## Forest Management and Virtual Forest

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### Traditional forest management plan

- Forest stand data and operational maps: in paper, screen, pad...
- Virtuality in forestry professional's imagination

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- Stand characteristics:
  - Timber volumes m<sup>3</sup>, m<sup>3</sup>/ha
  - Soil: mineral/peatland, fertility, stones, drainage status...
- Tree characteristics:
  - Height, d1.3, age... by tree species

Totally abstract for non-professionals.





## Combining forestry data with topographic (map) data and more accurate photogrammetric data

Helps navigating and planning of logging and other operations



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# LIDAR-based inventory data; In large scale operative use since 2007 in Finland

- more data: more accurate, location-based tree data, versatile data on forest environment

- Soil type
- Moisture
- Understory
- Accurate ground model...







# **Risk management: Forest fires** - Canopy base hight?

Source: Arbonaut Ltd.





### **Risk management: Forest fires**



### **Risk management: Risk trees on electric lines**

#### 3D LiDAR model



Source: Arbonaut Ltd.



### **Operability for loggings**

Soil bearing capacity - seasonal operability map





Source: Arbonaut Ltd.





# Fast development in technology

- Decreasing costs and increasing accuracy of sensors
- New fleets for collecting data: ALS, satellites, drones, forest machines, vehicles...
- More accurate modeling due to rapidly growing big data and processing capacity

## Dynamic data & fusion of multiple data sources

- On-demand data mining for industry's changing needs
- Dynamic data on operational environment: weather data, logistic data...
  - Simulations, forecasting / scenarios



(with)

### Quality / operability of forest road network



Slice of LiDAR data reveals pieces of road that are risky in rainy seasons → need for repair!





Damage risks highlighted in road network

Source: Arbonaut Ltd.



JWTHE

More data & more complex planning cases

Need for Digital Twin of Forest

Need for Common Language

→ Need for Visualization - 3D game technologies, VR/AR

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## Thank You for Your Attention! – Let's go and see how the virtual forest looks like

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