

# A (not so) Complete Guide to Genome Browsers

9/17/13 BYOB

# Web-based



←→  
GBrowse

←→  
JBrowse

e!Ensembl

# Client-based





# The Elements of Bioinformatics

Year of first release → 00  
Tool name → Xx

OPEN SOURCE TOOLS

KEY TO TOOL TYPE																									
<div>Aligners (pairwise)</div>	<div>Aligners (short read)</div>	<div>Other Aligners</div>	<div>Multiple Sequence Aligners</div>	<div>Assemblers Genomic (Long read)</div>	<div>Assemblers Genomic (Short read)</div>	<div>Assemblers (mRNA)</div>	<div>Structure Modelling</div>	<div>Gene Prediction (mRNA)</div>	<div>Gene Prediction (ncRNA)</div>	<div>Sequence Tools</div>	<div>Database / Warehouse</div>	<div>Workflows</div>	<div>Genome Browsers</div>	<div>ToolKit &amp; APIs</div>	<div>Structure Visualisation</div>										
<div><div>Bn</div><div>BLAST NCBI</div><div>90</div></div>	<div><div>So</div><div>SOAP</div><div>08</div></div>																								
<div><div>Hm</div><div>HMMER</div><div>98</div></div>	<div><div>Ma</div><div>MAQ</div><div>07</div></div>																								
<div><div>Mu</div><div>MUMMER</div><div>99</div></div>	<div><div>Bo</div><div>BOWTIE</div><div>08</div></div>	<div><div>Cl</div><div>CLUSTALW</div><div>94</div></div>	<div><div>Pe</div><div>PECAN</div><div>06</div></div>	<div><div>Mi</div><div>MIRA 97</div><div>97</div></div>	<div><div>Se</div><div>SEQCLEAN</div><div>04</div></div>	<div><div>Jm</div><div>JMOL</div><div>01</div></div>	<div><div>Sd</div><div>SOAP: DE NOVO</div><div>09</div></div>	<div><div>Un</div><div>UNIGENE</div><div>03</div></div>	<div><div>Gl</div><div>GLIMMER 3</div><div>98</div></div>	<div><div>Cd</div><div>CD-HIT</div><div>06</div></div>	<div><div>Tr</div><div>TRNASCAN</div><div>97</div></div>	<div><div>Bm</div><div>BIO MART</div><div>03</div></div>	<div><div>Ta</div><div>TAVERNA</div><div>03</div></div>	<div><div>Eb</div><div>ENSEMBL BROWSER</div><div>00</div></div>	<div><div>Bp</div><div>BIO PERL</div><div>00</div></div>	<div><div>Pl</div><div>PLINK</div><div>07</div></div>	<div><div>Sa</div><div>SAM TOOLS</div><div>09</div></div>	<div><div>Ps</div><div>PSI PRED</div><div>99</div></div>	<div><div>Py</div><div>PHYLIB</div><div>81</div></div>	<div><div>Em</div><div>EMBOSS</div><div>00</div></div>	<div><div>Bj</div><div>BIO JAVA</div><div>00</div></div>	<div><div>Bc</div><div>BIO CONDUCTOR</div><div>01</div></div>	<div><div>Bi</div><div>BISMARK</div><div>10</div></div>	<div><div>Ms</div><div>SWISS-MODEL</div><div>03</div></div>	
