

DADENLIMITED

Virtual Worlds - A Roadmap to the Future?

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Virtual Worlds

Virtual Worlds are worlds realised by computer. They differ from games in that they have no plots, quests or objectives, and no more rules than you might find in real life. In a virtual world you just do what you want to do, for as long as you want to do it. That may range from simply chatting to someone, or doing some sightseeing, through to playing games or going to a concert, or running a business.

The first virtual worlds were text based, ran on mainframes, and were typically offshoots of so-called Multi-User Dungeons (MUDs). The coming of the Internet enabled such worlds to be accessed more easily. They also became more graphic. Users were represented as Avatars, computer generated human or non-human characters which users could design and dress as they liked.

Since early 2006 Virtual Worlds have grown significantly in use and awareness. From Jan to Dec 2006 Second Life (by far the most successful virtual world) grew from 100,000 users to over 2 million, and now (Jul 2007) stands at nearly 8 million users.

If you need a primer on virtual worlds then please download our introductory White Paper "Virtual Worlds and v-Commerce".

Introduction

This monograph is one of a pair that we have produced about virtual worlds. The other is entitled "Virtual Worlds - A New Media". Both seek to answer the questions:

- Are Virtual Worlds different? and
- How important will Virtual Worlds become?

Both seek to raise the debate above that of a simple discussion about the size of the user base and the prevalence of brand names.

However the two papers look at these questions from completely different perspectives.

The other paper takes a more short-medium term perspective. It is focused on the impact of Virtual Worlds over the next few years, maybe the next 5 - 10 years, maybe more. It talks in the language of marketing and media, even of business. If you are interested in what virtual worlds could do for you today then that is the paper to be reading.

However this paper takes a long term view. It looks at what the ultimate manifestation of virtual worlds might be - and what the roadmap to that destination might look like. Although the journey has already started, the paper's focus is really 20, 50 even 100 years out. To some it talks the language of science fiction; to us though it is the language of science, engineering and ultimately society.

Whilst you may choose to embrace or ignore virtual worlds in the short term, it is our belief that in the long term you are unlikely to have any choice.

What is a Roadmap?

In futurology terms a roadmap is an attempt to map out the technological, environmental, social and political forces and changes around a particular development. The map tries to identify the most likely and/or important milestones in the future progress of that development, and some of the most likely alternative paths between those milestones.

Definition of “Virtual Worlds”

Our working definition of a true, open Virtual World is:

“A shared, multi-sensual, pseudo-3D electronically generated environment in which users, represented by avatars, can act, create and communicate at will, retain IPR and can, at will, exchange assets, information and currency with each other and with the outside world subject to no other laws, rules and restrictions other than might be applied in the real world.”

We use the term “synthetic environment” to define the broader class of computer generated experiences that also includes 3D chat, 3D visualisation and simulation tools and on-line games.

“80 Percent of Active Internet Users Will Have A 'Second Life' in a Virtual World by the End of 2011 ”

- Gartner Group, April 2007

Scope

The scope of this roadmap is the future development of virtual worlds (for a definition see the box at left). Within this roadmap we are not so much concerned with the segmentation of virtual worlds (eg into Massive Multiplayer On-Line Games (MMOs), 3D chat etc), or their application to specific markets, but rather the bigger picture of their long term evolution. The roadmap will principally concern itself with the technological options and milestones in this evolution, but will identify social, economic and political issues where they may significantly affect development. Our initial focus here is on the technological milestones.

Assumptions

In developing this roadmap we have made a few basic assumptions:

- There are no military, political, social, economic or environmental issues which will block or otherwise significantly delay or deflect the roadmap
- Virtual Worlds remain primarily a private sector endeavour, and not under monopoly control
- There is a continuing will to develop Virtual Worlds

We have also assumed that the development of Virtual Worlds along this roadmap is now something that can be accomplished by the private sector, and that it is not dependent on governmental (or even private sector) mega-projects – although Government funding may help speed the process, and government involvement as a major user/participant is almost inevitable.

