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## virtual, *adj.* and *n.*

**Pronunciation:** Brit. /'vɜːtʃʊəl/, /'vɜːtʃ(ə)l/, /'vɜːtʃʊəl/, /

'vɜːtʃəl/, U.S. /'vɜrtʃ(əw)əl/

### Forms:

α. ME 16–17 **vertual**, 15–16 **vertuall**; *Sc.* pre-17 **vertuale**, pre-17 **vertuall**, pre-17 **wertual**, pre-17 **wertuale**, pre-17 **wertuall**.

β. ME **virtualle**, ME–16 **virtuall**, ME– **virtual**, 16 **uirtual**; also *Sc.* pre-17 **wyrtualle**.

### Frequency (in current use):

**Etymology:** A borrowing from Latin; modelled on a Latin lexical item. **Etymons:** Latin *virtualis*. < post-classical Latin *virtualis* of or relating to power or potency (frequently from 12th cent. in British sources), that has the power to produce an effect, potent (13th cent. in British sources), morally virtuous (from 13th cent. in British sources) < classical Latin *virtus* VIRTUE *n.* + *-ālis* -AL *suffix*<sup>1</sup>, after classical Latin *virtuōsus* VIRTUOUS *adj.*

Compare Middle French, French *virtuel* that is such in essence, potentiality, or effect (1480), of or relating to a faculty of the soul (1481 in a philosophical context), possessing particular physical virtues, powerful (1526).

Compare also Spanish *virtual* (early 15th cent.), Italian *virtuale* (a1406, earliest in sense A. 4a).

Compare earlier VIRTUOUS *adj.*

In the specific use in mechanics in sense A. 6 after French *virtuel* (1717 in this sense, in a letter by Johann Bernoulli to his French colleague Pierre Varignon, with reference to velocity, 1858 with reference to momentum).

With the α. forms compare the α. forms at VIRTUE *n.*

### A. *adj.*

**I.** Senses relating to particular qualities or virtues; = VIRTUOUS *adj.*

#### †1.

**a.** Inherently powerful or effective owing to particular natural qualities. *Obs.*

- ▶a1398 J. TREVISA tr. Bartholomaeus Anglicus *De Proprietatibus Rerum* (BL Add. 27944) (1975) II. XIX. viii. 1276 But vertual light [L. *luce virtuali*] ygadered in a litel place oþer in a poynt is ycleped moche light.
- a1500 (▶c1477) T. NORTON *Ordinal of Alchemy* (BL Add.) (1975) l. 1740 (*MED*), Oure chief digistere for oure entent Is virtuale hete of the matere digerent.
- 1598 G. CHAPMAN in Marlowe & G. Chapman *Hero & Leander* (new ed.) III. sig. F3, So to all obiects..his sences flame Flowd from his parts, with force so virtuall, It fir'd with sence things meere insensuall.
- 1626 BACON *Sylua Syluarum* §326 See if the Virtuall Heat of the Wine, or Strong Waters will not mature it.
- 1657 R. LIGON *True Hist. Barbados* 106 Though the virtuall beams of the Sun, give growth and life to all the Plants and Flowers it shines on.
- 1675 E. WILSON *Spadacrene Dunelmensis* Pref. sig. A5, Even ordinary water admits of a virtual mixture at least, as Experience evidenceth in Chalybate waters.
- 1724 P. MILLER *Gardeners & Florists Dict.* II. sig. P8, By..the virtual Qualities of the Sun and Air, [vapours] are formed into Clouds.
- 1792 *Conjuror's Mag.* June 448/1 By his virtual heat he [sc. Jupiter] fosters the foetus, and by his moisture nourishes what had been dried up by Saturn in the first month.

**b. spec.** Of a plant, liquid, or other substance: having potent healing properties; powerful, strengthening. Cf. VIRTUOUS *adj.* 8b. *Obs.*

Sometimes as part of an extended metaphor, with reference to spiritual healing.

