Althea: the cannabis software framework

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Summary: Althea is a cloud-based software framework designed to store and share cannabis market, genetic, and chemical profile data. Based on an XML file format, Althea sets an industry standard for the storage, retrieval, and analysis of strain, cannabinoid, and terpene data. Hosted in Google's cloud, Althea provides breeders, labs, researchers, practicioners, patients, and the emerging cannabis and hemp industry with invaluable tools upon which to grow.

Marijuana legalization, the spread of medical marijuana and the re-emergence of industrial hemp will lead to more research about cannabis and hemp. Legal markets will emerge as hemp and cannabis become bulk agricultural commodities, grown, marketed and sold like corn, soybeans and wheat.

Breeders and growers, labs and researchers, practicioners and patients, buyers and sellers; all need access to market, genetic, and chemical composition data. What's missing is a *lingua franca*, a standardized way to store and share data relevant to cannabis.

Althea is a software framework designed to store and share cannabis data. Althea's real value lies in tools that analyze that data, transforming numbers into answers and solutions, applying data mining and visualization technology to vast pools of data, using machine learning to discern patterns and relationships, and more.

Portions of the Althea framework will be released under a Creative Commons license and other portions as commercial software.

The Althea File Format

Althea XML files have three main sections:

Market data includes lot number, price, and weight, data of interest to those involved in pricing, buying and selling cannabis as a bulk agricultural commodity.

Strain data includes common name, breeding lineage, Cannabis Breeder's Rights license, and genetic sequence, data all of which are of interest to breeders and growers, researchers, and others.

Chemical data includes cannabinoid and terpene profiles as measured by chromatography including the testing hardware and configuration used. This helps others evaluate the lab results in context and/or recreate them for themselves.

Althea files are XML 1.0 files with their own defined schema (XSD not DTD). While there is a JSON interface, XML is the default, sidestepping JSON injection attacks.

Althea files display well on phones and other screens courtesy of an attached CSS3 style sheet. They also work seamlessly with Excel. (*Figure 1*)

Althea + Excel

Microsoft Excel imports XML files, making it an excellent dashboard for Althea files. Excel is well suited for sorting, filtering and analyzing Althea files, singly or in bulk.

Spreadsheets can display data sorted by strains, profile data as CBD:THC ratios, identify terpene relationships, etc. Excel can import multiple Althea files and filter for preset market conditions much like stock or mutual trading.

Excel can also be configured as a tunnel between Althea and other applications or to send email or texts.

Althea in Google's Cloud

Althea was conceived with Google's cloud in mind. Portions of the Althea framework are web-based (XSD, CSS3 stylesheets, JSON, etc.).

Ultimately Althea is an SaaS platform. Google's cloud offers robust native XML support, user authentication and cryptograph primatives (hashes, HMAC, etc.) not to mention a large library of API's.

Google provides reliability and minimal latency. Off-site backup will be on another cloud platform TBD in true belt'n'suspenders fashion.

Support for Cannabis Breeder's Rights

Cannabis Breeder's Rights are a set of licenses much like Creative Commons for digital content. Cannabis Breeder's Rights allow breeders to pass along their wishes and intentions (propagation rights, commerce, and attribution) when they release strains to the public. *[www.LeBlancCNE.com/cannabis-breeders-rights/]*

Labs' CSV Files Beget Althea.xml

Lab equipment often generates CSV (comma separated values) files, which are easily converted to Althea files using Excel or Python. Configured correctly labs can generate custom branded Althea files automatically.

Genomic Sequcing, the real ID

DNA barcodes are supported by Althea:

```
<DNAbarcode>
  <sequenceID></sequenceID>
  <genome></genome>
  <locus></locus>
  <nucleotides1></nucleotides1>
  <nucleotides2></nucleotides2>
  <aminoAcids></aminoAcids>
</DNAbarcode>
```

Genomic sequencing is useful for identifying genotypes & genotype clusters, establishing the identity of a specific strain, and correlating genotypes with terpenes, cannabinoids, and other factors.

Hemp and cannabis gene sequences can be used as evidence of posession of a specific strain, especially when time/date stamped by a trusted third party (Althea as Trent).

Identifying Terpene Clutters

Althea can be used to evaluate terpene profiles as a way to identify and visualize groupings (and voids) among terpene strains. If a given genotype generates a specific chemotype (matrix of terpene values), other plant samples can be shown to be related or not.

Hemp's Day Is Coming

Althea is equally useful for hemp and marijuana not to mention hemp/marijuana crosses. As hemp production expands, it will be bred & sequenced,bought & sold, analyzed & tested, all of which calls for Althea.

