

Nintendo DSi Wireless & Wi-Fi

Dylan Rhoads
Bilingual Software Engineer

Software Development Support Group

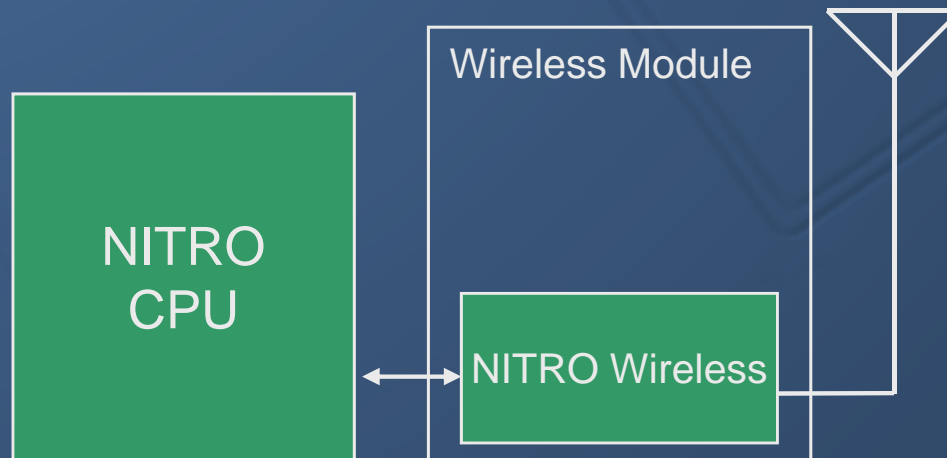
Presentation Overview

1. NITRO Wireless Module
2. TWL Wireless Module
3. Nintendo DS & DSi Local Wireless
 - ◆ Multi-Card Play (DS Wireless Play)
 - ◆ Single-Card Play (Download Play)
4. Nintendo Wi-Fi Connection & TWL-DWC
 - ◆ Matchmaking
 - ◆ Ranking
 - ◆ Network Storage
 - ◆ Download Service
5. Nintendo Zone

NITRO Wireless Module

- ◆ Nintendo DS & DS Lite include only the NITRO wireless module

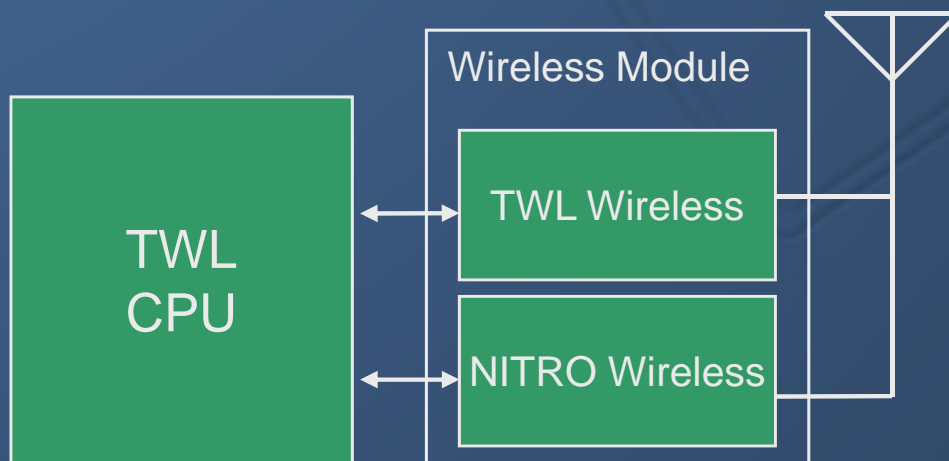
NITRO (Nintendo DS/DS Lite)



Nintendo DSi Wireless Modules

- ◆ Nintendo DSi includes 2 modules:
 - NITRO Wireless module
 - TWL Wireless module

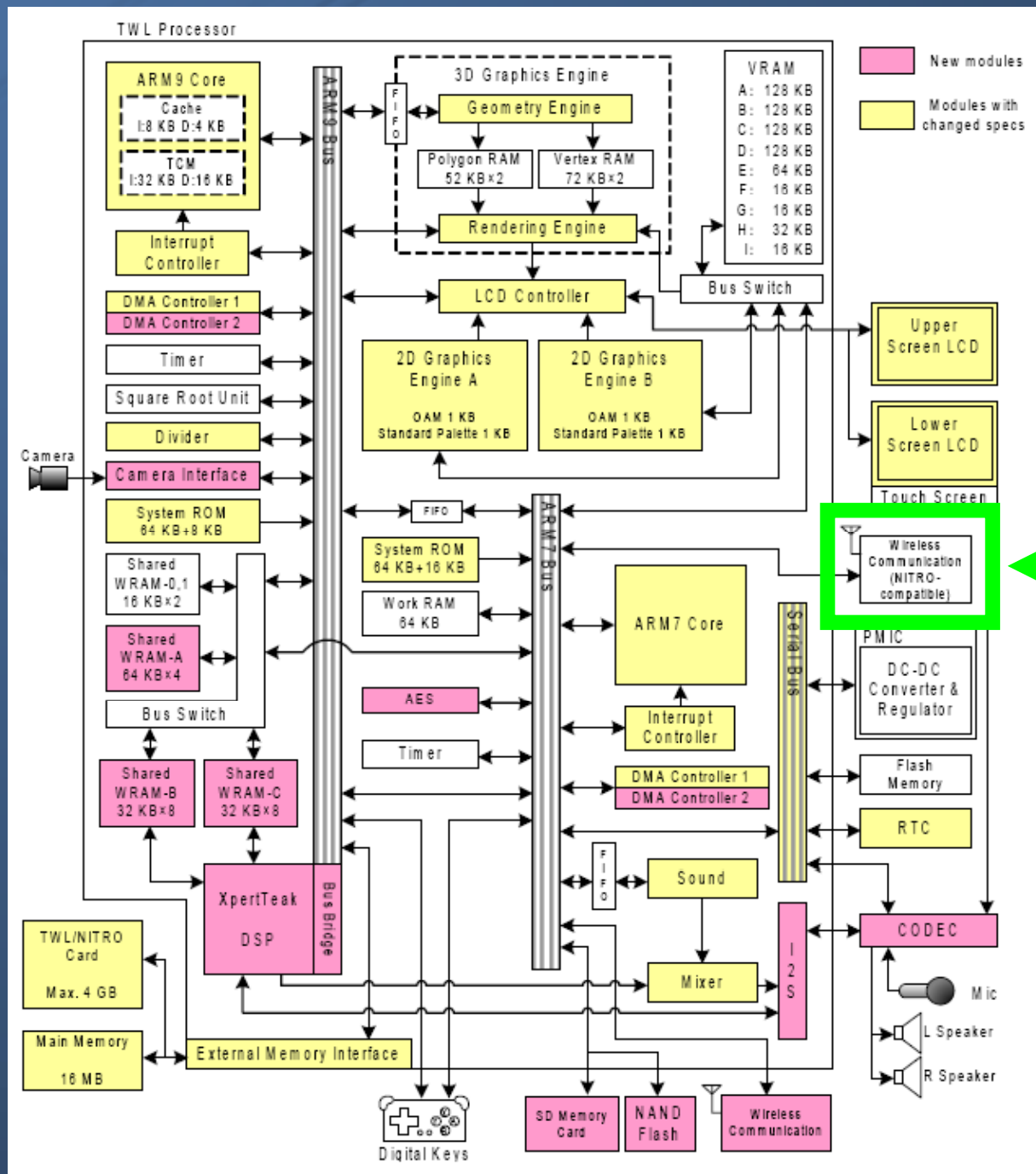
TWL (Nintendo DSi)



