SafeSki: Safety and Information Services for Ski Resorts

ESA ARTES 20 Integrated Applications Program

Feasibility Study

TeleConsult AUSTRIA

JOANNEUM RESEARCH DIGITAL

Brimatech
BRIDGING MARKETS AND TECHNOLOGIES

BERNER & MATTNER
AN ASSYSTEM COMPANY

GEOSAT SA
Bureau d'ingénieurs et géomètres officiels EPF/SIA

Plan of presentation

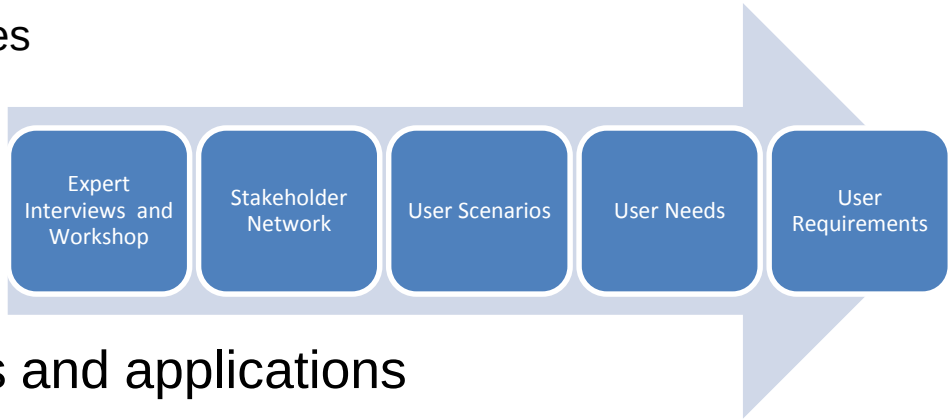
- **Context**
- **Scope**
- **Stakeholder interactions**
- **Presentation of selected services**
- **Proof of concept for technical aspects**
- **Viability of services**
- **Outlook on demonstration project**

SafeSki: Context

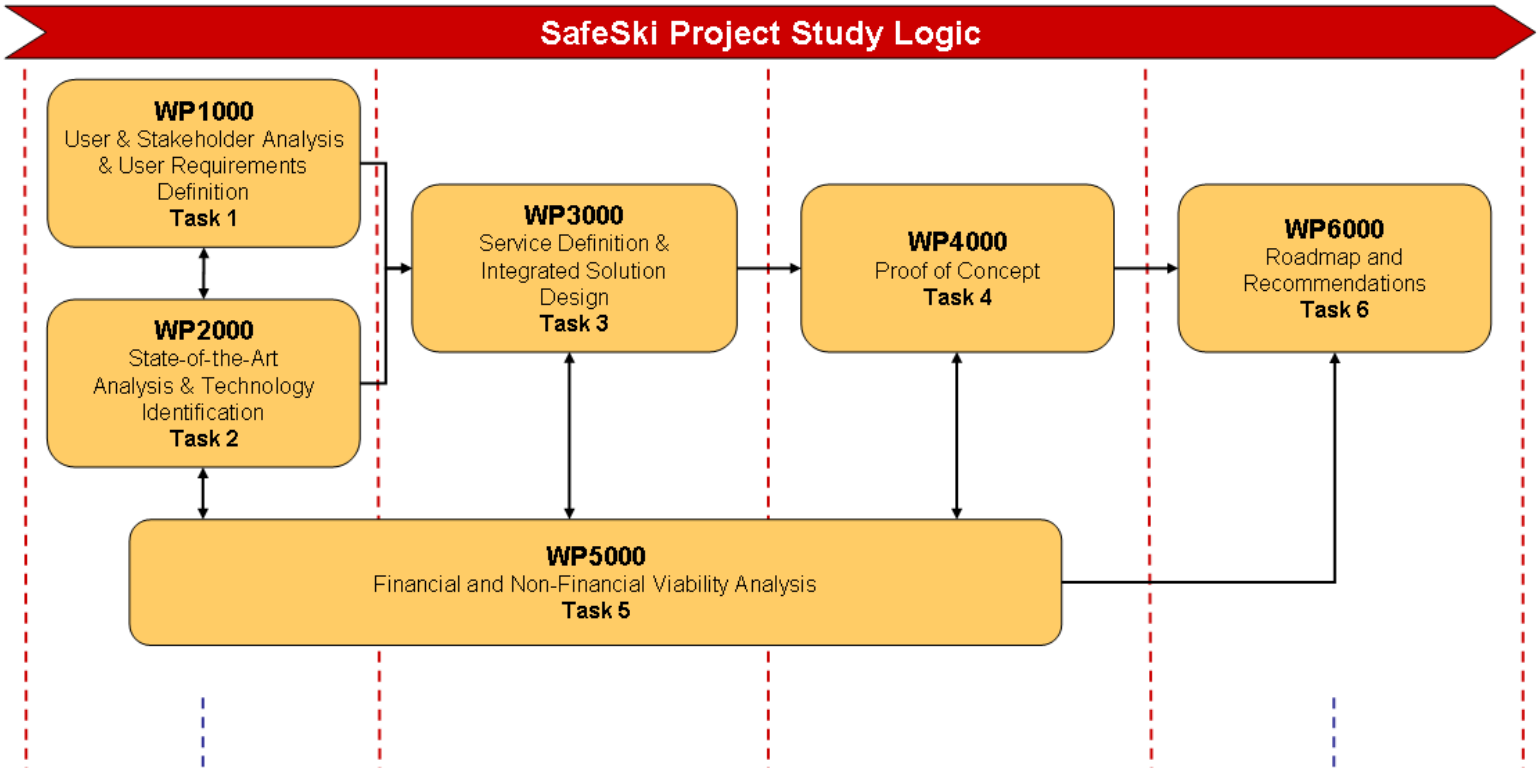
- **Safeski**: Feasibility study in the the frame of ESA ARTES 20 Integrated Application program → 100% founding by ESA
- Open Tender won by consortium
  - Teleconsult Austria (Project Leader)
  - Brimatech (Austria)
  - Johanneum Research (Austria)
  - Berner+Mattner (Germany)
  - Geosat (Switzerland)
- Feasibility study successfully terminated in march 2015
- Demonstration project in preparation

SafeSki: Scope

- Stakeholder Analysis
  - Scenarios for usage of future services
  - User Needs and requirements
- State-of-Art Analysis
- GAP analysis
- Specification of relevant services and applications
  - Check compliance to the user needs and stakeholder conditions
- Financial and non-financial viability analysis
  - Identify critical success factors and risks
- Feasibility study (Proof of Concept) and roadmap
  - Identify milestones towards the successful implementation



