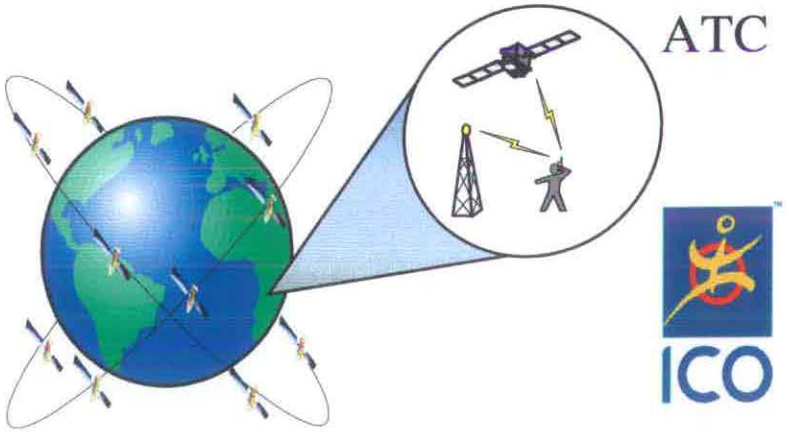
An Integrated Global Communications System

ICO

ICO System with Ancillary Terrestrial Component (ATC)

- ICO is a commercial, global mobile satellite system with significant global applications
  - Worldwide priority to an unprecedented amount of spectrum
  - Ubiquitous coverage (pole-to-pole)
  - Secure IP-based mobile voice and data services
- Compelling portfolio of services delivered through the ICO user terminals; handheld, vehicle, aircraft and maritime devices

- Global terrestrial network
  - 12 satellite access nodes ("SANs") connected by ICONET
  - IP-based system architecture
  - Network Management Center (NMC) located in England and redundant NOC located in US control both satellite and ATC network



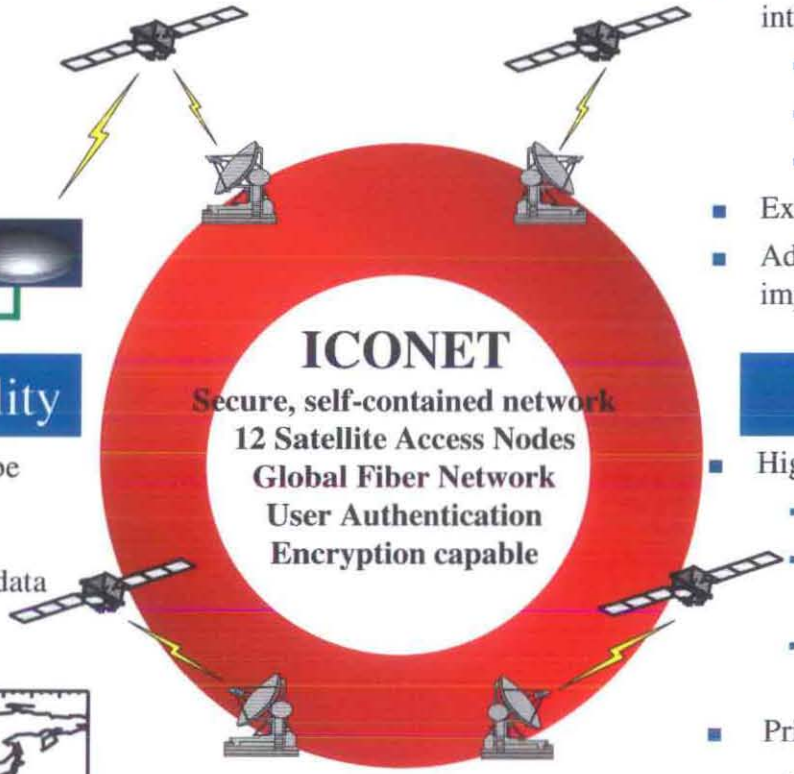
- Medium Earth Orbit (MEO) space segment

Number of Satellites:	12 operational
	2 planes x 6 (plus 2 spares)
Orbit:	10,355km
Frequency Bands (S band):	1985-2015 MHz uplink
	2170-2200 MHz downlink
Frequency Bands (feeder links):	5150-5250 MHz uplink
	6975-7075 MHz downlink

