

TV in VR

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Introduction

Vj g"gxqmwkqp"qh"uvt { vgnkpi "j cu"i qpg"vj tqwi j "xctkqu"r j cugu0Gctrkqu"npqy p"o gvj qf u" y gtg"vj tqwi j "r nkp"vgz0Rrc { u"cpf "vj gcv"gu"y gtg"uugf "vq"dtkpi "uqo g"qh"vj gug"uvtkgu"vq"rkg" dw"ht"vj g"o quv"r ctv"ctkuv"tgnkf "qp"vj gkt "cwf kgpeg"vq"ko ci kpg"vj g"hevkqpcn"y qtrf u"vj g { " y gtg"fguetkdkpi 0'knwutcvkpu"y gtg"c"pleg"cf f kkkp"vq"j gr "xkucrk" g"cp"ctkuv"r gtegr vkp0 Y kj "vj g"cf xgpv"qh"ekpgo c"kp"vj g"gctn { "3; 22au"uvtkpi "y kj "ukgpp"hko u"vq"vj g"ewtgpv" uwo o gt"dmqendwvgtu"y kj "vj gkt"EI K"5F "cpf "uwtqwpf "uqwpf "o"xlgy gtu"ctg"tcur qtvgf " kpv"vj gug"ko ci kpc { "y qtrf u"o"vq"gzr gkpeg"vj gug"y qtrf u"lwuv"cu"vj g"etgcvtu"qh"vj ku" eqpvgpv" gpxkukqpgf "k0'Xktwcn"tgerk { . "y kj "ku"cdk { "vq"r tqxkf g"cp"ko o gtukxg"o gf kwo " y kj "c"ugpug"qh"r tgupeg"cpf "f gr vj "ku"vj g"pgzv"htqpvkt"qh"uvt { vgnkpi 0' ""

Seminal events in history - Moon landing in 1969

Y j gp"P gk'Cto utqpi "cpf "Dw | "Crf tkp"vqm"vj g"htuv"uwr u"qp"vj g"o qqp"/"k'ecr wtgf "vj g" ko ci kpcvkqp"qh"vj g"y qtrf 0'Vj g"ewo kpcvkqp"qh" c"i tcpf "xkukqp"cpf "vj g"ceeqr cp { kpi " vgej pqm"i kcn'dtgcnmj tqwi j u"dtqwi j v'cdqw"cp"gxgpv"vj cv'tcpukzgf "i gpgtckvpu"vq"eqo g0' Cu"kw"j cr r gpgf "kp"vj g"3; 8; . "vj g"gpckrpi "vgej pqm"i { "ht"gzr gkpegkpi "vj ku"gxgpv"y cu"vj g" vtwugf "tcf kq"qt "vj tqwi j "i tckp { "dtqcf ecuu"qh"vgrgxkukqp"cpj qtu"fguetkdkpi "vj g"gxgpw"cu" vj g { "y gtg"fguetkdgf "vq"vj go # " ""

Super Bowl 49

Cu"vj g"Ugcwrg"Ugcj cy m"uqqf "c" { ctf "cy c { "htqo "y kppkpi "vj g"Uwr gt"Dqy n'kp"4237."337" o knkqp"r gqr ng"y vevj gf "qp"PE "kp"vj g"Wpkgf "Ucvgu"cmg0'kp"htqpv"qh"vj gkt"dkl "uetggp" VXu"cpf "gxgt { "r qukdng"qr vkqp"gzr rckpgf "vq"vj go "d { "vj g"eqo o gpcvqtu."vj g"ecuwcn"cpf "vj g" tcdk "hqvdcn"hcp"crkng"y vevj gf "cu"vj g"Ugcj cy m"muv"v w"vq" c"eqphwpeg"qh"gxgpw0'Vj g" o qtg"tedk { " co qpi uv"vj go "o"r qukdn { "htqo " Ugcwrg"cpf "Dquqp." vqnm"vq"Vy kwgt"cpf " Hcgdqm"vq"rco gpv"cpf "tqlqleg"tgur gevkgm 0'Vj g"Uwr gt"Dqy n'ku"qpg"qh"vj g"b quv"y vevj gf " gxgpw" gxgt { " { gct"cpf "ngw"o knkqpu"qh" xlgy gtu"gzr gkpeg"ku" wr u"cpf "f qy pu"cpf " eqo o gtekn'kp" c"xctkqv"qh"y c { u0Cm'qh"y j lej "ku"gpckngf "d { "vj g"vgej pqm"i { "qh"qwt"ko gu0' ""

Xktwcn' tgerk { " ku"vj g" pgzv" uwr " kp"vj ku" htqpvkt"qh" vgej pqm"i { " vj cv"y km"ftkxg"qwt" gzr gkpegu0' K'y km'tgf ghkg"qwt"gzr gevkvqu"qh"gzr gkpegkpi "gxgpw."y km"cf f "vq"qwt" r gtur gevkg"cpf "ko o gtug"vu"kp"xkuegcn"y c { u0' ""

Kp"vj g"eqo kpi "ugevkpu."y g"eqxgt"vj g"gxqmwkqp"qh"XT."vj g"XT"vgej pqm"i { "gequ { vgo . " cr r necvkpu"y j lej "ctg"tgcf { "ht"vcngqhh"pqy "xu"hwgtg."vj g"o ctngv"qr r qtwpk { "cpf "y j gtg" vj g" kpxguo gpw"ctg"j cr r gpkpi 0' Hkpcn { "y g"eqxgt"vj g"r qvkvkn"ej cmgpi gu"cpf "uqekn" ej cpi gu"cu"ctguw"qh"y kf gt"cf qr vkp0

VR Evolution

Qpg"ecp"hpf "gxf gpeg"qh'xk wcn'tgcrk\ "rpi "dghqg'vj g'y qtf "xk wcn'tgcrk\ 'y cu'eqkpgf "kp" r'v'3; : 2u'Rcpqtco k'r ckp'kpi u'ecp"dg"xky gf "cu"vj g"gctrkgu'cwgo r u'v'uj qy "vj kpi u'kp" 582"f gi tgg0Vj gug'r ckp'kpi u'y gtg"clo gf "vq"r tqxkf g"vq"vj g"xky gt'au"gp'vt g'hgrf "qh'xk'kqp" vq" o cng" vj go " hgrn' r t'gugpv' cv" vj g" uepgg'0'ugg" r ckp'kpi " qh' Dcwrg" qh' Dqtqf k'p'q" Itqo " pl'p'g'v'g'p'vj "egpwt {"kp" hki wtg" dgm'y +0'Xk wcn'tgcrk\ "gzr gtl'p'peg"kp" vj g"gctrkgt "f c{u'y cu" rko k'gf "vq"r tqxkf kpi "c"ugpug"qh'f gr vj 0'Vj g'i wk' kpi "r t'p'ekr ng"ht"cm'v'j g'f gx'legu"kp'x'gp'vgf " w'vq"vj g'r qr w'ct"i qqi ng"ectf d'qctf "ku" dcugf"qp" f go q'p'w'c'v'k'p'q"qh'Ej ct'rgu"Y j gc'w'v'p'p'g'au" t'gug'ctej "vj cv"vj g"dt'ckp"r tq'egu'gu"ugr ct'evg"vy q/f ko gp'uk'p'c'n'ko ci gu'htqo "gcej "g{g"kp'vq" c" uk'pi ng" qdl'gev' qh'vj tgg" f ko gp'uk'p'u'0'Dgm'y "hki wtg"uj qy u' vj g" gx'q'n'w'k'p'q" qh'XT"qxgt" vj g" {gct'u'0'