SafeSki: Stakeholder interaction

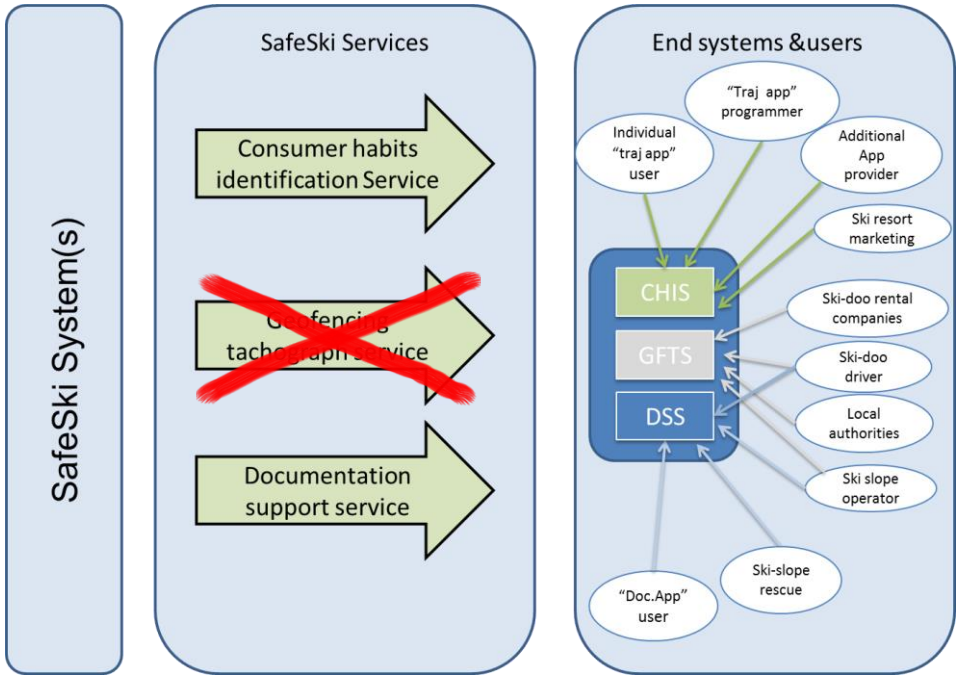


Discussion
- Actual state
- Problems
- Wish list

Telephone Interview
- Feedback about proposed services

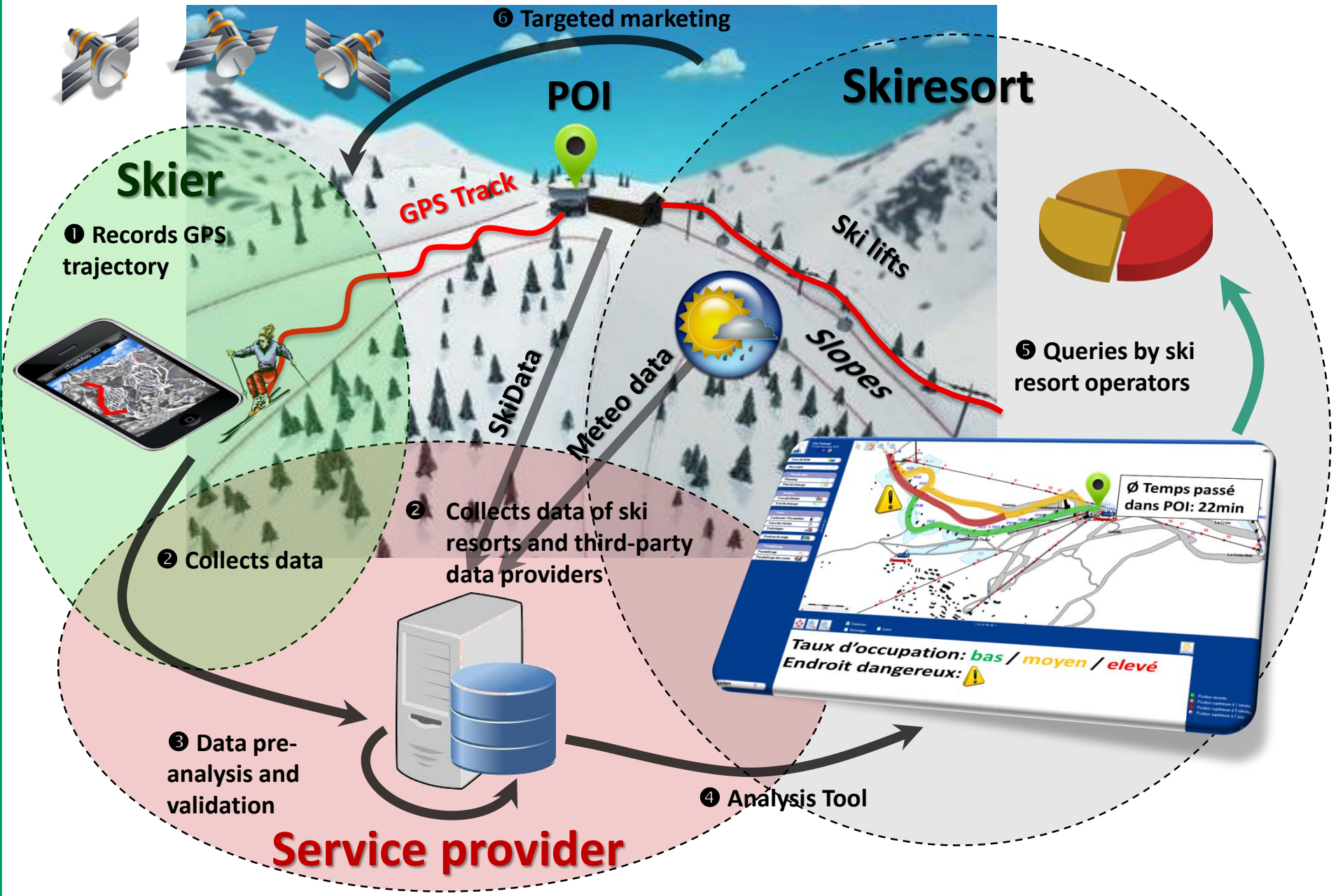
Presentation
- Results of PoC
- Selected Services
- Roadmap