Cannabis As a Bulk Agricultural Commodity

Legalization is bringing cannabis out into the open. Normalization will create large, mainstream markets. Cannabis will take its place as yet-another bulk agricultural commodity. Commerce is coming...

Althea contains market data like lot number, weight and pricing. Along with strain and chemical composition data, Althea can form the backbone of realtime trading platforms.

"I'm looking for lots 10 pounds or more, with at least 7% CBD and no more than 4% THC for $1800/lb or less."

A Researcher's Dream Come True

The widespread acceptance of medical marijuana generates as many questions as it does therapeutic results. The trickle of research underway now will pale in comparision to the research that will be undertaken in the not too distant future. This is doubly true when one considers both hemp and marijuana.

Research advances quickly when done in an open and collaborative environment. Having a standardized file format, cannabis-specific tools, and a cloud-based framework, Althea allows labs and researchers to pick the part(s) of Althea they want, eliminating the need to build tools from scratch.

Buy vs Build

Why Althea? The classic question is always *"Buy vs build?"* Unless a better mousetrap exists, Althea is available now and with portions of it released under a Creative Commons license, price isn't a limiting factor.

The Althea v1.5 is available now. Althea is LeBlanc CNE's primary focus in 2016.

Feedback is actively encouraged. Contributions are greatly appreciated. TIA

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www.LeBlancCNE.com/Althea/

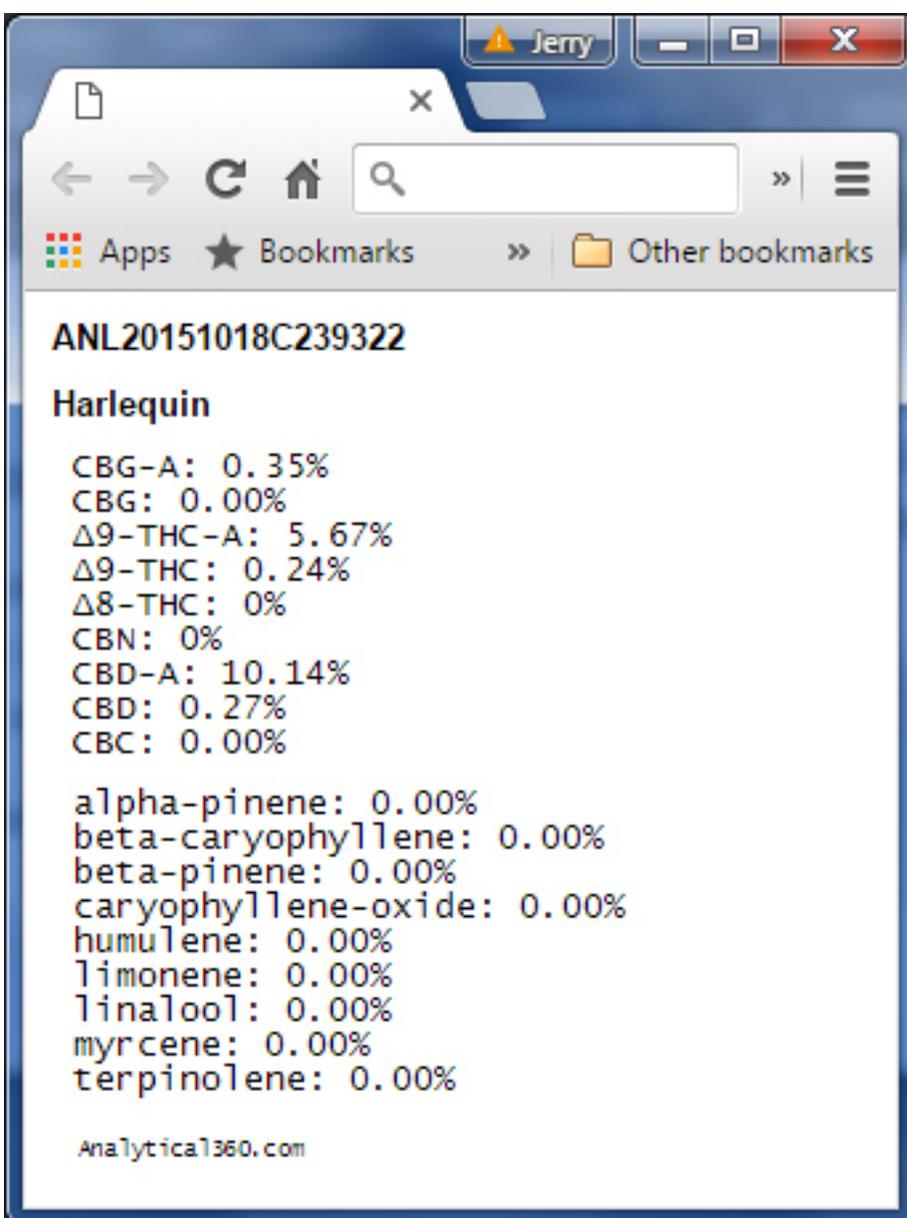*Figure 1, Althea XML file with linked CSS3 stylesheet*

