

NEVONEX

- Beschleunigte Anbindung von Landmaschinen ans IoT

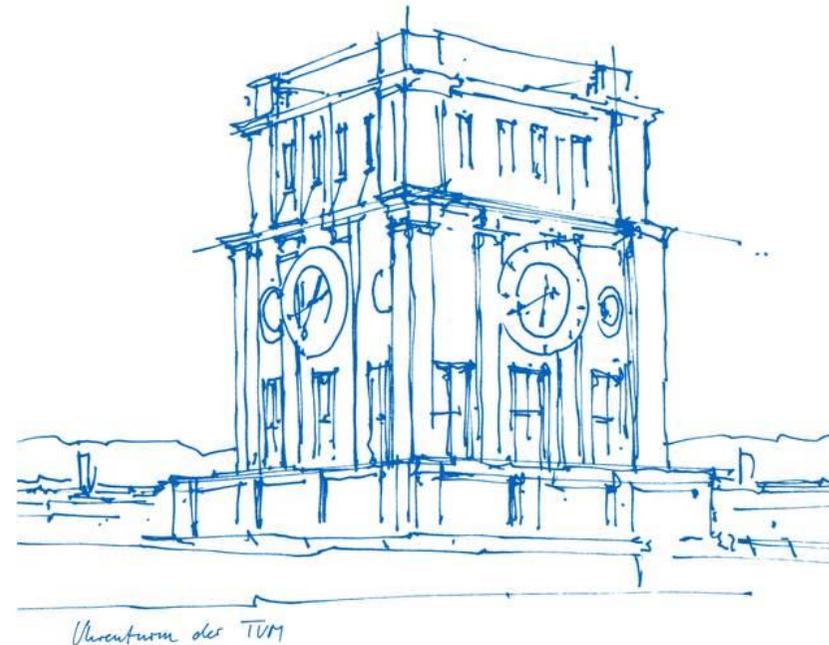
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Lehrstuhl für Agrarsystemtechnik

