NXTGEN Hightech
Agrifood 19: Ecosystem

Evaluation Report Test Validation Demonstration

Project title

Validating Hortivationpoint

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Details of the challenge owner

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Details of other involved parties

Organization	Name	Role in execution
InnovationQuarter	Liesbeth Leurs	Coordinating organization*
Hortivation	Harmen van Dam	Challenge owner*
Tomatoworld	Jan van Enthoven	Independent expert * & execution location
Robotleveranciers	Octiva	Data supplier
TNO	Hans 't Hart	Co-executor of the project
Robocrops	Colinda de Beer	Knowledge dissemination
Sensorleveranciers	30Mhz	Data supplier

Public summary of the evaluation report

Below is the project setup as described in the project plan. On the following two pages, the application in Tomatoworld is visually presented.

Test and validation

2024WP3_Hortiv_001
Status: Planning phase

Business case
Minimum viable product analysis
BC-3

Problem owner:
Hortivation
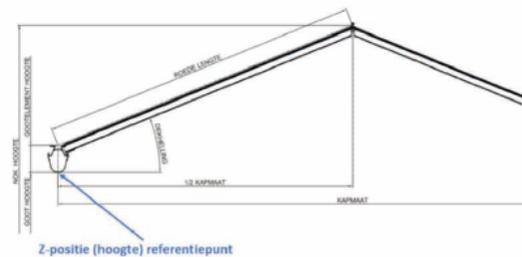
Involved:
Tomatoworld
TNO
Octiva
30MHZ
Robocrops / InnovationQuarter

Greenhouse Horticulture

Validation of Hortivationpoint

The essential step in improving interoperability and automation in greenhouses through the validation of a standardized reference point for positioning.

Broad knowledge question
How can a standardized reference point in greenhouses (the Hortivationpoint) help improve the positioning and coordination of autonomous systems in greenhouses? This addresses the system failure of lacking a universal standard for positioning (x, y, and z coordinates) within greenhouses and the transformation failure of unified positioning methods.

Approach
An MVP analysis will be conducted. Step 1 is defining an MVP for the Hortivationpoint and obtaining geometric data from Tomatoworld in line with ISSO88, followed by implementing the Hortivationpoint and linking objects to this reference point.

Objective
To validate the applicability of the Hortivationpoint through an MVP at Tomatoworld. This will be achieved by determining the Hortivationpoint at Tomatoworld and linking objects (from NXTGEN partners) there. The project focuses on the practical feasibility of this standardized reference point in greenhouses.

Results and reflection
The expected outcome of this project plan is a minimum viable product and its analysis. If approved (positive evaluation), this will form the basis for the next phase, in which a technical validation will be carried out. The parties involved in this project plan have committed to participating in the next phase.

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Below, the position of the Hortivationpoint is shown as the center of zones 4 and 5. On the left-hand side, the values are displayed on which this visualization is based.

KIS complexe kassen

Focus area: 5 Tomatoworld
Focus area in graph red: Off
Markers: On
Offset nulpunt x,y = 0 0
Plattegrond omkeren: No — ...te: Deze functie werkt in Excel alleen voor de Rotate gutter = 0
Mirror gutter direction: No   HP Horivation Point

order	Name	Building area — In Plattegrond	Building area — Layer Building Area	HP	Rotate	Geometry & Construction in (m) — Use Input	Width	Height	Bay position — Start	count	Gutter in (m) — Start	Length	Offset in (m) — X	Y	Surface building area — per order	Cumulative	HP Offset X — X	Y
1	Area 1	1	1	0	0	0	12.8	7	1	1	0.00	93.91	0	0	1202	1201.997		
2	Area 2	1	1	0	0	0	12.8	7	2	1	0.00	102.44	0	0	1311.2	2513.203		
3	Area 3	1	1	0	0	0	12.8	7	3	4	0.00	93.91	0	0	4808	7321.19		
4	Expo	1	1	1	0	0	12.8	7	3	1	93.91	38.39	0	0	491.44	7812.634	51.20	113.10
5	Tomatoworld	1	1	1	0	0	12.8	7	4	3	93.91	38.39	0	0	1474.3	9286.963	51.20	113.10
6	Kantoor	1	0	0	0	0	20	7	1	1	82.48	11.43	-13.4	0	228.6	9286.963		
7		0	0	0	0	0	0	0	0	0	0.00	0.00	0	0				
8		0	0	0	0	0	0	0	0	0	0.00	0.00	0	0				
9		0	0	0	0	0	0	0	0	0	0.00	0.00	0	0				
10		0	0	0	0	0	0	0	0	0	0.00	0.00	0	0				