Three Key Technologies

We, along with many commentators, identify Virtual Worlds – or at least the “digitisation” of the atom based world – as one of the 3 key technologies that will change human culture during this century. For reference the 3 are:

- Genetics
- Nanotechnology
- Digitisation

Genetics is primarily concerned with how we use biology to change our own bodies, and the life around us. Nanotechnology looks at using mechanical methods (at a microscopic level) to achieve the same ends. With Digitisation our focus is on the new domain of digital existence.

Warning: Science Fiction Alert!

This monograph is deliberately far reaching and provocative. That said, we believe that there is only one technology mentioned which may prove to be impossible – and remain the stuff of science fiction (and it's not the one below). Even that, though, changes none of our conclusions. Some technologies may come later than we predict, or be harder to achieve, but we are confident that they will happen.

Neural Interfaces



Whilst direct neural interfaces to virtual worlds may seem far fetched some scientists are already well down this path. The image above shows Prof. Kevin Warwick (in real and avatar form). He has already connected his own hand through neural connections to both a robotic hand and his wife's hand! With his presence already established in Second Life it can only be a matter of time before he and his team has a neurally controlled avatar.

Technology Strands

For this analysis we have identified 7 major strands of technological development for virtual worlds:

- Physics: how objects interact and behave in the world
- Functionality: what you can do in the world
- Rendering: how the world and the objects in it appear to users
- Avatar Appearance: how the avatar looks
- Avatar Interaction: how the avatars interact
- Virtual Agents: how avatars can act autonomous of human control
- User Interface: how the user controls the avatar and senses the world

These are shown below and detailed at Annex A.

Metrics

We have also tried to estimate the metrics that might be associated with the growth of virtual worlds over the coming decades. This is harder to estimate than the qualitative changes – but might give some idea as to the rates and extent of growth that could be expected. Please pay attention to orders of magnitude, not specific values.

These are shown and detailed at Annex B. In summary we expect:

- 500m virtual world users by the end of 2010 (up from 50m now, and representing 25% of Internet users – well down on the original Gartner prediction)
- 2 Bn virtual worlds users by 2020, representing 66% of a larger global Internet population
- Internet and Virtual Worlds user levels reach parity around 2040
- Simultaneous co-located avatar numbers reach 1000 by 2010 (currently 50 in Second Life), and 10,000 by 2020 – enabling large scale events to be held in-world
- “Built-out” area of the leading virtual world reaches country size by 2010 (currently state/county sized), world size by 2020 (watch out for Google Earth integration) and solar system size by 2030 (Mars here we come!)

Uses of Virtual Worlds

Virtual Worlds can be used in 6 principal ways:

- Socialising
- Entertainment
- Commerce, including marketing
- Business
- Learning
- Imagining

Our monograph on “Virtual Worlds as a New Media” is fundamentally focussed on the first three uses, although it also has implications for business and learning as well (which also make use of “media”).

Imagining is the domain of this monograph.

‘We think a lot about the nature of the brain, and whether computational substrates can be dense enough to enable thinking within them. I know exactly how that’s going down, I think... SL is dreaming. It could be looked at as one collective dream.’

- Philip Rosedale, CEO Linden Labs

Convergence

Virtual worlds do not stand alone. As well as related areas like MMOs, chat-rooms and even the web they are a part of an interconnected group of electronic media. Our convergence map (see Annex C) attempts to sketch out how these relationships may evolve over time.

At present we see four main areas of synthetic environment: 3D chat, open worlds, private worlds, and MMO games. Over the next two decades the boundaries between these will become blurred, and related systems such as messaging, entertainment, on-line games and even the web and desktop will be drawn into the maelstrom. Hopefully beyond that the systems will largely coalesce around a new 2 x 2 matrix defined by private and public, and information and experience spaces.

