



PRESENTATION OVERVIEW



1. Welcome, introduction
2. Understanding the industry's needs
3. Technical Solution: the INTERLINK Approach
4. Discussion
5. Testing the approach in three test cases
6. Vision and take away points
7. Q&A

1. CEDR-INTERLINK PROJECT

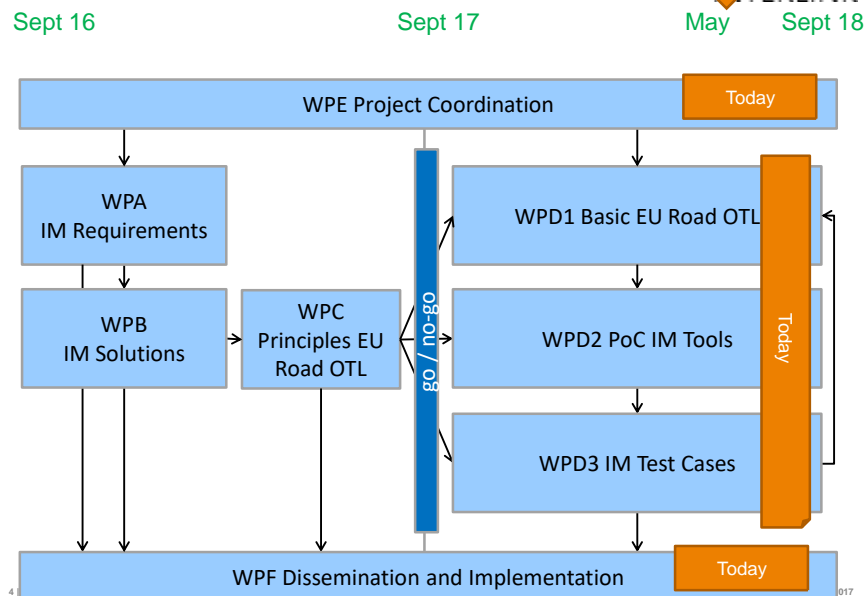


- › CEDR – Conference of European Directors of Roads
- › Objective: develop and apply way to define, link, manage infra asset info
 - › Focus on Roads
 - › Using W3C Linked Data approach
 - › Align with parallel standardisation initiatives
 - › Share best practice between NRAs
- › September 2016 – Autumn 2018
- › Deliverable: European Road Object Type Library (OTL)
- › To be tested in three test cases: Nordic countries, Germany, Netherlands

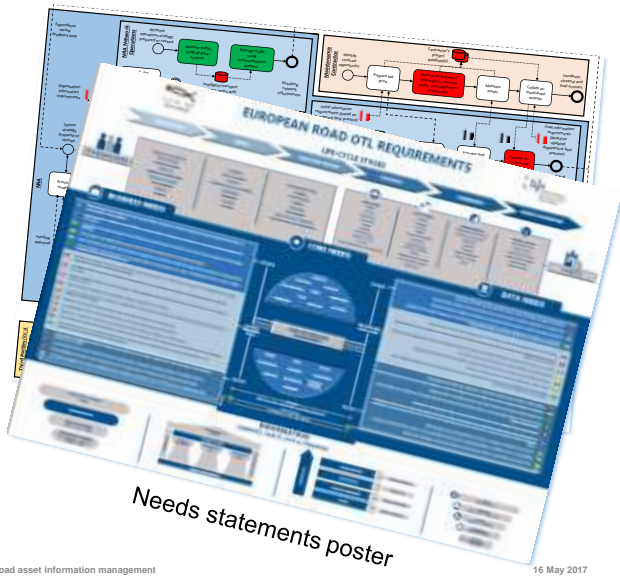
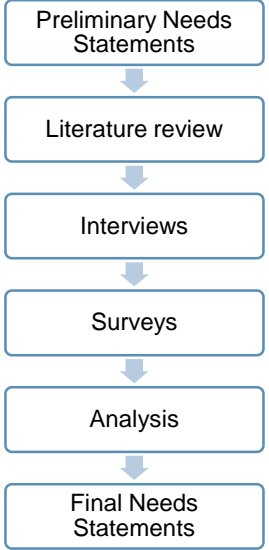
› www.roadotl.eu

