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The Internet Intelligence Authority

Bahrain's Internet Ecosystem: 2011 Trends

11 December 2011

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Key Findings

At the request of the Bahrain TRA, Renesys periodically evaluates the blend of transit provider alternatives that are available to Internet Service Providers in the Kingdom. Using publically visible BGP routing data collected from several hundred global vantage points outside Bahrain, each provider's transit arrangements are summarized to provide insight into the current state of the market.

Around the world, international transit provider diversity is a key driver of stability, quality, and price in each domestic market. As the number of physical and logical paths to international providers increases, competition in the wholesale IP transit marketplace can reduce cost and increase quality of service for businesses and consumers that use local providers to connect to the Internet.

This report summarizes the year-end state of the Bahrain Internet ecosystem, as seen through the lens of transit providers' BGP routing tables[1]. Within the Kingdom, ISPs continue to adjust to the changing competitive landscape, primarily by changing the ways they purchase international Internet transit. In the twelve months ending December 2011, a few trends in provider interconnection are clear:

- Starting in 2010, many more providers took advantage of the availability of Flag transit. Those numbers appear to have peaked in 2011, but Flag still plays an important part in the transit strategy of many Bahraini providers, including Nuetel, Mena Broadband, and LightSpeed, in addition to Batelco.

- At the same time, the momentum in 2011 customer base growth belonged to Saudi Telecom, whose new connectivity (across the King Fahd Causeway and over GCCIA dark fiber, to support the growth of Viva's 3G services) continues to attract significant new business.

- In November 2011, Zain Bahrain dropped Flag in favor of STC transit, just as they dropped Etisalat in favor of Flag a year earlier.

- The Bahrain Internet Exchange, a major customer of Tata and the last Bahrain transit customer of Etisalat, continues to face challenges as it adjusts to the role of minority backup transit provider for many of the Kingdom's ISPs. As the landing party of the new Tata cable in 2012, BIX may attract new interest in domestic interconnection from some of its former customers.

- The new Tata and GBI cables that will become operational in 2012 (managed by BIX and Batelco, respectively) will create interesting new alternatives for Bahrain's service providers. The new Tata cable, in particular, should give Tata a chance to win back some of the competitive momentum attained by Flag and STC in 2010-2011.

[1] BGP data collected from hundreds of providers worldwide, 1 July 2010 - 1 December 2011.

With regard to the Middle Eastern region's Internet development in 2011, generally:

- Bahrain is well-positioned relative to the region, in terms of the number of domestic providers it supports, the balance of their relative share of the domestic Internet market, and their ability to directly access and negotiate with multiple international providers for transit services.

- No single Bahraini provider counts more than 50% of the domestic market among its direct or indirect transit customers, as seen in the global BGP routing tables. This level of domestic routing diversity puts Bahrain in the top tier among regional Internet economies, many of which are dominated by a largest provider that still serves more than 90% of the domestic market.

- In **Lebanon,** the landing of the IMEWE cable in December 2010 and its subsequent service activation in December 2011 have attracted more transit customers to the national incumbent, ironically reducing the level of national Internet diversity while massively expanding the available capacity. A year of significant market and regulatory adjustment lies ahead.

- In **Oman**, the competitor (Nawras/Omani Qatari Telecom) has blossomed in the final months of 2011, and now has a third of the country's domestic market on-net. The incumbent, Omantel, has reduced its share from 100% to 86%. This may herald a trend toward market liberalization in anticipation of the EPEG international cable project and the establishment of a regional Internet exchange in Oman.

- In **Syria**, the only alternative transit provider (Syrian Communications Society, AS24814) went off the air entirely in the Spring of 2011, leaving SyriaTel without even nominal competition.

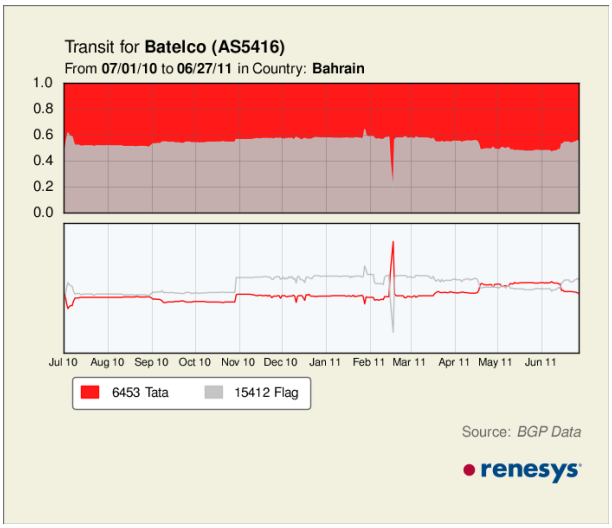
Finally, we examined the evolution of the regional IPv6 routing table. Bahrain's ISPs are not yet experimenting publically with IPv6 Internet transit. This does not have an immediate impact on the Kingdom's connectivity.

In the longer run, however, exhaustion of IPv4 Internet addresses will impose additional costs on Bahraini providers, either by forcing them to build alternative IPv6 Internet infrastructure, or by requiring them to purchase new IPv4 address space from existing assignees in the open market to support continued growth.

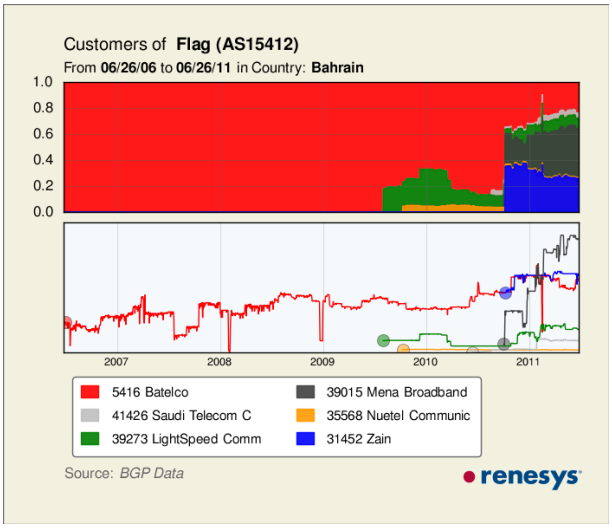
Methodology and Interpretation

Renesys continually monitors the global Internet routing table, synthesizing second-by-second changes in the advertised paths to every connected network on earth, and measuring round-trip latencies to those networks from around the world. Years of consecutive continuous observations are then mined to produce summaries of evolving interprovider relationships in each country, and each region of the world.

Transit shift plots present a histogram of a given provider's route selection percentages to each of their upstream transit providers, summing to 100%. The thickness of colored bands gives a visual indication of the importance of each provider in supplying Internet transit to the autonomous system in question over some lookback period (in this report, the trailing 18 months ending December 2011). Below the histogram, the unnormalized customer base is plotted as a line plot, to give a sense for the growth or loss of transit volume over the lookback period.



Customer transit plots provide equivalent information for the provider's customer base, indicating the relative contribution of each downstream ASN to the provider's total customer base. As with the regular (upstream) transit shift plots, the customer transit plots consist of a normalized stacked histogram on top, and an unnormalized line plot of the same customer base size data below.



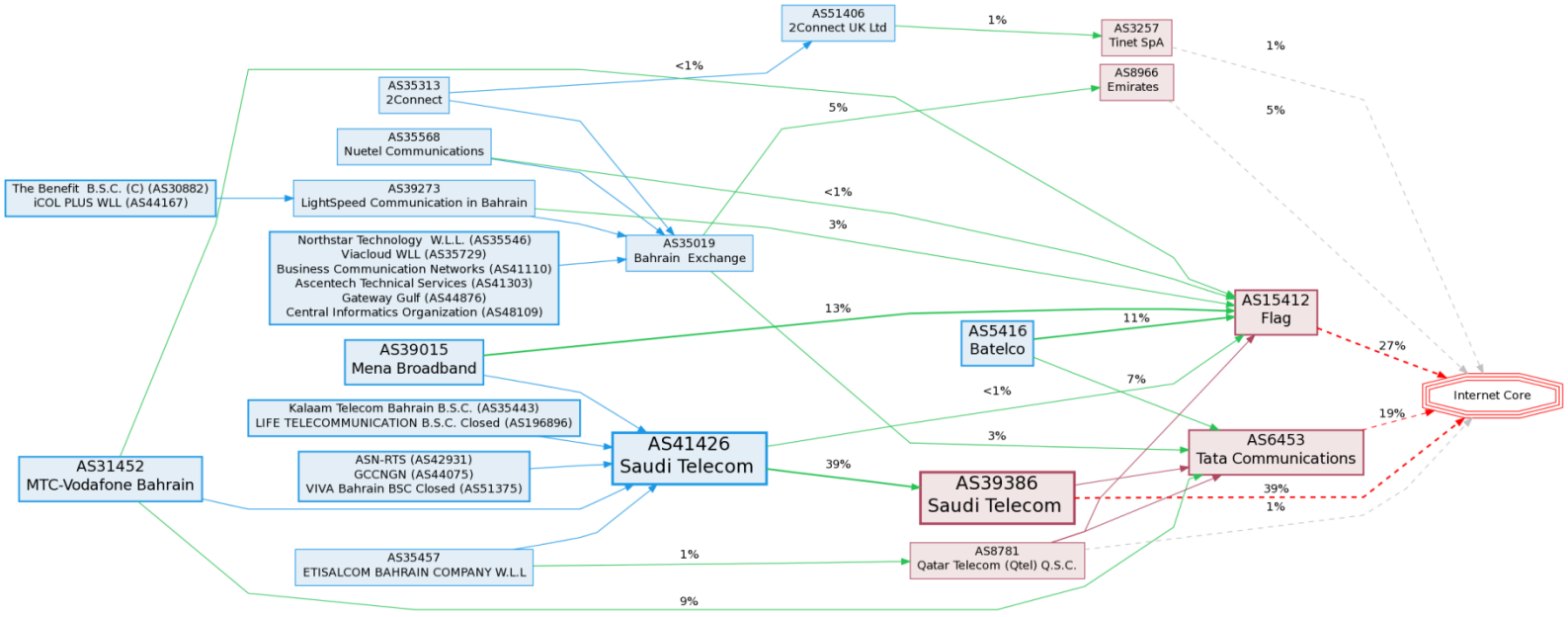
Transit Providers

In the following sections, we examine transit shift and customer transit plots for a cross-section of the key domestic and international transit providers in Bahrain. Transit shift and customer transit shift plots show the evolution of international transit implementations in the 18 months ending December 2011.

