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塑造智慧变革

北京
国家会议中心
2018年
9月10-12日
2018.hexagonchina.com.cn

Leica RealCity – The solution for 3D city digitization
Leica RealCity–三维城市数字化解决方案

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54%

Of population living in urban areas

54%人口居住在城市

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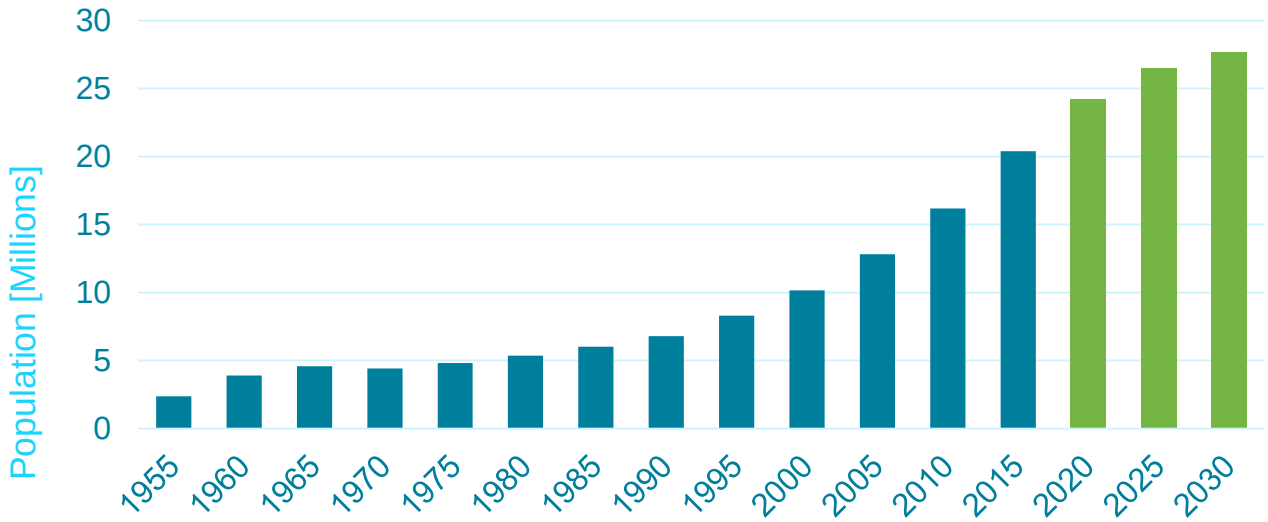
Beijing, China

One of the fastest growing cities in the world

2010 Population: **16.1M people**
2018 Population: **22.8M people**

一个世界上人口增长最快的城市之一

2010年人口数量：16.1百万；2018年人口数量：22.8百万



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Managing the growing cities of tomorrow
管理未来不断在发展的城市

Pollution 污染

Safety 安全

Health 健康

Infrastructure access 基础设施访问

Traffic congestion 交通拥堵

Mobility 迁移率

Urban Planning 城市规划

Disaster Prevention 灾害预防

Construction 建设

Environment 环境保护

Communication 通讯交流

Maintenance 维护管理

Challenges for administration
管理面临的挑战

Timely Information
及时的信息

Cost-Efficient Solutions
成本效益较高的解决方案

Accurate Data
精准的数据

Leica RealCity - From Sensor Design to Product Generation
Leica RealCity – 提供从传感器飞行计划设计到产品生成

Leica CityMapper

New generation sensor technology

Leica HxMap

High-performance post-processing

Leica CityMapper

新一代的传感器技术

Leica HxMap

高性能的数据后处理平台

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Supported Sensors
支持的传感器

RealCity	 City Mapper	Solution for 3D Smart Cities 三维智慧城市解决方案
RealWorld	 DMC IIe & III  RCD30	Wide area ortho mapping 大面积正射制图
RealTerrain	 SPL  TerrainMapper	LiDAR for wide area coverage 大面积区域的Lidar数据获取