TNO – ROD – RHDHV – AEC3 – Trimble – Semmtech – ii – p&b4.0

OVERVIEW CURRENT STATE



2. UNDERSTANDING THE INDUSTRY'S NEEDS



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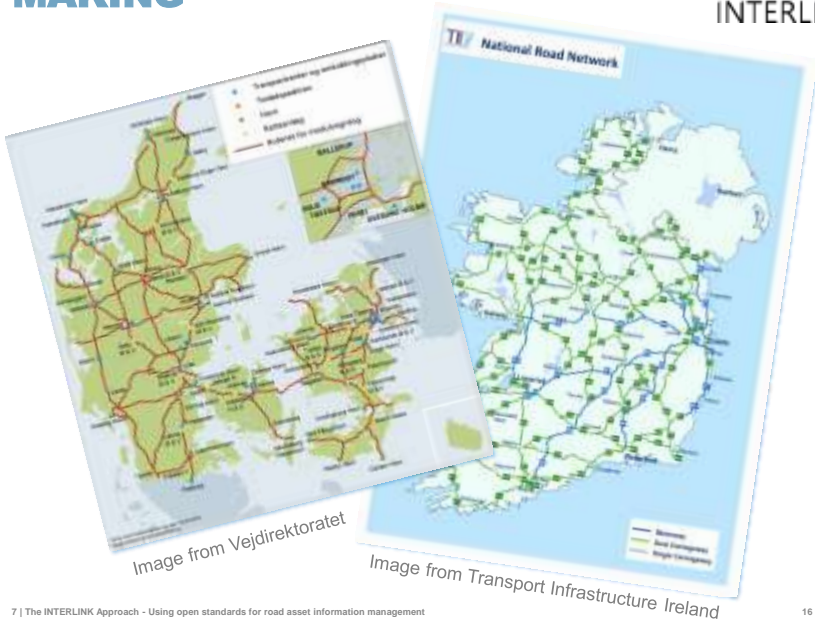
AS-IS: NETWORK OPERATIONS



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AS-IS: INVESTMENT DECISION MAKING



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AS-IS: CAPITAL WORKS PROJECTS



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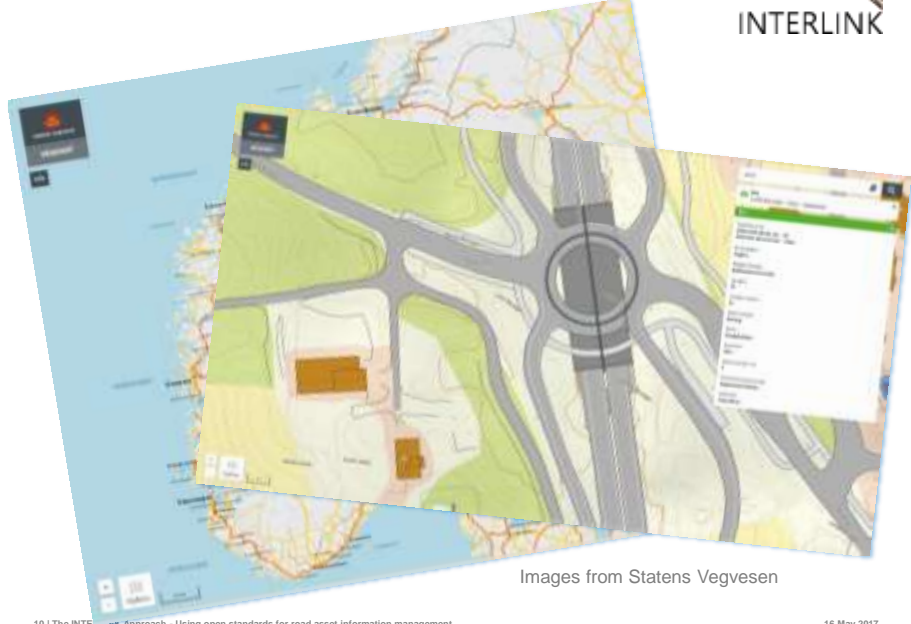
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AS-IS: HANDOVER



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AS-IS: ASSET MANAGEMENT



Images from Statens Vegvesen

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INDUSTRY'S NEEDS AND NEXT STEPS