Infrastructure Phases

Bringing together our assessment of the metrics changes and the convergence activity we identify four major phases in the development of the technical infrastructure which provides Virtual Worlds:

- Startup Phase (2000 – 2010) – A growing number of isolated virtual worlds, many the products of start-up companies, or the result of special projects within major media organisations
- Growth Phases (2010 – 2020) – A big surge in numbers as the entertainment and transaction space usage goes mainstream. The effect of this is likely to be that the model of isolated virtual worlds becomes unsustainable
- Consolidation Phase (2015 - 2030) - Initially Virtual Worlds combine, and then we start to migrate to (hopefully) open standards that allow all worlds to inter-link. The integration and inter-action extends to other related platforms
- Universal Phase (2030 – 2050) - The final major change is when Virtual World usage becomes just a “standard” part of the Internet in the way that the Web is now – and every Internet user also has their Virtual World existence.

This however is a technical/business analysis of the changes in Virtual Worlds; but what are the changes for the user?

Uploads, Post-Humans, The Singularity and Science Fiction

Warning: If you don't like or trust science-fiction please feel free to disregard this sidebar – although that won't necessarily stop it from becoming true!

The final, “post-human” space is the only part of our analysis which we consider is verging on science-fiction. Indeed the only really science-fiction technology here is “uploads” - moving our consciousness into a digital form. This is not to say that uploads are impossible, but just that it is the only technology here that do not appear to be natural progress from our current knowledge and technical capabilities.

Regardless of whether uploading is possible we may by 2050 be moving towards a “post-human” space – being able, through our virtual agents, sensory interfaces and an augmented reality, to exist in real and virtual spaces with ease – and probably simultaneously.

Such a development could be what is called a singularity – a change in human nature and existence so dramatic that we can't see beyond it.

“part of the essential component of human-equivalent AI is to be intimately connected to an environment”

*- Mitch Kapor, Linden Lab Chairman,
Founder of Lotus and Designer of Lotus
123.*

Evolving Spaces

Our development and analysis of this roadmap has led us to identify 6 spaces which Virtual Worlds are likely to occupy in our lives. The spaces do to an extent overlap, and indeed we already see some signs of the first 3 in the current virtual worlds. It is, though, important to bare in mind that for each space there may be fundamentally different audiences, business models, dominant virtual worlds and methods of interaction.

Social Space	... a space where people can meet and socialise
Entertainment Space	.. a space which rivals, and maybe then surpasses, many games, films and even TV as a source of compelling, “realistic” entertainment, both user and commercially generated
Transaction Space	... a space in which we are happy to conduct social, emotional, business and financial transactions which have real-world impacts
Agent Space	... a space in which we can leave software agents to conduct transactions for us, drawing on our own knowledge and experiences, access the web for raw information needs, and engaging other agents to fulfil or facilitate transactional needs
Dream Space	... a space in which our virtual experiences are as real to us as our dreams
Post-Human Space	.. a space in which we, or our synthetic agents or analogs, can live a complete existence, independent of the real, physical, world

Virtual World Generations

We consider that systems such as Second Life represent the third generation of Virtual Worlds.

The first generation where those early VRML and other systems of the late 1990s where avatars were often 2D and virtual spaces often stretched to infinity and were filled with solid polygons, but little architecture.

Active Worlds probably represents the top end of the Second Generation, or Early Third, where avatars were more developed, as were building tools, but scripting and certainly web interfacing, were limited.

Second Life and There are typical of Third Generation systems.

Further generations can probably be expected at around 5 yearly intervals. Multiverse is probably a continuation of Third Generation, but something like Croquet, when fully developed, could represent a 4th Generation.

“a computer-modelled world .. puts both ‘artificial’ and ‘real’ people on more of an equal footing. Indeed, this is a requirement of the Turing Test; .. An avatar controlled by a person you cannot see (or is the avatar under the control of AI?) is more in keeping with the conditions of the test.”

- Extropia DaSilva

Conclusions

Virtual Worlds are still in their early years. However we believe that they have now started an almost unstoppable march towards becoming a dominant factor, if not THE dominant factor in our lives.