Evidence of healthy churn in the wholesale transit markets is an important indicator of the health of the Internet ecosystem. Indeed, renegotiating agreements with international Internet transit providers is one of the primary ways that ISPs can continually improve the quality and lower the cost of the services they deliver over time.

When domestic providers negotiate directly with international providers, and balance their paid traffic across them on a daily basis, international providers must compete for Bahrain's business. This is critically important for the evolution of a market whose consumers and commercial sector rely on diverse international Internet connectivity to reach key content and financial markets in Europe, Asia, and North America.

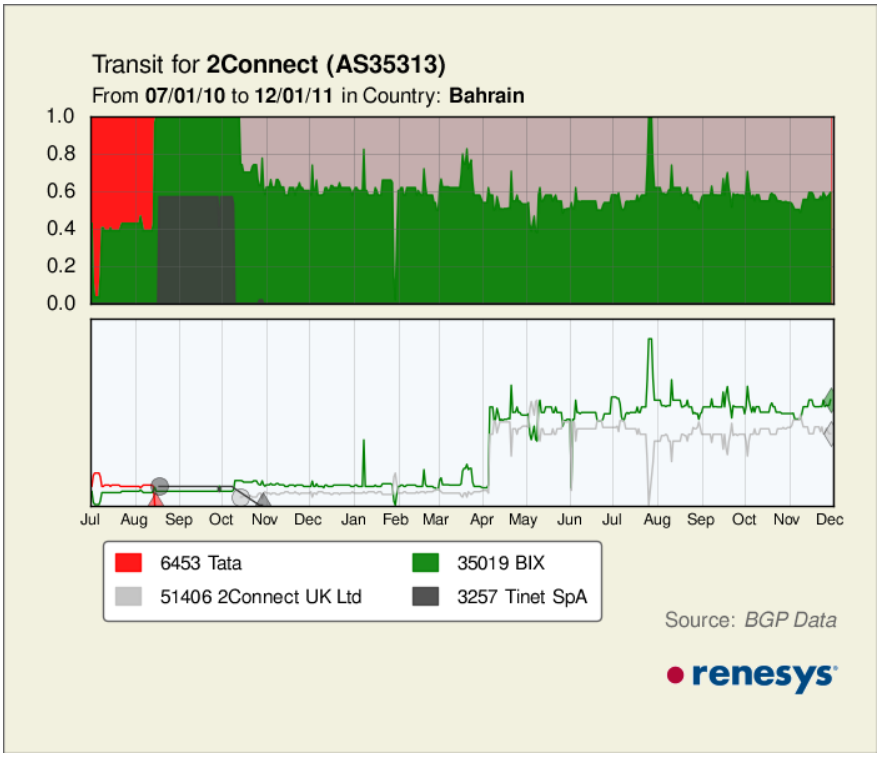
At the end of 2011, as shown in the domestic transit map below, Bahrain's providers have spread their bets across a wider range of international providers than ever before. Saudi Telecom, Flag, Etisalat, and Tata now compete to carry Bahrain's traffic to international markets along a diverse set of physical paths.



Local ISPs

2Connect

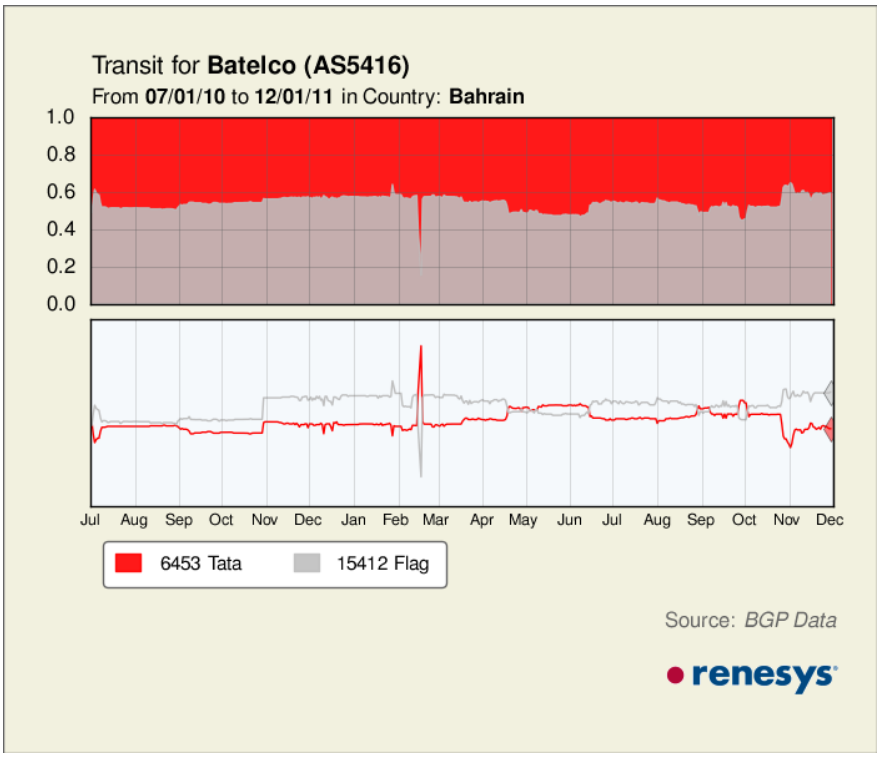
2Connect continues to route through their UK ASN (51406) and through the BIX, with the BIX continuing to play a major (60%) role.



Batelco

Batelco retains its rough 50-50 mixture of Tata and Flag transit, without significant modifications over the preceding 18 months.

It continues to be the case that Batelco has no downstream customers with their own autonomous system, able to "multihome" to competing providers.



Etisalcom Bahrain

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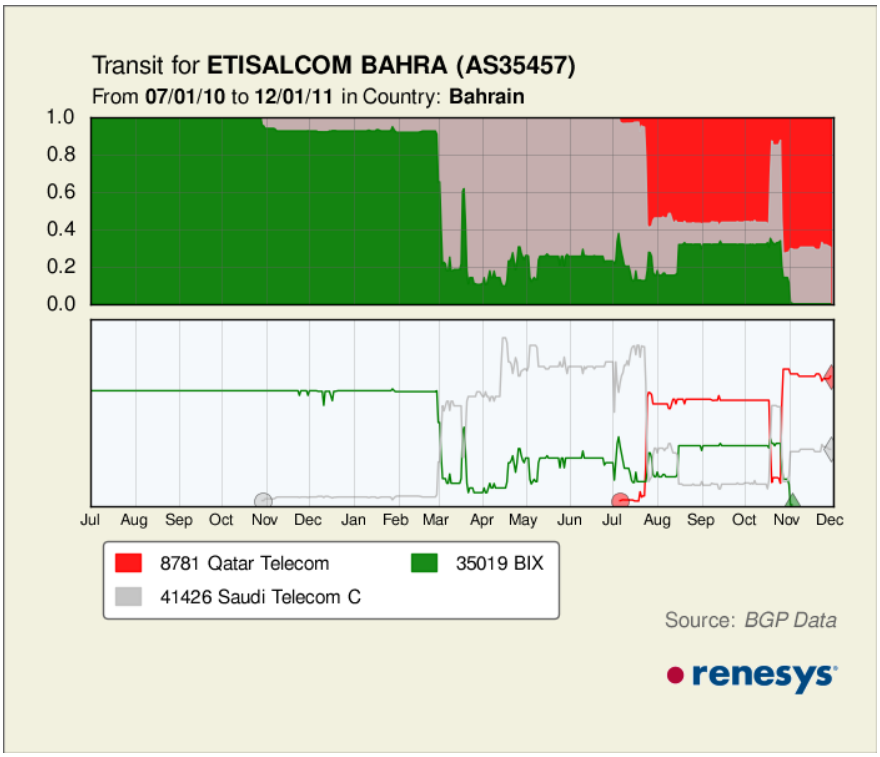
Etisalcom Bahrain first brought a small amount of STC transit online in November 2010.