Positie Markers	Size Markers	Size HP
Sliders		
0.36	0.92	1.26

KIS Surface area complexe kassen
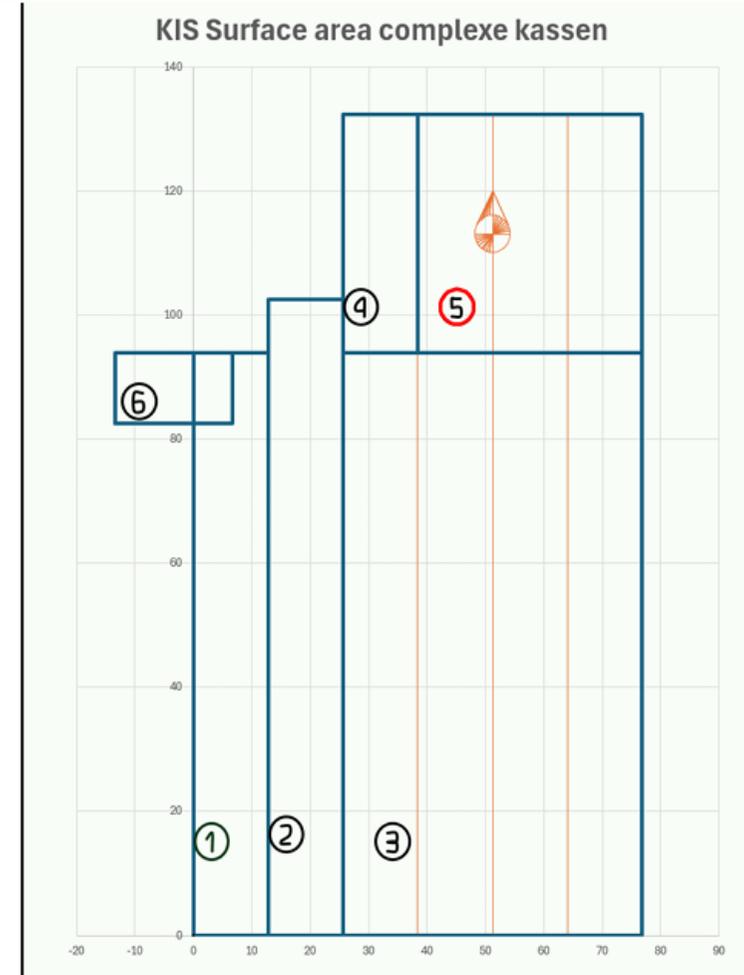
The image below shows a 3D representation of Tomatoworld, zones 4 and 5, with the Hortivationpoint located in the center.
