T7 Cloud Simulation

On-demand access simulation

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T7 Cloud Simulation in a Nutshell

T7 Cloud Simulation allows members and customers to

➢ Control the market
  o Create your own order books
  o Set the market trading phase
  o Change the state of specific products
  o Use the Liquidity Generator and Auto Matcher
  o Enter trade reversals
  o Test failover scenarios
  o Predefine market scenarios and test specific strategies that would not be possible in a shared environment
    • Create unique order books
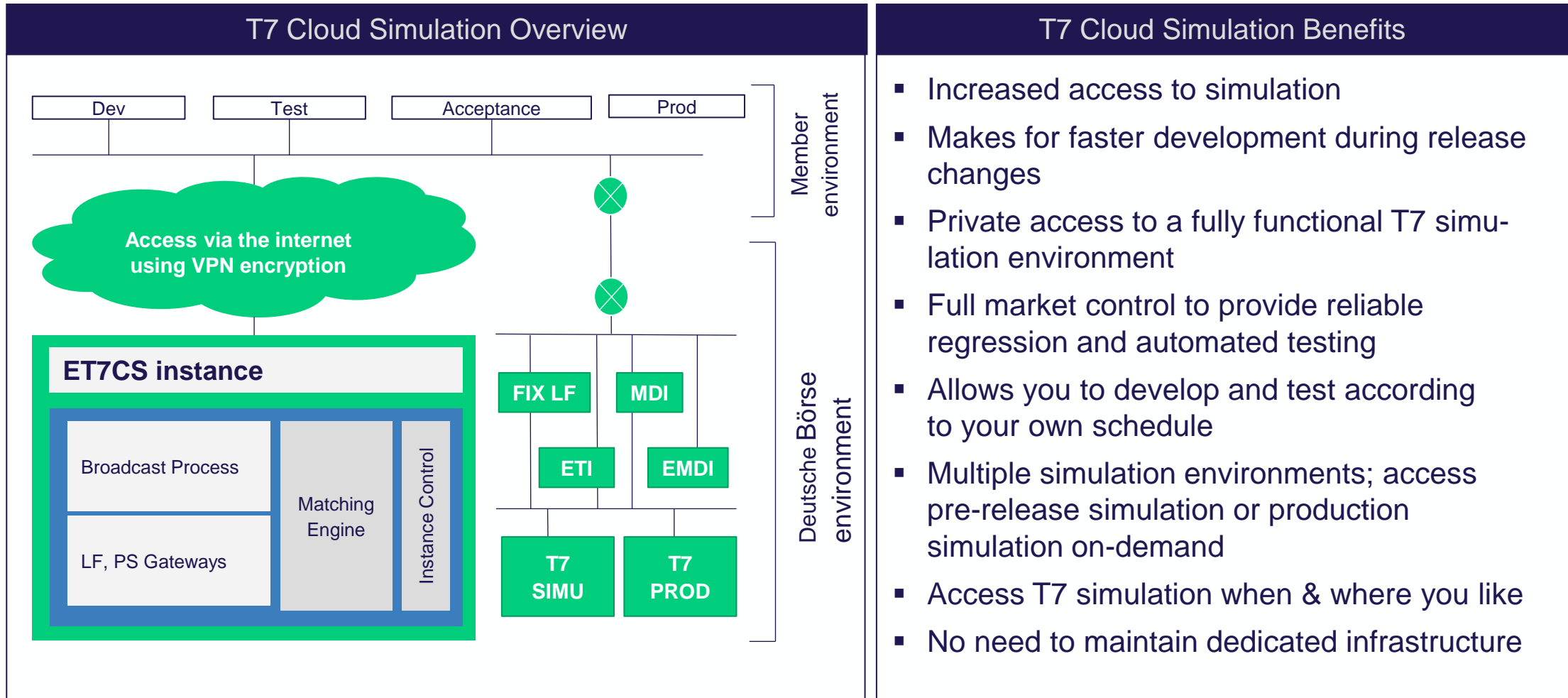   • Recreate specific trading scenarios

➢ Test strategies that are difficult / impractical to test in a shared environment
➢ Perform regression testing based upon own parameters
➢ Automate application testing to decrease development costs

T7 Cloud Simulation Service Offering and Benefits

Participants benefit from Deutsche Börse's T7 Cloud Simulation platform

T7 Cloud Simulation Overview

Dev | Test | Acceptance | Prod

Member environment

Access via the internet using VPN encryption

ET7CS instance

Broadcast Process

LF, PS Gateways

Matching Engine

Instance Control

Deutsche Börse environment

FIX LF | MDI

ETI | EMDI

T7 SIMU | T7 PROD

T7 Cloud Simulation Benefits

- Increased access to simulation
- Makes for faster development during release changes
- Private access to a fully functional T7 simulation environment
- Full market control to provide reliable regression and automated testing
- Allows you to develop and test according to your own schedule
- Multiple simulation environments; access pre-release simulation or production simulation on-demand
- Access T7 simulation when & where you like
- No need to maintain dedicated infrastructure

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T7 Cloud Simulation Features (1/2)

- ➢ Allows participating customers to deploy a private, on-demand instance of a T7 simulation environment for testing and development purposes. This instance is created and runs within a public cloud infrastructure allowing customers access from any computer with internet access anywhere in the world.