- 1604 T. DEKKER *Newes from Graues-end* sig. C2, O graue Enchauntresse, deigne to breath Thy Spells into vs, and bequeath Thy sacred fires, that they may shine In quick and vertuall medicine.
- 1660 F. BROOKE tr. V. Le Blanc *World Surveyed* 364 To Rivers they sacrifice the shels that come from them, to fountains fruits and vertual herbs [Fr. *herbes exquisis*].
- 1683 J. LEAD *Revelation of Revelations* 91 An high virtual Balsom, to heal the Wounded, who are under the striking of the Scorpion-Sting of the Serpent.
- 1713 T. HARRIS *Hymn to Redeemer* 6 The Panacea from Himself display'd Rich virtual Streams of Health, and distant Cures convey'd.
- 1794 J. HURDIS *Tears Affect.* 18 Ev'ry nook Some latent beauty to her wakeful search Presented, some sweet flow'r, some virtual plant.
- 1830 T. AIRD *Captive of Fez* II. 87 She knew..All virtual flowers; and how to win them..in their nightly dew.

## 2.

†**a.** Producing, or capable of producing, a particular result; effective.

*Obs.*

- ?a1475 (▶?a1425) tr. R. Higden *Polychron.* (Harl. 2261) (1869) II. 177 For a man and the worlde be assimilate in iij. thynges, in dimension diametralle..., in disposicion naturalle, and in operation virtuale [L. *in operatione virtuali*].
- 1526 W. BONDE *Pylgrimage of Perfection* III. sig. HHHvii<sup>v</sup>, That is called after saynt Thomas virtuall attencion, whiche causeth a person in the begynnynge of his prayer, to haue an actual consideration of the prayer or duety that he hath to do.
- 1619 W. SCLATER *Expos. 1 Thess.* 37 So vertuall was the speech of Paul a Prisoner, in the heart of his Judge.
- 1672 J. JOSSELYN *New-Englands Rarities* 12 The Loone is a Water Fowl, alike in shape to the Wobble, and as virtual for Aches.
- 1683 J. MOXON *Mech. Exercises* II. Pref. 5 Dr. Dee..as a verval Proof of his own Learned Plea, quotes two Authentique Authors.
- 1712 J. MATTHEWS *Energy of Liberality* 10 He devises how his Liberality may have a constant and virtual Operation after his Decease.

**b.** Designating a notional property, dimension, etc., of a thing which would produce an observed effect if counteracting factors such as friction are not allowed for; *spec.* designating a head of water which would give rise to an observed pressure in the absence of friction, etc. (cf. HEAD *n.*<sup>1</sup> 43b). Cf. EFFECTIVE *adj.* 6a.

- 1760 J. SMEATON in *Philos. Trans.* 1759 (Royal Soc.) 51 111 The circumference of the wheel, 75 inches, multiplied by 86 turns, gives 6450 inches for the velocity of the water in a minute;  $\frac{1}{60}$  of which will be the velocity in a second, equal to 107,5 inches, or 8,96 feet, which is due to a head of 15 inches; and this we call the *virtual* or *effective* head.
- 1815 J. SMITH *Panorama Sci. & Art* II. 124 Whatever may be the real length of the leg *b a* [of a siphon], the virtual or acting length when in use, only extends from *b* to the surface of the fluid.
- 1848 W. B. CARPENTER *Mech. Philos.* ix. 213 This point is termed the centre of oscillation; and its distance from the centre of suspension is the virtual or acting length of the pendulum.
- 1908 W. J. MILLAR *Rankine's Man. Steam Engine* (ed. 17) 101 In a close pipe it [sc. friction] takes effect by diminishing the pressure, and the virtual head due to it.

- 1910 *Proc. Royal Soc. A.* **84** 192,  $a'$  is the virtual radius, *i.e.*, the value calculated on the simple theory, and  $a$  the true radius.
- 1999 J. M. COULSON et al. *Coulson & Richardson's Chem. Engin.* (ed. 6) I. viii. 333 The power can also be expressed as the product  $Ghg$ , where  $h$  is termed the virtual head developed by the pump.

### †3. Morally virtuous. *Obs.*

In quot. 1898 (perh.) more generally: having commendable qualities.

- α1500 (▷c1425) ANDREW OF WYNTOUN *Oryg. Cron. Scotl.* (Nero) vii. l. 2206 Iohun of Salerne, prest cardynale, Commendit a lorde wertuale.
- 1607 T. DEKKER *Whore of Babylon* sig. D2<sup>v</sup>, You by your heauenly Influence change his vilenes Into a vertuall habit fit for vse.
- 1799 *Monthly Mag.* May 299/2 It is the expression of the moral, sentimental, and virtual life which makes beauty.
- 1898 G. MEREDITH *Odes French Hist.* 91 It was the foreign France, the unruly, feared;..Not virtual France, the France benevolent, The chivalrous.