ICO Technology Benefits

Soft Switch Packet Architecture

- Flexible IP-based architecture
- Simultaneous data and voice to the user
- Flexible framing format
- Rapid initiation of virtual circuits

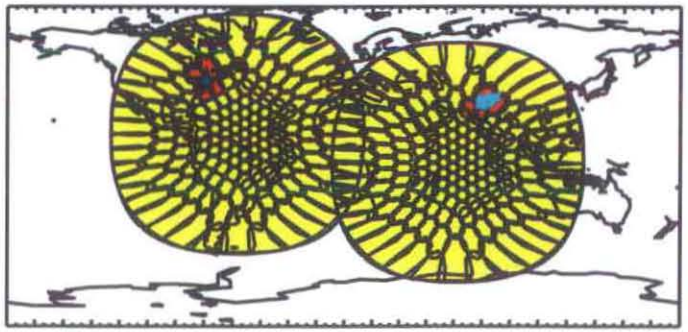


Satellite Modifications

- Satellite hardening to mitigate terrestrial interference
  - High power troposcatter
  - S-band Radar
  - Medium power fixed service link
- Extended dynamic range on payload
- Additional filters for improved performance

Power & Channel Flexibility

- System capacity (spectrum & power) can be rapidly reallocated within footprints and focused into specific cells
- Increased link margin (~10 dB) & greater data throughput with added error correction & power

