Global Locate Semiconductor Products

Topics

- *Company Overview*
- *Global Locate chipset advantages*
  - *Chipset architecture*
  - *Key advantages*
  - *Competitive comparisons*
- *Product Roadmap*
  - *Existing and future chipset products*
  - *Embedded IP migration path*
- *Global Locate IPR*
- *Summary*

Company Overview

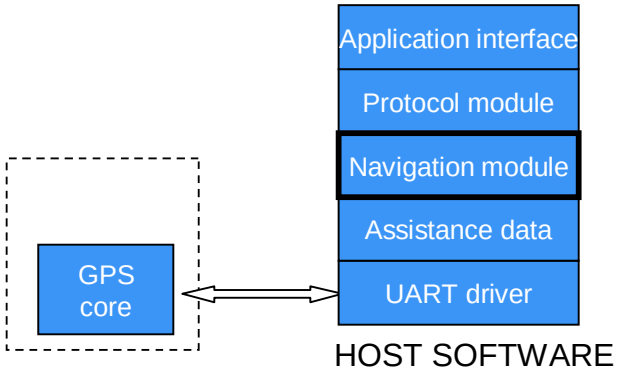
- *Founded in 1999, headquartered in San Jose, CA*
- *+70 employees*
- *Field offices in New Jersey, Tokyo, Madrid*
- *Business units*
  - *A-GPS Semiconductor Products*
  - *A-GPS Network Products and Services*
- *Largest revenue sources for 2005*
  - *Hewlett Packard: A-GPS chipset used in the iPAQ smartphone*
  - *Nextel: LBS and E911 A-GPS data services and servers*
- *Forecast revenue sources for 2006*
  - *GPRS handsets*
  - *UMTS handsets*
  - *Smartphones*
  - *GPS enabled cellular modems*
  - *Kid phones*
  - *E-911 and LBS AGPS Services*
  - *Hosted LBS services*
- *Partnership strategies*
  - *Reference design agreements with major wireless platform suppliers*
  - *OEM and Co-sale agreements with major network equipment vendors*
  - *End-to-End solution provider for LBS operators*

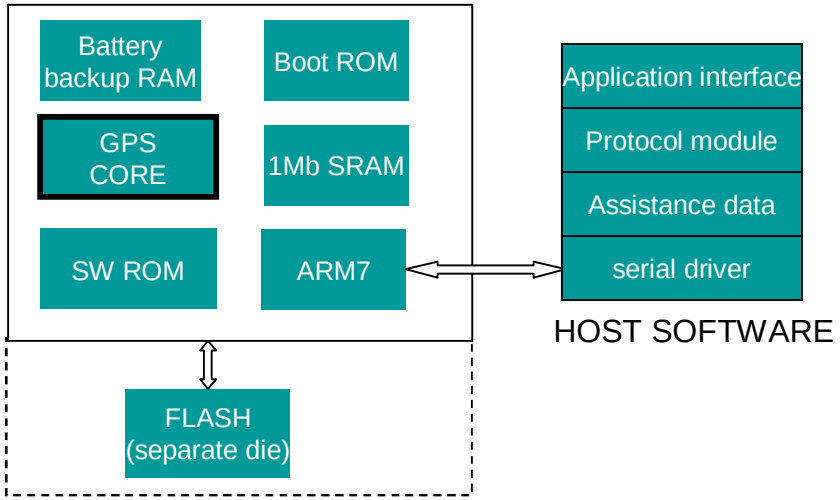
Semiconductor products
Key selection criteria

- ***Cost***
- ***Performance***
- ***Power Consumption***
- ***Size***
- ***Software Features***
- ***Time-to-Market***

Unique baseband processing architecture is lower cost than traditional GPS

Global Locate Architecture





Competitor System-On-Chip Architecture

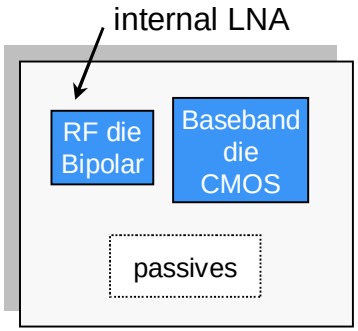
Less costly:

- ***Less silicon area at any process node***
- ***No external FLASH lowers BOM cost***
- ***No software ROM (masks not constantly changing)***
- ***Navigation module in host software leverages existing CPU resource***

Global Locate has the industry's most cost effective SIP solution

MantaRay System-in-Package GPS

53 PIN PFBGA



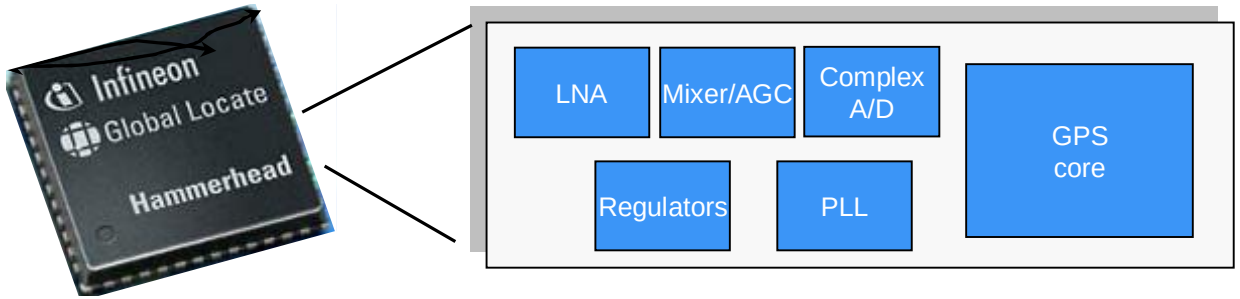
Compare competition

Sxxxxx: 3 die module with CMOS baseband, SiGe RF, and 4-MB FLASH. Reference design includes external LNA. 140 pin BGA.

Mxxxxx: 2 die module with SiGe RF/Baseband and FLASH. Reference design includes external LNA.