In technology adoptions terms (see Geoffrey Moore) Virtual Worlds have yet to “cross the chasm”. They are still the domain of the early adopters, but we judge that they are now just beyond the “visionary” stage.

In hype terms (see Gartner’s Hype Cycle) we consider that Virtual Worlds are finally pulling themselves out of the “slough of despond”. For Virtual Worlds the real hype was over 10 years ago with Virtuality headsets and immersive VR. That technology may come again, but a teenager (or business man or woman) playing or working in a virtual world is every bit as immersed as their 90s counterpart. That is not to say though that it will all be plain sailing as we move further along the hype-cycle curve towards the “plateau of productivity”. The man curve is, we are sure, a fractal. Focus in on any one part and you will see micro-cycles of different technologies and different platforms. The hype round Second Life may already be abating in some quarters, and its growing pains may not yet be over – but overall the trend is upwards.

For us though the factor that chimes the loudest is the fact that the first fully productive “spaces” may yet be 10 years away. The Web took just over 10 years to go from nothing to the nearly all pervasive system it is now. It seems reasonable to allow these latest generations of usable Virtual Worlds a similar time to establish themselves. And just as with the web organisations that engage now will have a chance to learn and establish mind-share in their sectors before the real competition is joined.

But that 10 year time-frame is important for another reason. Today’s 9 – 12 year olds are growing up with Club Penguin, Runescape and Disney’s Toontown. They are growing up in Virtual Worlds. In 10 years time they will be going to college, and starting work. And Virtual Worlds will be ready for them. Will we?

Social Implications

We are well aware that this paper has been very technology focused; and its companion piece – Virtual Worlds a New Medium – very marketing focused.

However, Virtual Worlds operate within the real world. A common challenge is why aren't we spending more time worrying about real world problems of poverty, war, identity and co-existence, rather than “escaping” into the Virtual World.

We believe that Virtual Worlds and their related technologies can have both a direct and indirect part to play in addressing these real world issues.

Their impact may not be as direct as the other 2 key technologies mentioned here – genetics and nano-technology – but we believe there is a linkage. We hope to explore this in a series of later essays.

Let us know if you'd like copies when they come out.

Second Life may even “accelerate the social evolution of humanity”

- Mitch Kapor, Chairman Linden Labs

About Us

Daden Limited is a Virtual Worlds agency based in Second Life and in Birmingham, UK. We have been working with avatar and Virtual World technology for almost 10 years. We have built environments in several Virtual Worlds, and also developed interfaces between virtual and real environments. We have a deep understanding of the possibilities offered by new technologies, but combined with good understanding of the marketing and usability issues to know what might work, and what won't.

We have worked on strategy, marketing and technology projects for a variety of companies and organisations including FTSE100, hi-tech start-ups, and public sector organisations, in the UK and abroad.

About the Author

David Burden is a Chartered Engineer by training but also spent 10 years in the British Army (where he claims to have been one of the first true cyberpunks - going to work in the 1980s dressed in black and with a laptop, wireless modem and 9mm pistol), as well as having been Marketing Director for a £60m turnover IT company.

During the dot-com boom David founded his own wireless start-up, and also set up First Tuesday Midlands, a regional chapter of the First Tuesday organisation. He founded Daden in 2004.

David's interest in Virtual Worlds pre-dates the web - his first Virtual World was the vast pen and ink Science Fiction role playing game that was Traveller, and for which we wrote several gaming supplements. Once the web arrived David realised how even simple tools such as Javascript and VRML could be used to create synthetic personalities, and Virtual Worlds.

David takes a keen interest in regional and national issues within the IT sector (having sat on and chaired committees at both levels), and has also spent time focussing on issues of accessibility and the digital divide.

David can be contacted at david.burden@dagen.co.uk

Updates

We would like to update this document on an annual basis, and get some broader views as to the development of virtual world technology – and particularly the time-scales for some of the technological advances discussed. If you would like to participate in such consultation please get in touch.

