IMAGINE IOT
PROTOTYPE CHALLENGE

A WHOLE LOT OF POTHOLES
Potholes and deteriorating road conditions are a constant nuisance and safety hazard for road users in our town. The roads have to be monitored continuously and repairs have to be planned and carried out in a timely manner.

However, the maintenance budget of the city administration is very limited and resources are scarce. The acquisition of road condition data is done by people regularly driving along the roads and manually collecting the information. Based on this data maintenance schedules are developed manually.

The result is that repairs are often carried out later than the road user would wish and often only when the damages are big enough to warrant a complete road renewal.

A constant and automatic acquisition of road condition data would help the road maintenance manager to plan the maintenance more efficiently. In that way repairs can be carried quicker and more targeted so that safety hazards are avoided and road users are more satisfied.
Persona and Point of View

Christoph
The Road Maintenance Manager

“I like to care for the roads of my hometown so that the people living here are happy when driving on them.”

About
- 50, married, 12 years road maintenance experience.
- The person planning road maintenance and deciding which road is repaired when, what is repaired how and all within a very limited budget and aligned with political decisions
- Interested in the latest technology
- I work with the Head of the Building Department and the Chief Financial Officer

Responsibilities
- I am responsible the roads and walkways of my town.
- I am responsible for multiple projects at any given time and the locations are spread over the whole area of my town
- I spend a lot of time in my office planning maintenance on my computer, but I also go out to assess damages and overview repairs personally.
- I get a fixed maintenance budget per year and I am responsible for keeping it.

Needs
- I need to constantly know the conditions of all roads of my town
- I need to plan the maintenance cost- and resource-efficient

Main Goals
- Staying within the road maintenance budget plan
- Carrying out repairs as quick as possible to keep the road users happy
- Using the limited maintenance resources (workers, vehicles) efficiently

Pain Points
- Road conditions can only be assessed by regular monitor runs using people and vehicle resources
- Damages can appear quickly – especially during winter – without me becoming aware of it
- Maintenance schedule plans are disrupted by new damages

As a road maintenance manager I need a way to constantly be aware of the road conditions in my town so that I can plan targeted and efficient maintenance.

POINT OF VIEW
<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>The yearly road management budget is defined</th>
<th>The road conditions are monitored. Road maintenance staff in road maintenance vehicles are driving each road in a specified order.</th>
<th>The road maintenance is planned</th>
<th>Repairs are carried out</th>
<th>New damages appear</th>
<th>Emergency repairs are carried out</th>
</tr>
</thead>
<tbody>
<tr>
<td>MINDSET</td>
<td>How can I keep the roads in order with so little money?</td>
<td>When can I assess the complete situation? The data collection is taking ages!</td>
<td>Where are the biggest damages? Where are safety hazards? Should I patch a hole or renew the whole road? How can I do all this within my budget?</td>
<td>Is the work on time and on budget?</td>
<td>Are there damages that I don’t know about?</td>
<td>These unscheduled repairs are affecting my budget! I have no staff to do the repairs right now!</td>
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<tr>
<td>FEELING</td>
<td>😊</td>
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<tr>
<td>TOUCH POINTS</td>
<td>Yearly budget plan</td>
<td>Road maintenance vehicles</td>
<td>Road maintenance plan</td>
<td>Road maintenance staff</td>
<td>Roads</td>
<td>Road maintenance staff</td>
</tr>
</tbody>
</table>
Prototype

IoT Setup
All municipal vehicles are fitted with shock sensors that monitor and store the location and intensity of shocks. Vehicles can include garbage trucks, road cleaning vehicles, vehicles of the different municipal institutions, private vehicles of the municipal staff (on a voluntary basis). Vehicles of citizens can also be fitted on a voluntary basis offering their owners an incentive, such as free parking in the town center. It has to be made sure that data from private vehicle sensors is gathered anonymously and without a connection to the individual vehicle owner.

The sensors of the municipal vehicles send their data to collection devices as soon as they get back to their garages. Such collection devices are also placed in locations in the town center to read the data of the sensors in private vehicles. Only data from locations within the town borders are used.

The data is stored in a central data base and used for the Road Maintenance Manager Application. Here it is enriched with information such as the planned repair costs and time per pothole and the available budget.
Prototype Screens

From the **Planning** screen the user can view and select the damages. For the selected potholes the planned repair time and costs are displayed. From the selected list the user can create a work order or save the list for later use.

During the **Work Order Creation** the user can select a date on which repair teams are available and assign the work order to one of them.
On the Dashboard screen several analytic components can be displayed. These can be influenced by filters.

From this the user can evaluate several KPI, such as the status of the budget and the repair efficiency.