Global Locate is the only GPS supplier with single die RF-CMOS technology

Hammerhead Single Chip A-GPS Receiver



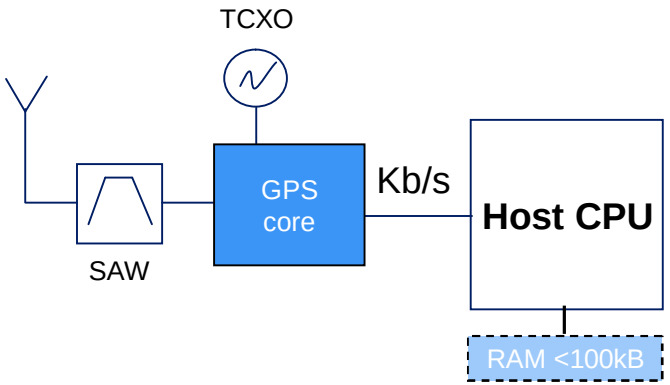
RF-CMOS process technology

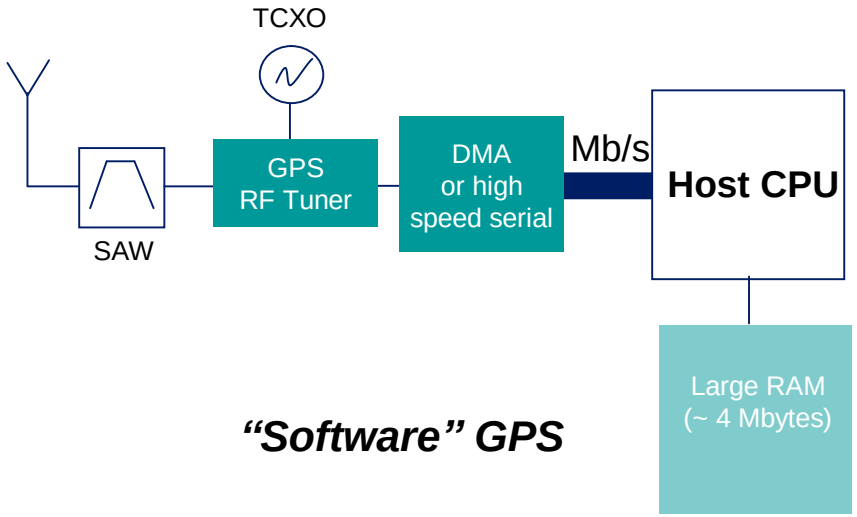
- ***proven for high volume wireless applications***
- ***more cost effective than SiGe***

Other competitors have no similar product

“Software” GPS is not realistic

Global Locate Architecture

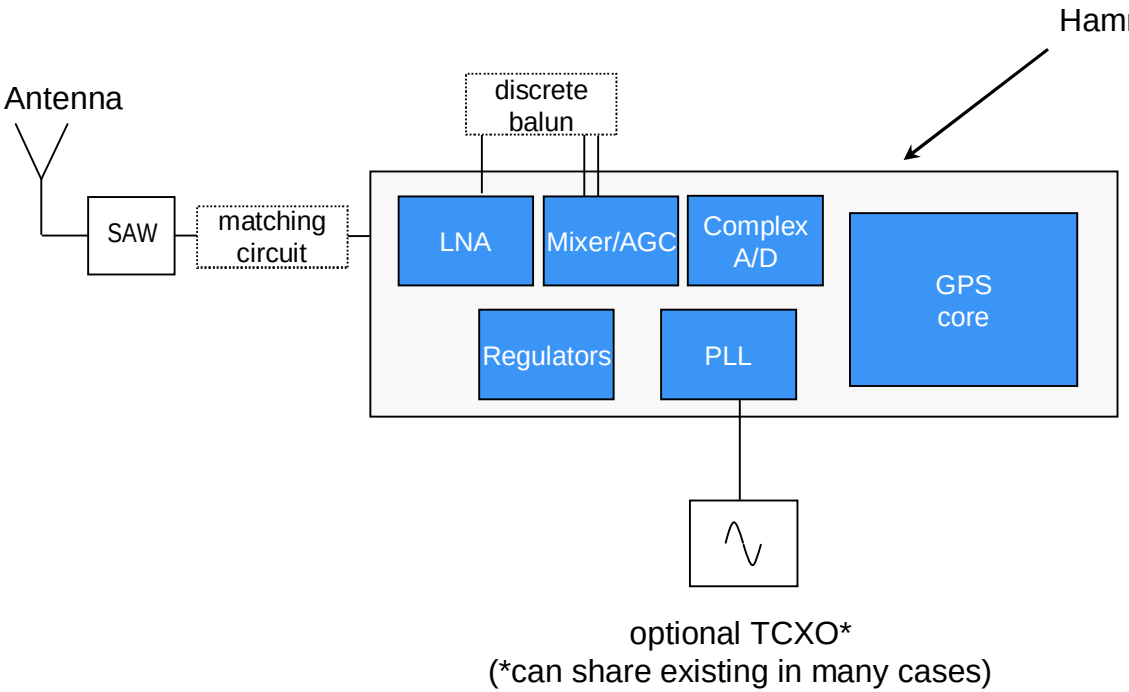




“Software” GPS

	Global Locate Architecture	*“Software” GPS*
Hardware required	Single chip RF-CMOS	Today: tuner + custom ASIC (could be single chip in the future), Large RAM
Output data rate	Kb/s	Mb/s
Host software	Non real time (<3MIPS)	Real time interrupt driven, processor intensive (>200Mips) Must run simultaneously with graphics intensive navigation apps
Performance	State-of-the-art	Inadequate

Handset-optimized architecture minimizes BOM costs



Miscellaneous parts cost

Component	Est. Cost
Capacitors	$0.02
Inductors	$0.08
SAW	$0.24
	$0.34
TCXO*	$1.05
Antenna	$0.35
Total misc. parts cost	**$1.74**

Semiconductor products
Key selection criteria

Cost

Performance

Power Consumption

Size

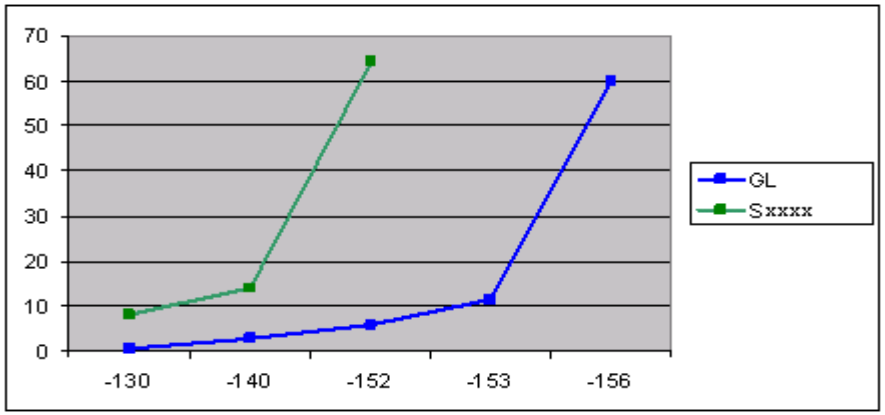
Software Features

Time-to-Market

Global Locate leads the industry in performance. Example: assisted cold start versus Sxxxxx