41. GIL-Jahrestagung, 08. März 2021



NEVONEX explained

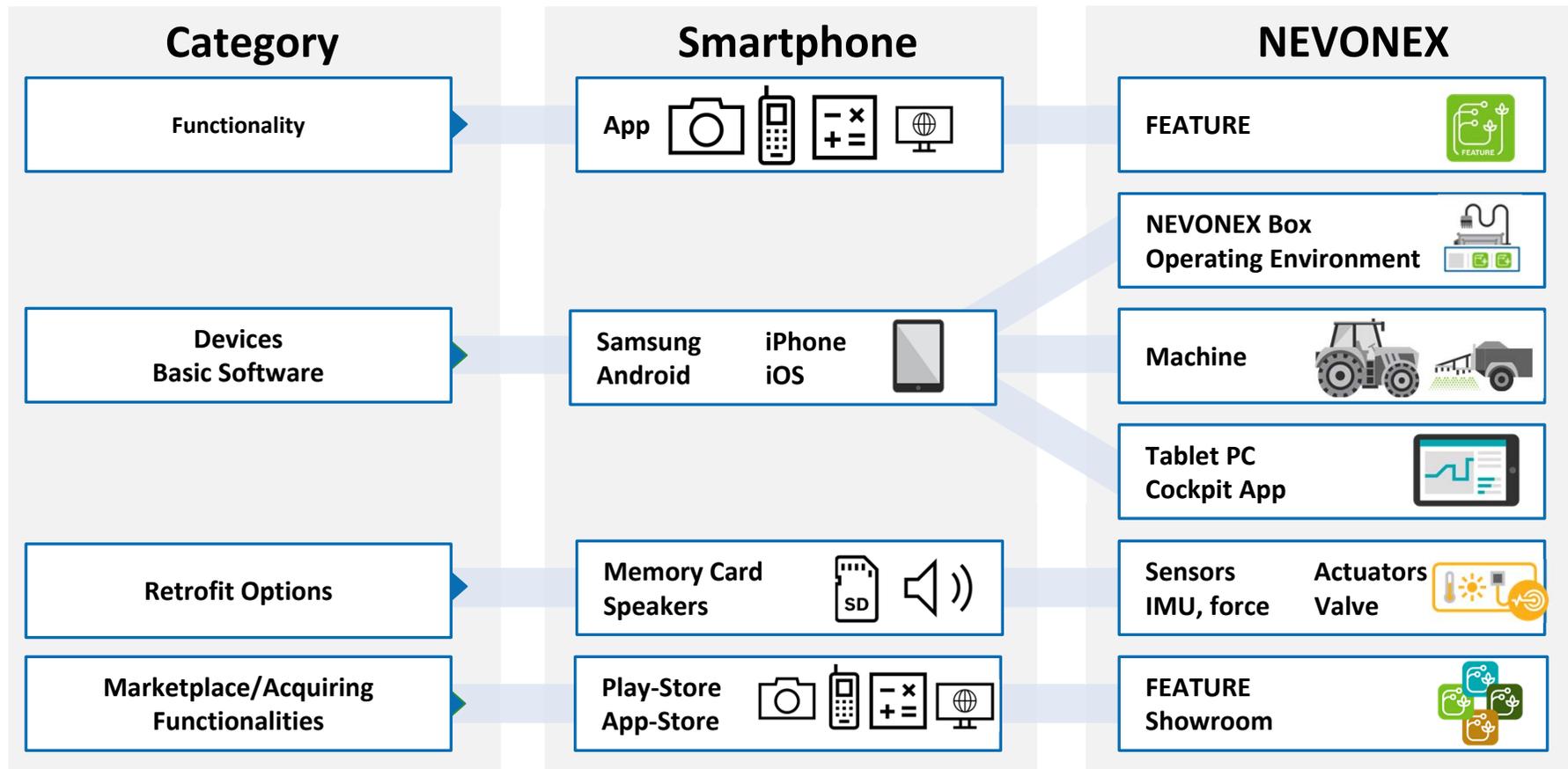
NEVONEX explained



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NEVONEX explained