- › **Needs statements, e.g.**
 - › Publish information requirements
 - › Gather information through life cycle using best available format
 - › Open standards
 - › Access info through GIS or BIM
- › **Information management functionality based on use cases**
- › **Recommendations to NRAs**
 - › Linked data & standardisation – active contribution, sharing, open
 - › Capital works and maintenance contracts – validate, certify, scale
 - › Project and asset managers – start small – top five
 - › Learn from each other – UK, DE, NL, NO, SE, FI
- › **Recommendations to Supply chain**
 - › Software companies – extension to LD/SW
 - › Engage with INTERLINK consortium

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3. TECHNICAL SOLUTION

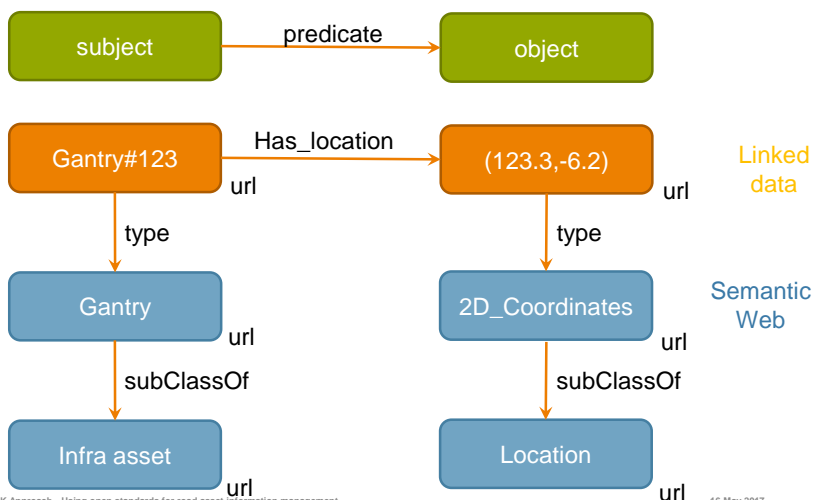


- › The basis of Linked data
- › The value of linked data
- › The European Road OTL
- › The INTERLINK approach
- › Practical example

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WHAT IS LINKED DATA?



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FROM ONE STAR TO FIVE STAR LINKED OPEN DATA: THE HYBRID APPROACH



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WHY LINKED DATA / SEMANTIC WEB?



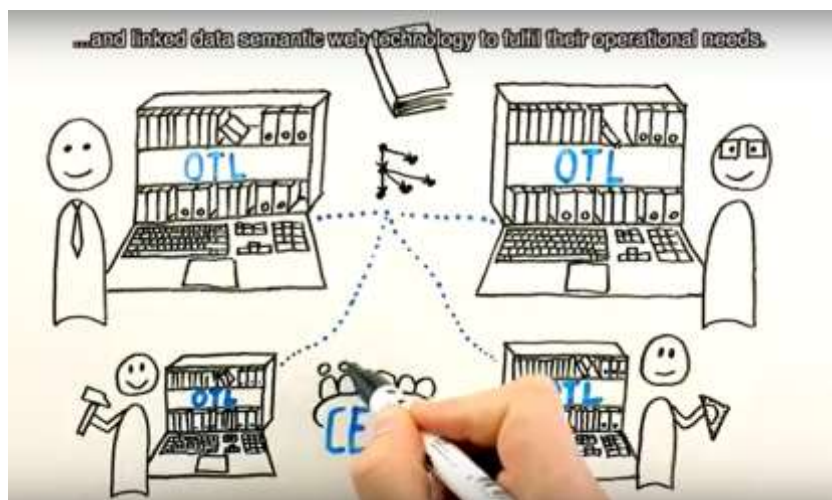
- › (Open) **Data**: data common denominator in life-cycle and over supply-chain; data liberated from applications
- › **Linked**: data from multiple sources connected
- › **Web**: based on common W3C technology
- › **Semantic**: adding meaning to data to make it computer interpretable

➔ **LD / SW is a powerful (the only?) technology that can help to meet the business needs**

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TNO innovation
for life



› [CEDR-INTERLINK video on the European Road OTL](#)

› <https://youtu.be/gczSTEyif5Y>

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EUROPEAN ROAD OTL (EUROTL)