Median Time to Fix versus Signal Strength (all satellites at equal power)

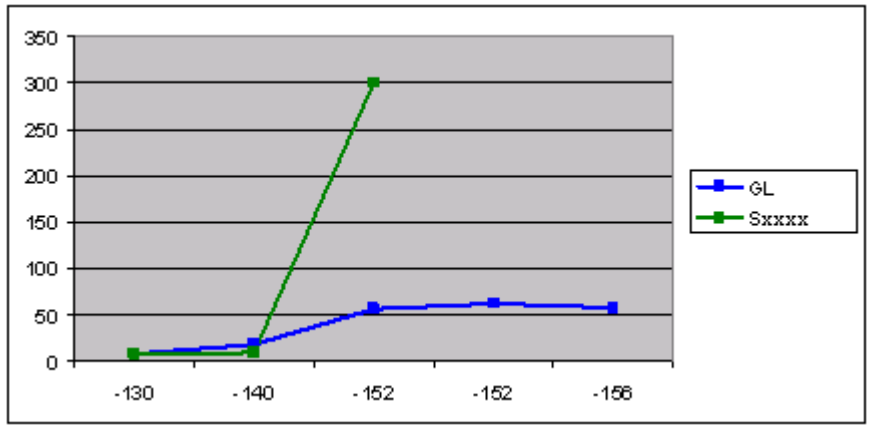
no fix below -152dBm



FASTER

95% Accuracy in meters (all satellites at equal power)

MORE ACCURATE



Global Locate chipsets excel in navigation applications

Global Locate enhanced sensitivity provides a better user experience
Example: continuing to track signals while stopped under an overpass

compare Sxxxx

Global Locate performance greatly exceeds 3GPP performance standards

Performance in Standardized Tests, MS-based mode
Independent Cold Starts with Assistance Data

Test	TTFF (median)	Accuracy 67%	Accuracy 95%
Accuracy Test	**2s** (20s)	**4m**	**8m** (30m)
Sensitivity Test (coarse time)	**4s** (16s)	**15m**	**31m** (100m)

3GPP Minimum Requirements shown in (grey)
Global Locate performance shown in blue

Semiconductor products
Key selection criteria

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Performance

Power Consumption

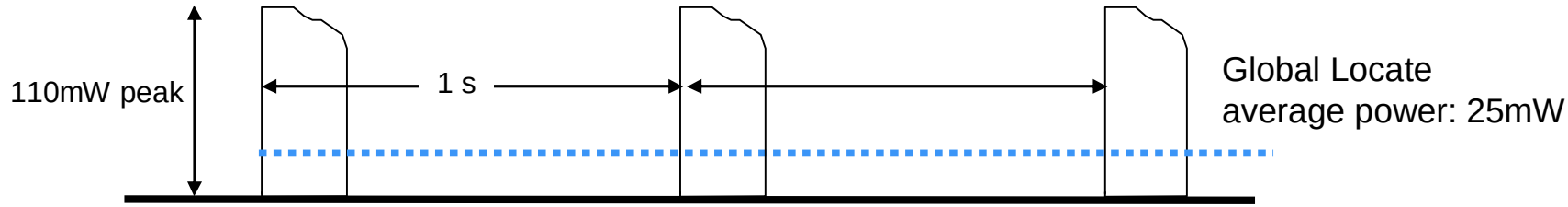
Size

Software Features

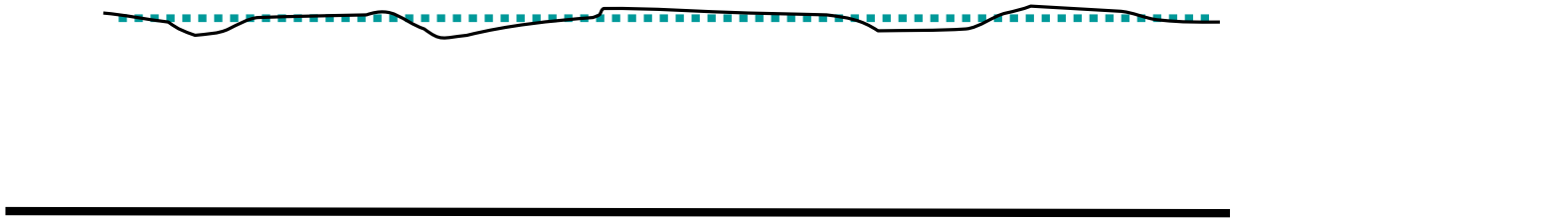
Time-to-Market

Global Locate direct measurement technology results in low power consumption

At one second position update rate, Global Locate chipsets consume 75% lower average power due to direct measurement technology

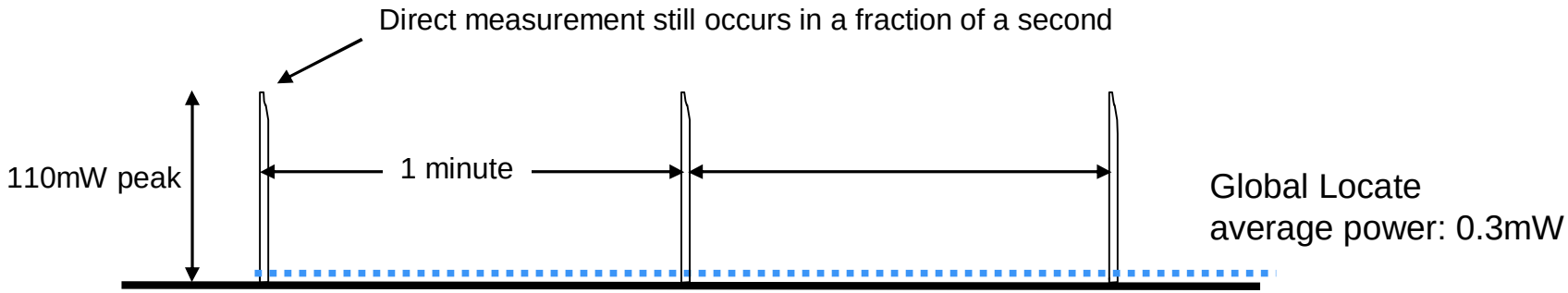


While all identified competitor's chips use continuously running tracking loops



For less frequent fixes the effect is even more dramatic

At one minute position update rate, Global Locate chipsets consume 97% lower average power due to direct measurement technology