– compared to the Universe of Smartphones

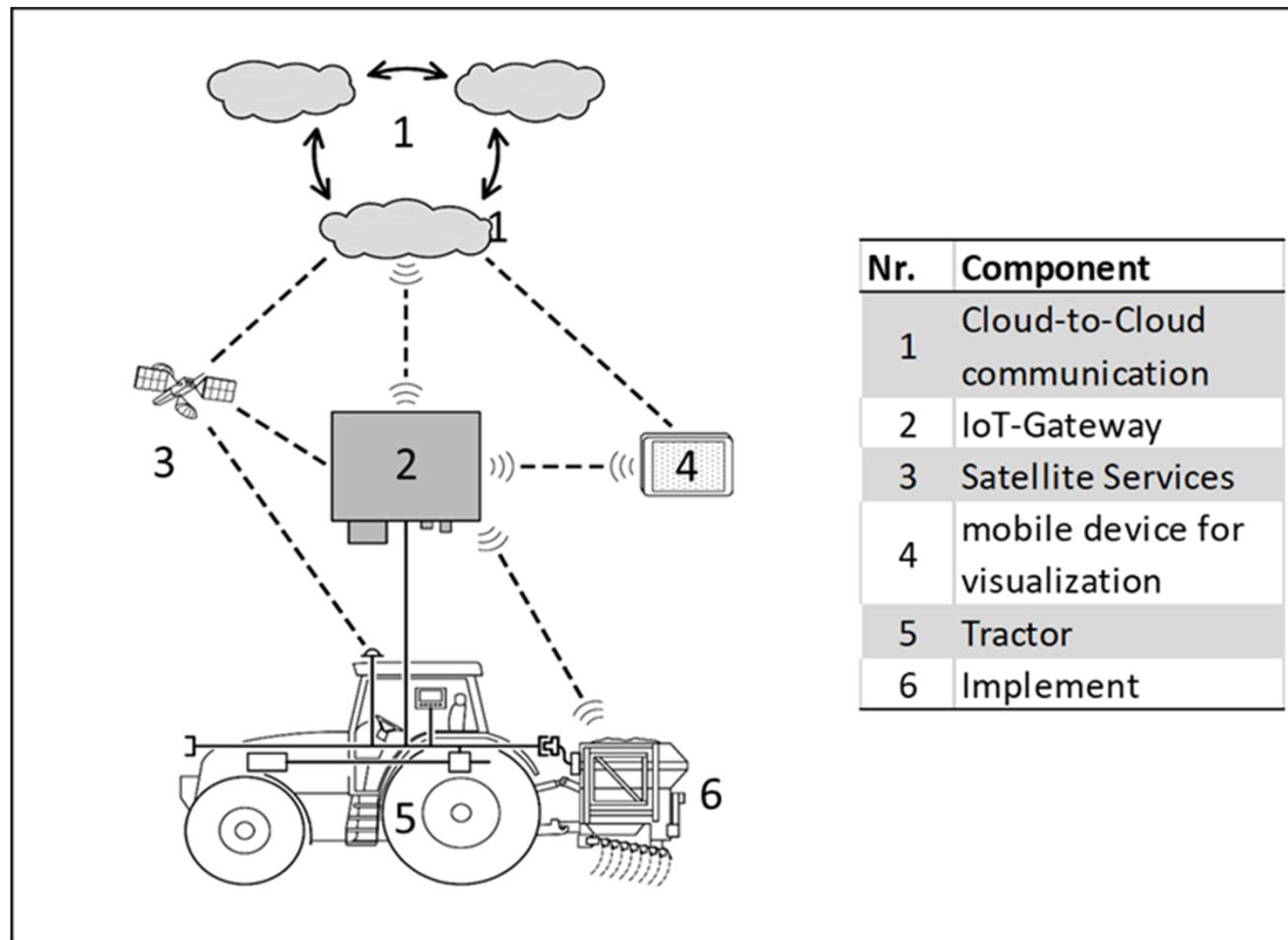


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What's the difference between NEVONEX and ...?