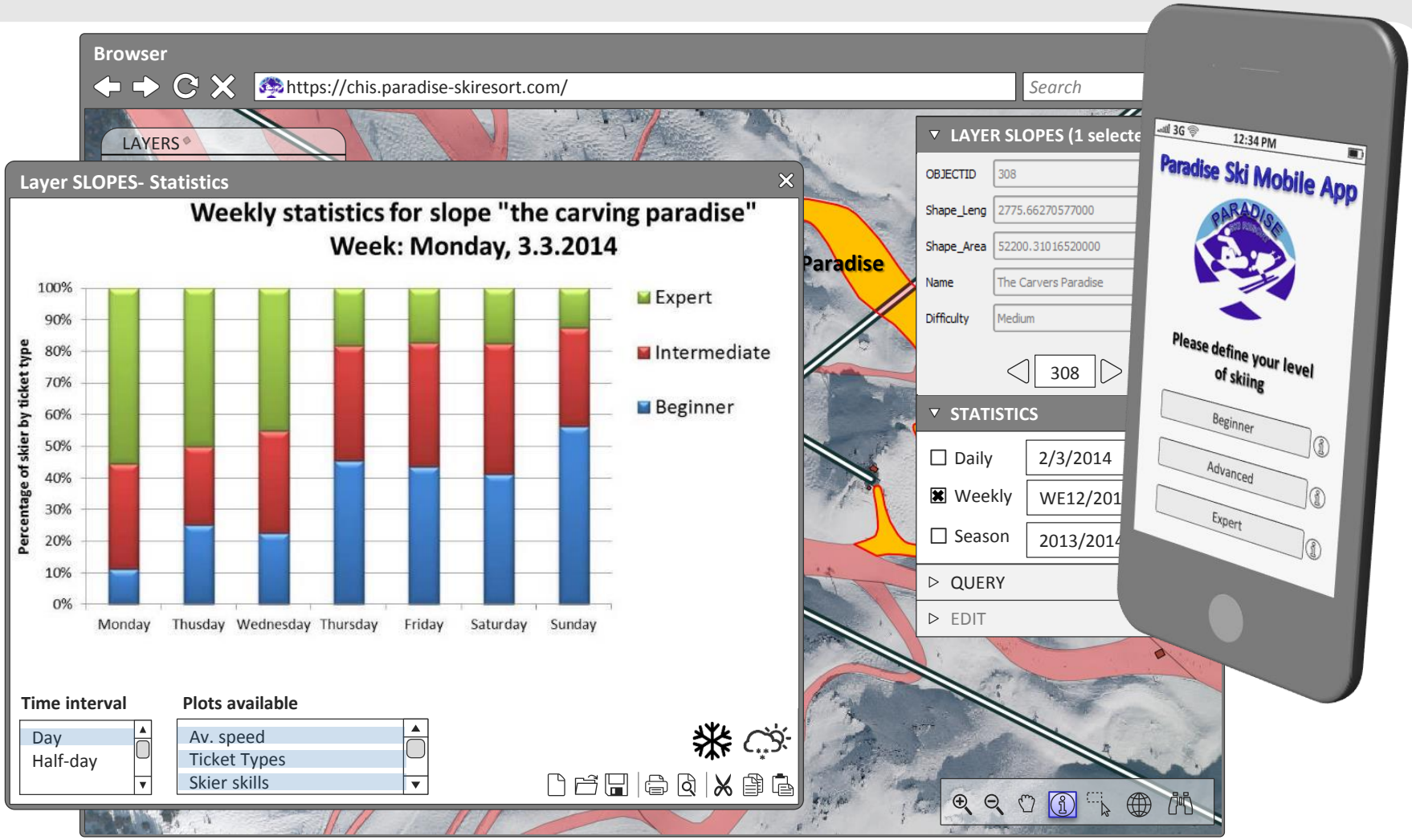
Selected Services



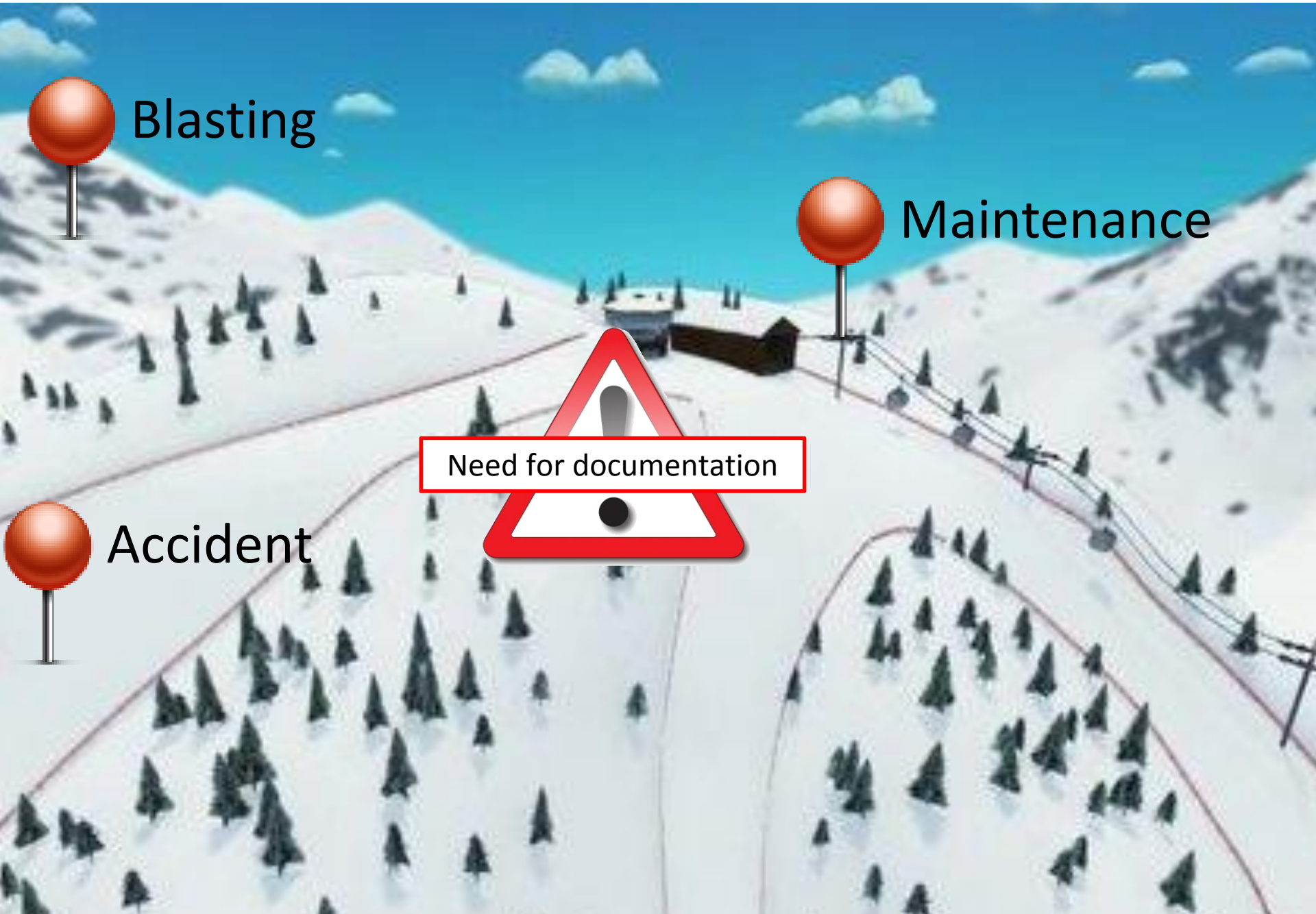
Acro.	Service	Short description
CHIS	Consumer habits identification Service	The "consumer habits identification service" will collect data about end user customers in ski resorts and provided these data in a valuable format to the ski resort member organisations (e.g. marketing).
DSS	Documentation support service	The documentation support service (DSS) will provide services for an easier and documentation of activities (e.g. incidents, accidents, and blasting operations) with seamless data processing i.e. as much data as possible is captured and inserted automatically where required.