While the competitor's chips typically require 6 seconds to reacquire

Careful IC design provides low standby current

- ***Standby current for Global Locate chipsets is 1µW***
  - ***Compare Sxxxx @ 0.75mW***
  - ***Crucial parameter for phones and other devices that remain in standby for long periods***

Semiconductor products
Key selection criteria

Cost

Performance

Power Consumption

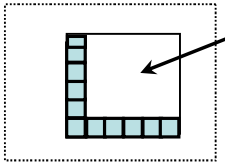
Size

Software Features

Time-to-Market

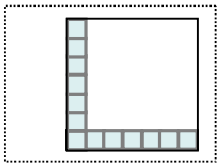
Industry leading footprint

MantaRay SIP



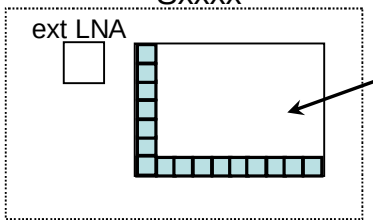
2 die inside: RF + digital
Internal LNA
6.5x5.5mm package
typical board space 75mm²

Hammerhead



Single chip GPS
Internal LNA
7x7mm package
typical board space 75mm²

Sxxxx



3 die inside: RF + digital + 4Mb FLASH
7 x 10mm package
External LNA required
typical board space 140mm²

Semiconductor products
Key selection criteria

Cost

Performance

Power Consumption

Size

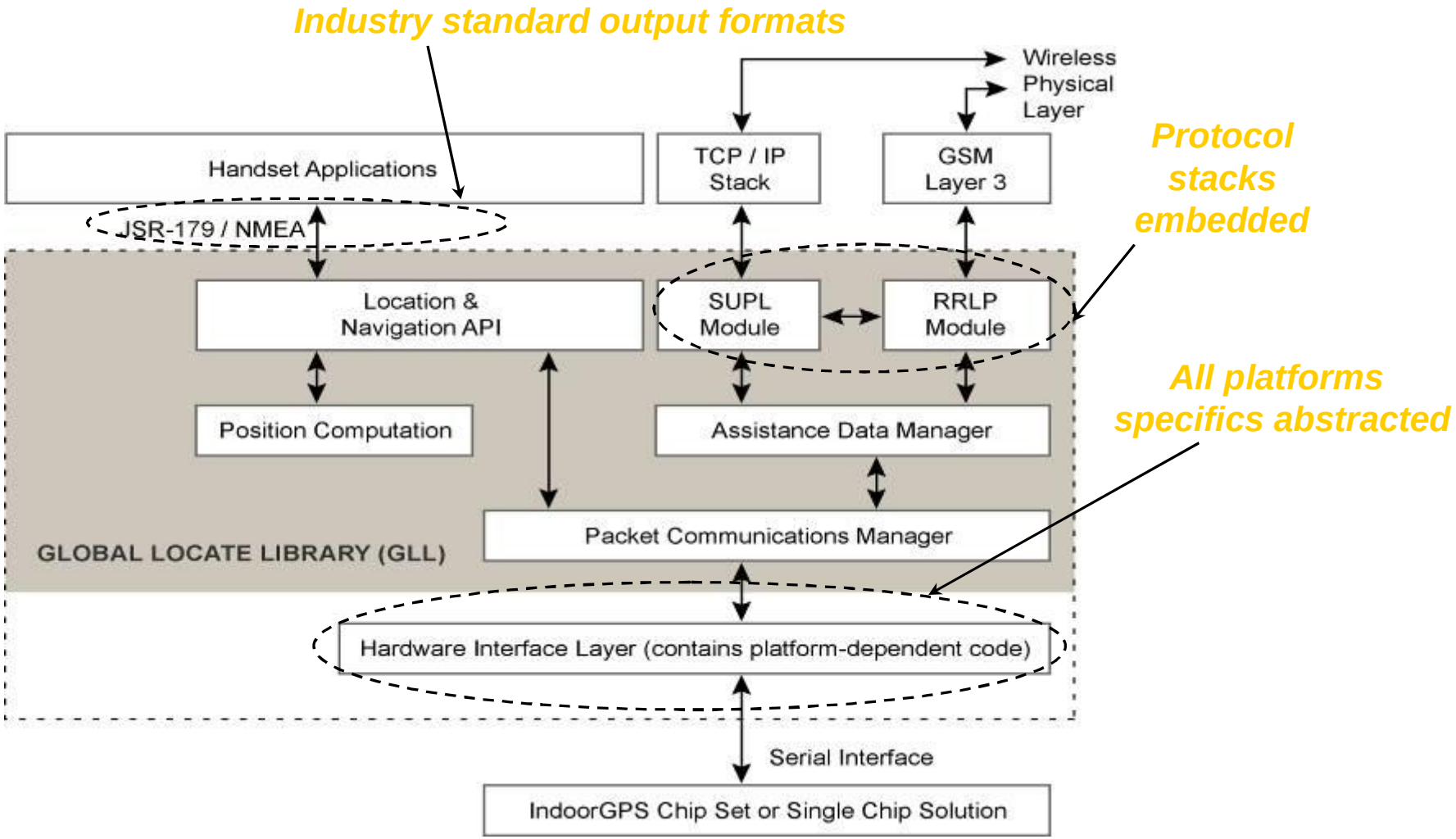
Software Features

Time-to-Market

Global Locate software is the most comprehensive in the industry

- *All operating modes supported*
  - *Autonomous*
  - *Ephemeris-only Aiding*
  - *Long-term-orbit (LTO = Multi-day ephemeris aiding)*
  - *MS-Assisted*
  - *MS-Based*
- *Optimized for all usage models*
  - *Rapid first fix in the broadest range of environments*
  - *Accurate real time navigation*
  - *Super low power periodic tracking*
  - *Meets 3GPP and FOMA (Japan) industry requirements*
- *Protocol stacks embedded*
  - *SUPL: network initiated/set initiated*
  - *C-Plane: RRLP and RRC message support*
  - *Interoperability proven with every major network equipment vendor!*
- *Platform independent performance*
  - *Tolerates serial and task latency (as opposed to real-time processing)*
  - *Portable to any embedded processor with or without a standard OS*
  - *SDKs available for Pocket PC, Symbian, Linux*

