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“Getting There from Here”

March 8, 2008

Jon Watte

Evolution of Enterprise Virtual Worlds

Play → *Practice Plan Rehearse* → *Perform*

- MMOGs
- Social Nets

- Distributed Learning
- Learning Mgmt Systems Integration
- Distributed Review

- Distributed workplace collaboration
- Mashups with other business applications
- **Seamless interoperability** between virtual worlds

Standalone apps → *The Collaborative Web*

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MMVE Beyond Games (Serious or Not)

	Retail	Communi-cations & Technology	Healthcare	Financial Services	Military & Intelligence	Transport-ation	Energy
Employee Training & Learning	✓	✓	✓	✓	✓	✓	✓
Virtual Office Collaboration	✓	✓	✓	✓	✓	✓	✓
Emergency Preparedness	✓	✓	✓	✓	✓	✓	✓
Customer Service	✓	✓	✓	✓			
Product/Process Prototyping	✓	✓	✓		✓	✓	✓
Virtual Retail	✓	✓					

Enterprises are seeing opportunity for multiple applications and benefits by investing in a Virtual World platform

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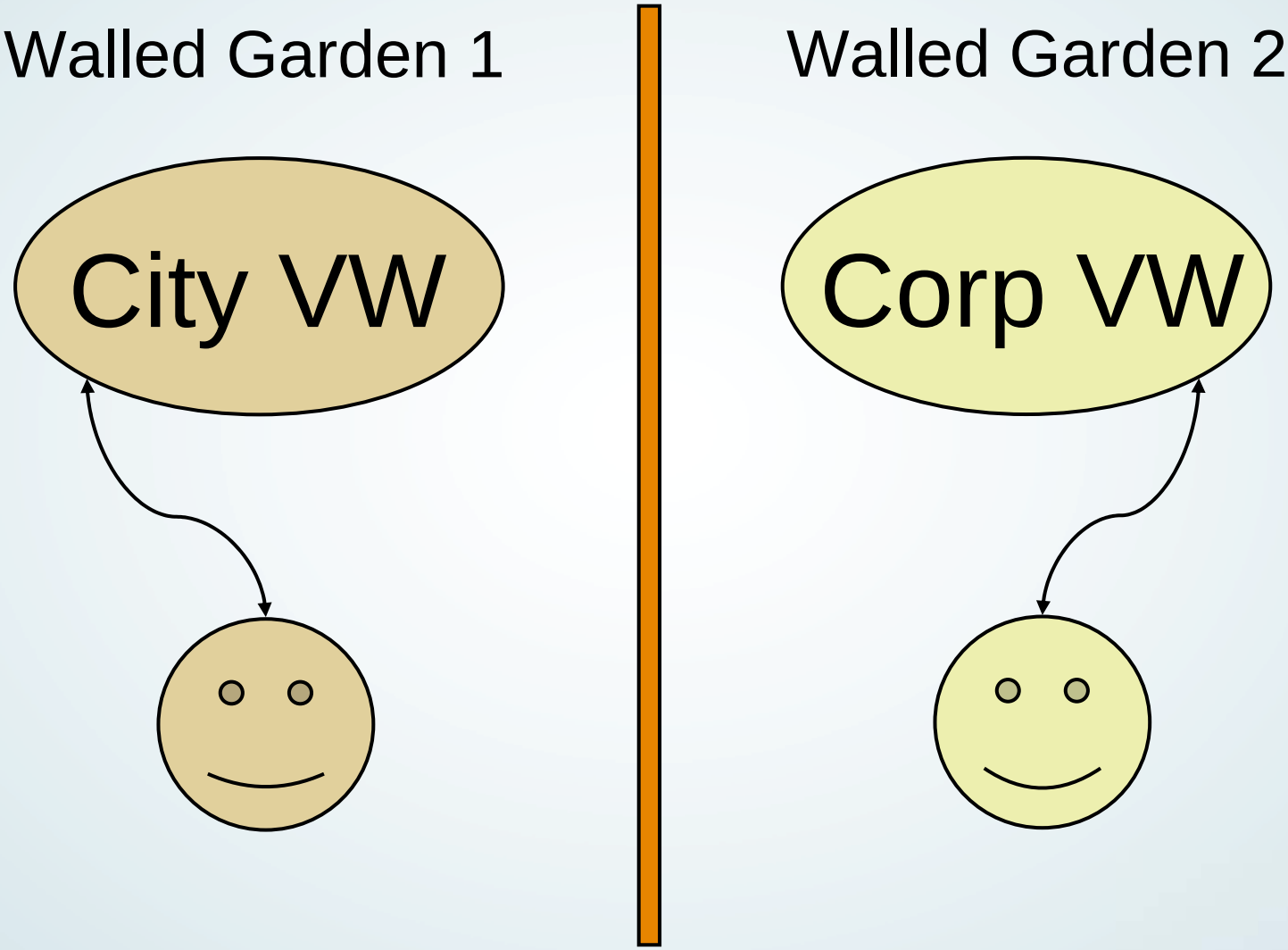
Example

