National Aeronautics and Space Administration

SAFELY ENABLING LOW-ALTITUDE AIRSPACE OPERATIONS

Unmanned Aerial System Traffic Management (UTM)

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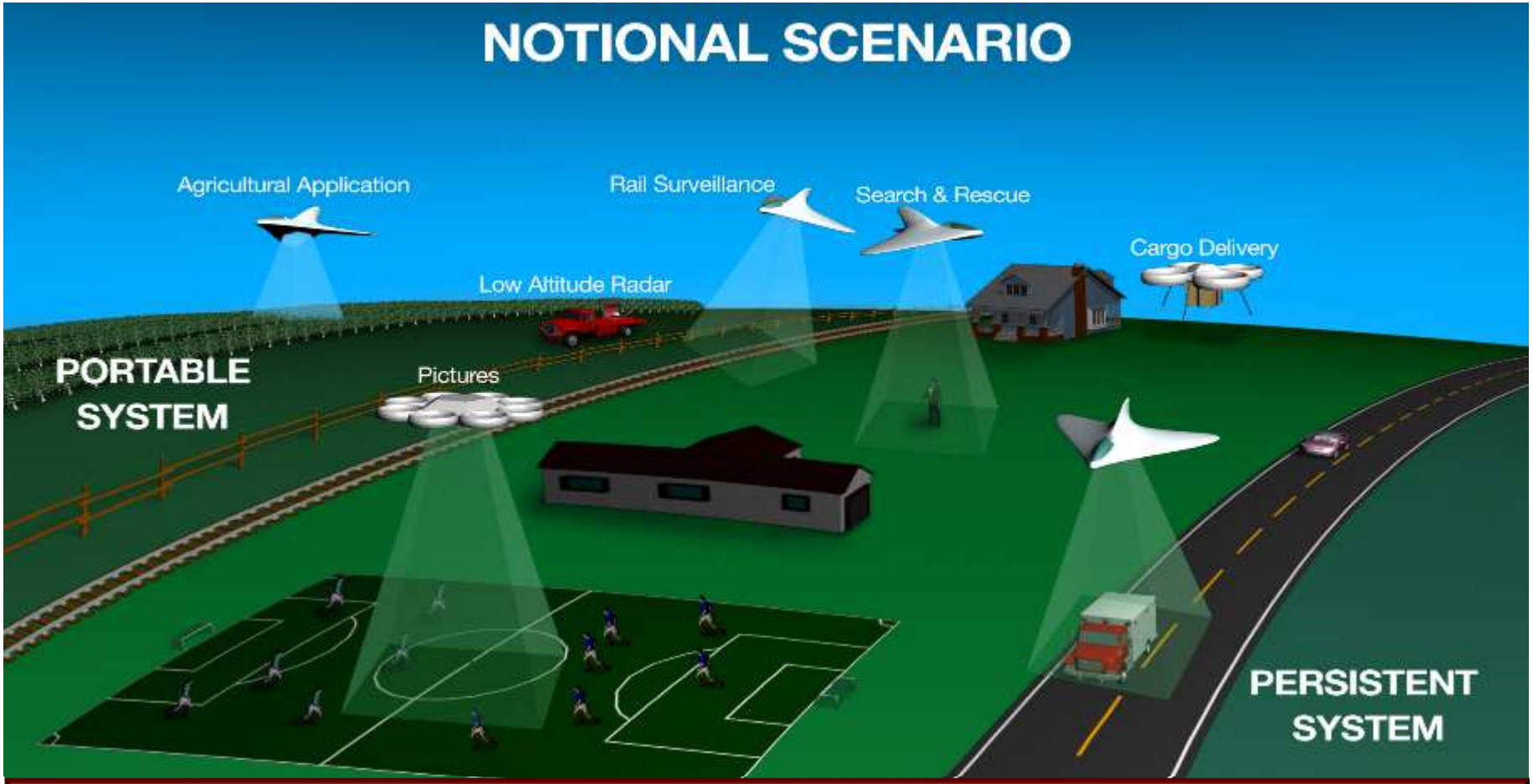
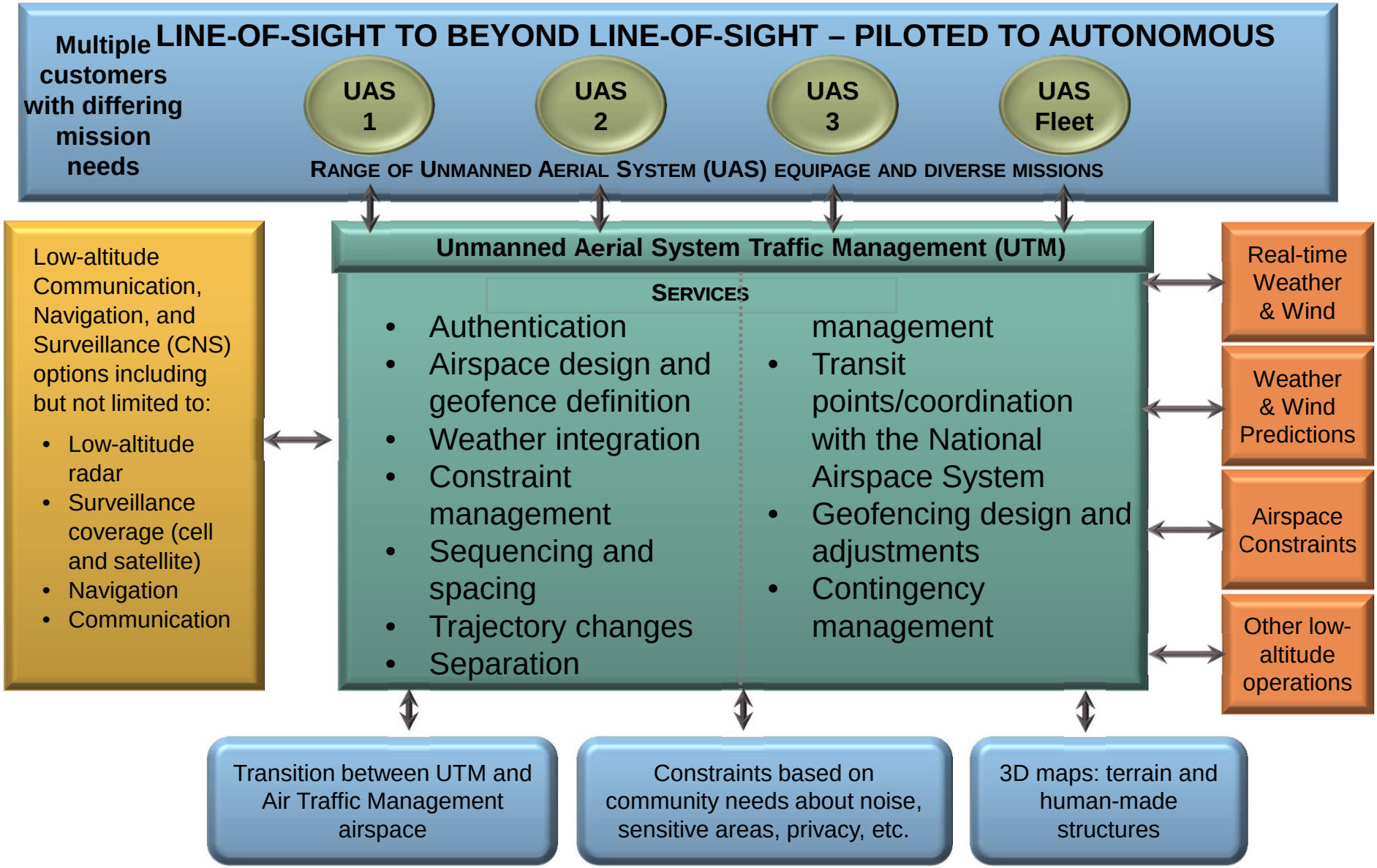
Unmanned Aerial System Traffic Management (UTM)
Flexibility Where Possible Structure Where Necessary