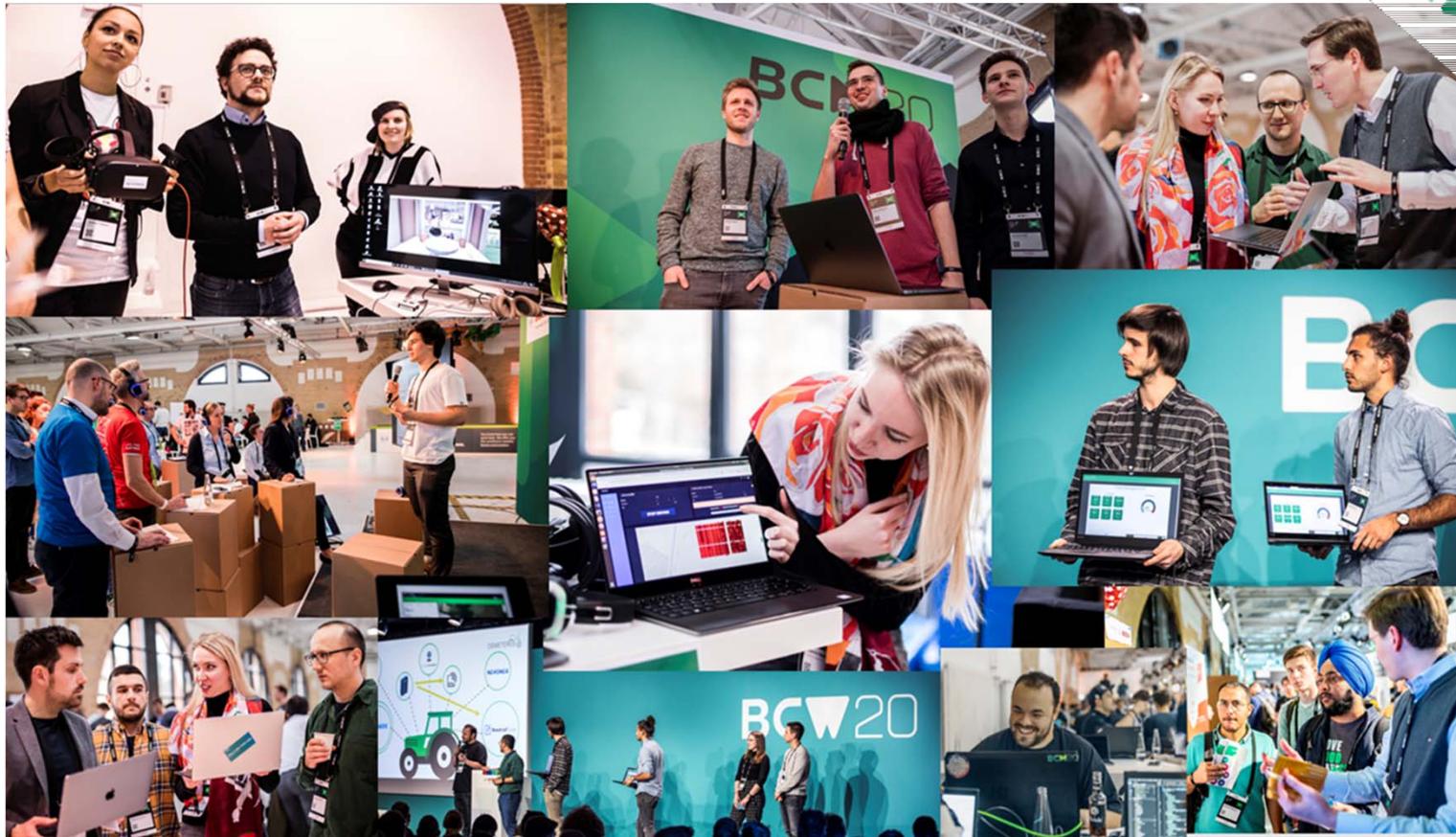


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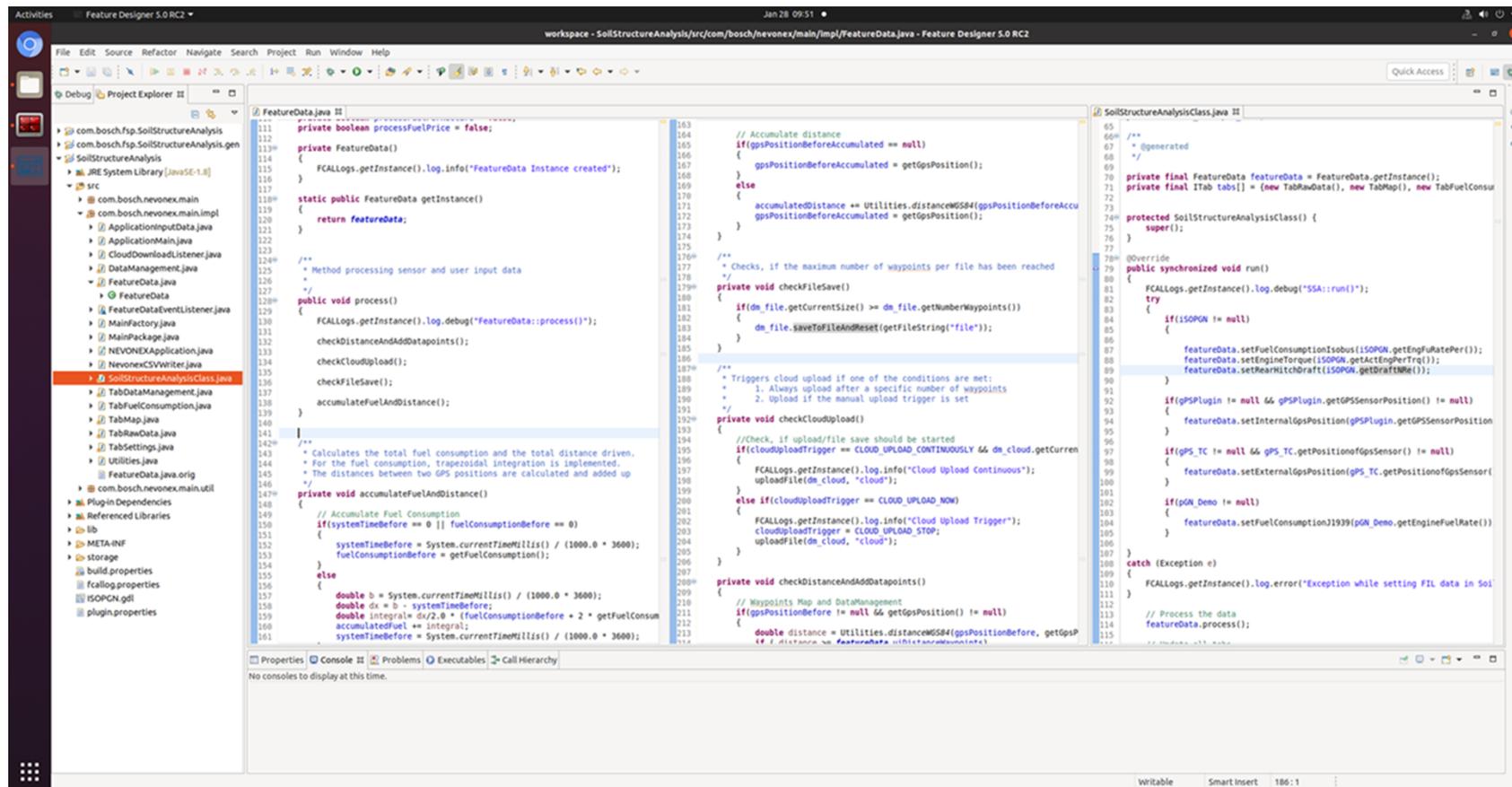
Erfahrungsbericht