- **Greenleaf Medical**
  - Leader in the application of virtual reality to tele-rehabilitation and the challenges of behavioral health. Company is a medical product development company and consulting group that has been successfully creating medical software since 1988.
- **Solution**
  - Computer-based approach for treating teen behavioral disorders using a multiplayer immersive environment called SECTER – the Simulated Environment for Counseling, Training, Evaluation, and Rehabilitation based on OLIVE™
  - Successful results working with the NJ based Center for Family Guidance
- **Plans**
  - Expanding application development to other behavioral therapy areas and home based telemedicine

Interoperability Scenario

- Consider a city that uses a VW by vendor A for planning and training
- Consider a company with a factory plant within that city that uses a VW by vendor B for education and operations
- Consider a case where they want to collaborate
  - Emergency exercises
  - City planning
  - Meetings and collaboration

Existing Architecture



Universal Clients?

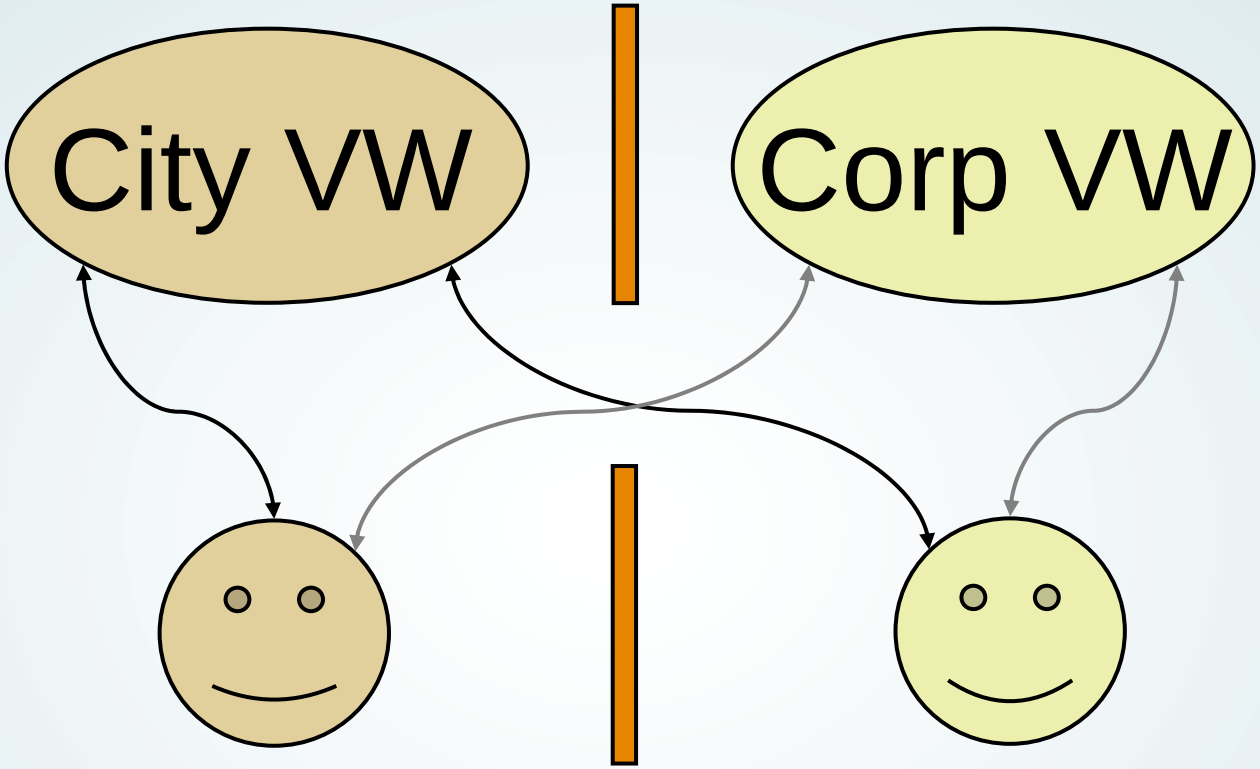
A Universal Client is software you install on your computer to let you connect to any virtual world and experience its full capabilities.

