

Multiplayer-Spielwelt-Synchronisierung

Gameanalyse

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Grundlegende Forschungsfrage

- Wie kann eine veränderbare Spielwelt synchron gehalten werden?
- Was sind bewährte Ansätze bei der Implementierung?
- Wie kann die Datenübertragung komprimiert werden?
- Recherche für Projekt



Minecraft

2009



- Freie kreative Sandbox
- Ikonischer Voxel-Style
- Meistverkaufte Computerspiel
- Tiefe mit Höhenschichten



Valheim

2021



- Wikinger-Fantasy-Rollenspiel
- Low-Poly-Style
- Komplexere Physik-Simulation
- Horizontale Inselwelt mit Biomen



Gemeinsamkeiten

- Baumechanik mit persistenten Veränderungen
- Kooperatives Survival
- Riesige prozedural generierte Open-World
- Sehr erfolgreich
- Öffentliche Informationen zu technischen Details

Analysekategorien

- Technische Multiplayer-Implementierung
 - Architektur
 - Synchronisierung
 - Komprimierung bei Datenübertragung
- Multiplayer-Performance

Multilayer-Performance

Erfahrungsberichte

Minecraft

10

AlexPlays

I've played this game on almost every platform possible, for over 10 years. It's great in singleplayer, but even better in multiplayer. You can have fun with the base game in vanilla or with mods, regardless of your age. It's the game that I have the most memories with and I think that every gamer should have played it at least once. Only thing that I don't really like is the Marketplace on Bedrock Edition, since most add-ons are paid.

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ForlornFigure

The only game I've gone back to over the years consistently. It's a masterpiece in every way. With the updates, the game has become more charming and personable since the beginning. I'm not a fanatic in any way, but Minecraft is a game that anyone can play and that's why I love it so much.

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MirandaLind

It's a great game, you can express yourself easily in 3D blocks. You can choose to have infinite resources, or survive the monsters in the night. Definetly worth the money it cost me. Really hate that bedrock edition needs extra money to get mods tho. Otherwise, Java edition is absolutely perfect.

8

DSR_Reviews

Great game without a doubt but it quickly gets boring (especially without mods and friends).

Valheim

 Nico | Dadmode :) 27. Mai 2024 um 8:16

The Land of Stutter and Desync

I really hope there's a big fix coming for Ashlands because as of now, we simply can't play in multiplayer. There's near constant desync issues and stuttering in Ashlands where enemies just appear and disappear, the game keeps freezing etc.

 [IN-S] Cyllin 1. Mrz. 2021 um 14:07

LOW FPS & LAG/DESYNCS? Look here.

 aquila 8. Jan. 2024 um 0:55

How has this game improved on the technical side since Launch?

post-launch Valheim was very stable and bug-free (sort of) for an early access title, but there still were some major problems, especially when building a village with some friends and space got cluttered with things, the FPS dropped very low at times. have they done something about this?

other problem was rubberbanding, lag and desync when exploring with multiple people.

desync issues. This is not a gives you some insight and ning, as well as providing some

 Hawk 22. Feb. 2021 um 2:40

Playing on two servers with 6 to 8 players on at a time. Haven't had any problems at all.

#13

Minecraft–Implementierung



- Server–Autorität
- Chunk–based Unterteilung der Spielwelt
- Palette–Komprimierung für Datenübertragung
- Custom–Engine (Java) 