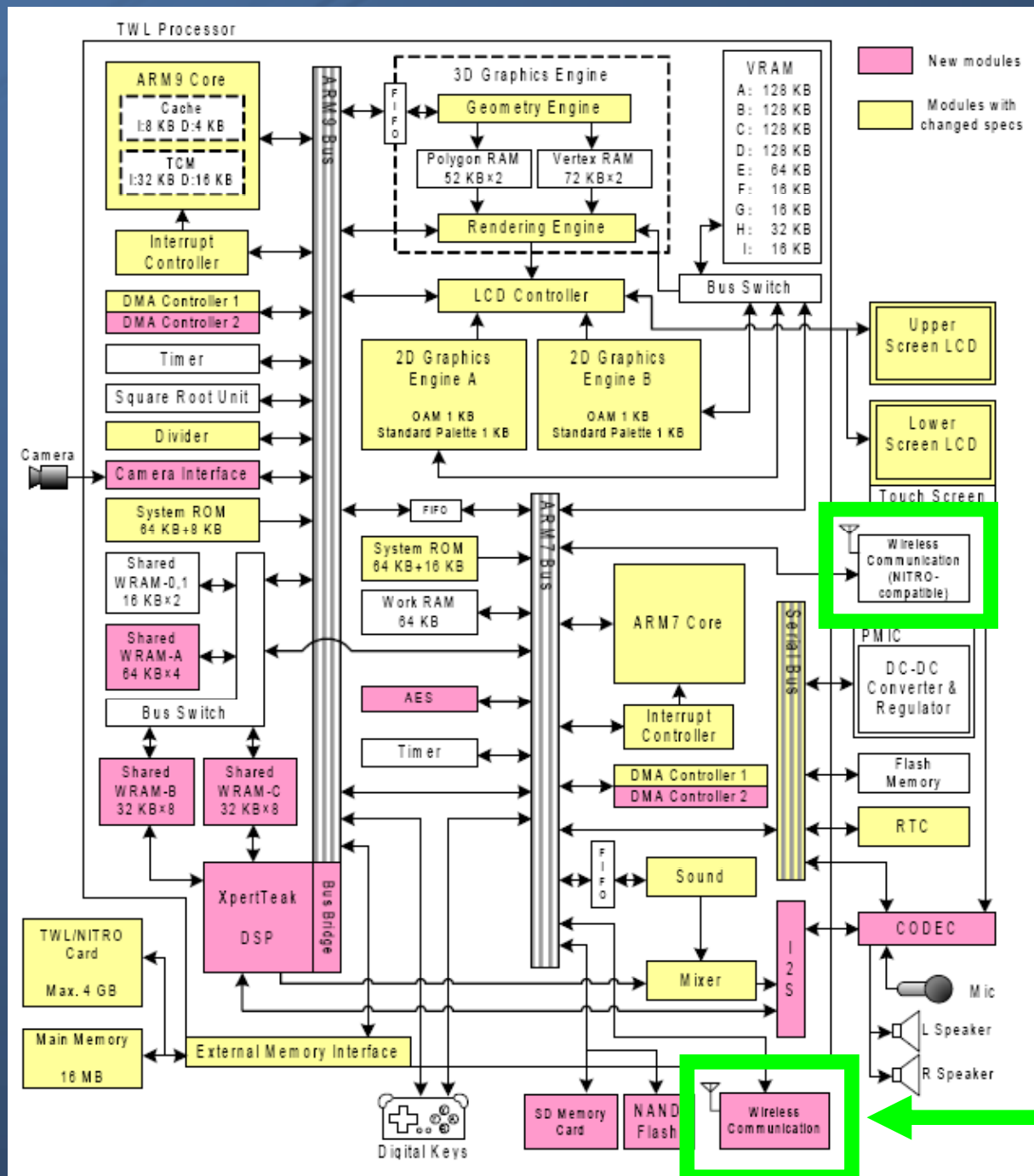
TW L Processor



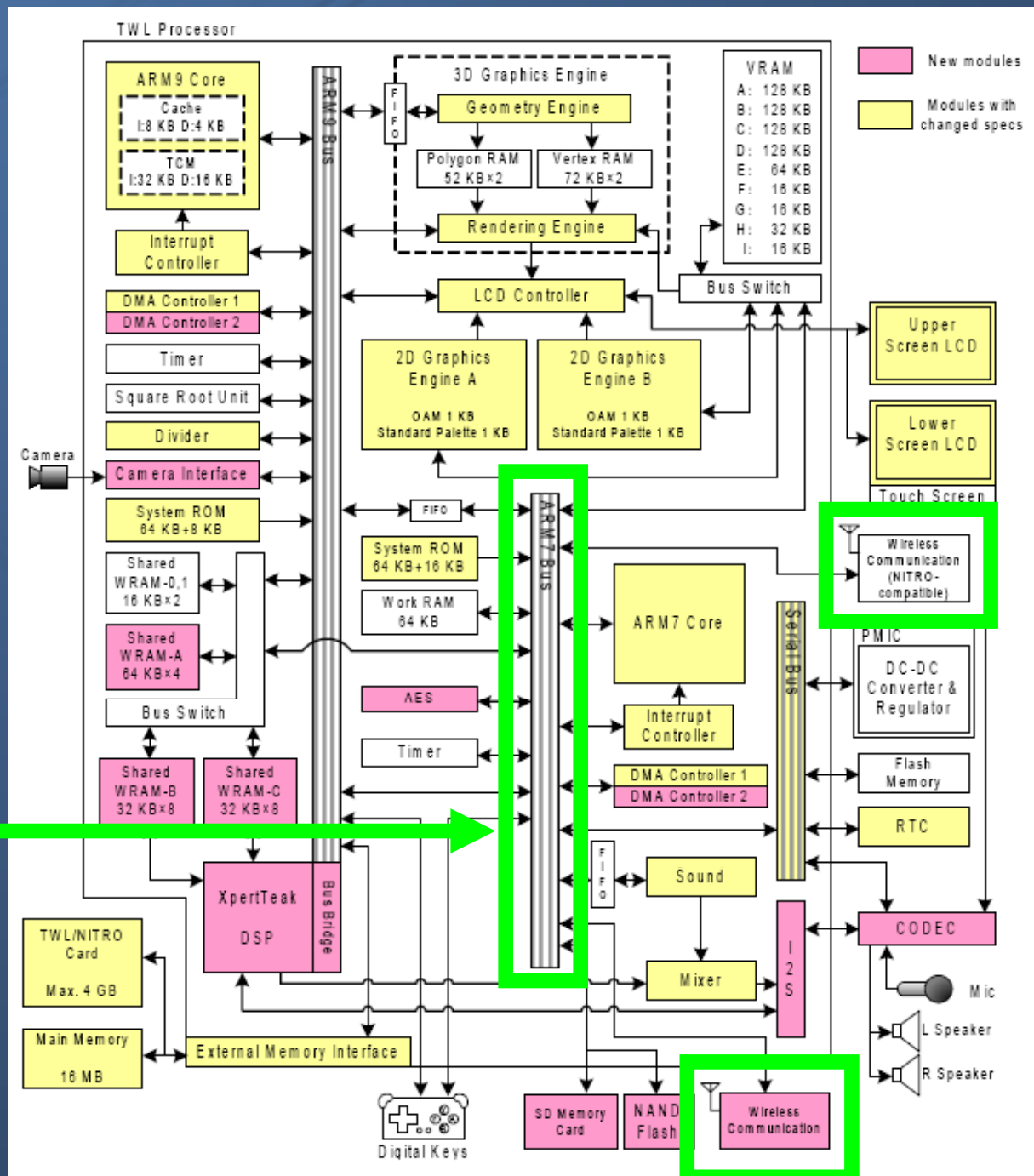
NITRO Wireless Module



TWL Wireless Module

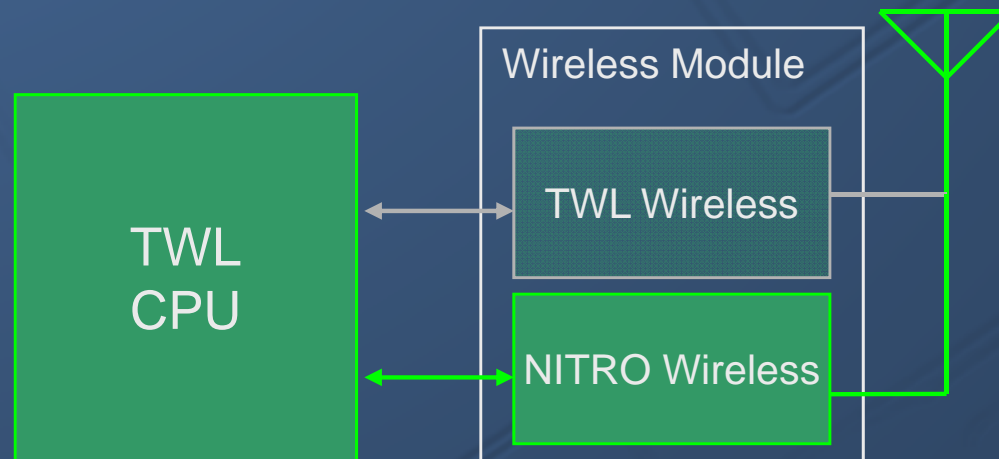


ARM7 Bus



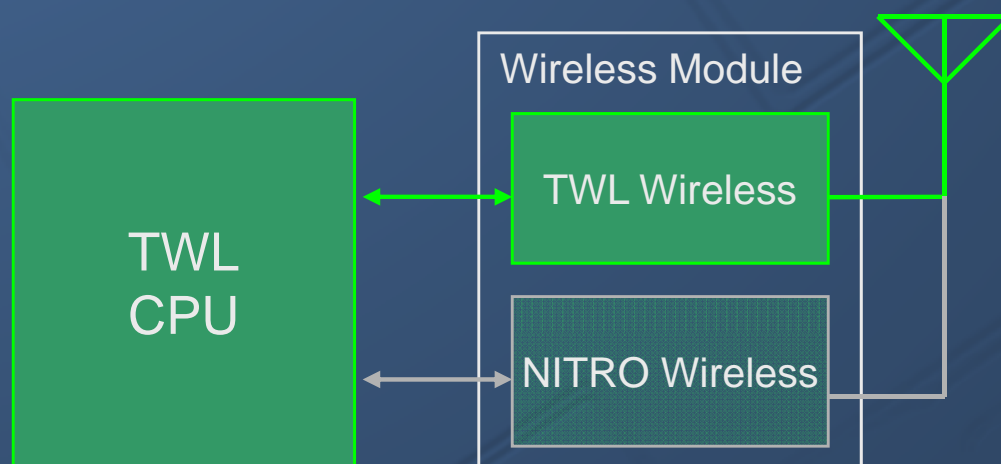
NITRO Wireless Module

- ◆ NITRO-compatible wireless module
- ◆ Same hardware as in Nintendo DS & Nintendo DS Lite
- ◆ Connected to ARM7 bus



TWL Wireless Module

- ◆ New hardware supporting secure high-speed communication
- ◆ 2.4GHz band (same as Nintendo DS)
- ◆ Connected to ARM7 bus



TWL Wireless Module (Cont.)

- ◆ 10-30 meter communications range depending on environment & orientation (same as Nintendo DS)
- ◆ Unique MAC address can be used for identification (same as Nintendo DS)
- ◆ Wireless communications still consumes additional power
 - Turn power OFF when not in use

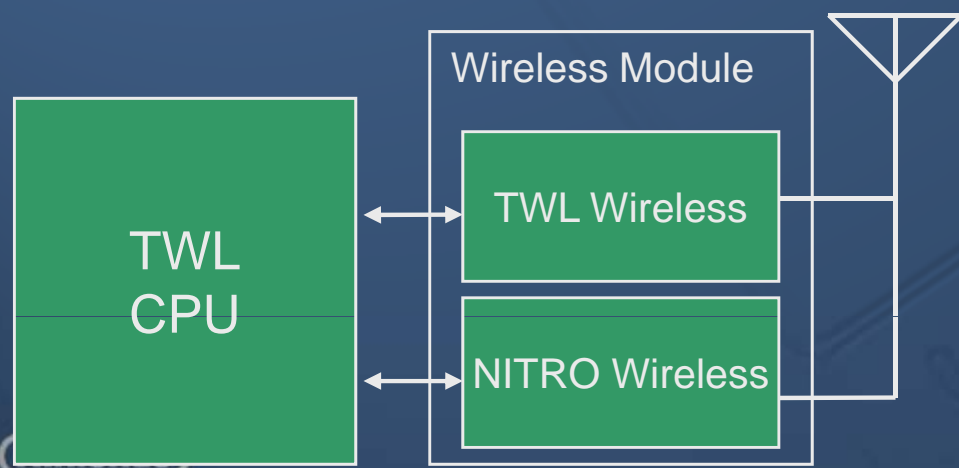
TWL Wireless Module (Cont.)

- ◆ Security protocols
 - WEP 40-bit/104-bit/128-bit compatible
 - WPA-PSK (TKIP/AES)
 - WPA2-PSK (TKIP/AES)
- ◆ Wireless channels (varies by region)
 - USA/Taiwan: Channels 1-11
 - Japan/Europe/Australia: Channels 1-13

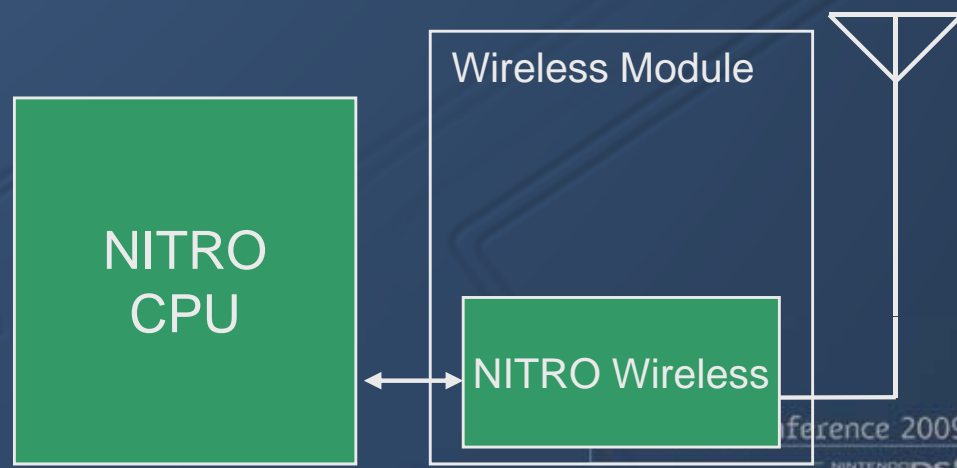
Nintendo DSi Wireless Modules

- ◆ New TWL Wireless module added to Nintendo DSi to enable secure high-speed Internet communication
- ◆ Legacy NITRO Wireless module included to maintain compatibility with Nintendo DS & DS Lite systems
- ◆ NITRO Wireless & TWL Wireless can't be used simultaneously
- ◆ TWL Wireless only usable by TWL-DWC applications
 - NITRO-DWC games use NITRO Wireless on Nintendo DSi