Building the Universal Client

- Two ways to build the UC
  - 1: Pick an existing implementation
    - Second Life is trying
  - 2: Develop it from scratch
    - A solid 3D virtual world is a 5-10 year effort
- All existing technologies would have to be updated

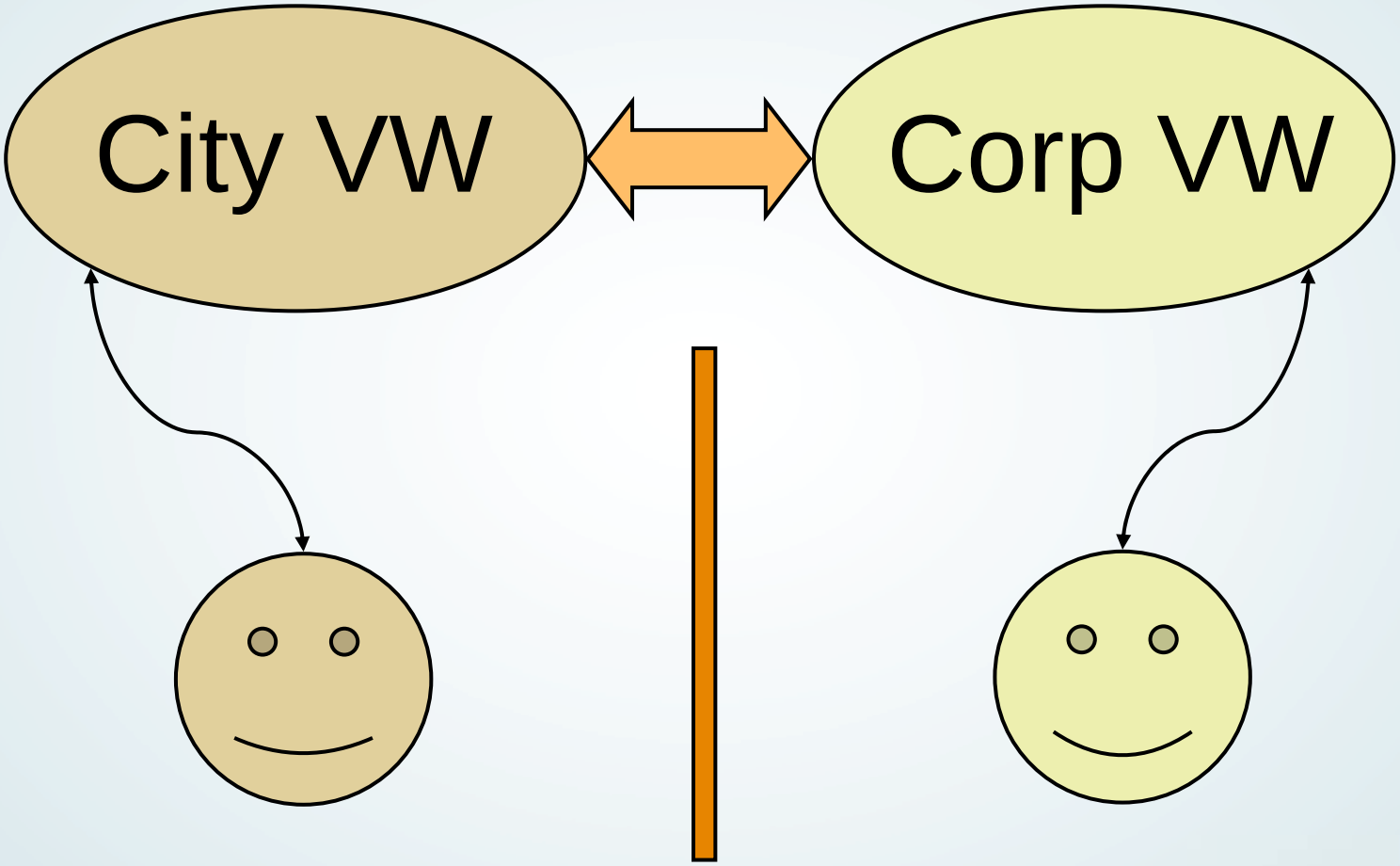
Either way, there's 5-10 years of pain!