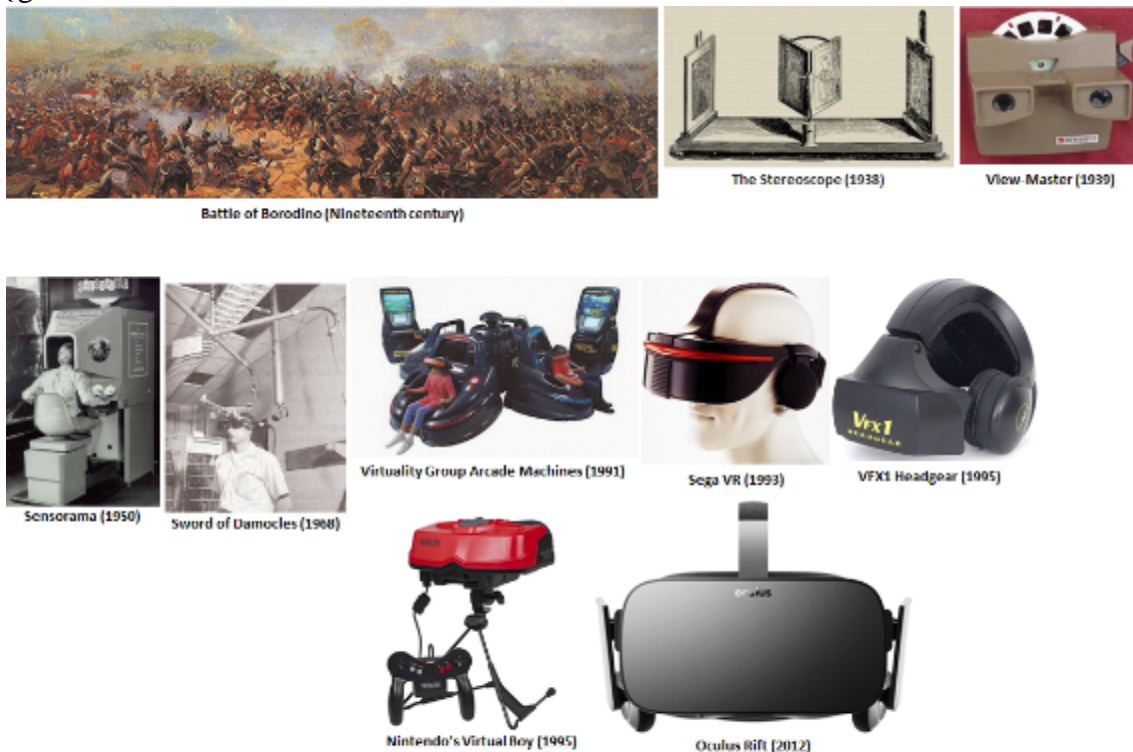


Figure 1: VR evolution in pictures

Earlier versions of virtual reality devices(before 1950):

kp"3: 5: "Ej ctrgu" Y j gcwvqpg"etgcvgf "htuv'uvgtgqueqr gO'K' wugf "c" r ckt" qh"o kttqtu"cv'67" f gi tgg"cpj rgu"vq"vj g"vugt)u"g{gu."gcej "tghngevpi "c" r lewtg"nqecvgf "qhh"vq"vj g"ukf gO'kp"3: 5: " Y knko " I twdgt" f gxgnr gf "c" y j gp" r qr wrct" f gxleg" \$Vj g" Xlgy /O cvgt"\$ y j lej " wugf "c" ektewrct"ectf dqctf " y kj "eqmrgf "vtcpur ctgpekgu"cpf "ngpugu"vq"i kxg" c" hggri"ht" f gr vj "cpf " y cu'engxgn{ "wugf "ht" xkgy kpi "hco qwu'rcpf o ctmi"cpf "vqwkuke"cwcevkpuO' "

1950s

Elpgo cvqi tcr j gt "O qtvpq"J gkri "kptqf wegf "vj g"Ugpuqtco c"y j lej "ku'rkng"cp"ctecf g/uv{rg" vj gcvtg"ecdkpgv"vj cv'y qwr{ "uko wrvg"ugpugu"kp"cf f kkpq"vq"xlkqpO'Vj g"Ugpuqtco c"y cu" f guki pgf "vq"hwnt "ko o gtug"vj g"kp{ kxf wcn"kp"vj g"hrn "d{ "wulpi "pqv'lwuv'uki j v'cpf "uqwpf O'K' hgcwtgf "uvgtgq"ur gcngtu."c"uvgtgqueqr le"5F" f kur rc{ . 'hcpu."uo gmi{ gpgtcvqtu"cpf "c"xlkdcvki " ej cktO'O qtvpq"j ko ugh'dvkrf "8"uj qt'v' hrn u"vq"i kxg"vj g"xlk wcn'gzr gtlgpeg"kp"ugpuqtco cO' O qtvpq"cnq"dvkrf "htuv"j gcf "o qwpvgf "f kur rc{ "J O F +O'Wprkng"vqf c{ }u'kpvtcevkxg"J O F).u. " O qtvpq)u" f gxleg" y cu" pqp" kpvtcevkxg" y kj "pq" o qvkap"ugpuqtuO' Vj g"j gcf ug'v' r tqxkf gf " uvgtgqueqr le"5F"cpf "y kf g'xlkqp"y kj "uvgtgq"uqwpf O' "

1960s

kp"3; 83"vy q"gpj kpggt"htqo "Rj kre"Eqtr qtevkp" *Ego gcw' ("Dt{ cp+f gxgnr gf "cp"J O F " y kj "o qvkap"vtcempj "ecr cdkk{ O'K'y cu"ecmgf "J gcf uki j v' "htuv'o qvkap"vtcempj "J O F +." y j lej " y cu" f guki pgf "ht" vclvki " qh"o kktct{ " r gtuqppgnO' J gcf uki j v' f kf "pqv' j cxg" vj g" kpgi tcvkp"qh"eqo r wgt"cpf "ko ci g"i gpgtcvkpO' Ncvgt "kp"3; 87"Kcp"Uwj gtrcpf "f gxgnr gf " pgy "J O F "ecmgf "\$Wnko cvg" f kur rc{ \$O'Vj ku" f gxleg"ku"o wej "emugt"vq"vqf c{ }u'XT" f gxlegu."k' cmqy gf "wugt"vq"i gv'c'hggri"ht"xlk wcn'tgerkv{ "vj tqwi j "J O F"cpf "k'cr r gctgf "tgerkuke"vj tqwi j " cwi o gpvgf "5F" uqwpf "cpf "cevkng"hgfdcenO'Ego r wgt"j ctf y ctg"y cu'wugf "vq"etgcvg"xlk wcn' tgerkv{ " cpf "wugt"j cf "vj g"cdkklv{ "vq"kpvtcevy kj "qdlgeu"rkng" cwi o gpvgf "tgerkv{ +O'kp"3; 8: " Kcp" Uwj gtrcpf " cpf " j ku" uwf gpv' Dqd" Ur tqwm" f gxgnr gf "c" f gxleg"ecmgf " \$Uy qtf "qh" F co qengu\$ "vj ku" f gxleg" j cf "XT"cpf "CT" hgcwtgu."dw"y cu"j wi g"uct{ "mqnkpi "y kj "ku" j gcx{ "j gcf "o qwpv'cpf "utcr uO'J gcf "o qwpvgf "f kur rc{ "y cu"uq"j gcx{ "vj cv'k'j cu"vq"dg" uwr gpf gf "htqo "egkpi O' "

Xlk wcn' tgerkv{ " vgo "y cu" eqkpgf "kp"3; ; 9"d{ "xk wcn'r tqi tco kpi "rd="vj ku"y cu"vj g"htuv' eqo r cp{ "vq"ugm'Xlk wcn'Tgerkv{ "i qi i ngu" *G{ gRj qpg"3"& 622=G{ gRj qpg"J TZ "&6; .222+ cpf "i mxgu" *& 222+O' "

In 1990

D{ " 3; ; 3" xlk wcn' tgerkv{ " y cu" o cf g" cxekrdng" vq" r wdrlc" d{ " Xlk wcn' " I tqwr "Ctecf g" Ocej kpgu"cpf "i co guO'Vj gug"o cej kpgu" cmqy gf "r rc{ gtu"vq"y gct" c"ugv'qh'XT"i qi i ngu"cpf " r rc{ "qp"i co kpi "o cej kpgu"y kj "tgcnk" g"ko o gtukxg"uvgtgqueqr le"5F" xk wcn'uO'Uqo g"wpku" y gtg"cnq"pgvy qtnrgf "vq" gj gt'ht" c"o wnk'r rc{ gt"i co kpi "gzr gtlgpegO' Ugi c"ppqwpgef "rwpej "qh"j gcf ug'v'kp"3; ; 3"cpf "f kur rc{ gf "k'kp"3; ; 5."vj ku"r tqvq{ r g'j cu" c" NEF "f kur rc{ "uetggp."o qvkap"vtcempj "u{ ugo "cpf "uqwpf "u{ ugo O' Cnj qwi j "hkg"i co gu" y gtg" f gxgnr gf "ht" vj ku" f gxleg." k' pngxg" j k' vj g" o ctngv' f wg" vq" ko o gpug" vej pkecn'

ej cngpi gu"cpf "eqo o qp"j gcmj "kuwgu"vj cv'cee qo r cplgf "XT"vgej pqmji {."j gcf cej gu"cpf "
o qvqpp"ukempguu0'
"