Service CHIS: **C**onsumer **H**abits **I**dentification **S**ervice




Browser
https://chis.paradise-skiresort.com/
Search
LAYERS
Layer SLOPES- Statistics
Weekly statistics for slope "the carving paradise"
Week: Monday, 3.3.2014
Percentage of skier by ticket type
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Monday
Thusday
Wednesday
Thursday
Friday
Saturday
Sunday
Expert
Intermediate
Beginner
Time interval
Day
Half-day
Plots available
Av. speed
Ticket Types
Skier skills
LAYER SLOPES (1 selecte
OBJECTID
308
Shape_Leng
2775.66270577000
Shape_Area
52200.31016520000
Name
The Carvers Paradise
Difficulty
Medium
308
STATISTICS
Daily
2/3/2014
Weekly
WE12/201
Season
2013/2014
QUERY
EDIT
Paradise
3G
12:34 PM
Paradise Ski Mobile App
Please define your level of skiing
Beginner
Advanced
Expert

Service DSS: **D**ocumentation **S**upport **S**ervice

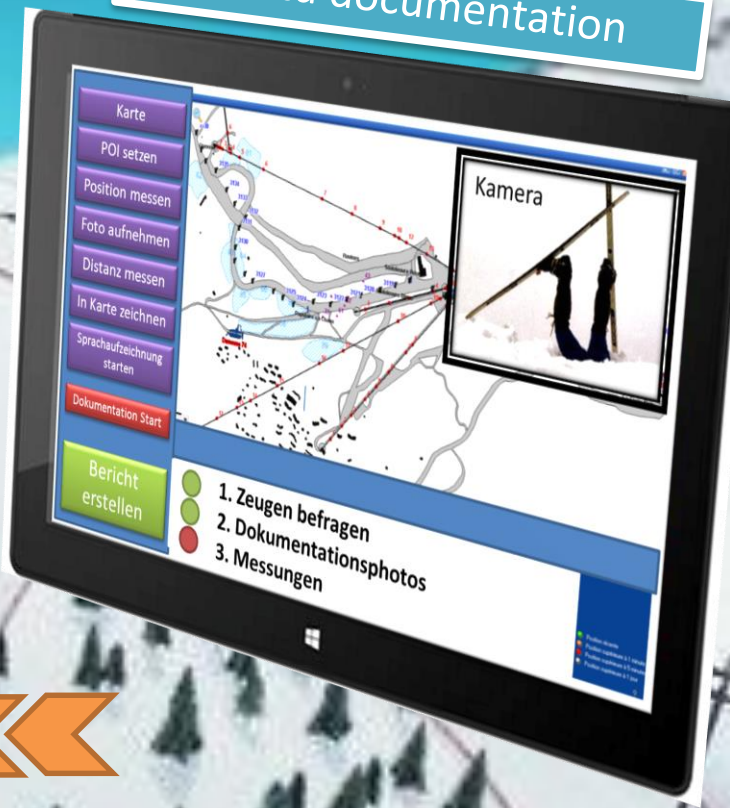


Service DSS: **D**ocumentation **S**upport **S**ervice