<div><div>Ss</div><div>SSAHA</div><div>03</div></div>	<div><div>Bw</div><div>BWA</div><div>09</div></div>	<div><div>Cf</div><div>T-COFFEE</div><div>00</div></div>	<div><div>Pr</div><div>PRANK</div><div>10</div></div>	<div><div>Ce</div><div>CELERA</div><div>97</div></div>	<div><div>Fo</div><div>FORGE</div><div>09</div></div>	<div><div>Rm</div><div>RasMOL</div><div>95</div></div>	<div><div>Sg</div><div>SGA</div><div>09</div></div>	<div><div>Cu</div><div>CUFFLINKS</div><div>09</div></div>	<div><div>Eu</div><div>EUGENE</div><div>99</div></div>	<div><div>Fx</div><div>FASTX-TOOLKIT</div><div>09</div></div>	<div><div>Rn</div><div>RNA FOLD</div><div>10</div></div>	<div><div>In</div><div>INTERMINE</div><div>07</div></div>	<div><div>Gx</div><div>GALAXY</div><div>07</div></div>	<div><div>Ap</div><div>APOLLO</div><div>02</div></div>	<div><div>Ig</div><div>IGB</div><div>04</div></div>	<div><div>Ut</div><div>UTGB</div><div>07</div></div>	<div><div>Am</div><div>AMPLICON NOISE</div><div>10</div></div>	<div><div>Qi</div><div>QIIME</div><div>09</div></div>	<div><div>Eh</div><div>eHIVE</div><div>00</div></div>	<div><div>En</div><div>ENSEMBL API</div><div>00</div></div>	<div><div>Br</div><div>BIO RUBY</div><div>00</div></div>	<div><div>La</div><div>LAGAN</div><div>03</div></div>	<div><div>Mve</div><div>MAI VE</div><div>10</div></div>	<div><div>Hh</div><div>HH PRED</div><div>03</div></div>	
<div><div>Ex</div><div>EXONERATE</div><div>05</div></div>	<div><div>Bf</div><div>BFAST</div><div>09</div></div>	<div><div>Ma</div><div>MAFFT</div><div>02</div></div>	<div><div>Mv</div><div>MAVID</div><div>04</div></div>	<div><div>Ar</div><div>ARACHNE</div><div>02</div></div>	<div><div>Me</div><div>MERACULOUS</div><div>10</div></div>	<div><div>Co</div><div>CORTX_CON_RP</div><div>08</div></div>	<div><div>Pa</div><div>PE-ASSEMBLER</div><div>10</div></div>	<div><div>Oa</div><div>OASES</div><div>10</div></div>	<div><div>Ep</div><div>ENSEMBL PIPELINE</div><div>00</div></div>	<div><div>Fq</div><div>FASTXQC</div><div>10</div></div>	<div><div>Si</div><div>SIGNALP</div><div>97</div></div>	<div><div>Ch</div><div>CHADO</div><div>10</div></div>	<div><div>Kn</div><div>KNIME</div><div>08</div></div>	<div><div>Gb</div><div>GBROWSE</div><div>02</div></div>	<div><div>Nc</div><div>NCBI-MAPVIEWER</div><div>04</div></div>	<div><div>By</div><div>BioPYTHON</div><div>03</div></div>	<div><div>Pic</div><div>PICARD</div><div>09</div></div>	<div><div>Vc</div><div>VCFTOOLS</div><div>09</div></div>	<div><div>Gk</div><div>GENBANK</div><div>82</div></div>	<div><div>Ip</div><div>INTERPRO</div><div>05</div></div>	<div><div>Cm</div><div>ChEMBAL</div><div>08</div></div>	<div><div>Cb</div><div>ChEBIV</div><div>10</div></div>			
