Global Earth Database Recommendations

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Agenda

The intent of this deck is to capture current status and recommendations for Phase 0 and Phase 1 deployments of ILP as it relates to database content both externally sourced and internally sourced

GRiDS and Partner Discussion

- Current Status
- Strategy
- Timeline

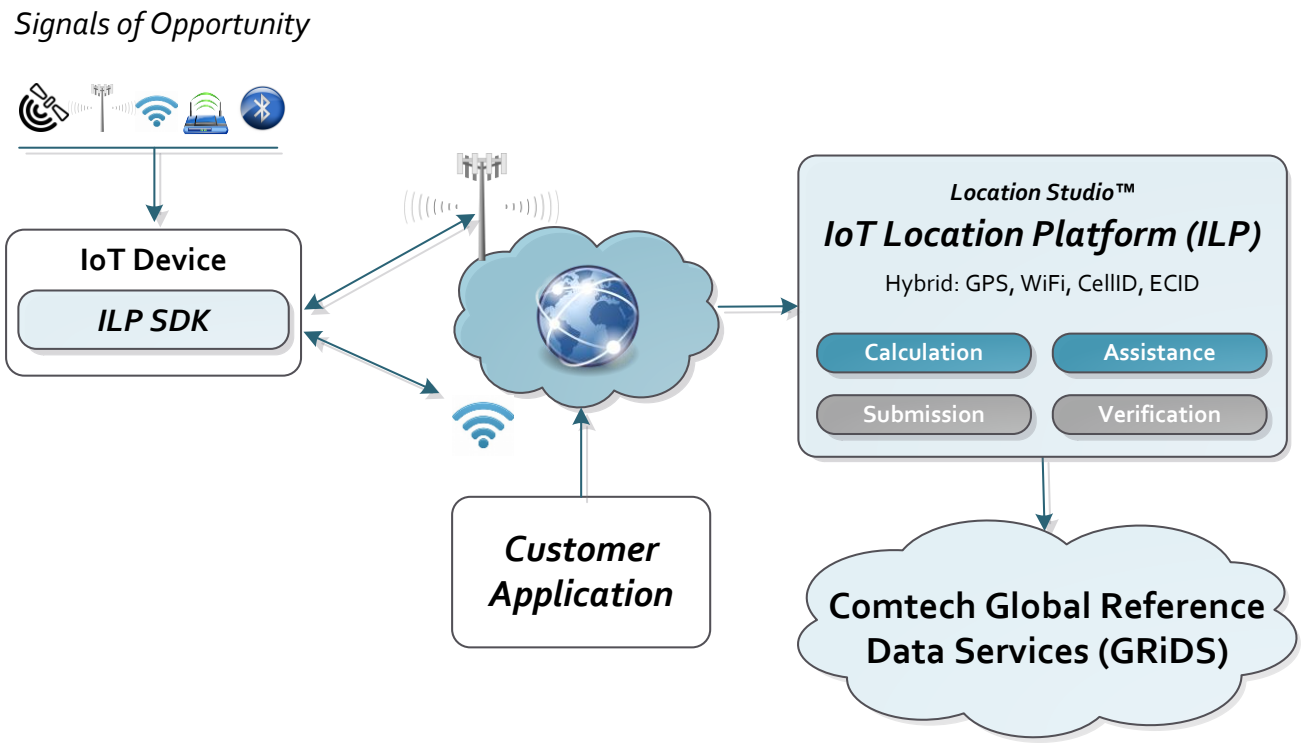
ILP Production Overview

- Status
- Phase 0
- Phase 1

GRIDS AND PARTNER DISCUSSION

Global Reference Data Services (GRiDS)

- Enables a wide-variety of positioning on a global scale when coupled with ILPS
- GRiDS Services include:
  - **Cell and WiFi Content** – cellular and WiFi databases from multiple sources including Comtech
  - **SLAM** – Comtech's HD content for indoor/outdoor positioning
  - GNSS Assistance – inclusive of extended ephemeris, broadcast updates, and standard assistance data for SET-Assisted and SET-Based call flows



The focus of this discussion is on cellular, WiFi, and SLAM content

ILP and Global Reference Data Services™ (GRiDS) Overview

ILPS

Provides Over-the-Top (OTT) hybrid position services

- Positioning
- Assistance
- Probe/Survey Submission

Key Components:

- Positioning Service
- Submission Service
- Callback Registrar

GRiDS

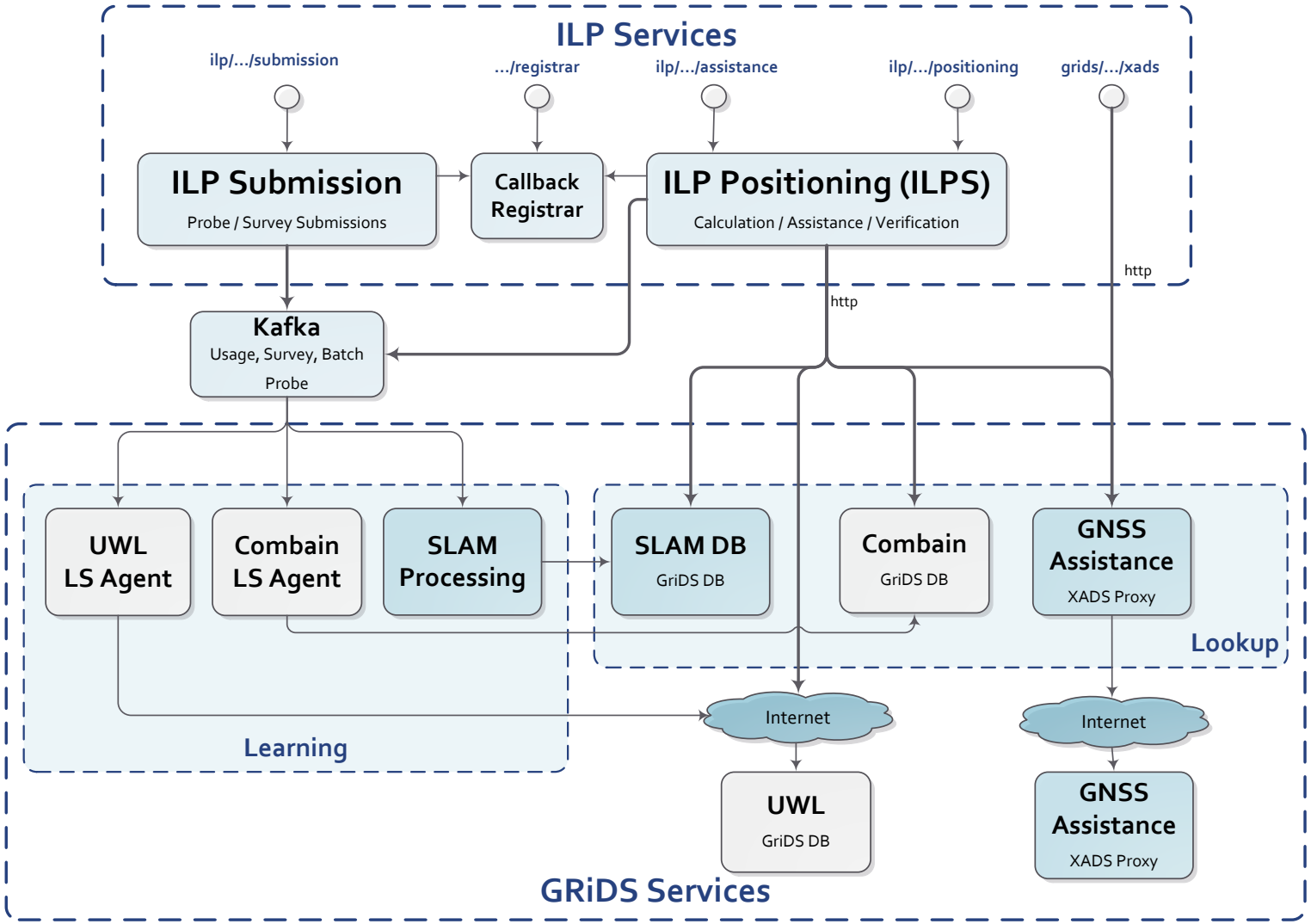
Provides the data lookup and learning functions

- Tightly integrated with ILP
- Extensible

Key Components:

- Learning Services – multiple configurations possible
  - SLAM
  - Combain
  - Unwired Labs
- Look-up Services – multiple configurations possible
  - SLAM
  - Combain
  - Unwired Labs

ILP and Global Reference Data Services™ (GRiDS) Architecture



Database Status: Focus on Cellular and WiFi Content

- Current Status
  - Two external service providers: Combain and Unwired Labs
  - Advantage:
    - Enables GE to offer specific services to customers with Global Coverage (e.g., Hisilicon)
  - Disadvantage:
    - Coverage in China may be poor