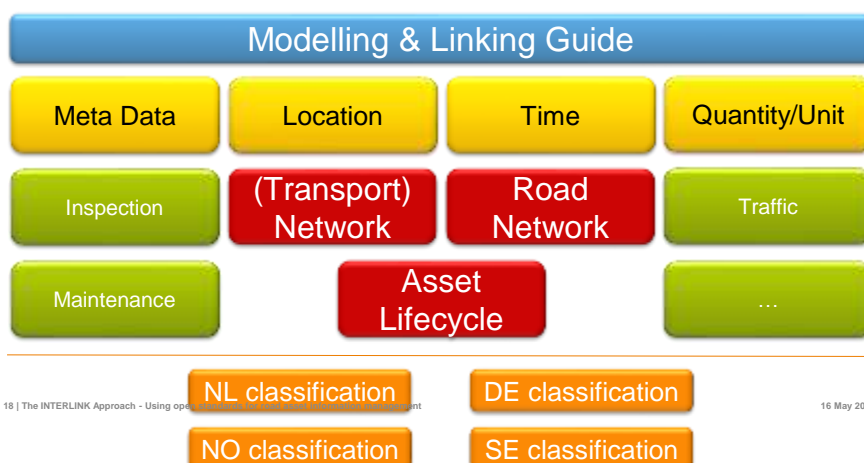


- › Framework of harmonised and linked existing OTLs on European level for Road Asset Management Data
- › The EUROTL is a set of recommendations for National Road Authorities
- › Tested in three test cases: Nordic, Germany, Netherlands
- › After the project, road authorities can:
 - › Gradually evolve from document- to data-driven, in a hybrid solution
 - › Make data sets uniform using Modelling & Linking Guide
 - › Reuse OTLs from the EUROTL and connect to national OTLs

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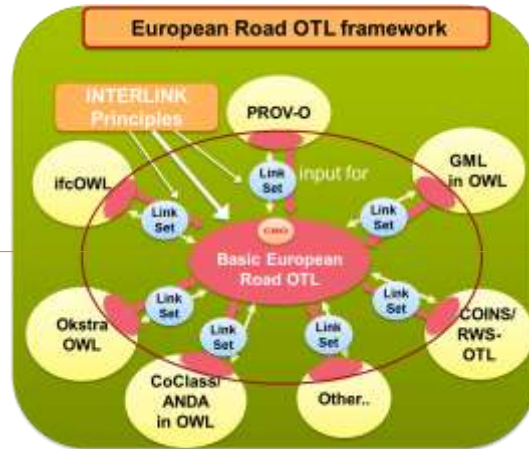
EUROPEAN ROAD OTL FRAMEWORK



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LINKING EUROPEAN ROAD OTL TO OTHER STANDARDS

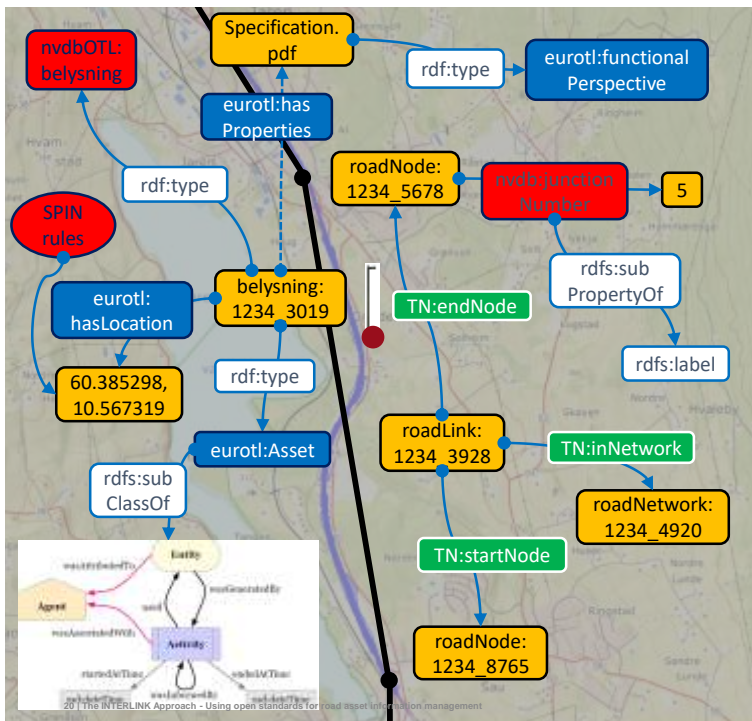


Links to existing international OTLs

Links to existing national OTLs

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E4, Jaren, Norway (from Nordic Test Case)