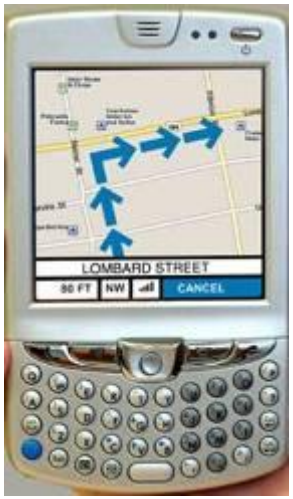
Software Architecture



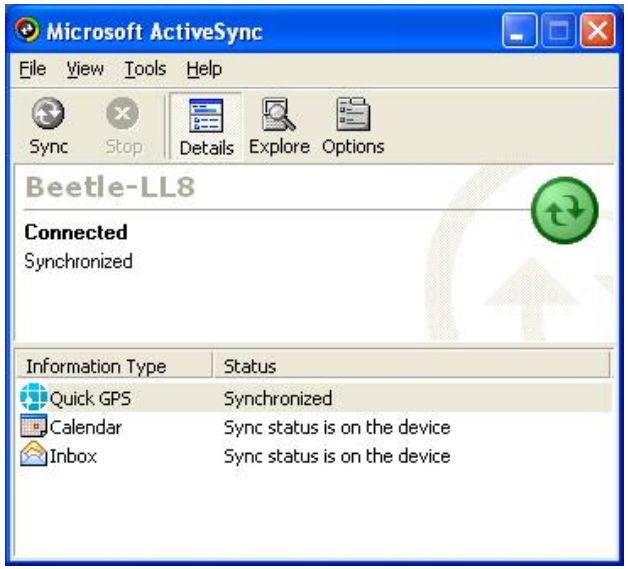
Ephemeris-only Aiding and LTO

- ***Ephemeris-only Aiding***
  - ***Unlike MS-based, network server does not provide initial position***
  - ***GPS software optimizes search around last known position but is robust to travel***
- ***Long Term Orbit Aiding***
  - ***Global Locate WWRN provides multi-day ephemeris files***
  - ***Perfect for occasionally connected devices***
  - ***Unique, patented feature***
- ***These modes operate independently from operator infrastructure, over any wireless IP bearer***

LTO Benefits in practice



LTO synchronizes from your desktop PC



or over GPRS/EDGE

Benefit of LTO:

Time to fix is seconds versus one minute or more

Availability is extended to tough environments and indoors

Semiconductor products
Key selection criteria

Cost

Performance

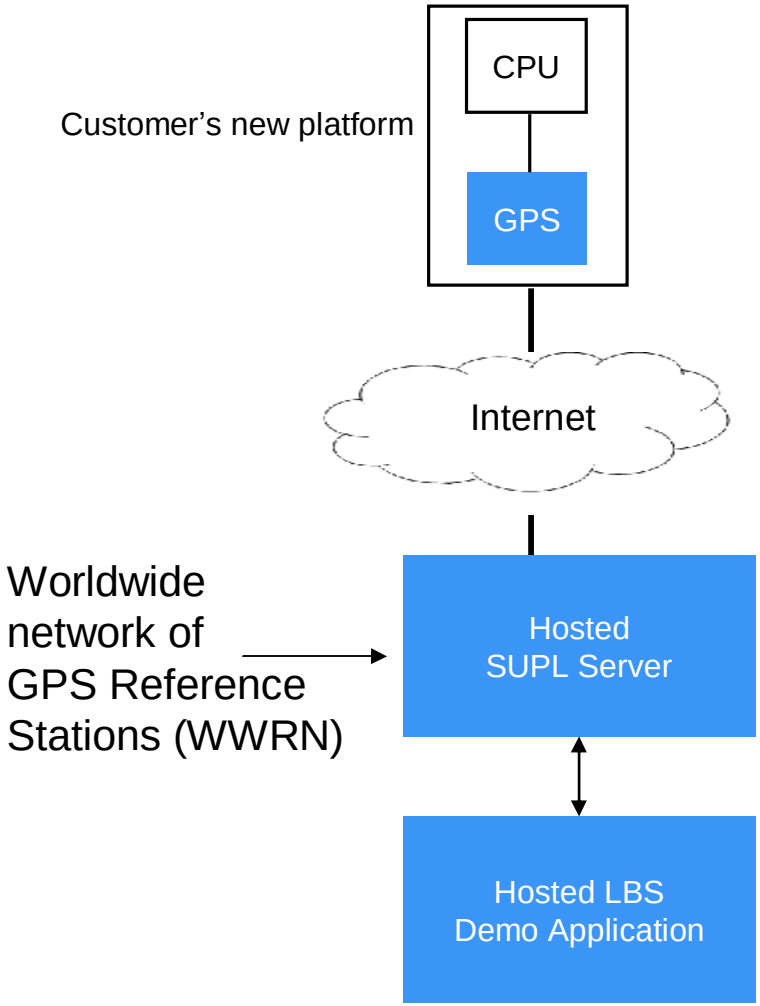
Power Consumption

Size

Software Features

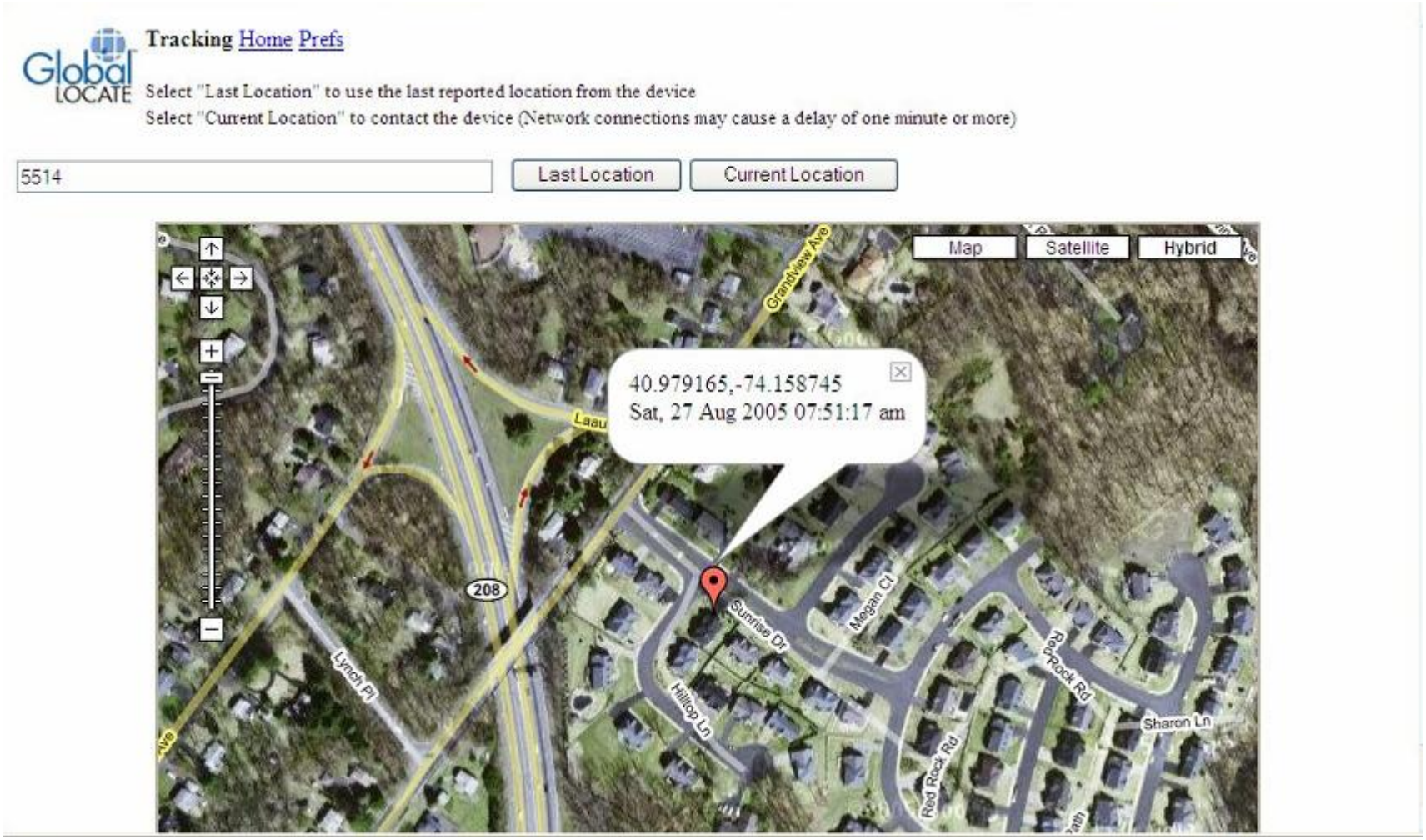
Time-to-Market

End-to-End Development Support



- ***WWRN has worldwide coverage***
  - ***develop or demonstrate anywhere in the world***
  - ***Servers hosted in Global Locate data centers***
  - ***99.999% uptime***
  - ***24x7 support***
- ***G-Map LBS Demo application***
  - ***network initiated call flows***
  - ***tracking application***
  - ***street map and earth images***
- ***All free of charge during the development phase***

G-Map LBS Demo Application



Global Locate FAE Support

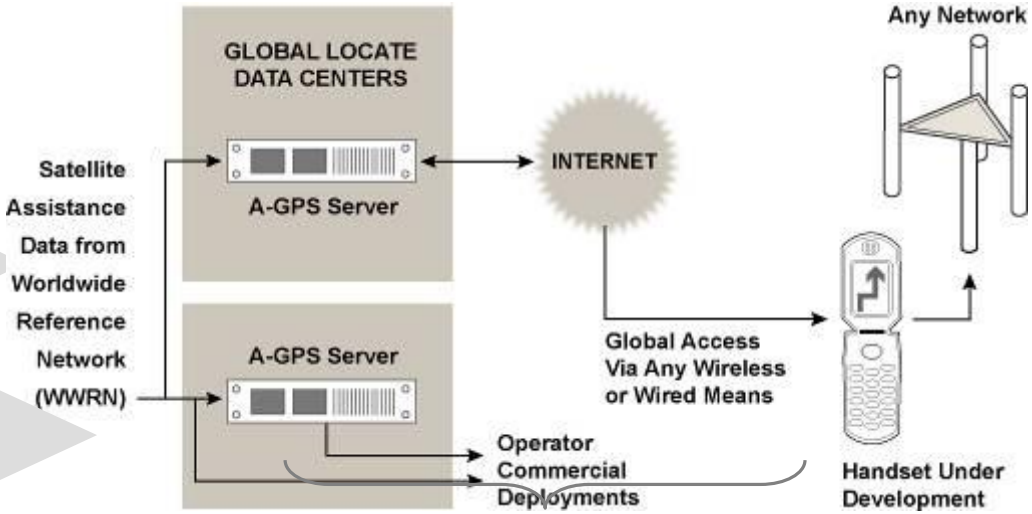
- ***3 Support centers: San Jose, Madrid, Tokyo***