## II. Senses relating to essential, as opposed to physical or actual, existence.

### 4.

**a.** That is such in essence, potentiality, or effect, although not in form or actuality. In later use also: supposed, imagined.

- ▷c1443 R. PECOCC *Reule of Crysten Religioun* (1987) 60 Þe virtual conteyner muste nedis be more parfit þan þe content or þan þe virtualy conteyned þing.
- α1525 J. IRLAND *Of Penance & Confession* in W. A. Craigie *Asloan MS* (1923) I. 68 In my hert consentand to thire [*sc.* sins]..in murmuracoun aganis God formale or wertuall.
- 1593 T. BELL *Motives Romish Faith* II. xi. 151 The Pope shall give to every seminarie priest, full authoritie to absolve from all excommunications and reserved cases what soever: so that now we have so many virtuall Popes in England, as seminarie priests.
- 1654 BP. J. TAYLOR *Real Presence* 21 We affirm that Christ is really taken by faith,..they say he is taken by the mouth, and that the spiritual and the virtual taking him in virtue or effect is not sufficient, though done also.
- 1656 A. BURGESS *CXLV Expository Serm.* lxxv. 398 If such things do come to passe, it's either by their expresse or virtuall compact with the devil.
- 1734 D. WATERLAND *Diss. Exist. First Cause* 30 Every Proof *a priori* proceeds by Causes either real

or virtual.

- 1786 J. APPLETON *Coll. Disc.* I. 282 Nor can [a mortal sin] be forgiven without repentance, either actual or virtual.
- 1850 R. MONTGOMERY *God & Man* 157 The ship may be said to have its virtual existence in the acorn, out of whose substance it is finally derived.
- 1883 A. BARRATT *Physical Metempiric* 157 The simplest conscious action involves actual or virtual thought.
- 1968 P. WARNER *Sieges of Middle Ages* iii. 54 By the time William heard the news in the south the siege was more than virtual; it was taking place physically.
- 1990 C. GANDELMAN in E. Spolsky *Uses of Adversity* iv. 94 The appreciation of an Other who is no longer virtual (inside the consciousness of the author) but actual, in the world.

**b.** That may be so called for practical purposes, although not according to strict definition; very near, almost absolute.

- 1648 J. WILDMAN *Lawes Subversion* 9 Whats such a Commitment lesse than a virtuall publicke Declaration, that you shall be destroyed in your Liberties, [etc.].
- 1697 G. BURGHOPE *Disc. Relig. Assemblies* 166 We shall find it to amount to no less than a virtual renunciation of our baptism.
- 1769 E. BURKE *Observ. Late State Nation* 77 One part of it could not be yielded..without a virtual surrender of all the rest.
- 1787 J. BENTHAM *Def. Usury* viii. 73 (*heading*) Virtual Usury allowed.
- 1820 J. MILNER *Suppl. Mem. Eng. Catholics* 132 To prevent the virtual choice of a Catholic Bishop by an A-Catholic Ministry.
- 1848 H. H. WILSON *Hist. Brit. India 1805–1835* III. v. 211 He had reigned thirty-three years, during the first ten of which he was virtual sovereign of the greater part of Hindustan.
- 1922 *World Tomorrow* July 206/1 Men who have lived unto themselves since they were virtual outlaws at the time of the Revolution.
- 1981 C. DEXTER *Dead of Jericho* iii. 37 She knew, with virtual certainty, that Charles had been unfaithful to her in the past.
- 2011 *N.Y. Times* (National ed.) 10 June A1/1 Egypt's economy..has now ground to a virtual halt.

**5. Physics.** Of an image: such that the light forming it appears to diverge from a point beyond the refracting or reflecting surface; designating the focus from which such light appears to diverge. Contrasted with REAL *adj.*<sup>2</sup> 6; see IMAGE *n.* 3a.

- 1692 W. MOLYNEUX *Dioptrica Nova* ix. 56 Draw  $gk$  directly to cross the Axis in  $e$ . I call the Point  $e$  the Virtual Focus, or Point of Divergence.
- 1692 W. MOLYNEUX *Dioptrica Nova* 96 What is here Demonstrated concerning the Real Image of a Convex Glass may be accommodated to the Virtual Image of a Concave.
- 1728 E. CHAMBERS *Cycl.* at *Point*, Point of Dispersion, is that wherein the Rays begin to diverge; usually call'd the Virtual Focus.
- 1808 J. WEBSTER *Elem. Nat. Philos.* (new ed.) 185 They issued from the virtual focus in the axis of the lens.
- 1859 S. PARKINSON *Treat. Optics* i. viii. 127 The image of an object under water is virtual.
- 1913 *Science* 26 Sept. 445/1 Irrespective of direction, the curvature is considered..negative if from a virtual focus.
- 2008 G. JACOBS & J. SCHULMAN *AP Physics B & C* xxiv. 290 A real image can be projected onto a screen, whereas a virtual image cannot.