- Asset data instantiation
- INSPIRE transport network ontology
- EUOTL
- Norwegian Road Database (NVD)
- W3C ontologies

belysning = lighting

Example query:
List all lighting columns on the E4 between Junctions 4 and 5 (in SPARQL)

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USE OF THE EUROTL



1. Use M&LG to (re)model internal OTLs
2. Re-use OTL(s) that are part of EUROTL
3. Share national OTLs for reuse by others
4. Define best practice
5. Harmonise
6. Standardise: prescribe the use of a part of the EUROTL



4. DISCUSSION



- › In small groups, please, discuss the following:
 - › If you were advising the government or a public body with a large stock of infrastructure assets, what recommendation would you provide for improving their asset information management?

LESSONS FROM THE NETHERLANDS



- › Based on experiences with Rijkswaterstaat, Dutch national road authority
- › AIM started in 2011, since 2014 applied in major road reconstruction project
- › Now for all new projects, starting with large maintenance contracts
- › Some achievements have been brought into international standardisation

- › Lessons
 - › Synchronous developments in departments
 - › Strive for sharing data
 - › Use linked data power
 - › Align with supply chain partners and other authorities
 - › Slice your OTL up in manageable domain OTLs

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5. THREE TEST CASES



- › NRA use cases and data
 - › Nordic (Sweden & Norway) – Trimble, Triona
 - › Germany – AEC3, interactive instruments, planen bauen 4.0
 - › The Netherlands – RHDHV, TNO, Semmtech

- › Use case-based definition of EUOTL requirements (bottom-up)

- › Demonstrate that business needs can be met with INTERLINK Approach

- › Use existing commercially-available software

- › Help NRAs and industry to understand implementation

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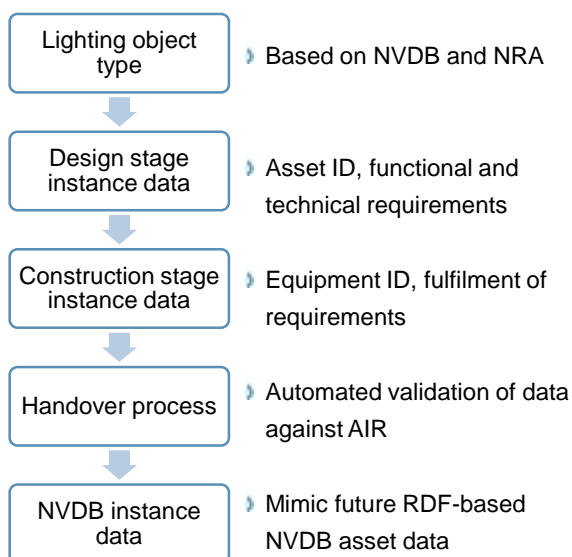
NORDIC CASE – ROAD LIGHTING IN JAREN



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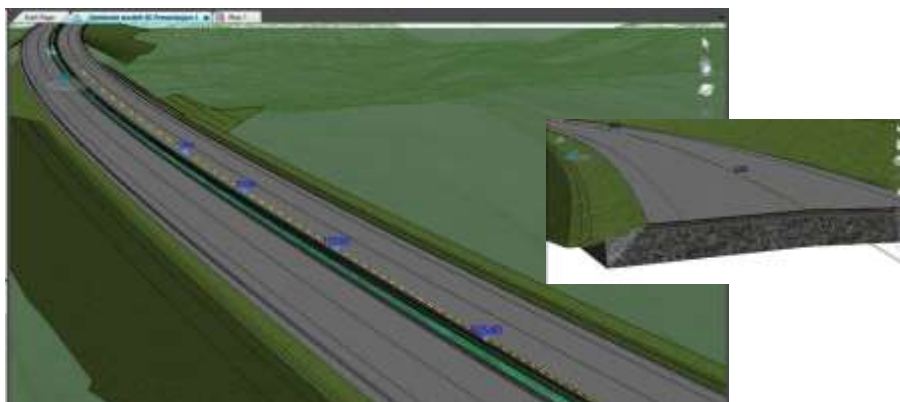
NORDIC CASE – ROAD LIGHTING IN JAREN