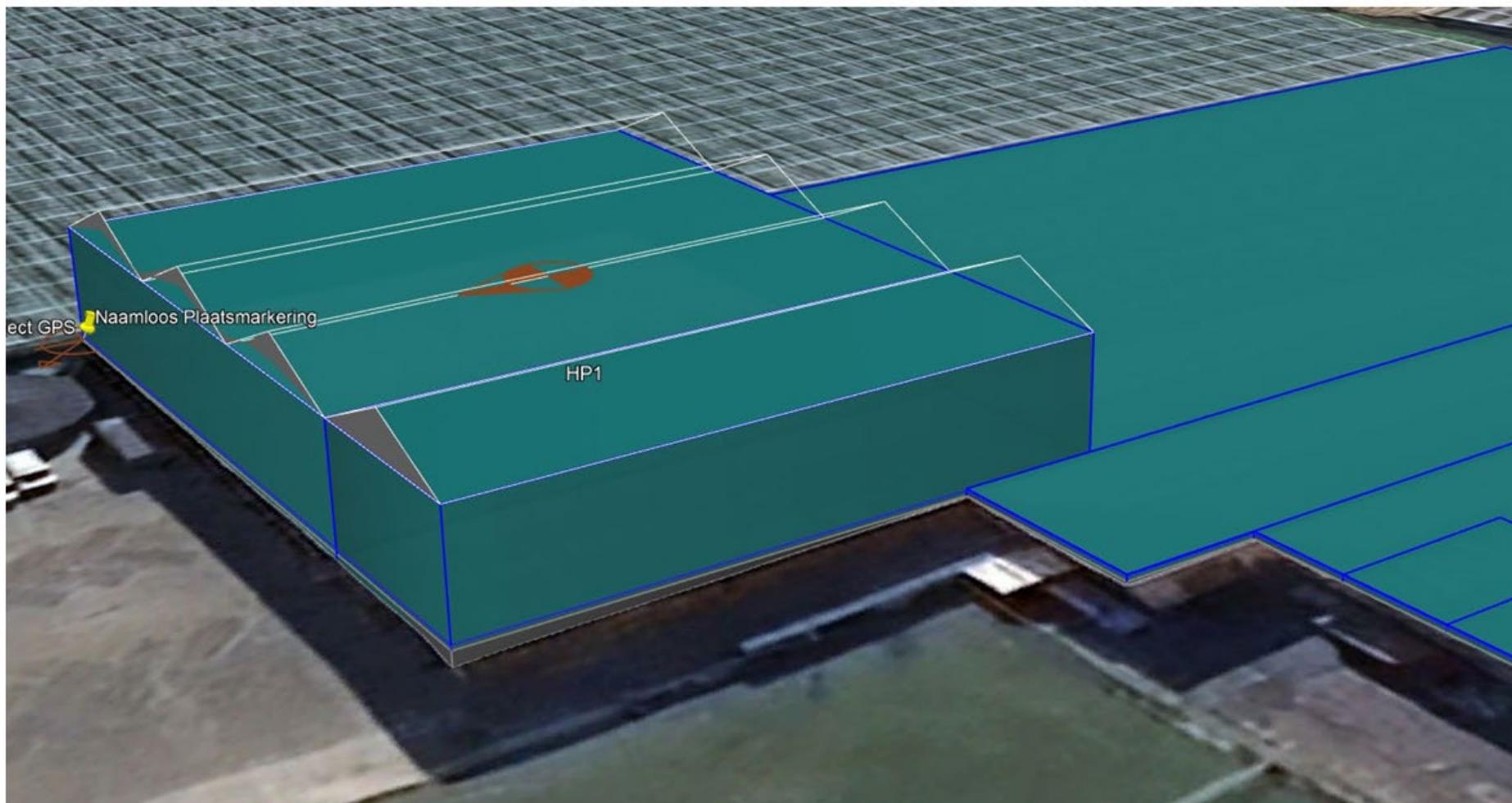
After determining the Hortivationpoint, sensors were localized. Below, the location of the sensors is shown on the floor plan of Tomatoworld.
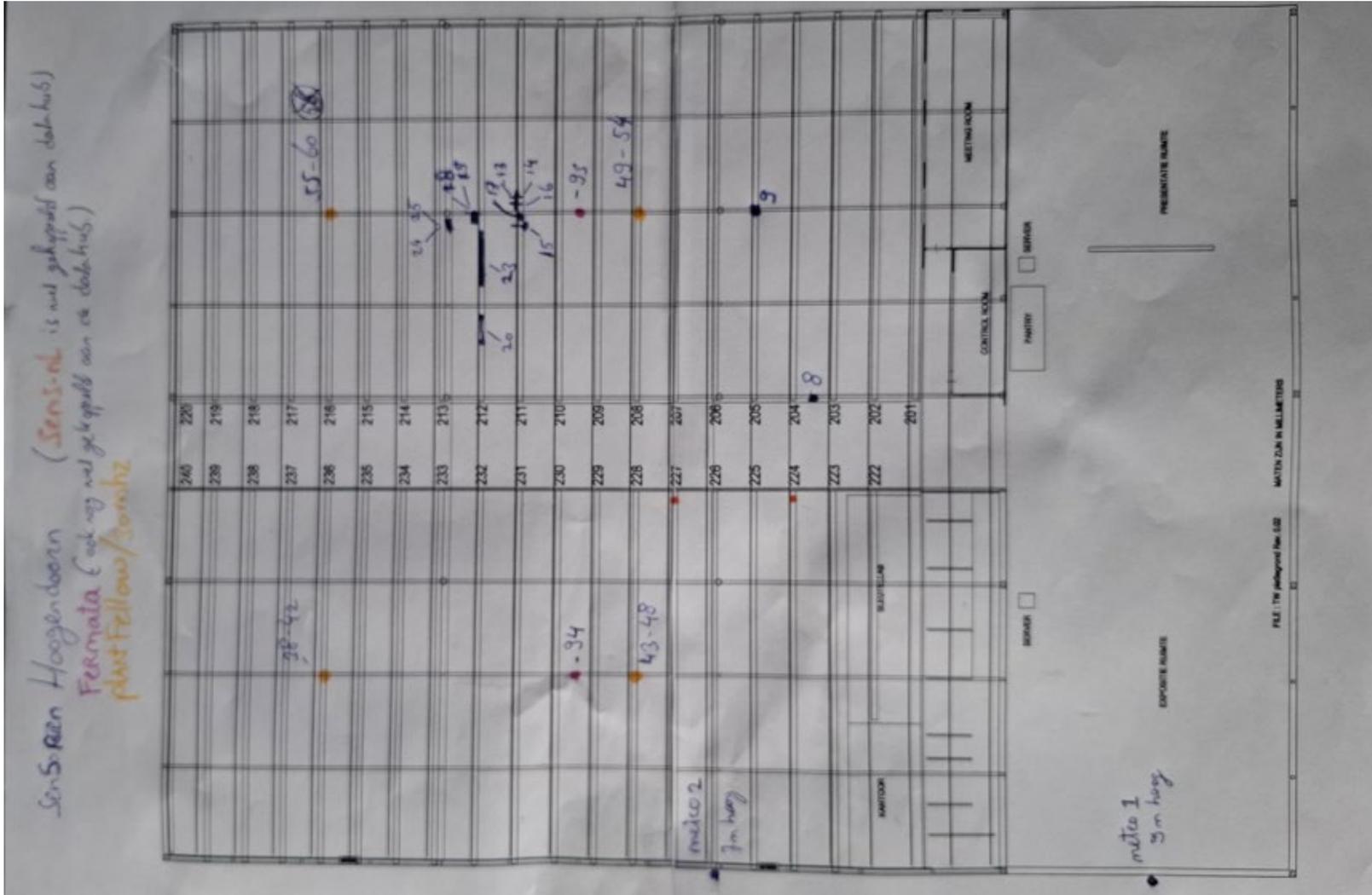
Broad knowledge question