<div><div>Fa</div><div>FASTA</div><div>88</div></div>	<div><div>Sm</div><div>SMALT</div><div>10</div></div>	<div><div>Ml</div><div>MUSCLE</div><div>04</div></div>	<div><div>Pb</div><div>PROBCONS</div><div>05</div></div>	<div><div>Ph</div><div>PHUSION(2)</div><div>03</div></div>	<div><div>Qu</div><div>QUAKE</div><div>10</div></div>	<div><div>Al</div><div>ALLPATHS-LG</div><div>07</div></div>	<div><div>Ba</div><div>BAMBUS 2.09</div><div>09</div></div>	<div><div>Ty</div><div>TRINITY</div><div>10</div></div>	<div><div>Sn</div><div>SNAP</div><div>11</div></div>	<div><div>Rk</div><div>REPEATMASKER</div><div>96</div></div>	<div><div>Vt</div><div>VARIANT TOOLS</div><div>11</div></div>	<div><div>Pd</div><div>PDP</div><div>71</div></div>	<div><div>Up</div><div>UniPROT</div><div>03</div></div>	<div><div>Iv</div><div>IGV</div><div>08</div></div>	<div><div>Ag</div><div>ARGO</div><div>07</div></div>	<div><div>At</div><div>ARTEMIS</div><div>02</div></div>	<div><div>As</div><div>APSAMPLER</div><div>05</div></div>	<div><div>Ge</div><div>GENABEL</div><div>12</div></div>							
<div><div>Ac</div><div>ACT</div><div>05</div></div>	<div><div>Rs</div><div>RNA-STAR</div><div>12</div></div>	<div><div>Po</div><div>PROT PAL</div><div>12</div></div>	<div><div>Fs</div><div>FSA</div><div>08</div></div>	<div><div>Pi</div><div>PRICE</div><div>11</div></div>	<div><div>Ve</div><div>VELVET</div><div>07</div></div>	<div><div>Sp</div><div>SPADES</div><div>09</div></div>	<div><div>Cn</div><div>CONTRAIL</div><div>09</div></div>	<div><div>Au</div><div>AUGUSTUS</div><div>09</div></div>	<div><div>Mg</div><div>MGENE</div><div>08</div></div>	<div><div>Mm</div><div>METABIOME</div><div>09</div></div>	<div><div>Jv</div><div>JALVIEW</div><div>04</div></div>	<div><div>Ct</div><div>CATH</div><div>97</div></div>	<div><div>Tg</div><div>MISO</div><div>12</div></div>	<div><div>Da</div><div>DALLIANCE BROWSER</div><div>10</div></div>	<div><div>Jb</div><div>JBROWSE</div><div>07</div></div>	<div><div>Mb</div><div>MrBAYES</div><div>04</div></div>	<div><div>Pn</div><div>PHASTCONS</div><div>04</div></div>	<div><div>Ug</div><div>UGENE</div><div>08</div></div>							
<div><div>Gm</div><div>GMAP/GSNAP</div><div>11</div></div>									<div><div>Ji</div><div>JIGSAW</div><div>05</div></div>	<div><div>Th</div><div>TOPHAT</div><div>08</div></div>	<div><div>Re</div><div>RSEM</div><div>12</div></div>	<div><div>Fb</div><div>FLEXBAR</div><div>12</div></div>	<div><div>En</div><div>ENA</div><div>12</div></div>	<div><div>Pf</div><div>PFAM</div><div>11</div></div>	<div><div>Sk</div><div>SEQMONK</div><div>07</div></div>	<div><div>Sv</div><div>SAVANT</div><div>10</div></div>									
															<div><div>Gk</div><div>GENBANK</div><div>82</div></div>	<div><div>Ip</div><div>INTERPRO</div><div>05</div></div>	<div><div>Cm</div><div>ChEMBAL</div><div>08</div></div>	<div><div>Cb</div><div>ChEBIV</div><div>10</div></div>							

