

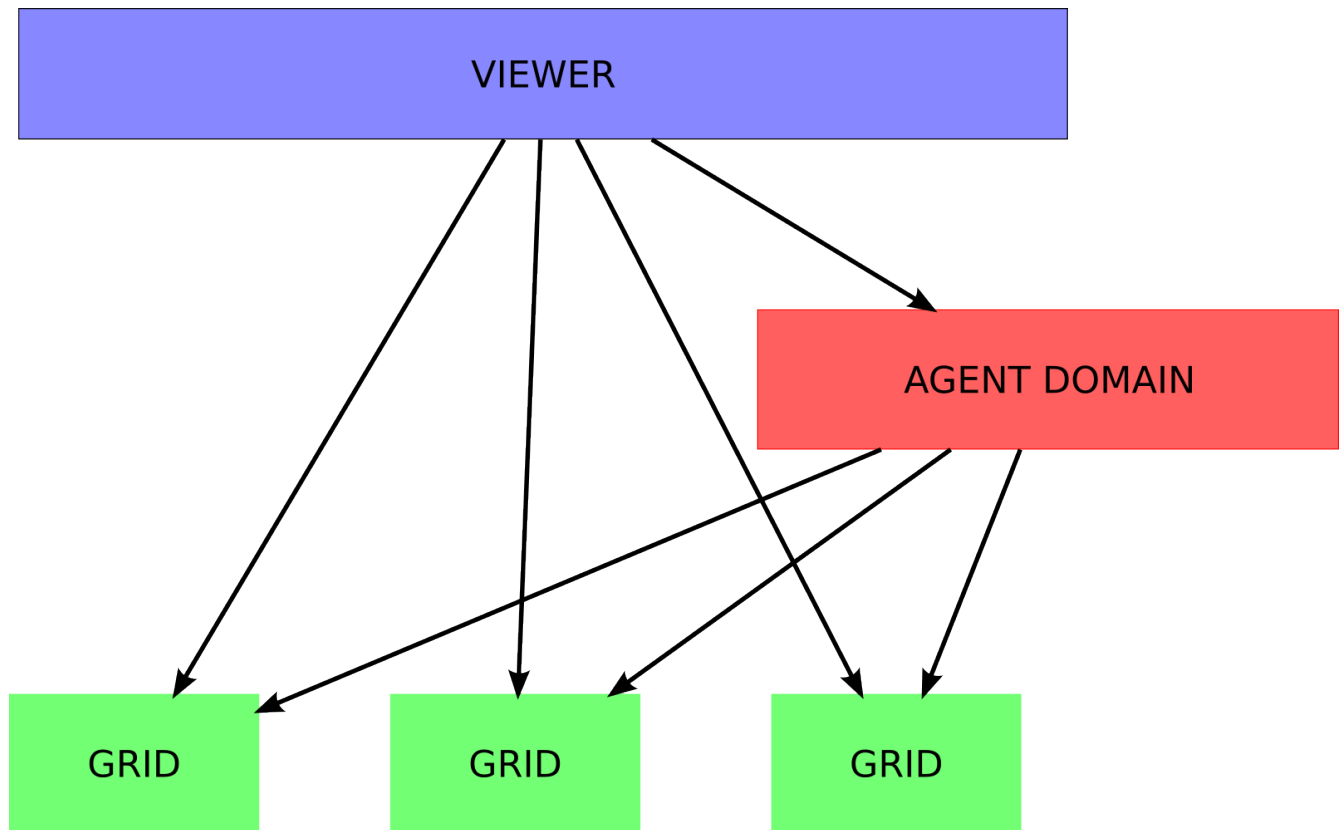
Loosely Coupled Virtual Worlds

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Abstract

The discussion of design philosophies for open and distributed virtual worlds leads to the discussion of trust, identity, authentication and policy. We will show how a design based on loosely coupled interaction can operate over a set of distributed virtual worlds, and discuss the advantages of this model in comparison to a model based on a central authority. Finally, we will discuss how the proven design solutions of the World Wide Web can translate into loosely coupled virtual worlds. We will show how a loosely coupled paradigm complements other, more centrally managed, strategies.