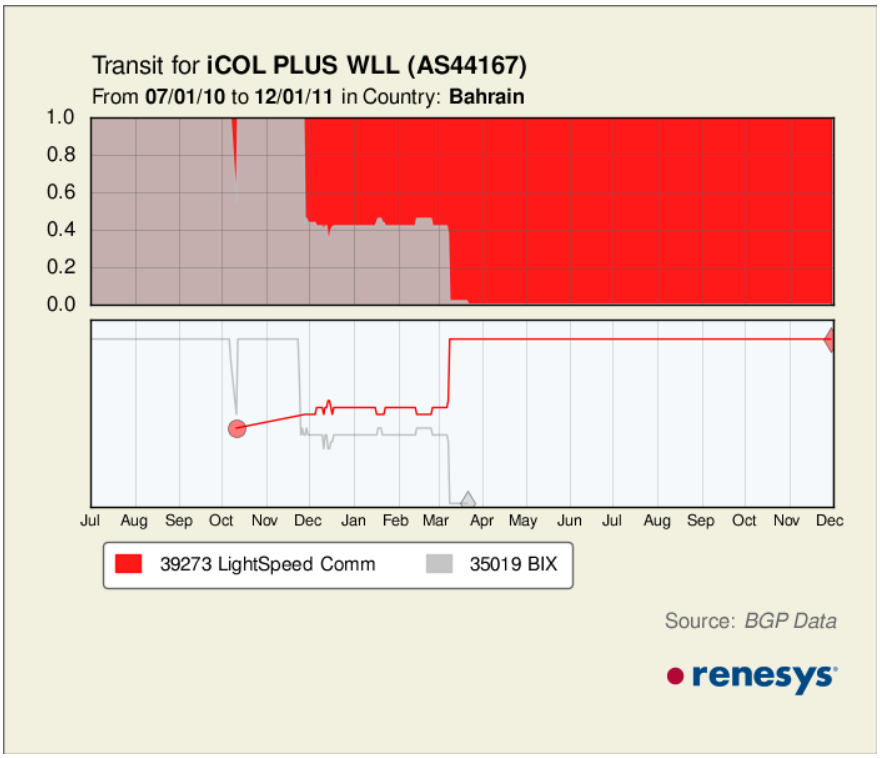
In March 2011 they switched to a blended strategy with 80% reliance on STC, relegating the BIX to backup status. In July, they added Qtel as a third provider, and in November, they dropped BIX transit entirely.



iCol Plus

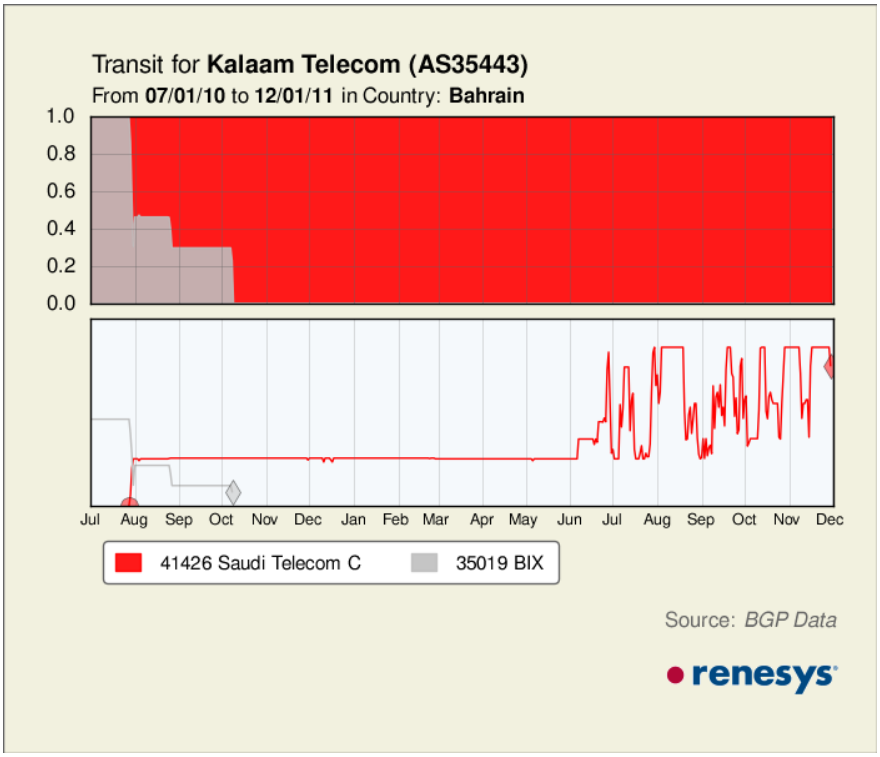
iCOL Plus dropped its BIX transit in stages, between December 2010 and March 2011, and is now single-homed behind LightSpeed.

Buying transit from LightSpeed allows iCol to take advantage of Flag transit indirectly, while retaining backup Tata/Etisalat paths through the BIX.



Kalaam

Kalaam Telecom eliminated its single-homed dependence on the BIX in October in favor of a new single-homed dependence on Saudi Telecom. This new arrangement has been stable throughout 2011, even though the number of prefixes advertised by Kalaam has fluctuated.

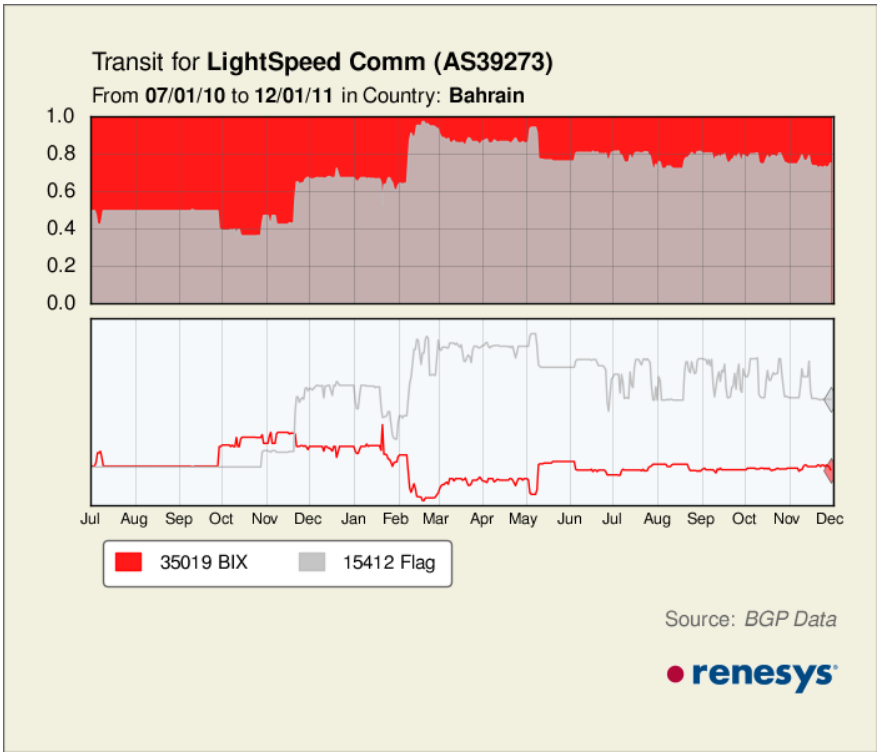


LightSpeed

With the increased availability of service from Flag and Saudi Telecom, many BIX customers appear to use the BIX as a relatively small backup transit connection.

LightSpeed, for example, continues to shift transit back towards Flag in 2011, though it retains a second transit relationship (now just 20-25%) through the BIX.

Recall that LightSpeed was formerly 100% dependent on Flag for transit.

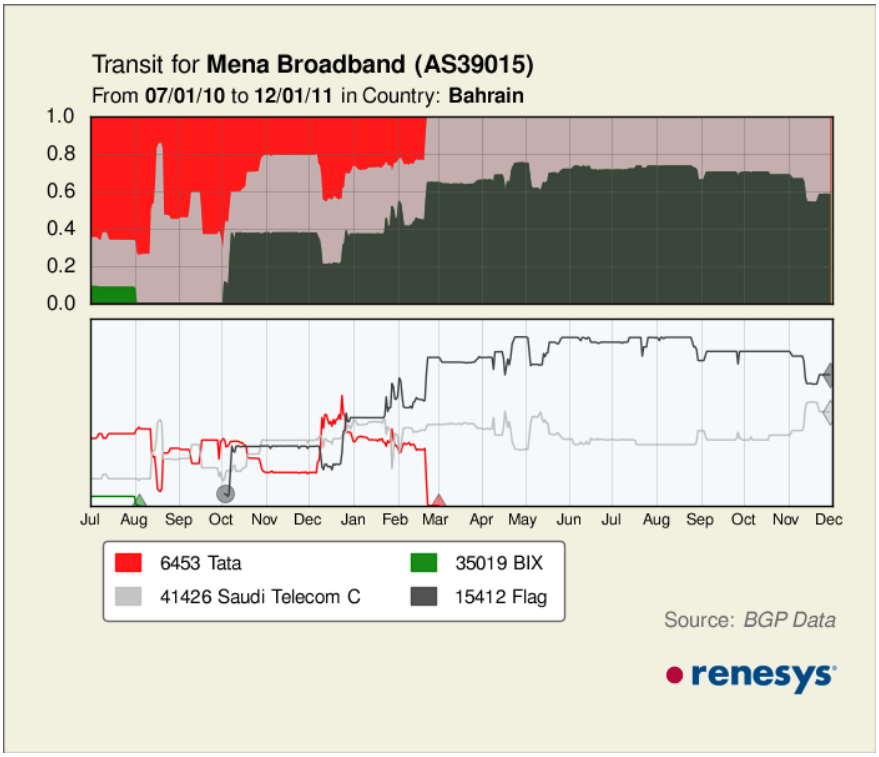


As their transit through Flag has grown, LightSpeed has built its base of significant downstream customers in 2011. These have included The Benefit Company and Life Telecommunications (the Kingdom's first active 4-byte autonomous system number) in addition to iCOL Plus and Orange Business.