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Vgej pqmji kgu) XHZ 3"J gcf i gct0' Xkt wcn' dq{ u"rkg"y cu"uj qtv'rkxgf "f wg"vq"ku"pq"j gcf "
tcentpi " qr vqpp." r qqt" s wcrk\ " ko ci gu" cpf " tgf " NEF " i ter j leu0' Wugtu" uqpp" uctvgf "
eqo r nckpki "qh'f k | kpguu."pcwugc" cpf "j gcf cej gu0' Xkt wcn' dq{ "y cu"uqrf "qpn\ "qp"p qt vj "
Co gtlec"y kj "eqw rg"qh'i co gu0'Gxgp"y kj "r tlegu" f kueqwpw"vj ku" f gxleg"eqwrf "pqv'urc{ "kp"
o ctngv'dg{ qpf "3; ; 80'

"XHZ 3"J gcf i gct"nk\y cu"uqrf "hqt"ctqwpf "&822" f qmctu'y j lej "kpenf gf "c"uqrf "XT"j gm gv"
y kj "f wcn'NEF" f kur rc{ u."vj tgg" f gi tgg"qh"o qvqpp"tcentpi "cpf "dwn/kp"uvgtgq"ur gcngtu."
r nuw" c"j cpf j grf "eqpvqmg"ecmgf "c"E{ dgtr wemly kj "ku"qy p"o qvqpp"ugpuqtu0'K'qpn\ 'j cf "c"
67" f gi tgg" hgrf "qh" xkgy "cpf "485z452" r kzgr' r gt" g{ g" f kur rc{ "y kj "qpn\ "478" eqmctu"o" c"
tghguj "tcvg"qh"82J | "cpf "c"rkdct{ "qh"i tgevi co gu" kpenf kpi "F qqo . "F guegpv"cpf "S weng"
j gr gf "k'uwtxkxg"kp"o ctngv'hqt'tgcuqpcdr' r gtlqf 0'
""

Virtual reality in the 21st century

Dgi kppki "qh"43uv'egpwt { "j cu"dtqwi j v'uki p hkecpv"ko r tqxgo gpv"kp"vgej pqmji { "vj cv'pqv"
qpn\ "gpj cpegf "Xkt wcn' tgcirk\ " gzr gtlgpeg" dw" cnuq" o cf g" vj go "uo cngt" *eqo hqtvcdr+ "
r qy gthwn" *hcuvt+ "cpf " ej gcr gt0' C" uwti g" kp" xkt wcn' tgcirk\ "f gxlegu" cpf "vgej pqmji kecn'
f gxgnr o gpv'ecp" dg"uggp"kp"4234/4237" f wg"vq"0'Dki "dtcpf "eqo r cplgu"rkng" I qqi rg" *"
ectf dqctf + "Uco uwpi *I gct "XT" + "cpf "J VE" *XKKG+ "j cxg" uwt hceg f "kp" vj g" o ctngv0' Co qpi "
vj gug" Qewnu" Tkn" *cppqwpegf "kp"4234+ "j cu" dggp" vj g" o quv' r qr wct "XT" j gcf ug v'kp" vj g"
o ctngv'y kj "Hcegdqqrnr wtej cukpi "k'hqt"4D" f qmctu0

VR Technology and EcoSystem

C "tvg"582"fgi tgg"5F "tvg gqueqr ke"XT "gzi gkpeg"uj qwf "i kxg" {qw" c"ugpug"qh"rt gugpeg." y kj "y kf g"hgfr "qh"xkgy "tvg"o kpk cni"vgep". "j ki j "tguqmwkq"y kj "tvg"r qukkqpcn"j gcf "tcentpi 0"

Vj gtg"ctg"vj tgg"o clp"ugi o gpv"qh"vgej pqmi { . "y j kej "eqo g"vqi gj gt"vq"r tqxkf g"cp"gpf "vq" gpf "ko o gtuks"5F "xk wcn"tgcrl" { "gzi gkpeg"pco gr" <"

- / J ctg y ctg"cpf "F kxkdwkq"
- / Eqvvpv"Etgcvkq"
- / Uqhy ctg"Rr"vqto u"cpf "F grkgt" { ""

Kp"vj g"hmjy kpi "ugevkpu"y g"htu"vzr rkp"uqo g"qh"vj g"XT"eqpegr w"cpf "vj gp"eqxgt"gej "qh" vj g"vj tgg"ugi o gpv"htqo "c"vgej pqmi { "cpf"eqo r cp { "r gtur gevks"g0 "

VR Concepts

Dghgtg"y g"i q"fggr "kpv"gej "XT"ugi o gpv"ku"ko r qtvcv"vq"wpf gtuvcpf "uqo g"qh"vj g"ng" { "eqpegr w"tgrv"vq"XT0Dgmjy "ku" c"dtkgh"gzr rcpvkq"qh"gej "qh"vj gug"vgt o <"

Presence"/"ku"r qkp"y j gtg" {qw"ctg"twn" "eqpxkpegf" {qw"ctg"kp"vj g"gpv"ktqpo gpv" r tguv"vq" {qw" {qw"ctg"qp" xk wcn"Ngf i g. " {qw"o kpf "npqy u"ku" xk wcn"cpf "uc" {u" o kva"qnc" { "vq"o qxg"hty ctf o"dw" {qw"dqf { "f qgup"v"kv"v"p0"

FOV"/"C"j wo cp"ecp"pcwcm" "ugg"392"fgi tggu"qh"xkgy cdrg"ctgc" "hgfr "qh"xkgy +0" o quv"equpuo gt"i tcf g"J O F "u"pqy "f kur r" ; 2"fgi tggu"vq"342"fgi tggu"qh"hx0"

Latency"/"ku"ko g"dgvy ggp"y j gp"xkgy gtu"o qxgu"j kulj gt"j gcf. "cpf"y j gp" {qw"ugg" r j {ukcni"wr f cvgu"qp"vj g"uetggp0Cp"ceegr wdrng"rvgep" { "ku"cp" {y j gtg"htqo "33"o u" hqt"i co gu"vq"42"o u" hqt"y cvej kpi "582"5F "XT"xkf gqu"

Resolution"/"ku"vj g" pwo dgt"qh"r kzgn"uj qy u"qp"vj g"uetggp"dqj "kp"y kf vj "cpf" j gki j v0Hqt"gzco r ng"o quv"pgy "XT"fgxlegu"tng"Qewwu"Tkiv"FM4"j cu" c"tguqmwkq" qh"3; 42z32: 2"cuq"tghgttgf"cu"32: 2r +hqt"gej "g" g0"

Head Tracking"/"y q"htqo u"