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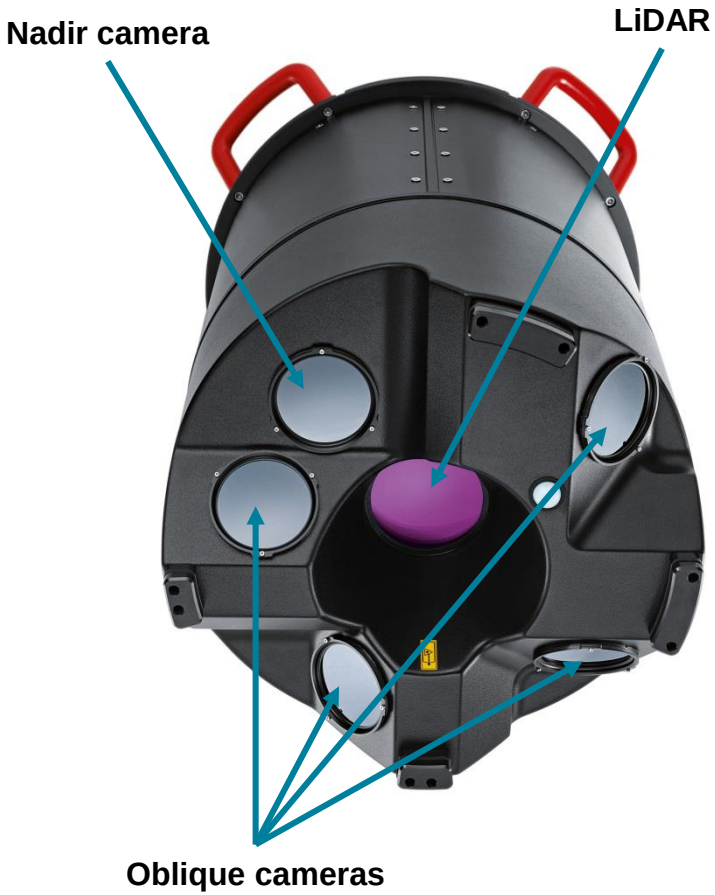
CityMapper sensors
CityMapper传感器

Nadir camera

- Leica RCD30 CH82 multispectral camera
- 80 MP, 5.2 µm pixels
- Mechanical bi directional motion compensation

下视镜头

- Leica RCD30 CH82 多光谱镜头
- 8千万像素，像素大小5.2 µm
- 机械式的双向像移补偿



Oblique cameras, 4 pcs 4个侧视镜头

- Leica RCD30 CH81 mini RGB camera
- 80 MP, 5.2 µm pixels
- 45 degrees viewing angle (other optional available)
- Mechanical in flight directional motion compensation

4个侧视镜头

- Leica RCD30 CH81 RGB镜头
- 8千万像素，像素大小5.2 µm
- 45 度视角(可根据需要定制)
- 机械式的航向像移补偿

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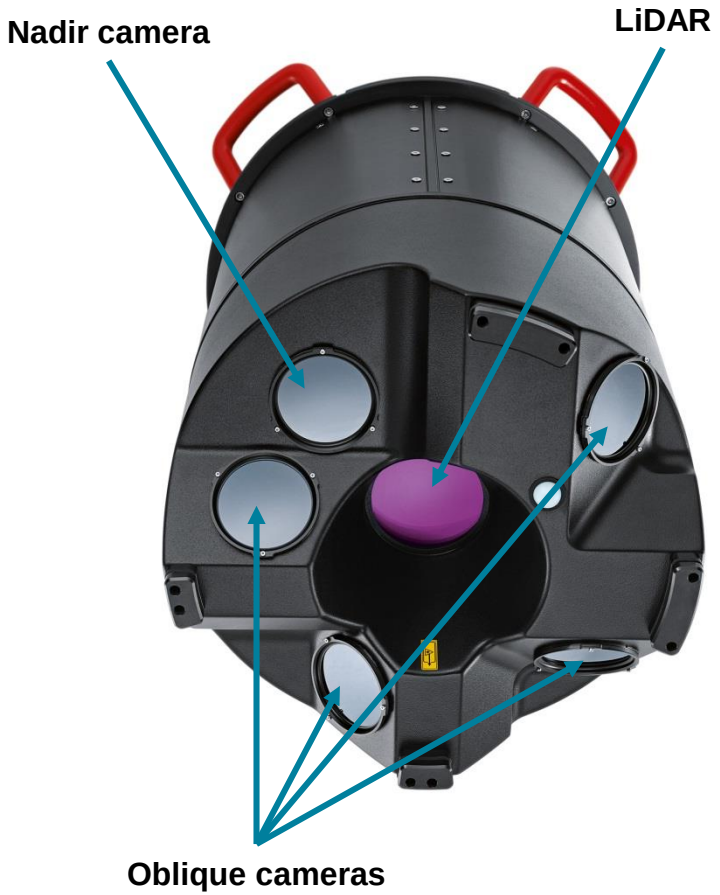
CityMapper sensors
CityMapper传感器