The MetaVerse Roadmap

If you are interested in the future of Virtual Worlds you may also wish to look at the Metaverse Roadmap which has been developed in the US over the last year. It can be found at:

<http://metaverseroadmap.org/>

We have deliberately NOT consulted this roadmap during the preparation of our own, but may incorporate our reflections on it in later versions on this roadmap.

Further Information

If you would like to talk though some of the issues raised in this monograph, or think that we can help you understand Virtual Worlds a little bit better, then please contact us:

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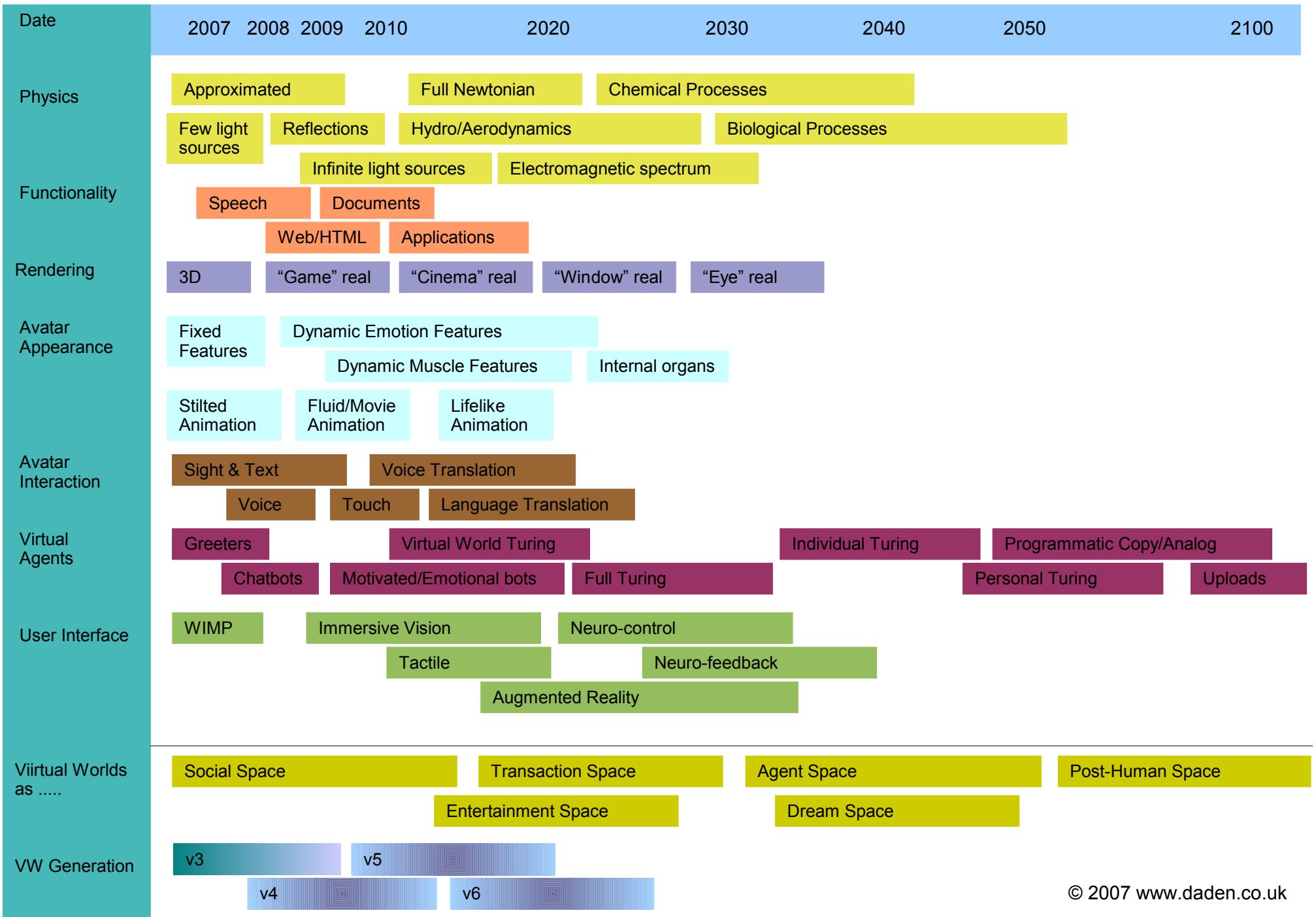
B13 9SG