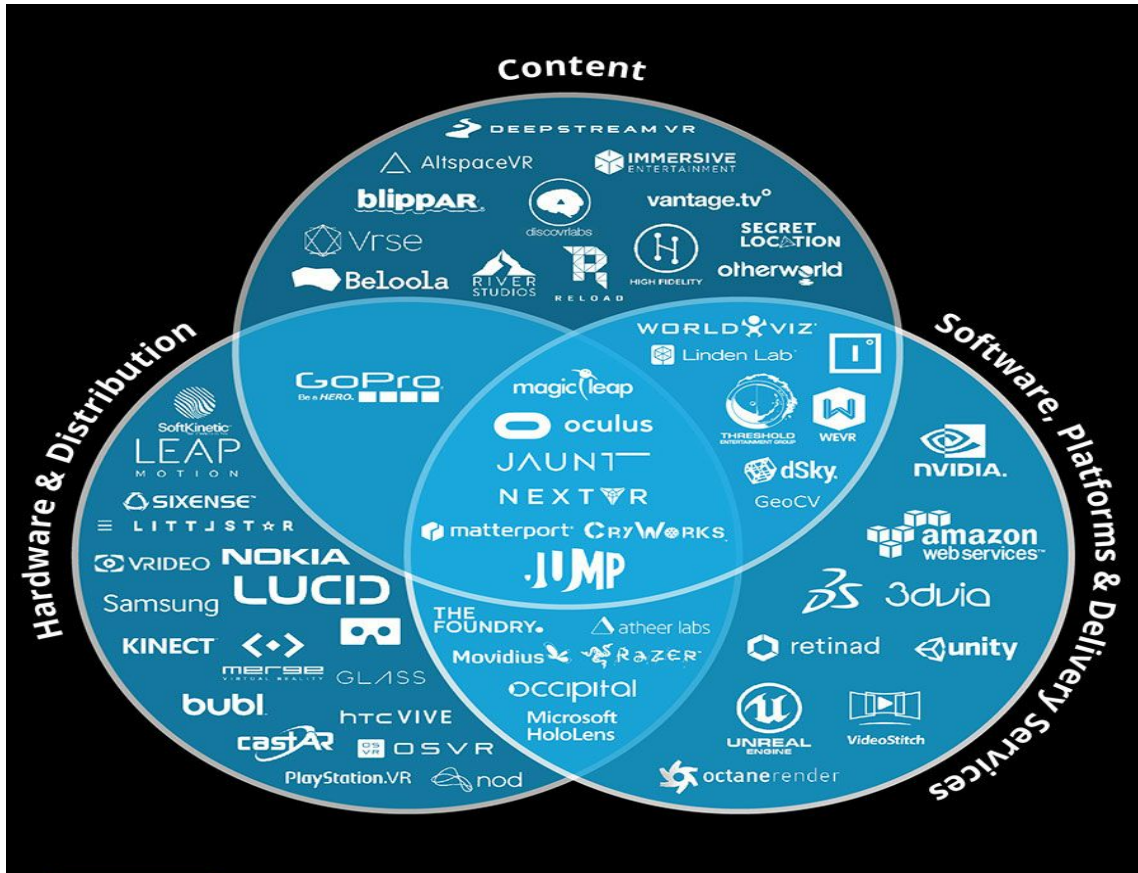
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Qewnu" tkh" wugu" kphctgf "eco gtc" eqo dkgf "y kj "o ci pgvqo gvtu"
cpf " i {tqueqr gu0' Eco gtc" r lemu" wr " tghgevtu" qp" y j" j o f " cpf "
gzvter qrvgu'r qukkqpcn'f cv'htqo "j qy "y j g{ "ctg'r qukkqpgf "
Ukzgpug" f gxgnr gf "gzr gtko gpvcn'cf f qp" y cv'wugu'o ci pgvke" hgrf u"vq"
f ggev'r qukkqp" qh'c' f gxleg. "wugf "kp" Uco uwpi "i gct" XT"
J VE" Xcrkg" wugu" Nki j y qwug" vgej pqm{ " hqt" r tqxkf kpi " vwg"
r qukkqpcn'o qxgo gpv'

360 degree video / "ku" c" hrc'v'gs wktgevcpi wrct "xkf gq" r tqlgevkqp" y cv'ku'o qtr j gf "kpvq"
c" ur j gtg" hqt" r r{ dcm' qp" XT" j gcf ug'0' C" uwcpf ctf "y qtrf "o cr "ku" cp" gzc o r r g" qh"
gs wktgevcpi wrct "r tqlgevkqp." y j lej "o cr u" y j g" uwthceg" qh" y j g" y qtrf " *ur j gtg+ " qp vq"
qt vj qi qpcn'eqqtf kpcvgu0'

Stereoscopic 3D videos / "ku" t gcm{ "y q' xkf gqu. "qpg" o cr r gf "vq" gcej "g{ g' r tqxkf kpi " "
f gr y j "cpf "5F 0' uq" y j gtg" ctg" 4" eco gtcu' r gt "hgrf "qh' xky 0' E j cmgpi gu' kp" r tqf welpi " "
5F "xkf gqu"

uwkej "eco gtc" hqvc i g" hqt" gcej "g{ g" ugr ctcvgn{ 0'
etgcvg' UDU*ukf g' d{ "ukf g+5F "xkf gq" o cr r kpi "y j g" rgh' c' p' f "tki j v' xkf gq" vq" gcej "
g{ g"
y j g" uwgtgqueqr ke "5F "tgf wegu" y j g" xkf gq" tguqnwkqp" dgecvug" 4" ukf g' d{ "ukf g"
xkf gqu' ur rks' y j g' tguqnwkqp" qh' uetggp"
o cz "tguqnwkqp" qp" I gct "XT" ku" 3; 42 ; 82" *j crh" qh" y j g" 56: 2 3; 42" hqt"
o qpqueqr ke "xkf gq+ "
y j gp "xky kpi "6M'582" xkf gq" *62; 8' z' 426: +qp" Uco uwpi "I gct. "y j lej "j cu" c"
HQX" qh' 342" f gi tggu. " { qw' ctg' qp n{ "uggkpi "62; 8 15" ? "3587" kq" 36M0



Source: Fast Company¹

Hardware and Distribution

Vj gtg" ctg" o clpn" wy q" m pf u" qh" j ctf y ctg" eqo r qpgpv" y j lej " gpcdrq" gpf " vq" gpf " XT"

1

http://b.fastcompany.net/multisite_files/fastcompany/imagecache/slideshow_large/slideshow/2015/10/3052209-slide-s-3-vr-and-augmented-reality-will-soon-be-worth-150-billion-heres-who-the-player-s-aremanatt-infograp.png

gZR gTkgpeg0"

Head Mounted Display (HMD) Devices

Hktuv'ku'vj g'j gcf "o qwpvgf "f kur r { " * J O F + " f gxlegu' y j lej " r gqr ng' utcr " qpva' y gkt' j gcf u' va' gplq { " ko o gtukxg' 5F " XT " gZR gTkgpegu0Kp' y j O F " ugi o gpv. ' j gtg' ctg' y j g' ng { " r r { gtu <

Qewnu' Tkh' / " ku' qpg' qh' y j g' hktuv' ugtkqwa' XT' j gcf ugv' r tqf wev' y j lej " uctvgf " y j g' o quv' tgegpv' y cxg' qh' ugtkqwa' kpxguo gpw' kp' XT' 0' Kp' r tlegf " cv' 822 " WUF " ewtgpva' " cu' qh' Cr tki' 4238. " kp' cf f kkp' pggf u' c' RE' y kj " j ki j " gpf " ur geu' r tlegf " cv' 3322 " WUF . " cu' qh' Cr tki' 42380'

Uco uwpi " I gct " XT' j gcf ugv' / " tgrku' qp' " Uco uwpi " I crcz { " r j qpgu' hqt' y j g' r tqeguulpi " r qy gt " cpf " f kur r { " cpf " eqtg' XT' " vgej " r tqxkf gf " d { " Qewnu' Tkh' 0' Vj g' i gct " kugh' i' ku' r tlegf " cv' 322 " WUF . " y j lej " ku' r tgw { " eqo r gmkpi " kh' { " qw' c' r gcf { " qy p' c' " eqo r cvkdrng' " Uco uwpi " I crcz { " gf i g' r j qpg0'

J VE " Xkxg' / " ku' xgt { " uko krc' " vq' Qewnu' Tkh' " kp' " hgcwtg' ur ge " cpf " r tleki 0' Qpg' dki " gzvc' " y j lej " Xkxg' " j cu' ku' y j g' " vtenedng' " eqpvtqmg' tu' y j lej " ngv' { " qw' ugg' { " qwt " j cpf u' kp' " htqp' v' qh' { " qw' cu' { " qw' o qxg' " ctqwpf " kp' " XT' 0' K' j cu' dki " i co g' " uqtg' " J VE " Ugeo " qh' hgtkpi " pwo gtqwa' i co gu0'

Rrc { " ucvkqp' " XT' / " htqo " Uqp { " ku' r tlegf " cv' 522 " WUF " * cu' qh' " Cr tki' 4238 + " cpf " j cu' uko krc' " hgcwtg' u' cpf " ecr cdkkkku' vq' " J VE " Xkxg' " cpf " Qewnu' Tkh' 0' Vj g' dki " f khtgpeg' " ku' y j cv' k' f qgu' pqv' tgs wktg' c' " ugr ctevg' " j ki j " gpf " RE. " cnj qwi j " k' f qgu' tgs wktg' { " qw' vq' " qy p' " Rrc { " ucvkqp' " eqpuqrng0'