LiDAR

- Pulse repetition frequency up to 700 KHz
- Laser divergence 0.25 mrad
- Up to 2500 m altitude range
- Oblique scanner, with various scan patterns
- Up to 40 degrees field of view

激光

- 脉冲重复频率可达到700 KHz
- 激光发散度为 0.25 mrad
- 飞行高度可达到2500m
- 倾斜激光扫描, 有多种不同的扫描模式
- 视场角可达到40度



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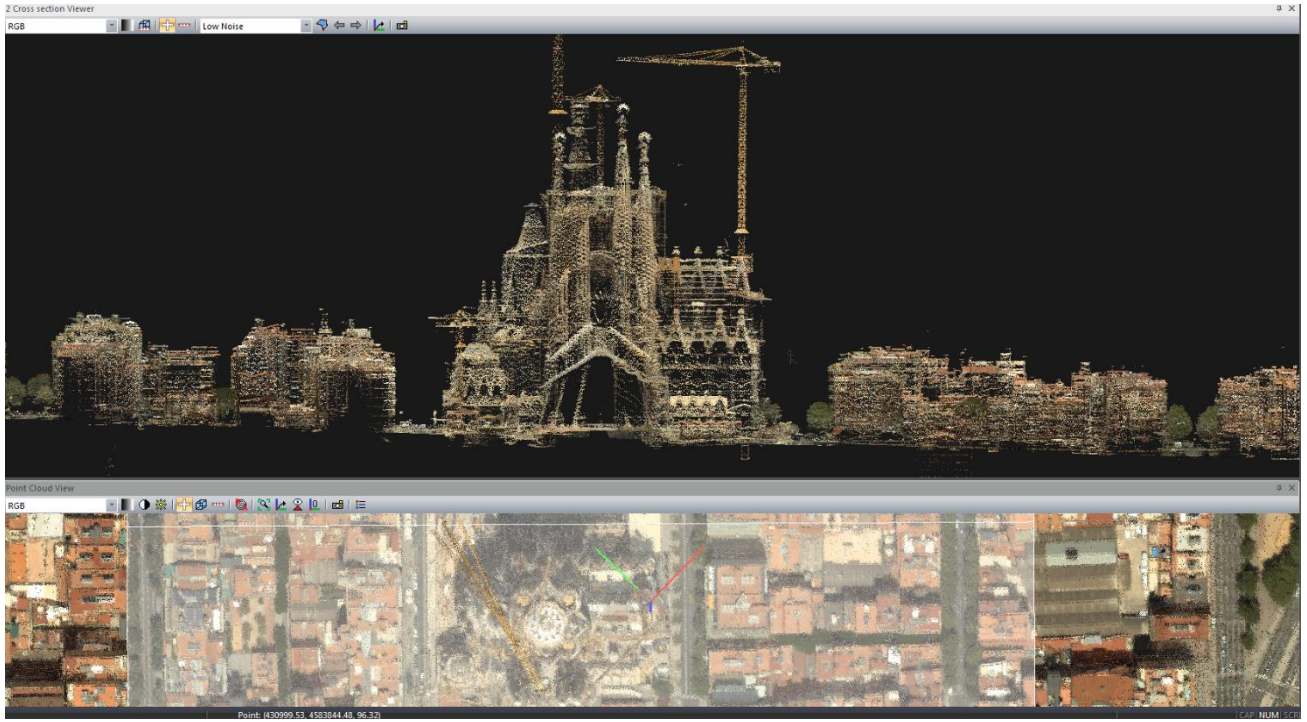
CityMapper LiDAR sensor – oblique scanning
CityMapper 激光传感器 – 倾斜扫描