TOOLS FREE FOR ACADEMICS ONLY

<div>02</div> <div>Bl</div> <div>BLAT</div>	<div>00</div> <div>Vm</div> <div>VMATCH</div>	<div>11</div> <div>Rt</div> <div>RNNOTATOR</div>	<div>11</div> <div>Av</div> <div>ANNOVAR</div>	<div>99</div> <div>Fg</div> <div>FGENESH</div>	<div>97</div> <div>Gn</div> <div>GENSCAN</div>	<div>06</div> <div>Bh</div> <div>BioWAREHOUSE</div>	<div>09</div> <div>Ga</div> <div>GATK</div>	<div>97</div> <div>Pm</div> <div>PAML</div>	<div>96</div> <div>Ro</div> <div>ROSETTA</div>	<div>04</div> <div>Cr</div> <div>CHIMERA</div>	<div>03</div> <div>DI</div> <div>DALI</div>	<div>01</div> <div>Pc</div> <div>PCAP</div>
<div>92</div> <div>Cm</div> <div>CROSSMATCH</div>	<div>01</div> <div>Sh</div> <div>SSAHA2</div>	<div>00</div> <div>Md</div> <div>MASKERAID</div>	<div>09</div> <div>Ab</div> <div>ABYSS</div>	<div>11</div> <div>Mk</div> <div>MAKER</div>	<div>08</div> <div>Mr</div> <div>MIRDEEP</div>	<div>02</div> <div>Uc</div> <div>UCSC</div>	<div>08</div> <div>Pt</div> <div>PATHWAY TOOLS</div>	<div>11</div> <div>Sw</div> <div>SRNA WORKBENCH UEA</div>	<div>03</div> <div>Mo</div> <div>MODELLER</div>	<div>03</div> <div>Pm</div> <div>PyMOL</div>	<div>09</div> <div>No</div> <div>AA</div>	

COMMERCIAL TOOLS

<b>Zm</b> ZOOM 08	<b>Ca</b> CASAVA 08	<b>Oz</b> OLIGOZIP 07	<b>Ne</b> NEWBLER 11	<b>Gd</b> GENEDATA 08	<b>It</b> INTEGROMICS 03	<b>Sr</b> SRS 97	<b>Gp</b> GENEPOOL 10	<b>Mh</b> MATCH 03	<b>Ge</b> GENEXPLAIN 03	<b>Pp</b> PIPELINE PILOT 99	<b>Gs</b> GENESPRING 05	<b>Gu</b> GENEIOUS PRO 05	<b>Cb</b> CLC BIO 10	<b>An</b> AVIDASNGS 05	<b>Pk</b> PARTEK 05
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#egelements

elements.eaglegenomics.com

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# Web-based



# Client-based



# Web-based

# Client-based



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# GFF3 file format

```
##gff-version 3
ctg123 example gene 1050 9000 . + . ID=EDEN;Name=EDEN;Note=protein kinase
ctg123 example mRNA 1050 9000 . + . ID=EDEN.1;Parent=EDEN;Name=EDEN.1;Index=1
ctg123 example five_prime_UTR 1050 1200 . + . Parent=EDEN.1
ctg123 example CDS 1201 1500 . + 0 Parent=EDEN.1
ctg123 example CDS 3000 3902 . + 0 Parent=EDEN.1
ctg123 example CDS 5000 5500 . + 0 Parent=EDEN.1
ctg123 example CDS 7000 7608 . + 0 Parent=EDEN.1
ctg123 example three_prime_UTR 7609 9000 . + . Parent=EDEN.1
```



Tilapia\_broad\_anchored\_v1: 40 kbp from LG1:14,124,000..14,163,999

Browser Upload and Share Tracks Preferences

#### Search

Landmark or Region:

LG1:14124000..14163999 Search

Examples: LG1:1..400000, LG2:1..400000, LG3:1..400000, LG4:1..400000, LG5:1..400000, LG6:1..400000, LG7:1..400000, LG8\_24:1..400000, LG9:1..400000, LG10:1..400000, LG11:1..400000, LG12:1..400000, LG13:1..400000, LG14:1..400000, LG15:1..400000, LG16\_21:1..400000, LG17:1..400000, LG18:1..400000, LG19:1..400000, LG20:1..400000, LG22:1..400000, LG23:1..400000, UNK1:1..400000.