I qqi ng' Ectf dqctf / " ku' y j g' ej gcr guv' j gcf ugv' * rkgctm { " o cf g' qh' ectf dqctf " hqt' " wpf gt' " 32 " WUF + " y j lej " r tqxkf gu' xlg' y gtu' y kj " c' " i rko r ug' qh' ko o gtukxg' gZR gTkgpeg' r quukdkkku' y kj qw' r c { kpi " cp { " o qpg { 0' " "

3D VR Cameras

Vj g' qvj gt' o clqt' r kgeg' qh' j' ctf y ctg' ku' y j g' eco gtcu' y j lej " r tqf weg' 582' xkf gqu' "

[Tlej q' Vj gvc' / " 32: 2r " J F . " 52' " r u' / " j cpf { " eco gtc' hqt' vcnkpi " 582' xkf gqu. " ej gcr guv' / " 582' WUF " "](#)

[Hggf qo " 582' / " 8' I qRtq' eco gtcu' qp' c' tki 0' "](#)

[Pqnc' Q' Q' / " qpg' qh' y j g' o quv' gZR gpukxg' r tqh' gukqpcn' i tcf g' eco gtcu. " equu' ctqwpf " "](#)

82."2222"WUF .j cu'gki j v'rgpugu'gcej 'y kj '3; 7'f gi tggu"HQX0'
[Xw g"Eco gtc](#)"/"j cu": "J F"eco gtcu'y kj "tgcmlø g"ugco ngu"uksej kpi "vq"o cng"c"
gs wktgevcpi wrct'xkf gq0'
[Iqqi ng"Lwo r](#)"/"38"eco gtc'tki 'kp'ektewrct'cttc{.'uksej kpi "vqi gj gt'lvgtgqueqr ke"XT"
xkf gq"
[N{vq"K o gti g](#)"/"dtgcmj tqwi j "vgej pqmji {"r tqxkf kpi "8"f gi tggu'qh'htggf qo 'kp'ixg"
cevkqp"gpvktqpo gpv0'
[PgzXT](#)"/"J cxg'r tqhguukqpcn'dtqcf ecuv'ugwr 'hqt'ixg'ur qtva'cpf "gpvgtvckpo gpv0'
[IcwpvXT](#)"/"r tqhguukqpcn'dtqcf ecuvgt"

Content Creation

Y j krg"vj g"kpkkcn'hqewu"j cu"dgpp"ctqwpf "hkz kpi "vj g"tqwi j "gf i gu"kp"vj g"j ctf y ctg"*dqvj "
j gcf ugu'cpf "eco gtc+'kp"vj g'rqpi 'twp.'kx'vj g'eqpvgpv'y j lej 'y kn'dg'vj g'ng{"f khtgtpvkvqt0'
XT"ku"ceqo r ngvgn{"pgy "o gf kwo "hqt"eqpuwo kpi "eqpvgpv"y j lej "tgs wktgu"ct"tgugv"kp"vj g"
vj kpnkpi "qh'vj g"y c{"vj g'r tqf wegtu"j cxg"vcf kxkqpcm{"r tqf wegf "xkf gq"eqpvgpv0'Uqo g"qh'vj g"
kpvgtgukpi "eqo r cplgu"kp"vj ku'ur ceg"ctg"

- / [Y gXT](#)"
- / [XTUG](#)"
- / [O kmXT](#)"

Cml'vj gug"eqo r cplgu"ctg"r tqf wekpi "uj qt v'hqto "582"f gi tgg"5F "XT"eqpvgpv"gzr gtlkpegu"
y j lej "ctg"gkj gt'r cuukxg"qt'kpvgtcevkxg0'

Software Platforms and Delivery Services

Hqt"f grkxgtkpi "vj g"XT"eqpvgpv'htqo "vj g"582"eco gtcu"vq"vj g"wgta'f qppkpi "vj g"J O F "
j gcf ugu."ugxgten'uqhvy ctg"r rnvhqtu u"cpf "f grkxgt{"ugtxklegu"ctg"lpxqrxgf0'Uqo g"qh'vj g"
ctgcu'kp'y j lej "vj gug'r rnvhqtu u'ctg'r rnc{kpi "ctg"<

I co kpi "Gpi kpgu"/"Wpkv{"5F"y kj "vj gk"i co kpi "gpi kpg"UF Mu'hqt"KQU."Cpf tqkf ."
Qewwu'Tkh'ku"cdki 'r rnc{gt'hqt'j gr kpi 'r tqf weg"5F"XT"i co gu0'
Xkf gq"Uksej kpi "Uqhvy ctg"/"Vj g'tcy "582"f gi tgg'xkf gq'ko ci gu'vcngp'htqo "f khtgtpv"
eco gtcu"pggf u"vq"dg"uksej gf"vqi gj gt"d{"c"uksej kpi "uqhvy ctg0'Vj ku"r tqeguu"
lpxqrxgu"y j qng"nv'qh'ko ci g'r tqeguukpi "kpenmf kpi 'ko ci g'eqttgevkqp"vq'tgo qxg'ngpu"

f kuxqt vkqp."eqo r qukpi 'hpcn'ko ci g'r kzgu'hqt'dqvj 'ngh'cpf 'tki j v'g{ g0'
F grkxgt { "qh'xkf gq"dku'qxgt"vj g'pgwy qtnl/"Hqt"vj g"wugtu"vq"gxgpwcm{ "ugg"vj g"XT"
eqpvgpv."eqo r cplgu'rkng"Co cl qp"CY U'r tqxkf g"ecr cdkrk{ "vq'tcphgt'dku'qxgt"vj g"
pgwy qtn'xk"tcf kxqpcn'EF P u0'Qvj gt"eqo r cplgu'rkng'Hcegdqmqncpf "I qwwdg'j' cxg"
vj gkt"qy p'EF P 'hqt'f grkxgtkpi "582'xkf gqu'vq'vj g'eqpuwo gtu'qxgt"vj g'y gd0'

"

Cu" {qw'ecp"ugg"htqo "vj g'f kci tco ."vj gtg"ctg"ugxgtcn'eqo r cplgu'rkng"P gzvXT." Qewwu."
I qRtq"cpf "Y gXT"y j lej "j cxg"r tgupeg"kp'cm'vj tgg"ugi o gpw'vq'r tqxkf g"cp"gpf "vq'gpf "
ko o gtukxg"XT"gzr gkpeg0

VR Applications & timelines

Y j krg'gxgt { "cur gev'qh'qwt'rkxgu'ecp"dg"vwej gf "d{ "XT"cr r rdecvkpu."y g'ugg'uki pkkcepv'
cevxk{ "kp'hmqy kpi "cr r rdecvkp"ctgcu'<

"

Games<Vj ku'ku'vj g'htuv'cr r rdecvkp'y j gtg'vj gtg'ctg'b cp{ 'rtqf wew'dgkpi 'tgrgcugf "
kp"4238" cpf "gzr gev'o ctngv'cf qr vkp"vq"ceegrctcvg0'Ngf "r tko ctkn{ "d{ "Qewwu."
Uco uwpi ."Uqp{."cpf "J VE."vj g'r rrvhqtto "j cu'ecwi j v'vj g'cwgpvkp"qh'i co gtu'cpf "
vej "gpj wukuw"ckng0' KE" guko cvgu"vj cv'XT"j gcf ugv'o cngtu"y kn'uj kr "; Ø"
o knkqp"wpku"cpf "i gpgtcvg" &4Ø" dnkqp"kp"42380'Y kj "vj ku'r wuj "qp"j ctf y ctg"
j gcf ugv'y g'gzr gev'vq"ugg"vj g'dgi kppkpi "qh'c"tgcupcdrg"kpucm'dcug'hqt'eqpvgpv'
etgcvtu'vq'vcti gv0'