Capture all sides on vertical structures, to support the city modelling application in complex urban environment

从各个方向获取垂直结构的点云信息，用于支持城市复杂建筑物的三维建模



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Benefits using a hybrid sensor for City Modelling
使用混合型传感器获取用于城市三维建模数据的优势

Image only
仅使用影像

- Higher point density and color information allows easier visual interpretation

  更高的点密度和色彩信息使得目视判读更加方便
- Data handling way heavier

  数据处理方式更加繁琐
- Gaps in Vegetation, shadows

  在植被和阴影处的建模存在漏洞
- Less attributes available to exploit, results in less derivative product or products of poorer quality

  更少属性信息可应用，使衍生产品更少或者生成的产品质量较差
- Additional smoothing algorithms required to produce plane surfaces

  为了生成平表面还需要使用其他额外的平滑算法

Lidar only
仅使用点云

- Continuos point coverage with reasonable point density for city modelling purpose

  拥有合理点密度的连续点云覆盖有助于城市三维建模
- Lidar attributes allow easier production of derivative products such as DTMs, tree specification

  激光雷达数据可使获取衍生产品例如：DTMs、植被参数更加方便。
- Data amount reduces processing speed for city modelling remarkably at same or better quality of the result

  在获取相同或者更好的成果情况下，点云可以明显提高三维城市建模的处理效率。
- Visual interpretation may be a bit more difficult due to missing colorization

  由于缺少着色，目视判断可能会更加困难

CityMapper - Economic advantage
CityMapper – 经济效益的优势

- Two datasets collected in one flight
  ➔ Half the collection costs, shorter projects, faster turn-around
- Hybrid sensor
  ➔No need for dual-hatch aircraft
- End user does not need to select between imaging and LIDAR
  ➔ Gets both
- One sensor – multiple possibilities: Flexibility during aerial survey
  ➔ collect multiple projects during a single flight

- 一次飞行可获取两套数据
  ➔ 一半的飞行成本，更短的项目周期，更快的周转
- 混合型传感器
  ➔不需要双舱口的飞机
- 最终用户不需要在影像和激光点云之间之间进行选择
  ➔ 两者均可获取
- 一个传感器 – 多种可能性: 航空测量较为灵活
  ➔ 一次飞行可执行多个项目

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CityMapper Success Story
CityMapper成功的故事

1 hr of on-line time

=

3 TB of raw data

1小时的飞行时间

=

可获取3TB原始数据

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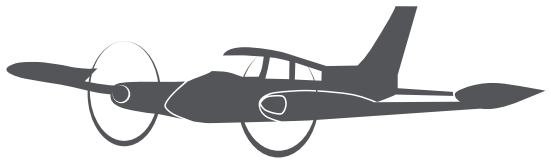
CityMapper Success Story
CityMapper成功的故事