TWL (Nintendo DSi)



NITRO (Nintendo DS/DS Lite)



Communications Modes

Multi-Card Play (DS Wireless Play)

- ◆ Wireless communication between a maximum of 16 systems (same as DS)
- ◆ Maximum data size of 512 bytes
- ◆ Uses NITRO Wireless module
- ◆ Complete DS & DS Lite compatibility
- ◆ Communications between Wii & Nintendo DSi/DS/DS Lite also possible

Communications Modes

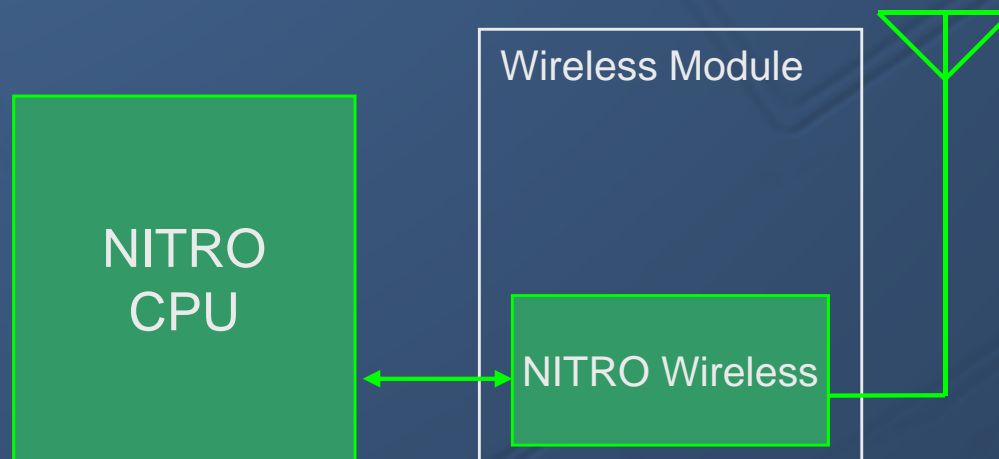
Single-Card Play (Download Play)

- ◆ Child device without game card downloads game from parent device
- ◆ Parent can specify address in data header and child stores accordingly
- ◆ Uses NITRO Wireless module
- ◆ Complete DS/DS Lite/Wii compatibility
- ◆ Nintendo DSi-only titles cannot be distributed via Download Play

Communications Modes

Nintendo Wi-Fi Connection on DS

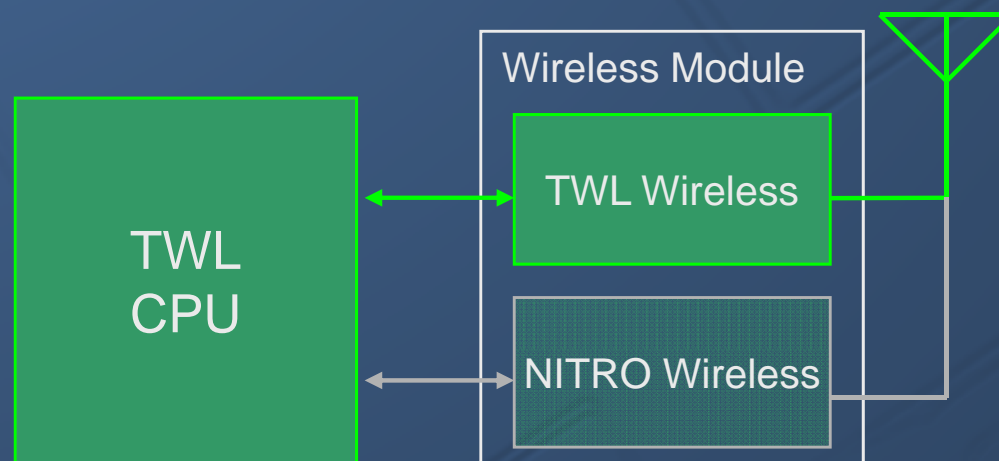
- ◆ Uses NITRO Wireless module
- ◆ 1 or 2 Mbps communication speed
- ◆ Only WEP security can be used



Communications Modes

Nintendo Wi-Fi Connection on DSi

- ◆ TWL-DWC uses TWL Wireless module (except for NITRO ROM)
- ◆ Higher-speed communication possible
- ◆ WEP/WPA/WPA2 security can be used



Wii-DS/DSi Communication

- ◆ **Caution:** Byte order (endianness) of Wii and Nintendo DS/DSi are different!
 - DS is Little-endian; Wii is Big-endian
 - Convert the data on the Wii side before sending and after receiving from the DS
- ◆ **Caution:** Wi-Fi communication speeds differ for the same TWL-DWC application running on Nintendo DSi vs. DS/DS Lite

TWL Wireless Quiz

- ◆ Q1: Can the TWL Wireless module be used for local communication?
- ◆ A1: No. As with Nintendo DS & DS Lite, all local communications use the NITRO Wireless module.
- ◆ Q2: OK, then how do I use TWL Wireless?
- ◆ A2: Use the TWL-DWC library.
HYBRID and LIMITED games built using TWL-DWC use TWL Wireless when run on Nintendo DSi.
- ◆ Q3: Do I even need to be aware of TWL Wireless?
- ◆ A3: When developing network games for DSi, you can design for higher communications speeds. Otherwise, you don't need to be aware of it.

Wireless Module Usage Table

	Nintendo DSi	Nintendo DS/ DS Lite
NITRO-DWC	NITRO Wireless	NITRO Wireless
TWL-DWC (NITRO ROM)	NITRO Wireless	NITRO Wireless
TWL-DWC (HYBRID ROM)	TWL Wireless	NITRO Wireless
TWL-DWC (LIMITED ROM)	TWL Wireless	N/A

TWL-DWC Library

- ◆ For development of titles that support Nintendo Wi-Fi Connection
- ◆ Connects to Internet via wireless LAN
- ◆ Same as NITRO-DWC:
 - Connecting to Nintendo WFC server
 - Creating friend roster
 - Creating friend information
- ◆ Wi-Fi Tools Agreement covers both NITRO-DWC and TWL-DWC

TWL-DWC & Build Types

- ◆ TWL-DWC v5.0 currently supports only HYBRID ROM & LIMITED ROM
- ◆ TWL-DWC v5.1 will include support for NITRO ROM as well
 - New TWL-DWC features will be available on Nintendo DS & DS Lite as well as Nintendo DSi!

TWL-DWC Compatibility

- ◆ No matchmaking compatibility between NITRO-DWC and TWL-DWC
- ◆ However, TWL-DWC 5.x **can** match & communicate with RVL-DWC 2.x
 - Internet matchmaking between Wii & Nintendo DS titles is now possible!



TWL-DWC Updates

- ◆ Wi-Fi Configuration Utility integration not required for Nintendo DSi-only applications
 - Still required for HYBRID and NITRO apps



TWL-DWC Updates (Cont.)

- ◆ New function: `DWC_SetRwinSize()`
 - TCP receive window size setting (rwin) can now be set from 4288 to 65535 bytes
 - ◆ Large downloads can become 2x-3x faster
 - Cautions:
 - ◆ Only available when using TWL Wireless
 - ◆ Increasing rwin consumes more memory
 - ◆ You must first disconnect from access point in order to use a new rwin value

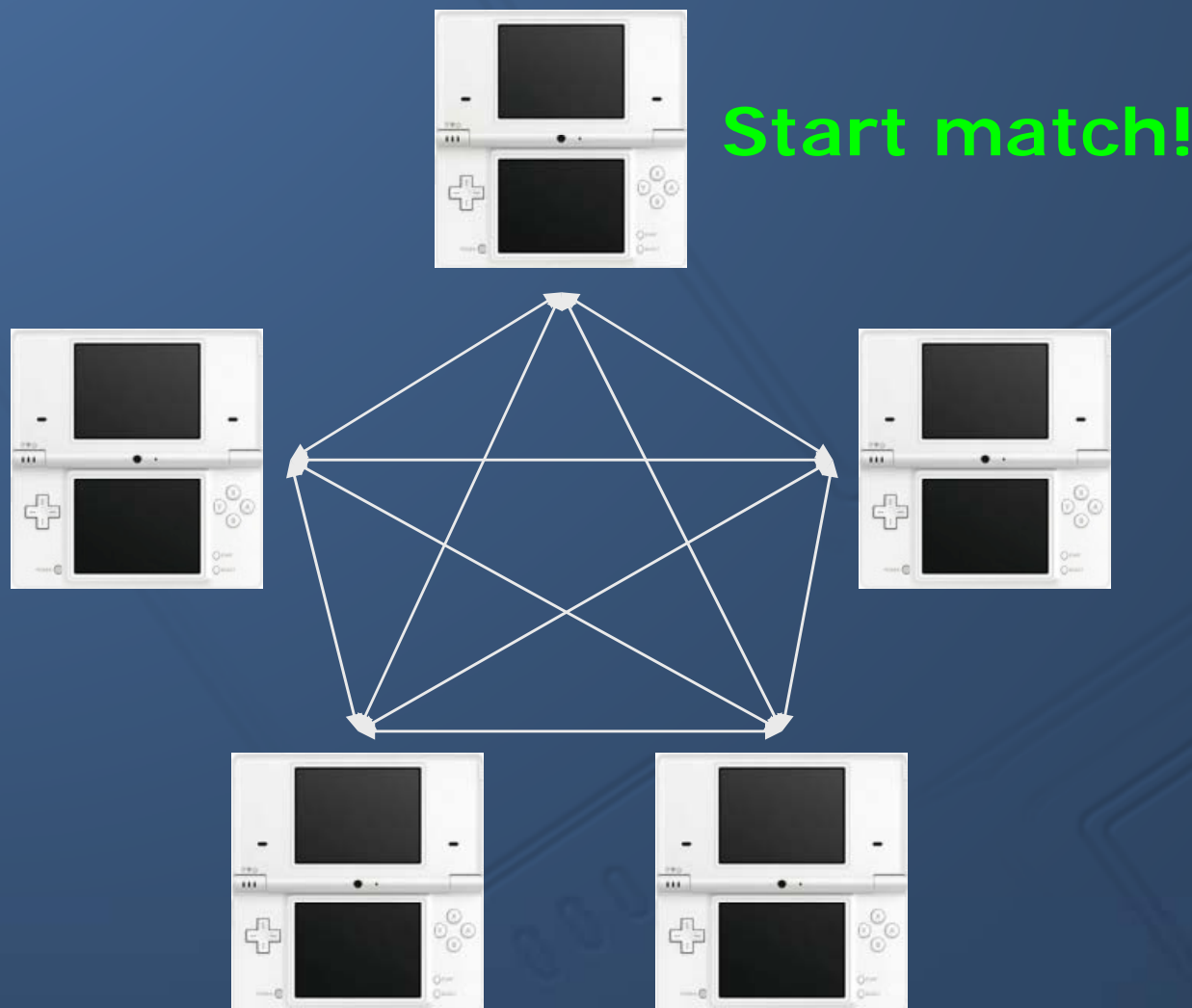
TWL-DWC 5.x New Feature: Matchmaking Topologies