The Agent Domain

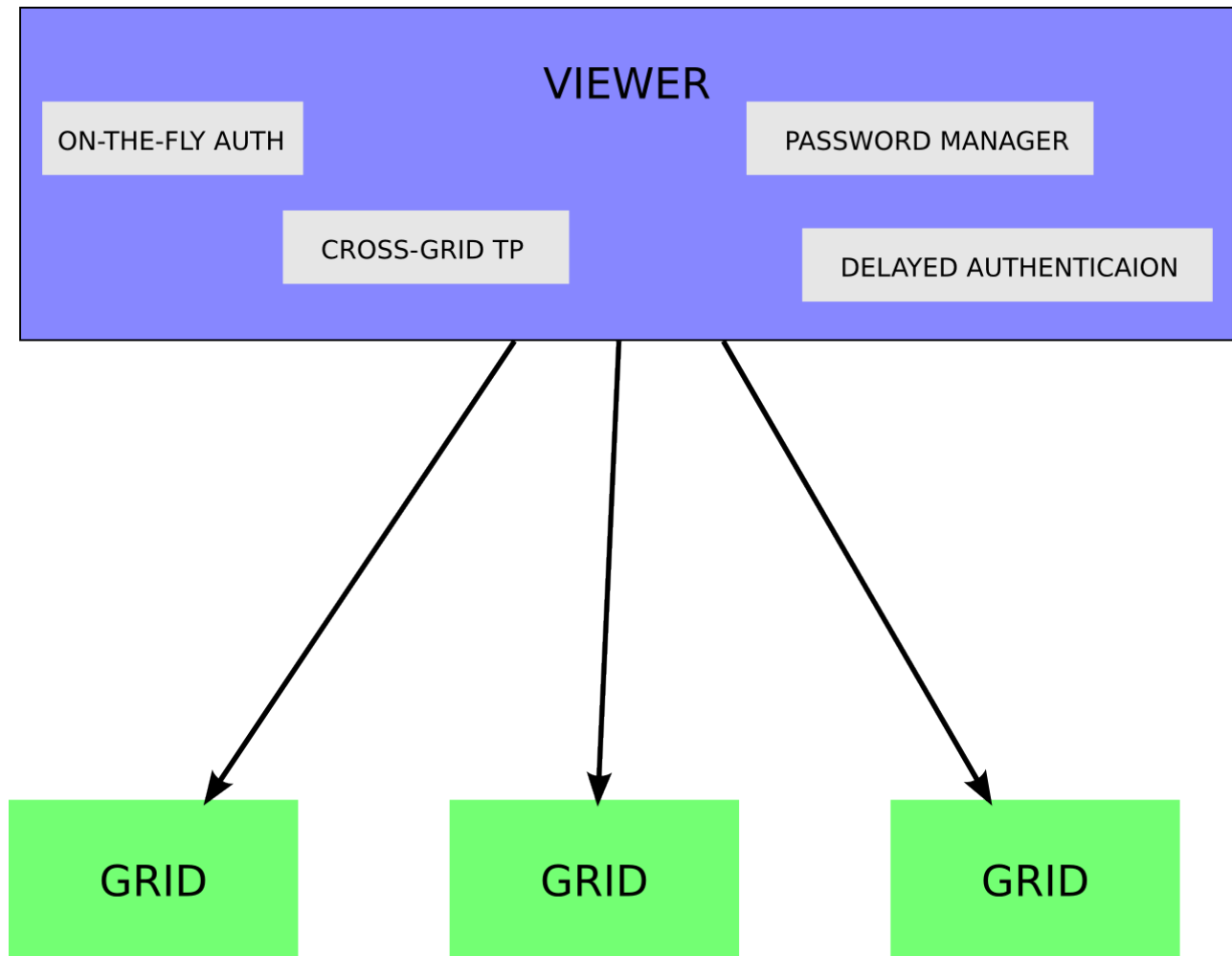


The agent domain has been the focal point of virtual world standardization efforts in relation to the Second Life protocol. The agent domain provides a form of portable identity, a means to store assets and friends lists, and a trust model for assets. Further, the agent domain can conceal assets, such as user-compiled script bytecode. High value cross-domain authentication tokens are exposed to only a single entity. This mitigates information security risk in cases where the user cannot authenticate, or does not trust, the grid owner.

The agent domain does not require a single centralized authority (which also becomes a single point of failure), but it does lend itself to a model with a single authoritative entity. By contrast, the agent domain model breaks down in the case of numerous agent domains. Given the natural tendency toward autonomy and the lack of trust between grid providers, many of them will want to run their own agent domain.