**6. Mech.** Designating a notional infinitesimal velocity in part of a mechanical system which is compatible with the constraints of the system. Also (of other physical quantities): resulting from such a velocity. Cf. CONSTRAINT *n.* 5b.

*virtual displacement, work*: see Special uses.

- 1807 T. YOUNG *Course Lect. Nat. Philos.* II. 45/1 This principle was extended still further by John Bernoulli, under the name of the law of virtual velocities. Where the forces acting on the different bodies are different, there is always an equilibrium when the sum of all the products of the masses into the forces by which they are actuated, and then into the initial velocities with which they would be obliged to move, referred to the direction of these forces, becomes equal to nothing.
- 1867 W. THOMSON & P. G. TAIT *Treat. Nat. Philos.* I. i. §237 The product of the force, into the virtual velocity of its point of application, has been called the Virtual Moment of the force.
- 1945 *Proc. National Acad. Sci. U.S.A.* 31 346 The differential equation of rolling in still water [where].. $I$  is the virtual moment of inertia about the longitudinal axis through the center of gravity.
- 2010 A. F. BOWER *Appl. Mech. of Solids* viii. 471 The principle of virtual work must be satisfied for all virtual velocities.

**7. Physics.** Designating an excited state of a physical system, such as

a nucleus, which has more energy than is needed for the emission of a particle but has a lifetime sufficiently long for it to be considered a quasi-stationary state.

- 1931 *Proc. Royal Soc. A.* **132** 681 Simple assumptions would be that the energy  $\varepsilon$  of the particles in a level depended on the number  $p$  on the level according to equation  $\varepsilon = A - a.p$  or  $\varepsilon = A - a.p^2$ , where  $A$  might be considered as the energy of the virtual level, and  $a$  the interaction energy.
- 1955 I. KAPLAN *Nucl. Physics* xvi. 368 Each excited state of the compound nucleus, whether bound or virtual, has a certain mean lifetime.
- 1963 *Radiation Res.* **20** 151 Because of dipole-dipole fluctuations, atoms neighboring a chosen one,  $i$ , occupy some virtual excited states part of the time.
- 2007 C. ILIADIS *Nucl. Physics Stars* ii. 131 Virtual states are not single-particle levels, but are the result of the interactions of many nucleons.

**8. Particle Physics.** Of a particle: unable to be directly detected and occurring over a very short interval of time and space, having (as a result of the uncertainty principle) a correspondingly indefinite energy and momentum which are not necessarily conserved over the time involved.

- 1944 *Proc. Royal Irish Acad. A.* **49** 110 Virtual mesons of all polarizations occur.
- 1961 W. S. C. WILLIAMS *Introd. Elementary Particles* xiii. 341 The four-momentum of this virtual electron is about 140 Mev/c.
- 1990 J. GRIBBIN & M. REES *Cosmic Coincidences* (1991) iv. 127 This strange dance of virtual particles is a requirement of quantum mechanics linked with the concept of uncertainty.
- 2008 *New Scientist* 1 Nov. 16/2 The Casimir-Polder force..arises from the exchange of the 'virtual' photons that pop in and out of existence in a vacuum.

## 9.

**a. Computing.** Of hardware, a resource, etc.: not physically present as such but made by software to appear to be so from the point of view of a program or user.

First recorded in *virtual memory n.* at Special uses. See also *virtual machine n.*, *virtual private network n.* at Special uses.

- 1959 *Proc. Eastern Joint Computer Conf.* xvi. 82/2 The sole function of the virtual memory is to increase machine speed.
- 1972 *Computer Jrnl.* **15** 199/2 We can..easily add new instructions to our virtual hardware, merely by extending the interpreter.
- 1991 *Personal Computer World* Feb. 273/2 You will want to make your virtual disk big enough to hold your file.
- 2009 *Computer Weekly* 6 Oct. 16/1 This free application essentially allows Amazon S3 online filespace to act as a virtual drive for PCs and servers.

