEGIN DIALOG @DialogHandleSQL05
     FROM SERVICE InitiatorService
     TO SERVICE   N'TargetServiceSQL05'
     ON CONTRACT  SampleContract
     WITH ENCRYPTION = OFF;


    SEND ON CONVERSATION (
        @DialogHandleSQL01,@DialogHandleSQL02,@DialogHandleSQL03,@DialogHandleSQL04,@DialogHandleSQL05
    )
         MESSAGE TYPE RequestMessage (@RequestMsg);

    SELECT @RequestMsg AS SentRequestMsg;

COMMIT TRANSACTION;
```

Multiple Begin Dialog
Single Send on Conversation

Docker – Load Balancing



- Windows NLB
  - 3rd party hardware
  - Kemp
  - F5
  - Cisco
  - Citrix
  - Radware
- 3rd party software
  - Kemp
  - Pfsense
  - Scalearc
  - Nginx
  - …

Démo

- Multicast Service Broker
- NLB conteneurs Docker

		Queue			Session rate			Sessions						Bytes	
		Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out
☐	Conteneur01	0	0	-	0	10		0	10	-	10	10	4h21m	9 160	15 780
☐	Conteneur02	0	0	-	0	10		0	10	-	10	10	4h21m	9 160	15 780
☐	Conteneur03	0	0	-	0	10		0	10	-	10	10	4h21m	9 160	15 780
☐	Conteneur04	0	0	-	0	10		0	10	-	10	10	4h21m	9 160	15 780
☐	Conteneur05	0	0	-	0	10		0	10	-	10	10	4h21m	9 160	15 780
	Backend	0	0		0	50		0	50	200	50	50	4h21m	45 800	78 900

Automatisation & gestion de configuration

- Infrastructure en tant que code

- Installation / gestion sur machine existante

Q & A

- Q & A
- Merci pour votre attention