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or IM Corro Moseley, our virtual representative in Second Life.

Virtual Worlds Roadmap

Annex A



Roadmap Events

Note that “time” represents our best estimate of when we think that the event might reach a wide audience, and “likelihood” represents the probability of that event happening at all within a 100 year time-frame. The events also refer to their inclusion within virtual worlds – we accept that many already exist in game and specialised synthetic environments.

Event	Time	Likelihood	Description
Physics			
Approximated	Now	Happened	Physics in the world is only approximate
Few Light Sources	Now	Happened	Avatars and objects are only illuminated by a few light sources
Reflections	2008-9	100%	Reflections are visible in surfaces, glass and water
Infinite Sources	2009-10	100%	As many light sources as necessary are visible and cast shadow
FullNewtonian	2010 – 2020	90%	The physics in the world matches all newtonian expectations
Hydo/Aerodynamics	2010 – 2020	80%	The physics can accurately model flight and fluid motion
Electromagnetic s	2015 – 2025	80%	Radio wave propagation can be accurately modelled
Chemical modelling	2020+	60%	Chemical reactions can be modelled to a reasonable degree
Biological modelling	2030+	50%	Biological functions (internal) can be modelled to a reasonable degree
Functionality			
Speech	2007-8	100%	Avatars can speak to each other, with position based volume
Web/HTML	2008-2010	100%	Web pages and text/HTML code can be shown and interacted with in-world
Documents	2009-2012	100%	Documents (eg Word, Excel) can be viewed and edited in-world
Applications	2010-2020	100%	Applications (eg another virtual world) can be used in-world
Rendering			
3D	Now	Happened	
“Game” real	2008 – 2010	100%	The imagery is as good as current best-of-breed video games
“Cinema” real	2010 – 2020	100%	The imagery is as good as current live-action cinema
“Window” real	2020 – 2030	95%	The imagery is as good as a real scene viewed through a window
“Eye” real	2030 – 2040	90%	The imagery is as good as reality

Event	Time	Likelihood	Description
Avatar Appearance			
Fixed Features	Now	Happened	Avatars are relatively fixed at the skin movement level
Dynamic emotion features	2008 – 2025	100%	Facial expressions change to reflect emotion
Dynamic muscle features	2009 – 2020	100%	Avatar skin moves in response to musculature changes
Internal organs	2020 – 2030	90%	Avatars can be “opened up” to view animated internal organs
Stilted animation	Now	Happened	Avatar animation is clearly “mechanical”
Fluid/game animation	2009 – 2015	100%	Avatar animation is fluid and as good as current best-of-breed games
Lifelike animation	2015 – 2020	100%	Avatar animation is totally life-like
Avatar Interaction			
Sight & Text	Now	Happened	Avatars can interact with each other by sight and text
Voice	2007 -2008	100%	Avatars can talk to each other
Voice Translation	2010- 2015	100%	Voice recognition hears speech and speaks it out through TTS as a different voice
Language Translation	2010 – 2015	100%	As voice translation, but language is changed as well
Touch	2009 – 2012	95%	Avatars can touch objects, and users get a force-feedback experience
Virtual Agents			
Greeters	Now	Happened	Bots (aka automated avatars) that can greet users and play simple messages
Chatbots	2006 – 2008	100%	Bots that can hold simple conversations with users
Motivated/Emoting Bots	2008 – 2010	100%	Bots that appear to act according to motivation and show emotion
Virtual World Turing	2010 – 2020	100%	A Bot which other virtual world users cannot tell by its dialogue from a real user
Full Turing	2020 – 2030	90%	A Bot and programme which users cannot tell from a real person
Individual Turing	2030 – 2040	80%	A Bot faithfully representing a historic/famous figure
Personal Turing	2040 – 2050	75%	A Bot that your colleagues, friends and family can't tell from you
Programmatic Copy	2050 – 2100	50%	A Bot created by programming that contains all your knowledge and experience
Uploads	2080+	10%	Your complete consciousness copied or moved into an artificial domain
User Interaction			
WIMP	Now	Happened	Windows, images/icons, mouse and pointer
Immersive Vision	2009 – 2020	100%	Eye-ware that gives you truly immersive visual experience
Tactile /Haptic	2010 – 2020	100%	Gloves, bodysuits and other devices that let you feel the virtual world
Augmented Reality	2015 – 2035	100%	The ability to overlay the virtual world on the real world
Neuro-control	2020 – 2035	90%	The ability to direct your actions in the virtual world through thought alone
Neuro-feedback	2025 – 2040	80%	The ability to sense the virtual world directly, rather than through real-world senses