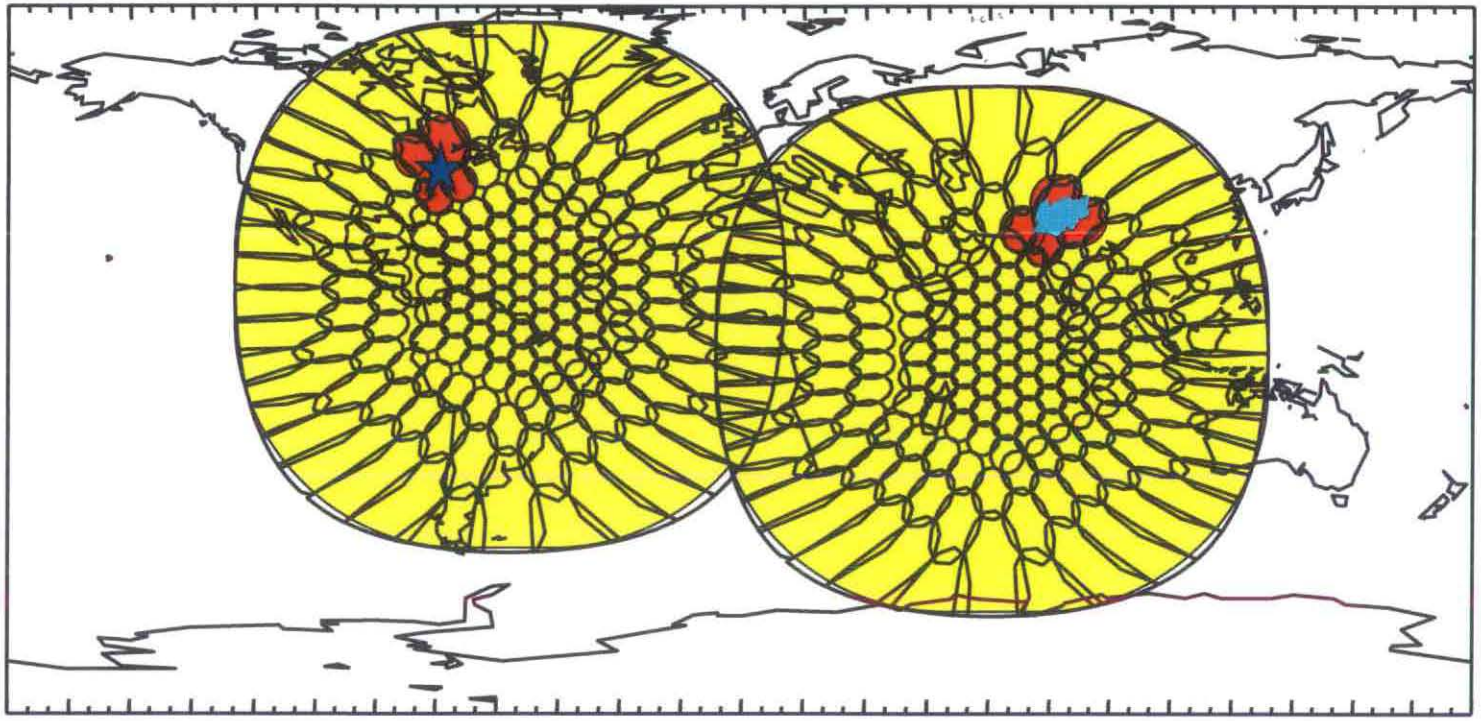


Access & Control

- Higher Availability
  - Multiple satellites in view 70% of time
  - Dynamic satellite selection improves availability
  - High altitude inclined orbit provides high look angles
- Priority Access
  - Dynamically prioritize users
  - Pre-emption capability

Hot Spot High Capacity Coverage

(max service at selected locations but still cover other areas)



80 channels per spot beam at or near hot spots
(1200 kHz or ~ 12 Mbps at hot spots)

1 channel per spot beam
(150 kHz or ~ 150 kbps other spot beams)

Hot Spots Can Be Covered ANYWHERE on the Planet Quickly

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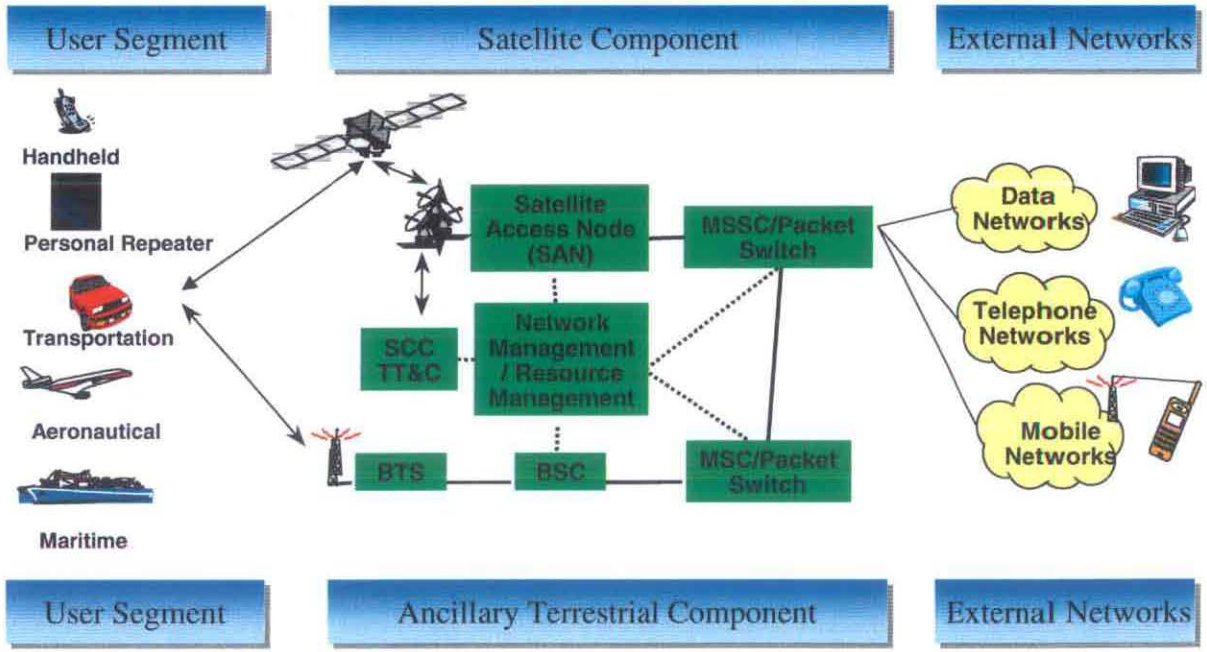
Moving Satellites to an Integrated Platform with Ancillary Terrestrial Component (ATC)

What is ATC?