FEATURE Entwicklung und erste Feldtests

BCX20 – Europe's biggest IoT Hackathon



Demo-FEATURE Development

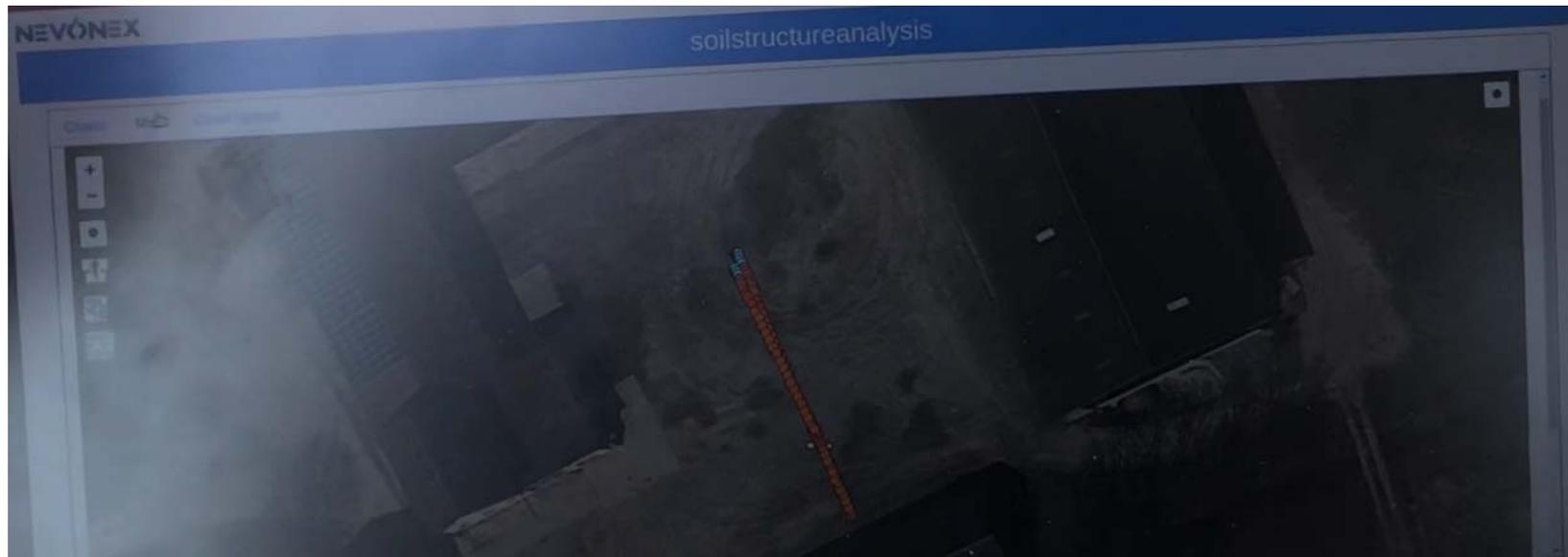


```

111 private boolean processFuelPrice = false;
112
113 private FeatureData()
114 {
115     FCALLogs.getInstance().log.info("FeatureData Instance created");
116 }
117
118 static public FeatureData getInstance()
119 {
120     return featureData;
121 }
122
123 /**
124  * Method processing sensor and user input data
125  */
126 public void process()
127 {
128     FCALLogs.getInstance().log.debug("FeatureData:process()");
129     checkDistanceAndAddDatapoints();
130     checkCloudUpload();
131     checkFileSave();
132     accumulateFuelAndDistance();
133 }
134
135 /**
136  * Calculates the total fuel consumption and the total distance driven.
137  * For the fuel consumption, trapezoidal integration is implemented.
138  * The distances between two GPS positions are calculated and added up
139  */
140 private void accumulateFuelAndDistance()
141 {
142     // Accumulate Fuel Consumption
143     if(systemTimeBefore == 0 || fuelConsumptionBefore == 0)
144     {