For parties that build and equip greenhouses, it is important to determine the exact location of elements within the greenhouse. This also applies to automated systems that must function autonomously in greenhouses or cooperate with each other, such as internal transport systems, spraying equipment, harvesting systems and scouting equipment. In practice, measuring GPS coordinates inside a greenhouse is not always reliable. Moreover, different positioning methodologies are used worldwide and even within countries, resulting in varying outcomes. This complicates automation of processes and data flows. The broad knowledge question in this project is:

How can a standardized reference point in greenhouses, the Hortivationpoint, help improve positioning and cooperation of autonomous systems in greenhouses?
The project addresses:
1. System failure: The absence of a universal standard for positioning, expressed in x, y and z coordinates, within greenhouses. This lack leads to inconsistencies and inefficiencies when using autonomous technologies such as internal transport systems and harvesting robots.
2. Transformation failure: The difficulty of enabling existing technologies within the sector to work together seamlessly, mainly due to diverse positioning methodologies used globally and locally. The project aims to address this by validating a new standard and developing technical applications that enable broader adoption and collaboration within the sector.

Validating the Hortivationpoint is a crucial step in addressing these failures and improving automation and data exchange within the horticultural sector.

Introduction

The Hortivationpoint is a virtual reference point with a coordinate system inside the greenhouse, developed by Hortivation for positioning objects in the greenhouse. This reference point enables objects such as robots and sensors to determine their location and relate it to one another. This represents an essential step in improving interoperability and automation within greenhouses.

Testing and validation of the application of the Hortivationpoint takes place in the following steps. Step 1 is within the scope of this executed test and validation project and is the subject of this final report.
*   Step 1: Developing an MVP by determining the Hortivationpoint in Tomatoworld and relating objects in Tomatoworld to this Hortivationpoint.
*   Step 2: Recording the positioning in the Robocrops data hub so that object locations in Tomatoworld become available to all data users. Functionality will be added to the Robocrops data hub within the AF UC19 project.
A go or no go decision moment takes place between the steps. After completion of Step 2, the results will be available to all NXTGEN partners via the Robocrops data hub.

This project focuses specifically on implementation and test validation in Tomatoworld, with the aim of developing and evaluating a Minimum Viable Product. This tests the applicability of the standard, which is crucial for broader sector adoption.