Training<Vj ku'ku'cpqj gt"cr r rdecvkp'y j gtg'y g'ugg'cf qr vkp'vknkpi "qh'kp"42380'
Cu"XT"r tqxkf gu"cp"ko o gtukxg"gzr gkpeg"cpf "gpcdrgu'vq"ceegrctcvg'vj g'rgctpkpi "
ewtxg."k'ku'dgkpi "wugf "d{ "O krkct{."P CUC"cpf "qvj gt"gpvtr tkugu'vq"kpqxcvg"cpf "
f kutw v'vj g'vckpkpi "kpf wut{ "cu'y g'npqy "k0'Utkxtredu"j cu'dggp"cr kqpggt"kp"vj g"
Ur qtu'vckpkpi "kp"Xk wcn'T gcrk{ 0'Ukpeg"lpeqr qtcvki "kp"lcpwct{ "4237."UVTKKT"
j cu'swlem{ "i ckpgf "o qo gpwo "y kj "grkvg'vgco u."uki pkpi "8"P HN'vgco u'kp'cf f kxqp"
vq"34"eqmgi kv'vgco u0'UVTKKT"j cu'cnq"gzr cpf gf "kvq"dcungvdcn'cpf "j qeng{." "
y kj "qpg'PECC'dcungvdcn'vgco ."qpg'P DC'vgco ."qpg'Y P DC'vgco ."cpf "qpg'P J N"
vgco "wulpi "vj g'eqo r cp{ v'vckpkpi "r rrvhqtto 0'Utkxtredu'ku't{ kpi "vq'dtgcmlkvq'vj ku"
o ctngv' d{ " go r m{ kpi " hqtto gt" Uwr gt" Dqy n' Ej co r kpu" cpf " PECC" F3"
Cm/Co gtlecpu."cpf "cf xkugtu'kpenw'f'c"J gcf "Eqcej"cpf "P HN'vgco "Rtgukf gpv0'"

² [y y y Utkxtredu&eqo](#)

Entertainment/Theme parks < "Vj ku" cpqj gt "cr r decvqp" y j gtg "XT" ku" r wuj kpi " vj g" dqwpf ctkgu" qh" vj go g" r ctni" gzr gtlgpeg0' Ukz" hrci u5" j cu" kvqf wegf " c" i tqwpf/dtgcnkpi " pgy " tkf g" gzr gtlgpeg" 6" vj g" P gy " Tgxqmwkqp" Xktwcn" Tgcrk{ " Eqcuvt0'Y gctkpi "y ktgruu" I gct "XT" j gcf ugu. "tkf gtu'dgeqo g" 6eq/r kqw6" qp" vj gk" qy p "xktwcn" hki j vgt "lgvu" cpf "dg" vcpur qt vgf "kvq" c "hwwtkwke" dcwrg" vq" ucxg" r rcpgv' Gctvj "Htqo " cp" crkqp "kpxcukqp0/" Ugg" o qtg "cv<"

Advertisement < "ku" cp" kvgt gukpi " cr r decvqp" ctgc" y j kej " j cu" vj g" r qvkvcrn" vq" f kutw v' qt " ceegrctcv" c" pwo dgt " qh" dwukpguu" vj cv' ctg" tgrkcpv' qp" eqo o gtekn' cf xgt kukpi "tgxgpwg" utgco u0'Y kj "vj g" rcwpej "qh" qwVwdgu'582' f gi tgg' xkf gq" cf u. " cm quv' gxgt { " dwukpguu" y kj " c" y gd" r tgugpeg" y kni' pggf " vq" go dtceg" 582" xkf gq" eqo o gtekn' r tqf wevqp0'Vj g { "ecppqv' chqtf " vq" uk' qw" vj g" y cxg" qh' uweeguuhw" XT" xkf gq" cf u'0'Y j gp' Eqec' Eqrc" o ctngf " vj g" 322vj " cpkxgtuct { "qh" vj gk" hktw' gxgt' Eqng" dqwrg" 6" vj gk" gpi ci kpi "582' f gi tgg' xkf gqu" cpf "cegf" qw' uvcpf ctf " utgco kpi " cf u' d { " c" y j qrr kpi "58' 0"

Tourism < "Vj g" vtcxgn' cpf "vqwtkuo 7" kpf wut { "ku" cm' cdqw' ugnkpi " cp" gzr gtlgpeg" c" hgnkpi . " c" rcpf uecr g. " vj g" j kvqt { "qh" c" r ctvewrt " f gukpcvqp0' Vtcf kkpccm { . " vj ku" j cu" dggp" ceeqo r rkuj gf " vj tqwi j " uj ctgf " gzr gtlgpegu" cpf " r lewtgu" Htqo " Htkpf u" cpf " qvj gt " vtcf kkpccn' o ctngkpi " ej cppgn0' Y kj " XT. " k' ecp" qr gp" w" c" pgy " ej cppgn' vq" tgej " o cp { " o qtg' r qvkvcrn' ewuqo gtu' ghgcvkgn' 0"

Entertainment/Sports / "K" vj ku" ugevq. " P gzvXT 8" j cu' r kvpggt gf " cpf " f gxgrgf gf " c" ewuqo " rpu/vq/ rpu" u { uvg " hqt" ecr wtkpi " cpf " f grkxgtkpi " rixg" cpf " qp/ f go cpf " xktwcn' t gcrk { " gzr gtlgpegu" k' v' w' dtqcf ecuv' s wcrk { 0'Y kj " ku' r cvpvgf " vgej pqrqi { . " P gzvXT" ku" vj g" qpn { " eqo r cp { " ecr cdrp" qh" vtcpuo kpkpi " rixg" j ki j " f ghkpkqp. " vj tgg/ f ko gpukpcn' xktwcn' t gcrk { " eqpvgp' qxgt " vj g" kvgtpgv' f grkxgtkpi " c" eqo r rvgv { " ko o gtukxg" cpf " rkg/ rkn" gzr gtlgpeg" hqt " vj g" xkgy gt0' Ku" r tqf wtkpi " XT" eqpvgp' hqt" F c { vqpc 9' Ect " Tcelpi . " P DC " Dcungvdcni co gu0"

Healthcare < "Vj gtg" ctg" o cp { " ctgeu" k' j genj ectg" y j gtg " XT" ku" uvtv kpi " vq" vcn" qhh" rkn" uwti gt { " uko wrcvqp. " r j qdk" vgcwo gpv" tqdqv" uwti gt { " cpf " unku" vclpkpi 0' J genj ectg' kpxqrgu" c" rqv' o qtg' tgi wrcvqp" cpf " j gpeg' y kn' cf qr v' XT" qxgt " c" rpi gt " vko g' htco g" cu' vj g' vgej pqrqi { " o cwtgu0"

3

[j wr u<ly y y 0kzhrci u0eqo lqxti gqti kc lwvcevkqpukt lpgy u/tgrgcug%vuj cuj 0GCRgJ \[UI 0f r vhl' j wr u<ly y y 0kzhrci u0eqo lqxti gqti kc lwvcevkqpukt lqxtxkgy](#)

⁴ [j wr <ly y y 0qpegr wt0eqo l{qwwdgu/582/xkf gq/ cf u/rcwpej/ ej cpi gu/ cf/ i co g1](#)

⁵ [j wr u<ly y y 0pqq 0eqo lctveng lktwcn' t gcrk { /vqwtkuo /o ctngkpi 1"](#)

⁶ [j wr <llqtwpq0eqo 4238 125 129 lhqz/ur qt w/vq/ utgco /o ctej /o cf pguu/ k/ xktwcn' t gcrk { 1](#)

7

[j wr <lxtkgy 0eqo 4238 lf ki kcnlpgy ulhgz/ur qt w/xktwcn' t gcrk { /pgzwt/ f c { vqpc/ 722/ 34239 2: 3: : 1](#)

Market Opportunity

Vj g"qxgtcm'o ctngv'qr r qtwpkv\ "hqt"XT"ku'f qo kpcv'f "d{ "XT"i co gu' k'p'v'j g'uj qtv'twp0Vj g" gpv'gtv'ckpo gpv'k'pf wux {"ku'm'q'q'nk'pi "cv'y'j ku'p'gy "o gf kwo "en'q'ugn\ "c'p'f "v'j g'r t'gf k'v'k'p'u'q'x'g't'v'j g" pgz'v'hgy {"g'c't'u'uj qy "v'j cv'y'j ku'k'p'f wux {"ku'm'q'q'nk'pi "v'q'g'z'r m'k'v'j ku'o gf kwo "k'p'q't'f g't'v'q'i t'q'y " t'g'x'g'p'w'g'u"