- **Near-term Goal** – Enable initial low-altitude airspace and unmanned aerial system (UAS) operations with demonstrated safety as early as possible, within 5 years
- **Long-term Goal** – Accommodate increased UAS operations with highest safety, efficiency, and capacity as much autonomously as possible (10-15 years)

UTM - One Design Option



High-Level UTM Builds

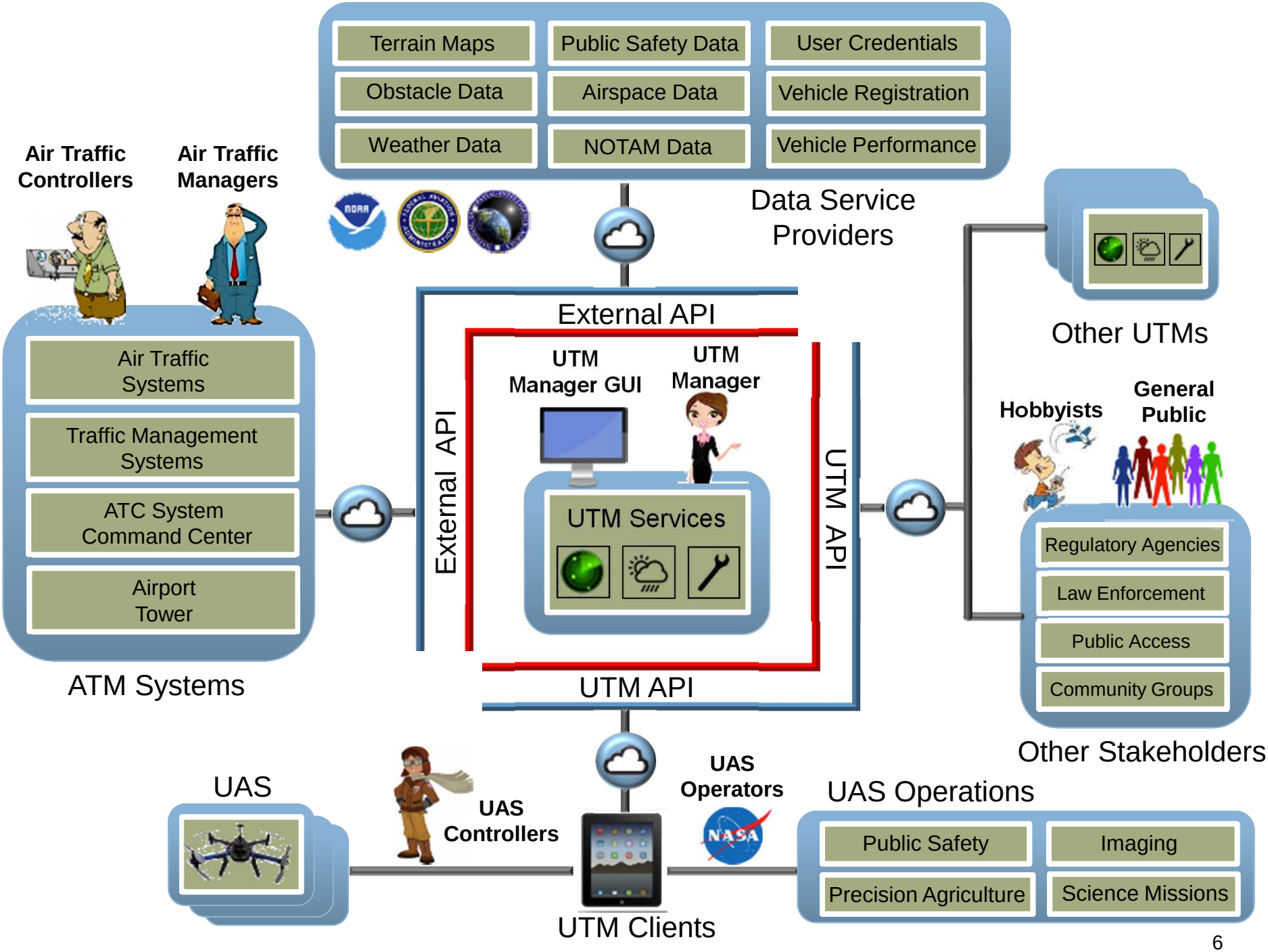
- **Build 1 (August 2015)**
  - Reservation of airspace volume
  - Over unpopulated land or water
  - Minimal general aviation traffic in area
  - Contingencies handled manually by UAS pilot
  - Enable agriculture, firefighting, infrastructure monitoring, mapping use cases amongst others

- **Build 2 (October 2016)**
  - Beyond line-of-sight
  - Sparsely populated areas
  - Procedures and “rules-of-the road” separate UAS
  - Contingencies alerted to UAS operator