Project description

Hortivationpoint

Greenhouse builders, installers and suppliers of equipment and data services benefit from a standardized reference point for automatic positioning in greenhouses. This also applies to growers using the greenhouses. Hortivation and TNO developed the Hortivationpoint for this purpose. This standardized center point of a greenhouse or greenhouse section simplifies determining the exact position of each object and enables equipment to function and cooperate effectively. The new standard is described in detail in the document Standardization of positioning in the greenhouse, which has been added as an amendment to the ISSO 88 publication.

Project objective

To validate the applicability of the Hortivationpoint by means of an MVP at Tomatoworld. This involves determining the Hortivationpoint for Tomatoworld and relating objects from NXTGEN partners to it. The project focuses on practical feasibility, cooperation between technologies and broader applicability within the sector.

Activities

This project covers only Step 1, namely realizing an MVP of the Hortivationpoint applied at Tomatoworld. This responds to the system failure of lacking a universal positioning standard. The objective is to assess feasibility and lay the foundation for addressing the transformation failure of seamless technology integration.

Approach elements:
- Defining an MVP for the Hortivationpoint.
- Obtaining geometric data of Tomatoworld in line with ISSO 88.
- Implementing the Hortivationpoint.
- Linking objects to this reference point.
-

Activities carried out:
- Requesting CASTA files from the greenhouse builder of Tomatoworld for geometric and construction data.
- Consulting with object suppliers in Tomatoworld, including 30MHz and Tomatoworld regarding Sense-NL, Fermata and Hoogendoorn sensors, to understand current positioning methods and link them to the Hortivationpoint.
- Determining the Hortivationpoint and linking objects to it.

Materials and methodology

Method

The methodology applied was based on a Minimum Viable Product analysis according to the NXTGEN test and validation menu BC-3. A basic version of the Hortivationpoint in accordance with ISSO 88 was developed, implemented in Tomatoworld and tested to validate key functionalities and iteratively improve based on user insights.

The Hortivationpoint is already formally standardized in ISSO 88. This project tested practical application by translating the standard into technical solutions present in Tomatoworld.

Quality assurance was ensured through cooperation with an independent expert at Tomatoworld, close alignment with TNO and evaluation of methodology and results by involved partners.

Results

Realization

The result is an MVP enabling technical validation in the next phase.
- CASTA files were requested but unavailable due to bankruptcy of the greenhouse builder. Geometric data were retrieved via permits from the Municipality of Westland.
- Consultation with suppliers showed that 30MHz Plantfellow sensors are already linked to the NXTGEN data hub. Location determination of other sensors remains unclear.
- The Hortivationpoint was successfully determined and objects were linked. Sensors manually plotted on the floor plan can now be linked to the Hortivationpoint and displayed accordingly. Actual combination of data occurs in Step 2.

Interpretation

Key findings
- CASTA calculations are not always available.
- Municipal permit databases can provide layout information.
- Growers often know sensor locations better than suppliers.
- Grower cooperation is essential.

Conclusions and future perspective

There are opportunities for standardization and innovation, as suppliers are not yet accustomed to sending data to a central system.

Next steps
- Step 2 Technical validation by combining robot and sensor data in one data environment.
- Step 3 Link with KIS to digitally unlock layout data and in future visualize sensor data on the floor plan.

Further research questions
- Do sensors or robots return location data via API.
- What units do they use.
- Is changing sensor location problematic.

Disseminatie

- Er is een demonstratie gegeven in Tomatoworld van het MVP Hortivationpoint op 15 oktober 2025.
  Zie https://nxtgenhightech.nl/agrifood/nieuws/recap-demodag-data-infrastructuur-glastuinbouw-okt25/
  Zie https://www.linkedin.com/posts/hortivation_hoe-zorg-je-dat-systemen-in-de-glastuinbouw-activity-7381277770233827328-hg_-?utm_source=share&utm_medium=member_desktop&rcm=ACoAAAF05HcBuIEgQD7xlmdF-8zpMKDMB060y50
- Door Hortivation worden de bevindingen van dit project gedeeld met de achterban via opname in de nieuwsbrief en presentaties op AVAG- en Hortivation-bijeenkomsten.

Reflection

Aspect	Reflection: what worked well, what could be improved
Received support	Many parties were required. Cooperation was good. A key success factor is ensuring someone drives follow-up steps to prevent delays.
Location facilities	The facilities at Tomatoworld were suitable.