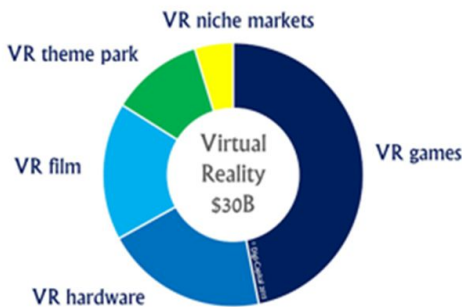
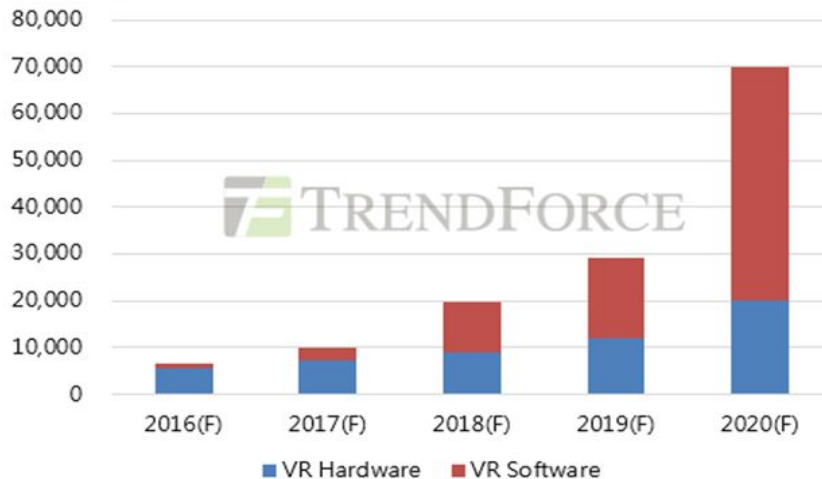


Figure: Global VR Market Value, 2016~2020

Unit: US\$ Million



Source: TrendForce, Dec., 2015

Vj g"qr r qtwpkv\ "hqt"v'j g"XT"j g'cf u'gu. "j cr v'k'eu'c'p'f "e'co g't'c"o c'p'w'k'c'ew't'g't'u'c't'g'r t'gf k'v'g'f "v'q" dg"c"u'ki p'h'k'c'p'v'r q't'v'k'p'q'h'v'j g't'g'x'g'p'w'g"i g'p'g't'c'v'g'f "d{ "v'j g'k'p'f wux {"0'Cu"v'j g'f g'x'k'eg'u"o c'w't'g"

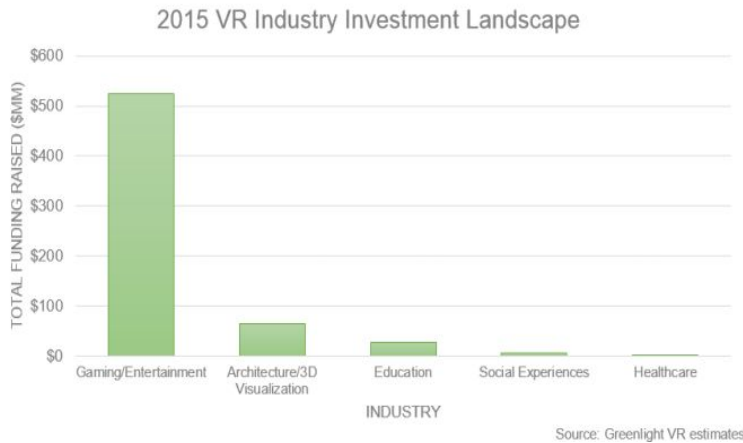
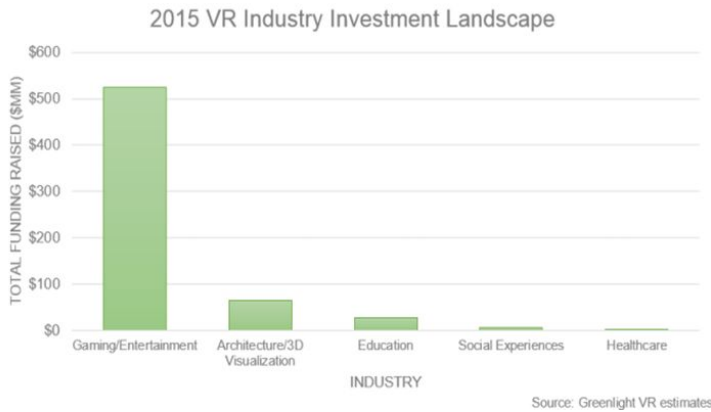
8

<http://www.digi-capital.com/news/2015/04/augmentedvirtual-reality-to-hit-150-billion-disrupting-mobile-by-2020/#.Vx2cfvkrLmE>

cpf "y gtg"ku"o qtg"cf qr vqp"qh"vj g"r rlvhqtu u. "y g"eqpvgpv"r tqxkf gtu"l"uqhy ctg"etgcvtu"lqt" XT"ctg"gzr gevfg "vq" f qo kpcvg"vj g"qxgtcnlo ctngv0

K\ YfY]g'h Y]bj Ygha Ybh[c]b[3

D{ "pqy "y g"cm'w'pf gtucpf "y cv'vj g"o ctngv"qr r qt w'pkv{ "hqt"XT"ku"j wi g"cpf "v'ej pqmji { "ku" dgeqo kpi "o cwtg"gpqwi j "vq" f grkxgt0Vj g"ng{ "s w'gukqp'ku"y j gvj gt "y gtg"ku"gpqwi j "xgpwtg" ecr kcn'hwpf kpi "uqo g"qh"vj gug"XT"cr r h'ecv'kpu"cpf "kh" { gu. "y j lej "ctgcu"ctg"uggkpi "etk'k'ecn" o cuu" qh'hwpf kpi 0'Dcugf "qp" guko cvgu"htqo "I tggpki j v"XT³². "i co kpi "cpf "gpvgtv'kpo gpv" ugevtu"j cxg"uggp"vj g"o clqt'k'v "qh"vj g"hw'pf kpi . "hqmjy gf "d{ "Ctej k'gewtg15F "x'k'w'cnk' c'v'k'p" cpf "gf wec'v'k'p0Vj ku'ecp"cn'q"dg"q'dugt'x'gf "d{ "y j g"XT"r tqf wevu.



⁹ <http://press.trendforce.com/press/20151204-2210.html>

¹⁰

<http://frenchtechhub.com/blog/2015/09/whats-actually-happening-in-the-virtual-reality-vr-industry/>

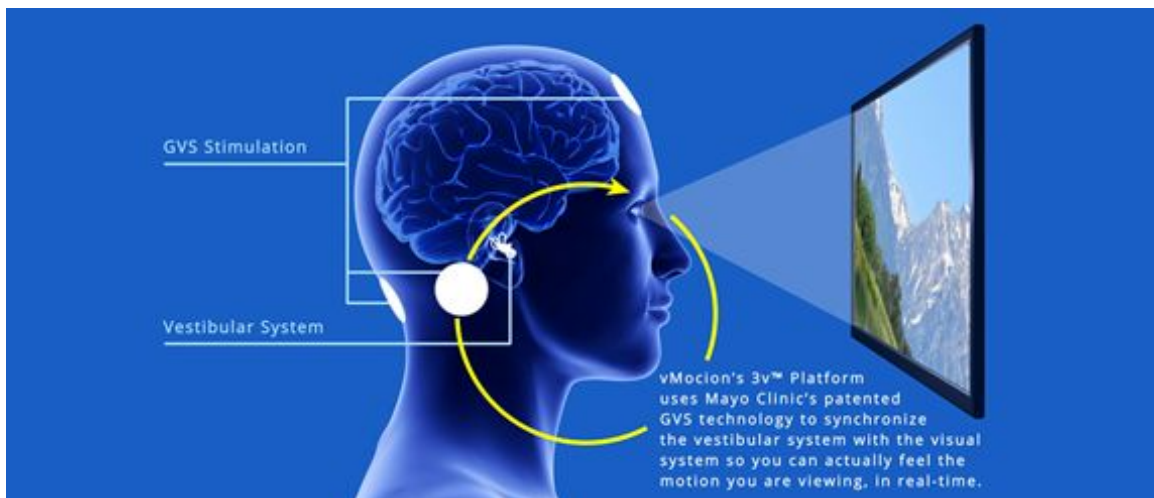
Challenges & Changes

"