- ➢ **Its low-cost**, consumption-based billing model offers customers easy access to a commitment-free environment for developing and testing trading software. Participants use and pay for as much access to the T7 Cloud Simulation as they choose. There are no minimums or maximums.

- ➢ Participants can choose from two different simulation environments and reference data when requesting **a** T7 Cloud Simulation instance. They can also choose to access the same T7 Release Software that is running in the simulation or the version running in production. For both versions participants can choose to use production like reference data (products) or test data (the up and coming products which might include new functionality).

- ➢ Offers the possibility to engage in testing of the upcoming T7 software version, one month prior to its deployment in the regular T7 Simulation environment.

- ➢ **Trading and Admin GUI access** provided, which means that participants can check positions and trades (trade, alter positions) in the trading GUI

T7 Cloud Simulation Features (2/2)

➢ **Trading and Admin GUI access**, It's possible to perform Trade Enrichment Maintenance, Entitlement Maintenance and transaction size limit maintenance etc.

➢ **Reports:** You can save data from an instance, by downloading the raw PCAP files for an instance either via the CS API or Launchpad.

Supported Interfaces

T7 Cloud Simulation offers members access to T7's standard interfaces including:

Trading interfaces	Market data
- Enhanced Trading Interface (ETI) - FIX LF Interface - GUI	- Reference Data Interface (RDI) - Market Data Interface (MDI) - Enhanced Market Data Interface (EMDI) - Enhanced Order Book Interface (EOBI) - GUI

Access includes **five** unique member IDs, each enabled with:
- four trader IDs (one supervising trader, one head trader and two regular traders)
- high-frequency ETI sessions
- low-frequency ETI sessions

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T7 Cloud Simulation - User Experience

Step 1:
Member logs into the T7 Cloud Simulation (CS) start page and requests an instance

T7 Cloud Simulation start page

Step 2:
A CS instance spins up for the member

T7 Cloud Simulation (CS) start page

T7 CS instance
Instance Control
T7 Architecture

Step 3:
Member logs into the Instance Control to control their Cloud Simulation Instance

T7 CS instance
Instance Control
T7 Architecture

Step 4:
Member connects to CS Instance via VPN over the Internet

T7 CS instance
Instance Control
T7 Architecture

Step 5:
Member develops / tests their software

T7 CS instance
Instance Control
T7 Architecture

Step 6:
When finished, member logs into the T7 Cloud Simulation Launchpad to terminate the CS instance

T7 CS
Start Page

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T7 Cloud Simulation - API Experience

Step 1:
Member logs into the T7 Cloud Simulation (CS) start page and creates an API key

T7 Cloud Simulation start page

Step 2:
Member uses the CS API to create instances in code

T7 Cloud Simulation REST API

T7 CS instance
T7 Architecture

Step 3:
Instances are managed using the CS API, perhaps as part of an automated build or CI pipeline

T7 Cloud Simulation REST API

T7 CS instance
T7 Architecture

Step 4:
Member connects to their CS instance via VPN over the Internet
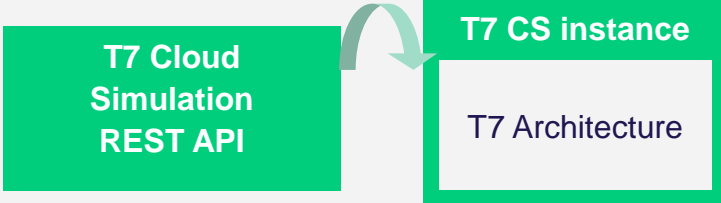
T7 CS instance
T7 Architecture

Step 5:
Member develops and tests their software

T7 CS instance
T7 Architecture

Step 6:
Member uses the CS API to terminate their instances, no human intervention required

T7 Cloud Simulation REST API

T7 CS instance
T7 Architecture

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T7 Cloud Simulation Limitations

Besides its benefits, Deutsche Börse's T7 Cloud Simulation platform also has its limitations

➢ No connection to Clearing, which means
  ▪ You can't test clearing / end-to-end trade processing
  ▪ No Member risk actions will be processed
➢ Customer support is limited due to the information available is limited to your private instance
➢ The order book is empty when starting your private instance
➢ You can only use the Member ID's provided (it is not possible to create an instance with your specific Member ID)
➢ There is no Market Operations, and you can't test against other 'real' participants

PS: Cloud Simulation will always open the same image in the same state, every start is the same time and date, therefore we do not experience any expirations, this means that every day is "Groundhog Day"

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T7 Cloud Simulation Outlook

> Deutsche Börse's T7 Cloud Simulation platform is highly customizable.

> We plan to launch further enhancements and functionality to complement our service in future releases, some ideas include
> - Sophisticated automated trade-generation scripts
> - Intraday product expirations
> - Addition reporting and audit trail functionality in the event of updated regulatory requirements
> - Historical order book data subscriptions and scenarios

> Please contact the Cloud Simulation Team with your wishes and ideas and we will do everything to enable the full potential of the Cloud Simulation for you.

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Thank you!

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