Integration Support

GL supplies GLL and sample application ported to customer platform

GL FAE and customer cooperate to create platform interface layer

GL hardware engineers work with customer to verify system sensitivity



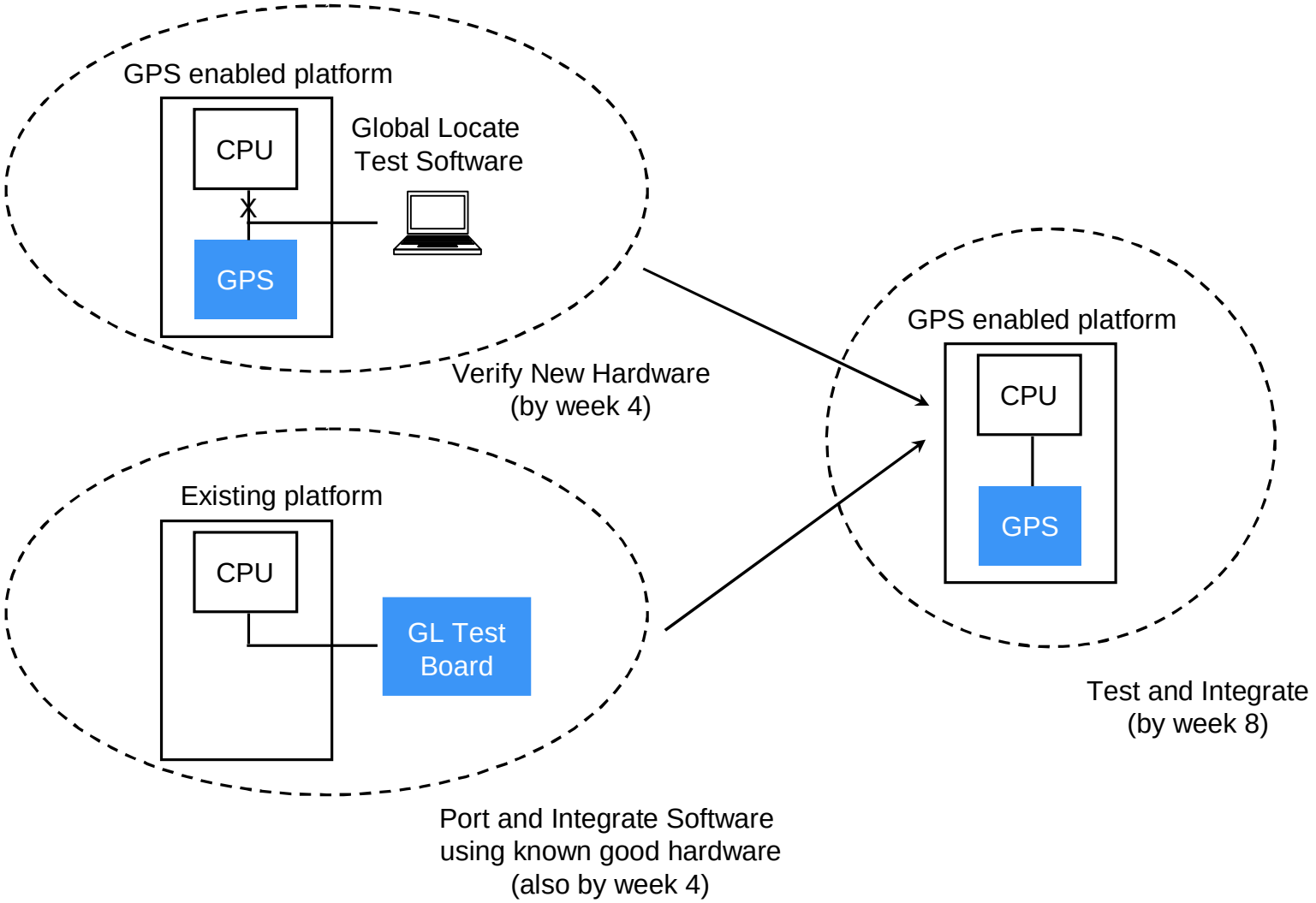
FAE/customer make target system ready to use with GL SUPL Server

Customer can perform U-plane field trials anywhere in the world (independent from operator)

GL FAE facilitates C-plane IOT test with SMLC vendor(s)

Customer ready for C-plane + U-plane operator trials

Typical Integration Project Flow



Integration Myth

- ***Myth**: system-on-chip solutions are easier to integrate*
- ***Truth**: this is true only for the case of pure autonomous GPS. For assisted GPS host software is required*
- ***Wisdom**: Choose a GPS supplier where the necessary software features are proven and integrated into an easy-to-integrate host library (Global Locate)*

Semiconductor products Summary

Cost

- ***superior architecture at any process node***
- ***smallest SIP***
- ***only RF CMOS single-chip GPS***