**b.** That is a computerized or digitized simulation of something; *spec.* (esp. in earlier use) simulated in virtual reality. Also: established or conducted using computer technology rather than more traditional means. Cf. VIRTUAL REALITY *n.*

- 1982 *InfoWorld* 12 July 32/2 A virtual office would be..built around a portable personal computer and local-area networks that would expand working horizons dramatically.
- 1991 *Sci. Amer.* (U.K. ed.) Sept. 118/2 Much of the content of this network will be private messages serving as 'virtual' town halls, village greens and coffeehouses.
- 1997 *Escape* Mar. 13/1 Virtual gigs are, like virtual sex, no substitute for the real thing.
- 2007 *Stuff* July (Travel Chilled Suppl.) 25/1 Second Life audio kit... Ideal for making your virtual living room as tech-heavy as your real-life abode.
- 2012 *Guardian* 4 Apr. 38/4 The NHS should make more use of 'virtual wards'.\_

**B. n.**

†**1.** *Christian Church.* = *virtual Church n.* at Special uses. *Obs. rare.*

- 1646 J. MAXWELL *Burden of Issachar* 20 Whatsoever power..the Catholike Church, or her virtuall and Representative, an œcumenical Council, justly challengeth, this general Assembly vindicateth to it selfe.

**2.** With *the*. That which is virtual rather than actual or real; (now) *spec.* that which is simulated by computer technology, virtual reality. Also occas. as a count noun.

- 1882 *Smith's Synonyms Discriminated* (new ed.) 737/2 The virtual is strong but indefinite. The

potential is powerful but inactive.

- 1915 *Mod. Lang. Notes* **15** 76/2 We must know what phase of the act is being used by thought to change the actual into the virtual.
- 1970 C. MASCHLER tr. J. Piaget *Structuralism* ix. 43 Locating the real within a system of virtuals.
- 1977 *Ethos* **5** 217 The Waters symbolize the entire world of the virtual; they are..the reservoir of all the potentialities of existence.
- 1999 'MC JABBER' in S.-J. Lovett *Oral* 103 You can live on, the virtual is such a tempting choice.
- 2009 *Atlantic Monthly* Mar. 37/1 Guitar Hero's genius was to retain at its core this mimetic act—the buttons, the colors, the high-velocity 'beat-matching'—while conjuring around it, via the black arts of the virtual, a floating sensorium of rock-and-roll performance.

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## SPECIAL USES

**virtual address** *n.* (*a*) *Computing* an apparent location in memory made available to programs by an operating system, and which corresponds to any address in physical or virtual memory; (*b*) a location on the Internet where a person or organization can be found or contacted.

- 1966 *IBM Systems Jnl.* **5** 79 The longer address is treated..as a virtual address that must be transformed to the actual, shorter memory address.
- 1992 *Byte* Nov. 296/2 Instead of accessing physical RAM locations directly, all application programs work through virtual addresses.
- 1995 *Business Wire* (Nexis) 9 Feb. The Internet's a great way to communicate but you just can't send real chocolates to a virtual address.
- 2011 *San Jose (Calif.) Mercury News* (Nexis) 30 Nov. He moved from his Santa Clara digs to Austin, Texas, two years ago, but his virtual address remains the same.
- 2012 D. A. PATTERSON & J. L. HENNESSY *Computer Organization & Design* (ed. 4) v. 493 We can think of a virtual address as the title of a book and a physical address as the location of that book in the library.

**virtual cathode** *n.* *Electronics* a minimum in potential in a space charge or electron beam, from which electrons are repelled and to

which positive ions are attracted.

- 1880 *London Med. Rec.* 15 Oct. 405/2 We have also a virtual cathode in the immediate neighbourhood, formed by the emergence of the current from the nerve into the surrounding tissues.
- 1964 *New Scientist* 1 Oct. 29/1 It was found that a virtual cathode could be obtained with a beam current of 3·5 milliamperes or more.
- 2006 C. E. STEWART *Weapons Mass Casualties & Terrorism Response Handbk.* xv. 212 Many electrons will pass through the anode and form a bubble of space charge—the virtual cathode—behind the anode.

† **virtual Church** *n.* (also **Church virtual**) *Christian Church Obs.* a person or body acting in the name of the whole church; a representative of the church, *spec.* the Pope.

Freq. used *depreciatively* by opponents of Roman Catholicism.