Using the Universal Client



The Universal Client doesn't enable the interoperability scenario!

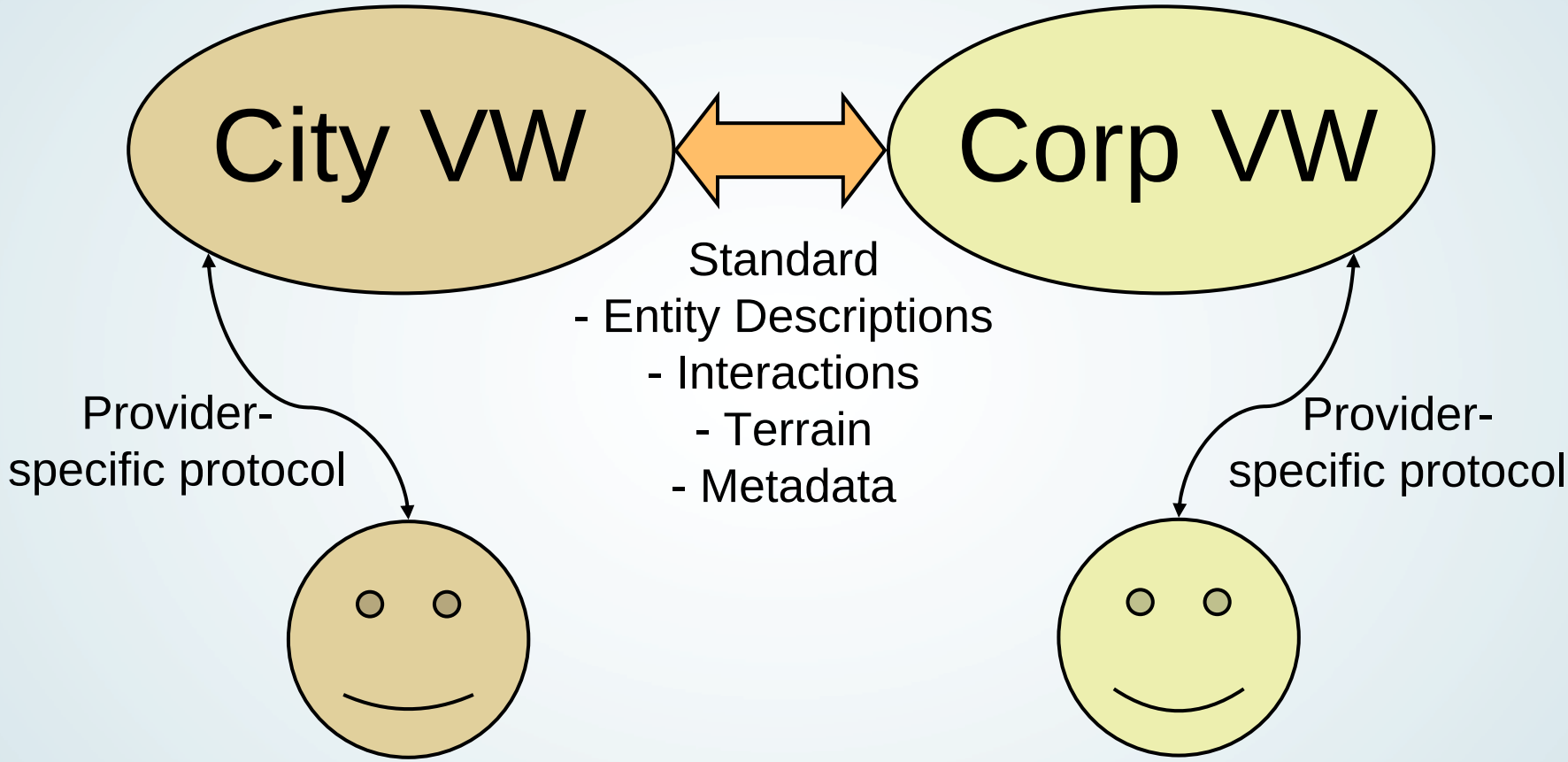
Alternative Architecture



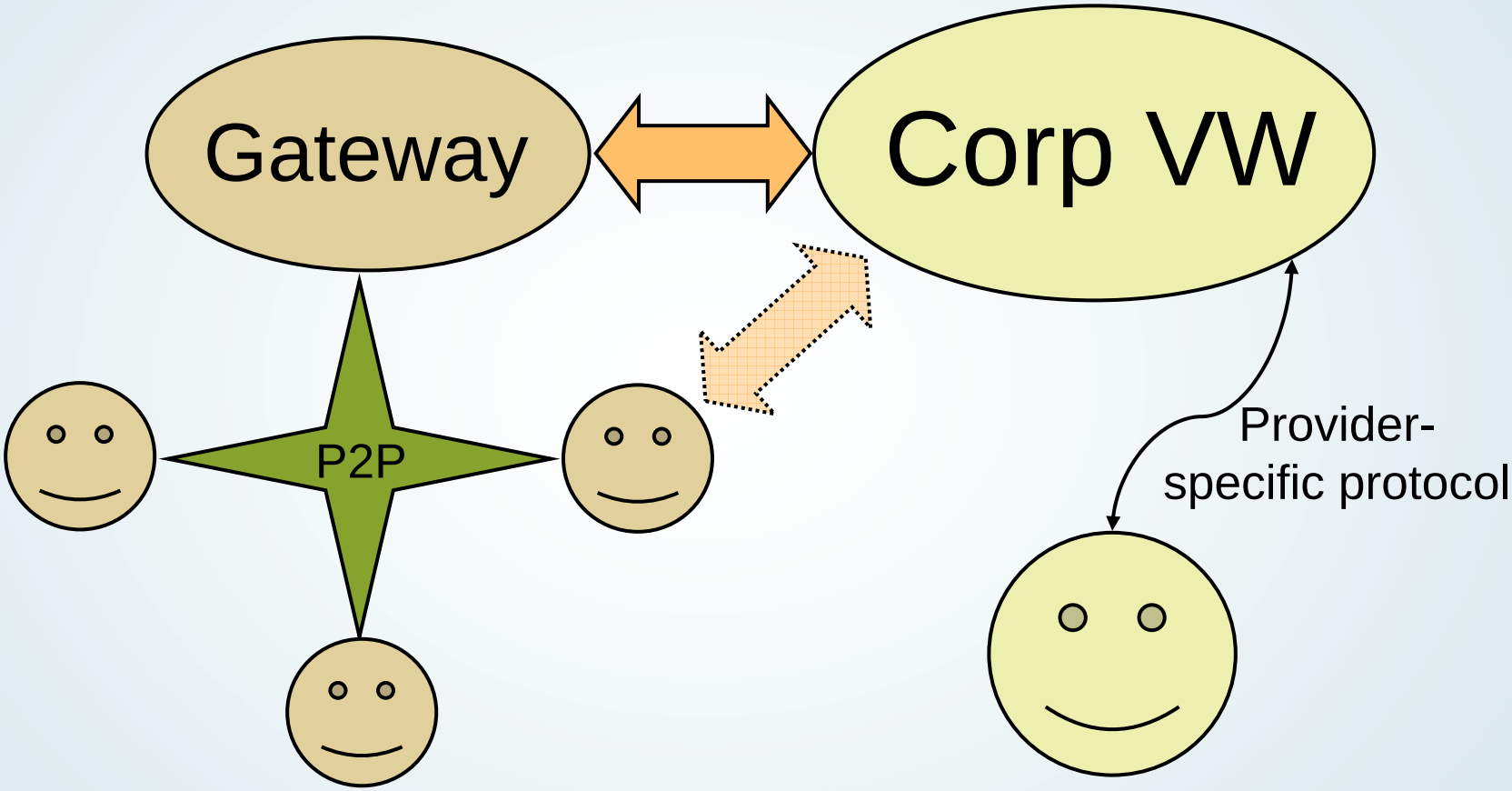
Server Connectivity Benefits

- Globally consistent
- Comparatively easy to build
  - Existence proof: OLIVE does DIS/HLA
- Political problems are diminished
- Users don’t need to do anything
  - Existing clients keep working
  - Existing infrastructure is preserved
- Known trust model
- Simliar to an ISP or email service model

Architecture Overview



Works for Peer-to-Peer



Challenges Ahead

- Is it worth it?
- Scaling the Virtual World
- Size issues (it’s too big!)
- Organizing the World

