

クラスEアドレス-IPv4最後の領域-

Shishio Tsuchiya

shtsuchi@arista.com

IPアドレスクラス [RFC791](#)

クラスA:0/8～127/8

0	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

0	1	1	1	1	1	1	1	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	.	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

クラスB:128.0/16～191.255/16

1	0	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	.	0	0	0	0	0	0	0
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1	0	1	1	1	1	1	.	1	1	1	1	1	1	1	.	0	0	0	0	0	0	.	0	0	0	0	0	0	0
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クラスC:192.0.0/24～223.255.255/24

1	1	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	.	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1	1	0	1	1	1	1	.	1	1	1	1	1	1	1	.	1	1	1	1	1	1	.	0	0	0	0	0	0	0
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IPアドレスクラス [RFC1112](#)

クラスD:224.0.0.0～239.255.255.255 マルチキャスト

1	1	1	0	0	0	0	.	0	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1	1	1	0	1	1	1	1	.	1	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

クラスE:240.0.0.0～255.255.255.255 実験用将来予約

1	1	1	1	0	0	0	0	.	0	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1	.	1	1	1	1	1	1	1
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

$2^{28}=268,435,456 \div 2$ 億アドレスの巨大なスペース

クラスEについて

- RFC5735で255.255.255.255は制限されたブロードキャストアドレス（として考えられていて、送信元アドレスとなる事は決して無い。240.0.0.0/8は将来使用のために確保
 - <https://tools.ietf.org/html/rfc5735#section-3>
- IPアドレス枯渇が叫ばれていた2007年2つのインターネットドラフトが提案された
 1. **Reclassifying 240/4 as usable unicast address space**
 - <https://tools.ietf.org/html/draft-fuller-240space>
 2. **Redesignation of 240/4 from “Future Use” to “Private Use”**
 - <https://tools.ietf.org/html/draft-wilson-class-e>

IPv4 Security Assessment

<https://tools.ietf.org/html/rfc6274#section-4.3.4>

- The former Class E addresses correspond to the 240/4 address block, and are currently reserved for experimental use. As a result, a most routers discard packets that contain a "Class" E address as the Source Address or Destination Address. If a packet is received with a 240/4 address as the Source Address and/or the Destination Address, the packet should be dropped and this event should be logged (e.g., a counter could be incremented to reflect the packet drop).
- 多くのルータの実装はクラスEアドレスを送信元もしくは宛先アドレスに含んでいるとそのパケットをドロップする

一般的な実装

```
cal426(config-if-Et60/1)#ip address 240.0.0.0/31
cal426(config-if-Et60/1)#show ip interface brief
```

Interface	IP Address	Status	Protocol	MTU	Address Owner
-----	-----	-----	-----	-----	-----
Ethernet60/1	240.0.0.0/31 !	down	down	1500	
Loopback0	10.255.255.2/32	up	up	65535	
Loopback1	10.255.255.102/32	up	up	65535	
Management1	10.92.62.240/26	up	up	1500	

! Warning: IPv4 routable 240.0.0.0/4 is disabled. This interface address is not active.

- クラスEアドレスはフォワードができない様に実装されている

クラスEアドレス対応ルータ

```
cal426#show running-config section router general
router general
```

```
    ipv4 routable 240.0.0.0/4
```

```
cal426#show ip interface brief
```

Interface	IP Address	Status	Protocol	MTU	Address Owner

Ethernet60/1	240.0.0.0/31	up	up	1500	
Loopback0	10.255.255.2/32	up	up	65535	
Loopback1	10.255.255.102/32	up	up	65535	
Management1	10.92.62.240/26	up	up	1500	

クラスEアドレス対応ルータ

```
cal426#show ip route ospf
```

```
VRF: default
```

```
Codes: C - connected, S - static, K - kernel,  
        O - OSPF, IA - OSPF inter area, E1 - OSPF external type 1,  
        E2 - OSPF external type 2, N1 - OSPF NSSA external type 1,  
        N2 - OSPF NSSA external type2, B - BGP, B I - iBGP, B E - eBGP,  
        R - RIP, I L1 - IS-IS level 1, I L2 - IS-IS level 2,  
        O3 - OSPFv3, A B - BGP Aggregate, A O - OSPF Summary,  
        NG - Nexthop Group Static Route, V - VXLAN Control Service,  
        DH - DHCP client installed default route, M - Martian,  
        DP - Dynamic Policy Route, L - VRF Leaked,  
        RC - Route Cache Route
```

```
O          10.255.255.1/32 [110/20] via 240.0.0.1, Ethernet60/1  
O          10.255.255.101/32 [110/20] via 240.0.0.1, Ethernet60/1
```

```
cal426#
```


クラスEアドレス対応ルータ

```
cal426#ping 240.0.0.1
PING 240.0.0.1 (240.0.0.1) 72(100) bytes of data.
80 bytes from 240.0.0.1: icmp_seq=1 ttl=64 time=0.261 ms
80 bytes from 240.0.0.1: icmp_seq=2 ttl=64 time=0.084 ms
80 bytes from 240.0.0.1: icmp_seq=3 ttl=64 time=0.082 ms
80 bytes from 240.0.0.1: icmp_seq=4 ttl=64 time=0.081 ms
80 bytes from 240.0.0.1: icmp_seq=5 ttl=64 time=0.081 ms

--- 240.0.0.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.081/0.117/0.261/0.072 ms, ipg/ewma 0.166/0.187 ms
```

まとめ

- 長い間将来予約とされてきたクラスEアドレスが、多くのクラウドタイタンを中心に利用が要求され、実装がされてきた。
- データセンターなどではIPv6リンクローカルなどルータ間でのIPアドレスの考え方が少し変わってきている
- 他OSなどのクラスEの実装状況などの確認をしたい
 - 他社ルータ？
 - Apple OSX/Linux Kernelは問題無い？



Thank You

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