145         systemTimeBefore = System.currentTimeMillis() / (1000.0 * 3600);
146         fuelConsumptionBefore = getFuelConsumption();
147     }
148     else
149     {
150         double b = System.currentTimeMillis() / (1000.0 * 3600);
151         double dx = b - systemTimeBefore;
152         double integrals = dx/2.0 * (fuelConsumptionBefore + 2 * getFuelConsumption() + fuelConsumptionBefore);
153         systemTimeBefore = System.currentTimeMillis() / (1000.0 * 3600);
154     }
155 }
156
157 // Accumulate distance
158 if(gpsPositionBeforeAccumulated == null)
159 {
160     gpsPositionBeforeAccumulated = getGpsPosition();
161 }
162 else
163 {
164     accumulatedDistance += Utilities.distanceWGS84(gpsPositionBeforeAccumulated, getGpsPosition());
165     gpsPositionBeforeAccumulated = getGpsPosition();
166 }
167
168 /**
169  * Checks, if the maximum number of waypoints per file has been reached
170  */
171 private void checkFileSave()
172 {
173     if(dm_file.getCurrentSize() >= dm_file.getNumberWaypoints())
174     {
175         dm_file.saveToFileAndReset(getFileString("file"));
176     }
177 }
178
179 /**
180  * Triggers cloud upload if one of the conditions are met:
181  * 1. Always upload after a specific number of waypoints
182  * 2. Upload if the manual upload trigger is set
183  */
184 private void checkCloudUpload()
185 {
186     //Check, if upload/file save should be started
187     if(cloudUploadTrigger == CLOUD_UPLOAD_CONTINUOUSLY && dm_cloud.getCurrentSize() > 0)
188     {
189         FCALLogs.getInstance().log.info("Cloud Upload Continuous");
190         uploadFile(dm_cloud, "cloud");
191     }
192     else if(cloudUploadTrigger == CLOUD_UPLOAD_NOW)
193     {
194         FCALLogs.getInstance().log.info("Cloud Upload Trigger");
195         cloudUploadTrigger = CLOUD_UPLOAD_STOP;
196         uploadFile(dm_cloud, "cloud");
197     }
198 }
199
200 private void checkDistanceAndAddDatapoints()
201 {
202     // Waypoints Map and DataManagement
203     if(gpsPositionBefore != null && getGpsPosition() != null)
204     {
205         double distance = Utilities.distanceWGS84(gpsPositionBefore, getGpsPosition());
206         if (distance > 0)
207         {
208             featureData.addWaypoint(distance, gpsPositionBefore, getGpsPosition());