Models, data, definitions

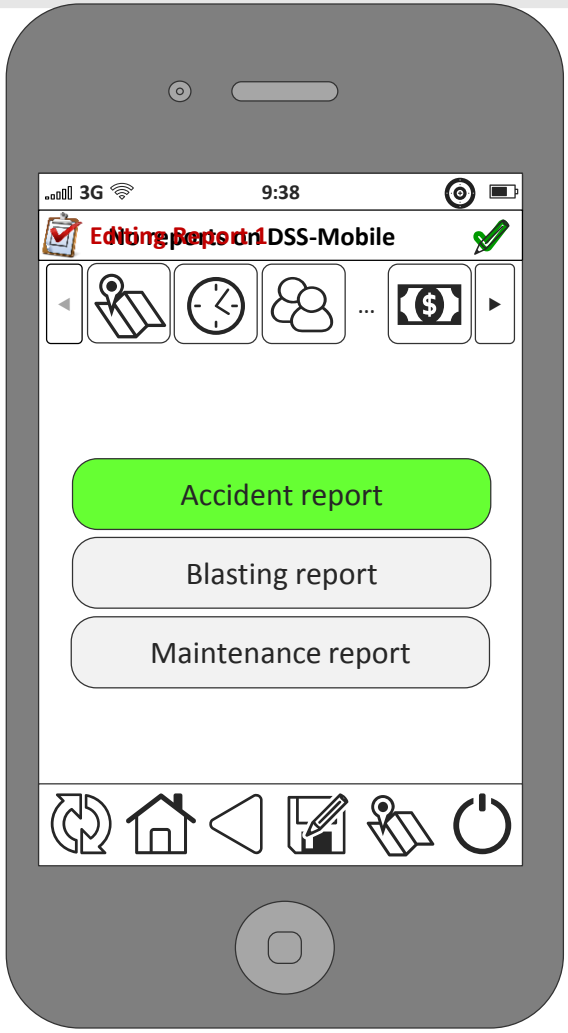
Need for documentation

In-situ documentation

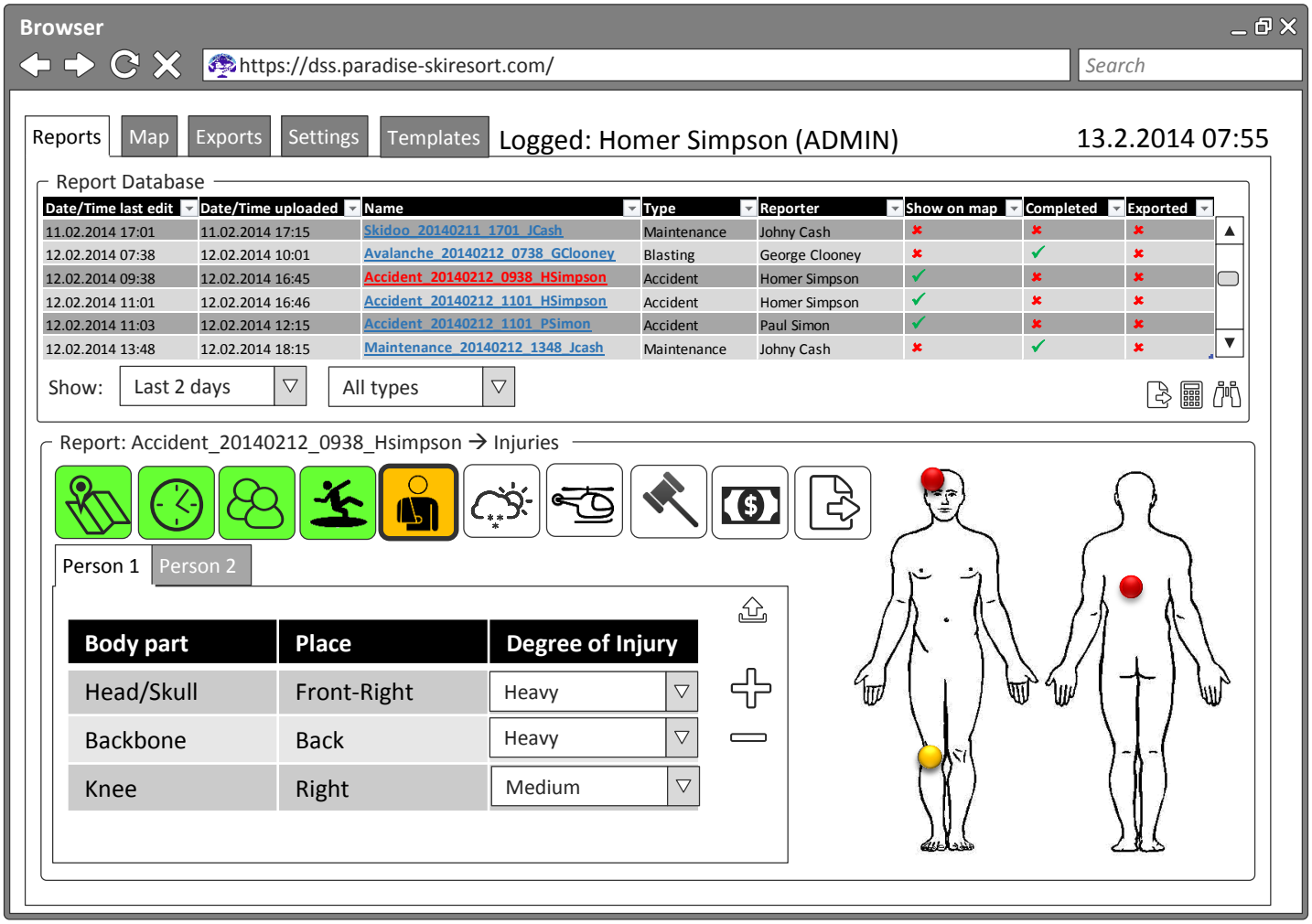


reports, archive, …

(SMARTPHONE OFFLINE)

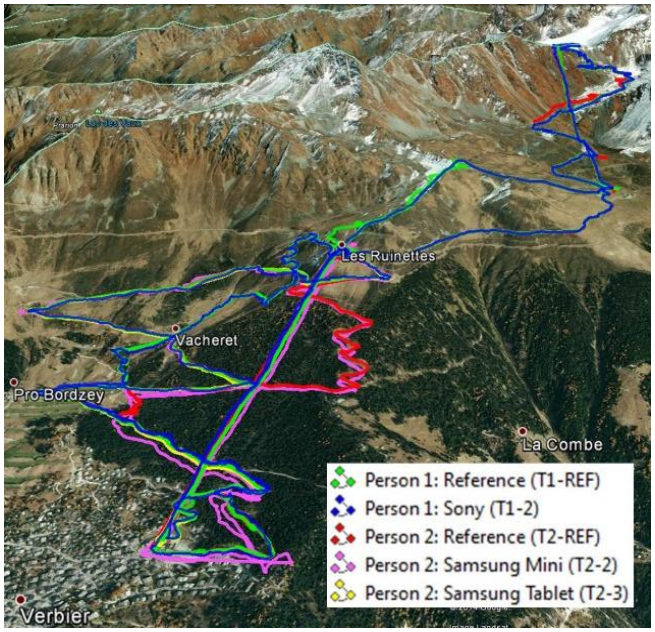


(DESKTOP ONLINE)



Proof of Concept

- Approach on 2 levels
  - User acceptance critical items (UCI) → Demonstration of services as Mock-ups
  - Technological critical items (TCI) → Field tests and data analysis
- Field test: gather dataset that can be used to address different TCI
  - Record GNSS data (**raw**, **enhanced**, **reference**) → quality assessment/enhancement
  - Ticketing data → correlation with trajectory data
  - Retention times in POI
  - Output: Conclusions and recommendations



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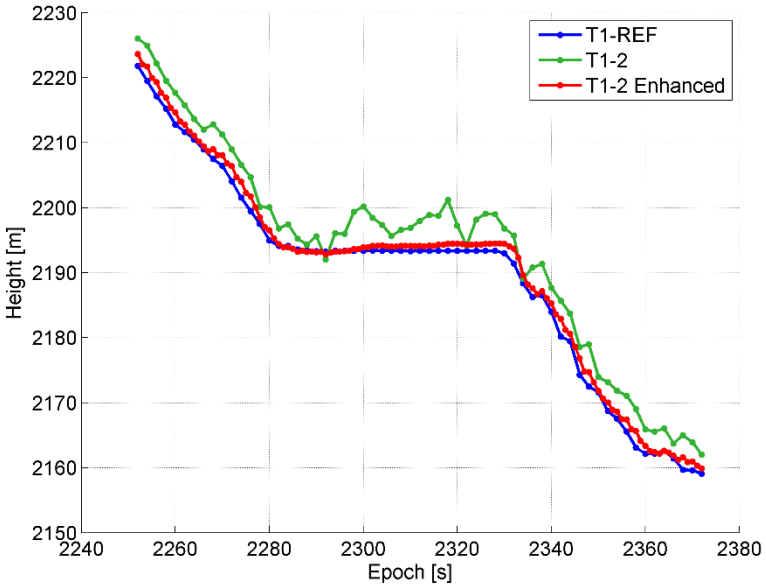
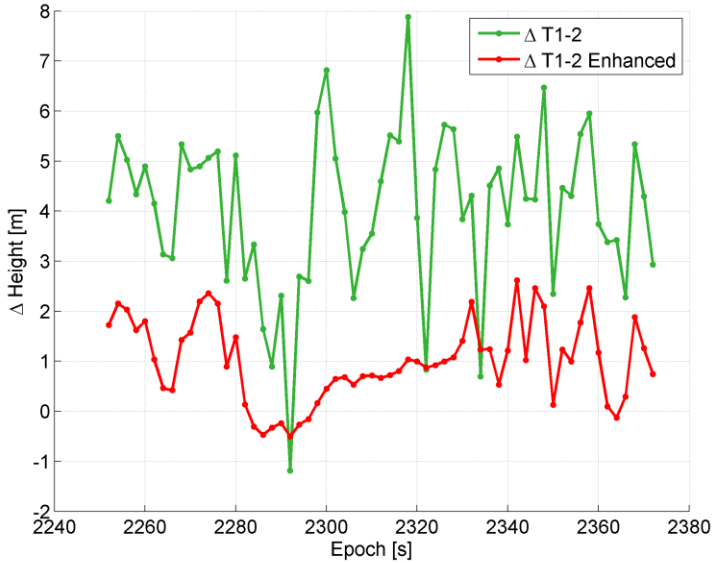
PoC - Technical Feasibility