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NORDIC CASE – ROAD LIGHTING IN JAREN



- › Gather life-cycle data with asset object, easing future access
- › Record design and construction history (e.g. approval)
- › Structured and unstructured => hybrid, gradual transition
- › Extended existing BIM software to query triple store and read Linked Data

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GERMAN CASE – BRIDGE IN HAMBURG



- › Three perspectives
 - › Traditional approach
 - › BIM pilot study (BIM4INFRA2020)
 - › INTERLINK Approach

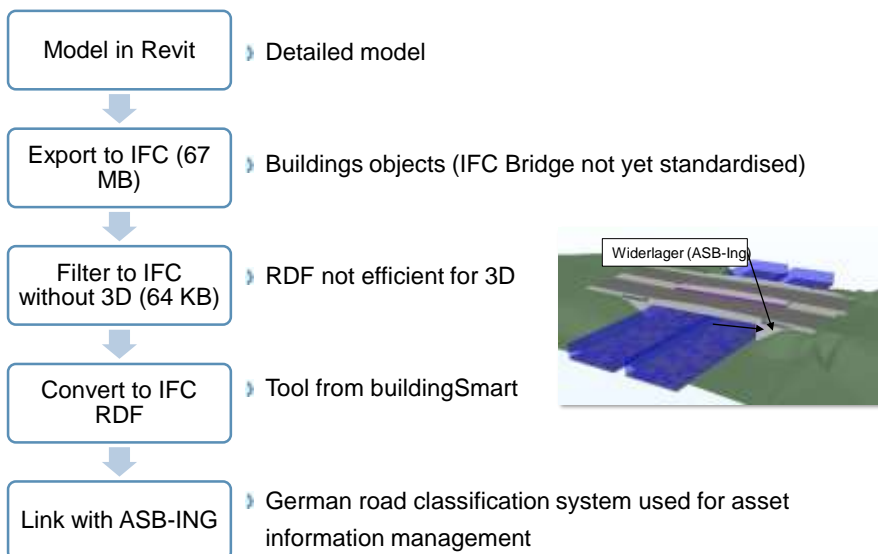
- › Pilot
 - › Detailed EIR
 - › Open standards
 - › IFC
 - › OKSTRA



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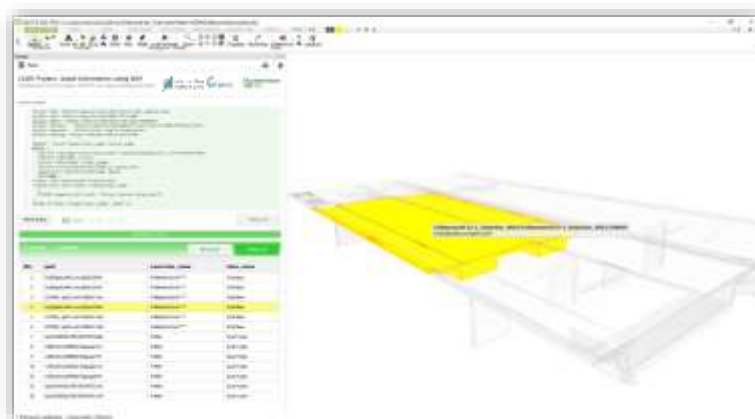
GERMAN CASE – BRIDGE IN HAMBURG



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GERMAN CASE – BRIDGE IN HAMBURG



- Improve ease of information handover to existing databases
- Link inspection records to bridge objects (e.g. condition rating)
- Query objects by ASB-ING class in triple store
- Visualise in IFC viewer (Desite)