- Integrates satellite & terrestrial networks
  - Allows satellite and terrestrial systems to utilize same frequency
  - Allows for dynamic frequency assignment on real / semi-real time basis based on requirement



Why is ATC needed?

- Revive MSS industry, which has many potential benefits:
  - Extension of robust wireless services to rural and under-served areas on a global basis
  - Augmentation of existing public safety, homeland defense, emergency service and military systems

What are the benefits of ATC?

- ATC will expand wireless communications services
  - Extend MSS availability to indoor and urban environments
  - Efficient usage of satellite spectrum in areas where it would otherwise remain unused

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Building the Communication Platform of the Future with ATC

- Integrated satellite and terrestrial networks provide flexible, truly global connectivity capable of supporting diverse communication platforms
  - Satellite – fixed – cellular – LAN & WAN networks
- Coordination of disparate communication networks on a secure platform
- IP transport to the device allows management of user access & availability
  - On-the-fly ability to establish and manage communication groups
  - Priority access by selected users
  - Preemption capability by selected users
- Adjustable spot beams and variable satellite power permits dynamic capacity allocation in regions where and when needed
  - Homeland Defense – Natural Disaster – Military Conflict
- Security maintained by self-managed network module which is integrated into the ICO service management platform

Without ATC, it remains a stove-pipe satellite world

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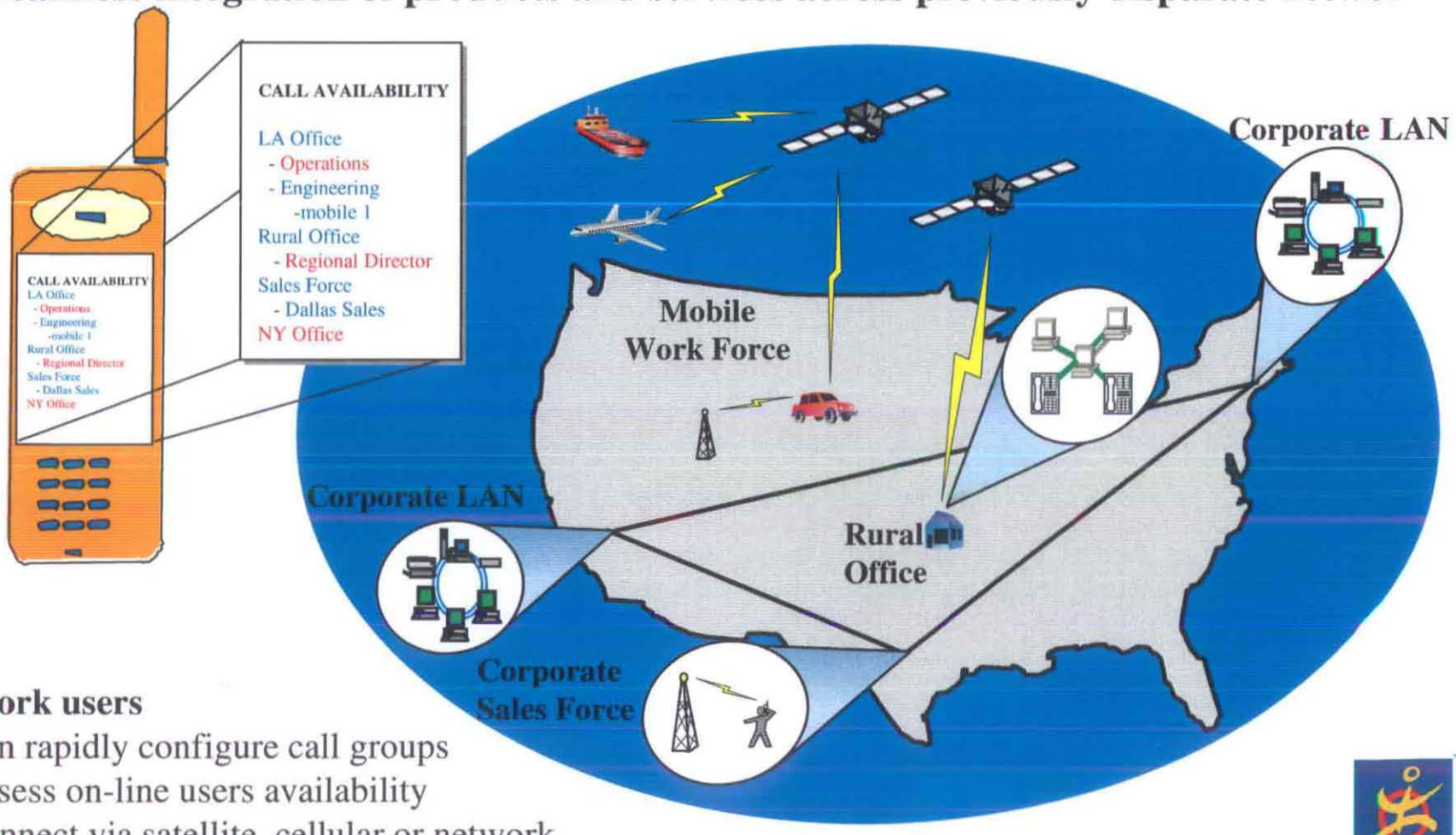
Integrated, Global IP Connectivity with ATC