The logic of grid service providers is similar to that of web service providers. A grid provider using a foreign agent domain sacrifices control of the digital assets their users may use on their grid: they must fully trust a party that may not trust them. This trust asymmetry gives the agent domain provider leverage and control over the grid provider. The relative lack of success of the application service provider model on the web is an example of the reluctance of many businesses to trust a third party with complete control over critical infrastructure.

The Loosely Coupled Virtual World



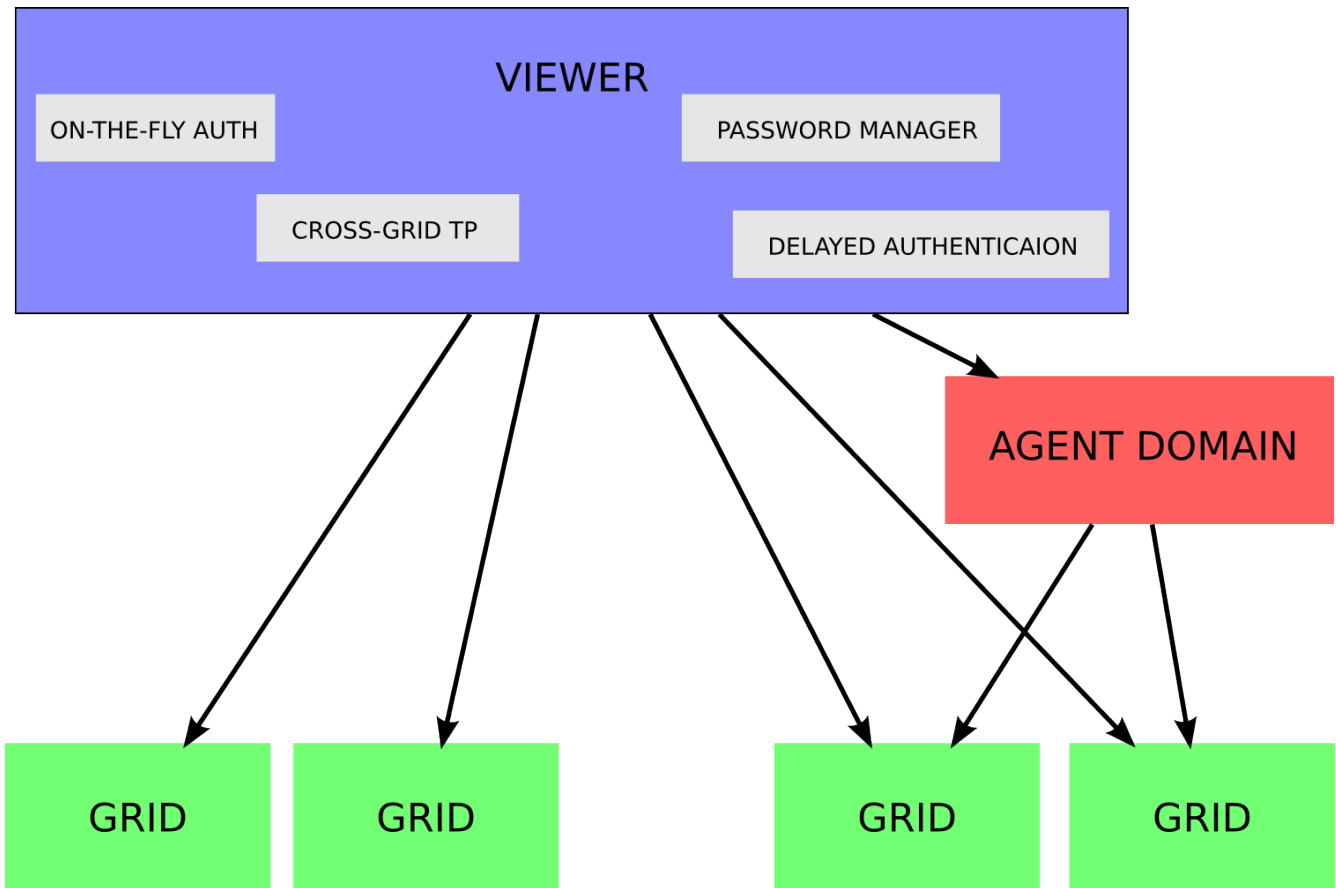
In a loosely coupled open virtual world, the emphasis in application development is taken off the protocol and placed on the client and the server. Just as HTTP does not define HTML, the protocol under this model does not dictate any but the most basic of services for the loosely coupled virtual world. A motto for the loosely coupled virtual world might be, “dumb protocol, smart software”.