Games can now select from 3 different matchmaking topologies:

- ◆ Mesh topology (exists in NITRO-DWC)
- ◆ Star topology (new in TWL-DWC 5.x)
- ◆ Hybrid topology (new in TWL-DWC 5.x)

Mesh Topology (from NITRO-DWC)

- ◆ Matchmaking doesn't complete until direct connections established between all clients



Mesh Topology (from NITRO-DWC)

◆ Pros:

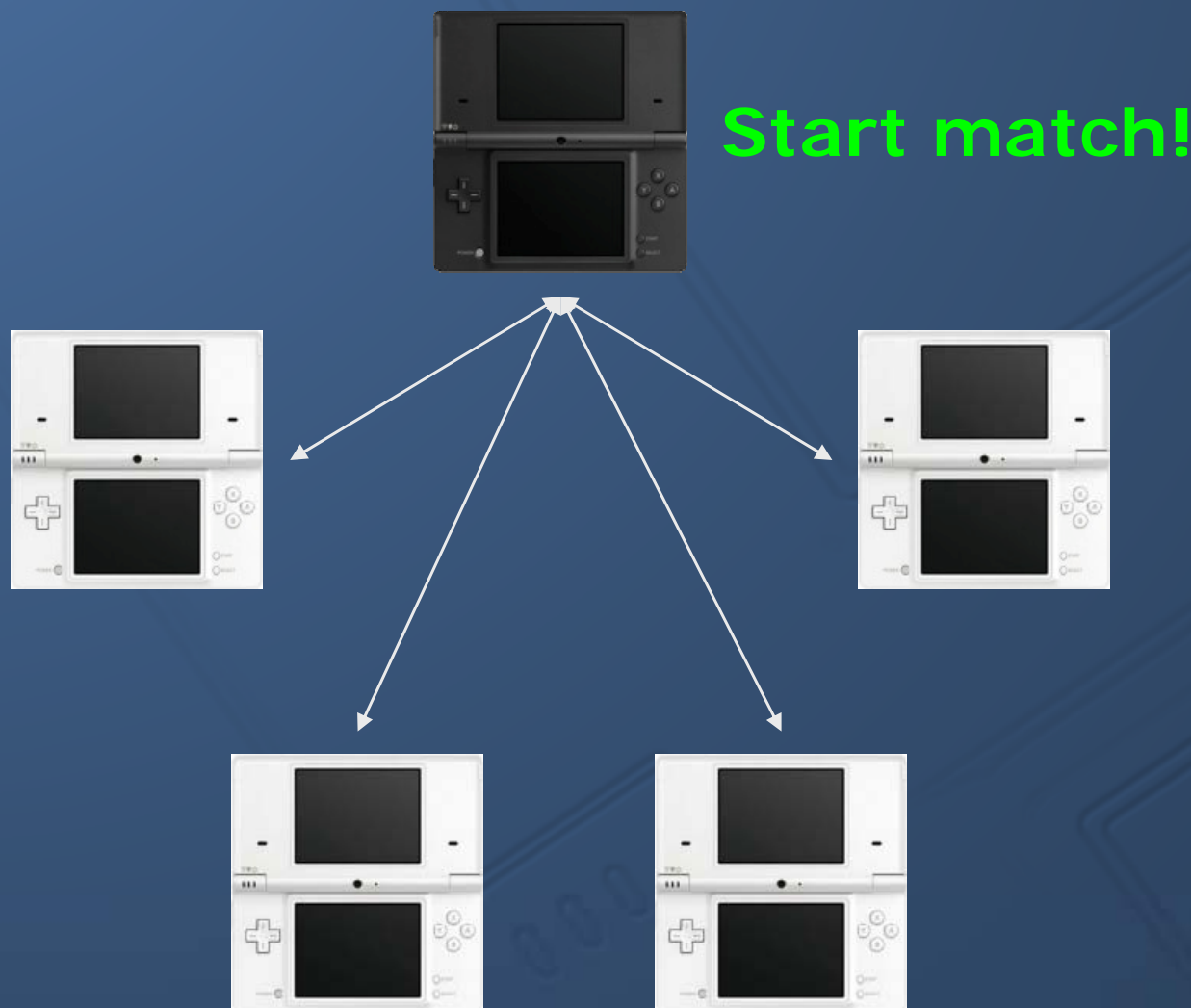
- Direct connections are guaranteed at the time that the game starts
- Useful for network-intensive multiplayer games with low numbers of players

◆ Cons:

- Takes time to establish direct connection between all clients (NAT negotiation)
- Time required for matchmaking time can be excessive for high numbers of players

Star Topology (new in TWL-DWC)

- ◆ Matchmaking completes as soon as connections established between server host and each client



Star Topology (new with TWL-DWC)

◆ Pros:

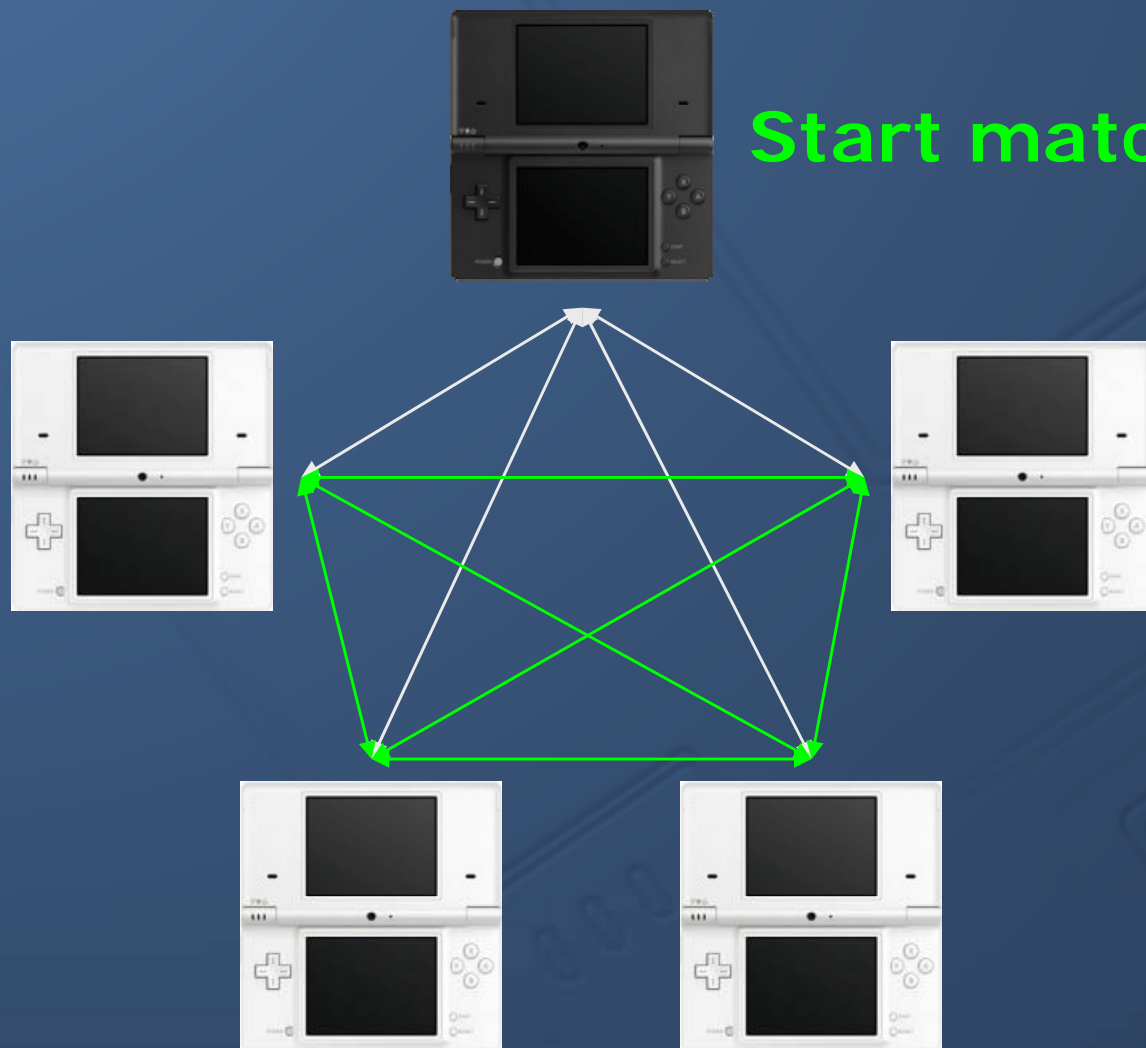
- Game can begin as soon as server host is connected to each client
- Can be appropriate for less network-intensive games with high numbers of players

◆ Cons:

- All communication occurs via server host
 - ◆ Can cause communication delays
 - ◆ Can be a burden on server host

Hybrid Topology (new with TWL-DWC)

- ◆ Match can begin as soon as connections are established between server host and each client
- ◆ **Mesh connections** established thereafter (best effort)



Hybrid Topology (new with TWL-DWC)

◆ Pros:

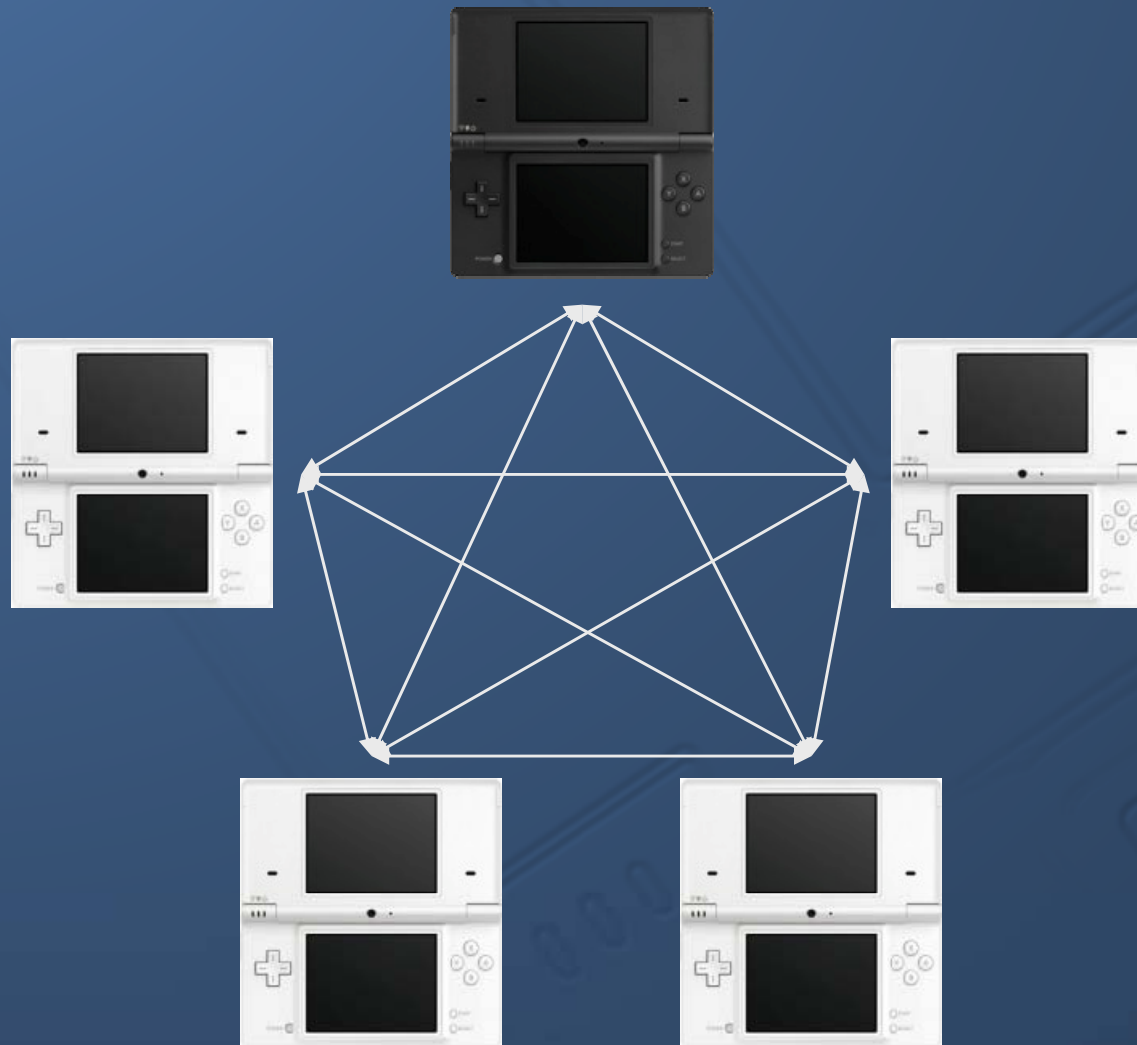
- Game can begin as soon as server host is connected to each client
- Direct connections are established as possible, so connectivity improves over time (even across multiple matches)
- Appropriate for less network-intensive games with higher numbers of players
 - ◆ Used in Mario Kart Wii