Virtual Worlds Roadmap – Metrics

Annex B

Date	2007	2008	2009	2010	2020	2030	2040	2050	2100
<u>Metrics</u>									
# internet users	1bn			2bn	3bn	4bn	5bn		World pop
# users in virtual worlds	50m	100m	200m	500m	2bn	3bn	5bn		World pop
% internet users	5%			20%	66%	75%	100%	100%	
# registrations in largest world	5m	10m	20m	30m	100m	(all systems interlinkd)			
# active users in largest world	1m	2m	4m	8m	90m	(all active)			
size of largest built "world"	City			Country	Continent	World	Solar System	Star Systems	
min prim/feature	1mm			0.5mm	0.1mm		0.05mm	0.01mm	
prims per 100 sq m	20			100	1000		10,000	100,000	
avatars visible	50			1000	10,000		100,000		
Virtual Worlds as	Social Space				Transaction Space		Agent Space		Post-Human Space
				Entertainment Space		Dream Space			

Note: These are very rough estimates indeed, and are intended more to give an idea of the orders of magnitude of change, rather than detailed numbers.

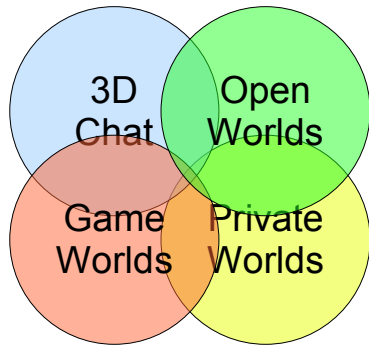
Roadmap Metrics

Metrics offer a far harder challenge than qualitative forecasting. Please treat the detail numbers with extreme caution, but rather focus on magnitudes, time-scales and patterns.