Minecraft-Implementierung

Server-Autorität



Client

Server

1. Player sendet Anfrage zur Platzierung von Block an X,Y,Z



2. Platzierung wird validiert

3. Welt wird aktualisiert

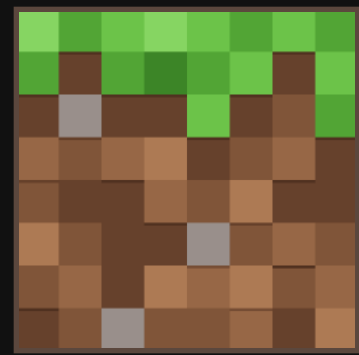


4. Client erhält Bestätigung über erfolgreiche Platzierung

5. Neuer Block wird angezeigt

Minecraft-Implementierung

Chunks



- 16 x 16 x 16 Blöcke je Chunk
- Mit Palette

0	1	2	3	4
---	---	---	---	---

5	5	5	5
6789	6789	6789	6789
80	80	432	432
432	432	432	27384

0	0	0	0
1	1	1	1
2	2	3	3
3	3	3	4

Minecraft–Implementierung



Vorteile

- Hohe Konsistenz
- Effiziente Komprimierung
- Cheat–Prevention

Nachteile

- Hohe Server–Last
- Hoher Umsetzungsaufwand

Valheim-Implementierung



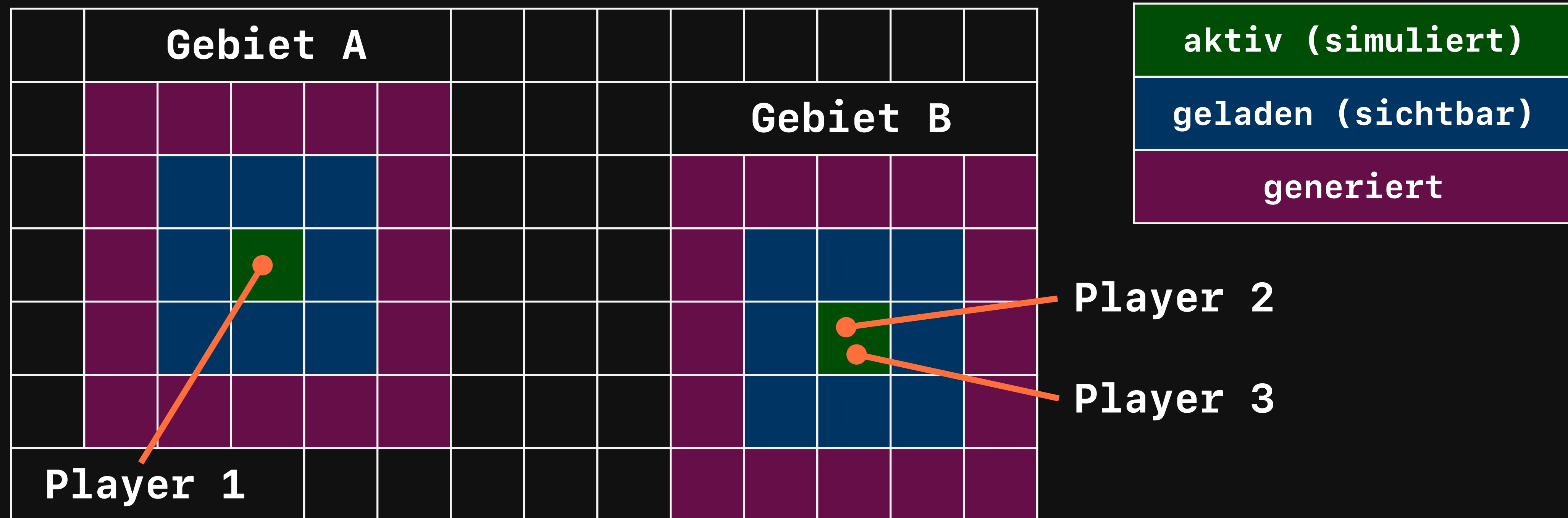
- Client-controlled distributed Game-Logic
- Area-Control an ersten Client, der Gebiet betritt
- Control-Transfer bei Verlassen des Clients
- Server speichert Zustand
- Unity (C#) 

Valheim-Implementierung

Area-Control



- Player 1 kontrolliert Gebiet A
- Player 2 kontrolliert Gebiet B



Valheim-Implementierung



Vorteile

- Komplexe Physik möglich
- Geringe Server-Last
- Geringe Umsetzungsaufwand

Nachteile

- Aufwändige Wartung
- Unfaire Lastverteilung
- Sehr latenzanfällig

Erkenntnisse

- Server-Autorität ist essentiell
- Hohe Konsistenz verhindert Probleme
- Nur für Player relevante Bereiche berechnen
- Aufwand für Komprimierung kann sich lohnen
- Interessant kreative Lösungen kennenzulernen

Ende

Vielen Dank!

- Fragen?
- Anmerkungen?

Quellen

Implementierungen

Minecraft



- https://minecraft.wiki/w/Java_Edition_protocol/Chunk_format
- <https://minecraft.fandom.com/wiki/Tick>
- <https://de.wikipedia.org/wiki/Minecraft>
- <https://wiki.fabricmc.net/tutorial:networking>
- <https://github.com/YouHaveTrouble/minecraft-optimization>

Valheim



- <https://valheim.fandom.com/wiki/Zones>
- https://valheim.fandom.com/wiki/Building_stability
- <https://help.dathost.net/article/103-valheim-server-lags-desync-instability>
- <https://dathost.net/blog/valheim-common-performance-issues-and-solutions>
- <https://help.dathost.net/article/103-valheim-server-lags-desync-instability>
- <https://gamedaft.com/what-engine-does-valheim-use/>

Recherche unterstützt durch Claude 

Quellen

Reviews

Minecraft



- <https://www.metacritic.com/user/AlexPlays/>
- <https://www.metacritic.com/user/ForlornFigure/>
- <https://www.metacritic.com/user/Sandushki/>
- <https://www.metacritic.com/user/MirandaLind/>
- https://www.metacritic.com/user/DSR_Reviews/

Valheim



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