Data Source

Tilapia\_broad\_anchored\_v1

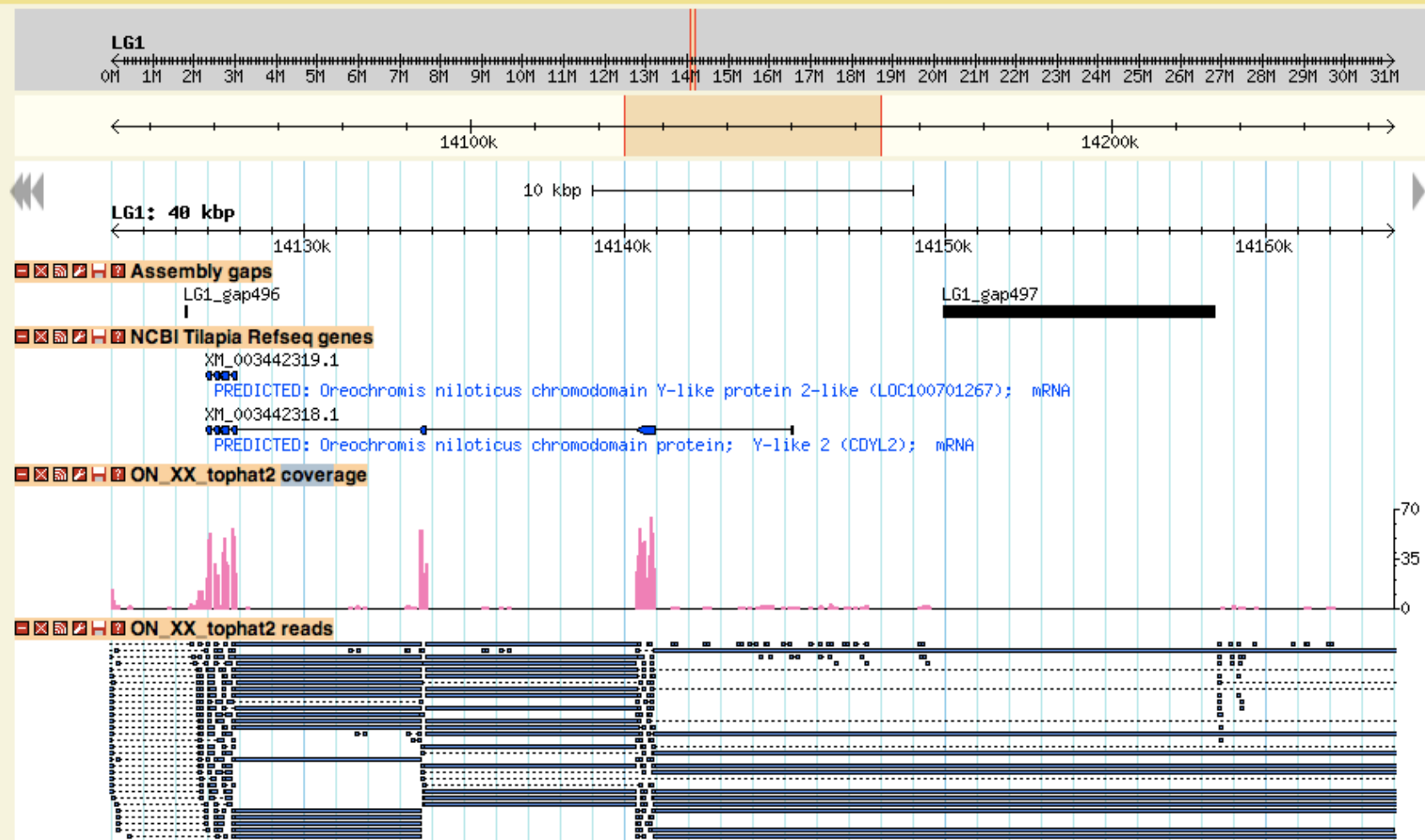
Annotate Restriction Sites Configure... Go