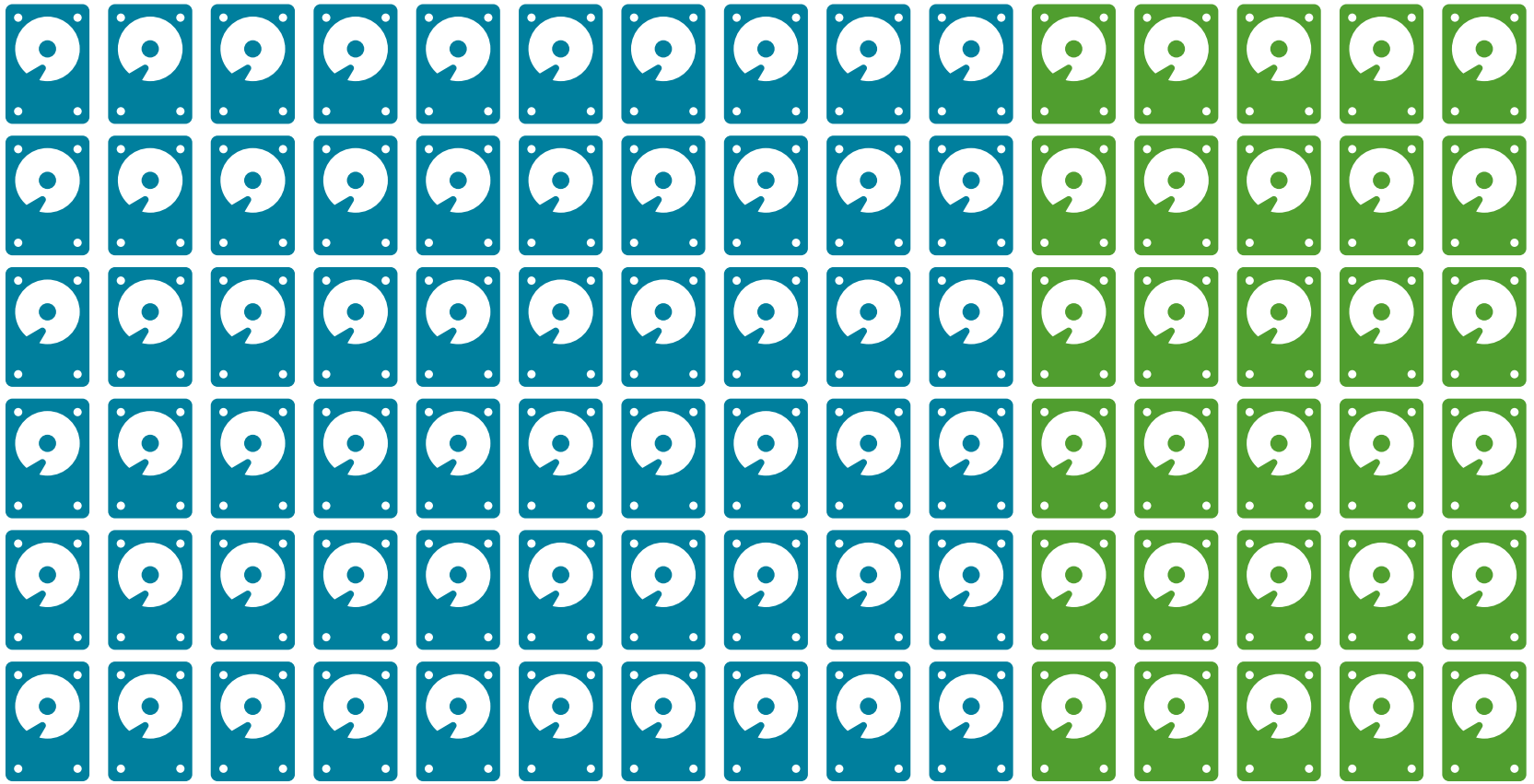
30+ active sensors

30+ 主动传感器



150-200TB of fresh data every week!

每周可获取150-200TB数据



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HxMap is the
core application
to process data
from Leica's airborne sensors
(from raw data to final output)
using one single common interface