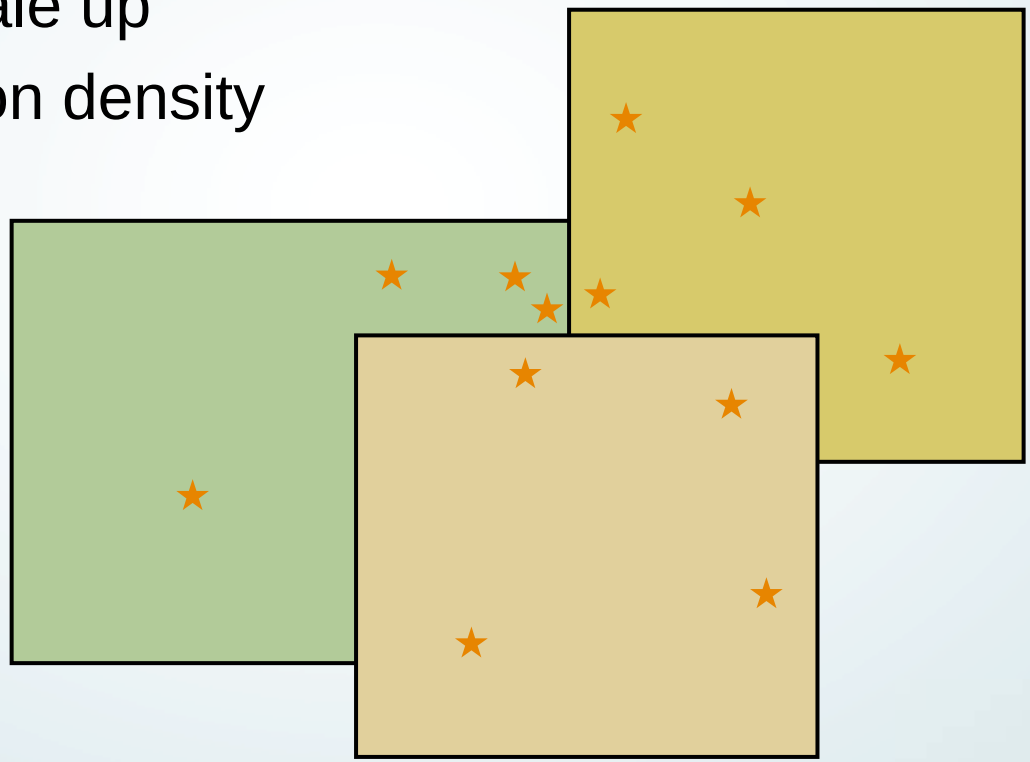
(Using OLIVE for examples, but the challenges are shared by all virtual worlds)

Is It Worth It?

- The question seems facetious
  - Most of us are believers
  - But we don’t yet do things like vote in the virtual world
- Society is still unconvinced
- **We need more research on efficacy**
  - Training/Education
  - Collaboration
  - Performance

Scalability: How OLIVE Scales Simulation

- Split simulation area by geography
  - Ghosting across borders
  - Easy to scale up
  - Limitation on density



Scalability: The Density Challenge

- **Moore's Law is dead (and buried)**
  - CPU frequency isn't doubling
  - 45 nm is actually a step backwards
- Demands for density are going up
  - Games solve this problem with sharding
  - Real Virtual Worlds don't have that luxury
- Solutions can come from many directions
  - Topology
  - Simulation
  - Hardware

Networking: Rich Experiences in Small Packets

- Network bandwidth is becoming a bigger problem
  - **A T1 isn't want it used to be**
  - … especially when shared by an office of 50!
- OLIVE uses client co-simulation
  - "Lockstep method"
  - Allows minimal network packets
- Given the same inputs and the same algorithm, the result should be the same on two different machines
- Additional management of reference times
  - To give a responsive view, the user runs ahead of time
  - Choice of options for dealing with actor/actor interactions

Networking: Richer Experiences, Smaller Packets?

- Lockstep method uses as much CPU for simulation on client as on server
  - We limit the view of the world
- Actor/actor interactions
  - Either accept round-trip latency
  - Or time travel (“snap”) the loser
  - **Better options are requested!**
- Methods of de-coupling interactions would help
  - Example: we don’t collide person/person

Organization: Wrestling the 3D Internet

- Characteristics of the 3D internet
  - Lots of interconnected virtual worlds
  - Connections are temporary
  - Content is temporary

Open 3D Internet Problems

- Charting the 3D internet
  - **How do I find where I'm going?**
- Searching the 3D internet
  - **What does it even mean to "search"?**
- Archiving the 3D internet
  - "Session Review" support can help
  - Versioning problems
  - **Can 3D interaction be transcribed?**

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Thanks!