◆ Cons:

- Communication lag before mesh is formed can still be a problem for network-intensive games

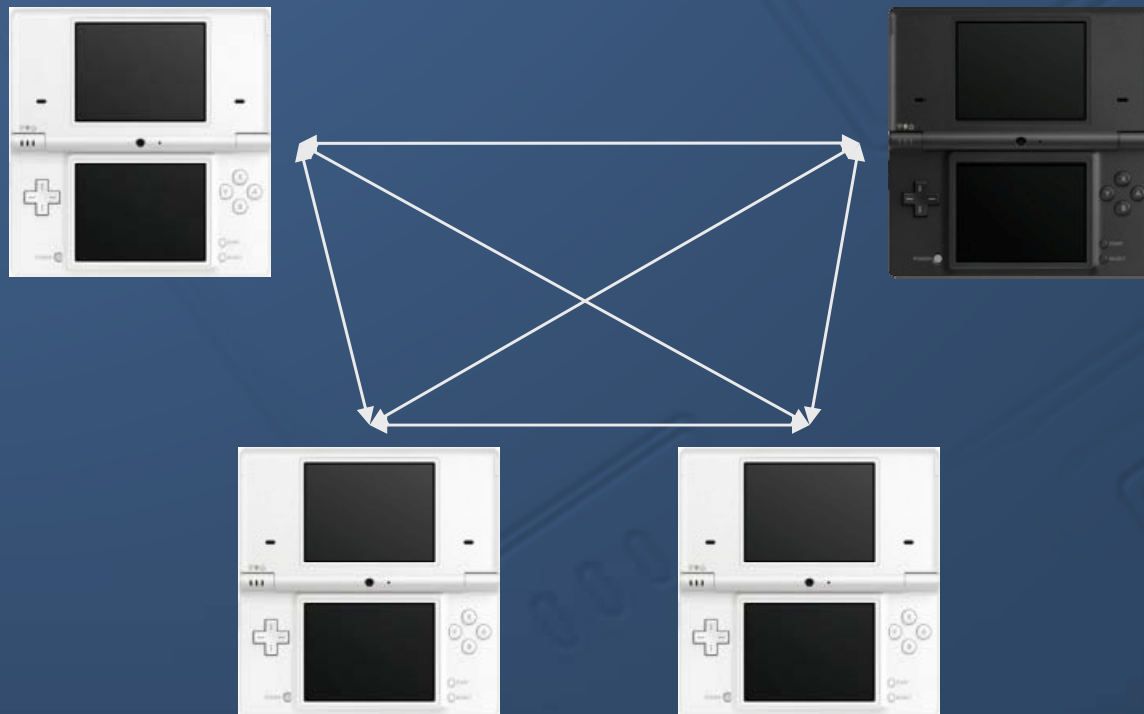
TWL-DWC 5.x New Feature: Host Migration

- ◆ If the server host disconnects from the group, one of remaining peers continues in server role



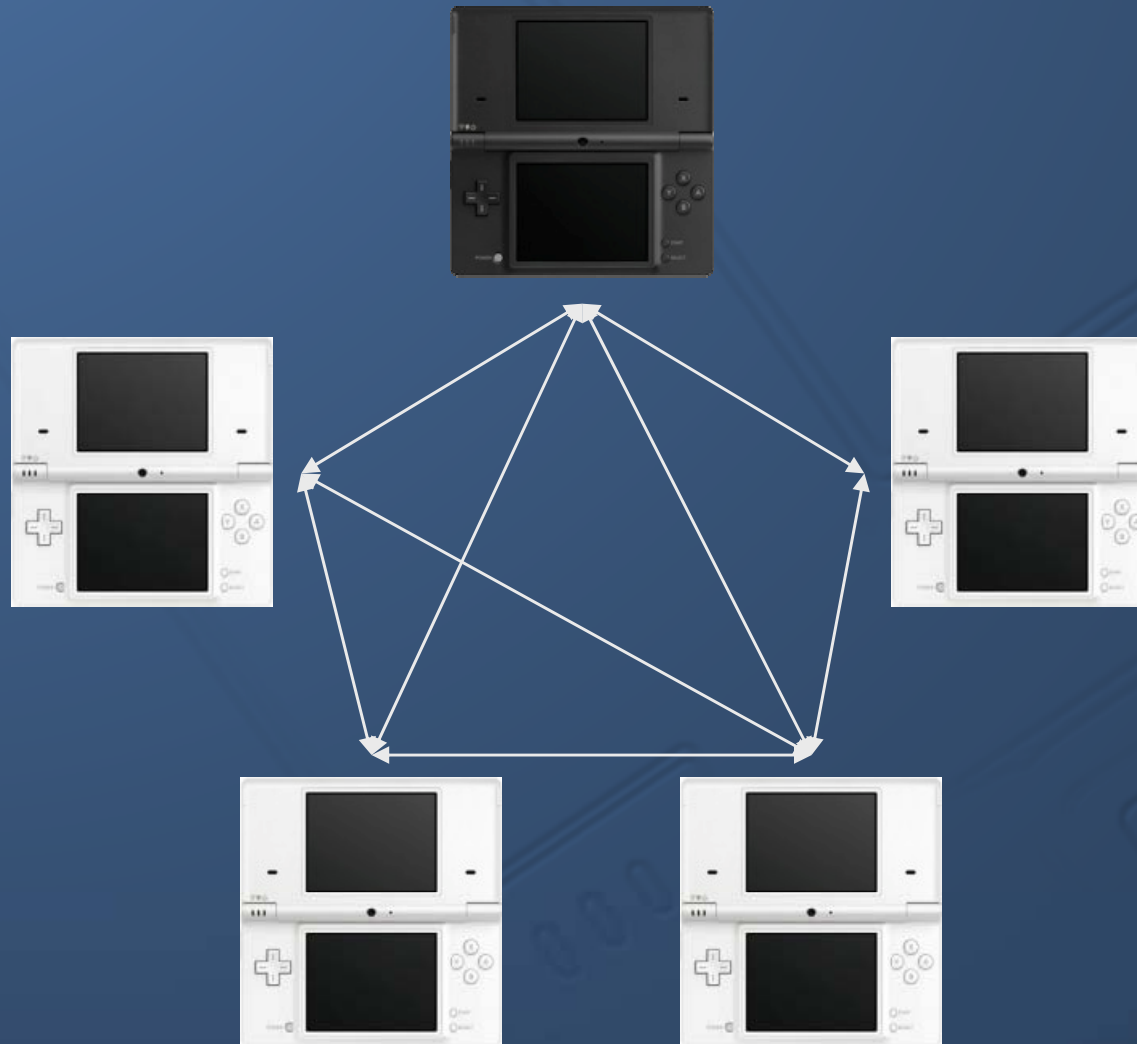
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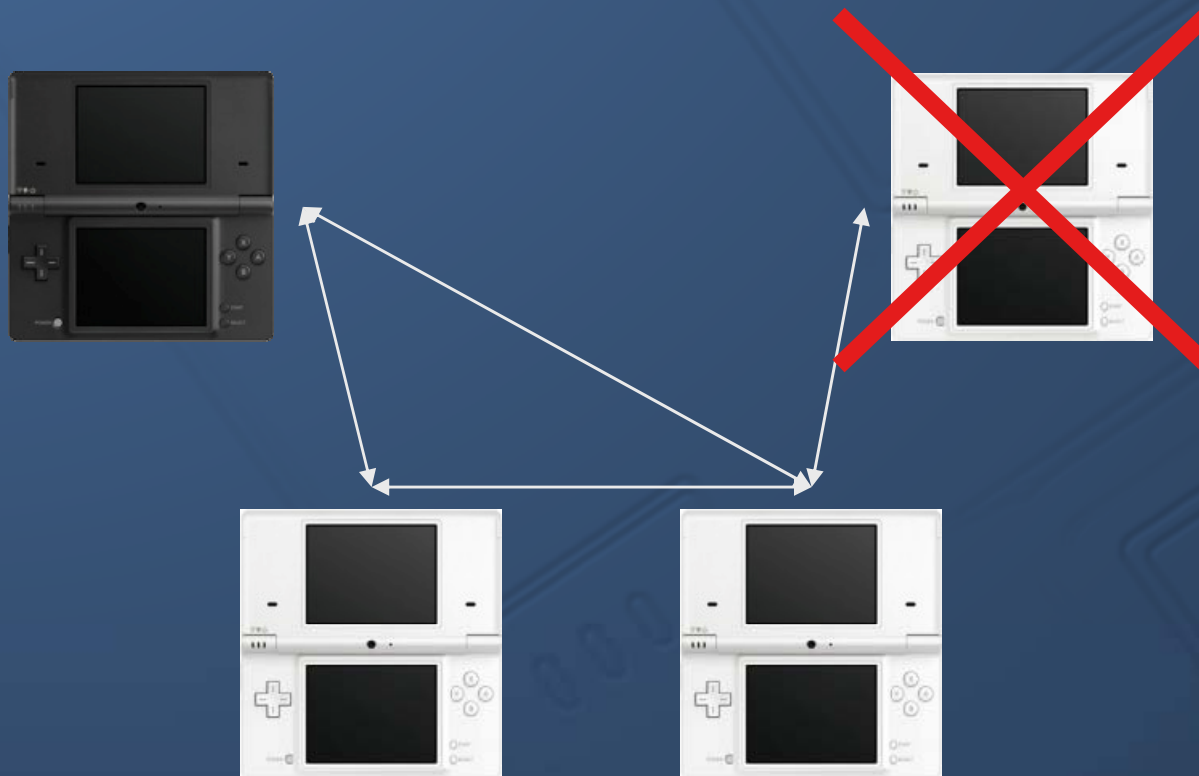
Host Migration: Cautions