209         }
210     }
211 }
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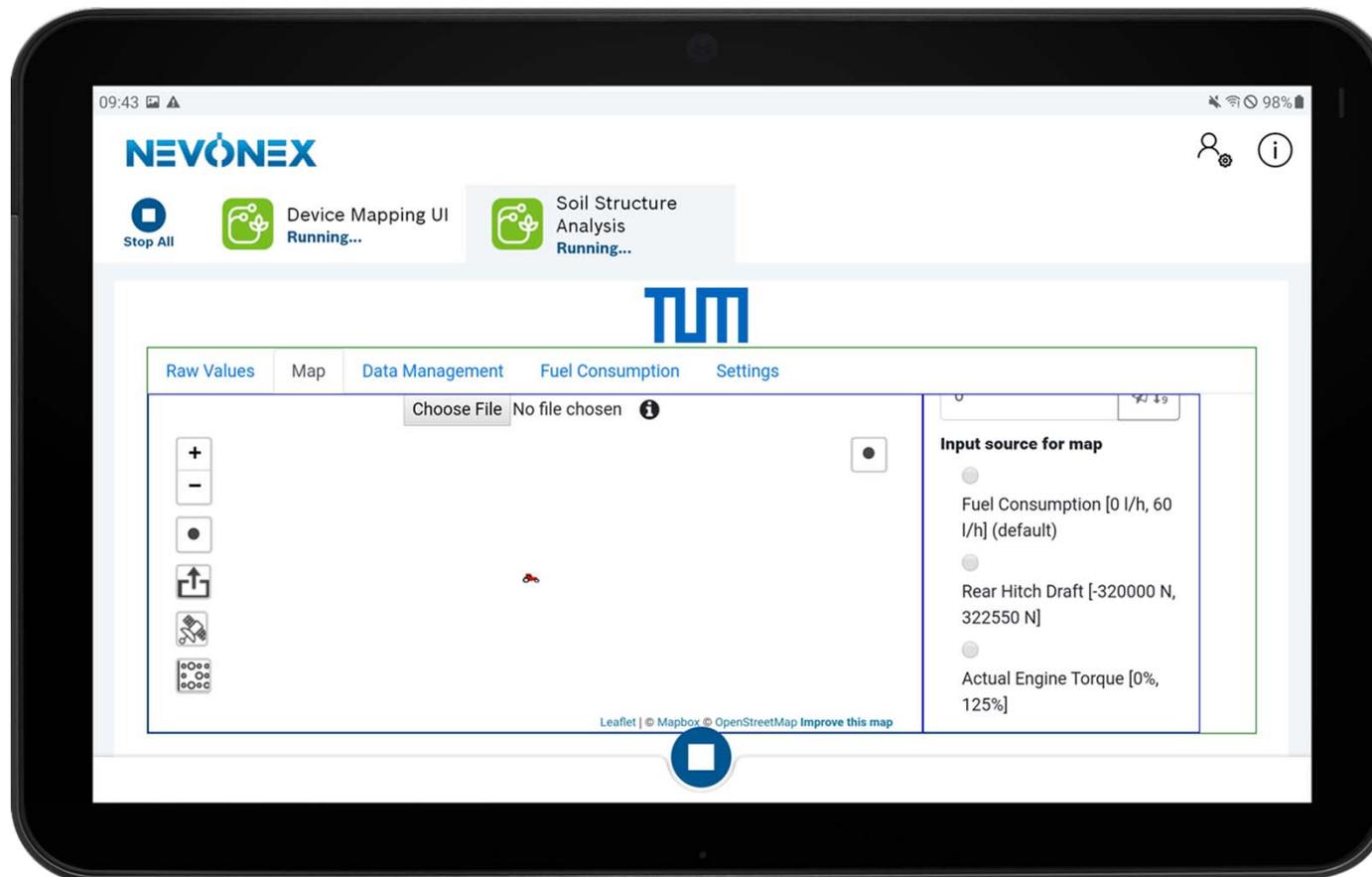
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Demo-FEATURE Deployment

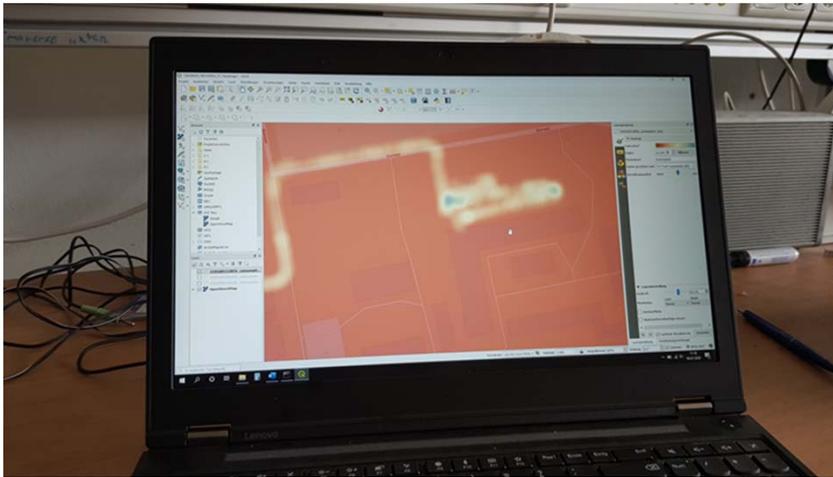


Demo-FEATURE Impressions from the tractor cabin

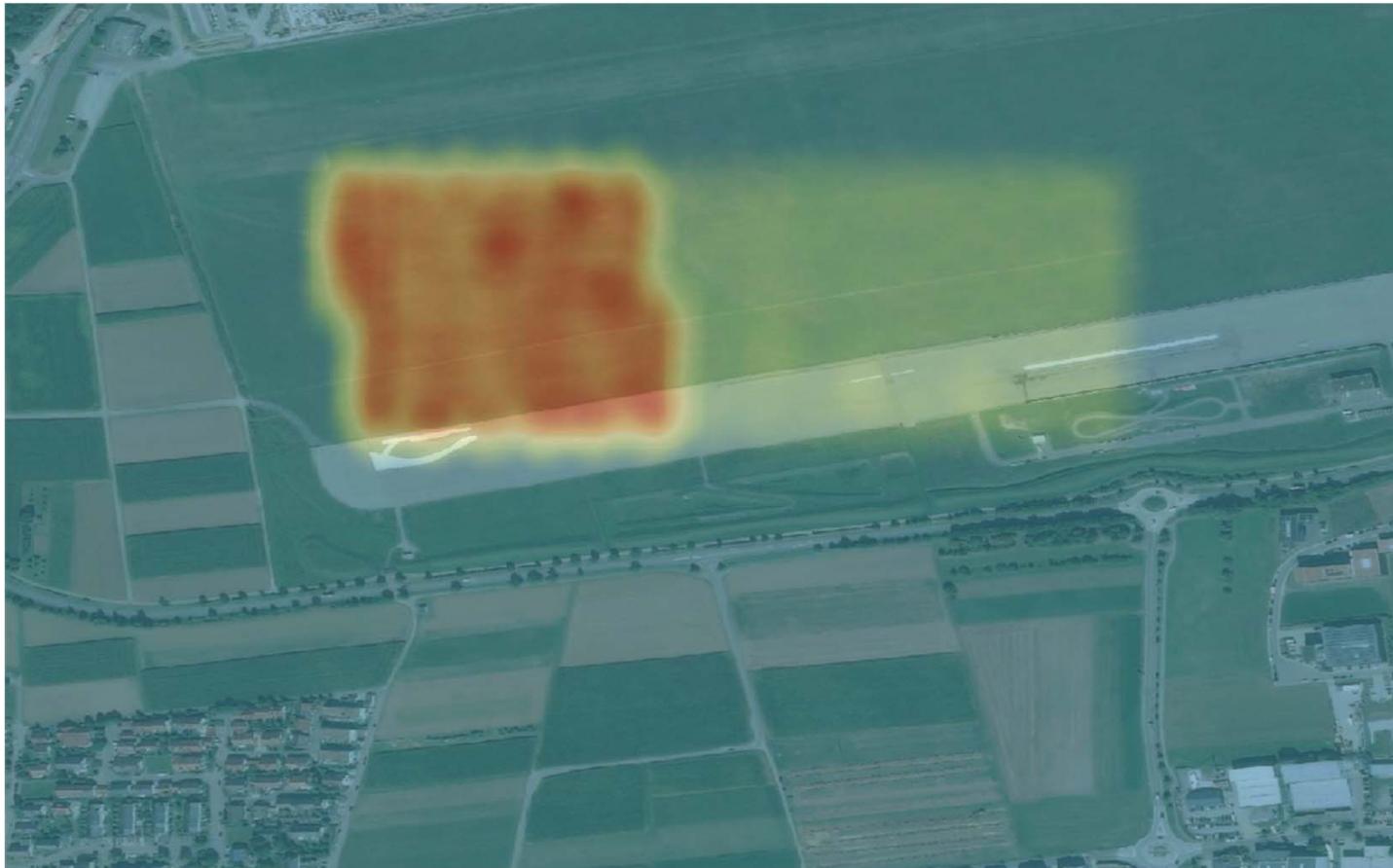




Demo-FEATURE First Field Test results



Demo-FEATURE full dataset



Take-Home Messages

Take-Home Messages

- NEVONEX ist ein IoT Framework für Landmaschinen im Kontext des IoT
- NEVONEX verbessert herstellerübergreifend **Interoperabilität, Kompatibilität** und **Konnektivität** von Traktoren, Anbaugeräten, Sensoren/Aktoren und Cloud-Systemen
- Zum Anwender kommt es in Form der **NEVONEX Box, Tablet mit Cockpit-App** und den gewählten **FEATURES** (vgl. Apps beim Smartphone)
- Im Kern ist NEVONEX eine **Sammlung von Schnittstellen** -> diese werden Entwicklern in **generischer** Form zur Verfügung gestellt
- Dadurch **Beschleunigt** NEVONEX den **Entwicklungsprozess digitaler Dienste** für Landmaschinen von der ersten agronomischen Idee bis hin zu ausführbarer Software auf der Maschine