Mena

Mena Broadband, which dropped BIX transit back in August 2010, continued to adjust its transit blend.

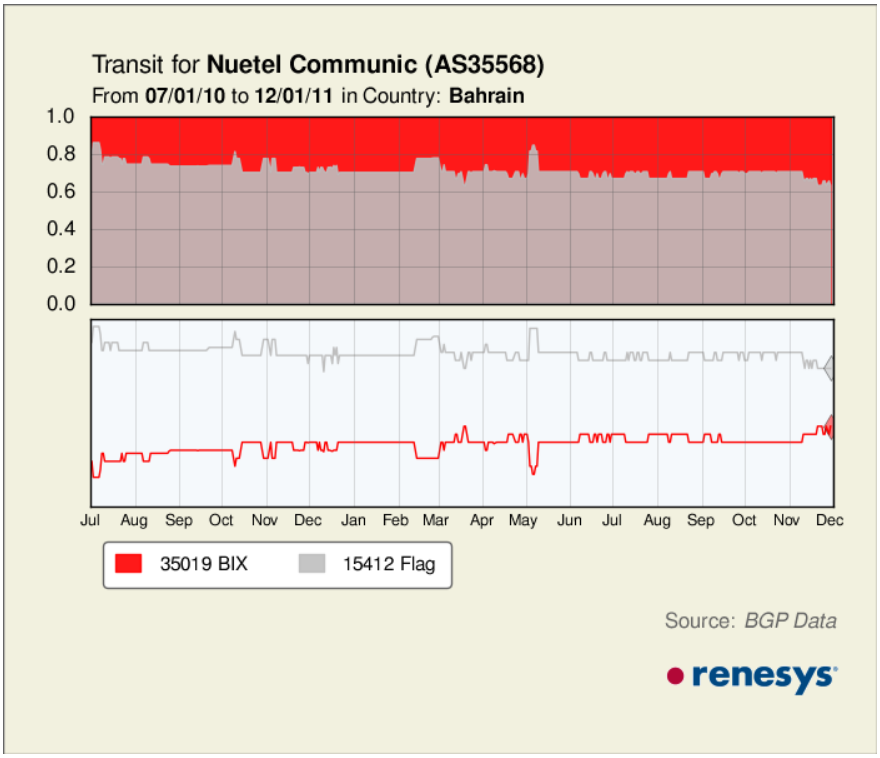
Mena also dropped Tata in March 2011, having replaced it with a blend of Flag and Saudi Telecom.



Nuetel

After a sequence of defections in 2010, the BIX has retained some of its multihomed customers in 2011. However, it increasingly serves as minority backup transit for these providers.

Nuetel continues to multihome to BIX and Flag, with roughly 75% of transit through Flag.

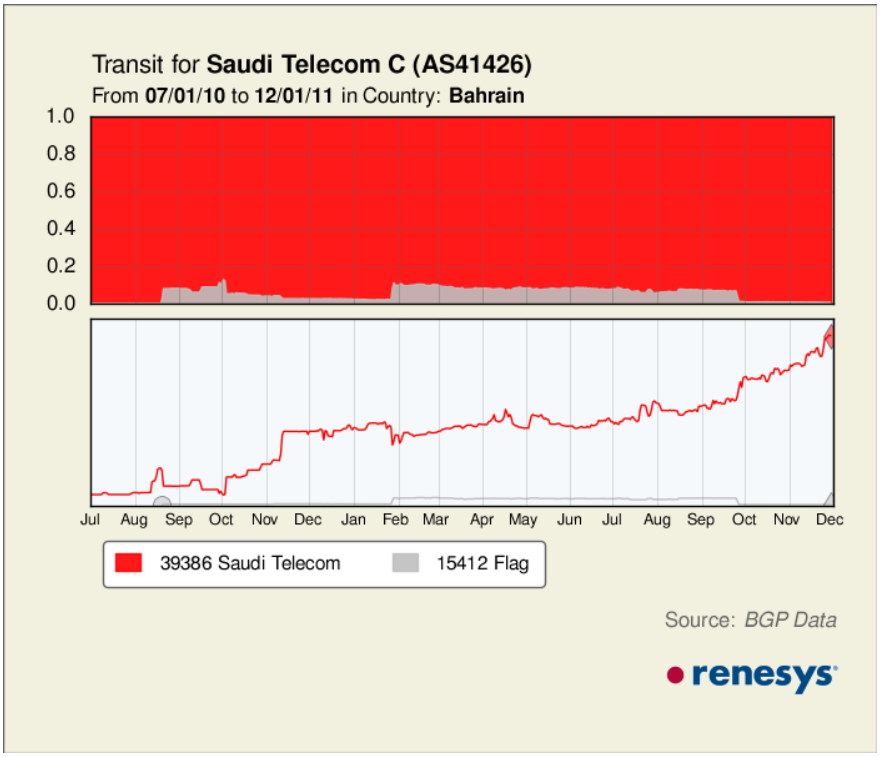


Viva (Saudi Telecom)

Viva's primary ASN, AS51375, is single-homed to STC's AS41426, used exclusively for Bahrain operations, and the two can be considered as a pair.

Saudi Telecom's total Bahrain transit has continued to grow smoothly throughout the last 12 months, representing a mixture of Viva's 3G mobile traffic and direct provision of IP transit to downstream providers.

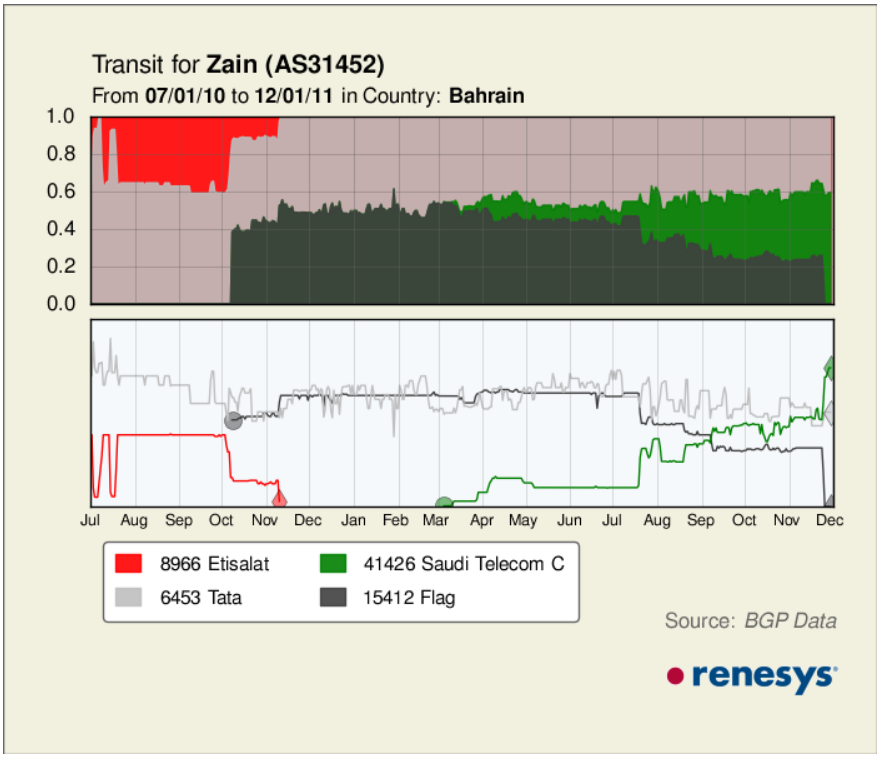
A small amount of STC's Bahrain traffic (less than 5%) is handled through their access to the Flag cable. The vast majority of it is backhauled to STC's main autonomous system in Saudi Arabia (AS39386) across the King Fahd Causeway, or over the GCCIA cable.



Zain

Zain's transition from Etisalat to Flag in November 2010 was followed by the addition of a small amount of Saudi Telecom transit in March 2011.