- Plan
  - Provide probe data to partner to grow coverage
  - Add SLAM processing and positioning; phased approach based on data analysis
    1. Add SLAM collection
    2. Add SLAM positioning

Database Status - Combain

Technical

- Regional solution in place with learning; content is a concern
- Need to crowd-source for system to grow
- Open to updates to and from global learning system
- Opportunity to pull-in eHi data

Current Deployment

- Look-up system deployed in China
- Learning system deployed in China
- No synching with global system occurs

Business

- GE has rights to use under current Comtech/Combain agreement
- Combain is ready to have discussions on contract moving forward
- Key points to resolve include:
  - Location of learning: local or online (pros & cons to each)
  - **Online decided on 10/10/17 (discussion w/Leon, Mike, Fred)**
  - Agreement on credit for providing probe data (through ILP, not direct)

Recommendation

- Need to agree on business terms
- Recommend transaction pricing until large deal in place
- Protects against contractual commitment if we assume ILP growth

Database Status – Unwired Labs

Technical

- Access to global content and global learning; latency a concern
- Opportunity for local system (e.g., Hisilicon) if needed

Current Deployment

- Look-up system is online
- Learning system is online
- All data is in synch

Business

- GE has rights to use under current Comtech/Unwired Labs agreement
- Unwired Labs is ready to have discussions on contract moving forward
- Key points do discuss:
  - Hisilicon deal: pricing in place, need formal agreement
  - Location of learning
  - Pricing

Recommendation

- Need to agree on business terms
- Recommend transaction pricing until large deal in place
- Protects against contractual commitment if we assume ILP growth

策略 (in English on following page)

在我们的SLAM正式启用之前，使用合作伙伴的方案；在SLAM启用之后，逐步减少其他方案。
合作伙伴的解决方案继续留用，成为战略客户的实时备选

Combain

- 查询
  - 数据本地化，达到低延迟的要求
- 自学习
  - 探测的数据来自于Combain微服务
  - **线上**
- 价钱
  - 交易量模式
  - 重新评估大客户价钱
- 查询优先权
  - 优先权决定于测试数据，价钱和战略关系

Unwired Labs

- 查询
  - 线上
  - 评估是否需要本地学习功能
- 自学习
  - 探测的数据来自于UWL自学习
  - 线上
- 价钱
  - 交易量模式
  - 重新评估大客户价钱
- 查询优先权
  - 优先权决定于测试数据，价钱和战略关系

SLAM

- 查询
  - 在工程和产品管理测试通过后，数据将上线
- 自学习
  - 探测的数据来自于SLAM ILP微服务
- 价钱 – 未确定
- 查询优先权
  - 在查询服务开始后，优先使用
  - 降低使用成本和对Combain/UWL的依靠

Strategy

Goal is to use partners until SLAM is ready

Once SLAM is ready, quickly reduce usage on partners

Retain partners indefinitely as "Hot" back-up and alternative solution for strategic customers

Combain

- Look-up
  - Local installation to meet latency requirements
- Learning
  - Probe data to be fed by ILP Combain micro-service
  - **Online**
- Pricing
  - Transaction model
  - Revisit with big customer
- Look-up Priority
  - Determine priority based on test data, pricing, and strategic relationship

Unwired Labs

- Look-up
  - Online
  - Evaluate if local learning is required
- Learning
  - Probe data to be fed by ILP UWL Learning Agent
  - Online
- Pricing
  - Transaction model
  - Revisit with big customer
- Look-up Priority
  - Determine priority based on test data, pricing, and strategic relationship

SLAM

- Look-up
  - Enable once data has been evaluated and product management/engineering ok
- Learning
  - Probe data to be fed by ILP SLAM micro-service
- Pricing – N/A
- Look-up Priority
  - Once Look-up is enabled, priority is first
  - Reduces use, cost, and dependency on Combain/UWL

Content Timeline

- Deployment
  - End of Oct, Phase 0 deployment
    - Supports AT&T and others
    - Local Combain Service, UWL backup
    - Probe data support via ILP Positioning (Combain)
  - End of Year, Phase 1 deployment
    - Supports Qualcomm, Hisilicon, Huawei, and others.
    - Probe data support (SLAM, Combain)
- Roadmap
  - End of August, Alpha SLAM POC - Deployed on test system
  - End of Oct, SLAM Survey Testing – on test system and possibly on Phase 0 also.
  - End of Year (EOY), production SLAM Probe Submission/Indoor location, deployed on Phase 1