Scroll/Zoom: << < - Show 40 kbp + > >> Flip

#### Overview

#### Region

#### Details



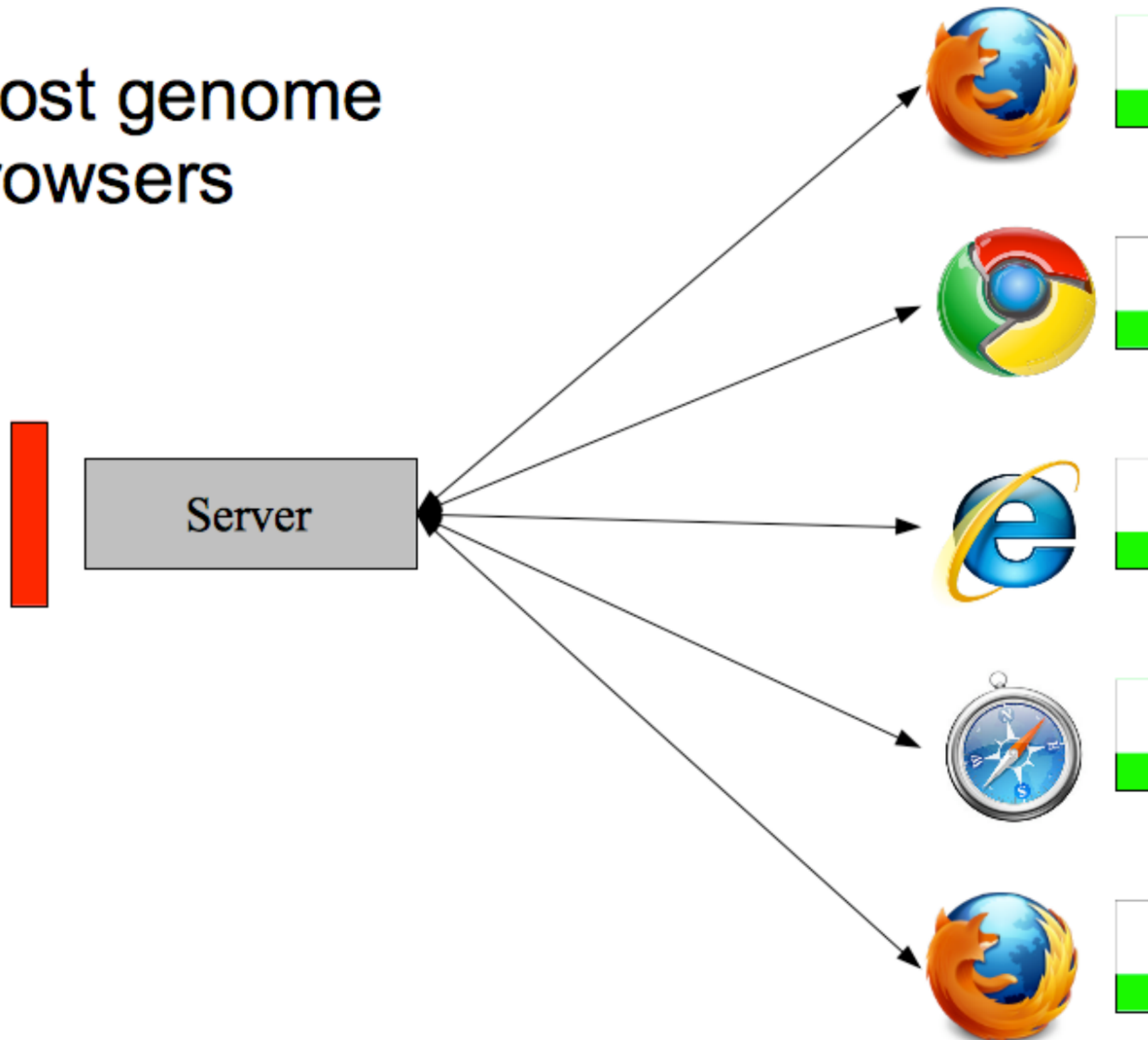
GFF/  
MySQL

BAM

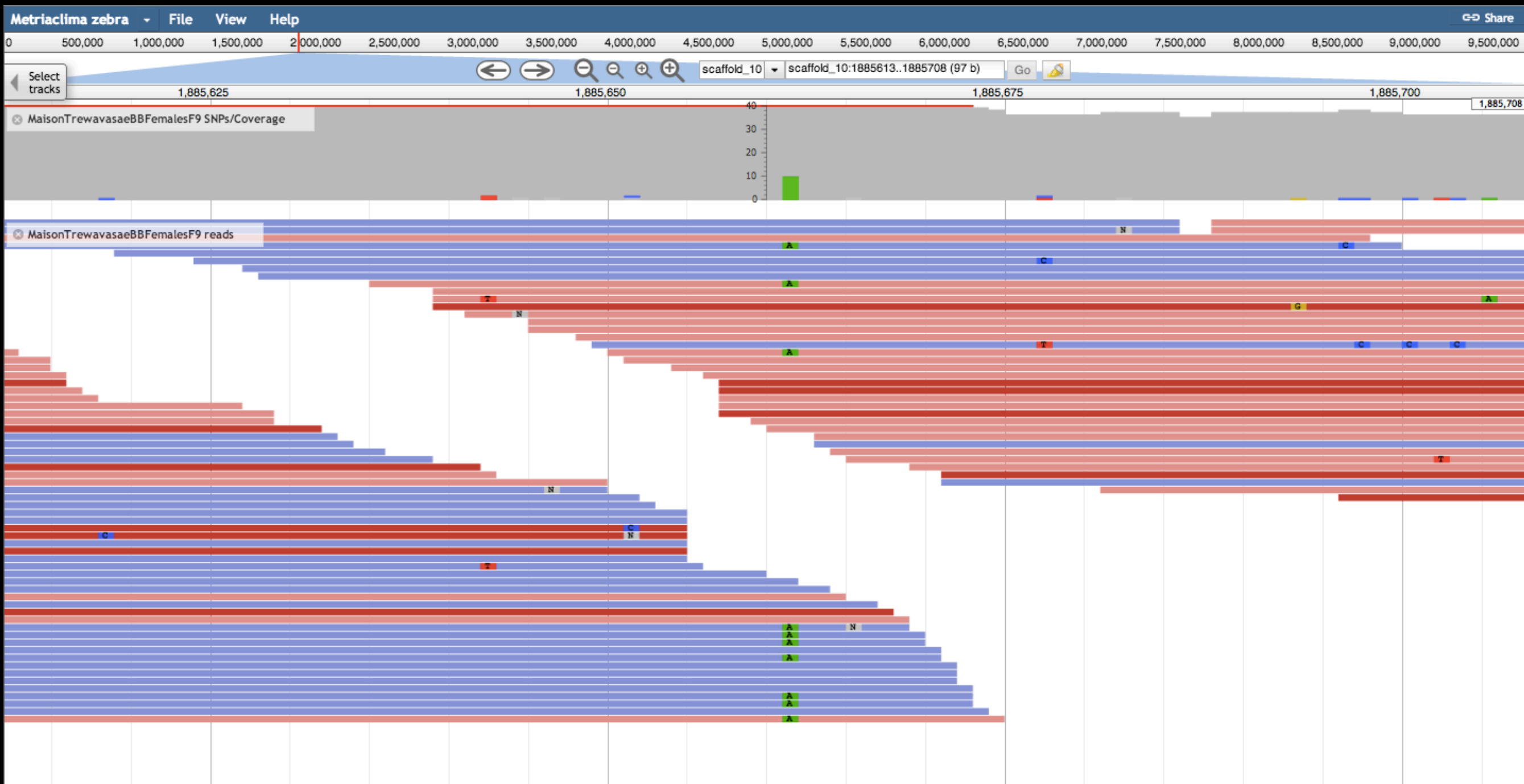
<http://gmod.org/wiki/GBrowse>