- ◆ Only clients already directly connected to new server continue – all others disconnected



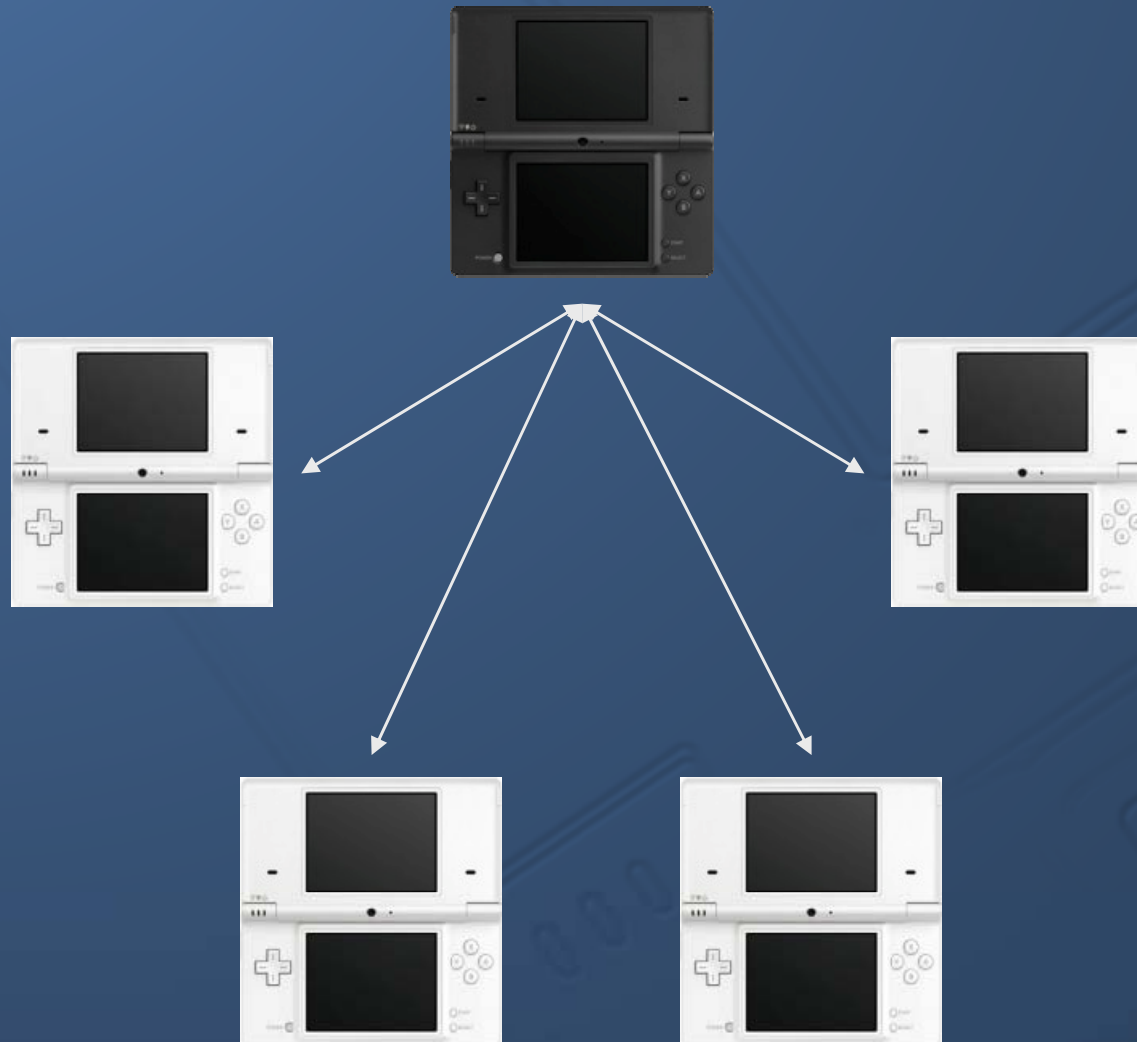
Host Migration: Cautions

- ◆ Only clients already directly connected to new server continue – all others disconnected



Host Migration: Cautions

- ◆ Only possible under **hybrid** or **mesh**
 - When server disconnects in **star**, all clients terminate with errors



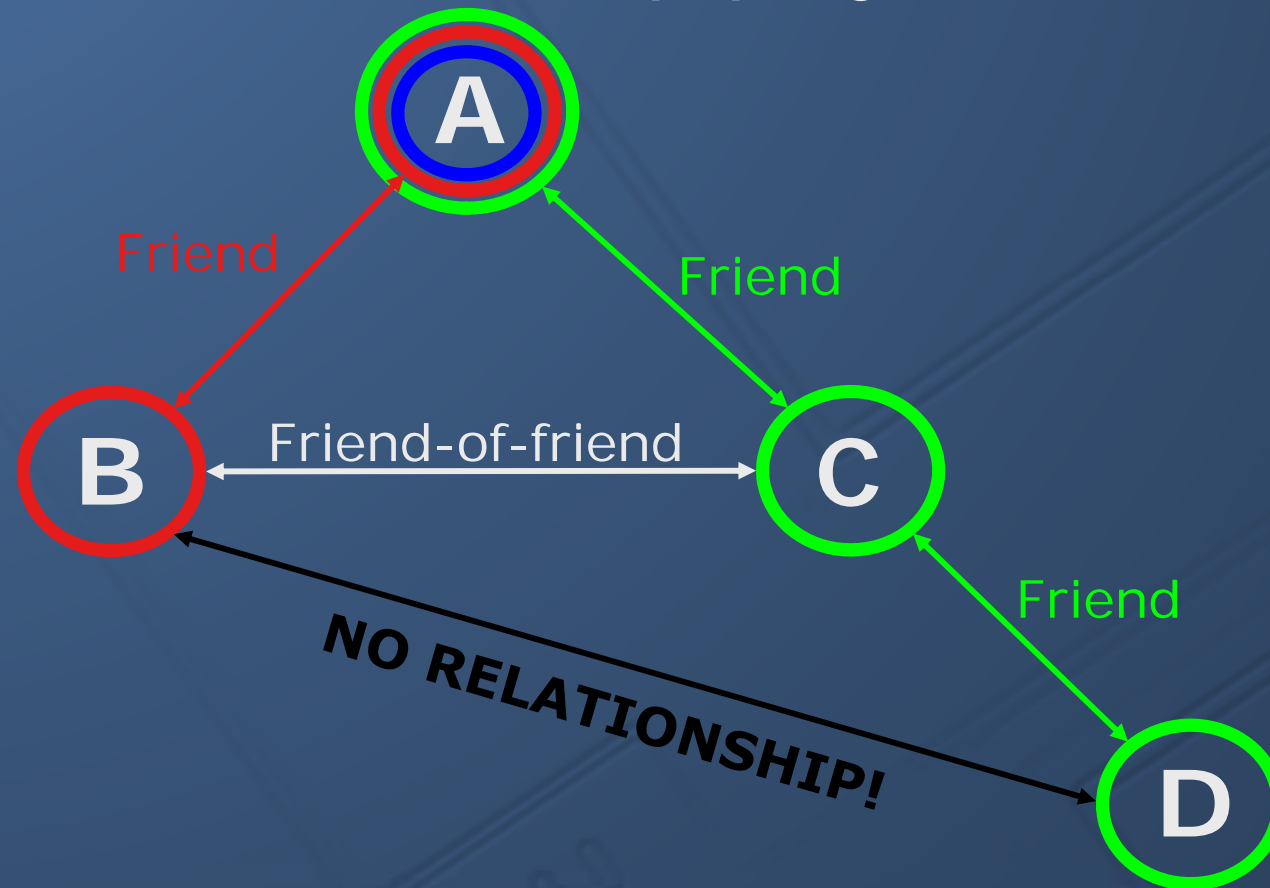
Host Migration: Cautions

- ◆ Only possible under **hybrid** or **mesh**
 - When server disconnects in **star**, all clients terminate with errors



Host Migration & Friends-only Matchmaking

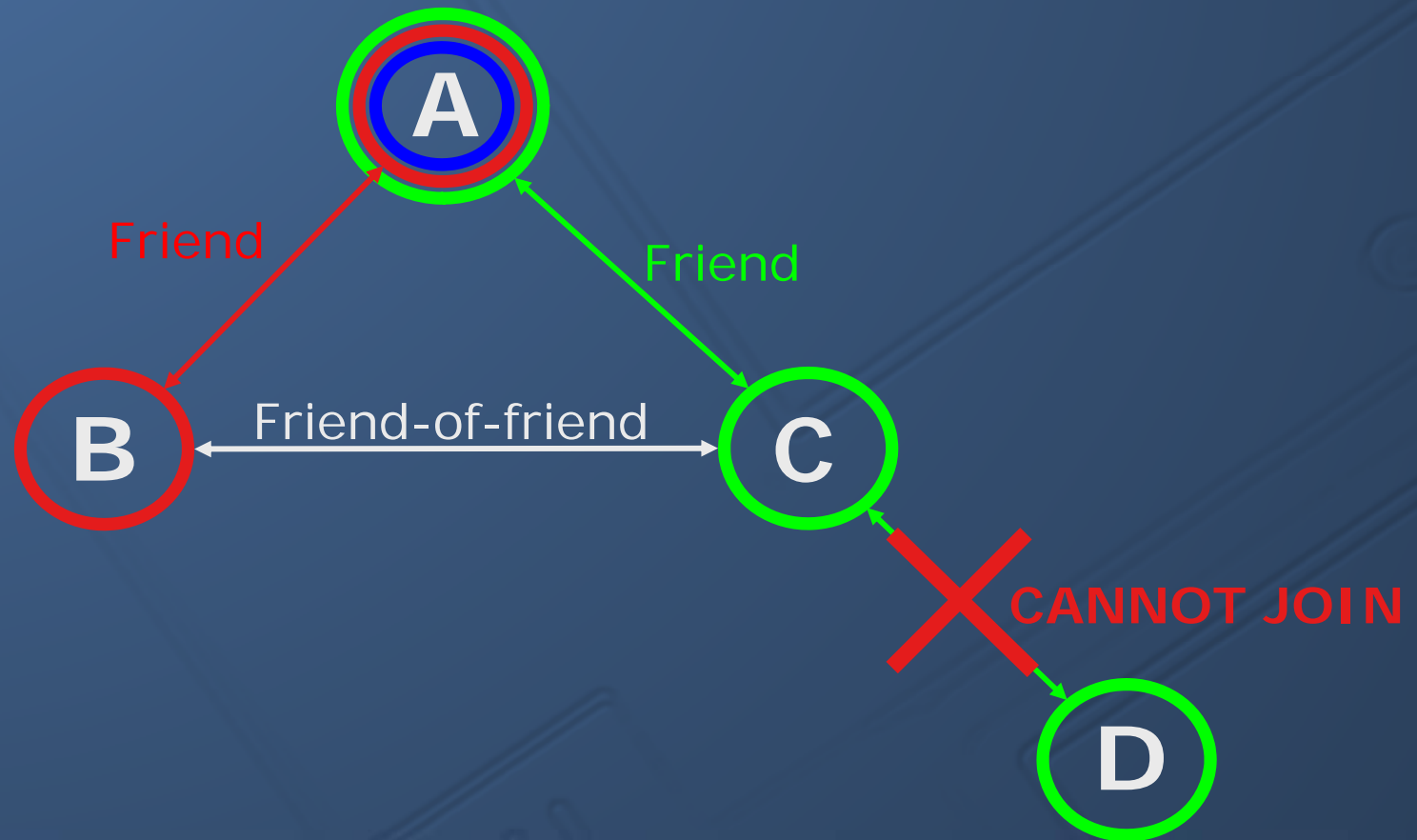
- ◆ Caution: Host migration can result in more distant relationships than friend-of-friend
- ◆ Problem: How do we keep players comfortable?