Seamless integration of products and services across previously disparate networks



Network users

- Can rapidly configure call groups
- Assess on-line users availability
- Connect via satellite, cellular or network
- Roam between satellite and cellular with same device
- Simultaneous use of voice and data services

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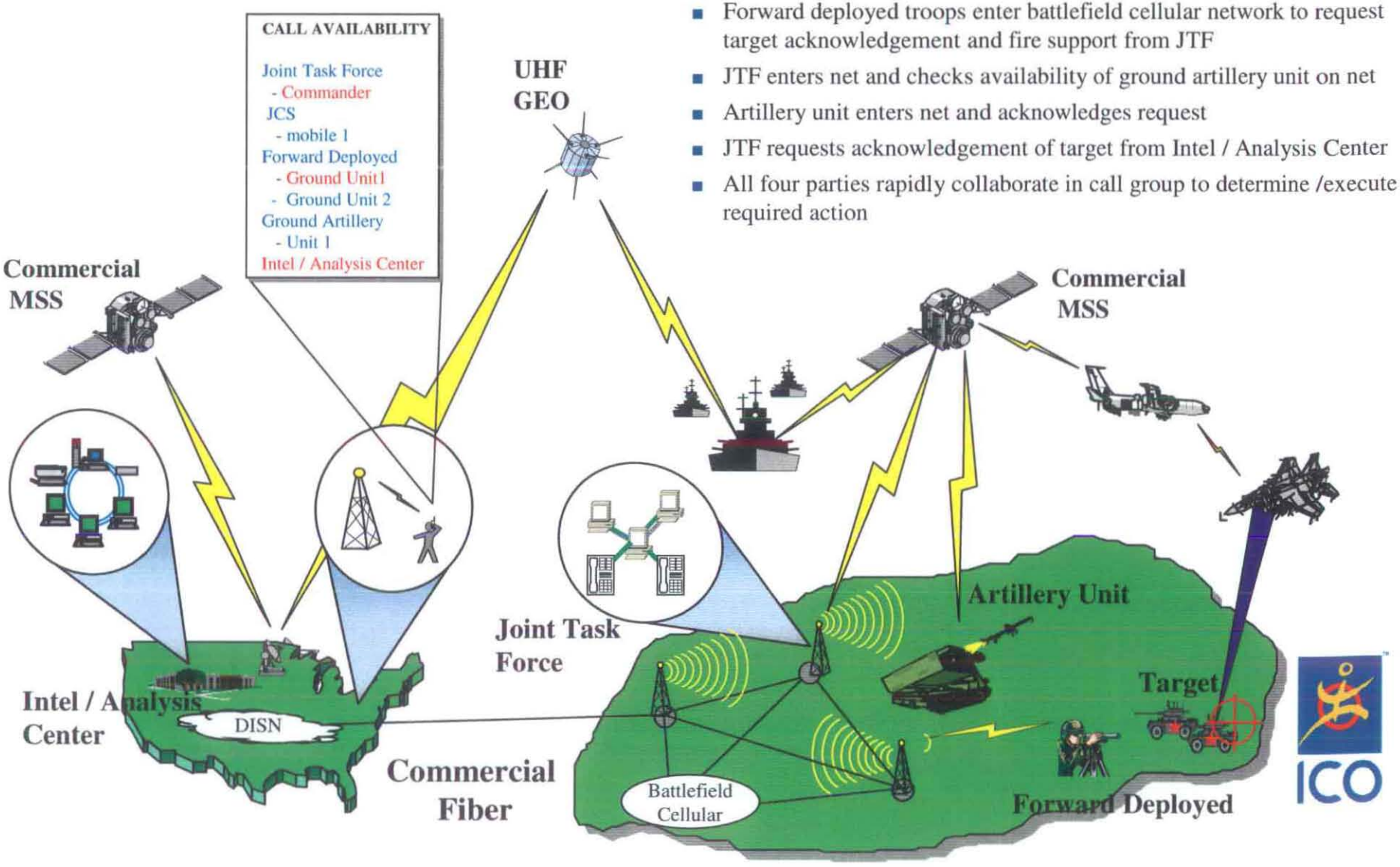
Capitalize on the Commercial Investment