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet type="text/css" href="http://althea.LeBlancCNE.com/althea-xml.min.css"?>
<!-- althea.xml  v1.5.0  03feb16  -->
<!-- Copyright LeBlanc CNE, Inc. 2016. CC-BY-4.0  -->
<cannabisProfiles xmlns="http://althea.LeBlancCNE.com" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://althea.LeBlancCNE.com althea.xsd">
<!-- units of measurement  -->
  <!-- grams, USD, and per centages are the default. changes must ripple through CSS, XLS, & other tools.  -->
  <units>
    <weightUnit>gram</weightUnit>
    <currencyUnit>USD</currencyUnit>
    <labUnits>%</labUnits>
  </units>
<!-- sample  -->
  <sample>
    <sampleName>ANL20141217C029669</sampleName>
    <sampleWeight>454</sampleWeight>
    <samplePrice>1000.00</samplePrice>
  </sample>
<!-- hardware  -->
  <testEquipment>
    <labName>WWW</labName>
    <machineModel>XXX</machineModel>
    <columnType>YYY</columnType>
    <methodUsed>ZZZ</methodUsed>
  </testEquipment>
<!-- plant name(s)  -->
  <plantName>
    <commonName>Harlequin</commonName>
    <breedingLineage>Columbian Gold x Thailand x Swizerland x Nepal</breedingLineage>
    <DNAbarcode>
      <sequenceID></sequenceID>
      <genome></genome>
      <locus></locus>
      <nucleotides1></nucleotides1>
     <nucleotides2></nucleotides2>
     <aminoAcids></aminoAcids>
    </DNAbarcode>
  </plantName>

<!-- chemical profiles  -->
  <profile>
<!-- cannabinoids  -->
    <cannabinoids>
      <CBG-A>0.57</CBG-A>
      <CBG>0.0</CBG>
      <delta9-THC-A>4.67</delta9-THC-A>
      <delta9-THC>0.29</delta9-THC>
      <delta8-THC>0.0</delta8-THC>
      <THCVA>0.0</THCVA>
      <THCV>0.0</THCV>
      <CBN>0.0</CBN>
      <CBD-A>9.35</CBD-A>
      <CBD>0.27</CBD>
      <CBDVA>0.0</CBDVA>
      <CBDV>0.0</CBDV>
      <CBCA>0.0</CBCA>
      <CBC>0.03</CBC>
      <!-- additional cannabinoids  -->
    </cannabinoids>
<!-- terpenes  -->
    <terpenes>
      <alpha-phellandrene>0.0</alpha-phellandrene>
      <alpha-pinene>0.23</alpha-pinene>
      <alpha-terpinene>0.0</alpha-terpinene>
      <alpha-terpineol>0.0</alpha-terpineol>
      <beta-caryophyllene>0.18</beta-caryophyllene>
      <beta-ocimene>0.0</beta-ocimene>
```

```
        <beta-pinene>0.0</beta-pinene>
        <camphene>0.0</camphene>
        <carene>0.0</carene>
        <caryophyllene-oxide>0.0</caryophyllene-oxide>
        <fenchol>0.0</fenchol>
        <humulene>0.27</humulene>
        <limonene>0.0</limonene>
        <linalool>0.0</linalool>
        <myrcene>0.36</myrcene>
        <terpinolene>0.0</terpinolene>
        <y-terpinene>0.0</y-terpinene>
        <!--  additional terpenes  -->
      </terpenes>
  </profile>
<!--  addendum  -->
  <addendum>
     <notes>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nullam tempus vel neque eget posuere.
Phasellus pretium sodales dui at vestibulum. Curabitur maximus, urna a dignissim congue, nibh nulla dictum est,
eu ultrices velit tortor a augue.</notes>
     <tags>cannabis CBD Harlequin segaKidz</tags>
     <!--  to be added by the althea Google Cloud   -->
     <testID></testID><!--  the testID is each althea.xml file's unique ID  -->
     <!--  to be added by the althea Google Cloud   -->
     <dateTime></dateTime>
     <!--  to be added by the althea Google Cloud   -->
     <HMAC></HMAC>
  </addendum>
</cannabisProfiles>
```