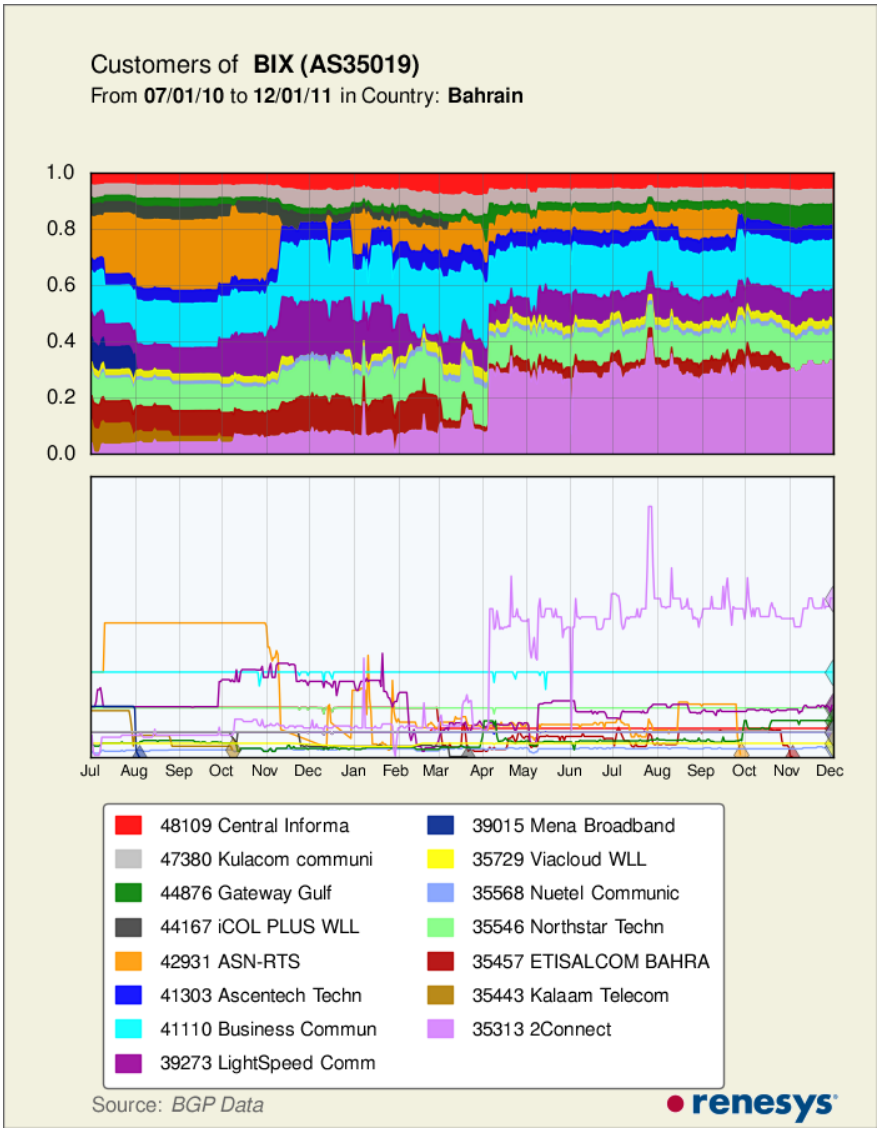
This "trial" of Saudi Telecom transit grew steadily throughout the course of the year, and in late November 2011, STC actually replaced Flag in Zain's transit mixture. At the close of 2011, Zain is dual-homed to STC (60%) and Tata (40%).



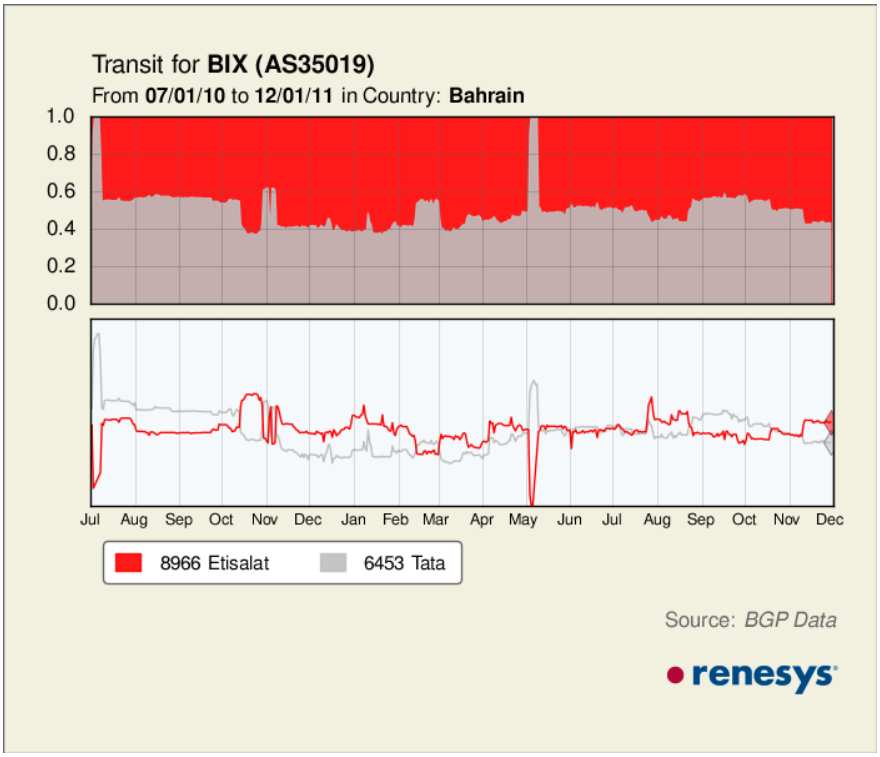
International Transit Providers

Bahrain Internet Exchange

The Bahrain Internet Exchange's customer base continues to be a mixture of small single-homed providers (Kalaam, Ascentech, Kulacom, Viacloud, Northstar, etc.) and backup transit for a couple larger multihomed providers (Mena Broadband, 2Connect).

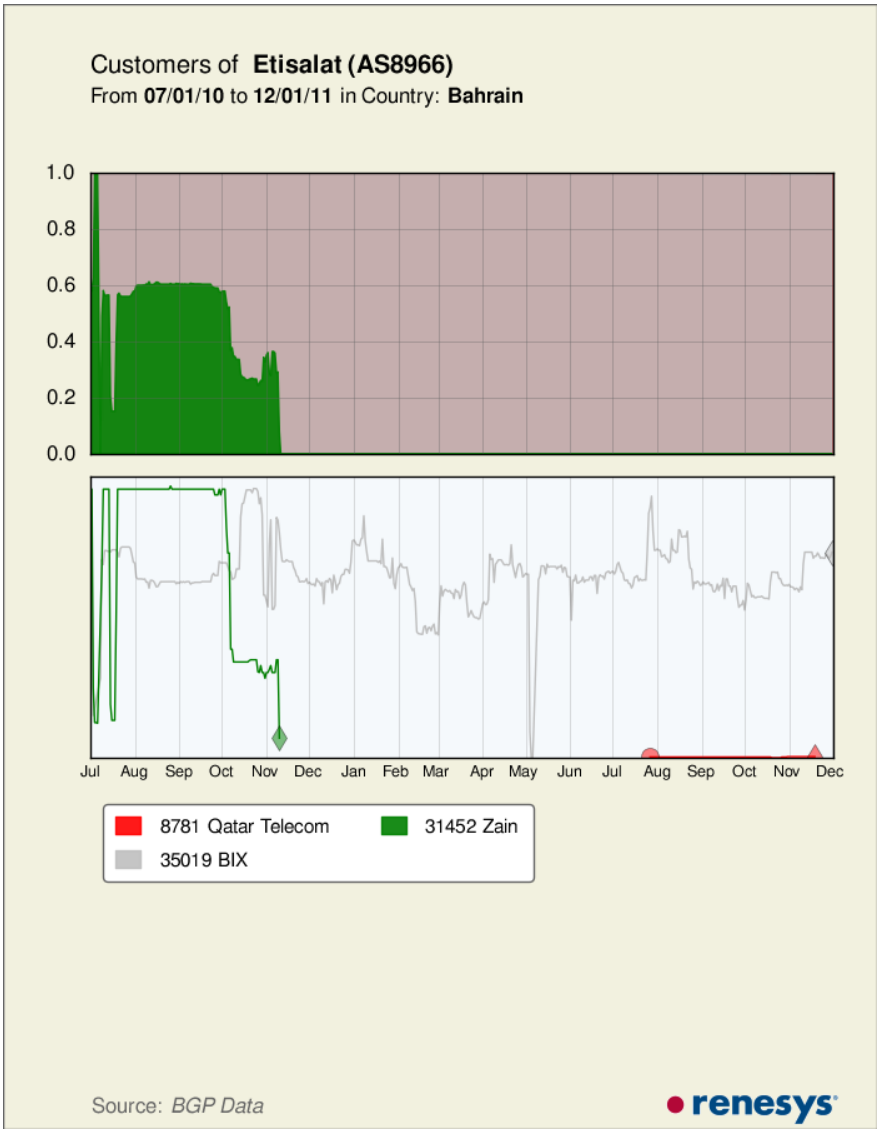


The BIX continues to send its traffic through Etisalat and Tata, with total transit volume (in terms of customer base) basically stable over the past 18 months.



