ENGINEERING DECISIONS BEHIND
WORLD OF TANKS
GAME CLUSTER

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#GDC2016
12+ years of software development: as a developer, team lead, architect, CTO, even as a product manager.

Currently — Solutions Architect in Wargaming
WORLD OF TANKS: RU

- Amsterdam: 40 servers
- Frankfurt: ~70 servers
- Moscow: 250+ servers
- Novosibirsk: 80+ servers
- Krasnoyarsk: ~70 servers

Servers distribution by region.
CLUSTER ANATOMY
HOW SINGLE CLUSTER WORKS
CLUSTER COMPONENTS

**LoginApp processes**
Responsible for logging user in. LoginApps have public IP.

**CellApp processes**
Power actual tank battles. Load is dynamically balanced among CellApps in real-time.

**BaseApp processes**
Proxy between user and CellApp. Runs all hangar logic. BaseApps have public IP.

**DBApp processes**
DBApps persist user data to the database.

***Mgr processes**
Manage instances of corresponding *App processes.
CLUSTER ANATOMY
HOW BATTLE IS HANDLED WITHIN CLUSTER INFRASTRUCTURE
**Cell load** — amount of time cell spends in calculation of game situation divided by length of game tick.

**CellAppMgr** changes cells’ sizes in real-time in order to keep load of every cell below configured threshold.
CellAppMgr can also add additional cells to space in order to maintain each cell's load below configured value.
Area of interest

Cell 1

Cell 2

500 m

Your tank

Enemy tank

Area of interest
“GHOST IN THE CELL”
LEVEL OF DETAILS

Beyond classical function of rendering optimization, LODs are used also in client-server network traffic optimization: in far LODs entity updates from server are becoming more sparse, some property updates are not being sent at all.
Reviver — a watchdog process used to restart other processes that fail.

Reviver processes are typically started on machines reserved for fault tolerance purposes.

*Mgr processes restart failed *App processes
Entities in **CellApp** store their back-up data in corresponding **BaseApp** entity.

**BaseApp** backs up its entities to other BaseApps, holds cell entity backup data.

Upon **CellApp** crash, cell entities will be restored from latest backup available.

If a **BaseApp** dies, each of its entities is restored on the **BaseApp** that was backing it up.
Single cluster targets Availability and Partition Tolerance in terms of CAP theorem.

AP approach in this case means that battle state in case of components failure is eventually consistent (among server and all connected clients).

*In theoretical computer science, the CAP theorem, also known as Brewer's theorem, states that it is impossible for a distributed computer system to simultaneously provide all three of the following guarantees: Consistency, Availability and Partition Tolerance.*
GEOGRAPHICALLY DISTRIBUTED

CLUSTER-OF-CLUSTERS
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Multi cluster targets Consistency and Partition Tolerance in terms of CAP theorem.

CP approach in this case means that account state is consistent among infrastructure components. This sacrifices Availability of the game for a particular client in case of Periphery cluster failure or network unavailability.

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EXTERNAL INTEGRATION: EVENT DRIVEN SOA
LARGEST MULTI-CLUSTER IN NUMBERS

30+ million players

Peak of 1.1+ million players simultaneously online

200+ logins/sec, spikes to 1000+

100+ battles started every second

3000+ state exports to external services per second

500+ Gb of accounts data
QUESTIONS?

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