- Quality of trajectory data depends on
  - Smartphone
  - Environment (orientation of slopes, signal shading, …)
  - Position of wearing the receiver
- Position enhancement at CHIS server
  - Usage of GNSS correction data received via internet
  - Usage of local atmospheric parameters (temperature, pressure, humidity)
  - Blunder detection
  - Filter algorithm → bridging gaps
  - Map matching
- Resulting enhanced trajectory by means of accuracy and availablity

Trajectory enhancement (1/2)

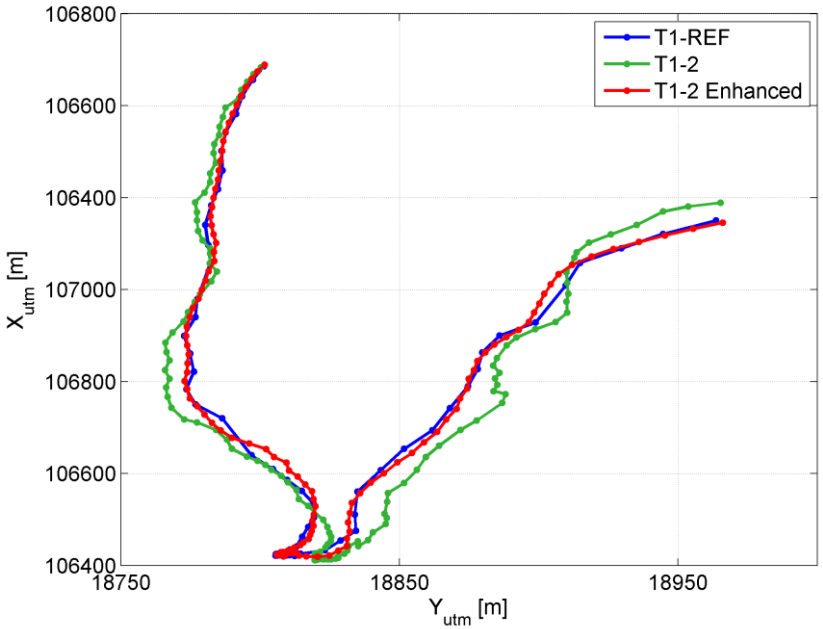
- Enhancement in height component due to usage of GPS correction data and local atmospheric parameters





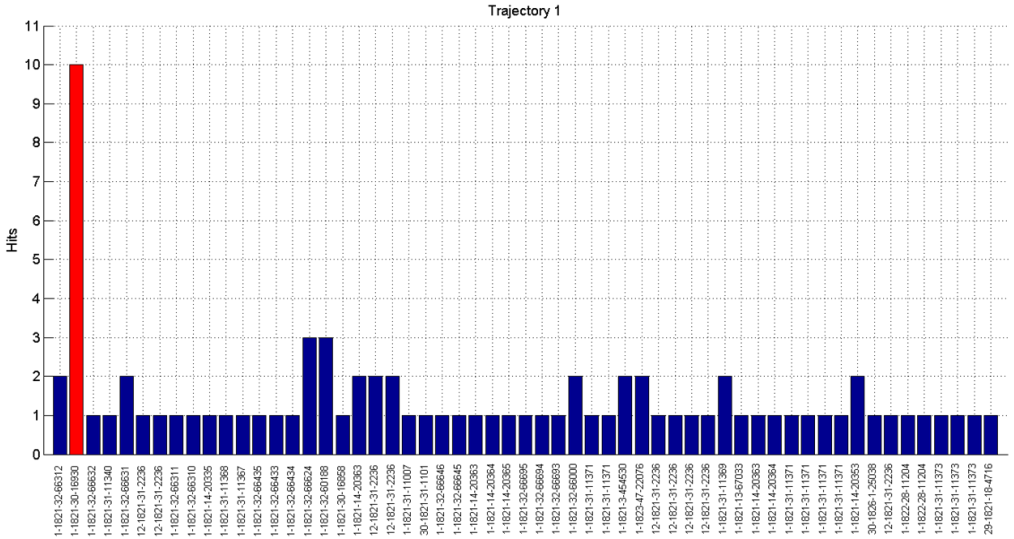
Trajectory enhancement (2/2)

- Enhancement in planimetric component due to usage of GPS correction data

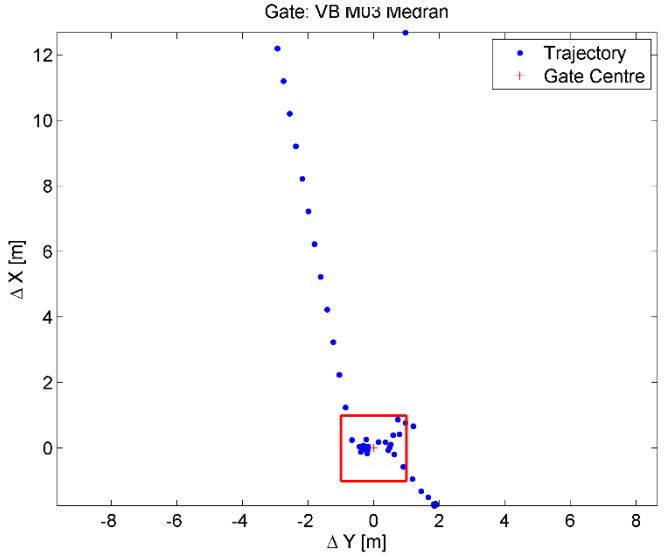


Ticket data correlation test

- Correlation between trajectory data and ticketing system



Ticket ID	Gate Name
1-1821-30-169307	Trajectory data #1
1-1821-30-169308	Trajectory data #2



- 2 ticket ID‘s correctly identified (out of 1360)
- 85-100% gate pass detection using tracks

Retention time

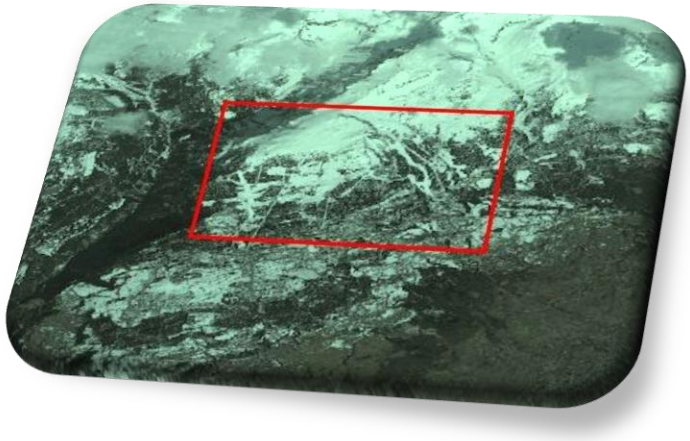
- Estimation of retention time at
  - Restaurant
  - Lift station