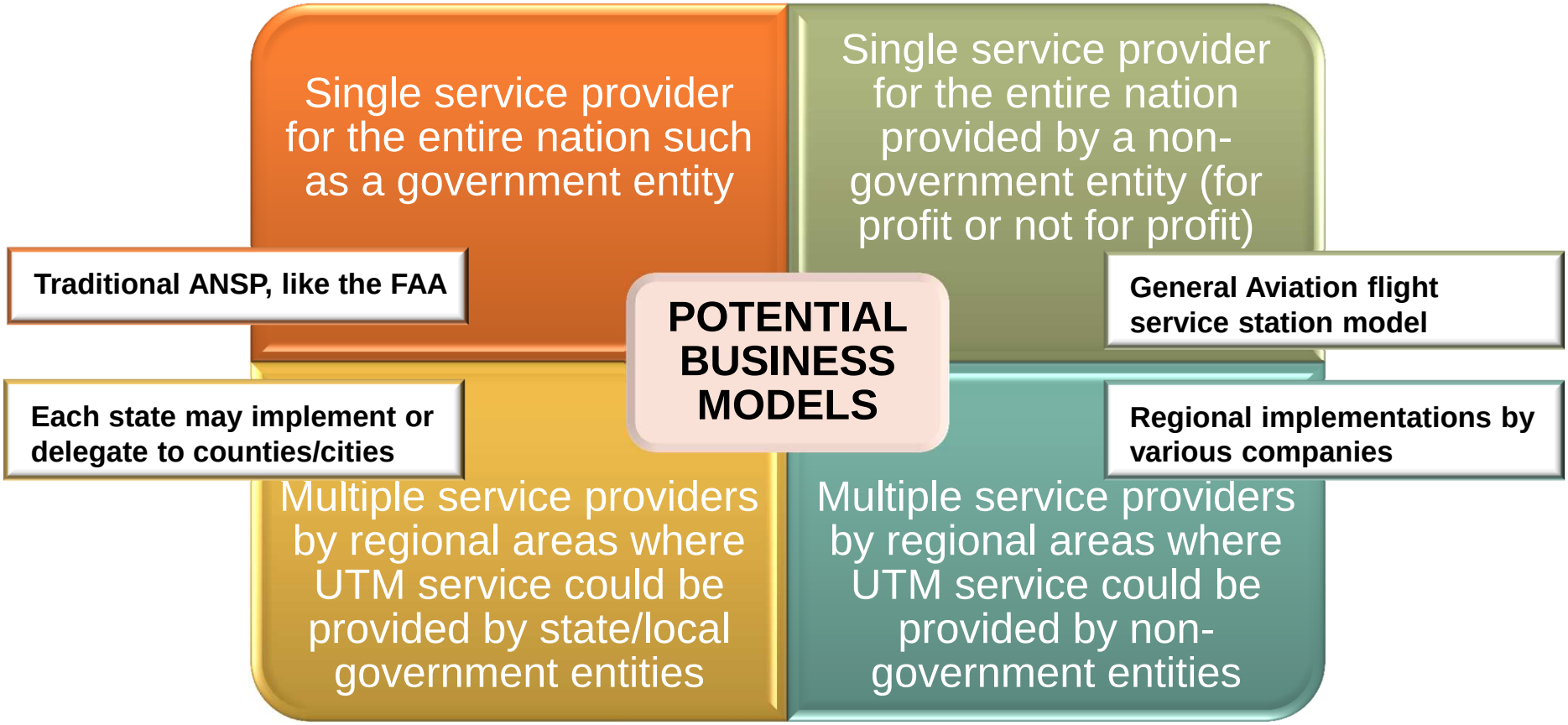
- **Build 3 (January 2018)**
  - Beyond line-of-sight
  - Over moderately populated land
  - Some interaction with manned aircraft
  - In-flight separation of UAS
  - Some contingencies resolved
  - Law enforcement, limited package delivery, and other use cases

- **Build 4 (March 2019)**
  - Beyond line-of-sight
  - Urban environments
  - Manned aircraft commonplace
  - Autonomous separation of UAS
  - Large-scale system-wide contingencies resolved

Notional UTM Airspace


Terrain Maps
Public Safety Data
User Credentials
Obstacle Data
Airspace Data
Vehicle Registration
Weather Data
NOTAM Data
Vehicle Performance
Data Service Providers
Air Traffic Controllers
Air Traffic Managers
Air Traffic Systems
Traffic Management Systems
ATC System Command Center
Airport Tower
ATM Systems
External API
External API
UTM Manager GUI
UTM Manager
UTM Services
UTM API
UTM API
Other UTMs
Hobbyists
General Public
Regulatory Agencies
Law Enforcement
Public Access
Community Groups
Other Stakeholders
UAS
UAS Controllers
UAS Operators
UAS Operations
Public Safety
Imaging
Precision Agriculture
Science Missions
UTM Clients

Consideration of Business Models



- Regulator has a key role in certifying UTM system and operations
- All UTM systems must interoperate

Key Considerations

- Flexibility where possible, structure where absolutely necessary
- Digital, virtual, and dynamic airspace management
- Geo-fences national assets, airports, and other areas
- Surveillance – Cell phone and satellite based communication, ADS-B where available
- Weather integration
- Large-scale contingency management procedures

Registration and agenda at: svc-auvsi.org

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