Host Migration & Friends-only Matchmaking

◆ Solution:

- First host: new clients can join if friends with host
- After first host migration, new clients **cannot join**



Good news: TWL-DWC handles this for you!

TWL-DWC 5.x New Feature: Group IDs

- ◆ Now possible to obtain Group ID of the local host using `DWC_GetGroupID`

Using Group ID to Re-join a Group

- ◆ Obtain Group ID of local host
- ◆ If disconnected, reconnect using `DWC_ConnectToGameServerByGroupID`
- ◆ If duplicate Group IDs exist (due to host migration etc.), library will automatically connect to the group with the most connected players

Using Group ID to Join Friend's Group

- ◆ Set friend status strings to Group IDs to make them visible to friends
 - Friends can now join each other's groups!
 - Mario Kart Wii made use of this feature

TWL-DWC Ranking Server

- ◆ Upload scores to ranking server
- ◆ Download rankings from ranking server
 - Get your own ranking
 - Get the top rankings (up to 30)
 - Get rankings of nearby players (up to 30)
 - Get rankings of friends/rivals (up to 64)
- ◆ Up to 764 bytes of user-defined data can be specified per score
- ◆ TWL-DWC v5.1 or later required

TWL-DWC Network Storage

- ◆ Store & share data via GameSpy's network storage server
- ◆ Data can be set as public or private
 - Other players can't reference private data
 - Friends can obtain public data
- ◆ Load your own data or data of friends saved in your friend roster
- ◆ Up to 4GB total data stored per title

TWL-DWC(-DL) Download Service

- ◆ Provided by Nintendo (not GameSpy)
- ◆ Included in DWC and DWC-DL libraries
 - Always use DWC-DL if GameSpy not used
- ◆ Up to 100 files of 1MB each
- ◆ Useful for timed distribution of content after release (new levels, items, etc.)
- ◆ Can maintain user interest post-launch

 nintendo zone™

About Nintendo Zone

- ◆ Nintendo Zone is a new proposal from Nintendo to implement the concept of Nintendo DS and Nintendo DSi as:
 - Machines That Will Enrich Each Owner's Life
- ◆ Nintendo is planning a variety of services that customers can access by connecting their Nintendo DS or Nintendo DSi to the Internet. Expansion of Nintendo Zone continues throughout Japan, North America and Europe.

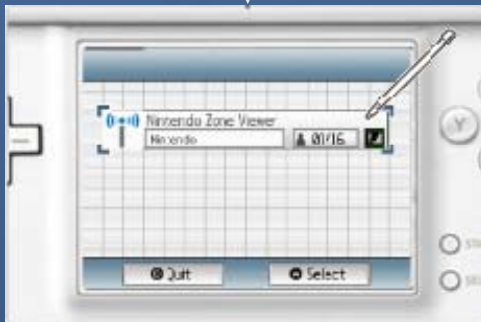
About Nintendo Zone

- ◆ Similar to Nintendo Wi-Fi Connection, Nintendo Zone makes connecting **simple** and **comfortable**.
- ◆ **Simple**: No registration or fussing over network settings is required.
- ◆ **Comfortable**: Eliminates harmful content and restricts unexpected Internet connections.

Nintendo Zone Operation (DS Lite)



Choose DS Download Play



Download the viewer



Choose items from the Menu


Nintendo-provided content:



Choose game previews/add-on data to download

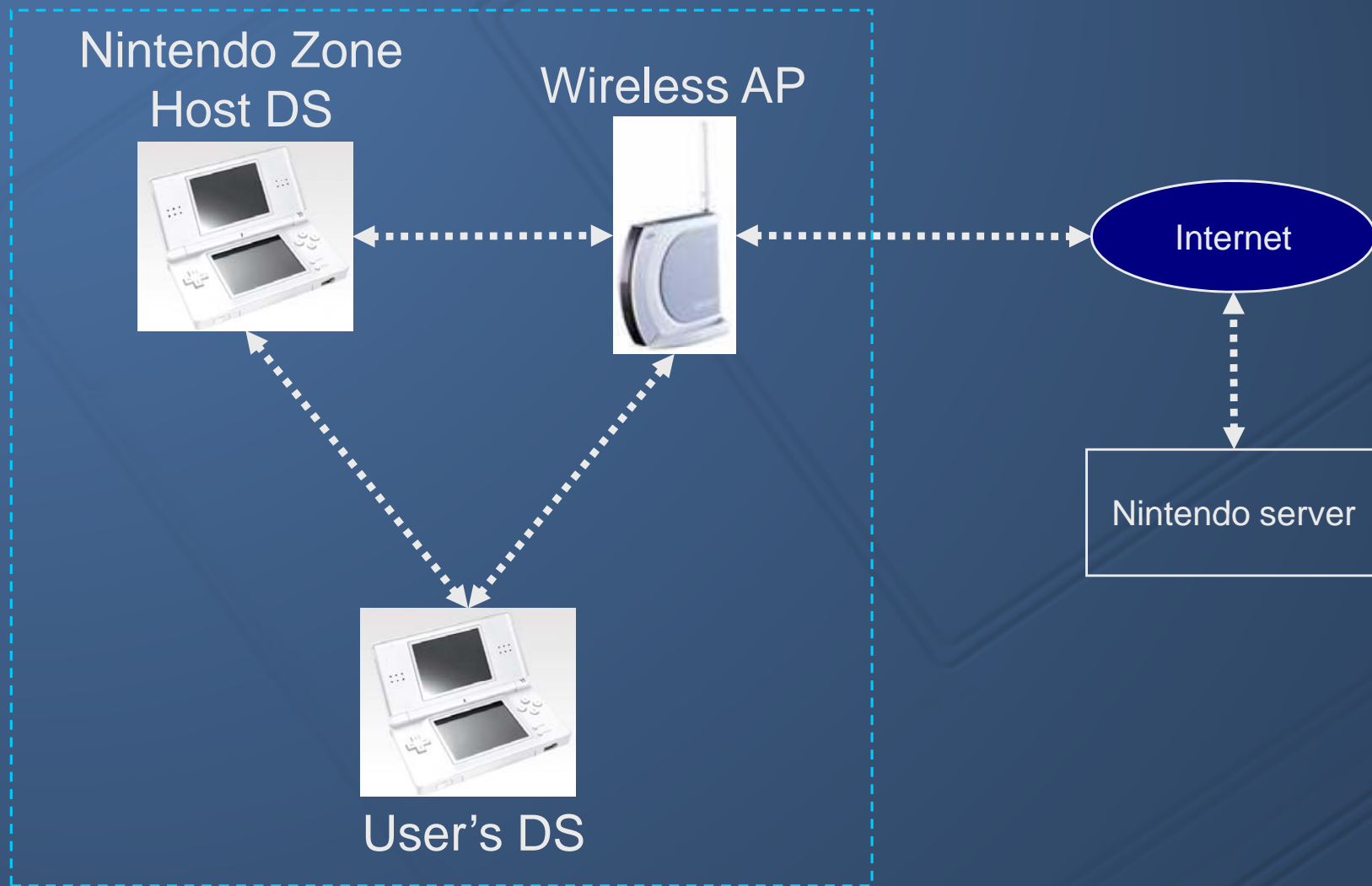


Browse "Area Content" at store (sample)

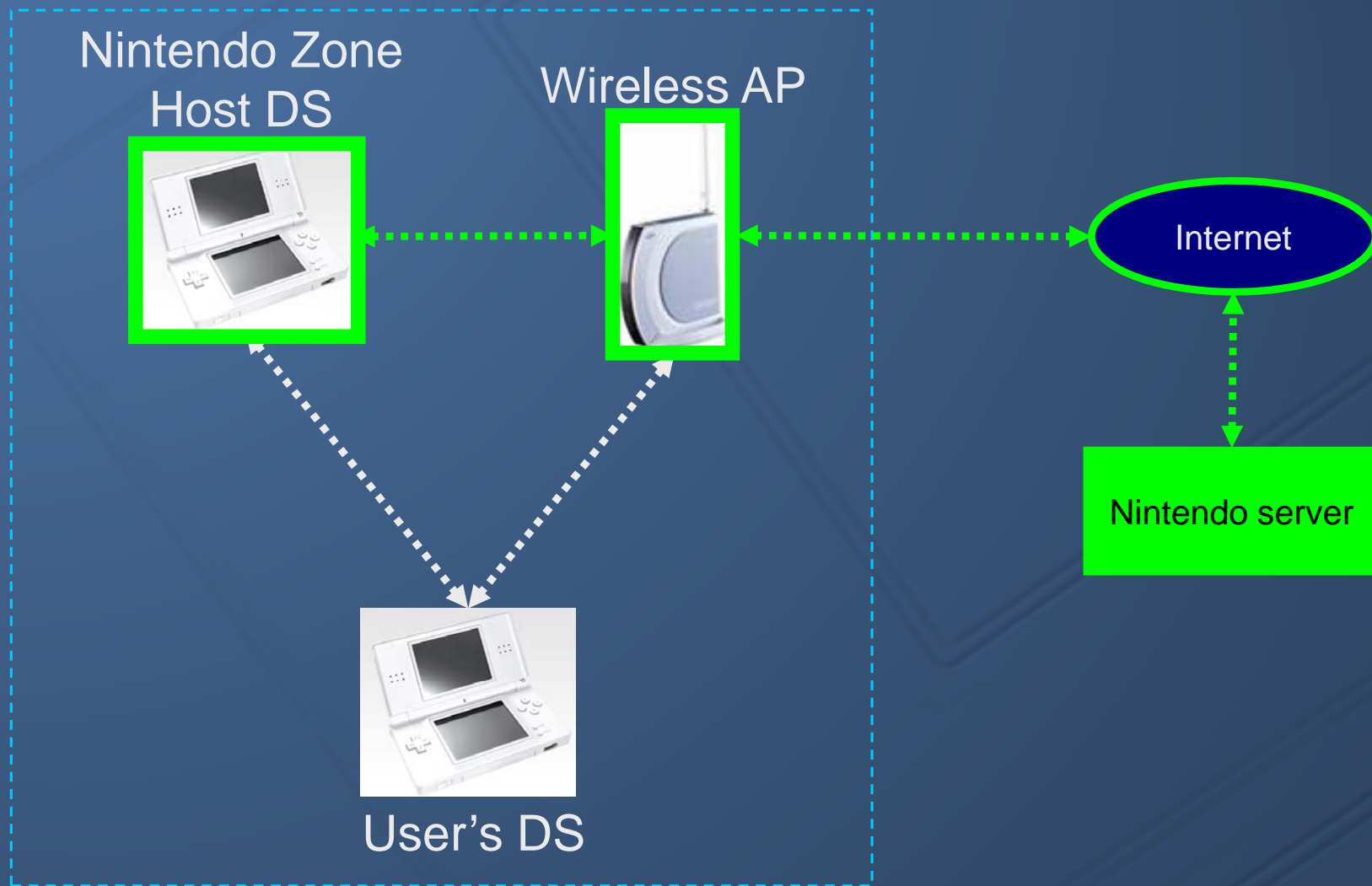
→ 
Data disappears when turned OFF

The Nintendo Zone viewer is pre-installed on Nintendo DSi systems, so Nintendo DSi users do not need to download the viewer. The viewer icon flashes on the DSi Menu when the system enters a wireless area to notify the user of the Zone.