- Based on trajectory data
- Differences between real and computed are within 2% of the total time

POI	Person/Device	Retention time noted	Retention time computed
Ski lift station	Person 1 (SONY)	00:23:15	00:23:32
	Person 1 (JAVAD)	00:23:15	00:23:35
	Person 2 (JAVAD)	00:23:15	00:23:28
Restaurant	Person 1 (JAVAD)	00:51:37	00:52:30
	Person 2 (JAVAD)	00:54:19	00:55:32

Proof of Concept - EO

- Assess added value of satellite remote sensing
  - Mid-resolution satellite imagery: gather information about snow coverage throughout the skiing season → map input for CHIS & DSS
  - High-resolution satellite imagery: count number of skiers → evaluate potential benefits for cross-validation of statistics performed by CHIS



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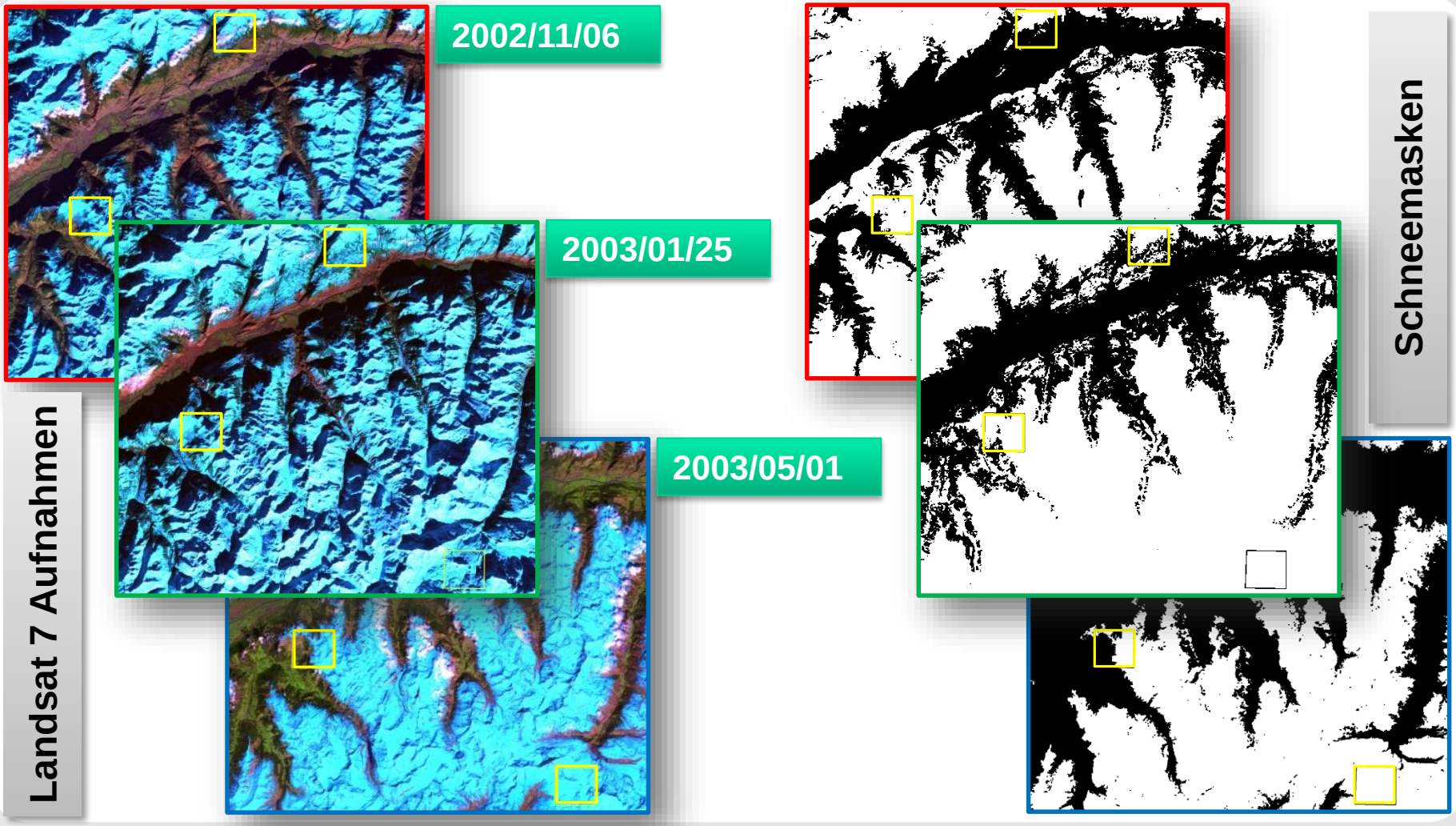
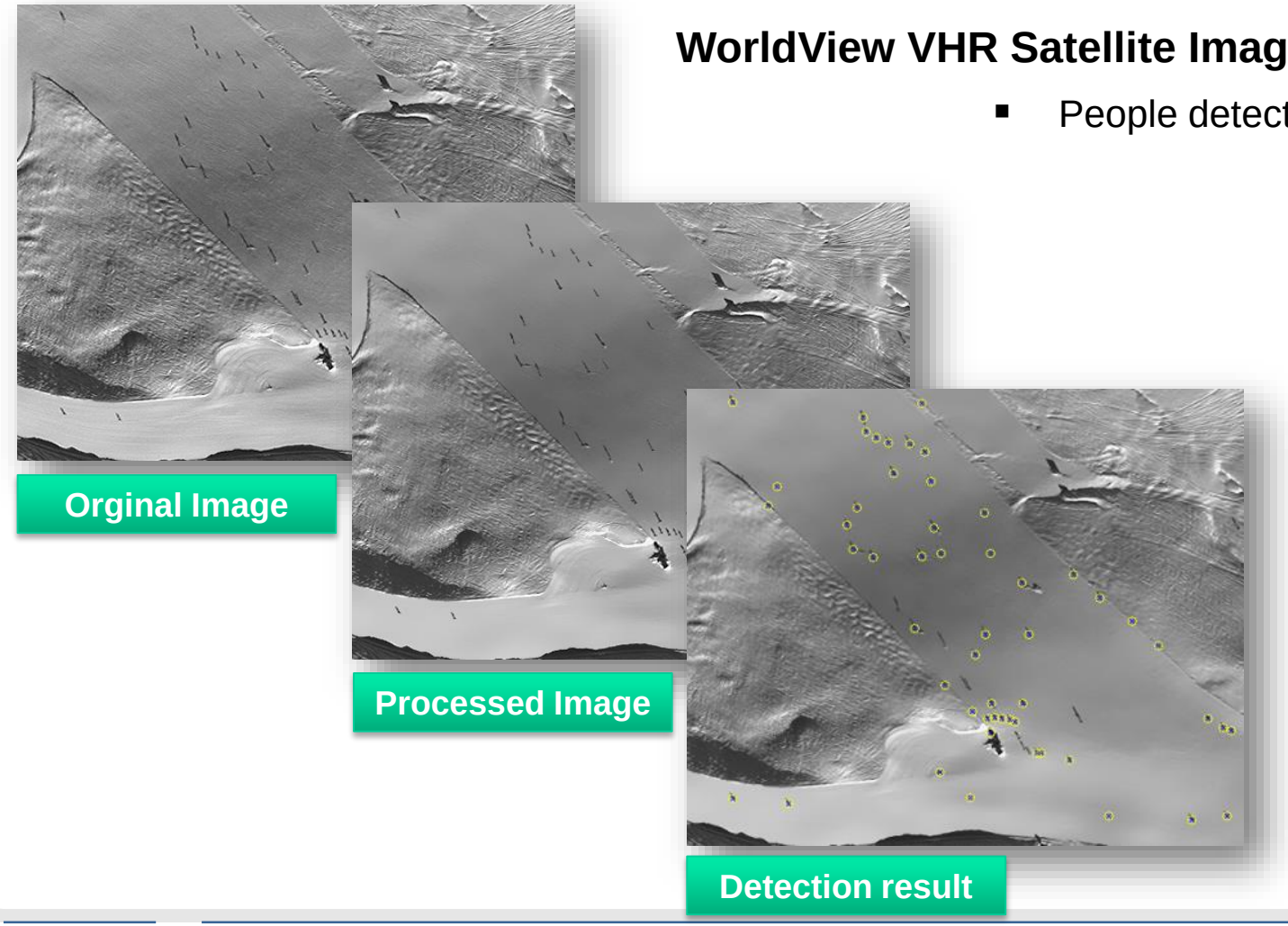
EO – Snow Coverage Time Series