- 1616 T. BEARD *Retractiue from Romish Relig.* v. 148 [They] take the Church in the third sense for the Pope, and then you haue the man that is the Church virtuall, and must be all in all.
- 1646 J. MAXWELL *Burden of Issachar* 45 It was not consented to by the Church: that is, the Virtuall Church, the Generall Assemblie.
- 1799 G. THOMSON *Confession, Covenants, & Secession Testimony* 13 The papists will have the church virtual, i.e. the pope so far above kings, that he may dethrone them.
- 1848 C. WORDSWORTH *Sequel Lett. M. Gondon* ii. 26 If the Romanists will resign up their senses and understanding to this virtual Church, (which is the Pope), [etc.].

**virtual corporation** *n.* a network of (loosely associated) individuals or organizations working together (now esp. by means of computer technology) for a specific goal or purpose.

- 1805 *Brit. Critic* Jan. 30 Although a perfect combination of all the dealers in one article is impossible, yet each trade may be considered as a virtual corporation, and actuated by a corporation spirit.
- 1897 *Econ. Jrnl.* 7 207 Farmers who have clubbed together to buy a reaper may be considered as forming a virtual corporation with unwritten stock.
- 1992 W. H. DAVIDOW & M. S. MALONE *Virtual Corporation* i. 5 What will the virtual corporation look like?.. To the outside observer, it will appear almost edgeless, with permeable and continuously

changing interfaces between company, supplier, and customers.

2000 *Bombay Times* 19 Sept. 6/1 The idea is to scale this up and bind virtual corporations that coalesce very quickly in internet time for a project.

**virtual displacement** *n. Mech.* a notional infinitesimal displacement in a mechanical system which is compatible with the constraints of the system; cf. sense A. 6.

1849 *Trans. Royal Irish Acad.* **22** 116 The equation of virtual velocities, as stated by M. Poisson and other writers, supposes no virtual displacements but those for which equal and opposite displacements are possible.

1930 *Amer. Math. Monthly* **37** 523 The virtual work of the weight  $w$  of the bead is  $\delta W = -3 wq^2\delta q$ , and this vanishes at  $q = 0$  for every virtual displacement.

2006 B. K. DONALDSON *Introd. Struct. Dynamics* i. 33 If a rigid body is in static equilibrium, any virtual displacement leads to zero virtual work.

**virtual height** *n. Radio* the height of a notional reflecting plane surface which in free space would give rise to the same travel time for reflected radio waves as an actual ionospheric layer.

1928 *Proc. IRE* **16** 85 The heights as given in this paper are virtual heights. They are calculated on the assumption that ordinary reflection takes place and that the layer is parallel to the earth's surface.

1975 D. G. FINK *Electronics Engineers' Handbk.* xviii. 107 A height equal to the virtual height  $h'$  of reflection of the equivalent vertical frequency.

2008 J. A. RICHARDS *Radio Wave Propagation* iii. 34 The height will be overestimated when assuming..that the signal travels at the speed of light; that is why it is referred to as the virtual height.

**virtual machine** *n. Computing* a simulation of a computer provided for a user and run by means of an actual computer.

1965 *IBM Syst. Jrnl.* **4** 199 This memory is achieved with a conventional 'one-dimensional' memory and an appropriate addressing technique. Such abstractions are coming to be known as virtual machines.

- 1988 *PC Mag.* 12 Jan. 52/2 The familiar Ctrl-Alt-Del keystroke can be used to reboot the current virtual machine.
- 2009 *TUAW* (Nexis) 7 Sept. All of your keystrokes and mouse clicks are going to be directed to the virtual machine, not your Mac.

**virtual memory** *n.* *Computing* apparent memory made available by making use of space on a hard drive or other secondary storage device, typically used as a supplement to physical memory when the amount of free space becomes low.

- 1959 Virtual memory [see sense A. 9a].
- 1985 *Which Computer?* Apr. 54/1 No doubt this is a side effect of using the disc as a virtual memory.
- 2011 *TUAW* (Nexis) 8 Aug. Your physical RAM fills up and OS X starts using your hard drive to supplement it with virtual memory.