Y j kg" XT" ku" dgkpi " cf qr vgf " kp" kp" ugxtgcn' cr r rkecvkp" ctgcu." j gtg" ctg" uqo g" qh" j vg" ej cmgpi gu'cpf "ej cpi gu'kp"r gqr ngou'dgj cxkqt'y g"gzr gev'vq'ugg'kp'pgct'hwwt g<"

Motion sickness / " Vj g" o clk" tgcucp" hqt" o qvkap" ukempguu" ku" rcvpe{. " vj g" vkp{ " dw' r gtegr vldng'f grc{ "dgy ggp'y j gp" {qw'o qxg" {qwt'j gcf "kp'XT"cpf 'y j gp'vj g'ko ci g'kp'htqp'v' qh' {qwt'g'gu'ej cpi guo' etgcvki "c" o kuo cvej "dgy ggp'vj g'o qvkap'y g'hggri*y kj "qwt'kppgt" gtu+ "cpf "vj g'ko ci g'y g'ugg*y kj "qwt'g'gu+0k' tgcni'kkg."vj g'f grc{ 'ku'guugpvkcm{ | gtq0\$Qwt" ugpuqt { "u' ugo " cpf " o qvt" u' ugo u' ctg" xgt { " vki j vq' " eqw rnf . \$" uc { u' Dgcw' Etqpkp. " y j q" gctpgf " j ku' Rj F " kp" eqo r wcvkpcn' pgwtquekgpeg" cv' O K' " cpf " ku' y tkkpi " c" dqqm' qp" vj g" pgwtquekgpeg'qh'XT0'Vq"ko r tqxg" O qvkap' ukempguu' qt " rcvpe{ 'kuu'gu' o cp { 'cr r tqcej gu'ctg" r tqr qugf " y j lej " kpxqkxg" ko r tqxkpi " f kur r { " vgej pqrni { " *f getgcug" r kzgn'uy kej kpi " vko g. " tghtguj " tcvg+." j gcf " tcentg" cpf " r tgf kvkpi " j gcf " o qxgo gp'0'

" xO qekap" ku" wukpi " vj g" O c { q" Enkple" u' I cixcple" Xgukdwrt " Uko wrcvkap" vgej pqrni { " vq" etgcvg" c" o qtg" ko o gtukxg" XT" g'zr gtlgpeg" d { " uko wrcvki " vj g" kppgt" gct' vq' r' gtegkxg' o qvkap'0' Ugg'dgmy 'hki wtg³³0"



Wearable head-gear: "kp" vj g" r cuv' ugxtgcn' { gctu. " uki pkkcpv' r tqi tguu' j cu' dggp" o cf g" vq" o cng" vj g" j gcf " i gctu" rki j vtg" uq" vj cv' vj g { " ecp" uk' eqo hqtvcn { " qp" y getgtu' j gcf 0' Ncvguv' Qewnu' Tkh' cpf " J VE" Xlxg" ctg' tgrv' kxgn' " rki j vtg" cv' 692" i tco u' cpf " ecp" dg' gcukn' " f qppgf " y kj " c" ukpi ng" j cpf " rknng" c" dcugdcn' ecr. " vj gtg" ctg" ukm' ctgcu' vq" ko r tqxg" kp' tgf wvki " j gev'

¹¹ <http://www.vmocion.com/technology.html>

i gpgtcvfg "htqo "f kur m{ "uetggpu"cpf "r tqxkf lpi "y kf gt "hgrf "qh'xkgy 0Y g'dgrkxg"lp"vj g'pgzv' 7"{ gctu. "vj g"uk g"qh"j gcf i get "y km'dg" c"mqv'uo cmgt "cpf "uko r rgt "vq" j cpf ng "cm quv'uko krt "vq" g{ gi ruugu0'

Social interaction: "Cu'Xkt wcn'tgcrk\{ "gZR gtlgpegu'i clp"y kf gt "cf qr vqpp."cpcn\ usu'dgrkxg"kv' y km' dtlpi " ej cpi gu" kp" uqekn' kpvgtcevkqpu" vj cv' y gtg" pqv' uggp" y kj " VX" qt " kpvgtpgv0' Tgugctej gtu'dgrkxg"pgy "ko o gtukxg"vej pqmji { "eqwrf "rgcf "vq"kuqr vqpp"cpf "y j gp"uqekn' pggf u" ctg" o gv' qprkpg." kp/r gtuqp" kpvgtcevkqpp" o c{ " pqv' dg" pggf gf " cu" o wej 0' Kk" XT" vej pqmji { "ku'twn\ "ko o gtukxg."kv'eqwrf "rgcf "vq"cf f lkvqpp"dgj cxlqt "cpf "eqphwukqp"dgwy ggp" tgrk\{ "cpf "xkt wcn'tgcrk\{ "htqo "ugt kquw'i co gtu0Rtkxce{ "y km'dg"cv'i tgcvtg "tkum'cu'cm'xkt wcn' tgrk\{ "gZR gtlgpeg"ecp"dg"vtcengf "cpf "o cpr wrvfg 0' "

Kp" Ur kg" qh' vj g" r gtegxgf " ej cmgpi gu" kp" uqekn' kpvgtcevkqpu." vj gug" kpvgtcevkqpu" eqwrf " cewcm\ "dg"o wej "o qtg"ko o gtukxg"cpf "r qy gthwn'y kj "xkt wcn'tgcrk\{ "cu'qpg"ecp"xkt wcm\ " kpvgtcev'y kj "htkpf u"cpf "tgrvkgu"cm'qxgt "vj g'y qtrf "y kj qw'vtxgnkpi "qxgtugcu0P gy u" o gf lc"rkng"P gy "l qtm'Vko gu"cpf "pqr tqhk'qti cpl kvkqpu"ctg"ert gcf { "dwnf lpi "582" f gi tgg" XT" gZR gtlgpegu"lp"htqo "qh'uj qt v'o qxlg'erku. "vj cv'i gpgtcvfg"r qy gthwn'hggkpi u"qh'go r cvj { " co qpi uv'vj g'tlej "cpf "r qy gthwn'f qpqtu0

Summary

Kp" uwo o ct { . "xkt wcn'tgcrk\{ "ku" vj g"pgzv'htqpvkt "kp" vgtu u"qh'r tqxkf lpi "c"eqo r ngw"pgy " o gf kwo " hqt" kpvgtcevkqpp" vj cv' j cu" xkuegtcn' ugpug" qh"r tgugpeg" cpf "ko o gtukxgpguu" vj cv' eqppgevu"j wo cpu"lp"y c{ u'vj cv'u"pgxgt "dggp"r quukdng'y kj "cp{ "qvj gt"o gf kwo 0Y g'dgrkxg" vj g"eqpf kkvpu"ctg"tkr g"ht"XT"vq"vcngqhh"lp" c"dki "y c{ . "ecwukpi "f kut wr vqpp"vq"kpewo dgpvu" cetquu"vj g"lpf wut { "ugi o gpvu'uvctvki "y kj "i co lpi "cpf "uj qt v'uvqt { "vgnkpi 0"

Hqt "cf qr vqpp"dg{ qpf "i co lpi . "vj g'tgcn'kppqxcvkqpu"y km'j cr r gp"kp"eqpvgpv'ur ceg. "y j gtg" r tqf wegtu" y qwrf " wug" vj ku" o gf kwo au" ecr cdkkxkgu" vq" r tqxkf g" cp" cwj gpvke" uvqt { vgnkpi " gZR gtlgpeg"lp"ugevtu"rkng"gf wecvkqpp."o qxlgu"cpf "dg{ qpf 0Gxgpwcm\ . "vj g"eqphwugpeg"qh' xkt wcn'tgcrk\{ "y kj "cwi o gpvfg "tgrk\{ "y km'rgcf "wugtu"vq"vwn\ "cej kxg"vj g"j qn\ "i tckl'qh' ÷vgrgr qt vcvkqpp0'dgkpi "lp"o wnr ng'r nregu'cv'vj g'uco g'vko g+"gZR gtlgpeg0'

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