Nintendo Zone Delivery Method

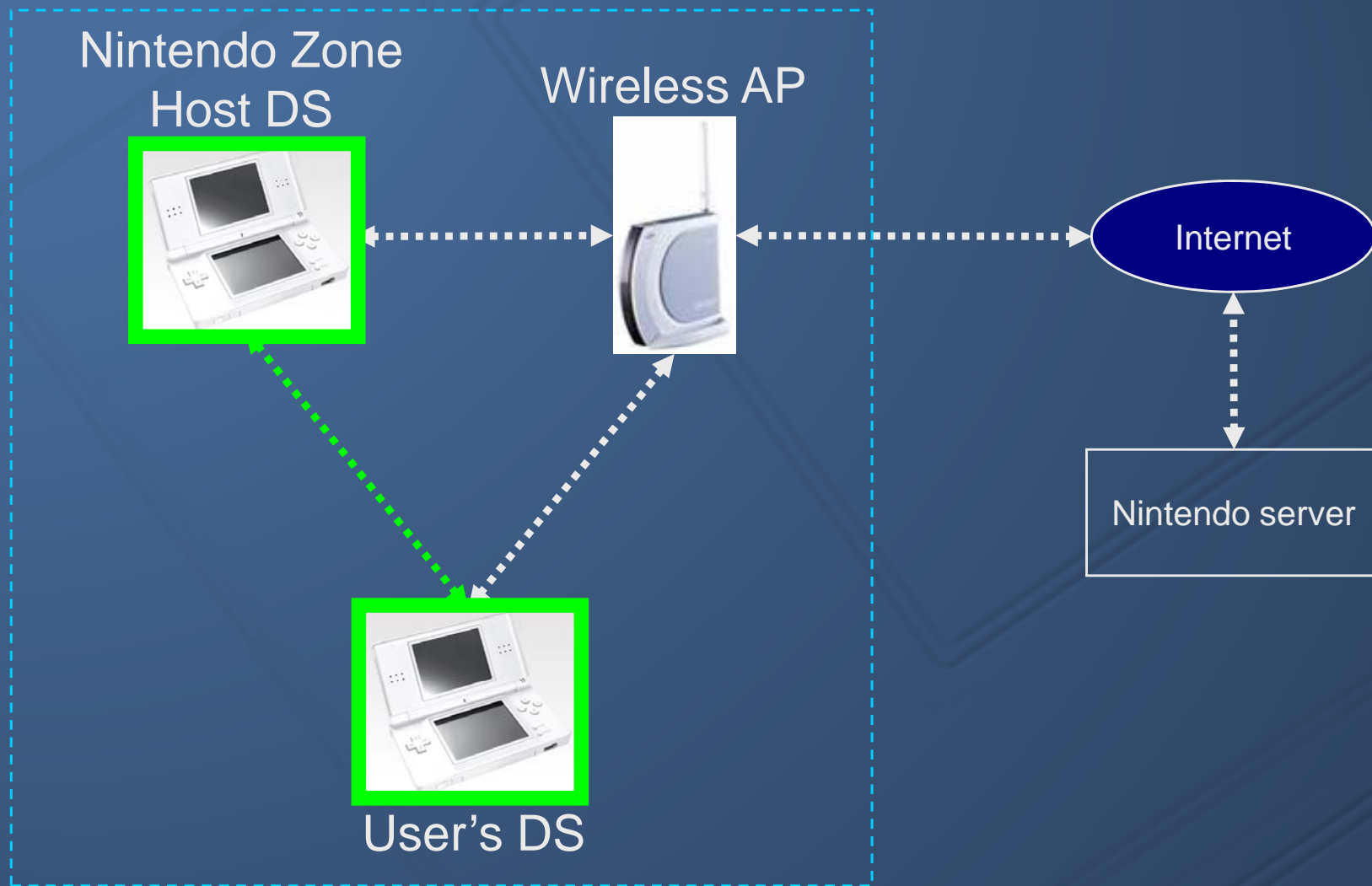


Nintendo Zone Delivery Method



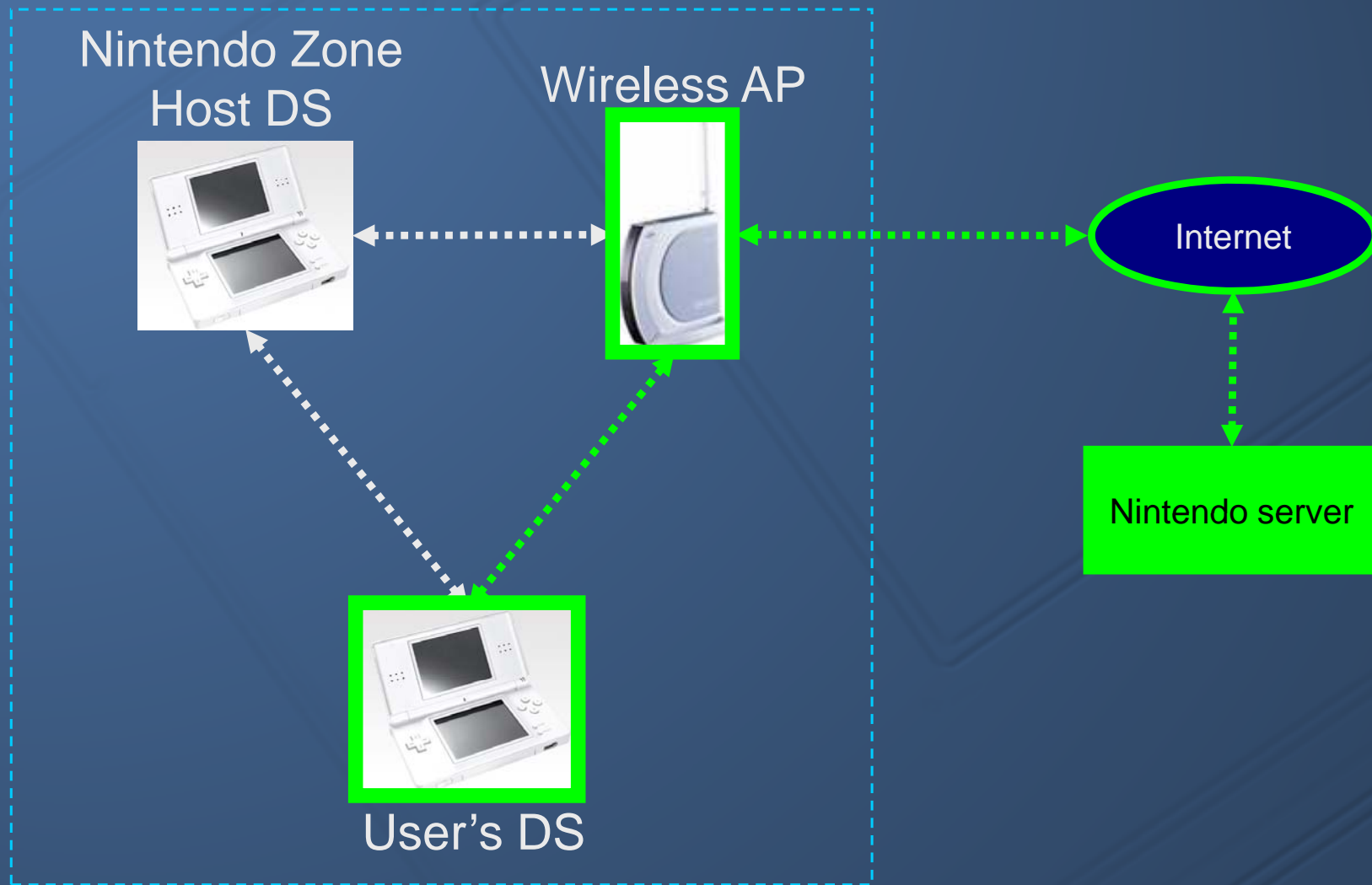
- ◆ 1. Host Nintendo DS downloads Nintendo Zone viewer from Nintendo's server & holds in memory

Nintendo Zone Delivery Method



- ◆ 2. Host DS delivers viewer onto the consumer's Nintendo DS/DS Lite via DS Download Play

Nintendo Zone Delivery Method



- ◆ 3. Viewer automatically configures wireless AP settings using info from Host DS wireless beacon & connects to Nintendo's server via Internet

Nintendo Zone Content

- ◆ Area Content:
 - Content based on locations, shops and facilities that provide Nintendo Zone access.
- ◆ Nintendo-provided content:
 - Nintendo Wi-Fi Connection Access
 - ◆ Access Wi-Fi communication features of NWC-compatible software
 - DS Download Service
 - ◆ Provides users with demos and additional data.
 - Nintendo DSi Exclusive Applications
 - ◆ Users can use the Nintendo DSi Shop and Nintendo DSi Browser.

Nintendo Zone Content:

Nintendo Wi-Fi Connection Access

- ◆ Nintendo Wi-Fi Connection features including matchmaking, rankings & downloads can be used in Nintendo Zone.
- ◆ Nintendo WFC Download Service
 - Using Nintendo Zone location information, exclusive data can be distributed at specific locations via Nintendo Wi-Fi Connection.
- ◆ Example: Item Distribution
 - Item A available at home/non-Nintendo Zone
 - Item B available only at Nintendo Zone

Nintendo Zone Content: DS Download Service

- ◆ Game Previews
 - Distribution of Nintendo DS demos with same specifications as demos on DS Download Stations and Nintendo Channel.
- ◆ Add-On Data
 - Distribution of add-on data for games.
- ◆ Limited Editions
 - Add-on data and programs available at specific locations or for a limited time.

Development of Games Supporting Nintendo Zone

- ◆ Standard support included in DWC Library
 - Use NITRO-DWC 3.1, TWL-DWC 5.0 or later
- ◆ Check using **Nintendo Zone Simulator**
 - When a beacon is received from the Nintendo Zone host, DWC processes it automatically
 - To prevent unexpected issues at Lotcheck, all titles should use the Nintendo Zone Simulator (included in TWL-DWC) to check this in advance.
- ◆ Contact SDSG (support@noa.com) when considering plans for using Nintendo Zone

Thank you!

Questions, comments, requests?

support@noa.com