Etisalat

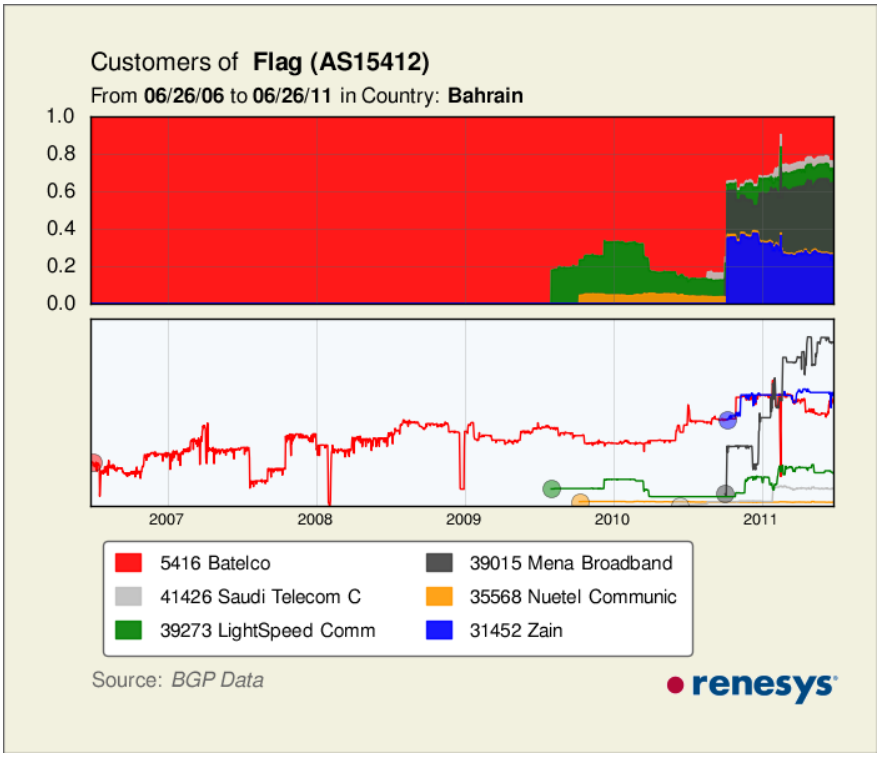
In fact, the BIX is now Etisalat's only significant transit customer in Bahrain, since Zain Bahrain moved to Flag transit in November 2010 (and subsequently to STC transit in November 2011).



Flag

The main story of 2010 was certainly the increased willingness of Bahrain providers to take advantage of Flag transit. In 2011, this trend has moderated in the face of new competition from Saudi Telecom.

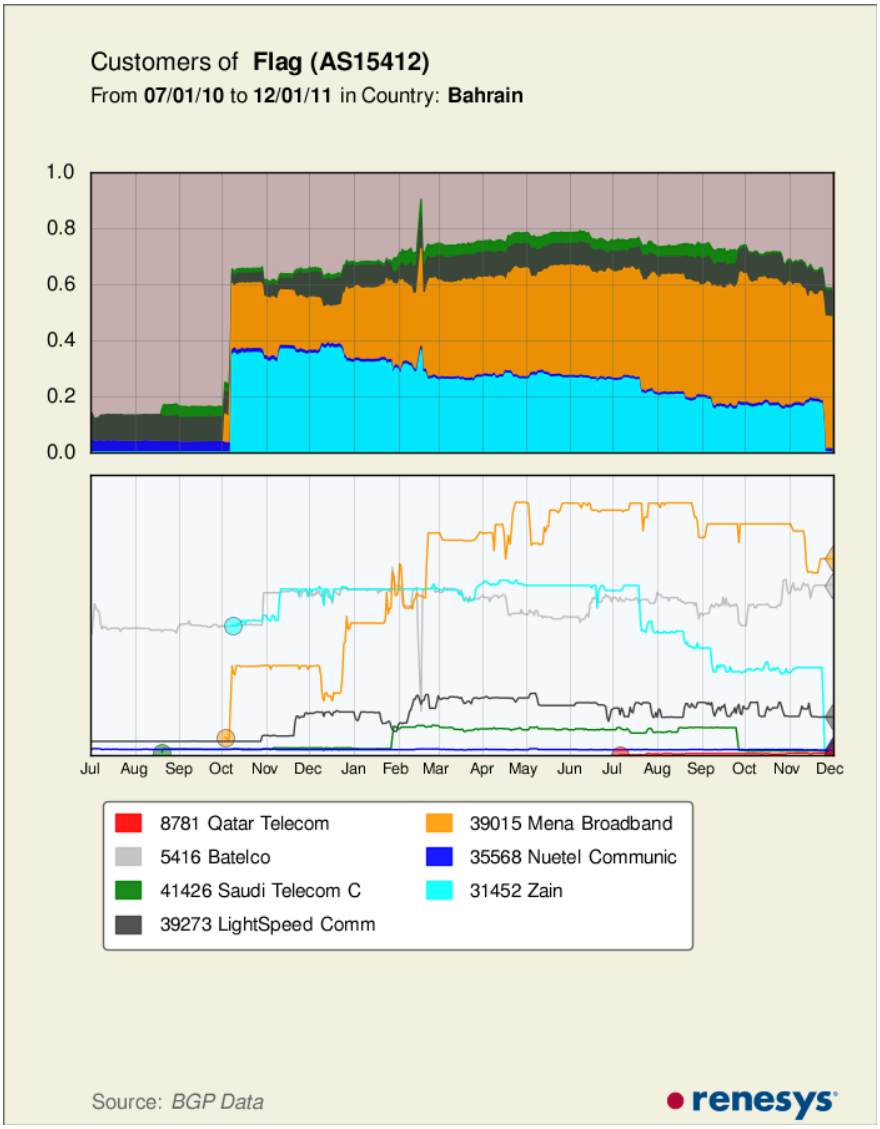
This five-year plot shows the sudden growth of Bahraini providers' Flag transit over the last two years, after a long period in which Batelco was Flag's only customer. (Note five-year timescale.)



Examining the trends of the last 18 months, it's clear that in the last expansion round of non-Batelco Flag transit , which appeared in October 2010, many providers made commitments to shift significant portions of their traffic onto Flag.

After peaking in July 2011, however, Flag utilization has dropped somewhat. In Bahrain, STC's use of Flag as a backup transit provider for Viva effectively ended in October. Zain dropped Flag transit altogether in the final weeks of November.

There haven't been any visible new customer wins for Flag in Bahrain since the end of 2010, and in 2011, the new contract momentum clearly belonged to Saudi Telecom.



Saudi Telecom

This plot clearly summarizes the success STC has had in bringing new Bahrain customers on-net over the course of the last 18 months.

Mena Broadband was the first customer; Kalaam joined in August 2010.

Viva Bahrain (STC's mobile network) makes a visible appearance in October 2010.

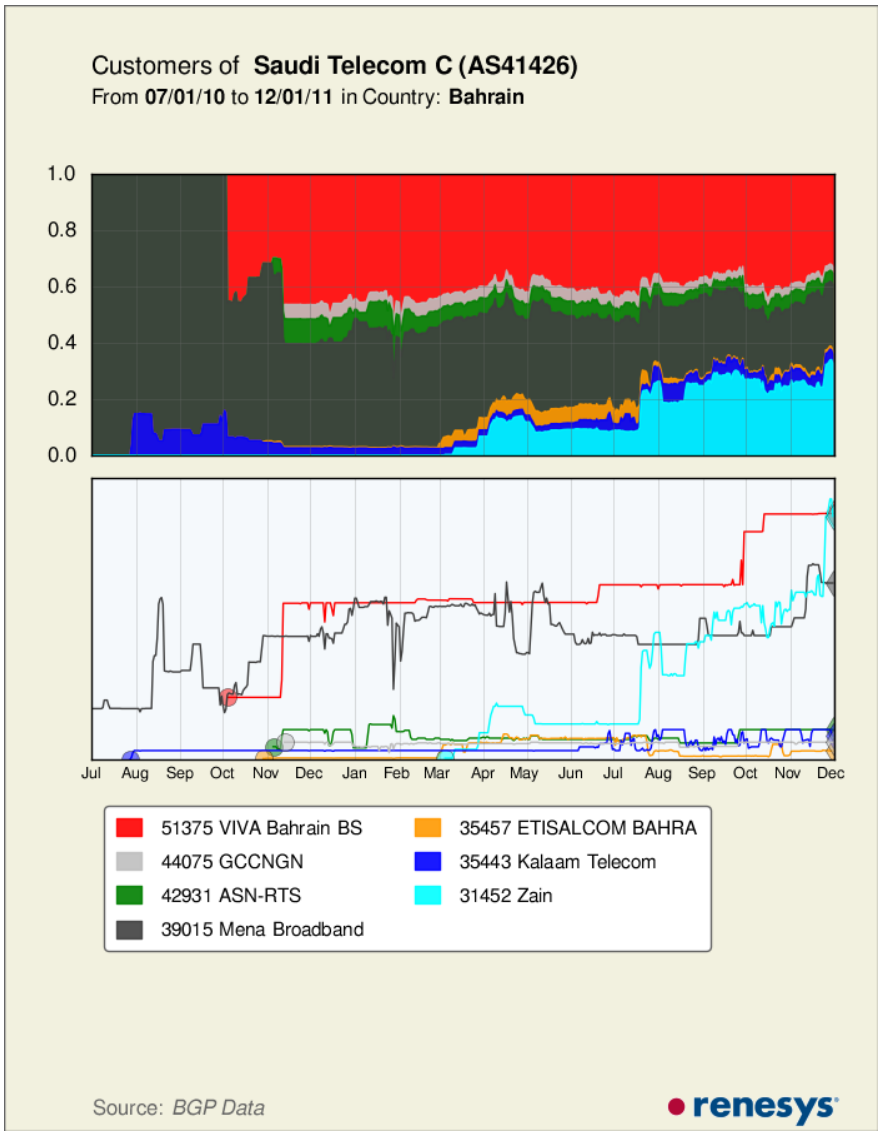
RTS and GCCNGN join in November. Etisalcom Bahrain ramps up in March 2011 after a long experimental period. Zain Bahrain follows shortly thereafter, and climbs sharply in November 2011 after Zain drops Flag in favor of STC.