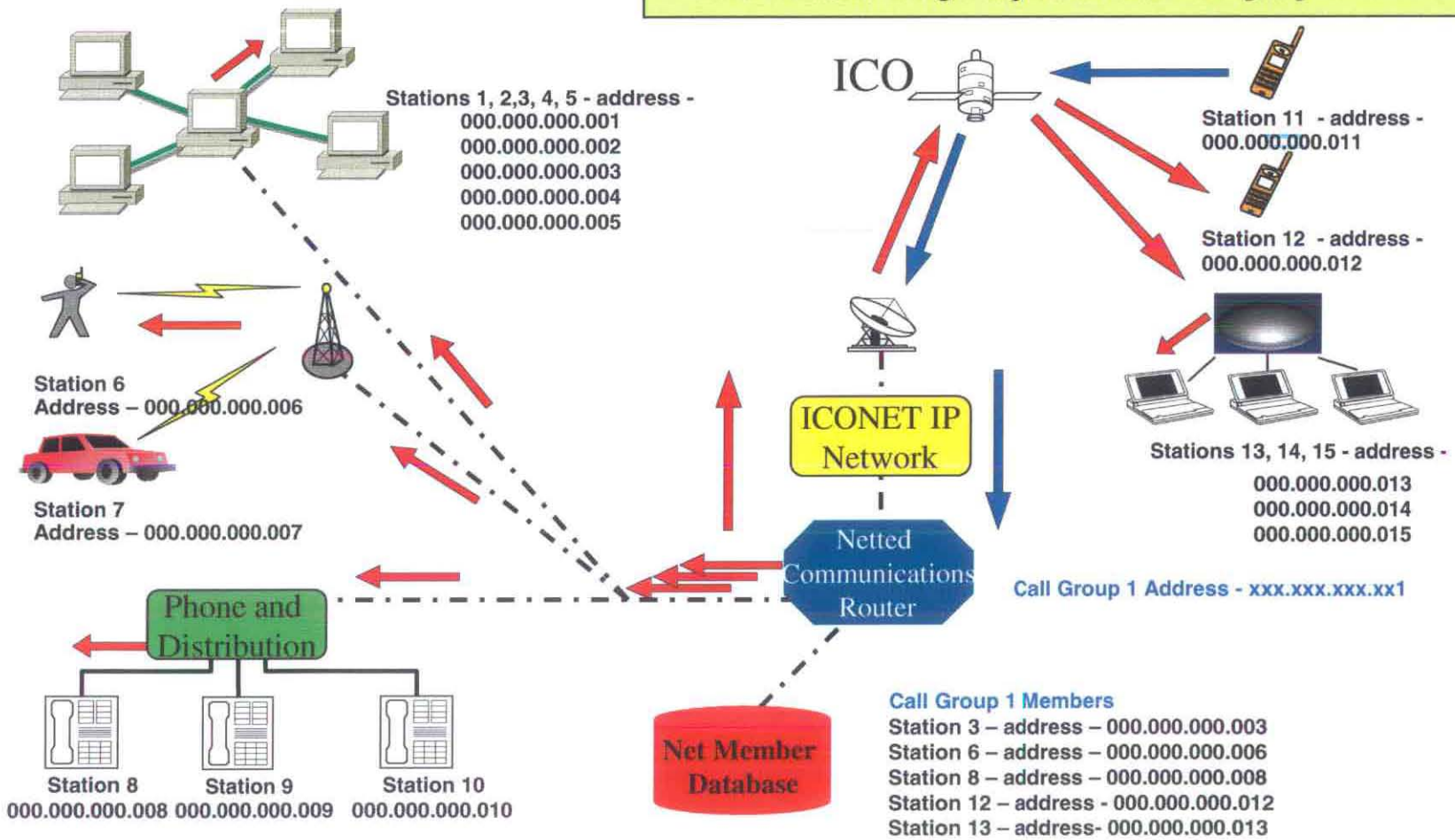
- **Rapid initiation of talk groups**
  - Forward deployed troops enter battlefield cellular network to request target acknowledgement and fire support from JTF
  - JTF enters net and checks availability of ground artillery unit on net
  - Artillery unit enters net and acknowledges request
  - JTF requests acknowledgement of target from Intel / Analysis Center
  - All four parties rapidly collaborate in call group to determine /execute required action