**virtual pet** *n.* an electronically simulated animal with which human interaction is possible; *spec.* a hand-held toy with a small screen displaying the animated image of a pet which can be cared for and responded to (by pushing buttons) as if it were a real pet; cf. TAMAGOTCHI *n.*

- 1992 *Austral. Financial Rev.* 27 Apr. 14/2 Further into the future, the more esoteric possibilities include virtual reality products—computer-generated artificial worlds—such as virtual-pets or even virtual-friends that could talk and have limited powers of human-like interaction.
- 1993 *Sunday Times* 25 Apr. (Business Computing mag.) 8/3 The team is creating the world's first 'virtual pets', the Charlottes... Although the project is in its infancy the team has already managed to create a computer-screen world where these creatures live.
- 1997 *Cleveland (Ohio) Plain Dealer* (Nexis) 1 Dec. 13 c, Hand-held virtual pets come in many shapes and abilities.
- 2001 *Contact* May 73/3 Virtual pets, or tamagotchis as the Japanese christened them a few years ago, are back in mobile form.

**virtual private network** *n.* *Computing* a network connected via the Internet in which encryption is used to provide secure access to a remote computer, thus simulating a private network; abbreviated

**VPN.**

- 1983 *Proc. IEEE Mil. Communications Conf.* III. 609/2 Capabilities such as CSDC and Virtual Private Networks.
- 1994 *Network World* 11 July 62/2 We have a virtual private network now from here to the U.K.
- 2012 *Sunday Times* (Nexis) 4 Mar. (Features section) 7, I have the old-school DJ set-up... It's connected to a computer which is connected to the studio through a virtual private network.

**virtual representation** *n.* political representation of a group or constituency who have not voted, or are not permitted to vote, for those who represent them; the (theoretical) political representation of people who are disenfranchised; cf. *actual representation n.* at **ACTUAL** *adj.* and *n.* Special uses.

Originally and chiefly with reference to the lack of actual representation in Parliament for inhabitants of the British colonies, especially in colonial America.

- 1765 D. DULANY *Considerations Taxes in Brit. Colonies* 6 Where have They defined, or precisely explained what They mean by the Expression, *Virtual Representation*? As it is the very Hinge upon which the Rectitude of the Taxation turns, something more satisfactory than mere Assertion..is necessary.
- 1839 *Mirror of Parl.* 21 Mar. 1499/1 You struck down, by the Reform Bill, the notion of a virtual representation, but you have not given a real representation in its stead.
- 1960 L. M. THOMPSON *Unification S. Afr.* iii. 115 This is the old argument of 'virtual representation', which had been used by Britain against her North American colonies in the eighteenth century and by opponents of parliamentary reform in Britain in the nineteenth century.
- 2008 *Austral. Financial Rev.* (Nexis) 26 Sept. 23 Just as Americans then dismissed the notion of 'virtual representation' by the English, US politicians are ensuring that Paulson is not handed a blank cheque and that taxpayers gain equity representation in a bail-out of Wall Street funded by them.

**virtual temperature** *n.* the temperature that something would have to have in order to compensate for some physical effect; (in later use) *Meteorol.* the temperature that dry air would have to have in order to have the same density as a given body of moist air when at the same pressure.

[In the specific use in meteorology after French *température virtuelle* ( C. M. Guldberg & H.

Mohn *Études sur les mouvements de l'atmosphère* (1876) i. i. 6.]

- 1871 *Nature* 13 July 204/1 This high temperature, besides, is really a virtual temperature, as..this body at the outer shell must certainly be at a lower temperature.
- 1910 C. ABBE tr. C. M. Guldberg & H. Mohn in *Smithsonian Misc. Coll.* 51 No. 4. 124 We call the quantity  $T$  the virtual temperature; for dry air the virtual temperature is the same as the absolute temperature.
- 2006 J. M. WALLACE & P. V. HOBBS *Atmospheric Sci.* iii. 67/2 Even for very warm and moist air, the virtual temperature exceeds the actual temperature by only a few degrees.

**virtual work** *n. Mech.* the work done by a force making a virtual displacement.

- 1877 G. M. MINCHIN *Treat. Statics* iv. 61 The product of the force,  $P$ , by the projection,  $ON$ , of the virtual displacement is called the virtual work of the force.
- 1942 J. L. SYNGE & B. A. GRIFFITH *Princ. Mech.* ii. 60 The chief merit of the principle of virtual work lies in the fact that it does not involve the reactions of constraints.
- 2007 T. H. G. MEGSON *Aircraft Struct.* (ed. 4) iv. 90 The virtual work done by the forces,  $F$ , during the virtual displacement,  $\Delta^v$ , is zero.

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This entry has been updated (OED Third Edition, December 2013).

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