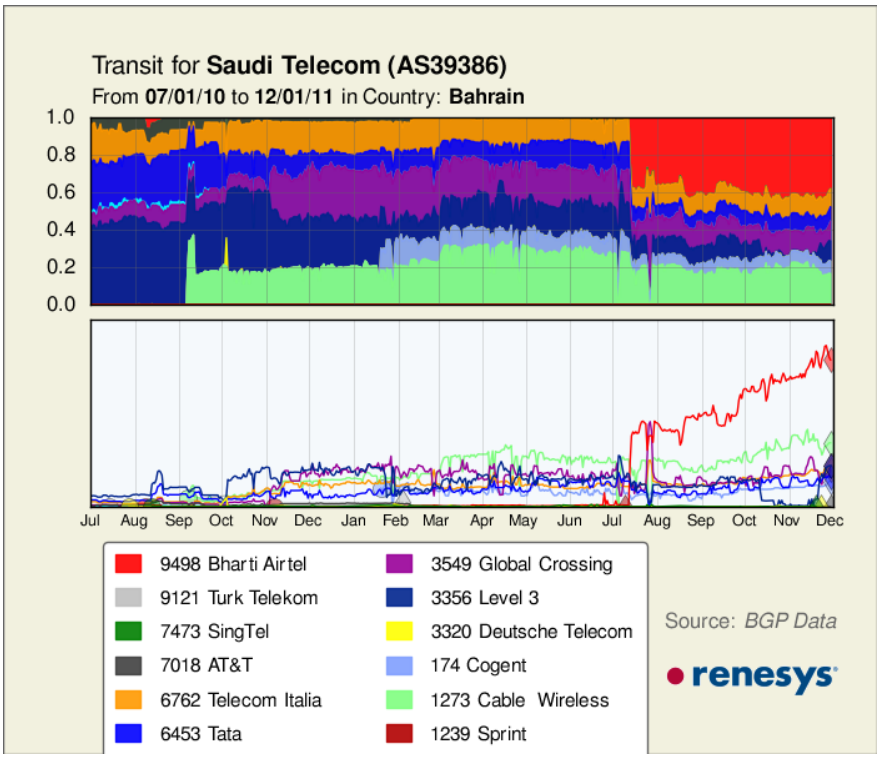
The STC upstream provider autonomous system, Saudi Telecom 39386, takes advantage of very diverse international transit to carry traffic to and from Bahrain.

Bharti Airtel (AS9496) emerged as a significant transit provider for STC 39386 in July 2011, and has rapidly become the single largest provider of international transit to STC.

Cogent has also appeared as a provider in Saudi Arabia in the last 18 months, selling to Etihad Atheeb as well as STC.

The arrival of Cogent in a national market traditionally signals lower prices ahead; we'll see whether this is true in Saudi Arabia, and whether the benefits will trickle down to Bahrain.



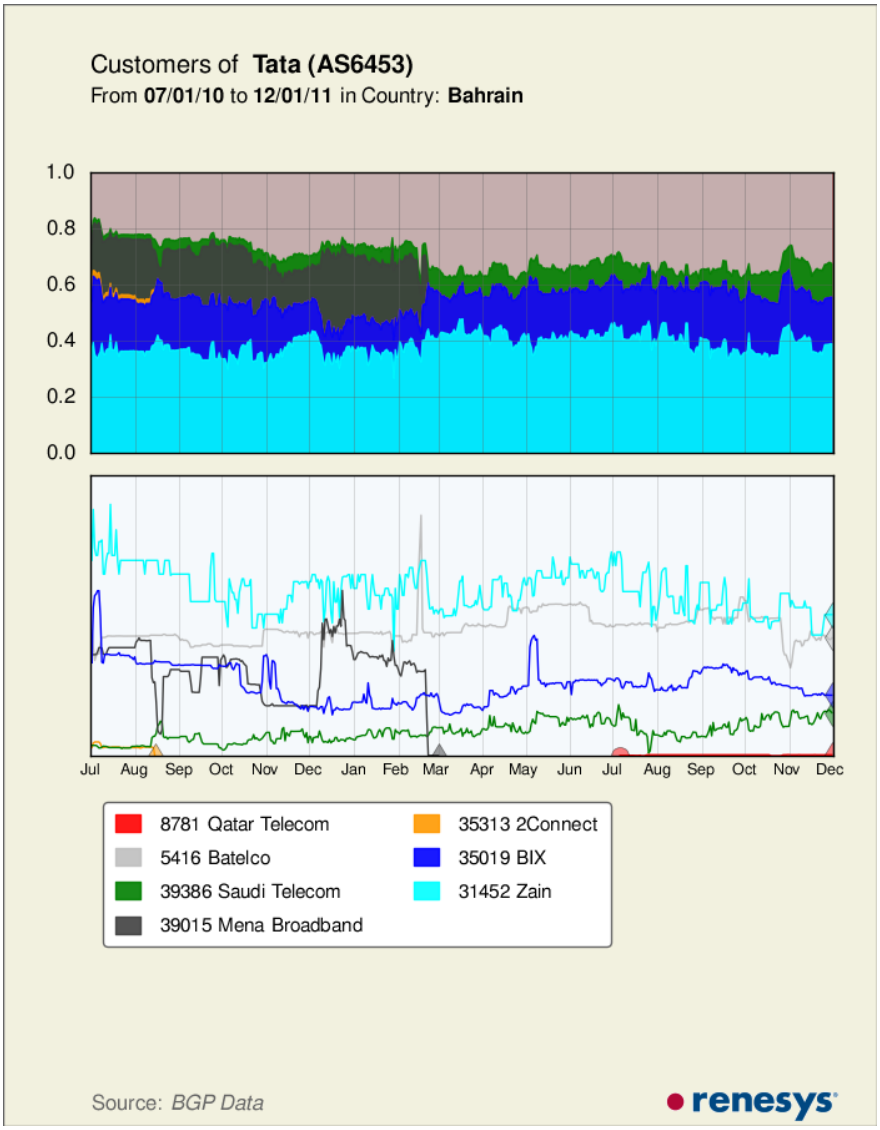


Tata

When the new Tata cable comes ashore in 2012, it seems reasonable to predict that both Tata and the BIX will regain some additional share of the Bahrain routing table. The impact of the GBI cable, landed by the incumbent, will be harder to predict.

Even in the face of new competition from Flag and STC for Bahrain transit, however, Tata continues to hold the leading position among international transit providers.

Aside from the loss of Mena Broadband, Tata's three major remaining customers (Batelco, Zain Bahrain, and the BIX) seem to be holding fast. Still, Tata's overall on-net share of the domestic market has dropped from 99% to 84% over the course of the year.



Summary: Key International Transit Providers

The table below summarizes the four-year evolution of the percentage of the Bahrain Internet marketplace that each international transit provider holds as a direct or indirect transit customer.

Note that Flag's on-net percentage appears to have peaked at 64% in January 2011. Saudi Telecom's growth in 2011 is clearly evident, and by year's end STC had nearly half of the Bahrain market on net.

CC	ASN	NSP	Jul-07	Jan-08	Jul-08	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Dec-11
BH	6453	Tata	93%	95%	92%	99%	97%	93%	93%	99%	77%	84%
BH	15412	Flag Telecom	42%	46%	32%	26%	22%	26%	20%	64%	52%	37%
BH	8966	Emirates			27%	31%	35%	35%	38%	29%	16%	11%
BH	39386	Saudi Telecom								24%	27%	45%

Market Dominance of Domestic Providers: "On-Net" Percentages

On-net percentages can also be used as a reasonable metric for examining relative domestic provider dominance, by measuring the weighted percentage of the national market served as customers of a given provider (directly or indirectly).

If there are several domestic providers in a given market with similar on-net percentages below 50%, it's more likely that the market supports significant competition. If one domestic provider has more than 75% of the country's address space on-net, on the other hand, it can be a sign that competition is limited.

In the tables of domestic provider on-net numbers on the following pages, note that **Iran, Syria, the UAE, Qatar,** and **Oman** all have a single largest domestic carrier with more than 75% of the domestic market on-net, potentially signaling an IP transit market in which competition is limited.

Jordan, Lebanon and **Saudi Arabia** are intermediate cases, whose incumbent provider still retains between 50% and 75% of the national market on-net. In each case, the emergence of a strong competitor (typically a mobile provider) is driving demand for international transit on better terms. As rival solutions to the international transit puzzle emerge, and domestic providers reach out to international carriers directly, the incumbent's share of domestic on-net market gradually declines.

Kuwait, Egypt, Iraq, and **Bahrain** all have a largest domestic provider with less than 50% of the market on-net, indicating that no single provider controls access to a simple majority of IP space.

Here, on-net percentages **may sum to more than 100%** if one of these domestic providers sells to one of the other listed domestic providers, as they each get credit for their overlapping customer bases.

Some specific 2011 trends in regional Internet economies are visible in these tables:

- In **Lebanon,** the landing of the IMEWE cable in December 2010 and its subsequent service activation in December 2011 have attracted more transit customers to the national incumbent, ironically reducing the level of national Internet diversity while expanding the available capacity.
- In **Oman**, the competitor (Nawras/Omani Qatari Telecom) has blossomed in the final months of 2011, and now has a third of the country's domestic market on-net. The incumbent, Omantel, has reduced its share from 100% to 86%. This may herald a trend toward market liberalization in anticipation of the EPEG international cable project and the establishment of a regional Internet exchange in Oman.
- In **Syria**, the only alternative transit provider (Syrian Communications Society, AS24814) went off the air entirely in the Spring of 2011.