HxMap 是
处理徕卡航空
传感器数据的核心软件程序
(从原始数据到最终产品生成)
使用同一个操作界面

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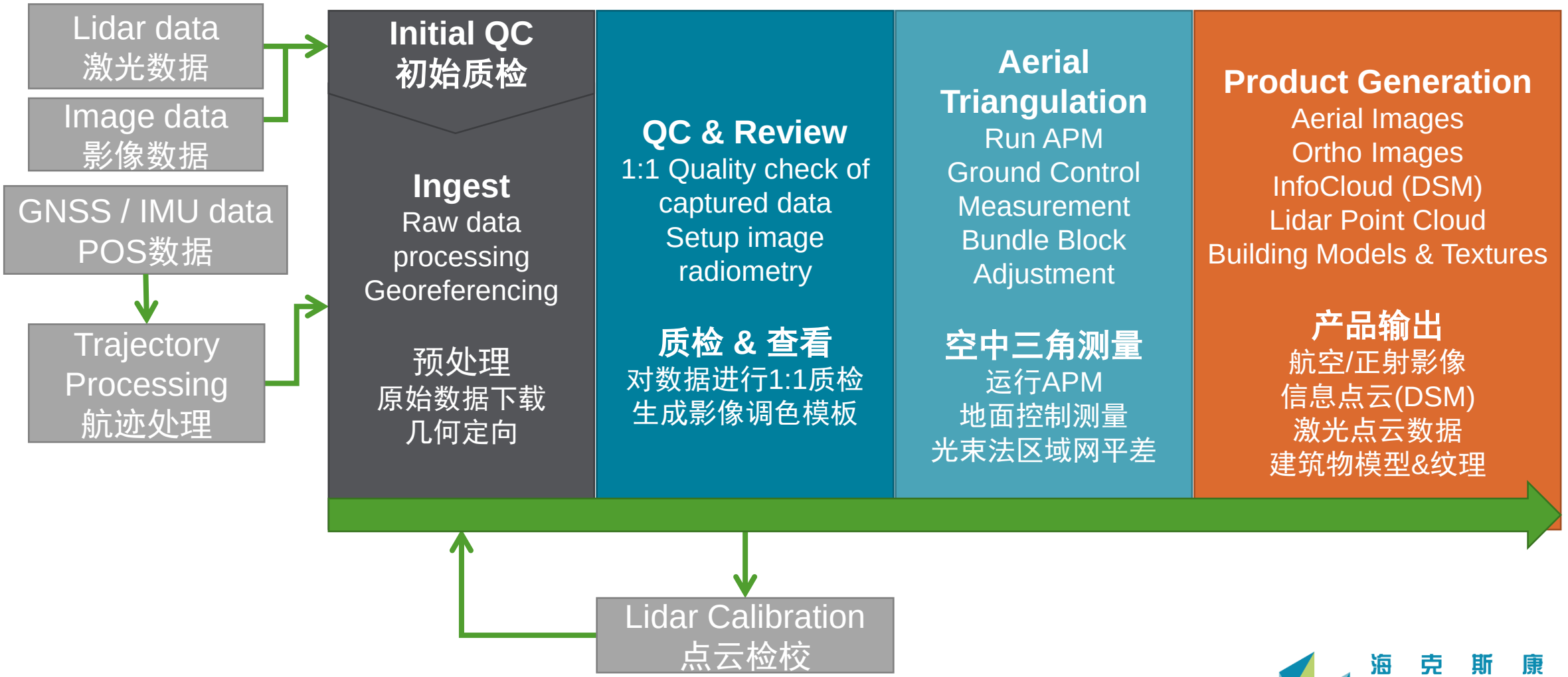
HxMap Solution Bundles
HxMap解决方案的功能模块

	RealCity	RealWorld	RealTerrain
Enabler 传感器模型支持	■	■	■
Provider 预处理模块	■	■	■
Core Image 影像核心处理模块	■	■	■
Core LiDAR 点云核心处理模块	■	□	■
3D Modeller 三维建模模块	■	□	□