The loosely coupled virtual world takes the metaphor of the World Wide Web and applies it to virtual worlds. Take cross grid teleport as an example. Instead of an agent domain-mediated 3-way handshake, the client logs out of one grid and logs into the other. Authentication tokens need not cross domains (a high security liability). Instead, the user can manage their accounts through a client-based password manager.

When a user visits a new web site, the user is unauthenticated by default. Applying that concept to the virtual world, we get a system of delayed authentication. As the web has shown, there is nothing that necessitates all users to be authenticated at all times. By providing access to designated areas by unauthenticated users of virtual worlds, many advantages are realized, including a low-commitment introduction to a virtual world, and inter-grid teleports without a modal authentication popup. Delayed authentication is a key to the logout-login method of teleporting.

This system is not without disadvantages. The user does not have a seamless cross-grid identity, and must store or remember passwords for each grid. If the user sets the same password on all grids, then each token is as high a liability as in the agent domain case.

A Hybrid Approach



A major strength of the loosely coupled virtual world is that it does not exclude the strengths of the agent domain model. Loose coupling does not conflict with the agent domain model, rather it complements them while removing some of the drawbacks of the agent domain. For closely partnered entities that are willing to trust an agent domain provider, joining an agent domain remains a potential solution, but it is not imposed on all grid-mediated transactions.

For grids that want total autonomy, the loosely coupled system allows to operate without relying on any particular third party for authentication and asset services. Providers of such grids might instead form loose confederations with other grid providers, with varying levels of commitment and trust.

Conclusions

Cross-grid assets are a common and sensitive topic when discussing the open virtual world. The topic touches on deeper issues of trust. The loosely coupled system allows for as much or as little trust as is possible through technical means, without imposing a particular trust framework. Not all of the questions of trust have easy, or universal, answers. The World Wide Web, however, has provided an environment in which mature arrangements have emerged that are sustainable in the disposal (the sharing and selling) of digital assets (content). We should not discard these lessons learned, rather we should apply them, extending the metaphors they use, to virtual worlds.

As technology and relationships on the Internet evolve, it will be essential to work within a framework that does not impose any particular view of trust and identity onto the open virtual world. A hybrid approach of loosely coupled services, combined with voluntary agent domain participation, provides this flexibility.