Other regional Internet markets were largely unchanged in 2011, with existing providers retaining their relative market share from the Internet transit perspective.

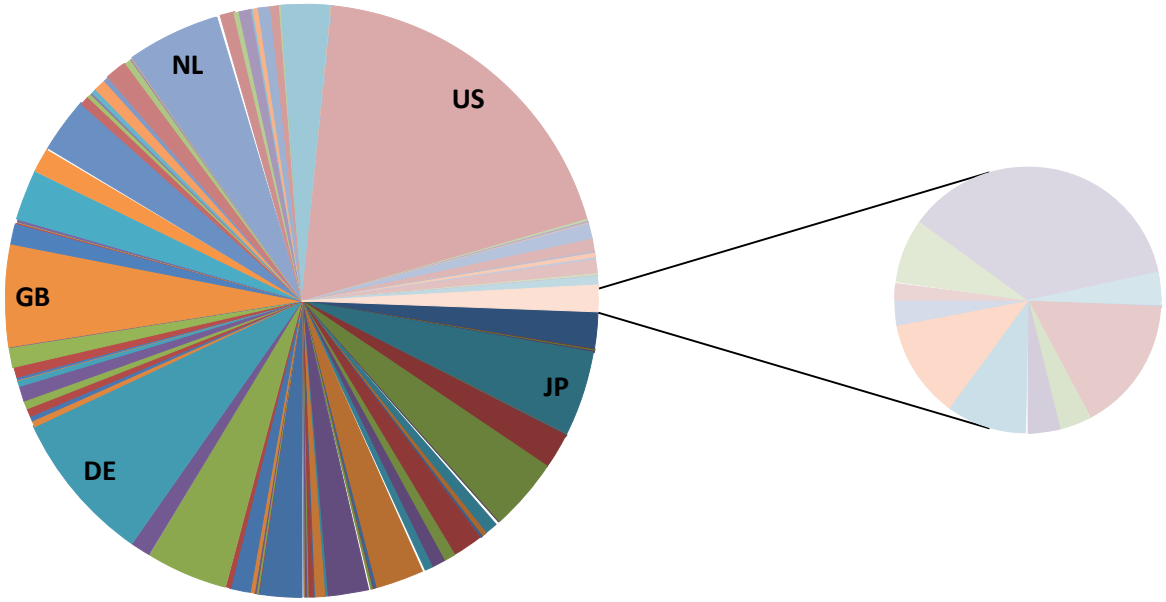
CC	ASN	NSP	Jul-07	Jan-08	Jul-08	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Dec-11
AE	**8966**	**Emirates Telecom**	**90%**	**92%**	**93%**	**97%**	**97%**	**98%**	**98%**	**97%**	**94%**	**98%**
AE	5384	Emirates Internet	71%	77%	82%	78%	79%	80%	71%	72%	70%	72%
AE	15802	Emirates Integrated Telecom	26%	21%	16%	20%	19%	19%	28%	27%	28%	27%
BH	**5416**	**BATELCO-BH**	**41%**	**45%**	**55%**	**40%**	**34%**	**31%**	**27%**	**21%**	**20%**	**19%**
BH	31452	Zain Bahrain	4%	4%	7%	24%	27%	27%	33%	25%	26%	23%
BH	39015	Mena Broadband	2%	2%	1%	5%	10%	15%	17%	26%	24%	23%
BH	51375	Viva Bahrain	--	--	--	--	--	--	--	9%	10%	13%
BH	35019	Bahrain Internet Exchange	51%	45%	31%	32%	36%	26%	21%	29%	17%	13%
EG	**8452**	**TE**	**34%**	**55%**	**80%**	**82%**	**51%**	**39%**	**34%**	**41%**	**36%**	**45%**
EG	36992	ETISALAT MISR	--	--	--	--	18%	25%	34%	33%	39%	31%
EG	24863	Link Egypt (Link.NET)	25%	19%	19%	21%	31%	33%	27%	24%	24%	26%
EG	24835	RAYA Telecom	24%	29%	27%	24%	20%	14%	16%	18%	16%	16%
EG	15475	Nile Online	19%	14%	10%	13%	12%	14%	7%	6%	7%	--%
IQ	21277	Newroz Telecom Ltd.	--	--	--	8%	17%	21%	26%	**45%**	**43%**	**36%**
IQ	44217	IQ Networks	--	--	--	--	--	--	12%	28%	21%	33%
IQ	49571	CellNet ltd ASN block	--	--	--	--	--	10%	10%	13%	10%	6%
IQ	50597	ScopeSky Communication	--	--	--	--	--	--	--	9%	8%	5%
IR	**12880**	**DCI**	**90%**	**91%**	**94%**	**98%**	**94%**	**92%**	**90%**	**90%**	**90%**	**94%**
IR	6736	IRANET/IPM	3%	2%	4%	5%	9%	11%	14%	16%	14%	10%
IR	21341	Soroush Rasaneh Institute	16%	13%	14%	15%	16%	13%	10%	7%	7%	5%
JO	**8697**	**Jordan Telecom**	**97%**	**100%**	**100%**	**100%**	**88%**	**85%**	**77%**	**76%**	**79%**	**76%**
JO	8376	Jordan Data Communications	34%	38%	36%	46%	41%	44%	37%	41%	45%	41%
JO	47887	NEU Telecom	--	--	--	--	--	--	--	10%	11%	11%
JO	42912	XOL Jo	--	--	--	--	1%	5%	11%	10%	8%	12%
JO	9038	Batelco Jordan	9%	16%	15%	12%	11%	8%	8%	9%	9%	9%

Percentage of domestic market on-net with leading providers. Dominant incumbents typically have 75%+ on-net. Percentages that add to more than 100% signify multihoming (consumer networks on-net with multiple providers).

CC	ASN	NSP	Jul-07	Jan-08	Jul-08	Jan-09	Jul-09	Jan-10	Jul-10	Jan-11	Jul-11	Dec-11
KW	43852	Kuwait Data Center co.	--		--	27%	23%	30%	33%	**36%**	**20%**	**25%**
KW	9155	QualityNet	27%	26%	28%	28%	20%	25%	26%	42%	31%	24%
KW	21050	Fast W.L.L.	24%	19%	17%	20%	20%	19%	19%	24%	16%	16%
KW	6412	KEMS	22%	24%	26%	22%	26%	23%	21%	20%	27%	26%
KW	3225	Gulfnet Kuwait	18%	24%	20%	13%	17%	16%	15%	18%	16%	14%
KW	29357	WATANIYA TELECOM	1%	5%	5%	9%	9%	9%	18%	17%	14%	19%
KW	42961	MTC GPRS	--	--	--	--	--	--	--	15%	28%	27%
LB	**42020**	**Liban Telecom**	**--**	**40%**	**30%**	**45%**	**66%**	**64%**	**63%**	**68%**	**69%**	**86%**
LB	42003	OGERO Telecom	18%	26%	21%	23%	42%	42%	46%	54%	50%	51%
LB	20535	InSat GmbH	--	4%	3%	2%	2%	3%	6%	--%	--%	--%
LB	39010	TerraNet sal	25%	19%	20%	17%	17%	18%	16%	13%	12%	12%
LB	8261	Archway	--	--	--	--	--	12%	14%	--%	--%	--%
LB	24634	Cyberia	14%	18%	14%	12%	13%	13%	11%	9%	--%	--%
OM	**8529**	**OmanTel**	**98%**	**100%**	**100%**	**100%**	**100%**	**100%**	**99%**	**100%**	**100%**	**86%**
OM	28885	OmanTel NAP	98%	100%	91%	100%	100%	100%	86%	88%	85%	68%
OM	50010	Omani Qatari	--	--	--	--	--	--	13%	12%	15%	32%
QA	**8781**	**Qatar Telecom**	**83%**	**83%**	**85%**	**75%**	**98%**	**99%**	**99%**	**99%**	**99%**	**99%**
QA	29384	Qatar Foundation	17%	16%	14%	15%	15%	15%	12%	11%	13%	12%
SA	**39386**	**Saudi Telecom Company**	**70%**	**80%**	**79%**	**75%**	**65%**	**67%**	**72%**	**67%**	**66%**	**59%**
SA	25019	SaudiNet	17%	17%	24%	26%	31%	31%	48%	49%	51%	47%
SA	35819	Mobily/Bayanat	2%	2%	2%	6%	18%	15%	12%	20%	23%	28%
SA	34400	Ettihad Etisalat		4%	8%	7%	10%	11%	8%	14%	17%	21%
SY	**29386**	**Syrian Telecom**	**54%**	**63%**	**64%**	**52%**	**66%**	**84%**	**99%**	**99%**	**99%**	**100%**
SY	24814	SCS	42%	34%	32%	44%	33%	27%	28%	19%	--%	--%

Percentage of domestic market on-net with leading providers (continued). Percentages that add to more than 100% signify multihoming (consumer networks on-net with multiple providers)

Middle Eastern Share of Global IPv6 Internet Space



Collectively, the Middle East represents approximately 1% of the total IPv6 market worldwide, as measured by the Renesys Market Intelligence Internet Index.

Within the region, Iran leads IPv6 deployment, with 36.8% of the Middle East's IPv6 presence.

The GCC states collectively represent another 34%.

Bahrain's Internet providers currently do not route any IPv6 space.