Performance

- ***best TTFF and accuracy***

Power Consumption

- ***direct measurement technology dramatically lowers average power***

Size

- ***smallest board footprint***

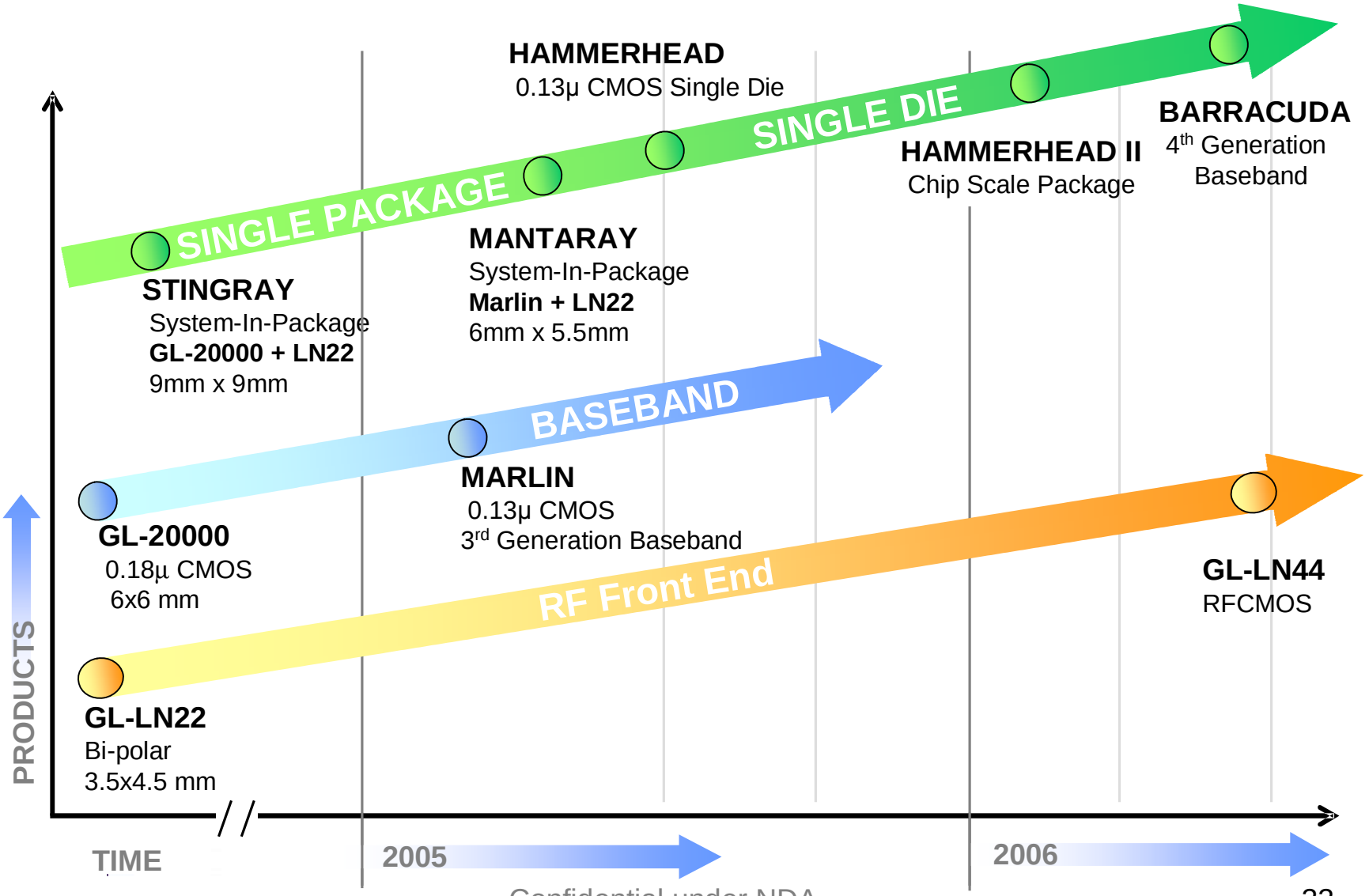
Software Features

- ***supports autonomous, ephemeris-only, and LTO***
- ***equally suited for navigation, tracking, and push-to-fix***
- ***C-Plane/U-Plane protocol stacks built-in***

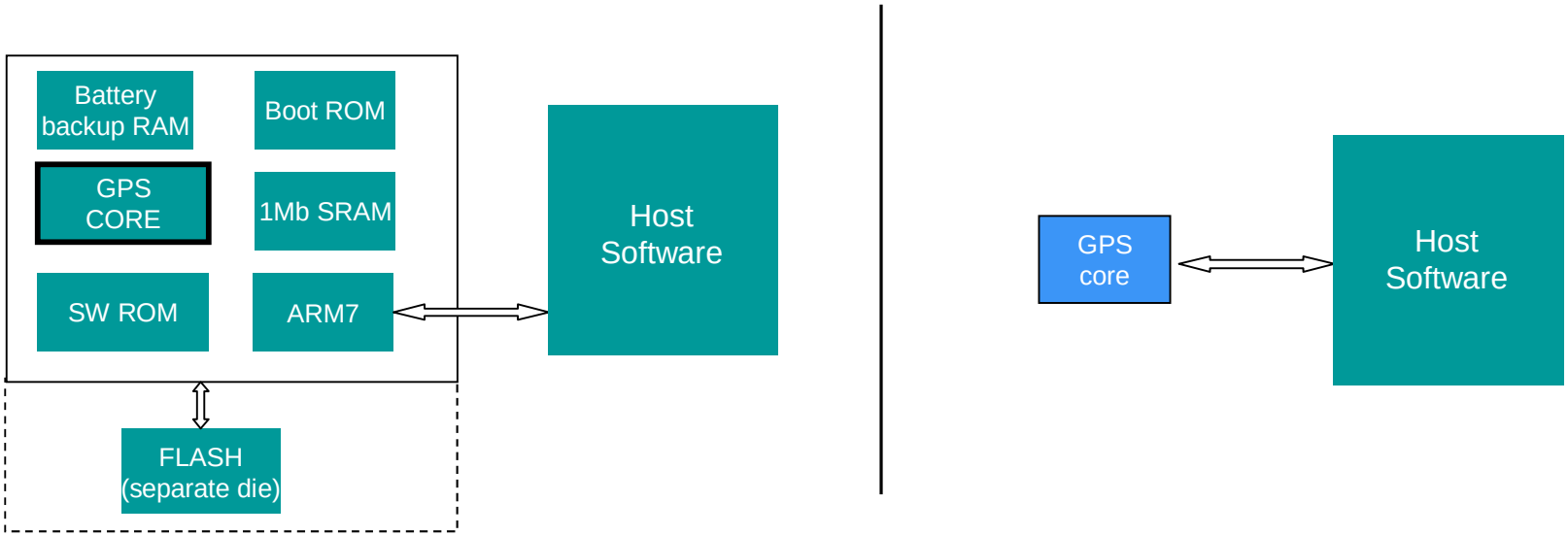
Time-to-Market

- ***worldwide demo support includes WWRN and LBS application***
- ***global FAE staff***
- ***proven interoperability of protocol stacks***

Product Roadmap



Global Locate architecture offers the easiest path to an embedded IP solution



	Competitor (SOC)	*Global Locate Architecture*
Scope of software effort	The ARM7 code (FLASH and SW ROM) must be moved to the customer IC.	None. Host software is unchanged from the discrete chip solution.
Scope of hardware effort	In addition to the GPS core a dedicated ARM7(FLASH/RAM) must be added to the customer IC. The GPS software is real time software and can't easily share an existing CPU.	Only the GPS core hardware function needs to be added.

Global Locate has an extensive, relevant and growing patent portfolio

- *129 Patent Applications filed*
  - *29 Patents issued or allowed covering*

WWRN:	***Wide area reference network for A-GPS data***
Long Term Orbit:	***Ephemeris several hours or days in advance***
Parallel correlation:	***Direct measurement technology***
GPS Time Solution:	***Solving for position without decoding TOW***
Terrain Model:	***Altitude Assistance for A-GPS***
MS-Based Operation:	***Utilizing ephemeris to enhance sensitivity***

  - *Many patents have priority back to 1999*
  - *52 Patent Applications identified as essential IPr under OMA*
- *Global Locate has conducted a complete infringement analysis*
  - *Global Locate technology requires no 3rd party licenses*

Summary

- ***Global Locate has the broadest end-to-end system knowledge when compared to GPS competitors***
- ***Global Locate products are highly competitive in terms of cost, size, performance, and power consumption***
- ***Global Locate has the most advanced and complete software library***
- ***Global Locate product roadmap includes improved single chip offerings and embedded IP***
- ***Global Locate has an extensive patent portfolio and the technology does not require any 3rd party licenses***