EO – People Counting

WorldView VHR Satellite Image (50 cm GSD)

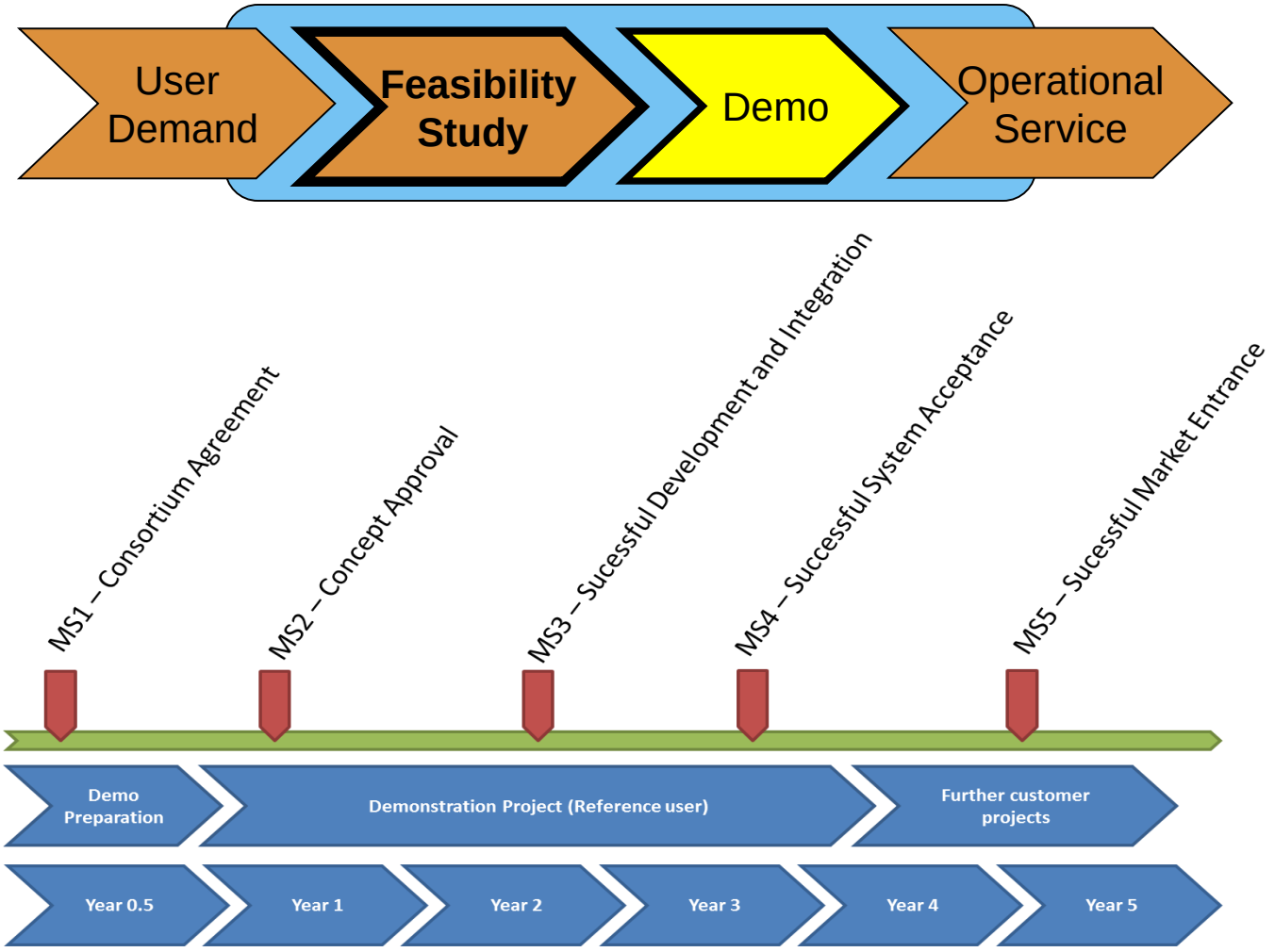
- People detection on ski slopes



Service Viability

- **Service benefits**
  - Clearly recognized by all interviewed stakeholders
  - DSS of great “immediate” interest
  - CHIS: perceived as very interesting for near future
- **Market Viability**
  - Market potential for solutions exists → focus on big ski resorts (technology and innovation driven) with high willingness to pay
- **Technical Viability:** No technical barriers
- **Commercial Viability**
  - Ratio price/benefits perceived as adequate by interviewed stakeholders
  - High synergies are identified in case both services are offered to one customer
- **Critical issues:**
  - DSS: none
  - CHIS: willingness of clients/third-party app providers to share trajectory data

DEMO PROJECT



DEMO PROJECT