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DUTCH CASE – REPAIR AND INSPECTION IN SOUTH HOLLAND



- › Maintenance contractor
- › Barrier inspection

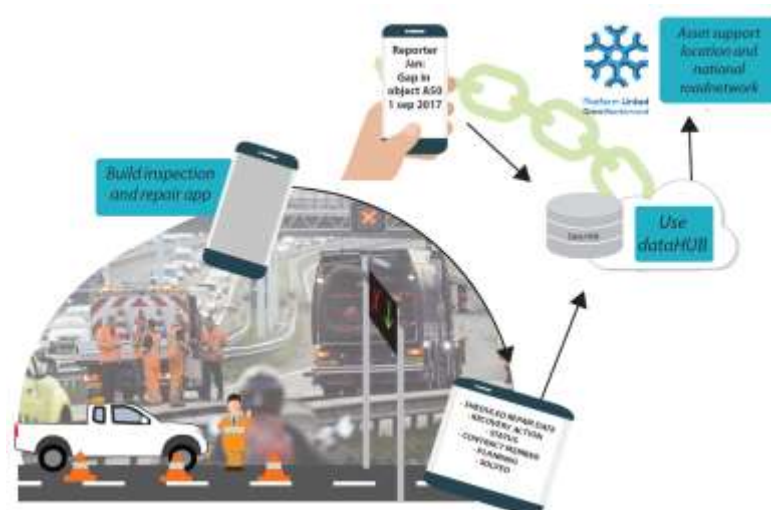


- › Info. delivery manual
- › 3 month delay from inspection to NRA system update
- › Affects validity of KPIs
- › Duplicate asset information

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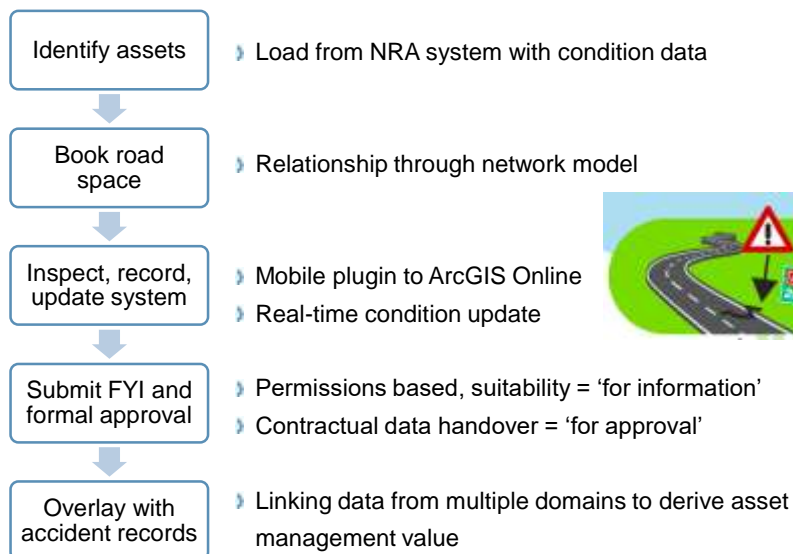
DUTCH CASE – REPAIR AND INSPECTION IN SOUTH HOLLAND



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DUTCH CASE – REPAIR AND INSPECTION IN SOUTH HOLLAND



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6. VISION FOR ASSET INFORMATION MANAGEMENT



- › Data should be liberated and shared
- › Big-mama, Mother-of-all-Models doesn't exist: Combine existing (open) standards in separate modules, with network model as a core
- › The actual ICT landscape is hybrid and will be so for a long time
- › Linked Data is the glue
- › Develop your OTLs from the bottom up and reuse where possible

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ROADMAP FOR YOUR ORGANISATION



- › Choose strategically for data-orientation using (open) data standards
- › Accept multiple formats / levels of information and use linked data as glue
- › Select your modelling (& linking) guide, pref. harmonised with business partners, KISS
- › Define your modular OTL framework , pref. harmonised with business partners
 - › Select, develop, implement your separate OTLs; starting small, reusing where possible
- › Implement in object-based systems, visualise data

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SUGGESTIONS FOR JOINT EFFORTS



- › Just-do-it on a small scale, learning by doing
 - › Experiment with Linked Data / Semantic Web
 - › Share knowledge and experiences
- › Leadership
 - › Shared vision on asset information management
 - › Collaboration between public – industry – academia
 - › National Proof of Concept project, demonstrating added value & feasibility
 - › Share, harmonise, standardise modular OTLs
- › Stay in touch with European / international developments
 - › CEDR BIM group
 - › Learn from / influence Building Smart, OGC, CEN, ISO, ...
 - › INTERLINK partners

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