General HxMap Workflow
HxMap工作流程



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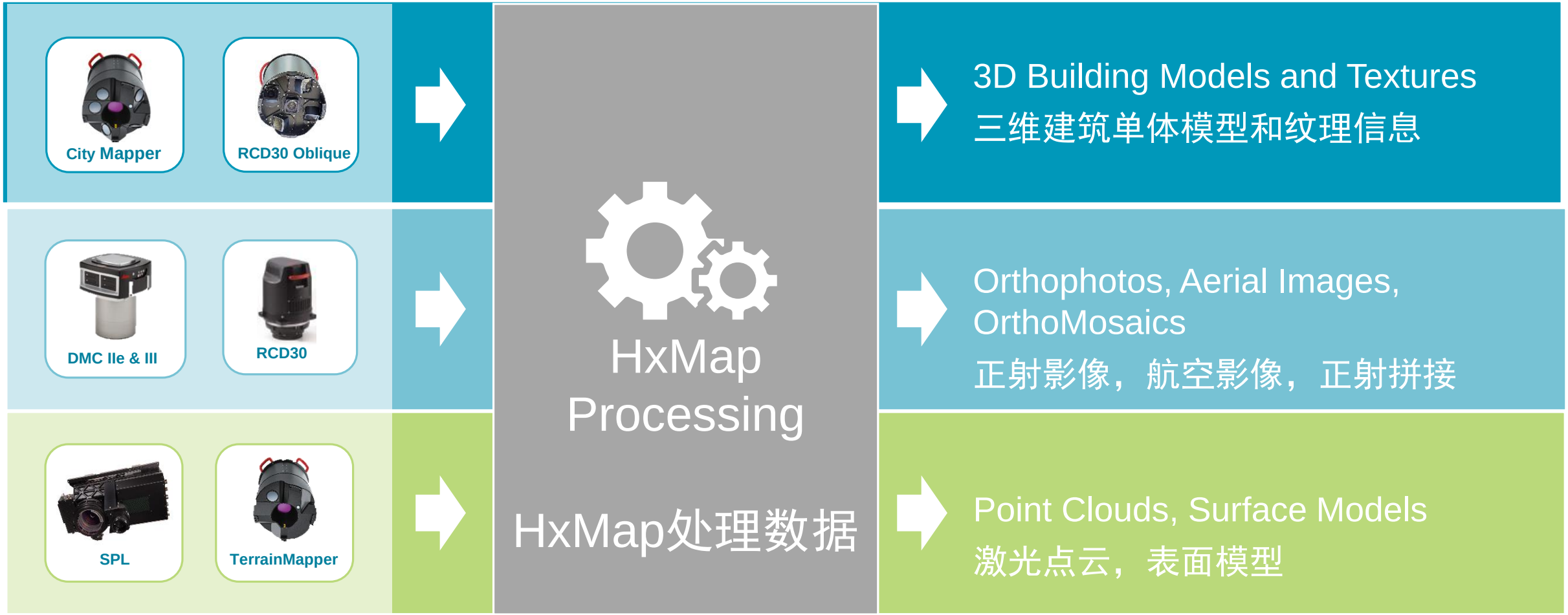
HxMap Infrastructure - 3 levels of compute optimizations
HxMap运行环境 – 3个层次的计算优化

1. HxMap performs **simultaneous instructions on multiple data**
   - This allows certain operations, such as per-pixel operations, to run many times faster by processing several pixels at once
2. HxMap is highly **multi-threaded** and where possible will consume all cores available in a system
3. To achieve higher throughput HxMap employs **distributed processing**
   - This allows multiple “jobs” to be run, in parallel, across multiple compute-nodes
   - Uses and open-source project by the University of Wisconsin called HTCondor which has proven to scale up to 10’000’s of thousands of nodes

1. HxMap可同时对多个数据执行处理命令
   - 允许例如：逐像素处理，可以同时处理多个像素从而使处理效率提升很多倍
2. HxMap运行需要多线程，在数据处理过程中可能会占用系统的所有内核
3. 为了获取较高的生产效率，HxMap采用分布式处理数据
   - 支持多个任务同时在多个节点机上计算运行
   - 采用威斯康辛大学的开源项目HTCondor，HTCondor已经被证实可支持增加到10000台节点机

Unified Processing Chain
统一的处理流程



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COWI

“HxMap has improved our processing speed for orthophotos **by 40%.** More improvement is to come by scaling up the cluster.”

“HxMap已经将生成正射影像的速度提升了40%。如果HxMap平台增加集群的数量，处理效率会提升更多。”

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HxMap - Economic advantage
HxMap – 经济的优势

- Immediate QC on raw data
  ➔ Assurance that data is ok
- Simultaneous and distributed processing
  ➔ High efficiency – needed for handling large datasets
- Fused data improves automatic modelling
  ➔ Reduced manual edits
- Improved accuracy of end product
  ➔ Increased customer satisfaction
- Fused workflow
  ➔ Less software tools, less training, less labor works

- 对原始数据快速质检
  ➔ 保证项目数据可用
- 高效分布式数据处理
  ➔ 高效率– 需要处理大量的数据
- 融合的数据提升完善了自动建模
  ➔ 减少人工修改工作量
- 提高终端产品的精度
  ➔提升了客户满意度
- 一体化工作流
  ➔ 减少使用的软件、培训、人工成本

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谢 谢

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