ICO Integrated IP Transport Concept

Station 11 initiates call group

- Station 11 checks display for availability of desired parties on network
- IP request from Station 11 to ICO Network to set up dynamic call group
- with Stations 3, 6, 8, 12 & 13
- Netted Comm Manager checks Net Member database and establish IP packet routing to requested users
- Each user acknowledges request and enters call group



ICO Assets and Advantages

- **12 State-of-the-Art ICO Satellites Primed for Mobile Voice and Data**
  - **+ Global Terrestrial Network**
  - **+ Spectrum and Licenses**

- Investments of nearly $3.7 billion in system infrastructure
- ICO Hughes HS601 satellites largely completed
- Worldwide terrestrial network consists of 12 fiber-linked ground stations on upgrade path to high-bandwidth Internet Protocol
- Global priority to spectrum : 2 x 15 MHz in the IMT-2000 core spectrum

- **Craig O. McCaw**
- **Greg Clarke**
- **Clayton, Dubilier & Rice**
- **Bill Owens**
- **Sam Ginn**
- **Bill Gates**

- Experienced leadership and exceptional sponsorship focused on operational excellence
- Assembling first class management team with track record in the telecommunications industry
- ICO raised $1.2 billion of equity capital in May 2000

- **Competitive Advantages**

- Integrated, unique collection of assets to provide global coverage
- Dedicated network with ability to support wide range of user equipment
- Multi-stage satellite power levels with dynamic capacity allocation
- Flexible IP transport network = user access and availability
- Group communications (push-to-talk) and private mobile radio
- Real-time and near real-time two-way messaging services (position reports, files, telemetry information, etc.)

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Going Forward

- FCC issued a Notice of Proposed Rulemaking (NPRM) on the ATC concept
- ATC will enable the MSS industry to achieve its vital mission of providing ubiquitous global connectivity and the NPRM decision will effect the viability of the MSS marketplace
- Current defense mandate coupled with today's spectrum scarcity dictates a creative solution/cooperation
- With ATC in place, the benefits of MSS will be attractive to a wide range of customers; DoD may leverage the new commercial networks and technologies
- Approval of ATC will create new, innovative wireless services and products
- ICO will develop a plan with an emphasis on ATC

MSS operators need DoD's support for the approval of ATC

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Summary

- Critical Elements for the Military
  - Accessing commercial spectrum for military usage
  - Leveraging commercial IT innovations
  - Obtaining quality military communications
    - Anti-jam (NGSO, Satellite Diversity)
    - Assured access
    - Secure netted communications
  - Seamless integration of commercial systems into the DISN

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