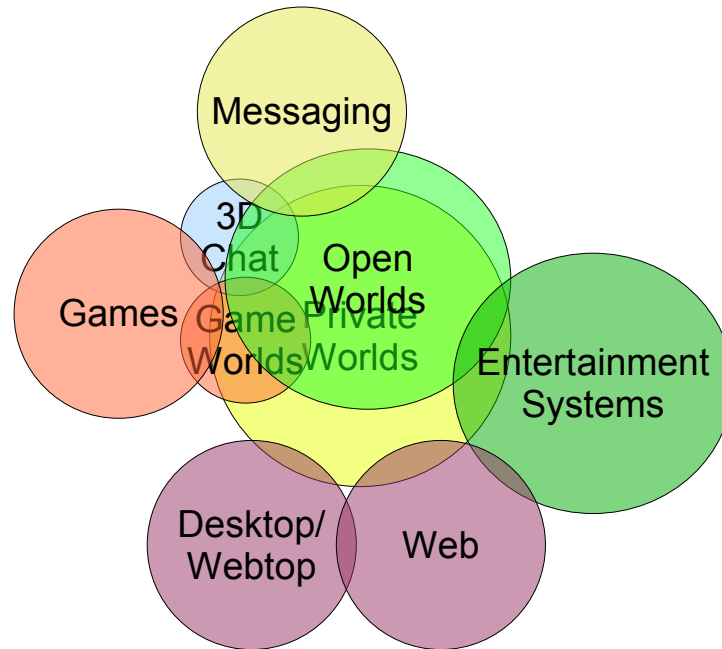
Metric	Meaning
# internet users	Global users using the Internet at least once a month
# users in virtual worlds	Global users using a Virtual World at least once a month
% internet users	Percentage of Internet Users who are also Virtual World users
# registrations in largest world	Number of valid registrations on the biggest Virtual World
# active users in largest world	Number of users who use the biggest Virtual World at least once a month
size of largest	Equivalent land area built upon within the largest (by built area) Virtual World
min prim/feature	Smallest prim or feature buildable/visible within the world (excepting textures and render artefacts)
prims per 100 sq m	Number of prims that the platform can support per 100 sq m in the virtual world
avatars visible	The number of avatars that can be visible to another avatar, assuming “normal” un-aided vision

Note that we assume that around 2010 – 2020 there is a big surge in numbers as the entertainment and transaction space usage goes mainstream. The effect of this is likely to be that the model of isolated virtual worlds becomes unsustainable and that we start to migrate to (hopefully) open standards that allow all worlds to inter-link. The final major change is when Virtual World usage becomes just a “standard” part of the Internet in the way that the Web is now – and every Internet user also has their Virtual World existence.

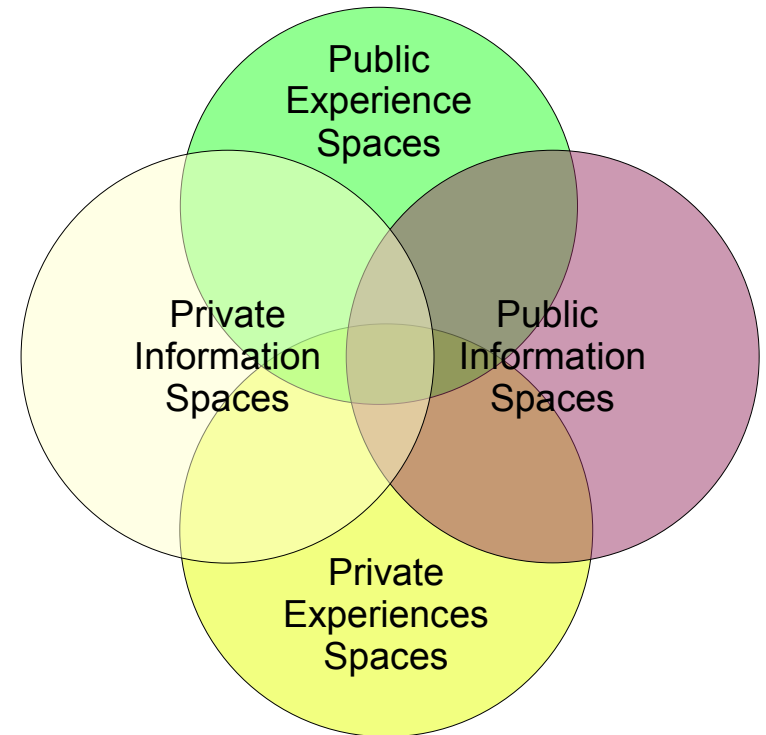
2007



2010 – 2020



2030+



Further information on the 4 quadrant analysis of synthetic environments and virtual worlds which starts this analysis can be found on our web site and in our Virtual Worlds – A New Medium White Paper, which is available for download from our web site.