## Most genome browsers

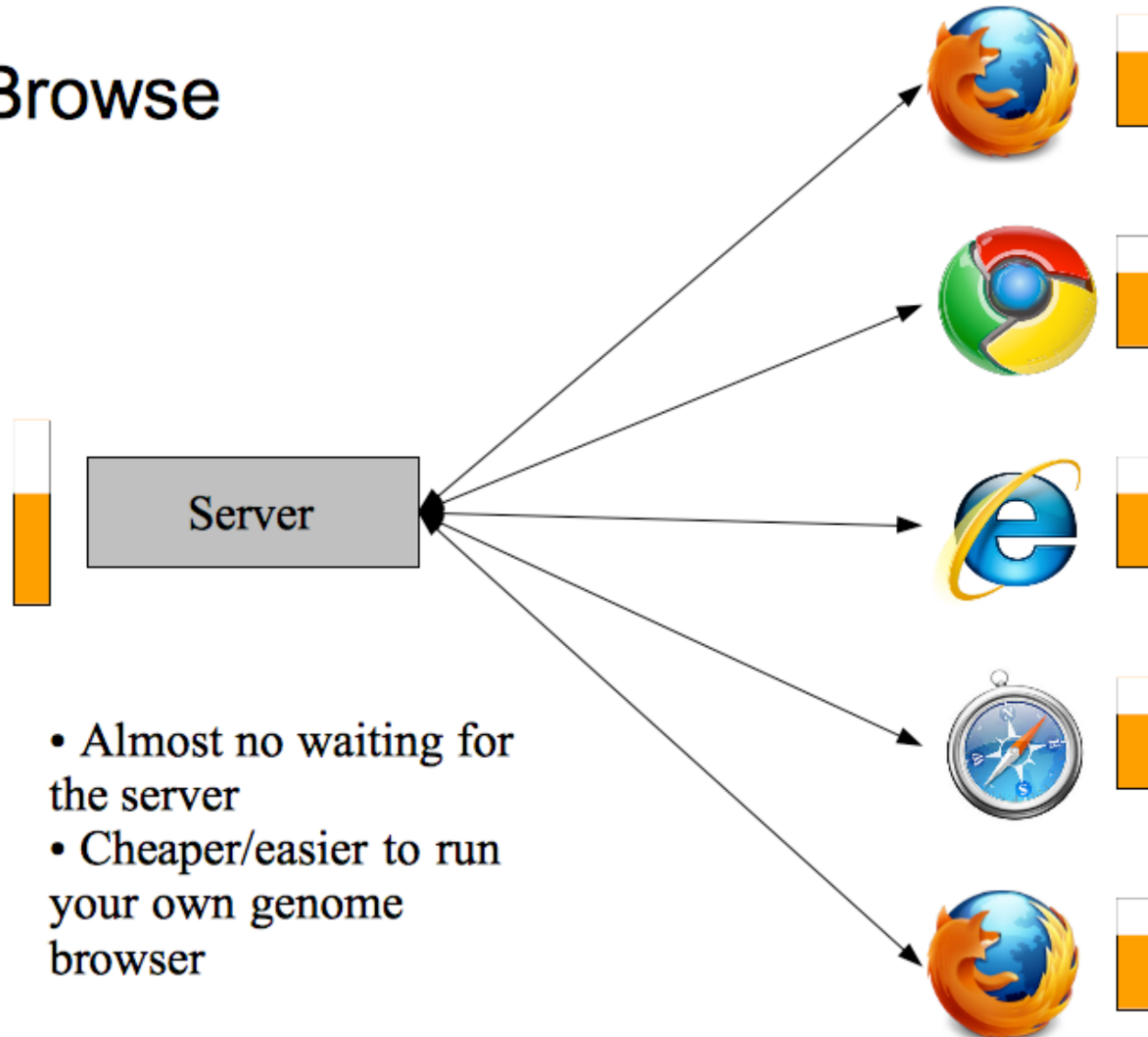


From: <http://prezi.com/nx4jy4etq-ug/gbrowse-20-and-jbrowse-for-ismb/>



<http://jbrowse.org/>

# JBrowse



From “GBrowse 2.0 and JBrowse for ISMB”

# VM and Cloud

- Virtual machines
- GMOD in the cloud
- <http://www.gmod.org/wiki/Cloud>



<http://www.broadinstitute.org/igv/>



# Savant

<http://genomesavant.com/p/savant/index>