ILP PRODUCTION OVERVIEW

Status

- Current System
  - Equivalent to Comtech's "Demo/Proof of Concept" system
  - Functional for validation, demonstrations, and functional testing
  - Used to test new ideas and features
  - Not to be used for commercial deployment

- Future: Production System
  - Comtech proposes phased approach
  - Phase 0: speedy production deployment to meet initial customer roll-outs
  - Phase 1: highly-scalable system to meet large scale customers

Phase 0

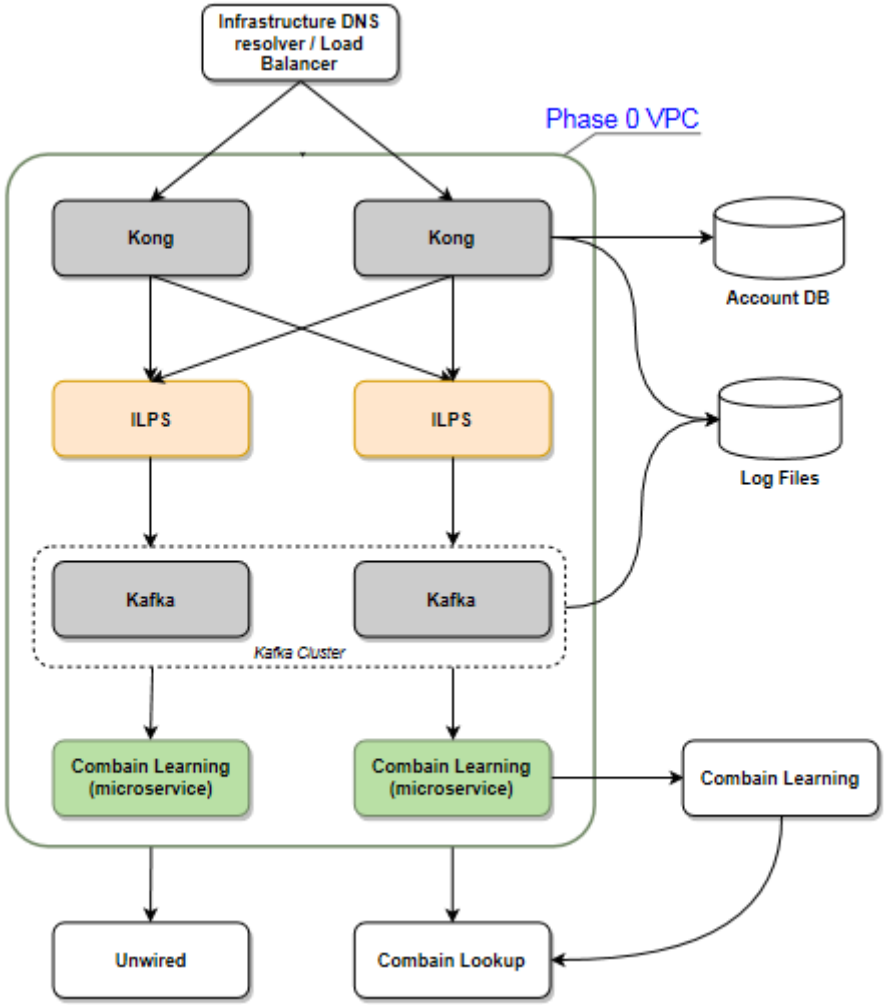
- Description
  - Initial production system GE can use to start onboarding the customers
  - Relieves customer pressure and provides time to roll-out full-scale commercial deployment

- Deployment
  - Expected to be deployed by GE resources with support from Comtech
  - Comtech to provide GE the design and configuration details.

- Schedule
  - Target end of October

- Gaps
  - Lack of expertise on Kafka cluster both with Comtech and GE is the biggest constraint for this phase
  - GE to hire Kafka expertise, it will be beneficial both short and long term

Phase 0 Architecture



Phase 1

- Description
  - Full production system with auto-scaling and high-availability
  - Includes ILP, initial SLAM release, and Combain Learning

- Deployment
  - Expected to be deployed by GE resources with support from Comtech
  - Comtech to provide GE the design and configuration details

- Schedule
  - US readiness: End of October
  - GE deployment : End of Year

- Gaps
  - Non-availability of resources to start work ASAP (at Comtech)
  - ILP and Combain Learning ready to make it prod-ready by end of October
  - Significant testing of SLAM required
  - GE to hire resources to aid in testing and deployment at GE

Proposed SaaS Architecture for Phase 1 Deployment